US EPA RECORDS CENTER REGION 5
1004849

State of Michigan
Department of Natural Resources

HAZARDOUS WASTE FACILITY OPERATING LICENSE

Name of Licensee: Detrex Corporation, Solvents and Environmental Services Division

Name of Owner: Detrex Corporation

Name of Operator: Detrex Corporation, Solvents and Environmental Services Division

Name of Titleholder of Land: Detrex Corporation

Facility Name: Detrex Corporation, Solvents and Environmental Services Division

Facility Location: 12886 Eaton Avenue, Detroit, Michigan, 48227

EPA Identification Number: MID 091 605 972

Effective Date:

Expiration Date:

Authorized Activities

Pursuant to Michigan's Hazardous Waste Management Act, 1979 P.A. 64, as amended (Act 64), and rules promulgated thereunder by the Michigan Department of Natural Resources (MDNR), an operating license is issued to Detrex Corporation, Solvents and Environmental Services Division (hereafter called "the licensee") to operate a hazardous waste storage facility located in Detroit, Michigan, at latitude 42° 23′ 50" and longitude 83° 10′ 22". The licensee is authorized to conduct the following hazardous waste management activities:

X Storage	___ Treatment	___ Disposal
X Container	___ Tank	___ Injection Well
X Tank	___ Surface Impoundment	___ Landfill
___ Waste Pile	___ Incinerator	___ Land Application
___ Surface Impoundment	___ Other	___ Surface Impoundment

Applicable Regulations:

The conditions of this license were developed in accordance with the applicable provisions of the November 19, 1991, rules under Act 64, as amended:

X Part 2	X R 299.9614	___ R 299.9623 to R 299.9625
X Part 3	X R 299.9615	___ R 299.9626
X Part 5	___ R 299.9616	X R 299.9627
X R 299.9601 to R 299.9611	___ R 299.9617	X Part 7
X R 299.9612	___ R 299.9618	___ Part 8
X R 299.9613	___ R 299.9619 to R 299.9622	

License Approval:

The licensee shall comply with all terms and conditions of this license. This license consists of the conditions contained herein (including those in any attachments) and the applicable regulations contained in R 299.9101 through R 299.11008 as specified in the license. Applicable rules are those which are in effect on the date of issuance of this license.

This license is based on the information submitted in the revised operating license application submitted on June 26, 1991, and any subsequent amendments (hereafter referred to as "the application"). The facility shall be constructed and/or operated as specified in the application. Any inaccuracies found in this information provides grounds for the revocation or modification of this license [see R 299.9519(6)] and enforcement action. The licensee shall inform the Director of any deviation from or changes in the information in the application which would affect the licensee's ability to comply with the applicable rules or license conditions.

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

Issued this ___ day of _____, 1992,

by _____.
Roland Harmes, Director

PART I

STANDARD CONDITIONS

A. TERMINOLOGY

Throughout this license, "Act 64" means Michigan's Hazardous Waste Management Act, 1979 P.A. 64, as amended, and "rules" means the Administrative Rules for Act 64, as amended. The term "Waste Management Division" means the division within the Michigan Department of Natural Resources (MDNR) responsible for administering Act 64, as amended, and its rules. Throughout this license, "Director" means the Director of the Department of Natural Resources.

B. EFFECT OF LICENSE

Any treatment, storage, or disposal of hazardous waste not specifically authorized in this license is prohibited. Issuance of this license does not convey property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of federal, state, or local law or regulations; 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 MDNR, or a defense to any order issued or any action brought under Act 64, Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [42 USC 9606(a)], or any other statutory or common law authority providing for the protection of the public health, welfare, or safety, or the environment. 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. LICENSE ACTIONS

The filing of a request for a license modification or revocation, or the notification of planned changes or anticipated noncompliance on the part of the licensee does not stay the applicability or enforceability of any license condition.

D. 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.

E. DUTIES AND REQUIREMENTS

1. Duty to Comply.

   (a) The licensee shall comply with Act 64, its rules and all conditions of this license.

   (b) Any license noncompliance constitutes a violation of Act 64 and is grounds for enforcement action, license revocation, license modification, or denial of a license renewal application.

2. Duty to Reapply. If the licensee wishes to continue an activity allowed by this license after the expiration date of this license, the licensee shall submit a complete application for a new license to the Chief of the Waste Management Division at least 180 days before this license expires.

3. License Expiration. To the extent consistent with Section 91(2) of Act 306, MCL 24.291(2), this license and all conditions herein will remain in effect beyond the license expiration date if the licensee has submitted a timely, complete application and, through no fault of the licensee, the Director has not issued a new license.

4. Need to Halt or Reduce Activity Not a Defense. It shall not be a defense for the licensee in an enforcement action that it would have been necessary to halt or reduce the licensed activity in order to maintain compliance with the conditions of this license.

5. Duty to Mitigate.

   (a) The licensee shall take all steps necessary to prevent and to correct any threat to, or impact on, the environment or human health, welfare, or safety resulting from, or that may result from, compliance or noncompliance with any condition in this license.

   (b) Upon notification from the Director 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 halt such activity and conduct other activities as required by the Director to eliminate said endangerment. The licensee shall not resume the halted activity without the prior written approval from the Director.

6. Proper Operation and Maintenance. The licensee shall at all times properly operate and maintain all facilities and related appurtenances which are installed or used by the licensee to achieve compliance with the conditions of this license. Proper operation and maintenance includes: effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls (including appropriate quality assurance procedures). This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the license.

7. Duty to Provide Information.

   (a) The licensee shall furnish to the Director, or any authorized representative, including, but not limited to, a contractor, within a reasonable time, any information that the Director or the authorized representative may request to determine:

      (i) Whether the management of hazardous waste may present an imminent and substantial hazard to the health of persons or to the natural resources, or is endangering or causing danger to public health or the environment;

      (ii) Whether cause exists for an enforcement action, license revocation, license modification, denial of a license renewal application, or to determine compliance with this license.

   (b) The licensee shall also furnish to the Director, or any authorized representative, upon request, copies of any record required to be kept by this license.

8. Inspection and Entry. The licensee shall allow the Director, or any authorized representative, including, but not limited to, a contractor, upon the presentation of credentials and other documents as may be required by law, to:

   (a) Enter at reasonable times upon the licensee's facility and any other locations where records are required to be kept under the conditions of this license;

   (b) Have access to and receive copies of, at reasonable times, any record required to be kept under the conditions of this license;

(c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this license; and

(d) Sample or monitor, at reasonable times, any substances or parameters at any location for the purpose of determining:

(i) Whether the management of hazardous waste may present an imminent and substantial hazard to the health of persons or to the natural resources, or is endangering or causing danger to public health or the environment;

(ii) Whether cause exists for an enforcement action, license revocation, license modification, denial of a license renewal application, or to determine compliance with this license.

If samples are taken for analysis, duplicate samples and a duplicate of the analytical results shall be furnished to the licensee upon request.

9. Monitoring and Records.

(a) Samples and measurements taken by the licensee for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample of the waste to be analyzed shall be the appropriate method from Appendix I of 40 CFR Part 261. Laboratory methods used by the licensee shall be those specified in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846 (1986) or an equivalent method included in any attachment to this license. Alternate methods for obtaining a representative sample or for alternate test methods may be used if approved in writing by the Director.

(b) The Director reserves authority to require specific monitoring for hazardous wastes or hazardous waste constituents in addition to those requirements detailed in this license, if the Director finds that additional monitoring is needed to demonstrate compliance with this license, Act 64, its rules, and any other applicable laws or rules.

(c) The licensee shall submit the results of all environmental monitoring required by this license in the form of an Environmental Monitoring Report to the Chief

of the Waste Management Division within 60 days of sample collection or within 7 days of receipt of the analytical results, whichever is sooner. In addition, the licensee shall submit results of air monitoring to the Wayne County Health Department, Air Pollution Control Division.

(d) The licensee shall provide environmental monitoring information or data which it generates to any person requesting such information or data. Such information or data shall be made available on the same day the licensee forwards this information to the Chief of the Waste Management Division and to the Wayne County Air Pollution Control Division.

(e) If the licensee conducts any additional environmental sampling or analysis beyond that required by this license, the results of such sampling or analysis shall be reported in accordance with Condition I.E.9.(c) of this license. Such increased frequency shall also be indicated in the Environmental Monitoring Report.

(f) The licensee shall preserve and retain all records and documents relating to this license, including, but not limited to, all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports and records required by this license, and records of all data used to complete the application for this license for a period of at least three years from the date of the sample, measurement, report, or record. The licensee shall notify the Director, in writing, at least 90 days prior to the destruction of such records and documents, and, upon request by the Director, the licensee shall deliver all such records and documents to the Director. This period may be extended by the Director at any time and is automatically extended during the course of any unresolved enforcement action regarding this facility.

(g) Records of monitoring information shall specify:

(i) The dates, exact place, and times of sampling or measurements;

(ii) The individuals who performed the sampling or measurements;

(iii) The dates analyses were performed;

(iv) The analytical techniques or methods used; and

(v) The results of such analyses.

10. Facility Modifications. The licensee shall give notice to the Chief of the Waste Management Division as soon as possible prior to any physical modifications to the licensed facility. In accordance with R 299.9519, the licensee shall request and obtain a license amendment prior to undertaking any modifications to the facility. The licensee shall obtain a construction permit prior to expanding, enlarging, or altering the facility.

11. Anticipated Noncompliance. The licensee shall give advance notice to the Chief of the Waste Management Division as soon as the licensee becomes aware of any changes or activity in the licensed facility which may result in noncompliance with license requirements.

12. Transfer of License. In accordance with R 299.9522, the licensee shall obtain the approval of the Director, by a modification to the license, prior to transferring ownership or operation of the facility to another person. In addition, the licensee shall comply with the requirements of R 299.9605 when transferring the ownership of the facility. The new owner/operator shall not accept hazardous waste at the facility unless the license modification has been issued by the Director.

13. Reporting of Noncompliance.

(a) The licensee shall immediately report to the Director any noncompliance with the license that may endanger human health or the environment. The licensee shall fulfill this reporting requirement by immediately contacting the Chief of the Waste Management Division at 517-373-2730, if the noncompliance occurs during the period 8:00 a.m. to 5:00 p.m., Monday through Friday, except State holidays, or by calling the Department of Natural Resources Pollution Emergency Alerting System (PEAS) at 1-800-292-4706 during all other times. This report shall include the following:

(i) Information concerning the release or discharge of any hazardous waste or hazardous waste constituent which may endanger public drinking water supplies or the environment.

(ii) Information concerning the release or discharge of any hazardous waste or hazardous waste constituent,

or of a fire or explosion at the facility, which could threaten the environment or human health.

(iii) A description of the occurrence and its cause, including:

(A) Name, address, and telephone number of the owner or operator;

(B) Name, address, and telephone number of the facility;

(C) Date, time, and type of incident;

(D) Name and quantity of materials involved;

(E) The extent of injuries, if any;

(F) An assessment of actual or potential hazard to the environment and human health where this is applicable; and

(G) Estimated quantity and disposition of recovered material that resulted from the incident.

(b) The licensee shall also follow-up the verbal report by providing a written report to the Chief of the Waste Management Division within five days of the time the licensee becomes aware of the circumstances. The written report shall contain all of the information in Condition I.E.13.(a)(iii) 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 licensee need not comply with the five day written notice requirement if the Chief of the Waste Management Division waives the requirement and the licensee submits a written report containing this information within 15 days of the time the licensee becomes aware of the circumstances.

14. Other Noncompliance. The licensee shall report all other instances of noncompliance not otherwise required to be reported above, 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 I.E.13. of this license.

15. Other Information. Whenever the licensee becomes aware that he/she failed to submit any relevant facts in the license application, or submitted incorrect information in a license application or in any report to the Director, the licensee shall promptly submit such facts or information.

16. Public Utility Notification. The licensee shall notify any public utility of any excavation, tunneling, or discharging of explosives or demolition of buildings that may affect the utility's facilities in accordance with Act 53 of the Public Acts of 1974, MCL 460.701 to 460.718, and comply with each of the requirements of that Act.

F. ENVIRONMENTAL AND HUMAN HEALTH STANDARDS

The licensee shall operate the facility in a manner that will prevent all of the following:

1. Endangerment or damage to human health, welfare, or the environment.

2. Violations of the federal Clean Water Act or the Michigan Water Resources Commission Act, 1929 P.A. 245, as amended.

3. Air emissions in violation of the federal Clean Air Act or the Michigan Air Pollution Act, 1965 P.A. 348, as amended.

4. Exposure of humans or the environment to harmful quantities of hazardous waste or hazardous waste constituents.

5. Pollution, impairment, or destruction of the natural resources of the state.

G. SIGNATORY REQUIREMENT

The licensee shall insure that all reports required by this license or other information requested by the Director are signed by a responsible corporate officer. A responsible corporate officer means (i) a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million, if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures, or (iii) by a duly authorized representative

of the corporation. A person is a duly authorized representative of the corporation only if:

1. The authorization is made in writing by a principal executive officer of at least the level of vice president.

2. The authorization specifies either an individual or a position having responsibility for overall operation of the regulated facility or activity.

3. The written authorization is submitted to the Director.

H. DOCUMENTS TO BE MAINTAINED AT FACILITY SITE

The licensee shall maintain at the facility, until closure is completed and certified by an independent registered professional engineer, the following documents and amendments required by this license:

1. Waste analysis plan.
2. Inspection schedules.
3. Personnel training documents and records.
4. Contingency plan.
5. Closure plan.
6. Cost estimate for facility closure.
7. Up-to-date closure financial assurance instrument(s).
8. Operating log.
9. Site security plan.
10. Facility engineering plans and specifications.
11. Recordkeeping procedures.
12. Up-to-date liability insurance instrument or financial test.
13. Environmental monitoring sampling and analysis plans.
14. Environmental monitoring data and statistical records.
15. Preventative procedures (personnel protection plan).

PART II

GENERAL FACILITY CONDITIONS

A. DESIGN AND OPERATION OF FACILITY

The licensee shall maintain and operate the facility to minimize the possibility of a fire, explosion, or any sudden or non-sudden release of any hazardous waste constituents to the environment, including air, soil, or waters of the state which could threaten human health or welfare or the environment.

B. REQUIRED NOTICE

1. The licensee shall notify the Director in writing at least four weeks in advance of the date the licensee expects to receive hazardous waste from a foreign source. Notice of subsequent shipments of the same waste from the same foreign source in the same calendar year is not required. When receiving such hazardous waste, the licensee shall comply with applicable laws, including, but not limited to, any treaties or other agreements entered into between the country in which the foreign source is located and the United States.

2. When the licensee is to receive hazardous waste from an off-site source (except where the licensee is also the generator), he must inform the generator in writing that he has the appropriate license for, and will accept, the waste the generator is shipping. The licensee must keep a copy of this written notice as part of the operating log (see Condition II.J.1.).

C. GENERAL WASTE ANALYSIS

The licensee shall follow the procedures described in the attached waste analysis plan, Attachment 1 of this license.

D. SECURITY

The licensee shall comply with the security requirements of R 299.9605 and 40 CFR §264.14, which is adopted by reference in R 299.11003.

E. GENERAL INSPECTION REQUIREMENTS

1. The licensee shall follow the inspection schedule, Attachment 2 of this license. The licensee shall remedy any deterioration or malfunction of equipment or structures which the inspection reveals and make these corrections on a schedule which ensures that the condition does not and will

not threaten human health or welfare or the environment. Where a hazard is imminent or has already occurred, full remedial action must be taken immediately, but in any event, full remedial action shall be taken within a reasonable time. The licensee shall record inspections in an inspection log or summary and keep these records for at least three years from the date of inspection. The licensee shall notify the Director, in writing, at least 90 days prior to the destruction of such records and documents, and, upon request by the Director, the licensee shall deliver all such records and documents to the Director. The records shall include:

(a) The date and time of the inspection;
(b) The name of the inspector;
(c) A notation of the observations made; and
(d) The date and nature of any repairs or other remedial actions.

2. The licensee shall inspect the cargo portion of each waste-hauling vehicle to verify that it is empty of hazardous waste before the vehicle leaves the facility. Records of all such inspections shall be maintained by the licensee for a period of six months after the inspection was made. If an inspection reveals that waste remains in the vehicle, the licensee shall take all steps necessary to assure that the waste is removed from the vehicle before it leaves the facility. Inspection and waste removal shall be accomplished only in accordance with the procedures in the inspection schedule, Attachment 2 of this license. This inspection requirement shall not apply to vehicles transporting waste that has been rejected, or waste that is manifested to another hazardous waste management facility.

F. PERSONNEL TRAINING

The licensee shall conduct personnel training as required by Act 64 and its rules. This training program shall follow the attached outline, Attachment 3 of this license. The licensee shall maintain training documents and records as required by R 299.9605 and 40 CFR §264.16(d), which is adopted by reference in R 299.11003.

G. PREPAREDNESS AND PREVENTION

1. Required Equipment. At a minimum, the licensee shall equip the facility with the equipment set forth in the contingency plan, Attachment 4 of this license.

2. Testing and Maintenance of Equipment. The licensee shall test and maintain the equipment specified in Condition

II.G.1. of this license to assure its proper operation in time of emergency.

3. Access to Communications or Alarm System. The licensee shall maintain access to the communications or alarm system as required by R 299.9606 and 40 CFR §264.34, which is adopted by reference in R 299.11003.

4. Required Aisle Space. At a minimum, the licensee shall maintain aisle space as required by R 299.9606 and 40 CFR §264.35, which is adopted by reference in R 299.11003.

5. Arrangements with Emergency Response Teams. The licensee shall attempt to make arrangements for emergency services with state and local authorities as required by R 299.9606 and 40 CFR §264.37, which is adopted by reference in R 299.11003. If state or local officials refuse to enter into the preparedness and prevention arrangements with the licensee, the licensee must document this refusal in the operating log.

H. CONTINGENCY PLAN

1. Implementation of Plan. The licensee shall immediately implement the contingency plan, Attachment 4 of this license, and follow the emergency procedures described in R 299.9607 and 40 CFR §264.56 whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which threatens or could threaten human health or welfare or the environment. The provisions of 40 CFR §264.56 are adopted by reference in R 299.11003.

2. Copies of Plan. The licensee shall provide copies of the contingency plan as required by R 299.9607 and 40 CFR §264.53, which is adopted by reference in R 299.11003.

3. Amendments to Plan. The licensee shall annually review and revise as necessary, the contingency plan, in accordance with R 299.9607 and 40 CFR §264.54, which is adopted by reference in R 299.11003. All proposed revisions to the contingency plan shall be submitted to the Director for approval. If approved, the revisions shall become part of this operating license.

4. Emergency Coordinator. The licensee shall comply with the requirements of R 299.9607 and 40 CFR §264.55, concerning the emergency coordinator. The provisions of 40 CFR §264.55 are adopted by reference in R 299.11003.

I. MANIFEST SYSTEM

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

J. RECORDKEEPING AND REPORTING

1. Operating Log (Record). The licensee shall maintain a written operating log at the facility in accordance with R 299.9609.

2. Biennial Report. The licensee shall comply with the biennial report requirements of R 299.9610.

K. CLOSURE

1. Performance Standard. The licensee shall close and partially close the facility in accordance with the closure plan, Attachment 5 of this license, R 299.9613 and 40 CFR §264.111, which is adopted by reference in R 299.11003, and all other applicable requirements of this license, and all other applicable laws.

2. Amendments to Closure Plan. The licensee shall amend the closure plan if, at any time during the active life of the facility, proposed changes in operation or facility design will affect the closure plan, increase closure costs, or whenever there is a change in the expected year of closure. The licensee shall not implement the proposed changes unless the amended closure plan is approved by the Director and all other necessary approvals have been obtained.

   The licensee shall submit a proposed amended copy of the closure plan to the Director at the same time a license modification is requested.

3. Notification of Closure. The licensee shall notify the Director at least 45 days prior to initiating closure.

4. Time Allowed for Closure. After receiving the final volume of hazardous waste, the licensee shall remove from the site all hazardous waste in accordance with the schedule specified in the closure plan, Attachment 5 of this license. After receiving the final volume of hazardous waste, the licensee shall complete final closure activities in accordance with the schedule specified in the closure plan, Attachment 5 of this license.

5. Disposal or Decontamination of Equipment. During final or partial closure, the licensee shall properly dispose or decontaminate all contaminated facility equipment, structures, and soil.

6. Certification of Closure. When closure or partial closure is complete, the licensee shall submit to the Director, within 60 days, certification both by the owner or operator and by an independent registered professional engineer that the facility has been closed or partially closed in accordance with the approved closure plan.

L. COST ESTIMATE FOR FACILITY CLOSURE

1. The licensee's current closure cost estimate, prepared in accordance with R 299.9702(1) and 40 CFR §264.142(a), which are adopted by reference in R 299.11003, is specified in Attachment 6 of this license.

2. The licensee shall adjust the closure cost estimate for inflation within 60 days prior to the anniversary of the date of the establishment of the financial instrument used to demonstrate financial assurance as required by R 299.9702(1) and 40 CFR §264.142(b), which are adopted by reference in R 299.11003. If the financial instrument used is the financial test, the licensee shall adjust the closure cost estimate for inflation within 30 days after the close of the firm's fiscal year. Whenever the current cost estimate increases to an amount greater than the current value of the associated financial instrument for reasons other than inflation, the licensee shall, within 60 days, increase the value of the instrument to an amount at least equal to the adjusted cost estimates. Evidence of such increases must be submitted to the Chief of the Waste Management Division during the 60 day period.

3. The licensee shall revise the closure cost estimate whenever there is a change in the facility's closure plan, as required by R 299.9702(1) and 40 CFR §264.142(c), which are adopted by reference in R 299.11003.

4. The licensee shall keep at the facility the latest closure cost estimates as required by R 299.9702(1) and 40 CFR §264.142(d), which are adopted by reference in R 299.11003.

M. FINANCIAL ASSURANCE FOR FACILITY CLOSURE

1. The licensee shall provide and continuously maintain a closure financial assurance instrument approved by the Director in at least the amount of the cost estimates

required by Condition II.L. of this license. The licensee shall submit all proposed changes in financial assurance instruments to the Director and obtain his approval prior to implementation. In addition, the licensee shall maintain copies at the facility and shall make these documents available for inspection upon request from a MDNR representative.

2. The licensee shall provide the Chief of the Waste Management Division with a signed original of an approved renewal or replacement closure financial assurance instrument 60 days prior to the expiration date of the current instruments. Failure to provide such documentation is a violation of this license and shall be cause for the Director to access all funds provided in any financial instrument not renewed in accordance with this condition and to initiate revocation of this license.

N. LIABILITY REQUIREMENTS

The licensee shall continuously maintain liability coverage for sudden and accidental occurrences as required by R 299.9710, except as otherwise allowed by that rule.

O. INCAPACITY OF OWNERS OR OPERATORS, GUARANTORS, OR FINANCIAL INSTITUTIONS

1. The licensee shall notify the Director by certified mail of the commencement of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming the licensee as debtor, within 10 days after commencement of the proceeding.

2. A licensee who fulfills the requirements of Act 64 and its rules by obtaining a trust fund, surety bond, letter of credit, certificate of deposit, or insurance policy shall be deemed to be without the required financial assurance or liability coverage in the event of bankruptcy of the trustee or issuing institution, or a suspension or revocation of the authority of the trustee institution to act as trustee or of the institution issuing the surety bond, letter of credit, certificate of deposit, or insurance policy to issue such instruments. The licensee shall establish other financial assurance or liability coverage within 60 days after such an event.

PART III

CONDITIONS FOR STORAGE IN CONTAINERS

A. COVERAGE OF LICENSE

1. The hazardous waste container storage area shown on Drawing 7-3 is covered by this license. Any expansion or enlargement beyond the facility boundary shown on Drawings 7-1 and 7-2 or beyond the 8,250 gallon storage design capacity requires a construction permit from the Director.

2. Drawings 7-1, 7-2, 7-3, and 7-4 are incorporated into this license as Attachment 7.

B. WASTE IDENTIFICATION AND QUANTITY

1. The licensee may store no more than a total volume of 8,250 gallons of the hazardous wastes listed in Attachment 8 in a maximum of 150 55-gallon containers, or an equivalent volume in other size containers, at the facility, subject to the terms of this license.

C. CONTAINER STORAGE TIME LIMIT

1. The licensee shall not store any container of hazardous waste for more than one year at the facility prior to the recycling of its contents on-site or shipment off-site to another appropriately licensed hazardous waste treatment or disposal facility.

2. The licensee shall maintain an accurate inventory of the wastes stored in containers, including the dates on which each container is received and either recycled on-site or shipped off-site to another appropriately licensed hazardous waste treatment or disposal facility.

D. CONDITION OF CONTAINERS

If a container holding hazardous waste is not in good condition (e.g., severe rusting, apparent structural defects) or if it begins to leak, the licensee shall transfer the hazardous waste from such container to a container that is in good condition, or otherwise manage the waste in compliance with the conditions of this license.

E. COMPATIBILITY OF WASTE WITH CONTAINERS

The licensee shall assure that the ability of the containers to contain the waste is not impaired as required by R 299.9614 and 40 CFR §264.172, which is adopted by reference in R 299.11003.

F. MANAGEMENT OF CONTAINERS

1. The licensee shall keep all containers holding hazardous waste closed during storage except when it is necessary to add or remove waste, and shall not open, handle, or store containers in a manner which may rupture the containers or cause them to leak, as required by R 299.9614 and 40 CFR §264.173, which is adopted by reference in R 299.11003.

2. The licensee is prohibited from storing containers of hazardous waste in locations at the facility other than the hazardous waste container storage area referenced in Condition III.A.1.

3. The licensee shall place containers into the hazardous waste container storage area only in accordance with the configuration shown in Drawing 7-4 in Attachment 7 of this license or an alternate configuration approved by the Chief of the Waste Management Division.

4. The licensee shall not stack containers of hazardous waste greater than two high.

G. CONTAINMENT

The licensee shall operate and maintain the containment system in accordance with the requirements of R 299.9614 and 40 CFR §264.175, which is adopted by reference in R 299.11003, and the attached plans and specifications, Attachment 7 of this license.

H. LABELING OF CONTAINERS

1. The licensee shall ensure that each container of hazardous waste is labeled or marked clearly with the words "Hazardous Waste" and the hazardous waste number, as required by R 299.9614, and the date it was accepted for storage so that compliance with the one year storage limit can be assessed. The labels on each container shall be clearly visible for inspection.

2. The licensee shall clearly mark each container of land disposal restricted waste to identify its contents and the

date it was accepted for storage, as required by R 299.9627 and 40 CFR §268.50(a)(2)(i), which is adopted by reference in R 299.11003.

I. 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 R 299.9614(1)(a) and 40 CFR §264.175(b)(5), which is adopted by reference in R 299.11003, and as specified in Attachments 4 and 9 of this license.

PART IV

CONDITIONS FOR STORAGE IN TANKS

A. COVERAGE OF LICENSE

1. The hazardous waste storage tanks shown on Drawings 7-5, 7-6, and 7-7 are covered by this license. Any expansion or enlargement beyond the facility boundary shown on Drawings 7-1 and 7-2 or beyond the 5,500 gallon tank storage design capacity requires a construction permit from the Director.

2. Drawings 7-1, 7-2, 7-5, 7-6, and 7-7 are incorporated into this license as Attachment 7.

B. STORED WASTE IDENTIFICATION AND QUANTITY

1. The licensee may store no more than a total volume of 1,900 gallons in Tank 12 and 3,600 gallons in Tank 22 of the hazardous wastes listed in Attachment 8 in the tanks identified as Tanks 12 and 22 in Attachment 7, subject to the terms of this license.

C. DESIGN, CONTAINMENT AND ASSESSMENT OF TANK SYSTEMS

The licensee shall operate and maintain all tanks and associated appurtenances, including piping and secondary containment structures, in accordance with the applicable requirements of R 299.9615 and 40 CFR §264.192, §264.193, and §264.194, which are adopted by reference in R 299.11003, and the attached plans and specifications, Attachment 7 of this license.

D. GENERAL OPERATING REQUIREMENTS

1. As required by R 299.9615 and 40 CFR §264.194(a), which is adopted by reference in R 299.11003, the licensee shall not place hazardous wastes or treatment reagents in a tank system if they could cause the tank, its ancillary equipment, or the containment system to rupture, leak, corrode, or otherwise fail.

2. The licensee shall use appropriate controls and practices to prevent spills and overflows from tank or containment systems, as required by R 299.9615 and 40 CFR §264.194(b), which is adopted by reference in R 299.11003, by methods specified in Attachment 10 of this license.

3. The licensee shall immediately remove from service any tank system or containment system from which there has been a leak or spill, or which is unfit for use, and shall comply with the requirements of R 299.9615 and 40 CFR §264.196, which is adopted by reference in R 299.11003.

E. PROHIBITION ON STORING OR TREATING REACTIVE WASTES OR MATERIALS IN TANK SYSTEMS

The licensee is prohibited from storing or treating reactive wastes or materials in tank systems at the facility.

F. PROHIBITION ON STORING OR TREATING INCOMPATIBLE WASTES OR MATERIALS

The licensee is prohibited from placing incompatible wastes in the same tank system or placing hazardous waste in a tank system that previously held an incompatible waste or material.

G. INVENTORY AND RECORDKEEPING REQUIREMENTS

1. The licensee shall maintain an accurate inventory of the hazardous waste stored in tanks, including the date on which the contents of the tank are processed.

2. The licensee shall label tanks in accordance with the provisions of NFPA Standard No. 704 as required by R 299.9615(4).

3. The licensee shall clearly mark each tank containing land disposal restricted waste to identify its contents, the quantity of each hazardous waste received, and the date each period of accumulation begins, or record such information in the facility operating record, as required by R 299.9627 and 40 CFR §268.50(a)(2)(ii), which is adopted by reference in R 299.11003.

4. The licensee shall not store any hazardous waste in tanks for more than one year prior to recycle of the waste on-site or shipment of the waste to another appropriately licensed waste management facility.

H. DISPOSITION OF LIQUIDS ACCUMULATED IN CONTAINMENT SYSTEM

The licensee shall remove spilled or leaked waste and accumulated precipitation from the secondary containment system within 24 hours of detection and manage the collected material in accordance with the requirements of R 299.9615(1) and 40 CFR §264.193(b)(4), which is adopted by reference in R 299.11003, and the procedures in Attachments 4 and 9 of this license.

I. COMPLIANCE WITH AIR EMISSION AND WASTE MANAGEMENT REQUIREMENTS FOR STORAGE AND TREATMENT IN TANKS

The licensee shall comply with the applicable air emission and waste management requirements for hazardous waste storage and treatment in tanks as specified in Conditions VI.C. of this license.

PART V

ENVIRONMENTAL MONITORING CONDITIONS

A. AMBIENT AIR MONITORING PROGRAM

1. The licensee shall conduct ambient air monitoring in accordance with R 299.9611(2)(b) and the program specified in Attachment 11 of this license.

2. The licensee shall report ambient air monitoring results as required by Condition I.E.9.(c) of this license.

PART VI

CONDITIONS FOR AIR EMISSIONS

A. COVERAGE OF LICENSE

The hazardous waste management equipment and air pollution control equipment regulated by the Wayne County Health Department, Air Pollution Control Division (WCAPCD), and by this license is:

1. Hazardous Waste Storage Tank Number 12 (WCAPCD Permit Number C-7031)

2. Hazardous Waste Storage Tank Number 22 (WCAPCD Permit Number C-7032)

3. Carbon Adsorption System (WCAPCD Permit Number C-8644)

B. GENERAL CONDITIONS

1. Not more than 30 days after completion of the installation of the equipment listed in Condition VI.A. of this license (the emission sources), the licensee shall apply, in writing, for WCAPCD Certificates of Operation. Written application shall be sent to: Mr. Michael Maillard, Chief, Enforcement Services, Wayne County Department of Health, Air Pollution Control Division, 640 Temple Street, Suite 700, Detroit, Michigan 48201-2558.

2. Trial operation of the emission sources shall be allowed for 90 days, provided such operation is in compliance with all of the terms and conditions contained in the WCAPCD Installation Permits. If a Certificate of Operation has not been issued for an emission source prior to the expiration of the trial operation period, an extension of trial operation may be requested of the WCAPCD Director.

3. Operation of an emission source shall permanently cease upon denial of the Certificate of Operation by the WCAPCD. Denial of a Certificate of Operation is an appealable action pursuant to Section 1401(A) of the Wayne County Air Pollution Control Ordinance, as amended.

4. The licensee shall demonstrate compliance with all WCAPCD regulation requirements and with all other applicable state and federal regulation requirements and with all general and special conditions of the Installation Permits prior to issuance of any Certificate of Operation.

5. The licensee shall not reconstruct, alter, modify, expand, or relocate the emission sources unless plans, specifications, and an application for an Installation Permit are submitted to and approved by the WCAPCD.

6. No emission source shall be operated for any other purpose or in any other manner than that for which the WCAPCD Installation Permit was approved and for which a WCAPCD Certificate of Operation has been issued, unless otherwise authorized in writing by the WCAPCD. Such emission source shall also be maintained in a state of good repair.

7. Operation of the emission sources shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant value or property, or which causes unreasonable interference with the comfortable enjoyment of life and property.

8. Operation of the emission sources shall not interfere with the attainment or maintenance of the air quality standard for any air contaminant.

9. Operation of the emission sources shall not result in significant deterioration of air quality.

10. The licensee shall provide notification of any abnormal conditions or malfunction of process or control equipment covered by this license, resulting in emissions in violation of the WCAPCD requirements or of any air permit conditions for more than two hours, to the Enforcement Section of the WCAPCD. Such notice shall be made as soon as reasonably possible, but not later than 9:00 a.m. of the next working day. The licensee shall also, within 10 days, submit to the WCAPCD Enforcement Section and to the Chief of the Waste Management Division, a written detailed report, including probable causes, duration of violation, remedial action taken, and the steps which are being undertaken to prevent a reoccurrence.

11. Approval of air permit applications by WCAPCD does not exempt the licensee from complying with any future regulations which may be promulgated.

12. Approval of air permits by WCAPCD does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law.

13. The licensee shall notify any public utility of any excavation, tunneling and discharging of explosives or demolition of buildings which may affect said utility's facilities in accordance with 1974 P.A. 53, as amended, being sections 460.701 to 460.718 of the Michigan Compiled Laws and comply with each of the requirements of that Act.

14. The restrictions and conditions of the Installation Permits shall apply to any person or legal entity which now or shall hereafter own or operate the emission sources for which the Installation Permits are issued. Any new owner or operator shall immediately notify the Director of the WCAPCD Enforcement Section, in writing, of such change in ownership or principal operator status of the emission sources.

15. If the installation, reconstruction, relocation, or alteration of the emission sources for which WCAPCD permits have been approved has not commenced within, or has been interrupted for, 18 months, these permits shall become void unless otherwise authorized by the WCAPCD.

C. SPECIAL CONDITIONS

1. Emissions of volatile organic compounds (VOCs) from the solvent reclaiming process shall not exceed 0.218 pounds per ton of reclaimed solvent nor 2.60 pounds per hour, based on trichloroethylene, and based on a minimum of 95 percent removal of VOC from the process exhaust gases.

2. Emissions of methylene chloride from the solvent reclaiming process shall not exceed 0.378 pounds per ton of reclaimed solvent nor 4.09 pounds per hour, based on a minimum of 95 percent removal of methylene chloride from the process exhaust gases.

3. Emissions of trichloroethylene from the solvent reclaiming process shall not exceed 0.218 pounds per ton of reclaimed solvent nor 2.60 pounds per hour, based on a minimum of 95 percent removal of trichloroethylene from the process exhaust gases.

4. Emissions of tetrachloroethylene from the solvent reclaiming process shall not exceed 0.180 pounds per ton of reclaimed solvent nor 2.37 pounds per hour, based on a minimum of 95 percent removal of tetrachloroethylene from the process exhaust gases.

5. Total combined emissions of methyl chloroform from the solvent reclaiming process shall not exceed 0.265 pounds per ton of reclaimed solvent nor 2.85 pounds per hour, based on a

minimum of 95 percent removal of methyl chloroform from the process exhaust gases.

6. Emissions from this process shall not exceed 150 odor units per cubic foot of exhaust gas.

7. The licensee shall not process more than 46,800 gallons per day, or 17.1 million gallons per year, of spent halogenated solvents.

8. The licensee shall not reclaim more that 8.37 million gallons of methylene chloride as product per year.

9. The licensee shall not reclaim more than 7.89 million gallons of trichloroethylene as product per year.

10. The licensee shall not operate the solvent recovery process unless all process tanks, storage tanks, and distillation units are exhausted to the carbon adsorption system and the adsorption system is operating properly.

11. The licensee shall install and maintain equipment to indicate the occurrence of breakthrough in the carbon adsorption system.

12. Prior to the occurrence of breakthrough from the carbon bed in service, that bed shall be regenerated and all process exhaust gases directed to the other carbon bed in the adsorption system.

13. The licensee shall not process any materials other than those listed in Attachment 8 of this license without prior notification to, and approval by, WCAPCD.

14. The carbon adsorption system shall be exhausted unobstructed vertically upward from a stack with a maximum diameter of 16 inches at an exit point not less than 50 feet above ground level.

15. The licensee shall comply with all applicable regulations of the Resource Conservation and Recovery Act, including those specified in 40 CFR Part 264, Subparts AA and BB, and 1979 P.A. 64, as amended.

16. The licensee shall maintain a written record of the total volume of all hazardous waste shipments received by this facility, and quantity of each solvent species reclaimed as product, during the preceding 12-month period. This record shall be made available for inspection immediately upon request by WCAPCD.

17. Stack testing shall be conducted at the licensee's expense and with prior approval of the WCAPCD to verify compliance with the emission limitations and control efficiency requirements specified in Conditions VI.C.1-5 and in 40 CFR Part 264, Subparts AA and BB. Testing shall be conducted within the period of trial operation as defined in Section 401(D) of the Wayne County Air Pollution Control Ordinance, with a written report of the results submitted to WCAPCD within 60 days of completion of testing.

18. After a determination by, and written notification from, the WCAPCD Director that emissions from the above referenced equipment are causing unreasonable interference with the common public right to live free from foul or noxious odors, the licensee shall take immediate action to abate the source of odors. The licensee shall submit an abatement program for permanent resolution of this problem within 30 days of notification by the WCAPCD.

PART VII

SCHEDULE OF COMPLIANCE

A. SCHEDULE OF COMPLIANCE CONDITIONS

The licensee shall comply with the conditions and submittal dates as specified below.

1. Within 30 days of the effective date of this license, the licensee shall upgrade the unloading/loading area secondary containment system by repairing any expansion joints and cracks, installing the new dike between the unloading/loading area and the transfer facility as shown in Attachment 7, Drawings 7-1 and 7-2, and provide the unloading/loading area secondary containment system with a protective coating.

2. Within 30 days of completing the activities outlined in Condition VII.A.1 of this license, the licensee shall submit a written report to the Chief, Waste Management Division, which summarizes all of these activities.

3. Within 30 days of request by the Chief of the Waste Management Division, the licensee shall submit a soil monitoring plan for review and approval.

Attachment 1

Waste Analysis Plan

SECTION C

WASTE CHARACTERISTICS

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SECTION C

WASTE CHARACTERISTICS

This section provides a description of the chemical and physical nature of the hazardous wastes managed in the container and tank storage areas at the Detrex Corporation facility located in Detroit, Michigan.

The Eaton Avenue facility typically receives halogenated solvent wastes for reclamation (recycling) in both drums and bulk shipments from such industries as metal working industries degreasing operations, rubber molding recovery operations, electronic circuit board defluxing operations, and paint spraying equipment cleaning operations. The facility also sells virgin solvents, consequently, personnel are familiar with the wastes that are received at the facility.

The hazardous waste management operations include container storage and tank storage. Wastes are received in container or bulk shipments. The wastes are processed through the recovery (recycling) system which primarily consists of distillation followed by drying. The recovered solvent product is drummed or stored in product tanks for re-sale and the still bottoms remaining after distillation are transferred to a 5,000 gallon generator accumulation tank. The still bottoms are accumulated for less than 90 days prior to shipment off site to a permitted facility.

The information is provided pursuant to Michigan Act 64 Rule 299.9504(1)(c) which incorporates 40 CFR 270.14(b)(2) and (3) by reference. The applicable section(s) of the Federal Regulations (40 CFR) is referenced as appropriate.

C-1 OVERVIEW OF WASTE ANALYSIS PLAN

Detrex Corporation has developed a Waste Analysis Plan to ensure the Eaton Avenue facility accepts only wastes for which the facility is permitted to receive. The Waste Analysis Plan has been prepared recognizing the nature of the wastes accepted by Detrex and based on extensive Corporate experience in the handling and recovery (i.e. recycling) of solvent wastes. A copy of the Waste Analysis Plan is maintained at the facility at all times. The Waste Analysis Plan consists of two major types of characterization.

C-1a Waste Characterization

Prior to accepting wastes from a potential new client, Detrex Corporation requires the potential client to complete and certify a "Generator's Waste Material Profile Sheet". A copy of this profile sheet is included as Attachment C-1. This profile sheet requires the waste generator to complete a chemical analysis of the waste. Detrex then collects a representative sample of the potential clients' waste stream and conducts an analytical verification/confirmation program as a secondary check on the accuracy of the Generator's documented profile sheet. Detrex Corporation reviews the profile sheet and confirmation analysis report and conducts a thorough waste generation process review at the potential clients' facility. This process review pays particular attention to the clients solvent use and solvent handling procedures that generate the waste. Based on Detrex's extensive experience in the industry, this process review, in addition to the waste profile sheet information, is sufficient to enable Detrex to make a determination that the potential clients' waste stream is acceptable for storage and processing at the solvent recovery operation.

As an ongoing process, Detrex is presently requesting Generator Waste Material Profile Sheets from all existing clients. A copy of the "call-in" letter is provided in Attachment C-1. This program will be conducted annually for all clients as a continual check on the wastes being received at the Eaton Avenue facility. At any time that a generator notifies Detrex of a change in the generation process of a waste stream, or at any time that Detrex notices a potential change in waste stream characterization based on regular waste sampling and analysis, a re-characterization program consistent with the program described above will be completed prior to accepting any further wastes from that generator. A record of the results of any annual or other necessary re-characterization review will be maintained on-site in the generator's waste profile files.

C-1b Waste Screening

The second type of waste characterization includes waste screening that is conducted on every shipment of waste that is received at the facility.

Every container or bulk shipment of waste which is received at the facility is sampled. Visual observations of the sample identifing any out of the ordinary observations are recorded. For drum sampling, a composite sample of up to a maximum of 10 drums of a particular waste type per individual generator is then collected for analytical testing prior to signing the manifest. Analytical testing may be done in the on Site laboratory or at another laboratory. The testing procedures described in the following sections are followed by either laboratory. A laboratory Quality Assurance Project Plan (QAPP) has also been developed to ensure the reliability and accuracy of analytical results.

Analytical testing consists of specific gravity, ignitability, compatibility and gas chromatography. It is to be noted that ignitability testing is conducted on a discrete sample collected from every container or bulk shipment of waste received at the facility. The analytical results are recorded on an analytical report. The lab report, in conjunction with sample observation and a review of the specific generator's past analysis and waste profile documentation enable Detrex to determine that a waste is acceptable.

Based on the above, approval is given to sign the manifest and accept the wastes into the container or tank storage areas. In the event a waste stream is unacceptable, the manifest is not signed and the original waste generator contacted to determine appropriate handling of the rejected waste. The waste would be returned by Detrex to the original generator or the manifest and land disposal restriction certificate corrected as appropriate and the waste transported to properly permitted facility on behalf of the generator.

A complete record of all sampling and analytical work is placed in the operating files at the facility.

Revised by MDNR

C-1c Waste Compatibility

Another important aspect in the management of hazardous wastes is waste compatibility.

To prevent the mixing of incompatible wastes in the hazardous waste storage tanks at the facility, Detrex will perform compatibility testing on each bulk shipment of waste and composite of container samples per waste code per generator prior to their being emptied at the facility.

Prior to emptying any waste at the facility, a representative grab sample will be collected from each bulk shipment or composited from containers of the same waste code and generator, using a sampling tube or other similar sampling device. The sample will be placed into a small metal compositing container located within a containment area at the facility. The sampling container will already contain a representative sample of the waste from the storage tank into which the waste will be added.

Following placement of the grab sample into the sampling container, the container will be observed for a minimum of two minutes for any signs of incompatibility. This observation will include, but not be limited to, the generation of heat, unexpected change in color, generation of vapors, agitation or generation of bubbles, and generation of precipitate. If none of these changes are observed and the results of the other waste screening conducted indicate that the waste is acceptable, the bulk shipment or container(s) of waste will be charged to the storage tank. If one or more of these changes are observed, the manifest will not be signed, and the bulk shipment or container(s) will be set aside, sampled, and analyzed for the waste screening parameters, or the waste will be rejected. In the event that the waste is rejected, the original waste generator will be contacted to determine appropriate handling of the rejected waste. The waste would be returned by Detrex to the original generator or the manifest and land disposal restriction certificate corrected as appropriate and the waste transported to a properly permitted facility on behalf of the generator.

C-2 CHEMICAL AND PHYSICAL ANALYSES
[40 CFR §270.14(b)(2), §264.13(a)]

Provided in Table C-1 is a list of all hazardous wastes which may be received and stored in the container or tank storage areas. In addition to the list of wastes which may be stored at the facility, Table C-1 also provides, for each waste, its EPA hazardous waste identification number, the hazardous constituent/characteristic which designates the waste as hazardous, the EPA process code, and the waste's physical state.

Provided as Attachment C-2 to this application are representative Material Safety Data Sheets for each of the solvent hazardous wastes listed in Table C-1. These sheets describe in detail the chemical and physical properties of each waste managed at the facility to allow their safe handling in accordance with 40 CFR Part 264.

The following Sections document the specific analytical procedures followed by Detrex Corporation to ensure only F001 and F002 wastes with the inclusion of D-series compounds under the TCLP rule, are accepted at the facility.

TABLE C-1

LIST OF HAZARDOUS WASTES

Hazardous Waste	*EPA Hazardous Waste Number (1)*	*Hazardous Constituent/Characteristic*	*EPA Process Code*	*Physical State*
1,1,1 Trichloroethane	F001	Toxic	S01/S02	Liquid
Trichloroethylene	F001	Toxic	S01/S02	Liquid
Perchloroethylene	F001	Toxic	S01/S02	Liquid
Methylene chloride	F001	Toxic	S01/S02	Liquid
Trichlorotrifluoroethane (Freon)	F001	Toxic	S01/S02	Liquid
1,1,1 Trichloroethane	F002	Toxic	S01/S02	Semi-Liquid*
Trichloroethylene	F002	Toxic	S01/S02	Semi-Liquid*
Perchloroethylene	F002	Toxic	S01/S02	Semi-Liquid*
Methylene chloride	F002	Toxic	S01/S02	Semi-Liquid*
Trichlorotrifluoroethane (Freon)	F002	Toxic	S01/S02	Semi-Liquid*

(1) Detrex recognizes, based on process knowledge, that these wastes may also be classified as one of the following D-series compounds based on Toxicity Characteristic Leaching Procedure: D004(Arsenic), D005(Barium), D006(Cadmium), D007 (Chromium), D008 (Lead), D009 (Mercury), D010 (Selenium), D011 (Silver), D018 (Benzene), D019 (Carbon Tetrachloride), D021 (Chlorobenzene), D022 (Chloroform), D027 (1,4-Dichlorobenzene), D028 (1,2-Dichloroethane), D029 (1,1-Dichloroethylene), D030 (2,4-Dinitrotoluene), D034 (Hexachloroethane), D035 (Methyl Ethyl Ketone), D036 (Nitrobenzene), D038 (Pyridine), D039 (Tetrachloroethylene), D040 (Trichloroethylene) and D043 (Vinyl Chloride).

* Note: Represents a waste stream that has been partially distilled at the customer's degreasing operation facility.

C-3 WASTE ANALYSIS PLAN [40 CFR §270.14(b)(3), §264.13(b),(c)]

C-3a Parameters and Rationale [40 CFR §264.13(b)(1)]

C-3a (1) Initial Waste Characterization

Profile Information

A Generator's Waste Material Profile Sheet (see Attachment C-1) is required from each potential customer for each type of waste. The information on this form includes the process description, shipping mode, physical properties, chemical properties and certification. Further waste characterization/confirmation is completed by Detrex after receipt of a complete and certified profile sheet.

Analytical Information

As part of the information requested on the profile sheet, the waste generator is required to conduct and complete a chemical analysis of the waste. Detrex Corporation is responsible for collecting a representative sample of the prospective waste stream with analysis then being conducted on the raw waste sample for the following parameters:

Comprehensive Testing

- Ignitability (D001)	- EPA SW-846 Method 1010
- Corrosivity (D002)	- EPA SW-846 Method 9040
- Reactivity (D003)	- EPA SW-846 Section 7.3
- TCLP Analysis	- EPA SW-846 Method 1311
- EP Toxicity Analysis	- EPA SW- 846 Method 1310

This testing requirement applies only to those generators who have not profiled their material as listed waste (F001, F002) and have not provided characterization of D-series compounds based on process knowledge (i.e. TCLP testing is required for generators who do not classify the TCLP compounds based on analysis or process knowledge). For generators who are profiling listed (process defined) wastes and declaring D-series compounds based in process knowledge, further analysis for the D-series characteristics parameters is not required.

It should be noted that in the event testing is required for copper and zinc, the extraction procedure (EP) toxicity testing method will be utilized until such a time that Michigan receives authority for the TCLP provisions.

Due to the nature of the solvents and processes involved in waste streams submitted to Detrex for recycling, the remaining D-series constituents are not applicable to cleaning/degreasing systems:

D012	Endrin	D025	P-Cresol
D013	Lindane	D026	Cresol
D014	Methoxychlor	D031	Heptachlor
D015	Toxaphene	D032	Hexachloroebenzene
D016	2, 4-D	D033	Hexachloro-1,3-Butadiene
D017	2,4,5-TP Silvex	D037	Pentachlorophenol
D020	Chlordane	D041	2,4,5-Trichlorophenol
D023	O-Crescol	D042	2,4,6-Trichlorophenol
D024	M-Cresol		

These compounds are therefore not required to be formally analyzed via TCLP. Rather Detrex will obtain written certification documentation from the generator verifying that these compounds are not present in the waste stream, based upon the generator's knowledge of the materials and generating processes involved. In the event such certification is not provided, analysis will be conducted by Detrex.

Certain D-series parameters also appear in the 40 CFR 261 listings (process-defined) for F003, F004, and F005 wastes, i.e.

Benzene:	D019 and F003
Methyl ethyl ketone:	D035 and F005
Nitrobenzene:	D036 and F004

Therefore, in such cases where a TCLP analysis or generators process knowledge reveals the presence of these compounds, the generator must provide additional verification of the source (usage) of these compounds, so as to determine whether the waste is to be classified as F003, F004, or F005 on the basis of the generating process.

Additional Testing

In addition, a laboratory-scale estimate of potential solvent recovery and purity is performed via rotary vacuum distillation and specific gravity testing. The overhead distillate (recovered solvent) is subsequently analyzed by Gas Chromatography.

Process Review Verification

As the final step in the pre-acceptance qualification procedure, Detrex Corporation conducts an on-Site waste generation process review at the potential client's facility. In examining the generator's solvent usage and handling procedures, Detrex confirms proper classification of the waste with reference to listing description/definitions set forth in 40 CFR part 261. Only F001 and F002 listed waste types are acceptable for storage and processing at the Detrex solvent recovery operations.

This process review, in addition to the profile and analytical information as presented above enable Detrex to make a thorough and accurate determination of the characteristic and/or listed classification of each submitted waste stream, along with subsequent final acceptability of each stream in accordance with the facility license. Documentation of waste characterization is retained on file, on a per-waste stream basis, at the facility.

If an incoming waste is properly characterized as a F001 or F002 waste stream, it should be acceptable to the process stream. The solvent content of the waste, as determined by rotary vacuum distillation and the specific gravity method, provides an estimate of the recoverable solvent yield from the waste stream. Thus, as long as a waste is properly characterized as a F001 or F002 waste, with the inclusion of D-series compounds under the TCLP rule the waste is physically acceptable to the process unit. There are no particular tolerance limits for acceptable versus unacceptable wastes.

C-3a (2) Waste Screening

Waste screening analysis is conducted on all wastes received at the facility to confirm the wastes acceptance prior to signing the manifest. The screening analysis is summarized on Table C-2 with parameter and rational for selection.

C-3b Test Methods [40 CFR §264.13(b)(2), §264.13(c)(1)]

Detrex is able to conduct all waste screening analysis at the Eaton Avenue facility. More detailed waste characterization is completed at an off-site laboratory facility following the Detrex Waste Analysis Plan. An off-site facility may also conduct screening analysis as conditions require (equipment maintenance). All containers are stored in a maintained segregated area within the hazardous waste container storage area until analysis is complete and the manifest is signed.

Detrex will conduct an ignitability test (ASTM Method D4982-89) on a discrete sample collected from each containers or bulk shipment of waste received at the facility. In the event a positive result is

TABLE C-2

PARAMETERS AND RATIONALE FOR THEIR SELECTION

Classification	*Parameter*	*Rationale*
F001 Hazardous Waste	1,1,1 Trichloroethane Trichloroethylene Perchloroethylene Trichlorotrifluoroethane Methylene Chloride	Listed toxic waste (F001)
F002 Hazardous Waste	1,1,1 Trichloroethane Trichloroethylene Perchloroethylene Trichlorotrifluoroethane Methylene Chloride	Listed toxic waste (F002)
Stabilizer Compounds	2-Propanol Nitromethane Butylene Oxide sec - Butyl Alcohol Dioxolane Cyclohexeneoxide n-propanol Toluene 1,4-Dioxane	Processing Knowledge (to determine amount/type of additional stabilizer required after recycling)
Other Compounds	Methanol Ethanol Acetone Methyl Ethyl Ketone Methylisobutyl Ketone t-Butyl Alcohol n-Butyl Alcohol Toluene Xylenes	Processing Knowledge [Expected only in very small quantities (ie. much less than 10 percent)]
	Ignitability	To ensure no flammable wastes are accepted
	Solvent Content (%)	Processing Knowledge
	Non-Volatile Residue (%)	Processing Knowledge

observed, the specific container(s) or bulk waste shipment will be rejected and immediately returned to the original generator by Detrex or the manifest and land disposal restriction certificate corrected as appropriate and the waste transported off Site to a permitted facility on behalf of the original generator. The waste would further tested utilizing ASTM D93 (Test Method for Flash Point by Pensky-Martens Closed Test) to confirm a flash point below 140°F in the event the manifest is to be changed to ensure proper classification

Provided as Attachment C-3 are copies of the Standard Operating Procedures for all testing methods conducted by Detrex. Included is the specific gravity test; a copy of ASTM Method D4982-89 (ignitability test); the solvent extraction method; and method for determination of solvents in spent solvents by gas chromatography. The solvent extraction and gas chromatography methods were developed by Detrex Corporation. They are modifications to U.S. EPA approved methodologies (i.e. Methods 8010 and 8015, SW-846). Standard methodologies are not appropriate due to the percentage levels of organics present in the waste streams. Standard methodologies were developed for the purpose of evaluating concentrations at very low detection levels for drinking water purposes.

Detrex also conducts a visual inspection of the hazardous waste during screening of the waste. Observations are made during sampling pertaining to abnormal solid content, color, or if it is an aqueous solution rather than an oil/solvent mixture.

Attachment C-4 presents a copy of the analytical report generated during waste screening. All appropriate laboratory results are documented on the laboratory report. In order to ensure the reliability and accuracy of the analytical results, Detrex Corporation has developed a Quality Assurance Project Plan (QAPP). A copy of this document is provided as Attachment C-5.

This document describes all laboratory procedures and related quality control/quality assurance procedures followed by Detrex Corporation laboratory personnel to ensure the reliability of analytical results.

C-3c Sampling Method [40 CFR §264.13(b)(3), §264.13(c)(2)]

The collection of concentrated waste samples is conducted by facility personnel. The samples are collected by glass thief. Sampling procedures are described in Attachment C-6.

C-3d Frequency of Analysis [264.13(b)(4]

Waste screening as described in the waste analysis plan is conducted on each shipment of wastes received from a customer.

The waste is sampled as per the sampling method presented in Section C-3c. A preliminary assessment of the waste sample will be made by running a rotary vacuum distillation and specific gravity test to determine the approximate solvent content and an ignitability test to ensure it is not potentially flammable. The sample is then submitted for organic analysis. Analytical procedures were described in Section C-3b and are further described in the QAPP.

Regardless of whether or not Detrex accepts the waste for processing, all of the foregoing knowledge, including laboratory results, is kept in the customer's file for future reference and comparison with future shipments, if they become a regular customer.

C-3e Additional Requirements for Wastes Generated Off Site [40 CFR § 264.13(b)(5)]

Each waste stream will be re-characterized annually, at a minimum, or when Detrex is notified or has reason to believe that the process or operation generating the hazardous waste has changed; or when the results of waste shipment inspections indicate that the hazardous waste received at the facility does not match the waste designated on the accompanying manifest. Detrex has implemented procedures requiring generators to notify Detrex when operation procedures change.

ATTACHMENT C-1

GENERATORS WASTE MATERIAL PROFILE SHEET

Revision 1
December 27, 1993

DETREX CORPORATION
Solvents & Environmental Services Division

GENERATOR WASTE MATERIAL PROFILE REPORT

Completion Date _____

Is this a ☐ New Waste for Approval?
or ☐ Waste Stream Reapproval? Previous Approval Date _____

Complete all sections of this report, attach laboratory reports required and send with a **REPRESENTATIVE ONE-PINT SAMPLE** of this waste to the facility. Waste loads will not be scheduled for shipment until the facility has issued an approval letter.

SECTION I - RECYCLING FACILITY

This waste approval request is being submitted for (check all that apply):

DETREX CORPORATION
SOLVENTS & ENVIRONMENTAL SERVICES DIVISION

☐ 322 International Parkway
Arlington, TX 76011
(817) 640-6017
FAX (817) 633-6834

☐ 835 Industrial Highway, Unit NO 1
Cinnaminson, NJ 08077
(609) 786-8686
FAX (609) 786-8288

☐ 1410 Chardon Road, Rear
Euclid, OH 44117
(216) 692-2464
FAX (216) 692-0080

☐ 2263 Distributors Drive
Indianapolis, IN 46241
(317) 241-9379
FAX (317) 241-1060

☐ 325B Emmett Avenue
Bowling Green, KY 42101
(502) 842-1490
FAX (502) 842-6291

☐ 12886 Eaton Avenue
Detroit, MI 48227
(313) 491-4550
FAX (313) 491-8044

☐ 312 Ellsworth Avenue, S.W.
Grand Rapids, MI 49503
(616) 454-9269
FAX (616) 454-9529

☐ 2537 LeMoyne Avenue
Melrose Park, IL 60160
(708) 345-3806
FAX (708) 345-3903

☐ 3114 Cullman Avenue
Charlotte, NC 28206
(704) 372-9280
FAX (704) 376-0732

☐ 3027 Fruitland Avenue
Vernon, CA 90058
(213) 583-8736
FAX (213) 588-9216

SECTION II - GENERATOR FACILITY INFORMATION

Generator Name _____ S.I.C. Codes* _____
Plant Name _____ US EPA ID # _____
Address _____
_____ State _____ Zip _____
Contact _____ Telephone ( ) _____ Fax ( ) _____
Alternate _____ Telephone ( ) _____ Fax ( ) _____

SECTION III - INVOICING INFORMATION

Customer _____ Has an account been opened? Yes ☐ No ☐
Address _____ If Yes, Account # _____
_____ State _____ Zip _____
Contact _____ Telephone ( ) _____ Fax ( ) _____

SECTION IV - SAMPLING INFORMATION

DATE SAMPLED: _____ TIME OF DAY: _____ TEMPERATURE: _____
TYPE OF CONTAINER: _____ SIZE: _____
TYPE OF SAMPLING DEVICE: _____
WERE CONTAINER & SAMPLING DEVICE CLEAN? ☐ YES ☐ NO SAMPLE TAKEN FROM: ☐ DRUM ☐ TANK ☐ OTHER _____
METHOD OF SAMPLING: _____ IS LABEL AFFIXED TO SAMPLE? ☐ YES ☐ NO
SAMPLED BY (PLEASE PRINT NAME CLEARLY): _____
WASTE PRODUCT STORAGE: ☐ INSIDE ☐ OUTSIDE ☐ HEATED ☐ NOT HEATED ☐ OUTSIDE BUT UNDER ROOF COVER

* If Applicable

SECTION V - SHIPPING AND HANDLING INFORMATION

1. Is this waste:
   a. Reactive? Yes ☐ No ☐
   b. Shock Sensitive? Yes ☐ No ☐
   c. Explosive? Yes ☐ No ☐
   d. Pyrophoric? Yes ☐ No ☐
   e. Oxidizer? Yes ☐ No ☐
   f. Radioactive? Yes ☐ No ☐

   If yes, contact DETREX Representative **before completing this form.**
2. Shipping Mode: Bulk Liquid ☐ Bulk Solid ☐ Drums ☐ Other ☐
3. Shipping Volume per Week _____ per Month _____
4. Annual Total Volume _____ One Time Only Volume _____
5. DOT Shipping Name* _____
   Hazard Class* _____ UN/NA #* _____
6. US EPA/State Hazardous Waste Codes _____

SECTION VI - WASTE "FINGERPRINT"

1. Select one or more general description(s) for the waste at 70°F:
   Powdery Solid ☐ Sludge (non pumpable) ☐
   Other Solid ☐ Liquid (pumpable) ☐
   Soils ☐ Liquid (multi phase) ☐
   Debris (describe) _____
2. Does the waste have a characteristic odor? Yes ☐ No ☐ Describe _____
3. Color Description _____

USEPA SW-846* Method

4. Are Free Liquids associated with this waste? Yes ☐ No ☐ . . . . Method 9095
5. Density: _____ lbs/gallon or lbs/cubic yards or _____ specific gravity
6. pH-Range: <2 ☐ 2-4.9 ☐ 5-9.9 ☐ 10-12.4 ☐ >12.5 ☐ (attach lab results) Method 9040 or 9045
7. Flash Point: - Liquid: <90°F ☐ 90-140°F ☐ 140-200°F ☐ >200°F ☐ (attach lab results) . Method 1010
   (If Flash Point <140°F, provide TOC and VOC analytical results.)
   - Solid: <90°F ☐ 90-140°F ☐ >140°F ☐

SECTION VII - GENERATING PROCESS & HAZARDOUS CHARACTERISTIC(S)

1. Waste Common Name _____
2. Provide a description of the process(es) generating this waste: **(A DETAILED EXPLANATION MUST BE PROVIDED. ATTACH ADDITIONAL PAGE(S) SHOWING PROCESS FLOW DIAGRAM AND DETAILS IF NECESSARY)**

   _____
   _____
   _____
   _____
3. Based upon lab analyses and/or knowledge of the process(es) generating the waste, describe the composition of the waste:

	Minimum		Maximum	
_____	_____	to	_____	%
_____	_____	to	_____	%
_____	_____	to	_____	%
_____	_____	to	_____	%
TOTAL.	_____		100	%

4. Based upon RCRA Hazardous Waste Regulations (40 CFR 261)

	YES	NO	CODES
a. Does this waste meet any F listing description?	☐	☐	_____
b. Does this waste meet any K listing description?	☐	☐	_____
c. Does this waste meet any P listing description?	☐	☐	_____
d. Does this waste meet any U listing description?	☐	☐	_____
e. Does this waste exhibit Ignitability?	☐	☐	_____
f. Does this waste exhibit Corrosivity?	☐	☐	_____
g. Does this waste exhibit Reactivity?	☐	☐	_____
h. Does this waste exhibit Toxicity? (attach lab results) - See Section IX.	☐	☐	_____
5. State Hazardous Waste?	☐	☐	_____
6. State Special Waste?	☐	☐	_____

* Per 40 CFR 172.101 (HM 181)

SECTION VIII - FUEL BLENDING

Please estimate the following:

Water (%) _____ Solids (%) _____ Heat value (BTU/lb) _____
Sulfur (%) _____ Chlorine (%) _____ PCBs (total ppm) _____
Ash (%) _____

SECTION IX - CERTIFICATIONS

	Yes	No
1. Does the waste contain cyanide amenable to chlorination above 250 ppm?	☐	☐
2. Does the waste contain reactive sulfide above 500 ppm?	☐	☐
3. Does this waste contain PCBs greater than 49 ppm?	☐	☐
4. Is this a dioxin/furan waste as specified in 40 CFR 261.31 under Hazardous Waste numbers F020, F021, F022, F023, F026, F027, F028?	☐	☐
5. Is this a California List hazardous waste containing halogenated organic compounds found in Appendix III of 40 CFR Part 268 in total concentration greater than or equal to 1,000 mg/L?	☐	☐
6. Is this a liquid hazardous waste containing Nickel (>134 mg/L) or Thallium (>130 mg/L)?	☐	☐

7. Mark the "Yes" column to indicate which TCLP testing has been conducted. (attach lab results)
For those constituents not tested, mark "No" **and** sign the certification provided.
Either "Yes" or "No" **MUST** be checked for each and every constituent.

TCLP REGULATORY ACTION LEVELS		CONSTITUENT TESTING CONDUCTED OR CERTIFICATION		
ZHE ORGANICS*	mg/L	YES	NO	CERTIFICATION
D018 Benzene	0.5	☐	☐	"Based upon my knowledge of the waste and the process generating the waste, these constituents are not present in the waste above hazardous classification levels."
D019 Carbon Tetrachloride	0.5	☐	☐	
D021 Chlorobenzene	100.0	☐	☐	
D022 Chloroform	6.0	☐	☐	
D028 1,2-Dichloroethane	0.5	☐	☐	
D029 1,1-Dichloroethylene	0.7	☐	☐	
D035 Methyl Ethyl Ketone	200.0	☐	☐	Signed _____
D039 Tetrachloroethylene	0.7	☐	☐	
D040 Trichloroethylene	0.5	☐	☐	
D043 Vinyl Chloride	0.2	☐	☐	
METALS				CERTIFICATION
D004 Arsenic	5.0	☐	☐	"Based upon my knowledge of the waste and the process generating the waste, these constituents are not present in the waste above hazardous classification levels."
D005 Barium	100.0	☐	☐	
D006 Cadmium	1.0	☐	☐	
D007 Chromium	5.0	☐	☐	
D008 Lead	5.0	☐	☐	
D009 Mercury	0.2	☐	☐	
D010 Selenium	1.0	☐	☐	Signed _____
D011 Silver	5.0	☐	☐	
001D Copper	100.0	☐	☐	
003D Zinc	500.0	☐	☐	
ACID EXTRACTABLES				CERTIFICATION
D023 o-Cresol*	200.0	☐	☐	"Based upon my knowledge of the waste and the process generating the waste, these constituents are not present in the waste above hazardous classification levels."
D024 m-Cresol*	200.0	☐	☐	
D025 p-Cresol*	200.0	☐	☐	
D026 Cresol	200.0	☐	☐	
D037 Pentachlorophenol	100.0	☐	☐	
D041 2,4,5-Trichlorophenol	400.0	☐	☐	
D042 2,4,6-Trichlorophenol	2.0	☐	☐	Signed _____

* If o, m and p Cresols cannot be differentiated, use Total Cresol concentration

(Continued)

SECTION IX - CERTIFICATIONS (Continued)

TCLP REGULATORY ACTION LEVELS			CONSTITUENT TESTING CONDUCTED OR CERTIFICATION		
BASE NEUTRAL EXTRACTABLES	mg./L	YES	NO	CERTIFICATION	
D027 1,4-Dichlorobenzene	7.5	☐	☐	"Based upon my knowledge of the waste and the process generating the waste, these constituents are not present in the waste above hazardous classification levels."	
D030 2,4-Dinitrotoluene	0.13	☐	☐		
D032 Hexachlorobenzene	0.13	☐	☐		
D033 Hexachlorobutadiene	0.5	☐	☐		
D034 Hexachloroethane	3.0	☐	☐		
D036 Nitrobenzene	2.0	☐	☐	Signed _____	
D038 Pyridine	5.0	☐	☐		
PESTICIDES				CERTIFICATION	
D020 Chlordane	0.03	☐	☐	"Based upon my knowledge of the waste and the process generating the waste, these constituents are not present in the waste above hazardous classification levels."	
D012 Endrin	0.02	☐	☐		
D031 Heptachlor (& its Hydroxide)	0.008	☐	☐		
D013 Lindane	0.4	☐	☐		
D014 Methoxychlor	10.0	☐	☐		
D015 Toxaphene	0.5	☐	☐	Signed _____	
HERBICIDES					
D016 2,4-D	10.0	☐	☐		
D017 2,4,5-TP (Silvex)	1.0	☐	☐		

REQUIREMENTS FOR A COMPLETE APPLICATION SUBMITTAL

APPLICATION PACKAGE CONTENTS

All pertinent items must be included together in one application package.

☐ 1) Waste Profile Report

☐ 2) Lab Reports Required for TCLP testing as indicated in Section IX

☐ 3) Representative Sample of Waste

☐ 4) MSDS - If Virgin Material

☐ 5) Other _____

"I hereby authorize Detrex personnel to add supplemental information to the waste approval file provided I am contacted to give verbal permission. I authorize Detrex personnel to obtain a sample from any waste shipment for purposes of verification and confirmation."

GENERATOR
Signature _____ Title _____

"I certify that all information (including attached information) is complete and factual and is an accurate representation of the known and suspected hazards, and waste generator regulations, pertaining to the waste described herein."

GENERATOR
Signature _____ Printed Name _____ Date _____

Company _____ Title _____

DETREX CORPORATION
Solvents Division
12886 Eaton Ave.
DETROIT, MI 48227

FAX:(313) 491-8044

TELEPHONE:
(313) 491-4550

February 6, 1991

During the past three years, the United States Environmental Protection Agency (EPA) has promulgated a series of new regulations pertaining to the treatment, storage, disposal, classification and testing of hazardous waste. Detrex Corporation, Solvents Division has maintained all current required regulatory documentation throughout this period, for the purpose of protecting its customers from any potential liability risk, while still continuing to provide comprehensive environmental services.

In an effort to maintain these standards of service it is necessary to initiate the updating of all waste stream information records. We are asking all of our customers to complete the enclosed "Generator's Waste Material Profile Sheet", making particular note of the following areas:

1. Technical Contact (Sec. A)

   This must be the person responsible for providing all of the correct waste stream and shipment information.

2. Complete Process Description (Sec. C)

   Please detail the waste generation process, including any "special" aspects of your operation that affect the waste composition.

3. USEPA Hazardous Codes (Sec. F)

   Note that in addition to your primary F 001 and/or F 002 listing, new D 040 (trichloroethylene) and D 039 (perchloroethylene) codes also apply as of September 25, 1990.

   Example land - ban notification forms are included for reference.

4. USDOT Shipping Name (Sec. F)

   Example manifests are also enclosed for your waste type(s), disregard the descriptions which do not apply to your waste stream. Use these for shipping reference as well as for correct filling of the Waste Material Profile Sheet section.

5. Technical Contact Signature (Certification: Sec. K)

   This must be signed for the form to be valid.

Please return the completed Profile Sheet to us, in the enclosed envelope, by February 28, 1991 so that we may expedite the updating of our files. If you have any questions, please contact your Detrex Account Representative or Joe Calderoni, our Quality Control Manager.

Thank you for your cooperation in allowing Detrex to continue to improve its services. We look forward to meeting your product and waste management needs for many more years to come.

Sincerely,

Ronald C. Hritzkowin
Facility Manager

RCH:kh

CC: M.O. O'Connor, Sales Manager
R. Anderson, Account Representative
P. Koehler, Account Representative

ATTACHMENT C-2

MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheet

MSD 8208.22

DETREX CHEMICAL INDUSTRIES, INC.
P.O. BOX 501,
DETROIT, MICHIGAN 48232

Approved by U.S. Dept. of Labor as "Essentially similar" to Form OSHA-20

Date: August, 1982	Edition: First
Chemical Name and Synonyms: Perchloroethylene; tetrachloroethylene CAS No.: 127-18-4	Trade Name and Synonyms: DETREX PERK, Perchlor, Perchloroethylene
Chemical Family: Halogenated Hydrocarbons	Formula: $CCl_2=CCl_2$
DOT Shipping Name: Tetrachloroethylene	DOT Hazard Class: ORM-A-UN1897

SECTION 1 • PHYSICAL DATA

Boiling Point @ 760 mm Hg:	Vapor Density (Air=1):	Specific Gravity (H_2O=1):	pH of Solutions:
250°F 121°C	5.83	(20°/20°C) 1.6	6.8 to 8.4
Freezing/Melting Point:	**Solubility (Weight % in Water):**	**Bulk Density:**	**Volume % Volatile:**
-8.2°F -22.3°C	@25°C 0.015%	13.6 lbs./gal. @ 20°C	Essentially 100
Vapor Pressure:	**Evaporation Rate**	**Heat of Solution:**	**Appearance and Odor:**
@ 20°C = 14.2mmHg	(ethyl ether=1): 0.09	Not Applicable	Clear, colorless liquid with ether-like odor.

SECTION 2 • HAZARDOUS INGREDIENTS

	%	Hazard Data
Perchloroethylene (Stabilized)	100	See Sections

SECTION 3 • FIRE AND EXPLOSION HAZARD DATA

Flash Point °F (Method Used)	Flammable Limits in Air (% by Volume)	Extinguishing Media:
None	None LEL: UEL:	For fires involving perchloroethylene, use water, dry chemical or carbon dioxide.

Special Fire Fighting Procedures: Fire fighters should wear pressure-demand self-contained breathing apparatus for possible exposure to hydrogen chloride and possible traces of phosgene.

Unusual Fire and Explosion Hazards: Perchloroethylene involved in fires can decompose to hydrogen chloride and possible traces of phosgene. See Detrex warning letter Form SoL 8208.21 attached.

SECTION 4 • HEALTH HAZARD DATA

Permissible Exposure Limits (TLV): See Section 5

Toxicity Data Ref.(1)	Classification (Poison, Irritant, Etc.)
LCLo Inhalation (rat) 4,000 ppm (4 hours)	Inhalation: Moderately Toxic
LD_{50} Dermal	Skin/Eye: Liquid mildly irritating to skin; eye irritant
LD_{50} Ingestion (rabbit) - 5,000 mg/kg	Ingestion: Slightly Toxic
Fish, LC_{50} (Lethal Concentration) 96hr. TLM 100-10 ppm	Aquatic: Toxic

Human Exposure Information/Data: Unconfirmed data[1] exists which indicate that perchloroethylene by ingestion may be more toxic to humans than indicated by the available data. Such unconfirmed data report poisonings at doses as low as 500 mg/kg.

24-HOUR EMERGENCY ASSISTANCE: (313) 358-5800

Section 4(Cont'd)- Permissible Exposure Limits

Current OSHA permissible exposure limits (29CFR 1910.1000) are 100 ppm (8-hour TWA); 100-200 ppm periodic excursions are allowed providing 8-hour TWA is at or below 100 ppm; 200-300 ppm excursions allowed only for maximum of 5 minutes in any 3-hour period; 300 ppm maximum allowable concentration (must not be exceeded).

ECTION 5 · EFFECTS OF OVEREXPOSURE

This section covers effects of overexposure for inhalation, eye/skin contact, ingestion and other types of overexposure information in the order of the most hazardous and the most likely route of overexposure.

Acute: Primarily a central nervous system depressant. Inhalation can cause irritation of the respiratory tract, dizziness, nausea, headache, loss of coordination and equilibrium, unconsciousness and if exposed to high concentrations in confined or poorly ventilated areas, even death.

Liquid splashed in the eye can result in discomfort, pain and irritation. Prolonged or repeated contact with liquid on the skin can cause irritation and dermatitis. The problem may be accentuated by liquid becoming trapped against the skin by contaminated clothing and shoes. Skin absorption can occur.

Chronic: Prolonged exposure above the OSHA permissible exposure limits may result in liver and kidney damage. Perchloroethylene has been extensively studied for cancer both in the U.S. and Europe by government, industry and academia. There is no documented evidence that perchloroethylene causes an increased cancer incidence in humans.

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

Eye or Skin Contact: Flush eyes and skin with plenty of water (soap and water for skin) for at least 15 minutes, while removing contaminated clothing and shoes. If irritation occurs, consult a physician.

Ingestion: If conscious, drink a quart of water. DO NOT induce vomiting. Take immediately to a hospital or physician. If unconscious, or in convulstions, take immediately to a hospital or physician. DO NOT give anything by mouth to an unconscious person.

Notes to Physician (Including Antidotes): NEVER administer adrenalin following perchloroethylene overexposure. Increased sensitivity of the heart to adrenalin may be caused by over-exposure to perchloroethylene.

SECTION 6 · REACTIVITY DATA

Stability: Stable	**Conditions to Avoid:** Avoid open flames, hot glowing surfaces or electric arc.
Hazardous Polymerization: Will not occur	**Conditions to Avoid:** None

Incompatibility (Materials to Avoid): Avoid contamination with caustic soda, caustic potash or oxidizing materials. Shock sensitive explosives may be formed. Also see Detrex warn letter Form SoL 8208.21 attached.

Hazardous Decomposition Products: Hydrogen chloride and possibly traces of phosgene.

SECTION 7 · SPILL OR LEAK PROCEDURES (See Detrex Forms SoL 8208.14 and SoL 8208.15 attached)

Steps to be Taken if Material is Spilled or Released: Immediately evacuate the area and provide maximum ventilation. Unprotected personnel should move upwind of spill. Only personnel equipped with proper repiratory and skin/eye protection should be permitted in area. Dike area to contain spill. Take precautions as necessary to prevent contamination of ground and surface waters. Recover or absorb spilled material on sawdust or vermiculite and sweep into closed containers for disposal. After all visible traces have been removed, thoroughly wet vacuum the area. DO NOT flush to sewer. If area of spill is porous, remove as much contaminated earth and gravel, etc., as necessary and place in closed containers for disposal. (See Below)

Waste Disposal Method:

Contaminated sawdust, vermiculite or porous surface must be disposed of in a permitted hazardous waste management facility. Recovered liquids may be reprocessed or incinerated or must be treated in a permitted hazardous waste management facility. Care must be taken when using or disposing of chemical materials and/or their containers to prevent environmental contamination. It is your duty to dispose of the chemical materials and/or their containers in accordance with the Clean Air Act, the Clean Water , the Resource Conservation and Recovery Act and all relevant state or local laws/regulat regarding disposal.

SECTION 8 · SPECIAL PROTECTION INFORMATION

Respiratory Protection: For emergencies or working in confined areas, wear self-contained breathing apparatus or supplied air respiratory protection (use the "buddy system" and wear a safety harness with a lifeline). In other circumstances involving potential overexposures, use NIOSH/MSHA-approved organic vapor respirator. (Observe limitations specified by manufacturer.) Respiratory protection program must be in accordance with 29CFR 1910.134.

Ventilation (Type): Mechanical (General) - Sufficient to maintain workplace concentration below permissible exposure limits.

Eye Protection: Splashproof goggles	**Gloves:** Polyethylene, neoprene or polyvinyl

Other Protective Equipment: Safety shower and eye-wash fountain in immediate area. Personnel protective clothing and use of equipment must be in accordance with 29CFR 1910.133 and 29CFR 1910.132.

SECTION 9 · SPECIAL PRECAUTIONS

Precautions to be Taken During Handling and Storing:

- Do not use in poorly ventilated or confined spaces.
- Perchloroethylene vapors are heavier than air and will collect in low areas.
- Keep container closed when not in use.
- Do not store in open, unlabeled or mislabeled containers.
- Liquid oxygen or other strong oxidants may form explosive mixtures with perchloroethylene.
- This material or its vapors when in contact with flames, hot glowing surfaces or electric arcs can decompose to form hydrogen chloride gas and traces of phosgene.
- AVOID CONTAMINATION OF WATER SUPPLIES: Handling, storage and use procedures must be carefully monitored to avoid spills or leaks. Any spill or leak has the potential to cause underground water contamination which may, if sufficiently severe, render a drinking water source unfit for human consumption. Contamination that does occur cannot be easily corrected.

Other Precautions:

- AVOID PROLONGED OR REPEATED BREATHING OF VAPORS. High vapor concentrations can cause dizziness, unconsciousness or death. Long-term overexposure may cause liver/kidney injury.
- USE ONLY WITH ADEQUATE VENTILATION. Ventilation must be sufficient to limit exployee exposure to perchloroethylene below OSHA permissible exposure limit (8-hour TWA - 100 ppm; ceiling 200 ppm; maximum peak 300 ppm, 5 minutes in any 3 hours). Observance of lower limits (outlined in Section 4) is advisable.
- AVOID CONTACT WITH EYES. Will cause irritation and pain.
- AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. May cause irritation or dermatitis.
- DO NOT TAKE INTERNALLY. Swallowing may cause injury or death.
- DO NOT EAT, DRINK OR SMOKE IN WORK AREAS.

References:

1. NIOSH Registry of Toxic Effectos of Chemical Substances, 1978
2. Industrial Hygiene and Toxicology, Volume II, Second Edition, F.A. Patty, 1963
3. Dangerous Properties of Industrial Materials, Fifth Edition, N. I. Sax, 1979
4. Federal Register, 45FR Hazardous Waste Management Systems Part III, Identification and Listing of Hazardous Wastes, Page 33084, May 19, 1980
5. Science Advisory Board, Subcommittee on Airborne Carcinogens, September, 1980

Comments: As this solvent (perchloroethylene) is used to clean and/or degrease a variety of metal and plastic parts, it should always be used in conjunction with properly designed and fully controlled solvent vapor degreasing equipment that is in compliance with the U. S. Environmental Protection Agency, OAQPS Guidelines, "Control of Volatile Organic Emissions from Solvent Metal Cleaning", and/or any other applicable federal, state or local regulatory guidelines.

Perchloroethylene is also used extensively in the commercial drycleaning industry. It should always be used in conjunction with properly designed and fully controlled equipment that is in compliance with all applicable federal, state and local regulatory guidelines.

Material Safety Data Sheet

MSD 8208.20

DETREX CHEMICAL INDUSTRIES, INC.
P.O. BOX 501,
DETROIT, MICHIGAN 48232

Approved by U.S. Dept. of Labor as "Essentially similar" to Form OSHA-20

Date: August, 1982	Edition: First
Chemical Name and Synonyms: 1,1,1-trichloroethane; methylchloroform CAS No. 71-55-6	Trade Name and Synonyms: PERM-ETHANE ® DG
Chemical Family: Halogenated Hydrocarbons	Formula: CH_3CCl_3
DOT Shipping Name: 1,1,1-trichloroethane	DOT Hazard Class: ORM-A I. D. Number: UN 2831

SECTION 1 · PHYSICAL DATA

Boiling Point @ 760 mm Hg:	Vapor Density (Air=1):	Specific Gravity (H_2O=1):	pH of Solutions:
165.4°F	4.54	1.300-1.320 @ 25°/25°C	6.0 to 7.5
Freezing/Melting Point:	**Solubility (Weight % in Water):**	**Bulk Density:**	**Volume % Volatile:**
-49°F -45°C	Negligible	10.80-10.97 lbs/gal @25°C	Essentially 100
Vapor Pressure:	**Evaporation Rate**	**Heat of Solution:**	**Appearance and Odor:**
@25°C = 135mmHg	(ethyl ether = 1):0.35	Not Applicable	Clear, colorless liquid - ether-like odor.

SECTION 2 · HAZARDOUS INGREDIENTS

	%	Hazard Data
1,1,1-trichloroethane (Stabilized)	100	See Sections 4 & 5

SECTION 3 · FIRE AND EXPLOSION HAZARD DATA

Flash Point °F (Method Used)	Flammable Limits in Air (% by Volume)	Extinguishing Media:
None when tested in accordance with DOT requirements.	LEL: 7% UEL: 15% See Below	water, dry chemical or carbon dioxide

Special Fire Fighting Procedures: Fire fighters should wear a NIOSH/MSHA-approved pressure-demand, self-contained breathing apparatus for possible exposure to hydrogen chloride and possibly traces of phosgene. Use water only in degreasers when aluminum reaction occurs.

Unusual Fire and Explosion Hazards: Vapors concentrated in a confined or poorly ventilated area can be ignited upon contact with a spark, flame, or high intensity source of heat. This can occur at concentrations ranging between 7-15% by volume. Decomposition or burning can produce hydrogen chloride or possibly traces of phosgene. Also see Detrex warning letter Form SoL 8208.21 attached.

SECTION 4 · HEALTH HAZARD DATA

Toxicity Data	Classification (Poison, Irritant, Etc.)
LC_{50} Inhalation (rat) 8,000 ppm/7 hours	Inhalation: Toxic
LD_{50} Dermal (rabbit) 15g/kg (2)	Skin/Eye: Liquid mildly irritating to skin; eye irritant
LD_{50} Ingestion (rat) 10-12g/kg (See Section 5)	Ingestion: Not significantly toxic
Fish, LC_{50} (Lethal Concentration) Not Determined	Aquatic:

Human Exposure Information/Data:

24-HOUR EMERGENCY ASSISTANCE: (313) 358-5800

SECTION 5 · EFFECTS OF OVEREXPOSURE

This section covers effects of overexposure for inhalation, eye/skin contact, ingestion and other types of overexposure information in the order of the most hazardous and the most likely route of overexposure.

·missible Exposure Limits (TLV):

350 ppm - 8-hour time-weighted average (TWA) - OSHA 29CFR 1910.1000 (May 28, 1975).

Acute

Primarily a central nervous system depressant. Inhalation can cause irritation of the respiratory system, dizziness, nausea, lightheadedness, headache, loss of coordination and equilibrium, unconsciousness and, if exposed to high concentrations in confined or poorly ventilated areas, even death. Depression of the circulatory system has been reported as a result of overexposure to 1,1,1-trichloroethane. The heart may be sensitized by overexposure and ventricular arrhythmia may be induced by epinephrine administration.

Liquid splashed in the eyes can result in disconfort, pain and irritation. Prolonged or repeated contact with liquid on the skin can cause irritation and dermatitis. The problem may be accentuated by liquid becoming trapped against the skin by contaminated clothing and shoes. Skin absorption can occur.

Chronic

longed exposure above the OSHA permissible exposure limits may result in liver and ney damage. 1,1,1-trichloroethane has been extensively studied for cancer both in the U.S. and Europe by government, industry and academia. There is no documented evidence that 1,1,1-trichloroethane causes an increased cancer incidence in humans.

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

Eye or Skin Contact: Flush eyes and skin with plenty of water (soap and water for skin) for at least 15 minutes, while removing contaminated clothing and shoes. If irritation occurs, consult a physician.

Ingestion: If conscious, drink large quantities of water, DO NOT induce vomiting. Take immediately to a hospital or physician. If unconscious, or in convulsions, take immediately to a hospital. DO NOT give anything by mouth to an unconscious person.

Notes to Physician (Including Antidotes): NEVER administer adrenalin following 1,1,1-trichloroethane overexposure. Increased sensitivity of the heart to adrenalin may be caused by overexposure to 1,1,1-trichloroethane.

SECTION 6 · REACTIVITY DATA

Stability: Stable	**Conditions to Avoid:** Avoid open flames, hot glowing surfaces or electric arcs.
Hazardous Polymerization: Will not occur.	**Conditions to Avoid:** None

Incompatibility (Materials to Avoid):
Avoid contamination with caustic soda, caustic potash or oxidizing materials. Shock sensitive explosives may be formed. Avoid contact with aluminum, magnesium, zinc and alloys thereof under high pressures. See Detrex warning letter Form SoL 8208.21 attached.

Hazardous Decomposition Products: Hydrogen chloride and possibly traces of phosgene.

SECTION 7 · SPILL OR LEAK PROCEDURES (See Detrex Forms SoL 8208.14 and SoL 8208.15 attached)

Steps to be Taken if Material is Spilled or Released: Immediately evacuate the area and provide maximum ventilation. Unprotected personnel should move upwind of spill. Only personnel equipped with proper respiratory and skin/eye protection should be permitted in area. Dike area to contain spill. Take precautions as necessary to prevent contamination of ground and surface waters. Recover or absorb spilled material on sawdust or vermiculite and sweep into closed containers for disposal. After all visible traces have been removed, thoroughly wet vacuum the area. DO NOT flush to sewer. If area of spill is porous, remove as much contaminated earth and gravel, etc., as necessary and place in closed containers for disposal. (See Below)

Waste Disposal Method: Contaminated sawdust, vermiculite or porous surface must be disposed of in a permitted hazardous waste management facility. Recovered liquids may be re-processed or incinerated or must be treated in a permitted hazardous waste management facility. Care must be taken when using or disposing of chemical materials and/or their containers to prevent environmental contamination. It is your duty to dispose of the chemical materials and/or their containers in accordance with the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act as well as any other relevant federal, state or local laws/regulations regarding disposal.

SECTION 8 · SPECIAL PROTECTION INFORMATION

Respiratory Protection: For emergencies or working in confined areas, wear self-contained breathing apparatus or supplied air respiratory protection (use the "buddy system" and wear a safety harness with a lifeline). In other circumstances involving potential overexposure, use NIOSH/MSHA-approved organic vapor respirator. (Observe limitations directed by manufacturer.) Respiratory protection program must be in accordance with 29CFR 1910.134.

Ventilation (Type): Dilution (General) or Local Exhaust - Sufficient to maintain workplace concentration below permissible exposure limits.

Eye Protection: Splashproof Goggles

Gloves: polyethylene, neoprene or polyvinyl alcohol

Other Protective Equipment: Safety shower and eye-wash fountain in immediate area. Personnel protective clothing and use of equipment must be in accordance with 29CFR 1910.133 and 29CFR 1910.132.

SECTION 9 · SPECIAL PRECAUTIONS

Precautions to be Taken During Handling and Storing:

- Do not use in poorly ventilated or confined areas.
- 1,1,1-trichloroethane vapors are heavier than air and will collect in low areas.
- Keep container closed when not in use.
- Do not store in open, unlabeled or mislabeled containers.
- Liquid oxygen or other strong oxidants may form explosive mixtures with 1,1,1-trichloroethane.
- This material or its vapors when in contact with flames, hot glowing surfaces or electric arcs can decompose to form hydrogen chloride gas and traces of phosgene.
- AVOID CONTAMINATION OF WATER SUPPLIES: Handling, storage, and use procedures must be carefully monitored to avoid spills or leaks. Any spill or leak has the potential to cause underground water contamination which may, if sufficiently severe, render a drinking water source unfit for human consumption. Contamination that does occur cannot be easily corrected.
- A chlorinated solvent used as a flashpoint suppressant must be added in sufficient quantity or the resultant mixture may have a flashpoint lower than the flammable component.
- Caution should be taken not to use in pressurized or totally enclosed system of light metal construction such as aluminum, magnesium, zinc or alloys thereof. Example, paint or adhesive spray system. (See Detrex Form SoL 8208.21 attached.)

Other Precautions:

- AVOID PROLONGED OR REPEATED BREATHING OF VAPORS. High vapor concentrations can cause dizziness, unconsciousness or death. Long-term overexposure may cause liver/kidney injury.
- USE ONLY WITH ADEQUATE VENTILATION. Ventilation must be sufficient to limit employee exposure to 1,1,1-trichloroethane below OSHA permissible limits (8-hour TWA 350 ppm). Observance of lower limits (outlined in Section 4) is advisable.
- AVOID CONTACT WITH EYES. Will cause irritation and pain.
- AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. May cause irritation or dermatitis.
- DO NOT TAKE INTERNALLY. Swallowing may cause injury or death.
- DO NOT EAT, DRINK, OR SMOKE IN WORK AREAS.

References:

1. NIOSH Registry of Toxic Effects of Chemical Substances, 1978
2. Industrial Hygiene and Toxicology, Volume II, Second Edition, F.A. Patty, 1963
3. Dangerous Properties of Industrial Materials, Fifth Edition, N.I. Sax, 1979
4. Industrial Toxicology, Hamilton and Hardy, 1974
5. Toxicity and Metabolisms of Industry Solvents, Browning, 1965
6. Toxicology, the Basic Science of Poisons, Casarett and Doull, 1980
7. Federal Register, 45FR Hazardous Waste Management Systems Part III, Identification and Listing of Hazardous Wastes, Page 33084, May 19, 1980
8. EPA Science Advisory Board, Subcommittee on Airborne Carcinogens, September, 1980

Comments: As this solvent (1,1,1-trichloroethane) is used to clean and/or degrease a wide variety of metal and plastic parts, it should always be used in conjunction with properly designed and fully controlled degreasing equipment that is in compliance with the U.S. Environmental Protection Agency, OAQPS Guidelines, "Control of Volatile Organic Emissions from Solvent Metal Cleaning", and/or all other applicable federal, state and local regulatory guidelines.

Material Safety Data Sheet

MSD 8208.19

DETREX CHEMICAL INDUSTRIES, INC.
P.O. BOX 501,
DETROIT, MICHIGAN 48232

Approved by U.S. Dept. of Labor as "Essentially similar" to Form OSHA-20

Date: August, 1982	Edition: First
Chemical Name and Synonyms: Trichloroethylene; trichloroethene CAS No.: 79-01-6	Trade Name and Synonyms: PERM-A-CLOR® NA, Trichlor, Trichlorethylene
Chemical Family: Halogenated Hydrocarbons	Formula: $CHCl = CCl_2$
DOT Shipping Name: trichloroethylene	DOT Hazard Class: ORM-A UN1710 (RQ 1000#/454kg)

SECTION 1 · PHYSICAL DATA

Boiling Point @ 760 mm Hg: 188°F	Vapor Density (Air=1): 4.54	Specific Gravity (H_2O=1): (20°/20°C) 1.465	pH of Solutions: 6.7 to 7.5
Freezing/Melting Point: -123.5°F -86.4°C	Solubility (Weight % in Water): 0.11 @ 25°C	Bulk Density: @ 20°C 12.2 lbs./gal.	Volume % Volatile: Essentially 100
Vapor Pressure: @ 20°C = 57.8mmHg	Evaporation Rate (ethyl ether=1): 0.28	Heat of Solution: Not Applicable	Appearance and Odor: Clear, colorless liquid with ether-like odor.

SECTION 2 · HAZARDOUS INGREDIENTS

	%	Hazard Data
Trichloroethylene (Stabilized)	100	See Sections 4 and 5

SECTION 3 · FIRE AND EXPLOSION HAZARD DATA

Flash Point °F (Method Used) None when tested in accordance with DOT requirements. (See Below)	Flammable Limits in Air (% by Volume) See Below LEL: 12.5% UEL: 90%	Extinguishing Media: Water, dry chemicals or carbon dioxide.

Special Fire Fighting Procedures: Fire fighters should wear NIOSH/MSHA pressure-demand, self-contained breathing apparatus for possible exposure to hydrogen chloride and possibly traces of phosgene.

Unusual Fire and Explosion Hazards: Vapors concentrated in a confined or poorly ventilated area can be ignited upon contact with a spark, flame or high-intensity source of heat. This can occur at concentrations of approximately 12.5% and above by volume. Decomposition or burning can produce hydrogen chloride and possibly traces of phosgene.

Also see Detrex warning letter Form SoL 8208.21 attached.

SECTION 4 · HEALTH HAZARD DATA

Permissible Exposure Limits (TLV): See Section 5

Toxicity Data Ref. (1),(2)	Classification (Poison, Irritant, Etc.)
LCLoInhalation (rat) - 8,000 ppm/4 hour	Inhalation: Toxic
LD_{50} Dermal	Skin/Eye: Liquid mildly irritant to skin; eye irritant.
LD_{50} Ingestion (rat) - 4,900 - 7,000 mg/kg	Ingestion: Slightly to moderately toxic
Fish, LC_{50} (Lethal Concentration) Not Determined	Aquatic:

Human Exposure Information/Data: Unconfirmed data[1] exists which indicate that trichloroethylene by ingestion may be more toxic to humans than indicated by the available animal data. Such unconfirmed data report poisonings at doses as low as 50 mg/kg.

24-HOUR EMERGENCY ASSISTANCE: (313) 358-5800

Section 4 (Cont'd) - Permissible Exposure Limits

Current OSHA permissible exposure limits (29CFR 1910.1000) are 100 ppm (8-hour TWA); 100-200 ppm periodic excursions are allowed providing 8-hour TWA is at or below 100 ppm; 00-300 ppm excursions allowed only for maximum of 5 minutes in any 2-hour period: 0 ppm maximum allowable concentration (must not be exceeded).

SECTION 5 · EFFECTS OF OVEREXPOSURE

section covers effects of overexposure for inhalation, eye/skin contact, ingestion and other types of overexposure rmation in the order of the most hazardous and the most likely route of overexposure.

Acute: Irritant and central nervous system depressant. Inhalation can cause irritation of the respiratory tract, dizziness, nausea, headache, loss of coordination and equilibrium, unconsciousness and, if exposed at high concentrations in confined or poorly ventilated areas, even death. Fatalities following severe acute exposure at high concentrations have been attributed to ventricular fibrillation resulting in cardiac failures.[3]

Liquid splashed in the eye can result in discomfort, pain and irritation. Prolonged or repeated contact with liquid on the skin can cause irritation and dermatitis. The problem may be accentuated by liquid becoming trapped against the skin by contaminated clothing and shoes. Skin absorption can occur.

Chronic: Prolonged exposure above the OSHA permissible exposure limits may result in liver and kidney damage. Trichloroethylene has been extensively studied for cancer both in the U.S. and Europe by government, industry and academia. There is no documented evidence that Trichloroethylene causes an increased cancer incidence in humans.

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician .

Eye or Skin Contact: Flush eyes and skin with plenty of water (soap and water for skin) for at least 15 minutes, while removing contaminated clothing and shoes. If irritation occurs, consult a physician.

Ingestion: If conscious, drink a quart of water. DO NOT induce vomiting. Take immediately to a hospital or physician. If unconscious, or in convulsions, take immediately to a hospital or physician. DO NOT give anything by mouth to an unconscious person.

Notes to Physician (Including Antidotes): NEVER administer adrenalin following trichloroethylene overexposure. Increased sensitivity of the heart to adrenalin may be caused by overexposure to trichloroethylene.

SECTION 6 · REACTIVITY DATA

Stability: Stable	**Conditions to Avoid:** Avoid open flames, hot glowing surfaces or electric arcs.
Hazardous Polymerization: Will not occur	**Conditions to Avoid:** None

Incompatibility (Materials to Avoid): Avoid contamination with caustic soda, caustic potash or oxidizing materials. Shock sensitive explosives may be formed.
See Detrex warning letter Form SoL 8208.21 attached.

Hazardous Decomposition Products: Hydrogen chloride and possibly traces of phosgene.

SECTION 7 · SPILL OR LEAK PROCEDURES (See Detrex Forms SoL 8208.14 and SoL 8208.15 attached)

Steps to be Taken if Material is Spilled or Released: Immediately evacuate the area and provide maximum ventilation. Unprotected personnel should move upwind of spill. Only personnel equipped with proper respiratory and skin/eye protection should be permitted in area. Dike area to contain spill. Take precautions as necessary to prevent contamination of ground and surface waters. Recover or absorb spilled material on sawdust or vermiculite and sweep into closed containers for disposal. After all visible traces have been removed, thoroughly wet vacuum the area. DO NOT flush to sewer. If area of spill is porous, remove as much contaminated earth and gravel, etc., as necessary and place in closed containers for disposal. (See Below)

Waste Disposal Method: Contaminated sawdust, vermiculite or porous surface must be disposed of in a permitted hazardous waste management facility. Recovered liquids may be reprocessed or incinerated or must be treated in a permitted hazardous waste management facility.[7] Care must be taken when using or disposing of chemical materials and/or their containers to prevent environmental contamination. It is your duty to dispose of the chemical materials and/or their containers in accordance with the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act and all relevant state or local laws/regulations regarding disposal of hazardous waste.

SECTION 8 · SPECIAL PROTECTION INFORMATION

Respiratory Protection: For emergencies or working in confined areas, wear self-contained breathing apparatus or supplied air respiratory protection (use "buddy system", also use harness and lifeline). In other circumstances involving potential overexposures, use OSH/MSHA-approved organic vapor respirator. (Observe limitations directed by nufacturer.) Respiratory protection program must be in accordance with 29CFR 1910.134.

Ventilation (Type): Mechanical (General) - Sufficient to maintain workplace concentration below permissible exposure limits.

Eye Protection: Splashproof goggles.

Gloves: Polyethylene, neoprene or polyvinyl alcohol.

Other Protective Equipment: Safety shower and eye-wash fountain in immediate area. Personnel protective clothing and use of equipment must be in accordance with 29CFR 1910.133 and 29CFR 1910.132.

SECTION 9 · SPECIAL PRECAUTIONS

Precautions to be Taken During Handling and Storing:

Do not use in poorly ventilated or confined spaces.

- Trichloroethylene vapors are heavier than air and will collect in low areas. Keep container closed when not in use.
- Do not store in open, unlabeled or mislabeled containers.
- Liquid oxygen or other strong oxidants may form explosive mixtures with trichloroethylene
- This material or its vapors when in contact with flames, hot glowing surfaces or electric arcs can decompose to form hydrogen chloride gas and traces of phosgene.
- AVOID CONTAMINATION OF WATER SUPPLIES: Handling, storage and use procedures must be carefully monitored to avoid spills or leaks. Any spill or leak has the potential to cause underground water contamination which may, if sufficiently severe, render a drinking water source unfit for human consumption. Contamination that does occur cannot be easily corrected.

Other Precautions:

- AVOID PROLONGED OR REPEATED BREATHING OF VAPORS. High vapor concentrations can cause dizziness, unconsciousness or death. Long term overexposure may cause liver/kidney injury.
  USE ONLY WITH ADEQUATE VENTILATION. Ventilation must be sufficient to limit employee exposure to trichloroethylene in work area at or below OSHA permissible exposure limits (8-hour TWA - 100 ppm; ceiling - 200 ppm; maximum peak - 300 ppm, 5 minutes in every 2 hours). Observance of lower limits (outlined in Section 4) is advisable.
- AVOID CONTACT WITH EYES. Will cause irritation and pain.
- AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. May cause irritation or dermatitis.
- DO NOT TAKE INTERNALLY. Swallowing may cause injury or death.
- DO NOT EAT, DRINK OR SMOKE IN WORK AREAS.

References:

1. NIOSH Registry of Toxic Effects of Chemical Substances, 1978
2. Industrial Hygiene and Toxicology, Volume II, Second Edition, F. A. Patty, 1963
3. Dangerous Properties of Industrial Materials, Fifth Edition, N. I. Sax, 1979
4. Industrial Toxicology, Hamilton and Hardy, 1974
5. Toxicity and Matabolisms of Industrial Solvents, Browning, 1965
6. Toxicology, the Basic Science of Poisons, Casarett and Doull, 1975
7. Federal Register, 45FR Hazardous Waste Management Systems Part III, Identification and Listing of Hazardous Wastes, Page 33084, May 19, 1980
8. EPA Science Advisory Board, Subcommittee on Airborne Carcinogens, September, 1980

Comments:

As this solvent (trichloroethylene) is used primarily to clean and/or degrease a wide variety of metal and plastic parts, it should always be used in conjunction with properly igned and fully controlled solvent vapor degreasing equipment that is in compliance h the U.S. Environmental Protection Agency, OAQPS Guidelines, "Control of Volatile organic Emissions from Solvent Metal Cleaning", and/or all other applicable federal, state or local regulatory guidelines.

Material Safety Data Sheet

MSD 8208.22

rev. 11/85

DETREX CORPORATION P.O. Box 5111, Southfield, MI 48086-5111

Approved by U.S. Dept. of Labor as "Essentially similar" to Form OSHA-20

Date: November, 1985	Edition: Second
Chemical Name and Synonyms: Perchloroethylene; tetrachloroethylene CAS No.: 127-18-4	Trade Name and Synonyms: DETREX PERK GOLD SHIELD PERK Perchlor, Perchloroethylene
Chemical Family: Halogenated Hydrocarbons	Formula: $CCl_2=CCl_2$
DOT Shipping Name: Tetrachloroethylene	DOT Hazard Class: ORM-A UN1897

SECTION 1 · PHYSICAL DATA

Boiling Point @ 760 mm Hg: 121°C 250°F	Vapor Density (Air=1): 5.83	Specific Gravity (H_2O=1): 1.6 @ 20/20°C	pH of Solutions: 6.8 to 8.4
Freezing/Melting Point: -22.3°C -8.2F	Solubility (Weight % in Water): 0.015% @ 25°C	Bulk Density: 13.6 lbs./gal. @ 20°C	Volume % Volatile: 100
Vapor Pressure: 14.2mmHg @ 20°C	Evaporation Rate (ethyl ether-1):0.09	Heat of Solution: Not Applicable	Appearance and Odor: Clear, colorless liquid with ether-like odor.

SECTION 2 · HAZARDOUS INGREDIENTS

	%	Hazard Data
Perchloroethylene (Stabilized)	100	See Section 4 & 5

SECTION 3 · FIRE AND EXPLOSION HAZARD DATA

Flash Point °F (Method Used) None when tested in accordance with DOT requirements	Flammable Limits in Air (% by Volume) LEL: none UEL: none	Extinguishing Media: For fires involving perchloroethylene, use water, dry chemical or carbon dioxide.

Special Fire Fighting Procedures: Fire fighters should wear NIOSH/MSHA-approved pressure-demand self-contained breathing apparatus for possible exposure to hydrogen chloride and possible traces of phosgene.

Unusual Fire and Explosion Hazards. Perchloroethylene involved in fires can decompose to hydrogen chloride and possible traces of phosgene.

SECTION 4 · HEALTH HAZARD DATA

Toxicity Data See Reference 1	Classification (Poison, Irritant, Etc.)
LC_{50} Inhalation (rat) 4,000 ppm (4 hours)	Inhalation: Moderately Toxic
LD_{50} Dermal Not Determined	Skin Not Determined
Skin/Eye Irritation See Section 5	Skin/Eye: Mildly irritating to skin; eye irritant
LD_{50} Ingestion (rabbit) 5000 mg/kg	Ingestion: Slightly Toxic
Fish, LC_{50} (Lethal Concentration) 96hr. TLM 100-10 ppm	Aquatic: Toxic

Human Exposure Information/Data: Unconfirmed data[1] exists which indicate that perchloroethylene by ingestion may be more toxic to humans than indicated by the available data. Such unconfirmed data report poisonings at doses as low as 500 mg/kg.

24-HOUR EMERGENCY ASSISTANCE: (313) 358-5800

SECTION 5 · EFFECTS OF OVEREXPOSURE

This section covers effects of overexposure for inhalation, eye/skin contact, ingestion and other types of overexposure information in the order of the most hazardous and the most likely route of overexposure.

missible Exposure Limits The individual permissible exposure limits are as follows:

OSHA: 100 ppm, 8-hour TWA (time-weighted average); 100-200 ppm periodic excursions are allowed providing 8-hour TWA is at or below 100 ppm; 200-300 ppm excursions allowed only for maximum of 5 minutes in any 3-hour period; 300 ppm maximum allowable concentration (must not be exceeded); 29CFR 1910.1000.

ACGIH: 50 ppm, 8-hour TWA (time-weighted average); 200 ppm, STEL (15-minute short-term exposure limit)

ACUTE

Inhalation: Perchloroethylene is primarily a central nervous system depressant and can cause possible central nervous system damage with overexposure. Inhalation can cause irritation of the respiratory tract, dizziness, nausea, headache, loss of coordination and equilibrium, unconsciousness and even death in confined or poorly ventilated area. Fatalities following severe acute exposure to various chlorinated solvents have been attributed to ventricular fibrillation.

Eye/Skin: Liquid splashed in the eye can result in discomfort, pain and irritation. Prolonged or repeated contact with liquid on the skin can cause irritation and dermatitis. The problem may be accentuated by liquid becoming trapped against the skin by contaminated clothing and shoes, and skin absorption can occur.

Ingestion: Swallowing of this material may result in irritation of the mouth and GI t along with other effects as listed above for Inhalation. Vomiting and subsequent aspiration into the lungs may lead to chemical pneumonia and pulmonary edema which is a potentially fatal condition.

CHRONIC

Prolonged exposure above the OSHA permissible exposure limits may result in liver and kidney damage. Perchloroethylene has been extensively studied for its cancer potential. There is no documented evidence to suggest that perchloroethylene causes an increased cancer incidence in humans, nor does available information from animal studies suggest that this material poses a carcinogenic risk to humans under conditions adhering to recommended occupational guidelines.

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

Eye or Skin Contact: Flush eyes and skin with plenty of water (soap and water for skin) for at least 15 minutes, while removing contaminated clothing and shoes. If irritation occurs, consult a physician. Thoroughly clean contaminated clothing and shoes before reuse or discard.

Ingestion: If conscious, drink large quantities of water. DO NOT induce vomiting. Take immediately to a hospital or physician. If unconscious, or in convulsions, take immediately to a hospital. DO NOT attempt to give anything by mouth to an unconscious person.

Notes to Physician (Including Antidotes): NEVER administer adrenalin following perchloroethylene overexposure. Increased sensitivity of the heart to adrenalin may be caused by overexposure to perchloroethylene.

SECTION 6 · REACTIVITY DATA

Stability: Stable	**Conditions to Avoid:** Avoid open flames, hot glowing surfaces or electric arcs.
Hazardous Polymerization: Will not occur	**Conditions to Avoid:** None

Incompatibility (Materials to Avoid): Avoid contamination with caustic soda, caustic potash or oxidizing materials. Shock sensitive explosives may be formed.

Hazardous Decomposition Products: Hydrogen chloride and possibly traces of phosgene.

SECTION 7 · SPILL OR LEAK PROCEDURES

Steps to be Taken if Material is Spilled or Released: Immediately evacuate the area and provide maximum ventilation. Unprotected personnel should move upwind of spill. Only personnel equipped with proper respiratory and skin/eye protection (See Section 8) should be permitted in area. Dike area to contain spill. Take precautions as necessary to prevent contamination of ground and surface waters. Recover spilled material on adsorbents, such as sawdust or vermiculite, and sweep into closed containers for disposal. After all visible traces, including ignitable vapors, have been removed, thoroughly wet vacuum the area. DO NOT flush to sewer. If area of spill is porous, remove as much earth and gravel, etc. as necessary and place in closed containers for disposal.

Waste Disposal Method: Contaminated sawdust, vermiculite or porous surface must be disposed of in a permitted hazardous waste management facility. Recovered liquids may be reprocessed or incinerated or must be treated in a permitted hazardous waste management facility. Care must be taken when using or disposing of chemical materials and/or their containers in accordance with the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act as well as any other relevant federal, state, or local laws/regulations regarding disposal.

RCRA - Hazardous Waste Number - U-210

SECTION 8 · SPECIAL PROTECTION INFORMATION

Respiratory Protection: Use a half or full facepiece organic vapor chemical cartridge or canister respirator when concentrations exceed permissible limits. Use self-contained breathing apparatus (SCBA) or full facepiece airline respirator with auxiliary SCBA operated in the pressure-demand mode r emergencies and for all work performed in storage vessels, poorly ventilated rooms, and other ıfined areas. Respirators must be approved by NIOSH or MSHA. The respirator use limitations made ɹy NIOSH/MSHS[6,7] and by the manufacturer must be observed. Respiratory protection programs must be observed. Respiratory protection programs must be in accordance with 29CFR 1910.134.

Ventilation (Type): Use local exhaust or dilution ventilation as appropriate to control exposures to below permissible limits.

Eye Protection: Splashproof goggles

Gloves: Viton , Polyvinyl alcohol*.
For limited service only: Nitrile.
(*degrades in water)

Other Protective Equipment: Boots, aprons, or chemical suits should be used when necessary to prevent skin contact. Personnel protective clothing and use of equipment must be in accordance with 29CFR 1910.133 and 29CFR 1910.132.

SECTION 9 · SPECIAL PRECAUTIONS

Precautions to be Taken During Handling and Storing:

- Do not use in poorly ventilated or confined spaces without proper respiratory protection (See Section 8).
- Perchloroethylene vapors are heavier than air and will collect in low areas.
- Keep container closed when not in use.
- Store only in closed, properly labeled containers.
- This material or its vapors when in contact with flames, hot glowing surfaces or electric arcs can decompose to form hydrogen chloride gas and traces of phosgene.
- AVOID CONTAMINATION OF WATER SUPPLIES. Handling, storage and use procedures must be carefully monitored to avoid spills or leaks. Any spill or leak has the potential to cause underground water contamination which may, if sufficiently severe, render a drinking water source unfit for human consumption. Contamination that does occur cannot be easily corrected.
  ı chlorinated solvent used as a flashpoint suppressant must be added in sufficient quantity or the resultant mixture may have a flashpoint lower than the flammable component.
- Do not use cutting or welding torches on drums that contained perchloroethylene unless properly purged and cleaned.

Other Precautions:

- Do not breathe vapors. High vapor concentrations can cause dizziness, unconsciousness, possible central nervous system damage or death. Long-term overexposure may cause liver/kidney injury.
- Use only with adequate ventilation. Ventilation must be sufficient to limit employee exposure to perchloroethylene below permissible exposure limits. Observance of lower limits (outlined in Section 5) is advisable.
- Avoid contact with eyes. Will cause irritation and pain
- Avoid prolonged or repeated contact with skin. May cause irritation or dermatitis.
- Do not swallow. Swallowing may cause injury or death.
- Do not eat, drink, or smoke in work areas.

References:

1. NIOSH registry of Toxic Effects of Chemical Substances, 1978
2. Industrial Hygiene and Toxicology, Volume II, Second Edition, F. A. Patty, 1963
3. Dangerous Properties of Industrial Materials, Fifth Edition, N. I. Sax, 1979
4. EPA Science Advisory Board, Subcommittee on Airborne Carcinogens, September, 1980
5. Encyclopedia of Chemical Technology, Volume 5, Third Edition, Kirk-Othmer, 1979
6. NIOSH/OSHA Occupational Health Guidelines for Chemical Hazards, DHHS (NIOSH) Publication No. 81-123, January, 1981
7. NIOSH/OSHA Pocket Guide to Chemical Hazards, DHEW (NIOSH) Publication No. 78-210 September, 1978

Comments: As this solvent (perchloroethylene) is used to clean and/or degrease a wide variety of metal and plastic parts, it should always be used in conjunction with properly designed and fully controlled solvent vapor degreasing equipment that is in compliance with the U. S. Environmental Protection Agency, OAQPS Guidelines, "Control of Volatile Organic Emissions from Solvent Metal Cleaning", and/or any other applicable federal, state or local regulatory guidelines.

Perchloroethylene is also used extensively in the commercial drycleaning of clothes. It ld always be used in conjunction with properly designed and fully controlled equipment that is ı compliance with all applicable federal, state and local regulatory guidelines.

DETREX AUTHORIZED SIGNATURE James R. Goodrich

Material Safety Data Sheet

MSD 8208.23

DETREX CHEMICAL INDUSTRIES, INC.
P.O. BOX 501,
DETROIT, MICHIGAN 48232

Approved by U.S. Dept. of Labor as "Essentially similar" to Form OSHA-20

Date:	Edition:
Chemical Name and Synonyms: Methylene Chloride; dichloromethane CAS No.: 75-09-2	Trade Name and Synonyms: Methylene Chloride
Chemical Family: Halogenated Hydrocarbons	Formula: CH_2Cl_2
DOT Shipping Name: Methylene Chloride	DOT Hazard Class: ORM-A - UN 1593

SECTION 1 · PHYSICAL DATA

Boiling Point @ 760 mm Hg: 103.6°F (39.8°C)	Vapor Density (Air=1): @ 20°C = 2.93	Specific Gravity (H_2O=1): 1.32	pH of Solutions: Neutral
Freezing/Melting Point: -142.1°F (-96.7°C)	Solubility (Weight % in Water): 2g/100 ml	Bulk Density: @ 20°C 11.15 lbs./gal.	Volume % Volatile: Essentially 100
Vapor Pressure: @ 20°C = 349 mmHg	Evaporation Rate (ethyl ether = 1): 0.71	Heat of Solution: Not Applicable	Appearance and Odor: Clear, colorless liquid with ether-like odor.

SECTION 2 · HAZARDOUS INGREDIENTS

	%	Hazard Data
Methylene Chloride (Stabilized)	100	See Sections 4 and 5

SECTION 3 · FIRE AND EXPLOSION HAZARD DATA

Flash Point °F (Method Used) None when tested in accordance with DOT requirements.	Flammable Limits in Air (% by Volume) See Below LEL: 12% UEL: 19%	Extinguishing Media: For fires involving methylene chloride, use water, dry chemicals or CO_2.

Special Fire Fighting Procedures: Fire fighters should wear NIOSH/MSHA-approved, self-contained breathing apparatus for possible exposure to hydrogen chloride and possible traces of phosgene.

Unusual Fire and Explosion Hazards: Vapors concentrated in a poorly ventilated area can be ignited upon contact with a spark, flame or high intensity source of heat. This can occur at concentrations between 12% and 19% by volume. Decomposition or burning can produce hydrogen chloride and possibly traces of phosgene. Also see Detrex warning letter Form Sel. 8208.21 attached.

SECTION 4 · HEALTH HAZARD DATA

Permissible Exposure Limits (TLV): 500ppm (TWA) See Section 4 (Cont'd) next page

Toxicity Data	Classification (Poison, Irritant, Etc.)
LC_{50} Inhalation LCLo (guinea pig) 5,000ppm/2hrs. TCLo*(human) 500ppm/8hrs.	Inhalation: Toxic
LD_{50} Dermal	Skin/Eye: Liquid mildly irritating to skin; eye irritant.
LD_{50} Ingestion - (rat) - 2.136mg/kg	Ingestion: Slightly toxic
Fish. LC_{50} (Lethal Concentration) Not determined	Aquatic:

Human Exposure Information/Data:

* Lowest published toxic concentration.

24-HOUR EMERGENCY ASSISTANCE: (313) 358-5800

Section 4 (cont'd) - Permissible Exposure Limit

Current OSHA permissible exposure limits (29CFR 1910.1000) are 500 ppm (8-hour TWA); 500-1,000 ppm period excursions are allowed providing TWA is at or below 500ppm; 1,000-2,000ppm excursions allowed only for maximum of five minutes in any 2-hour period -- 2,000ppm maximum allowable concentration (must not be exceeded).

*NIOSH recommends that the TWA exposure limit for methylene chloride is 75ppm. In the absence of occupational exposure to carbon monoxide (CO) above a TWA of 9ppm up to a 10-hour workday, occupational exposure to methylene chloride shall be controlled so that workers are not exposed to methylene chloride in excess of 75ppm (261 mg/cu m) determined as a TWA for up to a 10-hour workday, 40-hour workweek. In the presence of exposure to CO in the work environment at more than 9ppm as a TWA for up to a 10-hour workday, exposure limits of CO or methylene or both shall be reduced to satisfy the relationship:

$$\frac{C(CO)}{L(CO)} + \frac{C(CH_2Cl_2)}{L(CH_2Cl_2)} \leq 1$$

where: $C(CO)$ = TWA exposure concentration of CO, ppm

$L(CO)$ = the recommended TWA exposure limit of CO = 35 ppm

$C(CH_2Cl_2)$ = TWA exposure concentration of methylene chloride, ppm

$L(CH_2Cl_2)$ = the recommended TWA exposure limit of methylene chloride = 75 ppm

Occupational exposure shall be controlled so that workers are not exposed to methylene chloride above a peak concentration of 500ppm (1,740 mg/cu m) as determined by a 15-minute sampling period.

Employees working with methylene chloride should be aware of this hazard. This toxic effect is "additive" in nature with the risk being greater for smokers, who generally have higher levels of carboxyhemoglobin. Employees with a history of cardiovascular disease should not be allowed to work with methylene chloide unless approved by a physician.

SECTION 5 · EFFECTS OF OVEREXPOSURE

This section covers effects of overexposure for inhalation, eye/skin contact, ingestion and other types of overexposure information in the order of the most hazardous and the most likely route of overexposure.

Effects of Overexposure *

Acute: Inhalation effect is primarily narcosis. Principal symptoms may be headache, dizziness, nausea, tingling or numbness of the extremities, senses of fullness in the head, sense of warmth, stupor or dullness, lethargy and drunkeness. Exposure to very high concentrations may lead to unconsciousness or even death in confined or poorly ventilated areas.

Chronic: Several chronic inhalation studies reported by NIOSH revealed that test animals exposed to methylene chloride concentrations as high as 10,000ppm, showed slight liver and kidney changes. The results of these studies indicate that prolonged exposure limits may result in liver and kidney damage.

Chronic inhalation studies, cosponsored by several methylene chloride producers, were recently completed on rats. The results of these studies were reported to have revealed a mathematically significant increase in malignant salivary gland tumors in the group of male rats from the study's highest exposure level (3,500ppm).

Liquid splashed in the eyes can result in discomfort, pain and irritation. Prolonged or repeated contact with liquid on the skin can cause irritation and dermatitis. The problem may be accentuated by liquid becoming trapped against the skin by contaminated clothing and shoes. Skin absorption can occur.

Research has recently shown that methylene chloride is metabolized by the body to carbon monoxide.[4] Further, the amount of carbon monoxide formed is directly related to the amount of methylene chloride absorbed and can be sufficient to produce a substantial stress on the cardiovascular system through the elevation of the level of carboxyhemoglobin (COHb) -- the product formed by the combination of carbon monoxide and the blood's hemoglobin thus effectively reducing the amount of hemoglobin available for the transport of oxygen throughout the body.

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

Eye or Skin Contact: Flush eyes and skin with plenty of water (soap and water for skin) for at least 15 minutes, while removing contaminated clothing and shoes. If irritation occurs, consult a physician.

Ingestion: If conscious, drink a quart of water. DO NOT induce vomiting. Take immediately to a hospital or physician. If unconscious, or in convulsions, take immediately to a hospital or physician. DO NOT give anything by mouth to an unconscious person.

Notes to Physician (Including Antidotes): NEVER administer adrenalin following methylene chloride overexposure. Increased sensitivity of the heart to adrenalin may be caused by overexposure to methylene chloride.

SECTION 6 · REACTIVITY DATA

Stability: Stable	**Conditions to Avoid:** Avoid open flames, hot glowing surfaces or electric arcs.
Hazardous Polymerization: Will not occur	**Conditions to Avoid:** None

Incompatibility (Materials to Avoid): Avoid contamination with caustic soda, caustic potash or oxidizing materials. Shock sensitive explosives may be formed. Avoid contact with aluminum, magnesium, zinc and alloys thereof under high pressures. See Detrex warning letter Form Sol. 8208.21 attached.

Hazardous Decomposition Products: Hydrogen chloride and possibly traces of phosgene.

SECTION 7 · SPILL OR LEAK PROCEDURES (See Detrex Forms Sol. 8208.14 and Sol. 8208.15 attached)

Steps to be Taken if Material is Spilled or Released: Immediately evacuate the area and provide maximum ventilation. Unprotected personnel should move upwind of spill. Only personnel equipped with proper respiratory and skin/eye protection should be permitted in area. Dike area to contain spill. Take precautions as necessary to prevent contamination of ground and surface waters. Recover or absorb spilled material on sawdust or vermiculite and sweep into closed containers for disposal. After all visible traces have been removed, thoroughly wet vacuum the area. DO NOT flush to sewer. If area of spill is porous, remove as much contaminated earth and gravel, etc., as necessary and place in closed containers for disposal. (See Below).

Waste Disposal Method: Contaminated sawdust, vermiculite or porous surface must be disposed of in a permitted hazardous waste management facility. Recovered liquids may be reprocessed or incinerated or must be treated in a permitted hazardous waste management facility. Care must be taken when using or disposing of chemical materials and/or their containers to prevent environmental contamination. It is your duty to dispose of the chemical materials and/or their containers in accordance with the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act and all relevant state or local laws/regulations regarding disposal.

SECTION 8 · SPECIAL PROTECTION INFORMATION

Respiratory Protection: For emergencies or working in confined areas, wear self-contained breathing apparatus or supplied air respiratory protection. (Use the "buddy system" and wear a safety harness with lifeline). In other circumstances involving potentional overexposures, use NIOSH/MSHA-approved organic vapor respirator. (Observe limitations directed by manufacturer.) Respiratory protection program must be in accordance with 29CFR 1910.134.

Ventilation (Type): Mechanical (General) - Sufficient to maintain workplace concentration below permissible exposure limits.

Eye Protection: Splashproof goggles

Gloves: Polyethylene, neoprene or polyvinyl alcohol.

Other Protective Equipment: Safety shower and eye-wash fountain in immediate area. Personnel protective clothing and use of equipment must be in accordance with 29CFR 1910.133 and 29CFR 1910.132.

SECTION 9 · SPECIAL PRECAUTIONS

Precautions to be Taken During Handling and Storing:

- Do not use in poorly ventilated or confined spaces.
- Methylene chloride vapors are heavier than air and will collect in low areas.
- Keep container closed when not in use.
- Do not store in open, unlabeled or mislabeled containers.
- Liquid oxygen or other strong oxidants may form explosive mixtures with methylene chloride.
- This material or its vapors when in contact with flames, hot glowing surfaces or electric arcs can decompose to form hydrogen chloride gas and traces of phosgene.
- AVOID CONTAMINATION OF WATER SUPPLIES: Handling, storage, and use procedures must be carefully monitored to avoid spills or leaks. Any spill or leak has the potential to cause underground water contamination which may, if sufficiently severe, render a drinking water source unfit for human consumption. Contamination that does occur cannot be easily corrected.
- Caution should be taken not use in pressurized or totally enclosed system of light metal construction such as aluminum, magnesium, zinc or alloys thereof. Example, paint or adhesive spray system. (See form Sol. 8208.21 attached.)

Other Precautions:

AVOID PROLONGED OR REPEATED BREATHING OF VAPORS. High vapor concentrations can cause dizziness, unconsciousness or death. Long -term overexposure may cause liver/kidney damage.
USE ONLY WITH ADEQUATE VENTILATION. Ventilation must be sufficient to limit employee exposure to methylene chloride below OSHA permissible exposure limits (8-hour TWA - 500ppm; ceiling - 1,000ppm; maximum peak - 2,000ppm, 5 minutes in any 2 hours).

- AVOID CONTACT WITH EYES. Will cause irritation and pain.
- AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. May cause irritation or dermatitis.
- DO NOT TAKE INTERNALLY. Swallowing may cause injury or death.

References:

1. NIOSH Registry of Toxic Effects of Chemical Substances, 1978
2. Industrial Hygiene and Toxicology, Volume II, Second Edition, F.A. Patty, 1963
3. Dangerous Properties of Industrial Materials, Fifth Edition, N.I. Sax, 1979
4. Industrial Toxicology, Hamilton and Hardy, 1974
5. Toxicity and Metabolisms of Industrial Solvents, Browning, 1965
6. Toxicology, the Basic Science of Poisons, Casarett and Doull, 1975
7. Federal Register, 45FR Hazardous Waste Management Systems Part III, Identification and Listing of Hazardous Wastes, Page 33084, May 19, 1980
8. EPA Science Advisory Board, Subcommittee on Airborne Carcinogens, September, 1980

Comments: As this solvent (methylene chloride) is used to clean and/or degrease a wide variety of metal and plastic parts, it should always be used in conjunction with properly designed and fully controlled solvent vapor degreasing equipment that is in compliance with the U.S. Environmental Protection Agency OAQPS Guidelines, "Control of Volatile Organic Emissions from Solvent Metal Cleaning", and/or all other applicable federal, state or local regulatory guidelines.

Methylene chloride is also used extensively in industry as a solvent, thinner, paint stripper, etc. It should always be used in conjunction with properly designed and fully controlled equipment that is in compliance with applicable federal, state and regulatory guidelines.

DU PONT

MATERIAL SAFETY DATA SHEET

IDENTIFICATION

Name:
Freon® TF Solvent
Freon® PCA

Chemical Family:
Halogenated Hydrocarbon

Synonyms:
Trichlorotrifluoroethane
R-113, FC-113

Formula:
CCl_2FCClF_2

CAS Name:
Ethane, 1,1,2-Trichloro-1,2,2-Trifluoro

CAS Registry No.
76-13-1

Manufacturer/Distributor:
E. I. du Pont de Nemours & Co. (Inc.)

Medical Emergency Phone:
(800) 441-3637

Address:
Freon® Products Division
Wilmington, DE 19898

Transportation Emergency Phone:
CHEMTREC (800) 424-9300

PHYSICAL DATA

Boiling Point(°F):	117.6	Percent Volatile by Volume:	100%
Density:	1.57 g/cc @/77°F	Vapor Pressure:	334mm Hg @/77°F
Vapor Density (Air = 1):	6.5	Solubility in H_2O:	0.02% by wt. @ 77°F
pH Information:	Neutral	Evaporation Rate (CCl_4 = 1):	0.1
Form: Liquid		Appearance:	Clear
Color: Colorless		Odor:	Slight Ethereal Odor

HAZARDOUS COMPONENTS

Material(s):	Approximate % :
Trichlorotrifluoroethane	100

HAZARDOUS REACTIVITY

Stability:
Material is stable. However, avoid open flames and high temperatures.

Incompatibility:
Alkali or alkaline earth metals - powdered Al, Zn, Be, etc.

Decomposition:
This compound can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrochloric and hydrofluoric acids - possible carbonyl halides.

Polymerization:
Will not occur

FIRE AND EXPLOSION DATA

Flash Point:
None

Method:
TOC

Autoignition Temperature:
Not Determined

Flammable Limits in Air, % by Vol.
Lower: Nonflammable
Upper: Nonflammable

Autodecomposition Temperature:
Not Determined

Fire and Explosion:
Drums may rupture under fire conditions. Decomposition may occur.

Extinguishing Media:
Nonflammable

Special Fire Fighting Instructions:
Self-contained breathing apparatus (SCRA) may be required if drums rupture and contents are spilled under fire conditions.

HEALTH HAZARD INFORMATION

Principal Health Hazards:

Inhalation: Vapor is heavier than air and can cause suffocation by reducing oxygen available for breathing. Breathing high concentrations of vapor may cause light-headedness, giddiness, shortness of breath, and may lead to narcosis, cardiac irregularities, unconsciousness or death. LC 50 Rats 52,000 ppm/4 hrs.

Note: In screening studies with experimental animals, exposure at approximately 5000 ppm (v/v) and above, followed by a large intravenous epinephrine challenge, has induced serious cardiac irregularities.

Skin: Not a corrosive or irritant after single contact; however, repeated liquid contact can cause defatting of the skin resulting in irritation. This material is poorly absorbed through the skin (Rabbit ALD >11,000 mg/kg).

Eye: Liquid contact can cause discomfort, usually no extended effect.

Oral: Although oral toxicity is low [LD 50 Rat 43000 mg/kg], ingestion of FC-113 is to be avoided.

Exposure Limits:

PEL (OSHA)	1,000 ppm
TLV® TWA (ACGIH)	1,000 ppm

Safety Precautions:
Avoid breathing vapors and prolonged skin exposure. Use only in well ventilated area.

First Aid:

Inhalation: Remove to fresh air, call a physician. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Do not give epinephrine or similar drugs.

Note to Physician: Because of a possible increased risk of eliciting cardiac dysrythmias, catecholamine drugs, such as epinephrine, should be considered only as a last resort in life threatening emergencies.

Eye: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

Skin: Flush with water. Get medical attention if irritation is present.

Oral: No specific intervention is indicated as the compound is not likely to be hazardous by ingestion. However, consult a physician if necessary. Do not induce vomiting as the hazard of aspirating the material into the lungs is a greater hazard than allowing it to progress through the intestinal tract.

Medical Conditions Possibly Aggravated by Exposure:

Cardiovascular Disease: See Principal Hazards: Inhalation Section.

Other Health Hazards:

Freon® 113 is not listed as a carcinogen by IARC, NTP or OSHA. Based on animal studies and human experiences this fluorocarbon poses no hazard to man relative to systemic toxicity, carcinogenicity, mutagenicity, or teratogenicity when occupational exposures are below its TLV®.

PROTECTION INFORMATION

Generally Applicable Control Measures:

Normal ventilation for standard manufacturing procedures is generally adequate. Local exhaust should be used when large amounts are released. Mechanical ventilation should be used in low places.

Personal Protective Equipment:

Butyl gloves should be used to avoid prolonged or repeated exposure. Chemical splash goggles should be available for use as needed to prevent eye contact. Under normal manufacturing conditions no respiratory protection is required when using this product. Self-contained breathing apparatus (SCBA) is required if a large spill occurs.

DISPOSAL INFORMATION

Spill, Leak or Release:
Ventilate area. Do not flush into sewers. Dike spill. Collect on absorbent material and transfer to steel drums for recovery or disposal. Comply with federal, state and local regulations on reporting releases.

Waste Disposal: Comply with federal, state and local regulations. Remove to a permitted waste disposal facility. EPA Hazardous Waste Nos. F001 and F002 may apply to waste materials.

SHIPPING INFORMATION

Domestic - Other Than Air (DOT)

Proper Shipping Name	Not Regulated

International Water or Air (IMO/ICAO)

Proper Shipping Name	Not Regulated

Other Information

Shipping Containers	Drums, tank trucks, tank cars
Storage Conditions	Clean, dry area. Do not heat above 125°F.

Date Revised: 10/85
Person responsible: T. D. Armstrong, C&P Dept., Freon® Products Lab, Chestnut Run, Bldg. 711, Wilmington, DE 19898 (302) 999-3847 or (302) 999-4338.

DUPONT

ATTACHMENT C-3

TESTING METHODS

STANDARD OPERATING PROCEDURES FOR THE DETERMINATION OF SOLVENT CONTENT IN SPENT SOLVENTS FROM DEGREASING OPERATIONS USING SPECIFIC GRAVITY METHOD

STANDARD OPERATING PROCEDURES FOR THE DETERMINATION OF SOLVENT CONTENT IN SPENT SOLVENTS FROM DEGREASING OPERATIONS USING SPECIFIC GRAVITY METHOD

1.0 SCOPE AND APPLICATION

The specific gravity method for correlating solvent percent and specific gravity was devised by Mr. Jim Goodrich, formerly laboratory supervisor of the Detrex Solvent Laboratory and currently a chemist in Detrex's Research Technologies International (RTI) division. The graphs relating specific gravity and solvent percent (volume) are non-empirical and are based on the following assumptions:

i) the non-volatile fraction of the waste oil can be approximated by an oil of specific gravity 0.9.

ii) the relationship between specific gravity and volume percent is linear.

iii) a sample of 0% solvent would have a specific gravity of 0.9, and a sample of 100% solvent would have a specific gravity of the solvent in question..

The specific gravity method is designed to be used a screening procedure only; quantitation is performed by a gas chromatograph analysis.

2.0 SUMMARY OF METHOD

A representative sample of the spent solvent/oil mixture is obtained and the specific gravity is determined. The percent solvent is determined by comparing the specific gravity of the mixture to that of the pure solvent.

3.0 INTERFERENCES

The determination is for screening purposes only and any materials that will interfere with the measurement of the specific gravity will interfere with the percent solvent determination.

4.0 APPARATUS AND MATERIAL

4.1 Glass Thief for Collection of Sample

4.2 Thermometer

4.3 Specific Gravity Hydrometer Set - 0.90 to 1.60 specific gravity range

4.4 Hydrometer Jar

5.0 REAGENTS

5.1 Rinse Solvent - Solvent of same type as being measured to rinse hydrometer jar

6.0 SAMPLE COLLECTION, PRESERVATION AND HANDLING

Samples are collected in accordance to section 5.0 of the QAPP

7.0 PROCEDURE

7.1 Collect sample using the Glass Thief

7.2 Transfer sample to a container of sufficient size to allow for mixing.

7.3 Shake container for at least 30 seconds.

7.4 Place the thermometer and a hydrometer in the hydrometer jar.

7.5 Fill the hydrometer jar to within one inch of the top with the mixture to be tested.

7.6 If the hydrometer reads off-scale, replace it with a higher or lower range hydrometer as required.

7.7 Read the hydrometer to the nearest 0.01 SpG unit.

7.8 Pour sample back into original container.

7.9 Rinse hydrometer jar with solvent prior to collecting next sample.

7.10 Using the attached Solvent-Oil Mixture vs. Gravity Graph or Chart, for the appropriate solvent type, determine the weight per cent oil.

7.11 The solvent content is calculated as follows:

7.12 WEIGHT PER CENT SOLVENT = 100% - WEIGHT PER CENT OIL

8.0 QUALITY CONTROL

This procedure is for screening purposes only and no substantial quality control is required.

Standard Test Methods for Flammability Potential Screening Analysis of Waste[1]

This standard is issued under the fixed designation D 4982; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 These test methods are used to indicate the fire-producing potential of wastes. The following test methods can be applied to waste liquids, sludges, semisolids, or solids:

	Sections
Test Method A—Test Sample Exposed to Heat and Flame	11 to 13
Test Method B—Test Sample Exposed to Spark Source	14 to 15

1.2 These test methods should be used to measure and describe the properties of materials, in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials under actual fire conditions. However, results of these tests may be used as elements of a fire risk assessment that takes into account all of the factors that are pertinent to an assessment of the fire hazard of a particular end use.

1.3 These test methods are designed and intended as preliminary tests to complement the more sophisticated quantitative analytical techniques that may be used to determine flammability. These test methods offer, to the user, the option and the ability to screen waste for potentially hazardous flammability potential when the more sophisticated techniques are not available and the total waste composition is unknown.

1.4 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazard information is given in Section 6 and 13.4.3.1.

2. Referenced Documents

2.1 *ASTM Standard:*

D 93 Test Methods for Flash Point by Pensky-Martens Closed Tester[2]

2.2 *Other Standard:*

Prudent Practices for Handling Hazardous Chemicals in Laboratories[3]

3. Terminology

3.1 *Description of Term Specific to This Standard:*

3.1.1 *screening analysis*—a *preliminary* qualitative or semiquantitative test developed from classical qualitative and quantitative techniques that is designed to efficiently give the user specific information about a waste that will aid in determining waste identification, process compatibility, and safety in handling.

4. Summary of Test Methods

4.1 *Method A*—A test sample is exposed to heat and flame. The sample is reported as having a positive or negative flammability potential as described in the test procedure.

4.2 *Method B*—Sparks from a flint lighter are introduced to the vapor space immediately above a representative sample of a waste, and observation is made for a flash in the vapor space or ignition of the sample. A flash in the vapor space or ignition and burning of the waste indicates a positive flammability potential at ambient temperature.

5. Significance and Use

5.1 These test methods are intended for use by those in the waste management industries to aid in identifying the flammability potential or waste materials.

6. Hazards

6.1 Avoid inhalation and skin or eye contact, or any hazardous materials.

6.2 Standard laboratory hygiene practices should be followed when conducting these tests.

6.3 All tests must be performed in a laboratory hood equipped with an exhaust intake along the front edge of the work area to collect any heavier-than-air vapors generated.

6.4 The analyst must wear flame resistant oven gloves.

6.5 Waste containing or suspected of containing highly volatile organics or peroxides should be tested using a much smaller sample than that used in 13.2.

7. Sampling

7.1 Sample containers must be kept tightly sealed until tested.

7.2 Samples should be analyzed as soon as possible after collection.

7.3 If necessary, allow the sample to come to room temperature in a tightly sealed container. For example frozen material should be allowed to thaw completely.

8. Report

8.1 Report the following information:

8.1.1 Sample identification,

8.1.2 Date of test,

8.1.3 Sample classification: positive or negative, and

8.1.4 Reference to the procedure applied.

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[1] These test methods are under the jurisdiction of ASTM Committee D-34 on Waste Disposal and is the direct responsibility of Subcommittee D34.02 on Physical and Chemical Characterization.

Current edition approved Nov. 10, 1989. Published December 1989.

[2] *Annual Book of ASTM Standards*, Vol 05.01.

[3] National Research Council, National Academy Press, Washington, DC, 1981.

9. Quality Control

9.1 Quality control check samples and duplications should be performed at an action level specified by the laboratory and at an appropriate frequency.

9.2 Flammability standards should be maintained for analyst training and as reference guides. Examples are given in the following table.

Flammability Potential Screening Analysis

Methyl alcohol (methanol)	Difficult-to-see flame; flammable at or below room temperature.
Glacial acetic acid	Flammable at temperatures above normal room temperature.
Hendecane (n-undecane)	Flammable at temperatures higher than glacial acetic acid.
Kerosene (Fuel Oil No. 1)	Flammable over a range of temperatures higher than normal room temperature.
p-Xylene	Flammable at or above room temperature; freezes at 13°C. A spiked soil sample frozen at 0°C demonstrates interference.
Chlorofluorocarbon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	Warning: phosgene formation likely; see 13.4.3.1.

10. Precision and Bias

10.1 No statement is made about either the precision or bias of these test methods since the result merely states whether there is conformance to the criteria for success specified in the procedure.

TEST METHOD A—EXPOSURE TO HEAT AND FLAME

11. Interferences

11.1 Drafts in the laboratory fume hood where the test is performed could cause excessive cooling and false negative results. A properly operating fume hood with a face velocity of 150 ft/min should provide consistent, usable results.

11.2 Ignition sources that provide excessive heating rates alone or combined with a very small test portion may obscure results. That is, the sample may be decomposed, sintered, fused, evaporated, or otherwise consumed before positive or negative evidence of flammability is observed. The use of sufficiently large test portions and of heating rates typical of a bunsen burner should resolve this problem.

11.3 An inadequate source of heating could limit the volatilization of flammable components and provide false negative results.

11.4 Difficult-to-observe flames resulting from the burning of certain compounds (for example, methanol) could provide false negative results. If the presence of these compounds is suspected, the presence of flammability might be confirmed by the insertion of a watchglass just above the test material. The watchglass is then examined for products of combustion (for example, moisture and soot).

NOTE 1—The watchglass method cannot distinguish between vaporized water or water produced by combustion.

11.5 An improperly adjusted gas burner (for example, with an insufficiently aerated flame) could introduce raw gas into or immediately above the sample. This raw gas could briefly support a flame after the source of ignition is removed, providing the appearance of a flammable sample and a false positive result.

12. Apparatus

12.1 *Gas Burner*, (for example, a bunsen burner) with an adjustable air shutter and an adjustable gas orifice is needed. The gas burner and fuel supply line must be appropriate to the gas supplied: natural gas, artificial gas (including propane and butane), or liquified petroleum gas (LP gas or LPG). Where a gas supply line cannot be provided, a propane torch may be substituted.

12.2 *Lighter*, (for example, piezo lighter) for burner is required.

12.3 *Aluminum Weighing Boats* or other non-flammable containers are needed.

12.3.1 Caution—Weighing boats of material other than aluminum should be used if the testing materials react with aluminum, for example, caustics.

12.4 *Watchglass*.

12.5 *Large Beaker, Tongs, Asbestos-Free High-Temperature Gloves or Mittens*, or other apparatus as needed to extinguish burning materials.

13. Procedure

13.1 Light a gas burner and adjust to a typically blue flame that is not readily blown out. A yellow flame easily affected by drafts indicates insufficient air (the air:fuel ratio is too low). A sharp, blue flame is good. (If the flame rises above the burner head, is very difficult to light, or tends to extinguish itself, indicates that too much air or too much air and fuel are being supplied to the burner.)

13.2 Place a sufficient amount (approximately 5 g) of a test sample in an aluminum weighing boat or other nonflammable container.

13.3 Using a gas burner, hold the flame immediately above the test sample for 2 to 3 s without touching the visible flame to the sample.

13.3.1 If ignition (a flash or burning) is observed before or after the source of ignition (the flame of the burner) is removed, the sample is said to have a positive flammability potential. A positive result may require further investigation (see 13.4.1).

13.3.2 The confirmation of flammability may require the use of a watchglass (see 11.4).

13.3.3 If there is no ignition, proceed to 13.4.

13.4 Using a gas burner, briefly (for at least 15 s) apply the flame to the sample in an attempt to ignite the sample.

13.4.1 If the sample ignites, the sample is said to have a positive flammability potential.

13.4.1.1 When more accurate waste characterization is necessary, liquid samples may be quantified using a closed-cup flash point tester.

13.4.1.2 Solids with a positive flammability potential should be further investigated.

13.4.2 If the sample decomposes, boils (if a liquid), or otherwise fails to ignite after at least 15 s of continuous sample heating by the burner flame, the flammability potential is reported as negative.

13.4.3 Halogenated solvents typically give off visible vapors that may result in a false positive flammability potential.

NOTE 2: Warning—Phosgene, an extremely toxic gas, is a combustion product of halogenated compounds burned in air.

13.5 Shut off the gas burner when not in use. Extinguish a

burning sample by setting an aluminum weighing boat or watchglass atop the one containing the burning sample, (or invert a spoutless beaker over the sample container and all). Use of tongs or high temperature gloves or mittens may be necessary to handle the equipment.

TEST METHOD B—EXPOSURE TO SPARK SOURCE

14. Apparatus

14.1 *Oven Gloves.*

14.2 *Flint Lighter*, the type typically used to light an air/acetylene torch is required.

14.3 *Disposable 250-mL Beaker*, of plastic is required.

14.4 *Watchglass*, 100 mm.

14.5 *Metal Vessel* (with lid), of adequate depth and diameter to contain beaker and watchglass is needed.

14.6 *Thermometer.*

15. Procedure

15.1 Place approximately 100 mL of the representative sample of the material to be tested into the plastic beaker (see 7.3).

15.2 Place the plastic beaker in the steel vessel, beaker with the watchglass, and allow to stand at conditions for 5 min.

15.3 Record the ambient temperature.

15.4 Remove the watchglass, place the igniter immediately above the waste and strike it several times to produce sparks.

15.5 If the material does catch fire and burn, extinguish the flames by immediately placing the lid on the steel vessel, thus smothering the fire and report as positive flammability potential.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.

STANDARD OPERATING PROCEDURES FOR THE EXTRACTION OF SPENT SOLVENTS

STANDARD OPERATING PROCEDURES FOR THE EXTRACTION OF SPENT SOLVENTS

1.0 SCOPE

This method describes a sampling preparation procedure for the determination of halogenated solvents in a spent halogenated solvent oil mixture.

2.0 SUMMARY OF METHOD

A sample of spent halogenated solvent waste is weighed in a tared, flat bottom flask. The flask is connected to a rotary vacuum evaporator and the solvent is vacuum distilled from the mixture, the weight of residue is determined, and the total non-volatile percentage calculated.

3.0 APPARATUS AND MATERIALS

3.1 Rotary vacuum evaporator with heating bath.

3.2 250 m*l* flat bottom flasks:

3.3 Precision Balance: capable of measuring to .005 $\pm$ 001 g.

3.4 Vacuum Apparatus: water aspirator.

4.0 PROCEDURE

Preheat water bath to 90°C. Pour approximately 30 *ml* of sample into a tared flat bottom flask, weigh and record initial weight. Attach flask to rotary vacuum evaporator, apply vacuum, lower flask into water bath and roto-evaporate solvent from solvent-oil sample until condensate ceases flowing from the condensor. Remove flask from evaporator, dry, reweigh and record. Remove (pour) distillate from receiving flask into clean sample container and store for analysis.

5.0 DETERMINATION OF % NON-VOLATILE RESIDUE

The calculation of % non-volatile residue is as follows:

$$\frac{R}{S} \times 100 = \% \text{ NV}$$

R=Mass of residue after roto-evaporation

S=Mass of waste solvent before roto-evaporation

6.0 The distillate is subsequently analyzed for individual halogenated solvents by gas chromatography.

STANDARD OPERATING PROCEDURES FOR THE DETERMINATION OF SOLVENTS IN SPENT SOLVENTS BY GAS CHROMATOGRAPHY

STANDARD OPERATING PROCEDURES FOR THE DETERMINATION OF SOLVENTS IN SPENT SOLVENTS BY GAS CHROMATOGRAPHY

1.0 SCOPE

1.1 This method is used for the determination of recoverable halogenated and non-halogenated solvents in spent solvent oil mixtures. Applicable analytes and their respective retention times are presented in Table 1.

1.2 The range of concentration determined by this method is 0.5 to 100% and is applicable only to concentrated organic matrices.

1.3 This method is based upon a gas chromatographic/flame ionization detection (GC/FID) procedure.

2.0 SUMMARY OF METHOD

2.1 Prior to analysis, the samples are prepared for gas chromatography using the extraction procedure for waste solvent.

2.2 An aliquot of the extract is introduced into the gas chromatograph by direct injection. The solvents are separated by a capillary column and detected by a flame ionization detector.

3.0 INTERFERENCES

3.1 Potential interferences from the waste mixture are effectively reduced or removed by the vacuum distillation extraction procedure.

4.0 APPARATUS AND MATERIALS

4.1 Gas Chromatograph - Hewlett-Packard HP 5890 with Model 7673A autosampler and Model 3396 integrating recorder.

4.2 Column - Hewlett-Packard Ultra 2 (cross linked 5% phenyl methyl silicone gum) 50 meter x 0.32 mm ID with 0.52 µm film thickness

4.3 Detector - Flame Ionization Detector

4.4 Volumetric flasks - 10 ml Class A

4.5 Precision Balance - Capable of weighing 0.05 $\pm$ 0.01g

4.6 Pastuer Pipettes - 5 3/4" glass disposable

5.0 REAGENTS

5.1 Solvents - Chlorobenzene (ACS grade minimum with no interfering impurities)

5.2 Calibration Standards

Due to the high concentration range of this method, calibration standards may be prepared directly from the neat solvents.

5.2.1 Halogenated Solvents

ACS grade (99%+) solvents with no interfering peaks:

1,1,1-Trichloroethane
Trichloroethylene (trichloroethene)
Perchloroethylene (tetrachloroethene)
1,1,2-Trichloro-1,2,2-trifluoroethane (freon 113)
Methylene chloride

5.2.2 Non-Halogenated Solvents

ACS grade (99%+) solvents with no interfering peaks:

Methanol	n-Butyl alcohol
Ethanol	1,4-Dioxane
Acetone	Methylisobutyl ketone
2-Propanol	Toluene
t-Butyl alcohol	Methyl ethyl ketone

Nitromethane	Cyclohexene oxide
Butylene oxide	o-Xylene
sec-Butyl alcohol	m-Xylene
dioxolane	p-Xylene

5.2.3 Preparation of Standards

Calibration standards of the solvents are prepared at three concentration levels by weighing the appropriate mass of solvent in a tared 10 m*l* volumetric flask and diluting to the mark with chlorobenzene. Mixed standards may be prepared for the dilute standards. The procedure is:

- a clean, dry 10 m*l* volumetric flask is filled approximately half full with chlorobenzene. Allow the flask to stand approximately 10 minutes or until the wetted surfaces have dryed. Weigh the flask to the nearest 0.001 g.

- Using a Pastuer pipette, transfer the appropriate mass of solvent to the flask ensuring that the drops fall directly into the chlorobenzene without contacting the neck of the flask.

- Reweigh, dilute to the mark, stopper and mix by inverting the flask at least six times.

- Calculate the concentration in weight/volume percent from the net gain in weight. Correct for compound purity if purity is less than 98%.

- Repeat procedures for remainder of standards. For less concentrated standards, multiple compounds may be added.

- Transfer standards to the appropriate vials and cap with polyethylene lined closures.

6.0 SAMPLE COLLECTION, PRESERVATION AND HANDLING

Sampling is completed by personnel at each Solvents Division facility according to protocols described in Section C of each facilities Part B Permit Application. Sample handling and preservation are outlined in Section 5.0 of the QAPP.

7.0 PROCEDURE

7.1 Extraction

The procedure for sample extraction presented in the Standard Operating Procedures.

7.2 Gas Chromatography Conditions

Initial oven temperature and holding time	35° - 6 minutes
Oven temperature program 1	4°C/minute
Second oven temperature and holding time	90°C - 0 minutes
Oven temperature program 2	10°C/minutes
Final oven temperature and holding time	180°C - 1 minute

Injector temperature	200°C
Detector temperature	250°C
Injector: Split-split ratio	1:100
Sample volume	1.0 µl
Carrier gas	Helium at 180 psi
Detector gas	Hydrogen at 18 psi
	Air at 45 psi

7.3 Calibration

7.3.1 External Standard Calibration Procedure

7.3.1.1 For each analyte of interest, prepare calibration standards at a minimum of three concentration levels by the procedure described in section 5.2.3.

7.3.1.2 Inject each calibration standard using the autosampler. Tabulate peak area response against the amount injected for

each compound of the standard. This ratio of area to amount injected is termed the calibration factor and is defined as:

$$\text{Calibration factor} = \frac{\text{Total Area of Peak}}{\%\ \text{component}}$$

If the percent relative standard deviation (%RSD) of the calibration factors is less than 20% over the working range, linearity throughout the origin is assumed and the average calibration factor may be used. If the %RSD is greater than 20%, then a calibration curve is calculated using linear regression analysis. The minimum acceptable correlation coefficient is 0.975.

7.3.1.3 The working calibration curve or calibration factor must be verified each working day by the inspection of one or more calibration standards. If the response for any analyte varies from the predicted response by more than $\pm$ 15%, a new calibration curve must be established for that analyte.

$$\%\ \text{difference} = \left(\frac{C_1 - C_2}{C_1}\right) \times 100$$

Where:

C_1 = Expected concentration

C_2 = Determined concentration

7.4 Gas Chromatographic Analysis

7.4.1 Inject 1.0 µl of the sample extract using the autosampler. If the response exceeds the linear range of the system, dilute the extract and reanalyze.

7.4.2 Calibrate the system (or confirm calibration) prior to conducting any analyses. A midlevel standard must also be injected at specific frequencies and at the end of the analytical batch. The determined concentration must be within ± 15% difference as compared to the expected concentration. If this criteria is exceeded, inspect the GC system to determine the cause and perform the necessary maintenance to correct the problem before recalibrating the system. All samples that were analyzed after the standard that exceeded the criteria are out of control and must be reanalyzed after the corrective action is taken.

7.4.3 Establish daily retention times for each analyte. Use absolute retention times for each analyte from the daily check standard as the midpoint for that day.

7.4.3.1 Tentative identification of an analyte occurs when a peak from a sample extract falls within the daily retention time. No confirmation is necessary for the major degreasing solvents that are routinely determined. Compounds that are less frequently encountered will require an additional analytical technique for identification, if required. Tentative

identification is done more positively by spiking the sample with the suspected constituent and noting an increase in peak height. Sample would be sent to Detrex's RTI Lab in Detroit for positive ID, if necessary.

7.4.3.2 Validation of GC System Quantitative Performance

The midpoint calibration standard is used to evaluate this criterion. If any of the standards are outside of the daily retention time window, the system is out of control and corrective action will be necessary.

7.4.4 Sequence of Analysis

After the system has been calibrated and daily retention time calculated, the following sequence of analysis takes place:

1) Blank
2) 30 samples
3) Matrix Spike
4) Blank Spike
5) Duplicate
6) Calibration Check Standard(s)
7) Blank
8) 30 Samples

7.5 System Maintenance

These corrective actions may be required to remedy problems associated with poor response, shifting retention times, ghost peaks and unstable baselines.

7.5.1 System Bake-Out - To remedy problems associated with rising baselines and ghosts peaks, the chromatography system is baked out. This entails raising the oven temperature to the column conditioning temperature for two hours.

7.5.2 Septum Change - Unstable retention times and poor response may be attributed to a leaking injection port septum. Change septum per the maintenance manual guidelines.

7.5.3 Capillary Column maintenance - Ghost peaks and reduced response may be caused by dirty injection port inserts and front-end column contamination. Replace column insert with a clean-deactivated insert. Also, clipping the first few inches to a foot of the column may be necessary to remedy the problem.

7.5.4 Detector Maintenance-Reduced response may be caused by a dirty detector. Cool detector and clean as recommended in the maintenance manual. Recalibration of the system may be required after cleaning the detector.

7.6 Calculations

The concentration of each analyte in the sample is determined by calculating the peak response using the calibration factor or calibration curve determined in Step 7.3.1. The concentration of a specific analyte is calculated as follows:

$$\text{Concentration (\% wt/vol)} = \left(\frac{Ax}{cf} \right) \times D$$

where: Ax = Response for analyte in sample area units

cf = Calibration Factor - area units per unit concentrations

D = Dilution Factor (if any)

8.0 QUALITY CONTROL

8.1 Reagent Blanks - To demonstrate that the analytical system is not introducing analytes or interferences, reagent blanks consisting of chlorobenzene are processed with the samples. The blanks are carried completely through the extraction and measurement steps and are analyzed at a frequency of 1% of all samples or one per day; whichever is more frequent.

8.2 Accuracy Control

8.2.1 Matrix Spikes Samples - to demonstrate that the sample matrix is not affecting the accuracy of the measurement, matrix spike samples are analyzed. These samples consist of a sample aliquot that has been fortified with a known amount of analyte. The results are expressed as percent recovery (%R) of added analyte and are calculated by:

$$\%R = \left(\frac{SSR - SR}{SA} \right) \times 100$$

where SSR = Spike Sample result

SR = Sample result

SA = Spike added

Matrix spike samples are processed and analyzed at a frequency of one per week. Due to the nature of the samples, only a specific sub set of analytes will be spiked into the sample.

8.2.2 Blank Spike Samples - To demonstrate the efficiency of the extraction and analytical procedures, blank spike samples are analyzed. These samples consist of an artificial matrix that is spiked with a known amount of all analytes of interest. The results are expressed as percent recovery (%R) of added analyte and are calculated by

$$\%R = \left(\frac{BSR - BR}{SA} \right) \times 100$$

where BSR = Blank Spike Result

BR = Blank result

SA = Spike added

Blank spike samples are processed and analyzed at a frequency of one per week.

8.3 Precision Control

To demonstrate the repeatability of the extraction and analytical procedures, duplicate sample analyses are performed. Due to the fact that there will be detectable analytes in every sample, this type of precision control is preferable to matrix spike, matrix spike duplicate analysis. Equal aliquots of a sample are processed and analyzed. The results are expressed as relative percent difference and are calculated by:

$$RPD = \frac{|SR_1 - SR_2|}{\left(\frac{SR_1 + SR_2}{2}\right)} \times 100$$

Duplicate samples are analyzed at a frequency of 1% of all samples or one per day, whichever is more frequent. RPD is calculated for %NVR and for detectable analytes.

where: SR_1 = sample result 1

SR_2 = sample result 2

8.4 Control Limits and Corrective Actions

8.4.1 Reagent Blanks

Reagent blanks should be free from interfering peaks and analytes of interest. Should there be evidence of contamination, the following should be investigated to locate and eliminate the source.

-Purity of solvent used for blank
-Cleanliness of glassware
-Use of lubricating grease on distillation apparatus
-Adequate rinsing of GC syringe
-Carryover from previous sample analysis
-Contaminated GC system

If the problem is determined to be isolated only to the reagent blank (in the case of carryover) no corrective action is required. Should the problem be determined to be systematic, re-extraction and analysis of the samples associated with the reagent blank must take place. Documentation of corrective actions taken is recorded in a bound laboratory notebook.

8.4.2 Matrix Spike Samples

Recovery limits for spike compounds are listed below:

1,1,1-Trichloroethane	75-125%
Trichloroethylene	75-125%
Perchloroethylene	75-125%
Freon	65-125%
Methylene chloride	75-125%

Should recovery limits be outside the acceptance criteria, the following should be investigated or conducted:

-Re-analysis of the matrix spike sample
-Evaluation of results of sample analysis. Concentrated samples may cause the spiked sample to be outside the linear range of the instrument. Dilute and re-analyze.
-Sample homogeneity
-Loss of instrument calibration - analyze a check standard for calibration verification

Should re-analysis of the matrix spike sample still indicate an out-of-control situation, a new sample will be chosen for matrix spike analysis. If analysis still yields out-of-control results, a thorough investigation must be conducted and the finding documentated. All samples processed from the last in-control point must be reprocessed and re-analyzed.

Should results of matrix spike sample analysis indicate an isolated problem associated with the blank spike sample, re-extraction and re-analysis is not required. In all other cases, re-extraction and re-analysis from the last in-control sample must occur.

8.4.3 Blank Spike Samples - Recovery limits for blank spike compounds are listed below:

1,1,1-Trichloroethane	75-125%
Trichloroethylene	75-125%
Perchloroethylene	75-125%
Freon	65-125%
Methylene chloride	75-125%

Should the above recovery limits be exceeded, the following should be investigated or conducted:

-Re-analysis of the blank spike sample
-Contamination of distillation due to loss of vacuum or inappropriate bath temperature
-Loss of calibration of GC. A check standard should be analyzed.

8.4.4 Replicate sample analysis - RPD limits for NVR and detected compounds are 30%. Should this criterion be violated, the following should be investigated or conducted.

-Re-analysis of samples
-Contamination of distillation and GC systems
-Homogeneity of sample matrix
-Inefficient distillations

Should re-analysis of samples not elicit in-control results, a new sample from the batch will be chosen for replicate analysis. If the results of the new replicates still indicate an out-of-control situation, a thorough investigation must be conducted and the findings documented. All samples processed from the last in-control point must be re-extracted and re-analyzed.

9.0 METHOD PERFORMANCE

At this time, the performance of the method is still being evaluated.

10.0 REFERENCES

1) Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, EPA SW-846 Methods 8000, 8010 and 8015.

2) 1989 Annual Book of ASTM Standards, ASTM Volume 15.05 Methods D 3742 and D-3447, Volume 14.01.

Revision 1
December 27, 1993

Detrex CORPORATION

DETROIT LAB ANALYSIS REPORT

DATE _____

GENERATOR _____ SOLV TYPE _____

DRUM # _____ LAB I.D. # _____

DATE RECVD _____ MANIFEST # _____

SPEC GRAVITY _____

ROTOVAPOR DISTILLATION RESULTS

% YIELD _____ %NVR _____

PROC LOSS ALLOW _____ ACTUAL YIELD _____

IGNITABILITY SPOT TEST

NEGATIVE _____ POSITIVE _____ FLASHPOINT _____

GAS CHROMATOGRAPHY SUMMARY

_____ _____

_____ _____

_____ _____

_____ _____

COMPATIBILITY _____ (YES) _____ (NO)

ADDITIONAL ANALYSIS (by request only)

NAA _____ pH _____

MOISTURE CONT _____

COMMENTS _____

ANALYST _____

tah/ labsheet 12-14-93

12886 EATON AVENUE • DETROIT, MI 48227 • (313) 491-4550 • FAX (313) 491-8044

ATTACHMENT C-4

SAMPLE LABORATORY REPORTS

ATTACHMENT C-5

QUALITY ASSURANCE PROJECT PLAN

LABORATORY QUALITY ASSURANCE PROJECT PLAN

Solvent Reclamation Program
Detrex Corporation Solvents and Environmental Services Division

RECEIVED
JUL 9 1991
Waste Management
Division

JULY 1991
REF. NO. 3467 (2)

CONESTOGA-ROVERS & ASSOCIATES

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APPENDIX A STANDARD OPERATING PROCEDURES (SOPs)

LIST OF ACRONYMS AND SHORT FORMS

Detrex	-	Detrex Corporation Solvents and Environmental ServicesDivision
FID	-	Flame Ionization Detector
GC	-	Gas Chromatograph
MDL	-	Method Detection Limit
NVR	-	Non-Volatile Residue
QA	-	Quality Assurance
QAO	-	Quality Assurance Officer
QAPP	-	Quality Assurance Project Plan
QC	-	Quality Control
USEPA	-	United States Environmental Protection Agency

1.0 INTRODUCTION

This Laboratory Quality Assurance Project Plan (QAPP) presents the policies, organization, objectives and specific quality assurance (QA) and quality control (QC) objectives designed to achieve the specific data quality goals associated with the Solvent Reclamation Program of Detrex. The purpose of the QAPP is to ensure that the sample results are accurate, precise and representative of the spent solvents analyzed. The analytical results are necessary for approving waste material acceptability for storage and subsequent reclamation at Detrex permitted TSD facilities.

2.0 PROJECT DESCRIPTION AND OVERVIEW

Detrex Corporation Solvents and Environmental Services Division operates numerous Treatment, Storage or Disposal (TSD) facilities which specialize in the sale of halogenated solvents and cleaning equipment and the reclamation (recycling) of solvents from spent solvents generated from various industries. Incoming samples of spent solvents from the TSD facilities are analyzed in order to determine the recoverable halogenated solvent content solely for processing purposes and to ensure that the waste materials are properly labeled and manifested for shipping purposes.

Before any hazardous waste material is accepted from a new customer, the waste is sampled by the facility and analyzed to ensure its characterization is acceptable based on the operating permit of the facility and to the ultimate recovery (recycling) operation. In addition to sampling, an effort is made to document the generation process of the waste to further characterize its composition.

Regardless of whether or not the facility accepts the waste for processing, all of the foregoing knowledge, including laboratory results, is kept in the customer's file for future reference and comparison with future shipments, if they become a regular customer.

2.1 TARGET COMPOUNDS

Target compounds for analysis will vary with the process that generated the spent solvents. Generally, a specific generation process will employ a specific solvent(s) in the operation. Consequently, the major constituents of the spent solvent samples are generally known prior to analysis and the analyses are performed for confirmatory and processing purposes. The target compounds for the spent solvents analyses are:

Compound	*Required Detection Limits*
1,1,1-Trichloroethane	0.5 %
Perchloroethylene	0.5 %
Trichloroethylene	0.5 %
Methylene Chloride	0.5 %
Trichlorotrifluoroethane (freon)	0.5 %

Other analyses that are performed are, percent solvent content, ignitability, other compounds, and percent non-volatile residue (NVR).

2.2 DATA USAGE

The principle usage of data is to confirm the permitted acceptability of the waste material for acceptance at the TSD facility and also to confirm the identification of the major constituents of the spent solvents and

determine the percentage of recoverable solvent. This information is used for processing and transportation purposes.

3.0 PROJECT DESCRIPTION AND RESPONSIBILITY

Figure 3.1 presents the key staff organization for the QAPP. A summary of each of the key responsibilities is presented below:

Project Manager,
Detrex Corporation Solvents and Environmental Services Division

- general overview of the project to ensure that the objectives are met
- overall responsibility for the solvent reclamation project

Operations Manger,
Detrex Corporation Solvents and Environmental Services Division

- general overview of the project operations
- responsible for the branch personnel sampling operations

Laboratory Manager,
Detrex Corporation Solvents and Environmental Services Division

- routine assessment of measurement systems for precision and accuracy
- data reduction, validation and reporting
- development of QA/QC reports to management
- coordinate and schedule laboratory analyses
- supervise in-house chain-of-custody
- review calculations
- prepare and approve analytical reports
- also serves as Quality Assurance Officer with the following responsibilities:
    - overview laboratory quality assurance

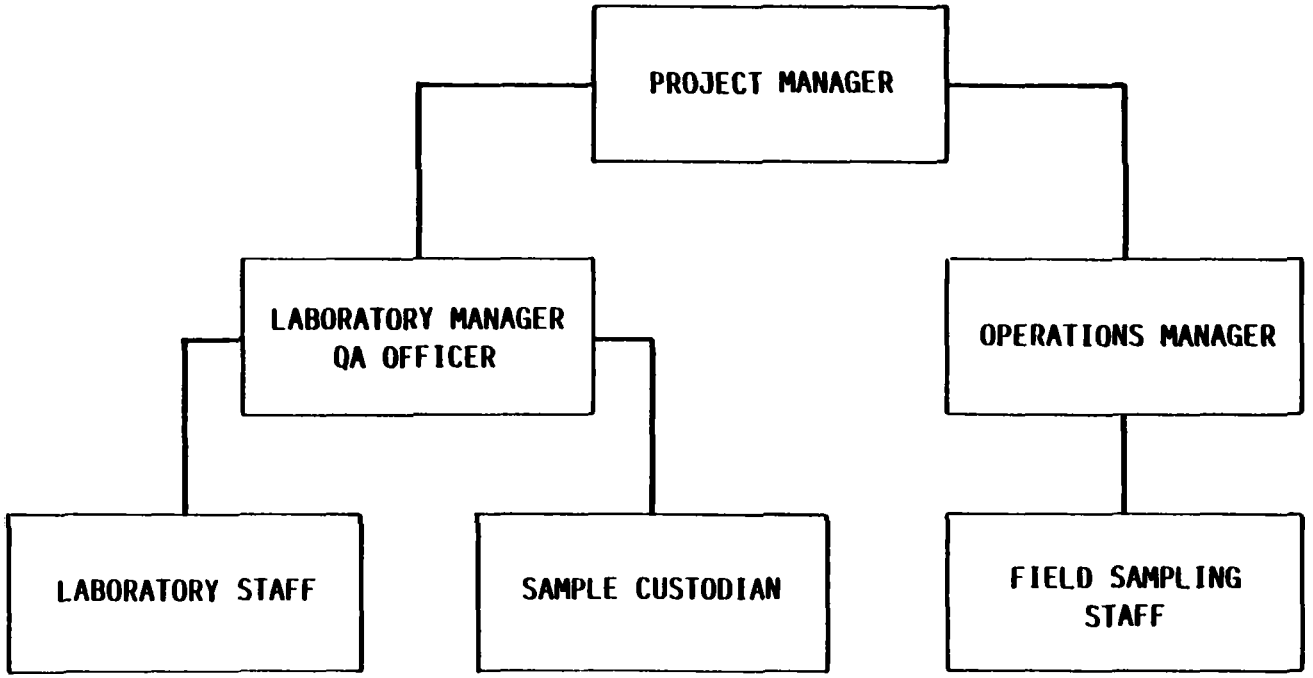

figure 3.1

STAFF ORGANIZATION
DETREX CORPORATION

- also serves as Quality Assurance Officer with the following responsibilities:
  - overview laboratory quality assurance
  - overview QA/QC documentation
  - conduct detailed data review
  - implement laboratory corrective actions, as required
  - prepare laboratory Standard Operating Procedures (SOPs)
  - approve the QAPP

Laboratory Chemist

- sample extraction and instrumental analysis
- instrument maintenance and calibration
- standard preparation and documentation
- data reduction and calculations
- preparation of reagents
- wet chemical analytical determinations

Branch Personnel

- serve as field sampling personnel with the following responsibilities:
  - collection of representative samples
  - sample labeling and chain-of-custody implementation
  - performance of % solvent field determination
  - performance of ignitability test

4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA IN TERMS OF PRECISION, ACCURACY, COMPLETENESS, REPRESENTATIVENESS

The overall QA objective is to develop and implement procedures for sample handling, laboratory analyses and reporting that will provide accurate data. Specific procedures to be used for sample handling, calibration, laboratory analysis, reporting, quality control, audits, preventative maintenance and corrective actions are presented in subsequent sections of this QAPP. The purpose of this section, is to address the objectives of accuracy, precision, completeness, representativeness and comparability.

4.1 LEVEL OF QA EFFORT

Sample analysis are performed following the SOPs as provided in Appendix A. The levels of laboratory QA effort for the analyses are specified in the applicable SOPs provided in Appendix A.

4.2 ACCURACY, PRECISION AND SENSITIVITY OF ANALYSES

The QA objectives for precision, accuracy and sensitivity are to achieve the QC acceptance criteria for the analytical procedures. The precision and accuracy guideline requirements are specified in the SOPs as provided in Appendix A.

Precision and accuracy for the halogenated solvent and NVR determinations will be determined by using duplicate samples and spiked samples, respectively.

For duplicate sample analysis, at least one duplicate sample will be analyzed at a frequency of 1% of all samples, or one per day, whichever is more frequent. The relative percent difference (RPD) for each detected analyte will be calculated for use during data assessment and validation. An advisory limit of 30% for RPD will be used for detected analytes above the detection limit. RPD will not be calculated for non-detected analytes.

For reagent blank analyses, at least one reagent blank will be processed and analyzed for 1% of all samples analyzed, or one per day, whichever is more frequent. The concentration for each component will be calculated for later use during data assessment and validation.

The matrix spike sample analysis is used to provide information on the effect of the sample matrix on the distillation procedure. Matrix spike samples will be analyzed at a frequency of 1% of all samples, or one per week, whichever is more frequent. The individual component percent recoveries (%R) will be calculated and reported. The acceptance criteria for matrix spike samples are outlined in applicable SOPs presented in Appendix A.

Blank spike sample analysis is used to provide information on the accuracy of the method. Blank spike samples will be analyzed at a frequency of 1% of all samples, or one per week, whichever is more frequent. The individual component %R will be calculated and reported. The acceptance criteria for blank spike samples are outlined in applicable SOPs presented in Appendix A.

4.3 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

It is expected that all analyses performed by the applicable SOPs will provide data meeting QC acceptance criteria for 80 percent of all samples analyzed. Any reason for variances will be documented. Corrective action procedures used to maximize the number of usable analyses are outlined in Section 14.0 of the QAPP.

The sampling procedure followed by facility personnel ensures that representative samples of the spent solvents will be obtained. Comparability of laboratory analyses will be ensured by the use of consistent units of concentration and standard operating procedures.

5.0 SAMPLE HANDLING, AND PRESERVATION TECHNIQUES

The following sections describe the sample handling techniques used in the project.

5.1 SAMPLE CONTAINERS, PRESERVATIVES AND HOLDING TIMES

Sample containers, preservatives and holding times are presented in Table 5.1.

5.2 SAMPLE LABELING AND DOCUMENTATION

The following protocols are employed by facility personnel during the sampling procedure:

1) Samples are labeled with the branch identification number, unique drum number(s), solvent type and sampling date.

2) A packing slip with branch identification, date shipped, drum numbers, solvent type, customer, analysis requested and percent solvent from field determination is completed for each shipment.

TABLE 5.1

SAMPLE CONTAINERS, PRESERVATION TECHNIQUES AND HOLDING TIMES FOR CONCENTRATED WASTE SAMPLES

Parameters	*Container*	*Preservative*	*Holding Time*
Volatile Organics	1 oz. glass with polyethylene-lined closure	none	14 days

3) The samples are packaged, sealed and delivered to the laboratory by common carrier at a minimum frequency of once per week.

4) Section 6.0 details the chain-of-custody procedure for the samples.

6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

This section details the procedures and protocols which are followed by facility personnel for the transport of samples to the appropriate laboratory. It is to be noted that for the Detroit, Michigan and Charlotte, North Carolina TSD facilities when analyses is to be conducted in the on-Site laboratory chain-of-custody procedures are not necessary.

6.1 CHAIN-OF-CUSTODY

A copy of the chain-of-custody form that accompanies any off-Site shipment of waste for analysis is provided as Figure 6.1.

6.2 SAMPLE DOCUMENTATION AND STORAGE IN THE LABORATORY

Sample receipt and log-in procedures are presented in the associated SOP in Appendix A.

FIGURE 6.1

DETREX CORPORATION

REQUEST FOR LABORATORY ANALYSIS

GENERATOR SUPPLIED INFORMATION (MUST BE COMPLETED)

Company Name _____ EPA ID No: _____

_____ Salesman: _____

Address: _____ Comments: _____

_____ _____

Phone No.: ( ) _____

_____ *RETURN* or *DISPOSE* of samples

Submitted by: Date

PROJECT NAME OR NUMBER _____ NUMBER OF SAMPLES _____

SAMPLE TYPE(S) _____

HAZARD CLASS _____

ANALYSIS(SES) REQUESTED _____

PLEASE LIST SAMPLE IDENTIFICATION NUMBERS ON REVERSE SIDE
(Column No. 2)

CHAIN OF CUSTODY

Relinquished By: Name	Date	Time	Received By: Name	Date	Time

FOR LABORATORY USE ONLY

Generator ID _____ Work Order No. _____

Sample results reported by: _____ Date _____ Time _____

Sample results reported to: _____

Sample results recorded: _____

Laboratory Book No. Page No.

Office Use LAB ID NO.	GENERATOR ID NO.	SAMPLE TYPE	ANALYSIS REQUESTED	COMMENTS

6.3 STORAGE OF SAMPLES

Upon completion of each job, all associated samples are packaged together and stored for a maximum period of 90 days prior to disposal.

6.4 SAMPLE DOCUMENTATION

Upon completion of analysis, a file for each job is assembled containing the following information:

- sample identification documents
- chain-of-custody forms, as appropriate
- raw data
- calculation
- originals of chromatograms
- originals of reports issued

7.0 CALIBRATION PROCEDURES AND FREQUENCY

The procedures indicated below are performed for all samples delivered to the laboratory for analysis. Specific procedures are presented in the applicable SOPs in Appendix A.

In general, the instruments are calibrated each day of sample analysis or the continuing calibration is verified using check standards. All calibration records are maintained by the laboratory for future reference.

7.1 GAS CHROMATOGRAPH CALIBRATION

Prior to analysis, the GC is calibrated as specified in the SOP in Appendix A.

7.2 PRECISION BALANCE CALIBRATION

The balance is initially calibrated at the factory and checked on a monthly basis. If the results of the periodic checks indicate a deviation from the expected value by more than 1%, recalibration by a certified technician must occur prior to use. The balance is cleaned and recalibrated by a certified technician at least yearly.

8.0 ANALYTICAL PROCEDURES

This section presents the analytical methods which are used by the laboratory to complete all required analyses.

8.1 HALOGENATED ORGANIC ANALYSIS

The method used for analysis of halogenated organics is a modification of Methods 8010 and 8015 for Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, EPA SW-846, 3rd edition, November 1986 (SW-846). The SOP is presented in Appendix A.

8.2 IGNITABILITY

The method used for ignitability testing is ASTM D 4982-89 "Standard Test Method for Flammability Potential Screening Analysis of Waste". The SOP is presented in Appendix A. The method used for analysis of flash point, which may be used on occasion to check ignitability results, is Method 1010 (Pensky-Marten Cup) for Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, EPA SW-846, 3rd edition, November 1986 (SW-846).

8.3 DETECTION LIMITS

Specific detections are highly matrix dependent. The detection limits for the analyses are presented in the SOPs in Appendix A.

9.0 DATA REDUCTION, VALIDATION AND REPORTING

Analytical data reduction and validation is performed under the direction of the laboratory QA officer (QAO). The QAO is responsible for assessing the data quality based on the QC results generated during the batch analyses. Figure 9.1 illustrates analytical data flow through the laboratory. Data reduction validation and reporting is conducted as detailed in the following steps:

- Raw data produced and checked by the responsible analyst is turned over for independent review by another analyst.

- The laboratory manager reviews the data for attainment of quality control criteria presented in the reference SOP.

- Upon completion of all reviews and acceptance of the raw data by the laboratory manager, a report is generated.

- The report and all supporting documentation is inspected by the QAO. Reanalysis of samples due to QC failure is determined and conducted.

- The final report is generated and signed by the laboratory manager.

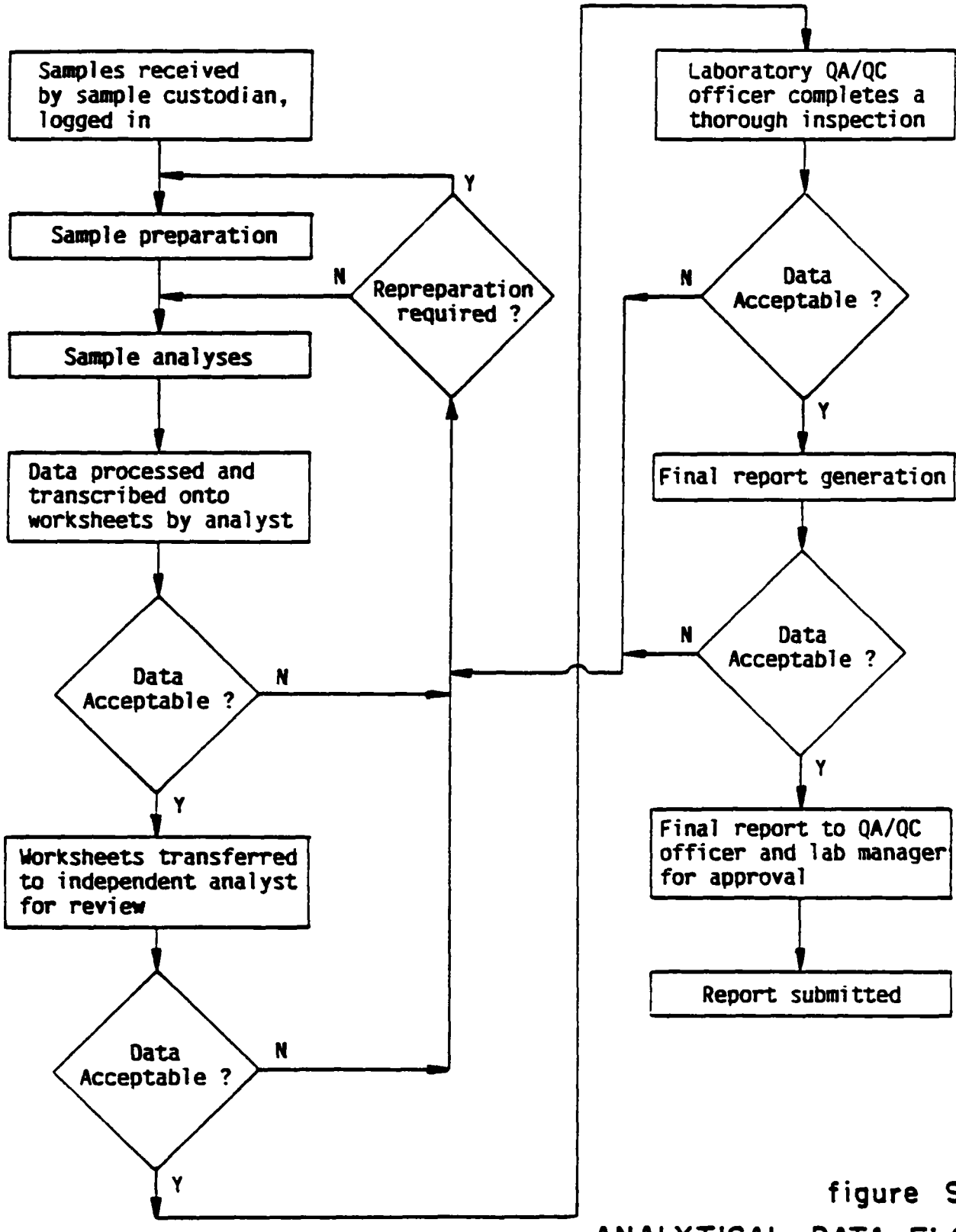

figure 9.1

ANALYTICAL DATA FLOW
DETREX CORPORATION

CRA

3467-5/17/90-1-(C)-0

10.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

The following sections present the internal quality control checks and frequency which are employed for laboratory measurements. Specific procedures related to internal laboratory QC samples (matrix spike, blank spikes, reagent blanks, duplicates) are detailed in the following subsections.

10.1 REAGENT BLANKS

A reagent blank will be analyzed at a frequency of 1%, or one per day, whichever is more frequent. The reagent blank, an aliquot of analyte-free solvent (chlorobenzene) will be carried through the entire analytical procedure.

10.2 MATRIX SPIKES

A matrix spike sample consisting of a sample fortified with a known concentration of analyte will be analyzed at a frequency of 1% or one per week, whichever is more frequent. Acceptance criteria and representative compounds are identified in the SOP presented in Appendix A. The results of the matrix spike samples are used to assess the accuracy of the method in a specific matrix.

10.3 BLANK SPIKE SAMPLES

A blank spike sample consisting on a synthetic matrix (oil/solvent mixture) fortified with all halogenated compounds of interest is analyzed at a frequency of 1% or one per week, whichever is more frequent. Acceptance criteria for these samples are presented in the applicable SOPs. The results of the blank spike are used to assess the accuracy of the method on a generic matrix typical of the spent solvent/oil mixture samples.

10.4 DUPLICATE SAMPLE ANALYSIS

Duplicate sample analysis are performed at a frequency of 1% or one per day, whichever is more frequent. This QC measure is performed to assess the analytical precision of the method and is applicable to the method as all samples will contain measurable concentrations of analyte(s).

10.5 SPLIT SAMPLES

Split samples are currently analyzed at a bi-yearly frequency. A typical sample is split and sent to an outside commercial laboratory with the results from both laboratories being compared and maintained on file.

10.6 BLIND PERFORMANCE EVALUATION SAMPLES

Blind performance evaluation samples are currently analyzed at a bi-yearly frequency. These consist of production samples split and analyzed by the QAO and the laboratory analysts. Results are compared and maintained on file.

11.0 PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY

For the purpose of internal evaluation, data from the project is evaluated on a continuing basis by the QAO over the duration of the project.

System audits are qualitative evaluations of all components of laboratory quality control measurement systems and are used to determine if the measurement systems are being used appropriately. The audits are conducted before the systems are operational and during the project. Such audits typically involve a comparison of the activities given the QA/QC plan described herein with activities actually performed.

The performance audit is a quantitative evaluation of the measurement systems used for a monitoring program. It requires testing the measurement systems with samples of known composition to evaluate precision and accuracy. The performance audit is accomplished by the review and statistical evaluation of QC sample results and is conducted and initiated by the QAO.

12.0 PREVENTIVE MAINTENANCE

Critical to the performance and minimization of downtime of all equipment, whether it be measurement or support, is proper maintenance. Preventive maintenance is performed as recommended by the manufacturer of the respective equipment. This maintenance will consist of, but is not limited to, the following minimum procedures at the specified time intervals.

12.1 PRECISION BALANCE

The balance will be cleaned and calibrated on a yearly basis by a certified technician, or more frequently should the need arise.

12.2 GAS CHROMATOGRAPH

Routine maintenance of the gas chromatograph includes daily checks of gas inventory, changes of septa as required by instrument performance, or at least weekly. Changes of injection port liners and clipping of the front end of the capillary column is performed as necessary. A maintenance contract with provisions for routine preventive maintenance visits is also maintained on the instrument.

13.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

13.1 QA MEASUREMENT QUALITY INDICATORS

13.1.1 Precision

Precision is assessed by comparing the analytical results between duplicate samples.

13.1.2 Accuracy

Accuracy is assessed by comparing a set of analytical results to the accepted or "true" values that would be expected. In general, matrix spike samples, duplicate samples and calibration check sample recoveries are used to assess accuracy.

13.2 STATISTICAL EVALUATIONS

In examination of data and determination of its precision and accuracy, standard statistical formulae will be used. Among these are the following:

1) <u>Mean of Measurements Generated by Each Sample Parameter (X)</u>

$$\bar{X} = \frac{1}{n} \left[\sum_{i=1}^{n} Xi \right]$$

where N = number of measurements

Xi = value of the measurement

2) <u>Standard Deviation of a Series of Individual Determination(s)</u>

$$S2 = \frac{\sum_{i=1}^{n} (Xi - x)2}{N - 1}$$

where N = number of measurements

Xi = value of the measurement

S = standard deviation

3) <u>Percent Relative Standard Deviation (% RSD)</u>

$$\%RSD = \left(\frac{s}{\bar{x}} \right) \times 100$$

s = standard deviation for a series of individual measurements

$\bar{x}$ = mean of the measurements

4) Percent Recovery

Percent recovery of spikes will be used to establish analytical accuracy and will be evaluated as follows:

$$\text{Matrix Spike Recovery} = \left(\frac{A-B}{C}\right) \times 100$$

where:

A = the analyte concentration determined experimentally from the spiked sample;

B = the background level determined by a separate analysis of the unspiked sample; and

C = the amount of the spike added.

5) Relative Percent Difference (RPD)

$$RPD = \frac{(|X1 - X2|)}{\left(\frac{X1 + X2}{2}\right)} \times 100$$

where:

X1 = first value, (i.e., MS value)

X2 = second value, (i.e., MSD value)

14.0 CORRECTIVE ACTION

The need for corrective action may be identified by system or performance audits or by standard QC procedures. The essential steps in the corrective action system will be:

- Checking the predetermined limits for data acceptability beyond which corrective action is required;

- Identifying and defining problems;

- Assigning responsibility for investigating the problem;

- Investigating and determining the cause of the problem;

- Determination of a corrective action to eliminate the problem (this may include reanalyses or resampling and analyses);

- Assigning and accepting responsibility for implementing the corrective action;

- Implementing the corrective action and evaluating the effectiveness;

- Verifying that the corrective action has eliminated the problem; and

- Documenting the corrective action taken.

For each measurement system, the QAO will be responsible for initiating the corrective action and the laboratory manager will be responsible for implementing the corrective action. The corrective action taken will depend upon the QA/QC criteria that did not meet the necessary criteria, and may range from qualifying the data to resampling. Corrective actions are further defined in the SOPs presented in Appendix A.

15.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

Management will receive reports on the performance of the measurement system and the data quality at regular internals.

Minimally, these reports will include:

- Assessment of measurement quality indicators, i.e., data accuracy, precision and completeness;

- Results of system audits; and

- QA problems and recommended solutions.

The project QAO will be responsible within the organizational structure for preparing these periodic reports.

APPENDIX A

APPENDIX A
STANDARD OPERATING PROCEDURES

CONTENTS

STANDARD OPERATING PROCEDURES FOR THE DETERMINATION OF SOLVENT CONTENT IN SPENT SOLVENTS USING SPECIFIC GRAVITY METHOD

STANDARD OPERATING PROCEDURE FOR SAMPLE RECEIPT AND LOG IN

STANDARD OPERATING PROCEDURE FOR GLASSWARE CLEANING

STANDARD OPERATING PROCEDURES FOR THE EXTRACTION OF SPENT SOLVENTS

STANDARD OPERATING PROCEDURES FOR THE DETERMINATION OF SOLVENTS IN SPENT SOLVENTS BY GAS CHROMATOGRAPHY

STANDARD TEST METHOD FOR FLAMMABILITY POTENTIAL SCREENING ANALYSIS OF WASTE (ASTM D 4982-89)

STANDARD OPERATING PROCEDURES FOR THE DETERMINATION OF SOLVENT CONTENT IN SPENT SOLVENTS FROM DEGREASING OPERATIONS USING SPECIFIC GRAVITY METHOD

STANDARD OPERATING PROCEDURES FOR THE DETERMINATION OF SOLVENT CONTENT IN SPENT SOLVENTS FROM DEGREASING OPERATIONS USING SPECIFIC GRAVITY METHOD

1.0 SCOPE AND APPLICATION

The specific gravity method for correlating solvent percent and specific gravity was devised by Mr. Jim Goodrich, formerly laboratory supervisor of the Detrex Solvent Laboratory and currently a chemist in Detrex's Research Technologies International (RTI) division. The graphs relating specific gravity and solvent percent (volume) are non-empirical and are based on the following assumptions:

i) the non-volatile fraction of the waste oil can be approximated by an oil of specific gravity 0.9.

ii) the relationship between specific gravity and volume percent is linear.

iii) a sample of 0% solvent would have a specific gravity of 0.9, and a sample of 100% solvent would have a specific gravity of the solvent in question..

The specific gravity method is designed to be used a screening procedure only; quantitation is performed by a gas chromatograph analysis.

2.0 SUMMARY OF METHOD

A representative sample of the spent solvent/oil mixture is obtained and the specific gravity is determined. The percent solvent is determined by comparing the specific gravity of the mixture to that of the pure solvent.

3.0 INTERFERENCES

The determination is for screening purposes only and any materials that will interfere with the measurement of the specific gravity will interfere with the percent solvent determination.

4.0 APPARATUS AND MATERIAL

4.1 Glass Thief for Collection of Sample

4.2 Thermometer

4.3 Specific Gravity Hydrometer Set - 0.90 to 1.60 specific gravity range

4.4 Hydrometer Jar

5.0 REAGENTS

5.1 Rinse Solvent - Solvent of same type as being measured to rinse hydrometer jar

6.0 SAMPLE COLLECTION, PRESERVATION AND HANDLING

Samples are collected in accordance to section 5.0 of the QAPP

7.0 PROCEDURE

7.1 Collect sample using the Glass Thief

7.2 Transfer sample to a container of sufficient size to allow for mixing.

7.3 Shake container for at least 30 seconds.

7.4 Place the thermometer and a hydrometer in the hydrometer jar.

7.5 Fill the hydrometer jar to within one inch of the top with the mixture to be tested.

7.6 If the hydrometer reads off-scale, replace it with a higher or lower range hydrometer as required.

7.7 Read the hydrometer to the nearest 0.01 SpG unit.

7.8 Pour sample back into original container.

7.9 Rinse hydrometer jar with solvent prior to collecting next sample.

7.10 Using the attached Solvent-Oil Mixture vs. Gravity Graph or Chart, for the appropriate solvent type, determine the weight per cent oil.

7.11 The solvent content is calculated as follows:

7.12 WEIGHT PER CENT SOLVENT = 100% - WEIGHT PER CENT OIL

8.0 QUALITY CONTROL

This procedure is for screening purposes only and no substantial quality control is required.

STANDARD OPERATING PROCEDURE
FOR SAMPLE RECEIPT AND LOG IN

STANDARD OPERATING PROCEDURE FOR SAMPLE RECEIPT AND LOG IN

1.0 SCOPE AND APPLICATION

The following describes the procedure for sample receipt and log in for the solvent reclamation program.

2.0 SUMMARY OF METHOD

Following collection, the samples are transported to the laboratory accompanied by chain-of-custody documentation. The samples are assigned a unique job number and unique sample numbers. All pertinent information is recorded in a bound, consecutively page-numbered logbook and scheduled for analysis.

3.0 PROCEDURE

3.1 Samples are delivered to the laboratory by means of common carrier and transferred to the sample custodian.

3.2 The sample custodian opens the package and removes the samples and associated chain-of-custody documentation. Any evidence of tampering with the sample package is recorded on the chain-of-custody document.

3.3 The contents of the package is compared against the chain-of-custody document and any discrepancies are noted.

3.4 The sample custodian assigns a unique job number and unique sample numbers to the samples.

3.5 The chain-of-custody document is completed and the job, sample numbers, and associated information is recorded in the sample log book.

3.6 An analytical request form is completed and the samples and copies of associated paperwork from each job is placed in a basket. The container is tagged with the job number and transferred to the appropriate analyst for analysis.

3.7 All original documentation is bound in a permanent book.

3.8 Upon completion of analysis, all samples from a job are stored together with the job tag for 90 days prior to disposal.

4.0 FORMS

Copies of forms and log books used during sample receipt and log in are attached for reference.

4-4-90
J-0111 7648-02-0585-American Precision-Freon- -R&B-

4-9-90
J-0112
7649-03-0234-Mag Products-111
7650-03-0235-Pan Rite-111
7651-03-0236-Electral-111
7652-03-0237-Turgeon & Sons-111
7653-03-0238-Caran Precision-111

4-9-90
J-0113
7654-04-3103-3105-TCE Great Neck Saw
7655-04-3106-3108-Perk-Gibson Tube Inc
7656-04-3109-DG-Union Breach
7657-04-3110-3114-TCE-Instrument Spec
7658-04-3115-3120-Manley Div KSG
7659-04-3117-DG Manley Div KSG
7660-04-3121-3126-TCE Textron Lycoming

4-9-90
J-0113
7661-04-3127-3130-TCE Textron Lycoming
7662-04-3131-TCE-Textron Lycoming
7663-04-3132-TCE-Textron Lycoming

J-0114
7664-13-Alumax-111-
7665-13-0217-TF-Southeastern Apt

4-10-90
J-0115
7666-11-4652-TRI-Liquid Waste Removal
7667-11-4653-TRI-Liquid Waste Removal
7668-11-4559-4560-TRI-US Engineering
7669-11-4556-4558-TRI-Brookside Corp
7670-11-4564-4569-Freon-Kingston Products
7671-11-4550-4555-Perk-Hoskins MFG
7672-11-4570-4571-Perk-Hoskins MFG
7673-11-4555-4557-TRI-IMC Corp.
4-10-90

PACKING LIST

ANCH 08-NC SALESMAN WATSON DATE SHIPPED 5/15 DATE RECVD 1

JO210

	~~Drum~~ Nos.	Type Solv.	Drums Sampled No.	Total Wt.	Customer	% Solvent Est.	Lab
210	2371-2380	1-1-1	10	4508	CONBRACO-P	45	
211	2381-2385	1-1-1	5	2189	"	66	
212	2432-2439	TRI	8	3891	R. BOSCH	52	
213	2440-2447	TRI	8	3176	"	48	
214	2448-2457	FREON	10	6166	"	93	
215	2458-2467	FREON	10	4945	"	90	
216	2468-2477	FREON	10	6098	"	96	
217	2478	FREON	1	394	"	94	

Richard,

Results will be

faxed to you by

1700 hrs. on 5-18-90

Phyllis

DETREX CORPORATION

REQUEST FOR LABORATORY ANALYSIS

GENERATOR SUPPLIED INFORMATION (MUST BE COMPLETED)

Company Name: _____ EPA ID No.: _____

_____ Salesman: _____

Address: _____ Comments: _____

_____ _____

Phone No.: (____) _____

_____ *RETURN* or *DISPOSE* of samples

Submitted by: Date

PROJECT NAME OR NUMBER _____ NUMBER OF SAMPLES _____

SAMPLE TYPE(S) _____

HAZARD CLASS _____

ANALYSIS(SES) REQUESTED _____

PLEASE LIST SAMPLE IDENTIFICATION NUMBERS ON REVERSE SIDE
(Column No. 2)

CHAIN OF CUSTODY

Relinquished By: Name	Date	Time	Received By: Name	Date	Time

FOR LABORATORY USE ONLY

Generator ID _____ Work Order No. _____

Sample results reported by: _____ Date _____ Time _____

Sample results reported to: _____

Sample results recorded: _____

Laboratory Book No. Page No.

Office Use LAB ID NO.	GENERATOR ID NO.	SAMPLE TYPE	ANALYSIS REQUESTED	COMMENTS

STANDARD OPERATING PROCEDURE
FOR GLASSWARE CLEANING

STANDARD OPERATING PROCEDURE FOR GLASSWARE CLEANING

1.0 SCOPE AND APPLICATION

The following describes the procedure for cleaning glassware. The procedure is applicable to glassware used in processing spent solvent samples.

2.0 SUMMARY OF METHOD

Glassware is subjected to a solvent rinse, detergent wash, tap water rinse, deionized water rinse and allowed to air dry.

3.0 APPARATUS AND REAGENTS

3.1 Deionized Water - ASTM Type II

3.2 Detergent - Baxter Micro - All purpose laboratory cleaner

3.3 Mixed Solvent - Halogenated mixed reclaimed solvent

3.4 Brushes - Assorted flask and tube brushes

4.0 PROCEDURE

4.1 Remove oily residue by rinsing glassware with mixed solvent. Collect waste and allow to drain.

Note: This step is unnecessary for glassware not used for spent solvent mixtures.

4.2 Add detergent/water mixture and scrub vigorously to remove any remaining debris.

4.3 Drain and rinse thoroughly with tap water. Drain to remove excess tap water.

4.4 Rinse at least three times with deionized water. Water should sheet off glassware with a minimum of water droplets remaining on the inside surfaces. If not, repeat procedure.

4.5 Drain and allow to air dry prior to reuse.

STANDARD OPERATING PROCEDURES FOR THE EXTRACTION OF SPENT SOLVENTS

STANDARD OPERATING PROCEDURES FOR THE EXTRACTION OF SPENT SOLVENTS

1.0 SCOPE

This method describes a sampling preparation procedure for the determination of halogenated solvents in a spent halogenated solvent oil mixture.

2.0 SUMMARY OF METHOD

A sample of spent halogenated solvent waste is weighed in a tared, flat bottom flask. The flask is connected to a rotary vacuum evaporator and the solvent is vacuum distilled from the mixture, the weight of residue is determined, and the total non-volatile percentage calculated.

3.0 APPARATUS AND MATERIALS

3.1 Rotary vacuum evaporator with heating bath.

3.2 250 m*l* flat bottom flasks:

3.3 Precision Balance: capable of measuring to .005 $\pm$ 001 g.

3.4 Vacuum Apparatus: water aspirator.

4.0 PROCEDURE

Preheat water bath to 90°C. Pour approximately 30 m*l* of sample into a tared flat bottom flask, weigh and record initial weight. Attach flask to rotary vacuum evaporator, apply vacuum, lower flask into water bath and roto-evaporate solvent from solvent-oil sample until condensate ceases flowing from the condensor. Remove flask from evaporator, dry, reweigh and record. Remove (pour) distillate from receiving flask into clean sample container and store for analysis.

5.0 DETERMINATION OF % NON-VOLATILE RESIDUE

The calculation of % non-volatile residue is as follows:

$$\frac{R}{S} \times 100 = \% \text{ NV}$$

R=Mass of residue after roto-evaporation

S=Mass of waste solvent before roto-evaporation

6.0 The distillate is subsequently analyzed for individual halogenated solvents by gas chromatography.

STANDARD OPERATING PROCEDURES FOR THE DETERMINATION OF SOLVENTS IN SPENT SOLVENTS BY GAS CHROMATOGRAPHY

STANDARD OPERATING PROCEDURES FOR THE DETERMINATION OF SOLVENTS IN SPENT SOLVENTS BY GAS CHROMATOGRAPHY

1.0 SCOPE

1.1 This method is used for the determination of recoverable halogenated and non-halogenated solvents in spent solvent oil mixtures. Applicable analytes and their respective retention times are presented in Table 1.

1.2 The range of concentration determined by this method is 0.5 to 100% and is applicable only to concentrated organic matrices.

1.3 This method is based upon a gas chromatographic/flame ionization detection (GC/FID) procedure.

2.0 SUMMARY OF METHOD

2.1 Prior to analysis, the samples are prepared for gas chromatography using the extraction procedure for waste solvent.

2.2 An aliquot of the extract is introduced into the gas chromatograph by direct injection. The solvents are separated by a capillary column and detected by a flame ionization detector.

TABLE 1
RETENTION TIMES FOR ORGANIC SOLVENTS

Compound	*Retention Time (minutes)*[1]
Methanol	2.83
Ethanol	3.16
Acetone	3.46
2-Propanol	3.51
t-Butyl alcohol	3.77
Freon	3.91
Methylene chloride	3.99
Nitromethane	4.45
Butylene oxide	5.19
Methylethylketone	5.22
sec-Butyl alcohol	5.32
Dioxolane	5.63
1,1,1-Trichloroethane	6.76
n-Butyl alcohol	7.69
Trichloroethylene	9.01
1,4-Dioxane	9.43
Methylisobutyl ketone	11.0
Toluene	12.4
Perchloroethylene	14.8
Cyclohexene oxide	17.8
o-Xylene	17.6
m-Xylene	18.2
p-Xylene	19.2

[1]Retention times are approximate and for illustration purposes only. Daily operating conditions will affect actual retention times.

3.0 INTERFERENCES

3.1 Potential interferences from the waste mixture are effectively reduced or removed by the vacuum distillation extraction procedure.

4.0 APPARATUS AND MATERIALS

4.1 Gas Chromatograph - Hewlett-Packard HP 5890 with Model 7673A autosampler and Model 3396 integrating recorder.

4.2 Column - Hewlett-Packard Ultra 2 (cross linked 5% phenyl methyl silicone gum) 50 meter x 0.32 mm ID with 0.52 µm film thickness

4.3 Detector - Flame Ionization Detector

4.4 Volumetric flasks - 10 ml Class A

4.5 Precision Balance - Capable of weighing 0.05 ± 0.01g

4.6 Pastuer Pipettes - 5 3/4" glass disposable

5.0 REAGENTS

5.1 Solvents - Chlorobenzene (ACS grade minimum with no interfering impurities)

5.2 Calibration Standards

Due to the high concentration range of this method, calibration standards may be prepared directly from the neat solvents.

5.2.1 Halogenated Solvents

ACS grade (99%+) solvents with no interfering peaks:

1,1,1-Trichloroethane
Trichloroethylene (trichloroethene)
Perchloroethylene (tetrachloroethene)
1,1,2-Trichloro-1,2,2-trifluoroethane (freon 113)
Methylene chloride

5.2.2 Non-Halogenated Solvents

ACS grade (99%+) solvents with no interfering peaks:

Methanol	n-Butyl alcohol
Ethanol	1,4-Dioxane
Acetone	Methylisobutyl ketone
2-Propanol	Toluene
t-Butyl alcohol	Methyl ethyl ketone

Nitromethane	Cyclohexene oxide
Butylene oxide	o-Xylene
sec-Butyl alcohol	m-Xylene
dioxolane	p-Xylene

5.2.3 Preparation of Standards

Calibration standards of the solvents are prepared at three concentration levels by weighing the appropriate mass of solvent in a tared 10 m*l* volumetric flask and diluting to the mark with chlorobenzene. Mixed standards may be prepared for the dilute standards. The procedure is:

- a clean, dry 10 m*l* volumetric flask is filled approximately half full with chlorobenzene. Allow the flask to stand approximately 10 minutes or until the wetted surfaces have dryed. Weigh the flask to the nearest 0.001 g.

- Using a Pastuer pipette, transfer the appropriate mass of solvent to the flask ensuring that the drops fall directly into the chlorobenzene without contacting the neck of the flask.

- Reweigh, dilute to the mark, stopper and mix by inverting the flask at least six times.

- Calculate the concentration in weight/volume percent from the net gain in weight. Correct for compound purity if purity is less than 98%.

- Repeat procedures for remainder of standards. For less concentrated standards, multiple compounds may be added.

- Transfer standards to the appropriate vials and cap with polyethylene lined closures.

6.0 SAMPLE COLLECTION, PRESERVATION AND HANDLING

Sampling is completed by personnel at each Solvents Division facility according to protocols described in Section C of each facilities Part B Permit Application. Sample handling and preservation are outlined in Section 5.0 of the QAPP.

7.0 PROCEDURE

7.1 Extraction

The procedure for sample extraction presented in the Standard Operating Procedures.

7.2 Gas Chromatography Conditions

Initial oven temperature and holding time	35° - 6 minutes
Oven temperature program 1	4°C/minute
Second oven temperature and holding time	90°C - 0 minutes
Oven temperature program 2	10°C/minutes
Final oven temperature and holding time	180°C - 1 minute

Injector temperature	200°C
Detector temperature	250°C
Injector: Split-split ratio	1:100
Sample volume	1.0 µl
Carrier gas	Helium at 180 psi
Detector gas	Hydrogen at 18 psi
	Air at 45 psi

7.3 Calibration

7.3.1 External Standard Calibration Procedure

7.3.1.1 For each analyte of interest, prepare calibration standards at a minimum of three concentration levels by the procedure described in section 5.2.3.

7.3.1.2 Inject each calibration standard using the autosampler. Tabulate peak area response against the amount injected for

each compound of the standard. This ratio of area to amount injected is termed the calibration factor and is defined as:

$$\text{Calibration factor} = \frac{\text{Total Area of Peak}}{\%\ \text{component}}$$

If the percent relative standard deviation (%RSD) of the calibration factors is less than 20% over the working range, linearity throughout the origin is assumed and the average calibration factor may be used. If the %RSD is greater than 20%, then a calibration curve is calculated using linear regression analysis. The minimum acceptable correlation coefficient is 0.975.

7.3.1.3 The working calibration curve or calibration factor must be verified each working day by the inspection of one or more calibration standards. If the response for any analyte varies from the predicted response by more than ± 15%, a new calibration curve must be established for that analyte.

$$\%\ \text{difference} = \left(\frac{C_1 - C_2}{C_1}\right) \times 100$$

Where:

C_1 = Expected concentration

C_2 = Determined concentration

7.4 Gas Chromatographic Analysis

7.4.1 Inject 1.0 µl of the sample extract using the autosampler. If the response exceeds the linear range of the system, dilute the extract and reanalyze.

7.4.2 Calibrate the system (or confirm calibration) prior to conducting any analyses. A midlevel standard must also be injected at specific frequencies and at the end of the analytical batch. The determined concentration must be within ± 15% difference as compared to the expected concentration. If this criteria is exceeded, inspect the GC system to determine the cause and perform the necessary maintenance to correct the problem before recalibrating the system. All samples that were analyzed after the standard that exceeded the criteria are out of control and must be reanalyzed after the corrective action is taken.

7.4.3 Establish daily retention times for each analyte. Use absolute retention times for each analyte from the daily check standard as the midpoint for that day.

7.4.3.1 Tentative identification of an analyte occurs when a peak from a sample extract falls within the daily retention time. No confirmation is necessary for the major degreasing solvents that are routinely determined. Compounds that are less frequently encountered will require an additional analytical technique for identification, if required. Tentative

identification is done more positively by spiking the sample with the suspected constituent and noting an increase in peak height. Sample would be sent to Detrex's RTI Lab in Detroit for positive ID, if necessary.

7.4.3.2 Validation of GC System Quantitative Performance

The midpoint calibration standard is used to evaluate this criterion. If any of the standards are outside of the daily retention time window, the system is out of control and corrective action will be necessary.

7.4.4 Sequence of Analysis

After the system has been calibrated and daily retention time calculated, the following sequence of analysis takes place:

1) Blank
2) 30 samples
3) Matrix Spike
4) Blank Spike
5) Duplicate
6) Calibration Check Standard(s)
7) Blank
8) 30 Samples

7.5 System Maintenance

These corrective actions may be required to remedy problems associated with poor response, shifting retention times, ghost peaks and unstable baselines.

7.5.1 System Bake-Out - To remedy problems associated with rising baselines and ghosts peaks, the chromatography system is baked out. This entails raising the oven temperature to the column conditioning temperature for two hours.

7.5.2 Septum Change - Unstable retention times and poor response may be attributed to a leaking injection port septum. Change septum per the maintenance manual guidelines.

7.5.3 Capillary Column maintenance - Ghost peaks and reduced response may be caused by dirty injection port inserts and front-end column contamination. Replace column insert with a clean-deactivated insert. Also, clipping the first few inches to a foot of the column may be necessary to remedy the problem.

7.5.4 Detector Maintenance-Reduced response may be caused by a dirty detector. Cool detector and clean as recommended in the maintenance manual. Recalibration of the system may be required after cleaning the detector.

7.6 Calculations

The concentration of each analyte in the sample is determined by calculating the peak response using the calibration factor or calibration curve determined in Step 7.3.1. The concentration of a specific analyte is calculated as follows:

$$\text{Concentration (\% wt/vol)} = \left(\frac{Ax}{cf} \right) \times D$$

where: Ax = Response for analyte in sample area units

cf = Calibration Factor - area units per unit concentrations

D = Dilution Factor (if any)

8.0 QUALITY CONTROL

8.1 Reagent Blanks - To demonstrate that the analytical system is not introducing analytes or interferences, reagent blanks consisting of chlorobenzene are processed with the samples. The blanks are carried completely through the extraction and measurement steps and are analyzed at a frequency of 1% of all samples or one per day; whichever is more frequent.

8.2 Accuracy Control

8.2.1 Matrix Spikes Samples - to demonstrate that the sample matrix is not affecting the accuracy of the measurement, matrix spike samples are analyzed. These samples consist of a sample aliquot that has been fortified with a known amount of analyte. The results are expressed as percent recovery (%R) of added analyte and are calculated by:

$$\%R = \left(\frac{SSR - SR}{SA} \right) \times 100$$

where SSR = Spike Sample result

SR = Sample result

SA = Spike added

Matrix spike samples are processed and analyzed at a frequency of one per week, whichever is more frequent. Due to the nature of the samples, only a specific sub set of analytes will be spiked into the sample.

8.2.2 Blank Spike Samples - To demonstrate the efficiency of the extraction and analytical procedures, blank spike samples are analyzed. These samples consist of an artificial matrix that is spiked with a known amount of all analytes of interest. The results are expressed as percent recovery (%R) of added analyte and are calculated by

$$\%R = \left(\frac{BSR - BR}{SA} \right) \times 100$$

where BSR = Blank Spike Result

BR = Blank result

SA = Spike added

Blank spike samples are processed and analyzed at a frequency of one per week.

8.3 Precision Control

To demonstrate the repeatability of the extraction and analytical procedures, duplicate sample analyses are performed. Due to the fact that there will be detectable analytes in every sample, this type of precision control is preferable to matrix spike, matrix spike duplicate analysis. Equal aliquots of a sample are processed and analyzed. The results are expressed as relative percent difference and are calculated by:

$$RPD = \frac{|SR_1 - SR_2|}{\left(\frac{SR_1 + SR_2}{2}\right)} \times 100$$

Duplicate samples are analyzed at a frequency of 1% of all samples or one per day, whichever is more frequent. RPD is calculated for %NVR and for detectable analytes.

where: SR_1 = sample result 1

SR_2 = sample result 2

8.4 Control Limits and Corrective Actions

8.4.1 Reagent Blanks

Reagent blanks should be free from interfering peaks and analytes of interest. Should there be evidence of contamination, the following should be investigated to locate and eliminate the source.

-Purity of solvent used for blank
-Cleanliness of glassware
-Use of lubricating grease on distillation apparatus
-Adequate rinsing of GC syringe
-Carryover from previous sample analysis
-Contaminated GC system

If the problem is determined to be isolated only to the reagent blank (in the case of carryover) no corrective action is required. Should the problem be determined to be systematic, re-extraction and analysis of the samples associated with the reagent blank must take place. Documentation of corrective actions taken is recorded in a bound laboratory notebook.

8.4.2 Matrix Spike Samples

Recovery limits for spike compounds are listed below:

1,1,1-Trichloroethane	75-125%
Trichloroethylene	75-125%
Perchloroethylene	75-125%
Freon	65-125%
Methylene chloride	75-125%

Should recovery limits be outside the acceptance criteria, the following should be investigated or conducted:

-Re-analysis of the matrix spike sample
-Evaluation of results of sample analysis. Concentrated samples may cause the spiked sample to be outside the linear range of the instrument. Dilute and re-analyze.
-Sample homogeneity
-Loss of instrument calibration - analyze a check standard for calibration verification

Should re-analysis of the matrix spike sample still indicate an out-of-control situation, a new sample will be chosen for matrix spike analysis. If analysis still yields out-of-control results, a thorough investigation must be conducted and the finding documentated. All samples processed from the last in-control point must be reprocessed and re-analyzed.

Should results of matrix spike sample analysis indicate an isolated problem associated with the blank spike sample, re-extraction and re-analysis is not required. In all other cases, re-extraction and re-analysis from the last in-control sample must occur.

8.4.3 Blank Spike Samples - Recovery limits for blank spike compounds are listed below:

1,1,1-Trichloroethane	75-125%
Trichloroethylene	75-125%
Perchloroethylene	75-125%
Freon	65-125%
Methylene chloride	75-125%

Should the above recovery limits be exceeded, the following should be investigated or conducted:

-Re-analysis of the blank spike sample
-Contamination of distillation due to loss of vacuum or inappropriate bath temperature
-Loss of calibration of GC. A check standard should be analyzed.

8.4.4 Replicate sample analysis - RPD limits for NVR and detected compounds are 30%. Should this criterion be violated, the following should be investigated or conducted.

-Re-analysis of samples
-Contamination of distillation and GC systems
-Homogeneity of sample matrix
-Inefficient distillations

Should re-analysis of samples not elicit in-control results, a new sample from the batch will be chosen for replicate analysis. If the results of the new replicates still indicate an out-of-control situation, a thorough investigation must be conducted and the findings documented. All samples processed from the last in-control point must be re-extracted and re-analyzed.

9.0 METHOD PERFORMANCE

At this time, the performance of the method is still being evaluated.

10.0 REFERENCES

1) Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, EPA SW-846 Methods 8000, 8010 and 8015.

2) 1989 Annual Book of ASTM Standards, ASTM Volume 15.05 Methods D 3742 and D-3447, Volume 14.01.

STANDARD TEST METHOD FOR FLAMMABILITY POTENTIAL SCREENING ANALYSIS OF WASTE (ASTM D 4982-89)

Designation: D 4982 – 89

Standard Test Methods for Flammability Potential Screening Analysis of Waste[1]

This standard is issued under the fixed designation D 4982; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 These test methods are used to indicate the fire-producing potential of wastes. The following test methods can be applied to waste liquids, sludges, semisolids, or solids:

	Sections
Test Method A—Test Sample Exposed to Heat and Flame	11 to 13
Test Method B—Test Sample Exposed to Spark Source	14 to 15

1.2 These test methods should be used to measure and describe the properties of materials, in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials under actual fire conditions. However, results of these tests may be used as elements of a fire risk assessment that takes into account all of the factors that are pertinent to an assessment of the fire hazard of a particular end use.

1.3 These test methods are designed and intended as preliminary tests to complement the more sophisticated quantitative analytical techniques that may be used to determine flammability. These test methods offer, to the user, the option and the ability to screen waste for potentially hazardous flammability potential when the more sophisticated techniques are not available and the total waste composition is unknown.

1.4 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazard information is given in Section 6 and 13.4.3.1.

2. Referenced Documents

2.1 *ASTM Standard:*

D 93 Test Methods for Flash Point by Pensky-Martens Closed Tester[2]

2.2 *Other Standard:*

Prudent Practices for Handling Hazardous Chemicals in Laboratories[3]

3. Terminology

3.1 *Description of Term Specific to This Standard:*

3.1.1 *screening analysis*—a *preliminary* qualitative or semiquantitative test developed from classical qualitative and quantitative techniques that is designed to efficiently give the user specific information about a waste that will aid in determining waste identification, process compatibility, and safety in handling.

4. Summary of Test Methods

4.1 *Method A*—A test sample is exposed to heat and flame. The sample is reported as having a positive or negative flammability potential as described in the test procedure.

4.2 *Method B*—Sparks from a flint lighter are introduced to the vapor space immediately above a representative sample of a waste, and observation is made for a flash in the vapor space or ignition of the sample. A flash in the vapor space or ignition and burning of the waste indicates a positive flammability potential at ambient temperature.

5. Significance and Use

5.1 These test methods are intended for use by those in the waste management industries to aid in identifying the flammability potential or waste materials.

6. Hazards

6.1 Avoid inhalation and skin or eye contact, or both, of any hazardous materials.

6.2 Standard laboratory hygiene practices should be followed when conducting these tests.

6.3 All tests must be performed in a laboratory hood equipped with an exhaust intake along the front edge of the work area to collect any heavier-than-air vapors generated.

6.4 The analyst must wear flame resistant oven gloves.

6.5 Waste containing or suspected of containing highly volatile organics or peroxides should be tested using a much smaller sample than that used in 13.2.

7. Sampling

7.1 Sample containers must be kept tightly sealed until tested.

7.2 Samples should be analyzed as soon as possible after collection.

7.3 If necessary, allow the sample to come to room temperature in a tightly sealed container. For example, frozen material should be allowed to thaw completely.

8. Report

8.1 Report the following information:

8.1.1 Sample identification,

8.1.2 Date of test,

8.1.3 Sample classification: positive or negative, and

8.1.4 Reference to the procedure applied.

[1] These test methods are under the jurisdiction of ASTM Committee D-34 on Waste Disposal and is the direct responsibility of Subcommittee D34.02 on Physical and Chemical Characterization.

Current edition approved Nov. 10, 1989. Published December 1989.

[2] *Annual Book of ASTM Standards*, Vol 05.01.

[3] National Research Council, National Academy Press, Washington, DC, 1981.

9. Quality Control

9.1 Quality control check samples and duplications should be performed at an action level specified by the laboratory and at an appropriate frequency.

9.2 Flammability standards should be maintained for analyst training and as reference guides. Examples are given in the following table.

Flammability Potential Screening Analysis

Methyl alcohol (methanol)	Difficult-to-see flame: flammable at or below room temperature.
Glacial acetic acid	Flammable at temperatures above normal room temperature.
Hendecane (n-undecane)	Flammable at temperatures higher than glacial acetic acid.
Kerosene (Fuel Oil No. 1)	Flammable over a range of temperatures higher than normal room temperature.
p-Xylene	Flammable at or above room temperature: freezes at 13°C. A spiked soil sample frozen at 0°C demonstrates interference.
Chlorofluorocarbon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	Warning: phosgene formation likely; see 13.4.3.1.

10. Precision and Bias

10.1 No statement is made about either the precision or bias of these test methods since the result merely states whether there is conformance to the criteria for success specified in the procedure.

TEST METHOD A—EXPOSURE TO HEAT AND FLAME

11. Interferences

11.1 Drafts in the laboratory fume hood where the test is performed could cause excessive cooling and false negative results. A properly operating fume hood with a face velocity of 150 ft/min should provide consistent, usable results.

11.2 Ignition sources that provide excessive heating rates alone or combined with a very small test portion may obscure results. That is, the sample may be decomposed, sintered, fused, evaporated, or otherwise consumed before positive or negative evidence of flammability is observed. The use of sufficiently large test portions and of heating rates typical of a bunsen burner should resolve this problem.

11.3 An inadequate source of heating could limit the volatilization of flammable components and provide false negative results.

11.4 Difficult-to-observe flames resulting from the burning of certain compounds (for example, methanol) could provide false negative results. If the presence of these compounds is suspected, the presence of flammability might be confirmed by the insertion of a watchglass just above the test material. The watchglass is then examined for products of combustion (for example, moisture and soot).

NOTE 1—The watchglass method cannot distinguish between vaporized water or water produced by combustion.

11.5 An improperly adjusted gas burner (for example, with an insufficiently aerated flame) could introduce raw gas into or immediately above the sample. This raw gas could briefly support a flame after the source of ignition is removed, providing the appearance of a flammable sample and a false positive result.

12. Apparatus

12.1 *Gas Burner*, (for example, a bunsen burner) adjustable air shutter and an adjustable gas orifice is . The gas burner and fuel supply line must be appropriate to the gas supplied: natural gas, artificial gas (including propane and butane), or liquified petroleum gas (LP gas or LPG). Where a gas supply line cannot be provided, a propane torch may be substituted.

12.2 *Lighter*, (for example, piezo lighter) for burner is required.

12.3 *Aluminum Weighing Boats* or other non-flammable containers are needed.

12.3.1 **Caution**—Weighing boats of material other than aluminum should be used if the testing materials react with aluminum, for example, caustics.

12.4 *Watchglass*.

12.5 *Large Beaker, Tongs, Asbestos-Free High-Temperature Gloves or Mittens*, or other apparatus as needed to extinguish burning materials.

13. Procedure

13.1 Light a gas burner and adjust to a typically blue flame that is not readily blown out. A yellow flame easily affected by drafts indicates insufficient air (the air:fuel ratio is too low). A sharp, blue flame is good. (If the flame rises above the burner head, is very difficult to light, or tends to extinguish itself, indicates that too much air or too much air and fuel are being supplied to the burner.)

13.2 Place a sufficient amount (approximately 5 g) of a test sample in an aluminum weighing boat or other non mable container.

13.3 Using a gas burner, hold the flame immediately above the test sample for 2 to 3 s without touching the visible flame to the sample.

13.3.1 If ignition (a flash or burning) is observed before or after the source of ignition (the flame of the burner) is removed, the sample is said to have a positive flammability potential. A positive result may require further investigation (see 13.4.1).

13.3.2 The confirmation of flammability may require the use of a watchglass (see 11.4).

13.3.3 If there is no ignition, proceed to 13.4.

13.4 Using a gas burner, briefly (for at least 15 s) apply the flame to the sample in an attempt to ignite the sample.

13.4.1 If the sample ignites, the sample is said to have a positive flammability potential.

13.4.1.1 When more accurate waste characterization is necessary, liquid samples may be quantified using a closed-cup flash point tester.

13.4.1.2 Solids with a positive flammability potential should be further investigated.

13.4.2 If the sample decomposes, boils (if a liquid), or otherwise fails to ignite after at least 15 s of continuous sample heating by the burner flame, the flammability potential is reported as negative.

13.4.3 Halogenated solvents typically give off visible vapors that may result in a false positive flammability potential.

NOTE 2: **Warning**—Phosgene, an extremely toxic gas, is a co tion product of halogenated compounds burned in air.

13.5 Shut off the gas burner when not in use. Extinguish a

burning sample by setting an aluminum weighing boat or watchglass atop the one containing the burning sample, (or invert a spoutless beaker over the sample container and all). Use of tongs or high temperature gloves or mittens may be necessary to handle the equipment.

TEST METHOD B—EXPOSURE TO SPARK SOURCE

14. Apparatus

14.1 *Oven Gloves.*

14.2 *Flint Lighter*, the type typically used to light an air/acetylene torch is required.

14.3 *Disposable 250-mL Beaker*, of plastic is required.

14.4 *Watchglass*, 100 mm.

14.5 *Metal Vessel* (with lid), of adequate depth and diameter to contain beaker and watchglass is needed.

14.6 *Thermometer.*

15. Procedure

15.1 Place approximately 100 mL of the representative sample of the material to be tested into the plastic beaker (see 7.3).

15.2 Place the plastic beaker in the steel vessel, cover the beaker with the watchglass, and allow to stand at ambient conditions for 5 min.

15.3 Record the ambient temperature.

15.4 Remove the watchglass, place the igniter immediately above the waste and strike it several times to produce sparks.

15.5 If the material does catch fire and burn, extinguish the flames by immediately placing the lid on the steel vessel, thus smothering the fire and report as positive flammability potential.

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.

ATTACHMENT C-6

STANDARD OPERATING PROCEDURE FOR

WASTE SAMPLING

STANDARD OPERATING PROCEDURE FOR

WASTE SAMPLING

STANDARD OPERATING PROCEDURE
WASTE SAMPLING

This section describes in detail the procedures that is to be followed for sampling the containers of spent organic solvents.

1. SAFETY CONSIDERATIONS

- proper ventilation and dermal protection is provided for the sampling operation

- any built-up pressure within a container is slowly released by gently cracking the bung

2. SAMPLING EQUIPMENT

Materials and equipment required for sampling are as follows:

1) 1 oz. narrow-mouth glass bottle with polyethylene-lined closure.
2) sample label.
3) 4-foot by 3/4 inch ID sampling thief.
4) bung wrench (non-sparking).
5) packing slip and chain-of-custody form (for off-site analyses).

3. DRUM SAMPLING

3.1 Discrete Liquid Concentrated Waste Samples

The following procedure shall be adhered to during the sampling of individual drums.

1) Remove bung using non-sparking bung wrench.
2) Slowly insert thief to the bottom of the drum or until a solid layer is encountered. About one foot of glass thief should extend above the drum.
3) Allow the waste in the drum to reach its natural level in the thief.
4) Cap the top of the thief with gloved thumb.

5) Carefully remove the thief from the drum and insert the uncapped end in a graduated beaker.
6) Gently pour appropriate sample volume into sample jar
7) Label sample.

The following procedures shall be adhered to during the sampling of bulk waste shipments.

1) Open access chamber into tanker truck.
2) Slowly insert thief to the bottom of the waste.
3) Allow the waste in the tanker to reach its natural level in the thief.
4) Cap the top of the thief with gloved thumb.
5) Carefully remove the thief from the tanker and insert the uncapped end in a graduated beaker.
6) Gently pour appropriate sample volume into sample jar.
7) Label sample.

3..2 Composite Sampling

The following procedure shall be adhered to during composite sampling. A maximum of ten drums may be composited. Only drums of the same waste type from the same generator may be composited.

1) Collect a drum sample from each drum according to the procedure described above.
2) Place sample from each drum to be composited into the same graduated beaker.
3) Mix entire composite gently and pour appropriate sample volume into sample jars.
4) Label sample.

4. CHAIN-OF-CUSTODY

For all analysis conducted off-Site, a chain-of-custody form (sample attached) shall be completed.

DETREX CORPORATION
SOLVENTS DIVISION

REQUEST FOR LABORATORY ANALYSIS

GENERATOR SUPPLIED INFORMATION (MUST BE COMPLETED)

Company Name _____ EPA ID No: _____

_____ Salesman: _____

Address: _____ Comments: _____

_____ _____

Phone No.: (____) _____

_____ *RETURN* or *DISPOSE* of samples

Submitted by: Date

PROJECT NAME OR NUMBER _____ NUMBER OF SAMPLES _____

SAMPLE TYPE(S) _____

HAZARD CLASS _____

ANALYSIS(SES) REQUESTED _____

PLEASE LIST SAMPLE IDENTIFICATION NUMBERS ON REVERSE SIDE
(Column No. 2)

CHAIN OF CUSTODY

Relinquished By: Name	Date	Time	Received By: Name	Date	Time

FOR LABORATORY USE ONLY

Generator ID _____ Work Order No. _____

Sample results reported by: _____ Date _____ Time _____

Sample results reported to: _____

Sample results recorded: _____

Laboratory Book No. Page No.

Office Use LAB ID NO.	GENERATOR ID NO.	SAMPLE TYPE	ANALYSIS REQUESTED	COMMENTS

Attachment 2

Inspection Schedule

SECTION F

PROCEDURES TO PREVENT HAZARDS

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SECTION F

PROCEDURES TO PREVENT HAZARDS

This section of the operating license application provides a description of the procedures implemented at the Detrex Corporation facility in Detroit, Michigan to prevent the possibility of a hazard from occurring.

This information is provided pursuant to Michigan Act 64 Rule 299.9504(1)(c) which incorporates 40 CFR 270.14(b) (5)) by reference. The applicable section(s) of the Federal Regulations (40 CFR) is referenced as appropriate.

F-2 INSPECTION SCHEDULE
[40 CFR §270.14(b)(5),§264.15, 264.174, 264.195]

F-2a General Inspection Requirements
[40 CFR §270.14(b)(5), §264.15(a) and (b), §264.33]

Detrex Corporation conducts regular inspections of the hazardous waste container and tank storage areas for leaking containers/tanks and for deterioration of containers/tanks and related process lines. Inspections are also conducted for deterioration of the secondary containment system that could cause or lead to the release of hazardous waste constituents to the environment or threaten human health. Additionally, after every waste shipment is received at the facility, the transport vehicle and the loading/unloading area are inspected.

The hazardous waste container and tank storage areas are contained within a single 'warehouse' type building. This allows an almost continual check by on-site staff and rapid detection and response to any problems.

Detrex Corporation also conducts regular inspections of the monitoring equipment, safety equipment, security devices and operating and structural equipment to ensure that no danger of a release of hazardous waste constituents or threats to human health exist.

Attachment F-3 presents typical hazardous waste inspection forms used in the general inspection procedures at the facility. These forms indicate typical problems that might be encountered as well as provisions for the reporting of any remedial actions that may be undertaken.

F-2a(1) Types of Problems [40 CFR §264.15(b)(3)]

Attachment F-2 presents the typical schedule for inspecting security, emergency equipment and the hazardous waste container and tank storage areas. Types of problems normally encountered with each inspection item are included. Copies of the inspection schedule are kept on file at the facility at all times.

F-2a(2) Frequency of Inspection [40 CFR §264.15(b)(4)]

Attachment F-2 also includes the frequency of inspection for each item.

F-2a(3) Remedial Action [40 CFR §264.15(c)]

Inspections may reveal problems of three types. The first type of problem involves the need for non-emergency maintenance. In this situation, qualified personnel will take the necessary actions as soon as possible to preclude further damage and reduce the potential for emergency repairs. The inspector will note in the inspections log when such action should be taken and verify the status at the next regularly scheduled inspection.

The second type of problem involves a non-emergency release of hazardous waste that is discovered during inspection. In this situation, appropriate remedial action will be taken immediately and documented in the inspection log. At a minimum, daily inspections will be made until the remedial action is completed.

The third type of problem involves the discovery of a release or the potential for the release of hazardous constituents to the environment in sufficient quantities to constitute an emergency. If this occurs, the Contingency Plan (included as Section G of this operating license application) will be implemented. The Contingency Plan provides a detailed description of the remedial action appropriate for this situation.

F-2a(4) Inspection Log [40 CFR §264.15(d)]

Provided in Attachment F-3 are typical daily, weekly and transport vehicle inspection records. These are completed by the inspector at the conclusion of each routine inspection. Each inspection record is kept on file in an inspection log for a minimum of three years.

ATTACHMENT F-2

INSPECTION SCHEDULE

Date: 09/03/91
Revision: 91-2
Attachment: F-2

ATTACHMENT F-2

HAZARDOUS WASTE INSPECTION SCHEDULE

Items	*Type of Problem*	*Inspection Frequency*
Container storage area	- Leaking drums - Drum bungs secure - Corrosion - Proper stacking height - Proper labelling - Adequate aisle space	Daily
Tank storage area and associated piping	- Leaking tanks or piping - Corrosion - Liquid level in tanks	Daily
Transfer lines/Transfer pumps	- Leaking, cracking	Daily
Interior Secondary containment	- Presence of liquid - Cracks, joints	Daily
Loading/Unloading Area	- Presence of liquids - Cracks/joints	Daily (when in use)
Absorbent material	- Adequate supply	Daily
Doors	- Open freely - Locks function	Daily
Fencing, Gates, Perimeter signs	- fencing intact - gates open freely, locks function - adequate signs present, legible	Weekly
Electronic Surveillance System	- alarms functioning properly	Weekly
Alarm system	- Functions	Weekly

Date: 09/03/91
Revision: 91-2
Attachment: F-2

ATTACHMENT F-2

HAZARDOUS WASTE INSPECTION SCHEDULE

Items	*Type of Problem*	*Inspection Frequency*
Fire extinguishers	- Available - Loss of pressure	Weekly
Self-contained breathing apparatus	- Available - Loss of pressure in tank	Weekly
Respirator	- Available	Weekly
Eye wash station/ Safety shower	- Functions - Scale or rust in water	Weekly
First aid kit	- Available - Adequate supplies	Weekly
Transporter Vehicle	- empty - presence of liquids	Every Shipment

ATTACHMENT F-3

INSPECTION RECORDS

DETREX CORPORATION
EATON AVENUE FACILITY
HAZARDOUS WASTE DAILY INSPECTION RECORD

Inspection Item	*Type of Problem*	*Problem Exists (Yes/No)*	*Remedial Action Required*	*Remedial Action Completed (date)*
Container Storage Area	- leaking drums - drum bungs secure - corrosion - proper stacking height - proper labelling - adequate aisle space			
Tank Area & Associated Piping	- leaking tanks or piping - corrosion - liquid level in tank			
Transfer lines/ Transfer Pumps	- leaking, cracking			
Interior Secondary Containment	- presence of liquid - cracks, joints			
Adsorbent Material	- adequate supply			
Doors	- opens freely - locks function			

Specific Comments: _____

_____

_____

_____

Inspection By:
Date:
Time:

DETREX CORPORATION
EATON AVENUE FACILITY
HAZARDOUS WASTE WEEKLY INSPECTION RECORD

Inspection Item	*Type of Problem*	*Problem Exists (Yes/No)*	*Remedial Action Required*	*Remedial Action Completed (date)*
Fencing/Gates/ Perimeter Signs	- fencing intact - gates open freely, locks function - adequate, legible signs			
Electronic Surveillance System	- functions properly			
Alarm System	- functions properly			
Fire Extinguishers	- available - loss of pressure			
Self-Contained Breathing Apparatus	- available - loss of pressure in tank			
Respirator	- available			
Eye Wash Station/ Safety Shower	- functions - scale or rust in water			
First Aid Kit	- available - adequate supplies			

Specific Comments: _____

_____

_____

_____

Inspection By:
Date:
Time:

DETREX CORPORATION
EATON AVENUE FACILITY
TRANSPORTER VEHICLE INSPECTION RECORD

Inspection Item	*Type of Problem*	*Problem Exists (Yes/No)*	*Remedial Action Required*	*Remedial Action Completed (date)*
Waste Inventory	- entire inventory (drum or bulk) removed			
Residual Material	- presence of liquids			
Loading/Unloading Area	- presence of liquids - cracks/joints			

Vehicle Identification: _____

Specific Comments: _____

_____

_____

_____

Inspection By:
Date:
Time:

Attachment 3

Training Program

SECTION H

PERSONNEL TRAINING

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SECTION H

PERSONNEL TRAINING

This section outlines the personnel training program completed by all employees of the Detrex Corporation facility in Detroit, Michigan. The information is provided pursuant to Michigan Act 64 Rule 299.9504(1)(c) which incorporates 40 CFR 270.14(b)(12) and 264.16 by reference. The applicable section(s) of the Federal Regulations (40 CFR) is referenced as appropriate.

H-1 OUTLINE OF TRAINING PROGRAM [40 CFR §264.16(a)(1)]

H-1a Job Titles/Job Description [40 CFR §264.16(d),(1) and (2)]

Detrex Corporation maintains the following documents and records at the facility:

1) The job title for each position related to hazardous waste management, and the name of the employee currently filling each job.

2) The written job description for each position as described in (1) above, which includes experience, skills and responsibilities. Job descriptions, a copy of which is provided in Attachment H-1, are kept on file in the plant office. The current employee's name is also recorded.

3) A written description of the type and amount of both introductory and continuing training given to personnel for each position related to hazardous waste management.

4) Records that document that the training and job experience have been completed by facility personnel.

Detrex Corporation maintain training records of former employees involved with hazardous waste management for three years from the date they last worked at the facility and will maintain training records on current personnel until closure of the facility.

H-1b Training Content, Frequency, and Technique [40 CFR §264.16(c), and (d)(3)]

The program developed by Detrex Corporation for training employees in the safe handling of hazardous wastes includes study, on-the-job training, and competence evaluation. Provisions are made for updating or revising the training program as necessary to ensure compliance with regulatory guidelines, changing facility conditions, and organizational changes.

A copy of the Hazardous Waste Management Facility Employee Training Program Manual developed by Detrex is provided in Attachment H-2. This outlines all aspects of the training program, providing each employee with the information required for the safe execution of his or her responsibilities.

H-1c Training Director [40 CFR §264.16(a)(2)]

Mr. Bill Moore has been appointed Corporate Training Director for Detrex Corporation. For this role Mr. Moore will be responsible for updating the existing personnel training program and ensuring all employees involved in hazardous waste management activities receive adequate training. Mr. Moore himself has received formal training as described in his curricula vita enclosed as Attachment H-3. Additionally, the Training Director attends various meetings/seminars with Detrex Corporations' Risk Management Team. The purpose of these is to help keep the facility Training Director as up-to-date as possible on changing regulations that affect operations.

H-1d Relevance of Training to Job Position [40 CFR §264.16(a)(2)]

Contents of the training program is tailored to each position. The Gold Shield Operator #1 receives training in the operation of: Process Equipment, Filling Station, Safety Equipment, Transportation and Material Handling Equipment, Emergency Equipment, and Forklift and Hand Truck Operation, and on the Contents of the Contingency Plan.

The Facilities Manager/Emergency Coordinator receives training in the Operation, Inspection and Recordkeeping for: Process Equipment, Safety Equipment, Transportation and Material Handling Equipment and Contingency Plan Procedures.

All facility employees participated in annual refresher training sessions which review general operating procedures and in particular implementation of the Contingency Plan and related safety equipment.

H-1e Training for Emergency Response [40 CFR §264.16(a)(3)]

This training program is designed to ensure that personnel not only handle hazardous wastes in a safe manner, but also properly respond to emergency situations. The program trains hazardous waste handling/management personnel to maintain compliance under both normal operating conditions and emergency conditions.

H-2 IMPLEMENTATION OF TRAINING PROGRAM
[40 CFR §264.16(b), and (d)(4)]

An employee is hired to fill a specific position (i.e. Gold Shield Operator # 1). The employee is first required to review the written training program for the position he/she is to fill. Upon completion, the employee is then given 40 hours of on-the-job training within 1 month of hiring.

No employee hired to work at this facility will work unsupervised prior to completion of the training program.

Employees are required to meet annually for reviews and updates of this training program and to discuss and study the following subjects:

1. All hazardous wastes currently being handled at the facility, noting only changes in waste type, volume, source, characteristics, or location that have occurred during the past year;

2. The status of operating conditions and procedures, noting any areas where there are problems or potential for problems. Employees participate in developing effective solutions;

3. The requirements contained in the facility's operating license, noting any changes that have occurred during the past year. Areas where maintenance or compliance is a problem are identified and discussed, and effective solutions are sought; and

4. Incidents that have occurred in the past year that warranted use of contingency plans and/or emergency action. This review focuses on the cause of the incident and identification of steps to be taken to prevent or to ensure better handling of such events in the future.

Records documenting that the required training or job experience required to ensure that employees are trained to perform their duties in such a manner that compliance with the operating license is assured, will be kept onsite in the office. These records will be kept until closure of the facility for current employees and for 3 years from the date of the individual employee's termination for former employees. Records will include job description, employee name, training contents, date and duration of training and the instructor assessment of competency.

ATTACHMENT H-1

JOB DESCRIPTIONS

Personnel at Detroit Branch

Facilities Manager	Ronald C. Hritzkowin
Quality Control Coordinator	Joseph Calderoni
Administrative Assistant	Lorie LaRosa
Secretary	Barbara Hooper
Gold Shield Operator #1*	Levi Douglass
	Greg Seretian
	Richard Barmore
	Pat Walter

* Union Contract Job Title

TITLE: FACILITIES MANAGER

POSITION TITLE: FACILITIES MANAGER

1. Marketing Operations:

   (a) Attend solvent deliveries assuring weight, number and count and, in event of bulk receipts, that lading appears to met quality specifications for color, moisture, and absence of suspended matter. Accept shipments in name of Detrex.

   (b) Attend loading of bulk shipments insuring that, if Detrex vehicle transport tank is clean and free of significant residue from previous loads in, if for hire or customer vehicle, transport tank is clean, dry, unblemished, and free of any residue. Execute shipping documents.

   (c) Supervise, assign, and direct employees involved in drumming operations. Inspect empty drums for suitability. Assure that drumming operation proceeds in an manner that preserves solvent quality and is performed according to good industrial practice respecting employees safety and protection of the environment. Assures are properly marked and in accordance with DOT regulations.

   (d) Supervise operation of warehouse. Schedule work of operators. Assure clean and orderly use of warehouse space.

   (e) Supervise private motor fleet and administer vehicle leases. Dispatch and route company drivers. Assure motor operations are performed according to regulations of USDOT and Michigan regulatory agencies. Read and retain driver logs and vehicle condition reports. Insure that company vehicles are properly maintained and serviced.

   (f) Recommend hiring of operators.

2. Environmental and Regulatory Responsibilities:

   Has full responsibility for on-site hazardous waste management as follows:

   (a) Is the assigned Branch Emergency Coordinator.

   (b) Supervises all record keeping by Quality Control Coordinator, Administrative Assistant, or for hazardous waste manifests done by other branch personnel.

   (c) Supervises the Operators when any on-site sampling is performed.

(d) Supervises the Quality Control Coordinator when on-site testing of hazardous waste is performed.

(e) Supervises all record keeping of all daily and weekly facility inspection reports as performed by the Secretary, Administrative Assistant, or the Gold Shield operator.

(f) Is the primary contact for all regulatory agency personnel in conjunction with Detrex Corporation Risk Management Group.

(g) Responsible for maintaining training levels of all branch personnel

(h) Has responsibility for all regulatory compliance in operation of the TSD facility.

3. General:

The incumbent reports to the Division Operations Manager and assists him/her as required. The incumbent performs some additional duties as the Division Operations Manager may direct.

4. Qualifications:

The incumbent should have at least 5 years experience in plant operations, including environmental and regulatory exposure. He/she must have a working knowledge of transportation operations. He/she must be sensitive to sales and marketing situations and be able to support the Sales/Marketing group as requested.

TITLE: QUALITY CONTROL COORDINATOR

POSITION RESPONSIBILITIES AND DUTIES:

Job Description:

Position is responsible for ensuring that the facility operates in accordance with Detroit Department of Water & Sewage, Wayne County Department of Health Air Pollution Control Division, and Corporate established product standards.

1. Primary Responsibilities:

   (a) Receive samples of hazardous waste at the facility, log in samples, complete waste sample profile sheets for samples, prepare samples for shipment to the appropriate analytical facility, logging in of analytical results, and dissemination of results to Salesmen.

   (b) Ensure that all shipments of non-flammable waste received at the facility are properly Manifested, labeled, marked with accumulation start date, sampled, logged into the Hazardous Waste Operating log, prepared for shipment to appropriate analytical facility or analytical results from generator/transporter are obtained, production control cards are prepared, and bench top fingerprint analysis are performed.

   (c) Ensure that all shipments of waste received at the facility are properly Manifested, labeled, marked with accumulation start date, labeled with Stream Code approval number, logged into the appropriate waste operating log, and coordinate shipments/pick-ups with drivers to allow for optimum use of equipment.

   (d) Coordinate treatment of waste water including supervision of treatment, subsequent sampling and disposal of effluent and filtered solids, shipment of samples and wastes, operation of waste water treatment process equipment, and the use and stocking of treatment chemicals.

   (e) Coordinate Air Monitoring Program including monitoring/sampling of influent and effluent from carbon absorption unit, logging in of results, operation of carbon absorption unit, stocking of materials for use in unit, and coordination of monitoring program with Wayne County Department of Health, Air Pollution Control Division.

2. Secondary Responsibilities:

   (a) Completion of Production Control cards for invoicing crediting of customers.

(b) Conducting titration for non-amine acceptance of reclaimed solvents, calculating amount of stabilizer concentrate is required in reclaimed solvent, and stocking of chemicals required for N.A.A. tests and test kits.

(c) Logging in production figures and shipment information, including completed manifests and certificates of destruction from TSDF's into hazardous and appropriate waste log books. Also responsible for assimilating data required and for putting together certificates of destruction and sending same to customers.

3. Regulatory Responsibilities:

In addition to the above mentioned, the following regulatory responsibilities shall be undertaken by the position:

(a) Maintain a file for Import and Export shipments of hazardous wastes for the current year. This data shall be compiled at the end of the year and used to complete the Import/Export Annual Report. The report shall be filed with the U.S.E.P.A. and M.D.N.R. and other parties requiring it not later than the end of the first calendar week of the proceeding year.

(b) Obtain samples of the effluent from the facility in a timely fashion each quarter of the year. The samples shall be forwarded to an independent laboratory for City of Detroit Water Analysis. Once the analytical results are received, the data shall be utilized to create the six month compliance report for the facility. The report shall be forwarded to the facility manager for timely review and submission to the City of Detroit.

Salary and performance reviews shall be given annually in January. The reviews shall use as a basis of performance the efficiency of completion of the above mentioned tasks as pertaining to the position.

4. Qualifications:

The incumbent should have, or be working toward, a degree in Chemistry (or equivalent). The incumbent should have at least 2 years of experience with laboratory and analytical procedures, preferably in an industrial situation. Experience in Hazardous Waste sampling and manifesting is preferred but not necessary. The incumbent should be able to work without close supervision, handling multiple assignments/projects.

TITLE: ADMINISTRATIVE ASSISTANT

POSITION RESPONSIBILITIES AND DUTIES

1. Primary Responsibilities:

   (a) Typing and mailing quotations and correspondences to customers for hazardous waste management services.

   (b) Receiving and maintaining quotation file from disposal facility for customer waste streams. Includes copying of original quotes and distribution to operations and sales personnel.

   (c) Taking phone orders for hazardous waste management services from customers and sales personnel and coordinating shipments/pick-ups with operational personnel.

   (d) Generating non-solvent sales and hazardous waste management services invoices, maintenance of non-solvent sales account file and non-solvent sales accounts receivable ledger and collections and maintenance of customers log summaries and generating invoices for surcharges.

2. Secondary Responsibilities:

   (a) Maintaining Solvent sales ledger and monthly sales summary file.

   (b) Logging vendor invoices in approved invoice file after Facility Manager has approved invoice for payment.

   (c) Maintaining file of hazardous waste processing batch cards from other Detrex branches and completing reclamation reallocation reports.

   (d) Compiling and publishing non-solvent sales month end report.

   (e) Coordinating Telemarketing activities with Sales Personnel.

3. Qualifications

   Must be able to operate five line telephone system, be able to type 50-60 wpm, type correspondences from a Dictaphone, and use a ten key adding machine. Shorthand and personal computer operational skills are considered helpful but not necessary currently.

TITLE: SECRETARY

Position Responsibilities and Duties:

1. Primary Responsibilities:

   (a) Does billing for both resale materials and reclaimed product; does all invoicing for Hazardous Waste disposal; and tolling.

   (b) Keeps records of accounts payable and receivable.

   (c) Responsible for inventory control.

   (d) Does mailing and correspondence.

   (e) Schedules delivery runs.

   (f) Fills out shipping forms, keeps records of shipping and receiving.

   (g) Completes outbound hazardous waste manifests.

   (h) Answers phones and processes paperwork on orders.

2. Qualifications

   Must be able to operate five line telephone system, be able to type 50-60 wpm, type correspondences from a Dictaphone, and use a ten key adding machine. Shorthand and personal computer operational skills are considered helpful but not necessary currently.

TITLE: GOLD SHIELD OPERATOR #1

Position Responsibilities and Duties:

1. Requisite Skills and Education:

   (a) Knowledge of streets in major cities in Southeast Michigan and Northwest Ohio.

   (b) Common knowledge of the mechanical operations of all mobile equipment.

   (c) Must have a valid chauffeur's licence and abide by governmental rules and regulations.

   (d) Must know the mechanical condition of the truck and report any defects.

   (e) Must pass DOT oral and written tests which will be scored by an impartial party.

   (f) Must pass DOT physical.

   (g) Must have respectable driving record. The Company's Risk Management Group will review the driving record or truck driver applications. Their decision to reject an applicant based on a poor driving record will be considered final and binding.

   (h) Must pass a driving test on Detrex equipment which will be evaluated by an impartial party.

   (i) Chauffeur's licence must be C-2 or better.

   (j) Will have successfully completed training at one of State of Michigan Community Development Programs; specifically, Hazardous Waste Industry Training and Technical Assistance programs.

** Terminology as exists in Union Contract.

(k) Will have successfully completed driver testing and have been certified by Risk Management as outlined in the Code of Federal Regulations, part 49, section 390-392.

(l) Will have a minimum of three (3) year's experience working with hazardous waste, including flammable and corrosive waste, or 6 calendar months on-the-job training involving working with these hazardous materials which will be considered probationary.

2. Performance:

(a) Must be capable of driving any automobile equipment owned or leased by the Company.

(b) Load and unload or assist in the loading or unloading of any vehicle owned or leased by the Company.

(c) Will make bulk deliverables using 1) tank truck, 2) portable tank, 3) tank trailer, as required.

(d) Will maintain all necessary log books when required as outlined in the Code of Federal Regulations, part 49, section 395.

(e) Will make hazardous waste pickups using: 1) stake trailer, 2) tank trailer, 3) vacuum tank trailer, 4) vacuum pumper as required and according to Federal and State Laws.

3. Responsibility:

(a) Responsible for the quality of workmanship.

(b) Must produce a fair day's work for a fair day's pay.

(c) Exercise due care of the various pieces of equipment while operating same.

(d) Must operate the equipment in a safety manner. Keep the equipment and the area wherein the work is performed tidy at all times.

(e) Responsible for implementing the transporters contingency plan in case of accidental spill of hazardous waste.

(f) Responsible to see that hazardous waste labels on drums are filled out properly and include the proper UN/NA numbers according to DOT regulations.

(g) Responsible for signing hazardous waste manifest on behalf of the Company that all information on manifest is correct and accurate.

(h) Responsible for insuring Land Ban Certifications; form is included with "F" series manifested shipments.

When working in Solvents Reclamation Department

1. Operates Stills in reclamation room.

   (a) Record weights of full drums.

   (b) Record hydrometer reading.

   (c) Record weight of empty drums.

   (d) Take samples of solvents to be sent to lab for analysis.

   (e) Drum reclaimed solvent.

2. Unload incoming shipments of solvents (drives forklift).

3. Load outgoing shipments.

4. Will have completed Clayton training on make-up water testing.

5. Will have completed training in Risk Management's spill prevention program.

6. Is knowledgeable on operation of all safety, equipment, SCBA, respirators, intercom, emergency disconnects, etc.

7. Is responsible for stacking drums three high into box van. Three (3) employees are required to do this job.,

8. Is responsible for daily and weekly inspections of the hazardous waste facility.

When working in Solvents Flammable Waste Transfer Station and/or Stabilizers Department

1. Responsible for insuring that all equipment is properly grounded before operations start.

2. Responsible for insuring that Stream Code Approval Number on Manifest is applied to containers before containers are placed on the trailer.

3. Responsible for insuring that shipments of flammable and/or corrosive waste correspond with information on manifest for the shipments.

4. Responsible for blending stabilizer concentrates using raw materials provided and established procedures as shown on batch cards.

5. Responsible for drumming and labeling batches of stabilizer concentrates.

6. Responsible completing Supplies Requisition forms including raw materials used after producing a batch of stabilizer concentrate.

7. Is responsible for daily and weekly inspections of the waste transfer station.

ATTACHMENT H-2

EMPLOYEE TRAINING PROGRAM

Date: 09/03/91
Revision: 91-2
Attachment: H-2

TRAINING PROGRAM

OVERVIEW

This facility primarily conducts on-the-job training programs. All new employees are familiarized with general/specific chemical hazards and instructed to perform their assigned tasks in a safe, efficient manner. Additional safety/product information is presented on a continual basis.

This facility operates essentially without detailed written job descriptions relying on a "standard operating procedures" approach. Employees are instructed/prepared for their assignments on a supervised, individual basis.

1. Job Titles and Duties

(a) Job Titles

An organization chart is presented for this reclamation and sales facility in Appendix 1. The titles of the personnel involved with hazardous waste management are:

Titles

Facilities Manager (Emergency Coordinator)
Quality Control Coordinator
Administrative Assistant
Secretary
Gold Shield Operator #1

There also are salaried sales employees who can be utilized for handling wastes and who assist in waste analyses.

Maintenance is performed by hourly employees trained to properly handle hazardous wastes.

(b) Duties

Detrex Corporation does not utilize detailed job descriptions for hourly employees or salaried sales employees. Rather, employees are assigned tasks similar to a given job title and are expected to perform those tasks in a safe and orderly fashion. The majority of training is "hands-on" the job directly related to an assigned position.

The different job titles reflect the relative knowledge, skill, care, effort and responsibility required to perform the duties of the assigned job. All employees are aware of their assigned tasks and are offered sufficient instruction to safely accomplish them.

The written job descriptions for the personnel involved with hazardous waste management are maintained at the facility as well as a list of the current personnel filling each job.

2. Training Content, Frequency and Techniques

(a) Training Content

Detrex Corporation's employee training regarding the safe handling of hazardous wastes is initiated during the first week of employment. Appendix 2 presents a training outline developed by the Training Director. This training program also involves an orientation generally provided by the Training Director or Facility Manager:

Attachment	Description
Appendix 3	Clerical-Technical Orientation Checklist (if applicable)
Appendix 4	Hourly Orientation Checklist (if applicable)
Appendix 5	What To Do If You Get Chemicals Spilled On Various Parts Of Your Body

New employees are supervised until they are deemed competent by the facilities manager for their assigned tasks.

As part of this program, employees are provided with a variety of written material. New employees receive copies of Section G (Contingency Plan) and appropriate portions of Section H (Personnel Training). Annual reviews contain information regarding regulatory changes, any implementations of the facility's contingency plan in the past year, and any changes in the facility's operating license. In addition, employees' questions and opinions are solicited and employees are, in turn, questioned to insure their comprehension.

Procedures for responding to emergencies are presented to employees on a general and a specific basis. As previously described, each

employee receives, among other documents and training, a copy of the facility's contingency plan, as well as information regarding the type and location of alarm systems and emergency communication equipment. This emergency equipment is inspected on a regular basis (see schedules and inspection forms contained in Section F).

Persons responsible for operation of the hazardous waste drum storage area are trained in the proper storage requirements to avoid potential hazards, which are described more fully in Section F of this operating license application.

In the event of an emergency such as an explosion or fire, the specific procedures set forth in the contingency plan (with which employees are familiar through the training program) would govern. Documentation of this training program is maintained in the form of sheets signed by affected employees upon completion of the training session. These sheets are maintained with the facility's operating record.

(b) Frequency

The employee training program, as described in this document, is undertaken by all employees immediately upon their hiring by the facility.

In addition, all employees are required to meet, at a minimum, annually for reviews and updates of the training program. These reviews cover any and all changes in the operational or response procedures at the facility, past incidents that have caused the implementation of the contingency plan, and any changes to the operating license and/or Federal and State regulations that require an alteration to existing operational procedures.

(c) Technique

Detrex Corporation utilizes the plant environment for all employee orientation and on-the-job training.

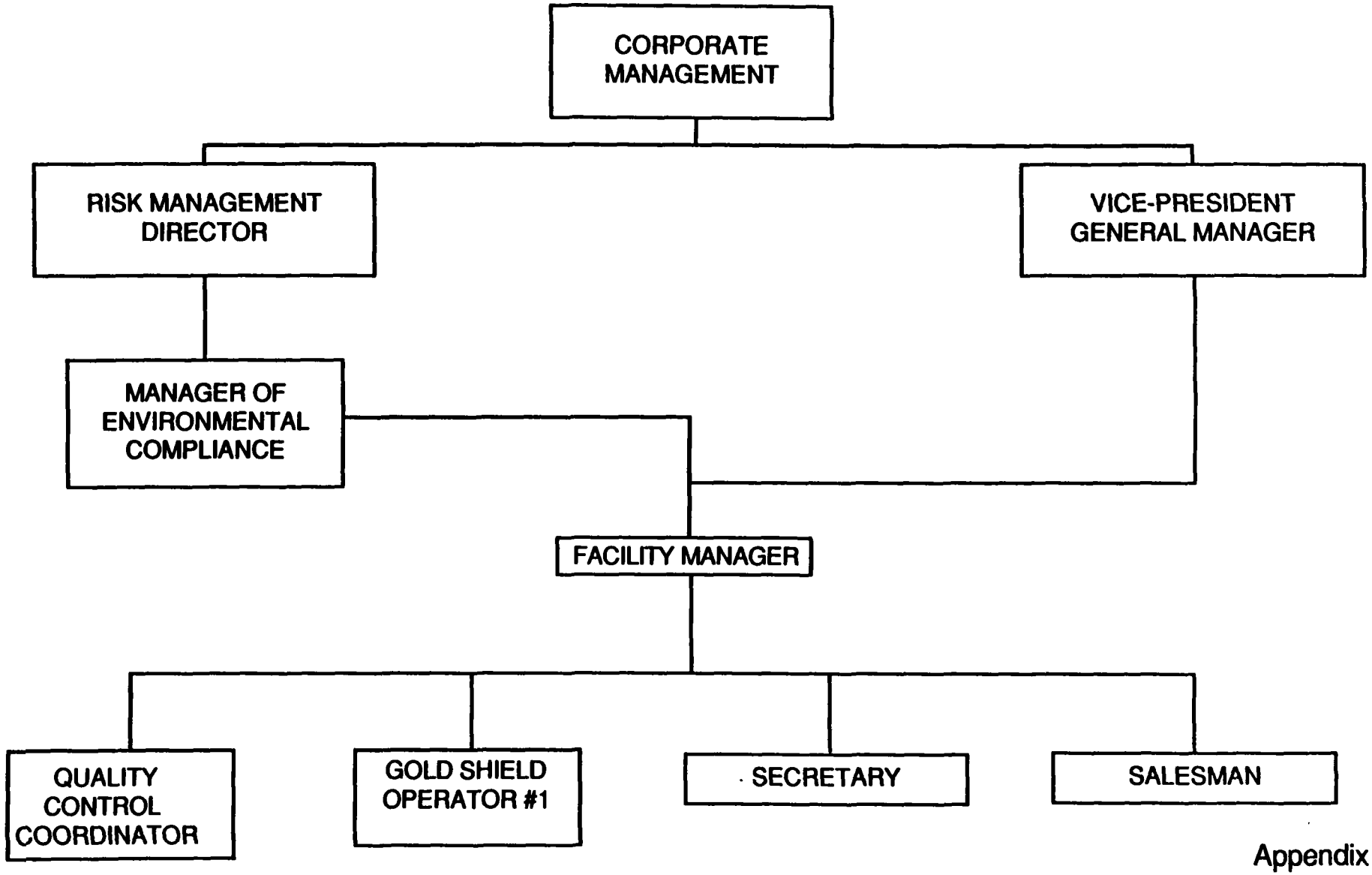
3. Training Direction and Implementation

All employees involved with hazardous waste management are trained by the Corporate Training Director and/or Facilities Manager/ Emergency Coordinator. All new personnel assigned to hazardous waste management tasks will complete the in-house training program within one (1) month of assignment to any hazardous waste management position. Employees will not perform assigned tasks unsupervised until training is complete.

Employees are required to meet annually for review/update of this training program. Their active participation is sought to maintain a valid program.

APPENDIX 1

ORGANIZATIONAL CHART



Appendix 1

ORGANIZATIONAL CHART
DETREX CORPORATION

APPENDIX 2

TRAINING DIRECTOR
TRAINING OUTLINE

Training Outline 40 CFR 264.16

I. Review of regulations regarding the transfer/disposal facility.

- A. 40 CFR 264 Federal Regulations
- B. State Regulations
- C. Hazardous Waste
  - 1. Definition
  - 2. Handling
    - a. Storage
    - b. Sampling
    - c. Transportation
  - 3. Manifesting
    - a. DOT
    - b. EPA
  - 4. Labeling
    - a. Drums
    - b. Storage area
    - c. 29 CFR 1910.1200 Requirements
  - 5. New Regulations
    - a. 24 Hour Phone Number
    - b. Emergency response Information
    - c. N.O.S. Items
    - d. Other

II. Facility operations

- A. Daily Inspection of equipment
- B. Inspection of Waste area, tanks, etc.
- C. Emergency cut-off systems
- D. Alarms or emergency call system
- E. Handling Drums
  - 1. Bungs
  - 2. Storage
  - 3. Other

III. Emergency Operations

- A. Contingency Plan implementation
- B. Fires
- C. Spills
  - 1. Containment
  - 2. Reporting
  - 3. Clean - up
  - 4. Releases
  - 5. Employee Protection
- D. Emergency Shut Down
- E. Notification

IV. Job Description

V. Transportation

- A. Driver Responsibility
- B. Check List
- C. Placarding
- D. DOT Regulations
- E. Areas of concern
  1. Proper Shipping Name
  2. Proper Waste Codes
  3. Handling Codes
  4. Discrepancies

APPENDIX 3

CLERICAL-TECHNICAL ORIENTATION CHECKLIST

CLERICAL-TECHNICAL ORIENTATION CHECKLIST

Items to Cover	*Key Points to Cover*	*Who Should Cover*	*When*	*Item Covered Initial Date*
Positive Attitude	- Assure employee that your role is to help him in his new job and that he should come to you for information and assistance.	Supervisor	First Day	
Salary	- Advise employee of his starting salary and the job rate. - Explain that employee's performance will be reviewed periodically and, if satisfactory, his salary will be increased until the job rate is attained. If progress is not satisfactory, the employee will be told the reason and salary increases will be withheld until satisfactory performance is reached. - Inform employee of periodic adjustments in the salary ranges to keep salaries comparable with other area employers. - Explain overtime payment provisions.	Supervisor	First Day	
Shop Rules of Conduct and Work Practices	- Give copy to employee. - Review each item with employee. - Stress importance of regular attendance and advance notice to the supervisor if absence is unavoidable. - Explain requirement to work reasonable overtime. - Instruct employee in the proper use and safeguarding of vehicles, tools and equipment.	Supervisor	First Week	
Community "Right to Know"	- Discuss the contents of the manual, particularly the valuable source of specific toxic substance information in the Material Safety Data Sheet binders. - Review each item with the employee	Supervisor	First Week	
Safety	- Explain Detrex's objective of production with no injuries, that all injuries can be prevented and that employee is to report any unsafe conditions and all injuries promptly to you. - Discuss fire and emergency procedures, including location of first aid facilities, fire extinguishers, etc. - Send employee to see the Emergency Coordinator for detailed instructions if the employee's job is potentially hazardous.	Supervisor and Emergency Coordinator	First Day	

CLERICAL-TECHNICAL ORIENTATION CHECKLIST

Items to Cover	*Key Points to Cover*	*Who Should Cover*	*When*	*Item Covered* *Initial*	*Date*
Equal Employment Opportunity	- Inform employee that Detrex does not discriminate and that Detrex bases clerical-technical personnel decisions on merit, qualifications, service and business needs.	Supervisor	First Week		
Company Background	- Explain corporate operations, the number and location of facilities, the number of employees, etc.	Supervisor	First Week		
Benefits	- Give employee a copy of "Employee Benefits Booklet". - Review the highlights of each plan, including the eligibility date, summary of the coverage, what the employee pays and what the Company pays.	Supervisor	First Week		
Pollution Control	- Explain that Detrex must meet Federal and State laws and regulations pertaining to air, water and land purity. - Point out that the improper handling and disposition of chemicals can pollute the air, water and land and can have adverse impact on Detrex and on Detrex's employees. - Review the required actions to minimize pollution in the plant. - Give employee a copy of the Annual Training and Orientation Checklist for Employees Regarding Hazardous Wastes. Discuss the contents, specifically Detrex's intent to protect our environment through proper handling of hazardous wastes.	Supervisor	First Week		
Energy Conservation	- Point out that Detrex's energy costs, like the employees, are constantly increasing and that Detrex welcomes any suggestions to reduce these energy costs. - Emphasize the need to conserve energy; e.g. heat, light, etc.	Supervisor	First Week		
Employee Confidential and Proprietary Information Agreement	- Have employee read the entire Agreement and sign and return to the Supervisor the Employee's Agreement Form	Supervisor	First Week		

CLERICAL-TECHNICAL ORIENTATION CHECKLIST

Items to Cover	*Key Points to Cover*	*Who Should Cover*	*When*	*Item Covered* *Initial*	*Date*
Acknowledgement of Orientation	- By signing below, the employee acknowledges that his supervisor and Personnel have covered the items listed above and that he intends to comply with the rules contained therein.	Supervisor	Second Week		

_____ _____
Employee's Signature Date

_____ _____
Supervisor's Signature Date

_____ _____
Personnel's Signature Date

* Wherever his, him or he are used, the terms are meant to cover male and female.

DISTRIBUTION: Original for employee's personnel folder in Payroll
Copy for employee's on-site personnel folder
Copy for employee

APPENDIX 4

HOURLY ORIENTATION CHECKLIST

HOURLY ORIENTATION CHECKLIST

Items to Cover	*Key Points to Cover*	*Who Should Cover*	*When*	*Item Covered* *Initial*	*Date*
Positive Attitude	- Assure employee that your role is to help him in his new job and that he should come to you for information and assistance.	Supervisor	First Day		
Salary	- Advise employee of his starting salary and the job rate. - Explain the timing and amount of progression increases and that progression increases will be withheld for unsatisfactory performance. - Inform employee of scheduled general and cost of living increases. - Explain overtime payment provisions.	Supervisor	First Day		
Shop Rules of Conduct and Work Practices	- Give copy to employee. - Review each item with employee. - Stress importance of regular attendance and advance notice to the supervisor if absence is unavoidable. - Explain requirement to work reasonableovertime and on any shift. - Instruct employee in the proper use and safeguarding of vehicles, tools and equipment.	Supervisor	First Week		
Community "Right to Know"	- Discuss the contents of the manual,particularly the valuable source of specific toxic substance information in the Material Safety Data Sheet binders. - Review each item with the employee.	Supervisor	First Week		
Safety	- Explain Detrex's objective of production with no injuries, that all injuries can be prevented and that employee is to report any unsafe conditions and all injuries promptly to you. - Discuss fire and emergency procedures, including location of first aid facilities, fire extinguishers, etc. - Send employee to see the Emergency Coordinator for detailed instructions.	Supervisor and Emergency Coordinator	First Day		

HOURLY ORIENTATION CHECKLIST

Items to Cover	*Key Points to Cover*	*Who Should Cover*	*When*	*Item Covered* *Initial*	*Date*
Equal Employment Opportunity	- Inform employee that Detrex does not discriminate and that Detrex bases hourly personnel decisions on merit and seniority.	Supervisor	First Week		
Company Background and Welcome	- Explain corporate operations, the number and location of facilities, the number of employees, etc.	Supervisor	First Week		
Benefits	- Give employee a copy of "Employee Benefits Booklet". - Review the highlights of each plan, including the eligibility date, summary of the coverage, what the employee pays and what the Company pays.	Supervisor	First Week		
Pollution Control	- Explain that Detrex must meet Federaland State laws and regulations pertaining to air, water and land purity. - Point out that the improper handling and disposition of chemicals can pollute the air, water and land and can have adverse impact on Detrex and on Detrex's employees. - Review the required actions to minimize pollution in the plant. - Give employee a copy of the Annual Training and Orientation Checklist for Employees Regarding Hazardous Wastes. Discuss the contents, specifically Detrex's intent to protect our environment through proper handling of hazardous wastes.	Supervisor	First Week		
Energy Conservation	- Point out that Detrex's energy costs, like the employees, are constantly increasing and that Detrex welcomes,any suggestions to reduce these energy costs. - Emphasize the need to conserve energy; e.g. heat, light, etc.	Supervisor	First Week		

HOURLY ORIENTATION CHECKLIST

Items to Cover	*Key Points to Cover*	*Who Should Cover*	*When*	*Item Covered* *Initial*	*Date*
Acknowledgement of Orientation	- By signing below, the employee acknowledges that his supervisor and Personnel have covered the items listed above and that he intends to comply with the rules contained therein.	Supervisor	Second Week		

_____ _____
Employee's Signature Date

_____ _____
Supervisor's Signature Date

_____ _____
Personnel's Signature Date

* Wherever his, him or he are used, the terms are meant to cover male and female.

DISTRIBUTION: Original for employee's personnel folder in Payroll
Copy for employee's on-site personnel folder
Copy for employee

APPENDIX 5

WHAT TO DO IF YOU GET CHEMICALS SPILLED ON VARIOUS PARTS OF YOUR BODY

WHAT TO DO IF YOU GET CHEMICALS SPILLED ON VARIOUS PARTS OF YOUR BODY

1. Chemicals in the Eye

Splashes of irritant chemicals in the eye, or even exposure to vapor or mist of some chemicals, may lead to serious eye injury. Those who may be exposed to such chemicals should always use proper protective goggles of face shields.

Seconds count. First aid should be immediate, and consists of a thorough flushing of the eye with tap water, using eye bath fountain if available, a gentle stream of water from a hose, or any other means by which the eye may be freely flushed. Lids should be forcibly held apart so that the entire surface of the eye may be flushed. Under most circumstances this flushing should be continued for at least fifteen minutes. Contact lenses should not be worn in chemical laboratories because of the added difficulty they cause in eye irritation.

The patient should then be referred to a physician, preferably an ophthalmologist with experience in handling chemical burns of the eye. Neutralizing solutions should never be used for first aid, since experience has demonstrated that they often aggravate the injury. Ointments are not recommended for first aid use.

2. Chemicals on Body or Clothing

The primary consideration is the prompt removal of the chemical from contact with the skin. This is true whether or not the material has local action. All contaminated clothing should be removed at once, preferably under a shower, and the contacted areas freely flushed with water, preferably with plenty of soap, and under a shower or running water. If exposure has been severe, call a physician, telling him the location of the patient and chemical involved.

The copious use of water to remove as far as possible all traces of the chemical is the most available and effective first aid measure. This applies whether or not the material is water-soluble. Chemical antidotes, such as alkalies for acid contacts and vice versa, or solvents such as alcohol for phenol, should not be used as first aid measures.

After thorough removal of the chemical, the patient should be kept warm and preferably lying down. Further treatment should be as directed by the physician.

ATTACHMENT H-3

CURRICULA VITA - TRAINING DIRECTOR

William M. Moore Jr.
6245 Atkins Road
Troy, Michigan 48098
(313) 879-8817

Education/Training

Emergency Response Training Technician Level, EPA Region IV, Bowling Green, Kentucky, 1990 (Scheduled July 23-27)
Emergency Response Training, Bowling Green State Vocational School, 1989

University Of Toledo, Toledo Ohio
Hazardous Materials Chemistry, 1989

Western Kentucky University, Bowling Green, Kentucky
Certified Hazardous Materials Manager Training
1989

Oklahoma State University, Stillwater Oklahoma, Environmental Audits- Preparation and Evaluation, 1988

Liberty Mutual Insurance Company, Hopkinton, Massachusetts, Hazard Communication and Chemical Control 1985

Liberty Mutual Insurance Company, Hopkinton, Massachusetts, Environmental Health Institute, 1986

Western Kentucky University, Bowling Green, Kentucky
M.A. Business Administration, 1974

Western Kentucky University, Bowling Green, Kentucky
B.S. Industrial/Mechanical Engineering Technology, 1974

Experience

March 1990 to Present — Detrex Corporation
Corporate Risk Management
Southfield, Michigan

Manager Environmental Compliance

Responsible for the Environmental matters of the entire Corporation. Responsible for training division personnel according to OSHA and EPA standards. Assist in completing required EPA and OSHA reports. Assist in day to day decisions concerning environmental and other corporate matters. Evaluate other areas of Risk Management.

June
to March 1990

Detrex Corporation
Equipment Manufacturing Division
Bowling Green, Kentucky

Chief Engineer
Electronic & Environmental
Engineering
Departmental Manager

Responsible for the total implementation of all EPA and OSHA regulations for this facility. Wrote and implemented the following programs for the Bowling Green facility and the California Facility:

- -Hearing Conservation Program
- -Employee Right to Know Training
- -Hazardous Waste Training
- -Facility Contingency Plan
- -Design and implemented Hazardous waste process flow
- -File and monitor KPDES Discharge for State permit
- -Manage Hazardous Waste Storage sight
- -Designed training for OSHA 1910.120 Standards

Responsible for completing all reports for EPA and OSHA agencies that concern our facility.

Responsible for supervising design of Electronic Cleaning equipment. Evaluating design criteria to make sure equipment met current EPA emission criteria as well as OSHA regulations, IE. noise, safety guards, etc.

January 1984
to March 1984

Gordan Smith Compressors
Temporary Position

February 1979
to January 1984

Consultant

ENGINEER

Consulting work with various industries dealing with design specifications of tools and related components.

August 1974
Feb. 1979

Kentucky Dept. of Industrial
and Vocational Education

COORDINATOR- INDUSTRIAL TRAINING PROGRAMS

Worked with industry within a ten county area in setting

up specific training programs. Assisted Engineering Departments in determining required skills needed for productive employees. Recommended implementation of equipment modification for increase in productivity. Evaluated existing employees using various time study methods to determine productivity for the purpose of additional training or changes in production process.

Organizations

President Emeritus; South Central Kentucky Association of Environmental Managers

Senior Member; Society of Manufacturing Engineers

Member; Certified Environmental Trainers

Personal

Married: Kathleen Moore

Children: Jana Moore 8 years old
Health: Above average
Activities: Snow Skiing, Scuba Diving, Flying, Instrumental Director Northfield Hills Baptist Church

Attachment 4

Contingency Plan

SECTION G

CONTINGENCY PLAN

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SECTION G

CONTINGENCY PLAN

This contingency plan has been prepared for the Detrex Corporation facility in Detroit, Michigan. The contingency plan has been designed to minimize hazards to human health or the environment and describes the actions facility personnel will take in response to fires, explosions, or any unplanned sudden or nonsudden release of hazardous waste or hazardous waste constituents at the facility.

The information is provided pursuant to Michigan Act 64 Rule 299.9607 which incorporates 40 CFR Part 264 Subpart D by reference. The applicable section(s) of the Federal Regulations (40 CFR) is referenced as appropriate.

G-1 GENERAL INFORMATION [40 CFR §270.14(b)(7), Part 264, Subpart D

Detrex Corporation owns a solvent sales and recovery (recycling) operation and transfer facility, operated in Detroit, Michigan. The street location and mailing address for the facility is:

Detrex Corporation
12886 Eaton Avenue
Detroit, Michigan 48227
Telephone: (313) 491-4550

This facility is a warehouse for virgin halogenated hydrocarbon solvents and a recovery (recycling) facility for spent solvents that are recovered via distillation. The facility also operates a transfer facility under 40 CFR. The facility is classified as as treatment, storage, disposal (TSD) facility and operates under EPA identification number MID 091605972.

The hazardous waste management operations include container storage and tank storage. Wastes are received in drum or bulk shipments. The wastes are processed through the recovery (recycling) system which primarily consist of distillation followed by drying. The recovered solvent product is drummed or stored in product tanks for re-sale and the still bottoms remaining after distillation are transferred to a 5,000 gallon generator accumulation tank. The still bottoms are accumulated for less than 90 days prior to shipment off site to a permitted facility. The entire operation is located within a single enclosed building. Attachment G-1, is a facility plan locating the hazardous waste container and tank storage areas, process equipment, and the transfer facility.

The facility processes hazardous waste classified under EPA Hazardous Waste Numbers F001 and F002. D-series compounds are also recognized to be present within the wastes. Table G-1 lists all of the wastes permitted to be received at the facility. Material Safety Data Sheets for all materials handled at the facility are found in Attachment G-2.

The facility employs eight personnel involved in various activities. A sign in/sign out sheet is maintained in the office by the secretary to identify the employees or visitors on-site at a given time.

This contingency plan contains emergency provisions to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents for the entire facility.

TABLE G-1

LIST OF HAZARDOUS WASTES
STORED IN FACILITY

Hazardous Waste	*EPA Hazardous Hazardous Waste Number*	*Hazardous Constituent/Characteristic*
1,1,1 Trichloroethane	F001/F002	Toxic
Trichloroethylene	F001/F002	Toxic
Methylene chloride	F001/F002	Toxic
Perchloroethylene	F001/F002	Toxic
Trichlorotrifluoroethane (Freon)	F001/F002	Toxic
Arsenic	D004	Toxic
Barium	D005	Toxic
Cadmium	D006	Toxic
Chromium	D007	Toxic
Lead	D008	Toxic
Mercury	D009	Toxic
Selenium	D010	Toxic
Silver	D011	Toxic
Benzene	D018	Toxic
Carbon Tetrachloride	D019	Toxic
Chlorobenzene	D021	Toxic
Chloroform	D022	Toxic
1,4-Dichlorobenzene	D027	Toxic
1,2-Dichloroethane	D028	Toxic
1,1-Dichloroethylene	D029	Toxic
2,4-Dinitrotoluene	D030	Toxic
Hexachloroethane	D034	Toxic
Methyl Ethyl Ketone	D035	Toxic
Nitrobenzene	D036	Toxic
Pyridine	D038	Toxic
Tetrachloroethylene	D039	Toxic
Trichloroethylene	D040	Toxic
Vinyl Chloride	D043	Toxic

G-2 EMERGENCY COORDINATORS [40 CFR §264.52(d) §264.55]

If an imminent or actual emergency is discovered, the Emergency Coordinator (either on the facility premises or on call) will be immediately notified. The primary Emergency Coordinator will be contacted first; if he is not available, the alternates will be contacted (in the order listed) until one is reached. The primary Emergency Coordinator and the alternates listed in the order they are to be contacted are listed in Table G-2 with their job title, contact numbers and home addresses.

The employee who discovers an imminent or actual emergency shall take responsibility for notifying the Emergency Coordinator or an alternative. At least one of the designated Emergency Coordinators will either be at the facility or on call and available to come to the facility, to respond to an emergency seven (7) days per week.

The Emergency Coordinator is thoroughly familiar with all aspects of the contingency plan, all operations and activities at the facility, the location and characteristics of wastes handled, the locations of all records within the facility, and the facility layout. The Emergency Coordinator has the authority to commit the resources necessary to implement the contingency plan. The Emergency Coordinator coordinates and directs all response efforts and personnel.

In the event that the Detroit Fire Department (DFD) responds to an emergency at the facility, the DFD Supervisor assumes the duties and authorities of the Emergency Coordinator. The Supervisor and the Emergency Coordinator then act together to coordinate and direct the response effort. The plant Emergency Coordinator's principal authority is to effectively provide the DFD Supervisor with comprehensive and detailed information concerning plant operations and the location and characteristics of materials handled.

A listing of the emergency response agencies and organizations which may be called upon to provide emergency assistance at the facility is provided in Table G-3 with their appropriate contact numbers.

At present, the local Police and Fire Departments and the local Hospital have a copy of the contingency plan.

TABLE G-2

EMERGENCY COORDINATORS

Name	*Job Title*	*Work Phone*	*Home Phone*	*Home Address*
Primary				
Ronald Hritzkowin	Operations Manager	(313) 491-4550	(313) 354-0930	23589 Lahser Southfield, Michigan 48035
Alternate				
Levi Douglass	Warehouse Manager	(313) 491-4550	(313) 863-0586	18615 Muirlend Detroit, Michigan 48221
Joseph Calderoni	Quality Control Coordinator	(313) 491-4550	(313) 728-2117	643 Forest Westland, Michigan 48185

TABLE G-3

EMERGENCY RESPONSE AGENCIES/ORGANIZATIONS

Name	*Phone Number*
Police Department	911
Fire Department	911
Mount Carmel Mercy Hospital	(313) 927-7000
National Response Center	800-424-8802
Detrex Corporation Risk Management Group	(313) 358-5800
Michigan Department of Natural Resources, Michigan Pollution Emergency Alerting System	800-294-4706
Emergency Spill Clean-Up Companies	
- Marine Pollution Control	(313) 849-2333
- Environmental Waste Control Inc.	(313) 561-1400
- K&D Industrial Services Inc.	(313) 326-3550

G-3 IMPLEMENTATION OF CONTINGENCY PLAN
[40 CFR §264.52(a) §264.56(d)]

The provisions of this contingency plan must be carried out immediately whenever there is an imminent or actual incident, such as fire, explosion, or release of hazardous waste or hazardous waste constituents which could adversely threaten human health or the environment. Minor leaks or spills in the hazardous waste container or tank storage areas would not normally trigger the implementation of the Contingency Plan, but would be managed by the Emergency Coordinator or his alternate. This section of the Contingency Plan offers the Emergency Coordinator guidelines to evaluate the need to implement the Contingency Plan.

The contingency plan will be implemented in the following situations:

A. Fire and/or Explosion

1. A fire causes the release of toxic fumes.

2. The fire spreads and could possibly ignite materials at other locations on site or could cause heat-induced explosions.

3. The fire could possibly spread to off-site areas.

4. Contamination could spread from the use of water or water and chemical fire suppressants external to the facility.

5. An explosion has occurred or an imminent danger exists that an explosion could occur at the facility.

B. Spill or Material Release

1. The spill (minor or major) could result in release of toxic liquids or vapors, thus causing a fire or gas explosion hazard or health hazard.

2. A minor or major spill that could result in soil and/or groundwater contamination.

G-4 EMERGENCY RESPONSE PROCEDURES [40 CFR §264.56]

G-4a Notification/Identifications/Assessment/Reporting [40 CFR §264.56]

In the event of an emergency, the Emergency Coordinator or his alternate will be contacted immediately and will:

1) If it is an imminent or actual emergency, involving sudden or non-sudden release, by fire, explosion or otherwise so as to threaten human health or the environment, the Emergency Coordinator will immediately warn facility personnel and appropriate emergency response authorities. The procedures listed below with regards to appropriate notification of the proper authorities shall be followed as soon as possible once the safety of personnel is assured.

2) Determine the origin, location, nature and extent of the problem;

3) Establish a command post from which to coordinate and direct the overall emergency response effort (The command post would likely be the main facility office where a telephone and a copy of this Contingency Plan are available);

4) Inform other personnel of the situation;

5) If it is a localized situation, not involving sudden or non-sudden release, by fire, explosion or otherwise, of hazardous waste or hazardous waste constituents so as to threaten human health or the environment, handle the matter according to routine procedures;

Notification

1. Notify appropriate national, state, and/or local departments, agencies and organizations with designated response roles, including the Risk Management Group of Detrex Corporation (See Table G-3.)

2. When notifying response teams, the Emergency Coordinator should be prepared to furnish the following information:

   a) Name and telephone number of reporter:
   b) Name and address of facility:
   c) Time and type of incident (e.g. release, fire):
   d) Name and quantity of material(s) involved and to what extent:
   e) The extent of injuries if any, and:

f) The possible hazards to human health or the environment outside of the facility.

Identification

Identify the character, exact source, amount and areal extent of any released materials. This may be accomplished by observation or review of facility records or manifests, and, if necessary, by chemical analysis.

Assessment

Assess possible hazards to human health or the environment that may result from the release, fire, or explosion. This assessment shall consider both direct and indirect effects of the release, fire, or explosion, including the effects of any toxic, irritating, or asphyxiating gases that are generated, or the effects of any hazardous surface water runoff from water or chemical agents used to control fire and heat-induced explosions.

The procedure for assessing possible hazards includes:

1. Identification of hazardous properties of the materials involved or by-products thereof.

2. Determination of threat to human health or the environment, both on site and off site.

3. Assess any environmental conditions (e.g. windspeed and direction) that may contribute to the seriousness of the hazard.

4. Determine the readiness and availability of response equipment, both on site and off site.

Reporting

If the Emergency Coordinator determines that the release, fire, or explosion could threaten human health or the environment outside the boundaries of the facility, he shall:

1) If his assessment of the emergency indicates that evacuation of the surrounding local areas may be advisable, immediately notify the Detroit Fire Department and Detroit Police Department at 911 and any other appropriate authorities as deemed necessary including the National Response Center.

2) Immediately contact all other appropriate departments, agencies and organizations with designated response orders and relate to them the specific information they require to respond (see Notification).

G-4b Control Procedures [40 CFR §264.52(a)]

Potential accidents are classified into three general areas:

1) Fire and/or explosion involving hazardous waste or hazardous waste constituents;

2) Accidental release in a liquid form of hazardous waste or hazardous waste constituent; and

3) Accidental release in the form of a vapor of hazardous waste or hazardous waste constituent.

G-4b(1) Fire and/or Explosion

The hazardous waste container and tank areas are accessible by fire-fighting and other emergency equipment. Response procedures in the event of a fire and/or explosion will be as follows:

1) Plant personnel will notify the office via telephone.

2) The Emergency Coordinator will be notified.

3) If a fire is minor, facility fire-fighting equipment such as fire extinguishers and fire hoses would be used, to extinguish the fire.

4) If a fire and/or explosion is major, the Detroit Fire Department will be contacted at 911, as well as other authorities as deemed necessary.

5) Any operating units such as process equipment, boilers, pumps, etc., would be shut down using main disconnect.

6) In the event that Step 3 fails to control the fire, Steps 4 and 5 will be implemented and all employees will immediately vacate the premise. Personnel will meet and be accounted for at the parking lot in front of the facility.

7) The Emergency Coordinator has the authority to direct other necessary actions as required.

8) An "all clear" signal will be given over the facility public address system when the fire and/or explosion has been extinguished and the personnel's safety is no longer endangered.

9) After a fire and/or explosion has been extinguished, clean-up procedures will commence. All emergency equipment used must be replaced, repaired, recharged or otherwise be in good operating condition and placed in the appropriate location before normal operations resume.

G-4b(2) Accidental Release, Liquid

If an accidental release of liquid occurs which cannot be controlled with absorbent material, the following steps will be taken:

1) Plant personnel will notify the office via telephone.

2) The Emergency Coordinator will be notified. Appropriate Emergency Response Agencies (i.e. Emergency Spill Cleanup) as listed in Table G-3 will be notified as deemed necessary.

3) The exact source and type of release of hazardous waste or hazardous waste constituent will be determined.

4) All pump(s) contributing to the release will be shut off.

5) Any section(s) of pipe contributing to the release will be isolated by closing the appropriate valves.

6) If the discharge is from a drum, the drum will be turned to orient the leak towards the top.

7) If the discharge is from a tank, the exact source of the discharge will be located and, if possible, isolated (i.e., leakage from a valve which is piped to the tank, packing or flanges may be adjusted to stop the leak).

8) A temporary dike of absorbent material will be placed around the discharge area.

9) Emergency ventilation fans will be activated and doors to the outside will be opened.

10) Plant personnel will be evacuated from building, if deemed necessary. Personnel will meet and be accounted for at parking lot in front of the facility.

11) Clean-up procedures, which may include notification of a spill clean-up firm, furnishing the clean-up crew with physical and/or chemical properties of waste and amount of waste released, shall be implemented.

a) Clean-up of released waste: The waste will be collected via use of absorbent material for small spills. The collected material will then be placed in DOT-approved containers and stored in a segregated area of the container storage area. The containers will be clearly labelled describing the source of the material. The material will subsequently be characterized as F001 or F002 material based on the source of the spilled material. The material would then be transported to an off-site facility permitted to receive the material in accordance with all state and federal regulations. For large spills, the waste will be collected with a wet-vac or pump and placed into DOT-approved containers in the container storage area. The waste would be characterized based on the source of the spilled material and subsequently be reclaimed (recycled) on-site. Residual material would be handled as described above for small spills.

b) Decontamination: Following cleanup with absorbent material, the affected area of the secondary containment area will be swept and all sweepings will be containerized and handled as identified above for small spills. The pad may be subsequently decontaminated by steam cleaning. Any wash waters generated will be collected in DOT-approved containers and transported off site for treatment/disposal at a permitted facility as described above unless the material meets the specifications for discharge in accordance with the facility's Detroit Water and Sewerage Department Wastewater Discharge Plant.

c) Cleanup of Contamination Soil: Should the spill or release occur outside the secondary containment area (i.e. external to the building and the loading/unloading area), cleanup will be accomplished by a firm specializing in such procedures. All visually contaminated soil, where practical, will be excavated

and placed in a temporary accumulation containers (i.e., drum, lugger, box) pending characterization for ultimate disposal. The base of the excavation would subsequently be sampled to ensure all contaminated soil has been removed. Analysis of soil samples for volatile organic compounds utilizing U.S. EPA Method 8240 (SW-846) would be conducted. Any soils exhibiting detectable levels of volatile organic compounds would be excavated and the new base of excavation re-sampled. All excavated material would subsequently be characterized as F001 or F002 material, based on the characterization of the spilled material, for secure disposal at a permitted off-site facility.

12) Emergency equipment used, must be replaced, repaired, recharged or otherwise be in good operating condition and placed in the appropriate location before operations resume.

G-4b(3) Accidental Release, Vapor

Steam to the distillation unit will be shut off immediately (cooling water will remain on to condense vapors in the distillation unit).

1) Plant personnel will notify the office via telephone.

2) The Emergency Coordinator will be notified.

3) Emergency exhaust fans will be activated and all doors to the outside will be opened.

4) If major, the local fire department will be called by telephone. Any operating units such as boilers, air conditioning or heating systems, pumps, etc. will be shut down immediately. Personnel will be evacuated from the building and will meet at the parking lot in front of the building to be accounted for. Appropriate Emergency Response Agencies as listed in Table G-3 will be notified as deemed necessary.

5) Clean up procedures will be initiated.

G-4c Prevention of Recurrence or Spread of Fires, Explosions or Releases [40 CFR§264.56(e)]

Actions to prevent the recurrence or spread of fires, explosions or releases may include:

1) Halting processes and operations.

2) Collecting and containing released wastes.

3) Prohibiting smoking in all areas except designated smoking areas.

4) Using non-sparking tools.

5) Protecting the area from open flame or heat generating activities.

6) Monitoring all valves, pipes or equipment for leaks or ruptures.

All reasonable safety procedures will be followed prior to resuming operations.

G-4d Storage and Treatment of Released Material
[40 CFR§264.56(g)]

Immediately after an emergency, the Emergency Coordinator will make arrangements for proper treatment, storage and/or disposal of all water and contaminated materials resulting from the release, fire or explosion. All resulting wastes generated will be considered a RCRA hazardous waste and managed as a RCRA waste unless it can be demonstrated to be non-regulated.

G-4e Incompatible Wastes [40 CFR§264.56(h)(l)]

The Emergency Coordinator will insure that wastes, which may be incompatible with the released material, are treated, stored, or disposed until cleanup procedures are completed.

G-4f Post-Emergency Equipment Maintenance
[40 CFR§264.56(h)(2)]

After an emergency event, or as required during the emergency response, all emergency equipment utilized in the affected area will be cleaned, or replaced, so that they are suitable for future use. Prior to resuming operations, an inspection of all utilized safety equipment will be conducted. All proper authorities will be notified that the post-emergency equipment maintenance has been performed and operations will resume.

G-4g Container Spills and Leakage [40 CFR §264.52, §264.171]

The procedures to be implemented when responding to a spill or leak from a container were described in Section G-4b(2), previously.

G-4h Tank Spills and Leakage [40 CFR §264.194(c)]

Contingency plan will be implemented, as necessary, should an accidental release of liquid occur from the recycling process equipment or generator accumulation tanks or transfer facility. The procedures to be implemented when responding to a spill or leak were described in Section G-4b(2), previously.

G-5 EMERGENCY EQUIPMENT [40 CFR §264.52(e)]

The type and physical location of facility's emergency equipment, including fire equipment, spill control equipment, breathing apparatus and medical treatment facilities is presented in Attachment G-3. A brief discussion of each aspect of the Emergency Equipment follows.

1) Communications System

- telephone/public address system
- sound 911 personal protection signal horn

2) Fire Control Systems and Equipment

- fire extinguishers
  - 4 ANSUL 10 lb ABC Type
  - 1 ANSUL 20 lb BC Type
  - 1 KIDDE 200 lb BC Type
  - 1 KIDDE 5 lb BC Type
- fire hydrants - 2 hydrants located directly in front of facility

3) Spill Control Equipment

- absorbent material:
  - Sorbent Pad - 3M Type T-156 (24" x 24")
  - Industrial Absorbent - EVCO (50 lb bags)

4) Health and Medical Emergency Equipment/Supplies

- respirators (Wilson Model 1070 Full-face respirator)
- SCBA (3 MSA Mask Model 401 Pressure Demand)
- Safety shower & eye wash (connected to city water supply)
- first-aid kit (DOT Health Care Cabinet sized for 20 people)
- gloves (leather and chemical resistant)
- boots & shoes (chemical resistant)
- company uniforms (daily change provided)
- total body coveralls (available)

G-6 COORDINATION AGREEMENTS [40 CFR §264.37/§264.52(c)]

To familiarize police, fire department and hospital officials with the layout of the facility, properties of the hazardous wastes handled at the facility and associated hazards, entrances to the facility, possible evacuation routes, and other aspects of the facility, copies of the contingency plan have been submitted to the appropriate officials.

Each person, or the chief officer of each department, agency or organization which received a copy of the contingency plan was asked to sign a Coordination Agreement form to acknowledge that he/she reviewed the plan, understood the department's, agency's, or organization's role under the plan, and that all members of the department, agency, or organization will be informed of the plan's content and their individual responsibilities. Signed agreements are maintained on file in the office.

G-7 EVACUATION PLAN [40 CFR §264.52(f)]

If an emergency occurs which cannot be adequately responded to by plant personnel, the Emergency Coordinator will signal employees by way of facility public address system to evacuate the facility. Employees will exit the facility by the most expeditious route (refer to Attachment G-4 for emergency routes). Once outside the building, employees will meet at the parking lot in front of the facility to be accounted for. The Emergency Coordinator will then notify the proper emergency response teams. The Emergency Coordinator, based on this assessment, may deviate from established procedures in order to effectively and safely respond to emergency situations.

G-8 REQUIRED REPORTS [40 CFR §264.56(j)]

As required, any emergency event requiring implementation of the contingency plan will be reported in writing to the MDNR Director within fifteen (15) days of the event. This report will, at minimum, contain:

1) Name, address, and telephone number of the owner or operator;

2) Name, address, and telephone number of the owner or facility;

3) Date, time, and type of incident (ie. fire, explosion);

4) Name and quantity of materials involved;

5) The extent of injuries, if any;

6) The assessment of actual or potential hazards to human health or the environment, where this is applicable; and

7) Estimated quantity and disposition of recovered material that resulted from the incident.

It will be the responsibility of The Risk Management Group of Detrex Corporation to submit reports to the appropriate agencies and to retain on file all applicable information in the event that the contingency plan was implemented.

The Risk Management Group of Detrex will also inform the appropriate departments, agencies and authorities that clean-up is complete before operations at the facility resume.

Detrex will place in the operating record all reports of any incident that requires implementing the contingency plan.

G-9 AMENDMENTS TO THE CONTINGENCY PLAN [40 CFR §264.54]

The contingency plan will be reviewed and immediately amended, if necessary, whenever:

1) the facility permit is revised

2) the plan fails in an emergency

3) the list of emergency coordinators changes

4) the list of emergency equipment changes

5) the facility alters its design, construction, operation, maintenance, or other circumstances in a way materially increasing the potential for fires, explosions or releases of hazardous waste/or hazardous waste constituents

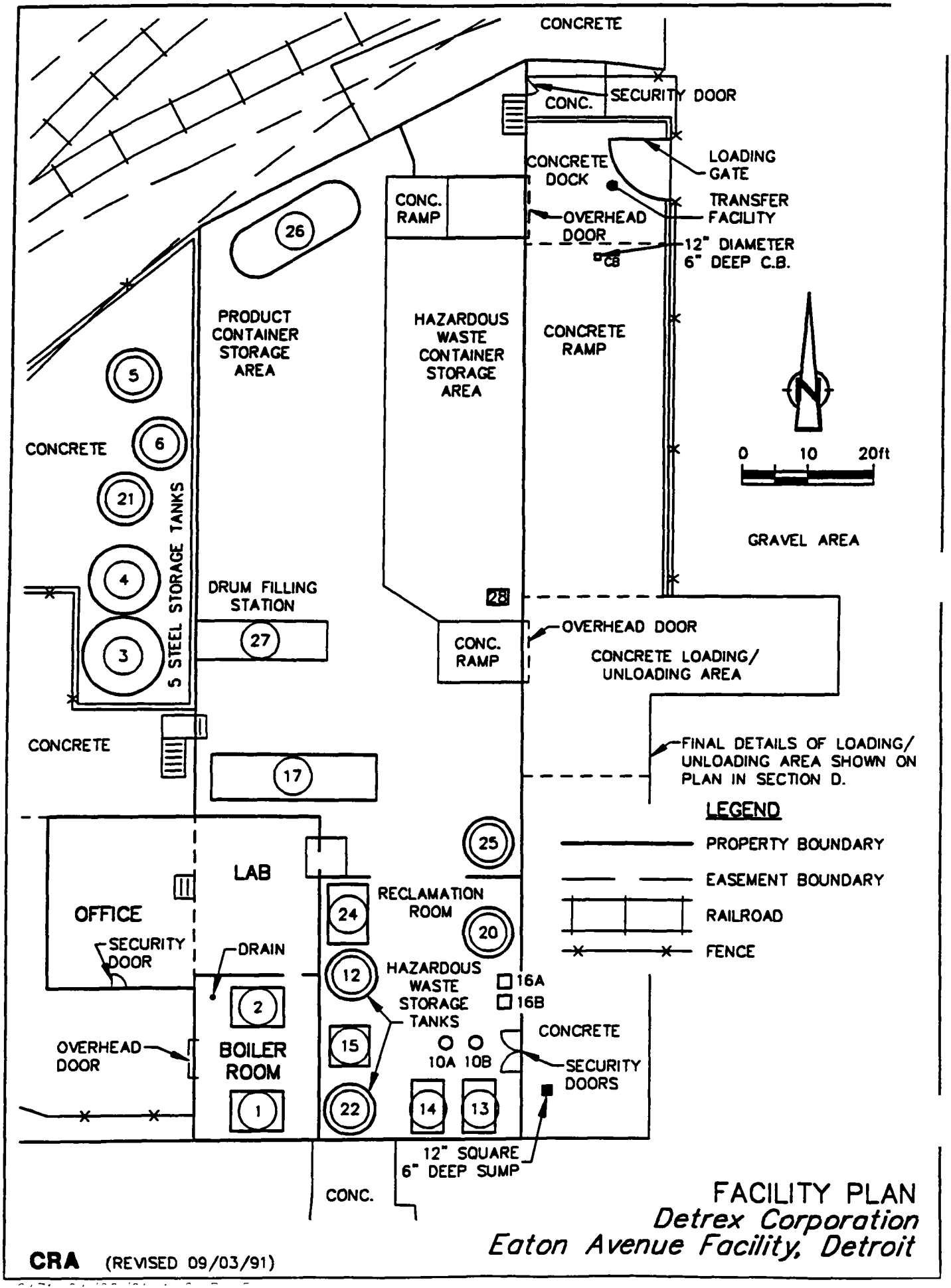
6) the actions/responses necessary to comply in an emergency situation change

All changes in this plan will be sent to every person, agency, department and organization on the contingency plan distribution list within 30 days of the effective date of the change.

ATTACHMENT G-1

FACILITY PLAN

ATTACHMENT G-1



FACILITY PLAN
Detrex Corporation
Eaton Avenue Facility, Detroit

CRA (REVISED 09/03/91)

Date: 09/03/91
Revision: 91-2

LIST OF PROCESS EQUIPMENT

I.D. No.	*Equipment Name*	*Description*
1.	Generator	Clayton Model E-100 Steam Generator. Unit burns natural gas to produce steam at the rate of 3450 lbs./hr. at 100 psig.
2.	Air Compressor	
3.	20,000 gal. Product Tank	20,000 gallon carbon steel storage tank for storage of 1,1,1 Trichloroethane.
4.	10,000 gal. Product Tank	10,000 gallon carbon steel storage tank for storage of Trichloroethylene
5.	4,500 gal. Product Tank	4,500 gallon carbon steel storage tank for storage of Perchloroethylene.
6.	4,500 gal. Product Tank	4,500 gallon carbon steel storage tank for storage of Trichloroethylene
10 A/B	2 - 600 gal. Receiver Tanks	Used for receiving product from Detrex stills. (Operated at atm. pressure).
12.	2,300 gal. Hazardous Waste tank storage tank	2,300 gallon carbon steel storage tank used for storage of F001 or F002 material prior to processing
13.	350 gal. Detrex Still	Detrex Model S-350. Used for recovering chlorinated solvents from spent solvents from degreasing operations (F001 material) via distillation. This unit can process approximately 2,000 gallons/day.
14.	350 gal. Detrex Still	Detrex Model S-600. Used for recovering chlorinated solvents from spent solvents from degreasing operations (F001 material) via distillation. This unit can process approximately 2,000 gallons/day.
15.	DCI Still	DCI Model Dyna-1-100 Solvent Recovery Still. Used to recover chlorinated solvents from still bottoms from recovery of same (F002 material) via live steam injection. This unit can process approximately 100 gallons per hour.
16 A/B	Drying Columns	Detrex Dual Column Drier. Used to remove water from recovered product (solvent) via adsorption.

Date: 09/03/91
Revision: 91-2

LIST OF PROCESS EQUIPMENT

I.D. No.	*Equipment Name*	*Description*
17.	5,000 gal. Still Bottom Tank	5,000 gallon carbon steel storage tank. Used for temporary accumulation of still bottoms from recovery of chlorinated solvents (F002 material).
20.	2,500 gal. Holding Tank	2,500 gallon 316 stainless steel storage tank used for storage of reclaimed solvent.
21.	4,500 gal. 1,1,1 Trichloroethane	4,500 gallon carbon steel storage tank for storage of 1,1,1 Trichloroethane.
22.	4,500 gal. Hazardous Waste Storage Tank	4,500 gallon carbon steel storage tank used for temporary storage of F001 or F002 material prior to being processed by Detrex stills.
24.	DCI Still	DCI Model Dyna-1-500 Solvent Recovery Still. Used to recover chlorinated solvents from still bottoms from recovery of same (F002 material) via live steam injection. This unit can process approximately 500 gallons per hour.
25.	3,000 gal. Holding Tank	3,000 gallon 316 stainless steel storage tank used for storage of reclaimed solvent.
26	SVRM - Carbon Absorption Unit	
27.	Drum Filling Station	Product Drumming Station. Used for filling 55-gallon drums with product. Unit can fill approximately 30 drums per hour and is operated as necessary.
28.	Product Blending Vessel	550 gallon carbon steel vessel utilized for product blending.

ATTACHMENT G-2

MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheet

MSD 8208.20

DETREX CHEMICAL INDUSTRIES, INC.
P.O. BOX 501,
DETROIT, MICHIGAN 48232

Approved by U.S. Dept. of Labor as "Essentially similar" to Form OSHA-20

Date: August, 1982	Edition: First
Chemical Name and Synonyms: 1,1,1-trichloroethane; methylchloroform CAS No. 71-55-6	Trade Name and Synonyms: PERM-ETHANE ® DG
Chemical Family: Halogenated Hydrocarbons	Formula: CH_3CCl_3
DOT Shipping Name: 1,1,1-trichloroethane	DOT Hazard Class: ORM-A I. D. Number: UN 2831

SECTION 1 · PHYSICAL DATA

Boiling Point @ 760 mm Hg:	Vapor Density (Air=1):	Specific Gravity (H_2O=1):	pH of Solutions:
165.4°F	4.54	1.300-1.320 @ 25°/25°C	6.0 to 7.5
Freezing/Melting Point:	**Solubility (Weight % in Water):**	**Bulk Density:**	**Volume % Volatile:**
-49°F -45°C	Negligible	10.80-10.97 lbs/gal @25°C	Essentially 100
Vapor Pressure:	**Evaporation Rate**	**Heat of Solution:**	**Appearance and Odor:**
@25°C = 135mmHg	(ethyl ether = 1):0.35	Not Applicable	Clear, colorless liquid - ether-like odor.

SECTION 2 · HAZARDOUS INGREDIENTS

	%	Hazard Data
1,1,1-trichloroethane (Stabilized)	100	See Sections 4 & 5

SECTION 3 · FIRE AND EXPLOSION HAZARD DATA

Flash Point °F (Method Used)	Flammable Limits in Air (% by Volume)	Extinguishing Media:
None when tested in accordance with DOT requirements.	LEL: 7% UEL: 15% See Below	water, dry chemical or carbon dioxide

Special Fire Fighting Procedures: Fire fighters should wear a NIOSH/MSHA-approved pressure-demand, self-contained breathing apparatus for possible exposure to hydrogen chloride and possibly traces of phosgene. Use water only in degreasers when aluminum reaction occurs.

Unusual Fire and Explosion Hazards: Vapors concentrated in a confined or poorly ventilated area can be ignited upon contact with a spark, flame, or high intensity source of heat. This can occur at concentrations ranging between 7-15% by volume. Decomposition or burning can produce hydrogen chloride or possibly traces of phosgene. Also see Detrex warning letter Form SoL 8208.21 attached.

SECTION 4 · HEALTH HAZARD DATA

Toxicity Data	Classification (Poison, Irritant, Etc.)
LC_{50} Inhalation (rat) 8,000 ppm/7 hours	Inhalation: Toxic
LD_{50} Dermal (rabbit) 15g/kg[2]	Skin/Eye: Liquid mildly irritating to skin; eye irritant
LD_{50} Ingestion (rat) 10-12g/kg (See Section 5)	Ingestion: Not significantly toxic
Fish, LC_{50} (Lethal Concentration) Not Determined	Aquatic:

Human Exposure Information/Data:

24-HOUR EMERGENCY ASSISTANCE: (313) 358-5800

SECTION 5 · EFFECTS OF OVEREXPOSURE

This section covers effects of overexposure for inhalation, eye/skin contact, ingestion and other types of overexposure information in the order of the most hazardous and the most likely route of overexposure.

Permissible Exposure Limits (TLV):

350 ppm - 8-hour time-weighted average (TWA) - OSHA 29CFR 1910.1000 (May 28, 1975).

Acute

Primarily a central nervous system depressant. Inhalation can cause irritation of the respiratory system, dizziness, nausea, lightheadedness, headache, loss of coordination and equilibrium, unconsciousness and, if exposed to high concentrations in confined or poorly ventilated areas, even death. Depression of the circulatory system has been reported as a result of overexposure to 1,1,1-trichloroethane. The heart may be sensitized by overexposure and ventricular arrhythmia may be induced by epinephrine administration.

Liquid splashed in the eyes can result in disconfort, pain and irritation. Prolonged or repeated contact with liquid on the skin can cause irritation and dermatitis. The problem may be accentuated by liquid becoming trapped against the skin by contaminated clothing and shoes. Skin absorption can occur.

Chronic

Prolonged exposure above the OSHA permissible exposure limits may result in liver and kidney damage. 1,1,1-trichloroethane has been extensively studied for cancer both in the U.S. and Europe by government, industry and academia. There is no documented evidence that 1,1,1-trichloroethane causes an increased cancer incidence in humans.

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

Eye or Skin Contact: Flush eyes and skin with plenty of water (soap and water for skin) for at least 15 minutes, while removing contaminated clothing and shoes. If irritation occurs, consult a physician.

Ingestion: If conscious, drink large quantities of water, DO NOT induce vomiting. Take immediately to a hospital or physician. If unconscious, or in convulsions, take immediately to a hospital. DO NOT give anything by mouth to an unconscious person.

Notes to Physician (Including Antidotes): NEVER administer adrenalin following 1,1,1-trichloroethane overexposure. Increased sensitivity of the heart to adrenalin may be caused by overexposure to 1,1,1-trichloroethane.

SECTION 6 · REACTIVITY DATA

Stability: Stable	**Conditions to Avoid:** Avoid open flames, hot glowing surfaces or electric arcs.
Hazardous Polymerization: Will not occur.	**Conditions to Avoid:** None

Incompatibility (Materials to Avoid):
Avoid contamination with caustic soda, caustic potash or oxidizing materials. Shock sensitive explosives may be formed. Avoid contact with aluminum, magnesium, zinc and alloys thereof under high pressures. See Detrex warning letter Form SoL 8208.21 attached.

Hazardous Decomposition Products: Hydrogen chloride and possibly traces of phosgene.

SECTION 7 · SPILL OR LEAK PROCEDURES (See Detrex Forms SoL 8208.14 and SoL 8208.15 attached)

Steps to be Taken if Material is Spilled or Released: Immediately evacuate the area and provide maximum ventilation. Unprotected personnel should move upwind of spill. Only personnel equipped with proper respiratory and skin/eye protection should be permitted in area. Dike area to contain spill. Take precautions as necessary to prevent contamination of ground and surface waters. Recover or absorb spilled material on sawdust or vermiculite and sweep into closed containers for disposal. After all visible traces have been removed, thoroughly wet vacuum the area. DO NOT flush to sewer. If area of spill is porous, remove as much contaminated earth and gravel, etc., as necessary and place in closed containers for disposal. (See Below)

Waste Disposal Method: Contaminated sawdust, vermiculite or porous surface must be disposed of in a permitted hazardous waste management facility. Recovered liquids may be re-processed or incinerated or must be treated in a permitted hazardous waste management facility. Care must be taken when using or disposing of chemical materials and/or their containers to prevent environmental contamination. It is your duty to dispose of the chemical materials and/or their containers in accordance with the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act as well as any other relevant federal, state or local laws/regulations regarding disposal.

SECTION 8 · SPECIAL PROTECTION INFORMATION

Respiratory Protection: For emergencies or working in confined areas, wear self-contained breathing apparatus or supplied air respiratory protection (use the "buddy system" and wear a safety harness with a lifeline). In other circumstances involving potential overexposure, use NIOSH/MSHA-approved organic vapor respirator. (Observe limitations directed by manufacturer.) Respiratory protection program must be in accordance with 29CFR 1910.134.

Ventilation (Type): Dilution (General) or Local Exhaust - Sufficient to maintain workplace concentration below permissible exposure limits.

Eye Protection: Splashproof Goggles

Gloves: polyethylene, neoprene or polyvinyl alcohol

Other Protective Equipment: Safety shower and eye-wash fountain in immediate area. Personnel protective clothing and use of equipment must be in accordance with 29CFR 1910.133 and 29CFR 1910.132.

SECTION 9 · SPECIAL PRECAUTIONS

Precautions to be Taken During Handling and Storing:

- Do not use in poorly ventilated or confined areas.
- 1,1,1-trichloroethane vapors are heavier than air and will collect in low areas.
- Keep container closed when not in use.
- Do not store in open, unlabeled or mislabeled containers.
- Liquid oxygen or other strong oxidants may form explosive mixtures with 1,1,1-trichloroethane.
- This material or its vapors when in contact with flames, hot glowing surfaces or electric arcs can decompose to form hydrogen chloride gas and traces of phosgene.
- AVOID CONTAMINATION OF WATER SUPPLIES: Handling, storage, and use procedures must be carefully monitored to avoid spills or leaks. Any spill or leak has the potential to cause underground water contamination which may, if sufficiently severe, render a drinking water source unfit for human consumption. Contamination that does occur cannot be easily corrected.
  chlorinated solvent used as a flashpoint suppressant must be added in sufficient quantity or the resultant mixture may have a flashpoint lower than the flammable component.
- Caution should be taken not to use in pressurized or totally enclosed system of light metal construction such as aluminum, magnesium, zinc or alloys thereof. Example, paint or adhesive spray system. (See Detrex Form SoL 8208.21 attached.)

Other Precautions:

- AVOID PROLONGED OR REPEATED BREATHING OF VAPORS. High vapor concentrations can cause dizziness, unconsciousness or death. Long-term overexposure may cause liver/kidney injury.
- USE ONLY WITH ADEQUATE VENTILATION. Ventilation must be sufficient to limit employee exposure to 1,1,1-trichloroethane below OSHA permissible limits (8-hour TWA 350 ppm). Observance of lower limits (outlined in Section 4) is advisable.
- AVOID CONTACT WITH EYES. Will cause irritation and pain.
- AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. May cause irritation or dermatitis.
- DO NOT TAKE INTERNALLY. Swallowing may cause injury or death.
- DO NOT EAT, DRINK, OR SMOKE IN WORK AREAS.

References:

1. NIOSH Registry of Toxic Effects of Chemical Substances, 1978
2. Industrial Hygiene and Toxicology, Volume II, Second Edition, F.A. Patty, 1963
3. Dangerous Properties of Industrial Materials, Fifth Edition, N.I. Sax, 1979
4. Industrial Toxicology, Hamilton and Hardy, 1974
5. Toxicity and Metabolisms of Industry Solvents, Browning, 1965
6. Toxicology, the Basic Science of Poisons, Casarett and Doull, 1980
7. Federal Register, 45FR Hazardous Waste Management Systems Part III, Identification and Listing of Hazardous Wastes, Page 33084, May 19, 1980
8. EPA Science Advisory Board, Subcommittee on Airborne Carcinogens, September, 1980

Comments: As this solvent (1,1,1-trichloroethane) is used to clean and/or degrease a wide variety of metal and plastic parts, it should always be used in conjunction with properly designed and fully controlled degreasing equipment that is in compliance with the U.S. Environmental Protection Agency, OAQPS Guidelines, "Control of Volatile Organic Emissions from Solvent Metal Cleaning", and/or all other applicable federal, state and local regulatory guidelines.

Material Safety Data Sheet

MSD 8208.19

DETREX CHEMICAL INDUSTRIES, INC.
P.O. BOX 501.
DETROIT, MICHIGAN 48232

Approved by U.S. Dept. of Labor as "Essentially similar" to Form OSHA-20

Date: August, 1982	Edition: First
Chemical Name and Synonyms: Trichloroethylene; trichloroethene CAS No.: 79-01-6	Trade Name and Synonyms: PERM-A-CLOR® NA, Trichlor, Trichlorethylene
Chemical Family: Halogenated Hydrocarbons	Formula: $CHCl = CCl_2$
DOT Shipping Name: trichloroethylene	DOT Hazard Class: ORM-A UN1710 (RQ 1000#/454kg)

SECTION 1 · PHYSICAL DATA

Boiling Point @ 760 mm Hg: 188°F	Vapor Density (Air=1): 4.54	Specific Gravity (H_2O=1): (20°/20°C) 1.465	pH of Solutions: 6.7 to 7.5
Freezing/Melting Point: -123.5°F -86.4°C	Solubility (Weight % in Water): 0.11 @ 25°C	Bulk Density: @ 20°C 12.2 lbs./gal.	Volume % Volatile: Essentially 100
Vapor Pressure: @ 20°C = 57.8mmHg	Evaporation Rate (ethyl ether=1): 0.28	Heat of Solution: Not Applicable	Appearance and Odor: Clear, colorless liquid with ether-like odor.

SECTION 2 · HAZARDOUS INGREDIENTS

	%	Hazard Data
Trichloroethylene (Stabilized)	100	See Sections 4 and 5

SECTION 3 · FIRE AND EXPLOSION HAZARD DATA

Flash Point °F (Method Used) None when tested in accordance with DOT requirements. (See Below)	Flammable Limits in Air (% by Volume) See Below LEL: 12.5% UEL: 90%	Extinguishing Media: Water, dry chemicals or carbon dioxide.

Special Fire Fighting Procedures: Fire fighters should wear NIOSH/MSHA pressure-demand, self-contained breathing apparatus for possible exposure to hydrogen chloride and possibly traces of phosgene.

Unusual Fire and Explosion Hazards: Vapors concentrated in a confined or poorly ventilated area can be ignited upon contact with a spark, flame or high-intensity source of heat. This can occur at concentrations of approximately 12.5% and above by volume. Decomposition or burning can produce hydrogen chloride and possibly traces of phosgene.

Also see Detrex warning letter Form SoL 8208.21 attached.

SECTION 4 · HEALTH HAZARD DATA

Permissible Exposure Limits (TLV): See Section 5

Toxicity Data Ref. (1),(2)	Classification (Poison, Irritant, Etc.)
LCLo Inhalation (rat) - 8,000 ppm/4 hour	Inhalation: Toxic
LD_{50} Dermal	Skin/Eye: Liquid mildly irritant to skin; eye irritant.
LD_{50} Ingestion (rat) - 4,900 - 7,000 mg/kg	Ingestion: Slightly to moderately toxic
Fish, LC_{50} (Lethal Concentration) Not Determined	Aquatic:

Human Exposure Information/Data: Unconfirmed data' exists which indicate that trichloroethylene by ingestion may be more toxic to humans than indicated by the available animal data. Such unconfirmed data report poisonings at doses as low as 50 mg/kg.

24-HOUR EMERGENCY ASSISTANCE: (313) 358-5800

Section 4 (Cont'd) - Permissible Exposure Limits

Current OSHA permissible exposure limits (29CFR 1910.1000) are 100 ppm (8-hour TWA); 100-200 ppm periodic excursions are allowed providing 8-hour TWA is at or below 100 ppm: 200-300 ppm excursions allowed only for maximum of 5 minutes in any 2-hour period: 300 ppm maximum allowable concentration (must not be exceeded).

SECTION 5 · EFFECTS OF OVEREXPOSURE

This section covers effects of overexposure for inhalation, eye/skin contact, ingestion and other types of overexposure nformation in the order of the most hazardous and the most likely route of overexposure.

Acute: Irritant and central nervous system depressant. Inhalation can cause irritation of the respiratory tract, dizziness, nausea, headache, loss of coordination and equilibrium, unconsciousness and, if exposed at high concentrations in confined or poorly ventilated areas, even death. Fatalities following severe acute exposure at high concentrations have been attributed to ventricular fibrillation resulting in cardiac failures.[3]

Liquid splashed in the eye can result in discomfort, pain and irritation. Prolonged or repeated contact with liquid on the skin can cause irritation and dermatitis. The problem may be accentuated by liquid becoming trapped against the skin by contaminated clothing and shoes. Skin absorption can occur.

Chronic: Prolonged exposure above the OSHA permissible exposure limits may result in liver and kidney damage. Trichloroethylene has been extensively studied for cancer both in the U.S. and Europe by government, industry and academia. There is no documented evidence that Trichloroethylene causes an increased cancer incidence in humans.

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician .

Eye or Skin Contact: Flush eyes and skin with plenty of water (soap and water for skin) for at least 15 minutes, while removing contaminated clothing and shoes. If irritation occurs, consult a physician.

Ingestion: If conscious, drink a quart of water. DO NOT induce vomiting. Take immediately to a hospital or physician. If unconscious, or in convulsions, take immediately to a hospital or physician. DO NOT give anything by mouth to an unconscious person.

Notes to Physician (Including Antidotes): NEVER administer adrenalin following trichloroethylene overexposure. Increased sensitivity of the heart to adrenalin may be caused by overexposure to trichloroethylene.

SECTION 6 - REACTIVITY DATA

Stability: Stable	**Conditions to Avoid:** Avoid open flames, hot glowing surfaces or electric arcs.
Hazardous Polymerization: Will not occur	**Conditions to Avoid:** None

Incompatibility (Materials to Avoid): Avoid contamination with caustic soda, caustic potash or oxidizing materials. Shock sensitive explosives may be formed.
See Detrex warning letter Form SoL 8208.21 attached.

Hazardous Decomposition Products: Hydrogen chloride and possibly traces of phosgene.

SECTION 7 - SPILL OR LEAK PROCEDURES (See Detrex Forms SoL 8208.14 and SoL 8208.15 attached)

Steps to be Taken if Material is Spilled or Released: Immediately evacuate the area and provide maximum ventilation. Unprotected personnel should move upwind of spill. Only personnel equipped with proper respiratory and skin/eye protection should be permitted in area. Dike area to contain spill. Take precautions as necessary to prevent contamination of ground and surface waters. Recover or absorb spilled material on sawdust or vermiculite and sweep into closed containers for disposal. After all visible traces have been removed, thoroughly wet vacuum the area. DO NOT flush to sewer. If area of spill is porous, remove as much contaminated earth and gravel, etc., as necessary and place in closed containers for disposal. (See Below)

Waste Disposal Method: Contaminated sawdust, vermiculite or porous surface must be disposed of in a permitted hazardous waste management facility. Recovered liquids may be reprocessed or incinerated or must be treated in a permitted hazardous waste management facility.[7] Care must be taken when using or disposing of chemical materials and/or their containers to prevent environmental contamination. It is your duty to dispose of the chemical materials and their containers in accordance with the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act and all relevant state or local laws/regulations regarding disposal of hazardous waste.

SECTION 8 · SPECIAL PROTECTION INFORMATION

Respiratory Protection: For emergencies or working in confined areas, wear self-contained breathing apparatus or supplied air respiratory protection (use "buddy system", also use harness and lifeline). In other circumstances involving potential overexposures, use NIOSH/MSHA-approved organic vapor respirator. (Observe limitations directed by manufacturer.) Respiratory protection program must be in accordance with 29CFR 1910.134.

Ventilation (Type): Mechanical (General) - Sufficient to maintain workplace concentration below permissible exposure limits.

Eye Protection: Splashproof goggles.

Gloves: Polyethylene, neoprene or polyvinyl alcohol

Other Protective Equipment: Safety shower and eye-wash fountain in immediate area. Personnel protective clothing and use of equipment must be in accordance with 29CFR 1910.133 and 29CFR 1910.132.

SECTION 9 · SPECIAL PRECAUTIONS

Precautions to be Taken During Handling and Storing:

Do not use in poorly ventilated or confined spaces.

- Trichloroethylene vapors are heavier than air and will collect in low areas. Keep container closed when not in use.
- Do not store in open, unlabeled or mislabeled containers.
- Liquid oxygen or other strong oxidants may form explosive mixtures with trichloroethylene
- This material or its vapors when in contact with flames, hot glowing surfaces or electric arcs can decompose to form hydrogen chloride gas and traces of phosgene.
- AVOID CONTAMINATION OF WATER SUPPLIES: Handling, storage and use procedures must be carefully monitored to avoid spills or leaks. Any spill or leak has the potential to cause underground water contamination which may, if sufficiently severe, render a drinking water source unfit for human consumption. Contamination that does occur cannot be easily corrected.

Other Precautions:

- AVOID PROLONGED OR REPEATED BREATHING OF VAPORS. High vapor concentrations can cause dizziness, unconsciousness or death. Long term overexposure may cause liver/kidney injury.
- USE ONLY WITH ADEQUATE VENTILATION. Ventilation must be sufficient to limit employee exposure to trichloroethylene in work area at or below OSHA permissible exposure limits (8-hour TWA - 100 ppm; ceiling - 200 ppm; maximum peak - 300 ppm, 5 minutes in every 2 hours). Observance of lower limits (outlined in Section 4) is advisable.
- AVOID CONTACT WITH EYES. Will cause irritation and pain.
- AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. May cause irritation or dermatitis.
- DO NOT TAKE INTERNALLY. Swallowing may cause injury or death.
- DO NOT EAT, DRINK OR SMOKE IN WORK AREAS.

References:

1. NIOSH Registry of Toxic Effects of Chemical Substances, 1978
2. Industrial Hygiene and Toxicology, Volume II, Second Edition, F. A. Patty, 1963
3. Dangerous Properties of Industrial Materials, Fifth Edition, N. I. Sax, 1979
4. Industrial Toxicology, Hamilton and Hardy, 1974
5. Toxicity and Matabolisms of Industrial Solvents, Browning, 1965
6. Toxicology, the Basic Science of Poisons, Casarett and Doull, 1975
7. Federal Register, 45FR Hazardous Waste Management Systems Part III, Identification and Listing of Hazardous Wastes, Page 33084, May 19, 1980
8. EPA Science Advisory Board, Subcommittee on Airborne Carcinogens, September, 1980

Comments:

As this solvent (trichloroethylene) is used primarily to clean and/or degrease a wide variety of metal and plastic parts, it should always be used in conjunction with properly designed and fully controlled solvent vapor degreasing equipment that is in compliance th the U.S. Environmental Protection Agency, OAQPS Guidelines, "Control of Volatile ganic Emissions from Solvent Metal Cleaning", and/or all other applicable federal, state or local regulatory guidelines.

Material Safety Data Sheet

MSD 8208.23

DETREX CHEMICAL INDUSTRIES, INC.
P.O. BOX 801.
DETROIT, MICHIGAN 48232

Approved by U.S. Dept. of Labor as "Essentially similar" to Form OSHA-20

Date:	Edition:
Chemical Name and Synonyms: Methylene Chloride; dichloromethane CAS No.: 75-09-2	Trade Name and Synonyms: Methylene Chloride
Chemical Family: Halogenated Hydrocarbons	Formula: CH_2Cl_2
DOT Shipping Name: Methylene Chloride	DOT Hazard Class: ORM-A • UN 1593

SECTION 1 • PHYSICAL DATA

Boiling Point @ 760 mm Hg: 103.6°F (39.8°C)	Vapor Density (Air=1): @ 20°C • 2.93	Specific Gravity (H_2O=1): 1.32	pH of Solutions: Neutral
Freezing/Melting Point: -142.1°F (-96.7°C)	Solubility (Weight % in Water): 2g/100 ml	Bulk Density: @ 20°C 11.15 lbs./gal.	Volume % Volatile: Essentially 100
Vapor Pressure: @ 20°C • 349 mmHg	Evaporation Rate (ethyl ether • 1): 0.71	Heat of Solution: Not Applicable	Appearance and Odor: Clear, colorless liquid with ether-like odor.

SECTION 2 • HAZARDOUS INGREDIENTS

	%	Hazard Data
Methylene Chloride (Stabilized)	100	See Sections 4 and 5

SECTION 3 • FIRE AND EXPLOSION HAZARD DATA

Flash Point °F (Method Used) None when tested in accordance with DOT requirements.

Flammable Limits in Air (% by Volume) See Below LEL: 12% UEL: 19%

Extinguishing Media: For fires involving methylene chloride, use water, dry chemicals or CO_2.

Special Fire Fighting Procedures: Fire fighters should wear NIOSH/MSHA-approved, self-contained breathing apparatus for possible exposure to hydrogen chloride and possible traces of phosgene.

Unusual Fire and Explosion Hazards: Vapors concentrated in a poorly ventilated area can be ignited upon contact with a spark, flame or high intensity source of heat. This can occur at concentrations between 12% and 19% by volume. Decomposition or burning can produce hydrogen chloride and possibly traces of phosgene. Also see Detrex warning letter Form Sel. 8208.21 attached.

SECTION 4 • HEALTH HAZARD DATA

Permissible Exposure Limits (TLV): 500ppm (TWA) See Section 4 (Cont'd) next page

Toxicity Data	Classification (Poison, Irritant, Etc.)
LC_{50} Inhalation LCLo (guinea pig) 9,000ppm/2hrs. TCLo*(human) 500ppm/8hrs.	Inhalation: Toxic
LD_{50} Dermal	Skin/Eye: Liquid mildly irritating to skin; eye irritant.
LD_{50} Ingestion - (rat) • 2.136mg/kg	Ingestion: Slightly toxic
Fish. LC_{50} (Lethal Concentration) Not determined	Aquatic:

Human Exposure Information/Data:

* Lowest published toxic concentration.

24-HOUR EMERGENCY ASSISTANCE: (313) 358-5800

Section 4 (cont'd) - Permissible Exposure Limit

Current OSHA permissible exposure limits (29CFR 1910.1000) are 500 ppm (8-hour TWA); 500-1,000 ppm period excursions are allowed providing TWA is at or below 500ppm; 1,000-2,000ppm excursions allowed only for maximum of five minutes in any 2-hour period -- 2,000ppm maximum allowable concentration (must not be exceeded).

[9]NIOSH recommends that the TWA exposure limit for methylene chloride is 75ppm. In the absence of occupational exposure to carbon monoxide (CO) above a TWA of 9ppm up to a 10-hour workday, occupational exposure to methylene chloride shall be controlled so that workers are not exposed to methylene chloride in excess of 75ppm (261 mg/cu m) determined as a TWA for up to a 10-hour workday, 40-hour workweek. In the presence of exposure to CO in the work environment at more than 9ppm as a TWA for up to a 10-hour workday, exposure limits of CO or methylene or both shall be reduced to satisfy the relationship:

$$\frac{C(CO)}{L(CO)} + \frac{C(CH_2Cl_2)}{L(CH_2Cl_2)} \leq 1$$

where: C(CO) = TWA exposure concentration of CO, ppm

L(CO) = the recommended TWA exposure limit of CO = 35 ppm

$C(CH_2Cl_2)$ = TWA exposure concentration of methylene chloride, ppm

$L(CH_2Cl_2)$ = the recommended TWA exposure limit of methylene chloride = 75 ppm

Occupational exposure shall be controlled so that workers are not exposed to methylene chloride above a peak concentration of 500ppm (1,740 mg/cu m) as determined by a 15-minute sampling period.

Employees working with methylene chloride should be aware of this hazard. This toxic effect is "additive" in nature with the risk being greater for smokers, who generally have higher levels of carboxyhemoglobin. Employees with a history of cardiovascular disease should not be allowed to work with methylene chloide unless approved by a physician.

SECTION 5 · EFFECTS OF OVEREXPOSURE

This section covers effects of overexposure for inhalation, eye/skin contact, ingestion and other types of overexposure information in the order of the most hazardous and the most likely route of overexposure.

Effects of Overexposure [9]

Acute: Inhalation effect is primarily narcosis. Principal symptoms may be headache, dizziness, nausea, tingling or numbness of the extremities, senses of fullness in the head, sense of warmth, stupor or dullness, lethargy and drunkenness. Exposure to very high concentrations may lead to unconsciousness or even death in confined or poorly ventilated areas.

Chronic: Several chronic inhalation studies reported by NIOSH revealed that test animals exposed to methylene chloride concentrations as high as 10,000ppm, showed slight liver and kidney changes. The results of these studies indicate that prolonged exposure limits may result in liver and kidney damage.

Chronic inhalation studies, cosponsored by several methylene chloride producers, were recently completed on rats. The results of these studies were reported to have revealed a mathematically significant increase in malignant salivary gland tumors in the group of male rats from the study's highest exposure level (3,500ppm).

Liquid splashed in the eyes can result in discomfort, pain and irritation. Prolonged or repeated contact with liquid on the skin can cause irritation and dermatitis. The problem may be accentuated by liquid becoming trapped against the skin by contaminated clothing and shoes. Skin absorption can occur.

Research has recently shown that methylene chloride is metabolized by the body to carbon monoxide.[4] Further, the amount of carbon monoxide formed is directly related to the amount of methylene chloride absorbed and can be sufficient to produce a substantial stress on the cardiovascular system through the elevation of the level of carboxyhemoglobin (COHb) -- the product formed by the combination of carbon monoxide and the blood's hemoglobin thus effectively reducing the amount of hemoglobin available for the transport of oxygen throughout the body.

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

Eye or Skin Contact: Flush eyes and skin with plenty of water (soap and water for skin) for at least 15 minutes, while removing contaminated clothing and shoes. If irritation occurs, consult a physician.

Ingestion: If conscious, drink a quart of water. DO NOT induce vomiting. Take immediately to a hospital or physician. If unconscious, or in convulsions, take immediately to a hospital or physician. DO NOT give anything by mouth to an unconscious person.

Notes to Physician (Including Antidotes): NEVER administer adrenalin following methylene chloride overexposure. Increased sensitivity of the heart to adrenalin may be caused by overexposure to methylene chloride.

SECTION 6 - REACTIVITY DATA

Stability: Stable	**Conditions to Avoid:** Avoid open flames, hot glowing surfaces or electric arcs.
Hazardous Polymerization: Will not occur	**Conditions to Avoid:** None

Incompatibility (Materials to Avoid): Avoid contamination with caustic soda, caustic potash or oxidizing materials. Shock sensitive explosives may be formed. Avoid contact with aluminum, magnesium, zinc and alloys thereof under high pressures. See Detrex warning letter Form Sol. 8208.21 attached.

Hazardous Decomposition Products: Hydrogen chloride and possibly traces of phosgene.

SECTION 7 - SPILL OR LEAK PROCEDURES (See Detrex Forms Sol. 8208.14 and Sol. 8208.15 attached)

Steps to be Taken If Material is Spilled or Released: Immediately evacuate the area and provide maximum ventilation. Unprotected personnel should move upwind of spill. Only personnel equipped with proper respiratory and skin/eye protection should be permitted in area. Dike area to contain spill. Take precautions as necessary to prevent contamination of ground and surface waters. Recover or absorb spilled material on sawdust or vermiculite and sweep into closed containers for disposal. After all visible traces have been removed, thoroughly wet vacuum the area. DO NOT flush to sewer. If area of spill is porous, remove as much contaminated earth and gravel, etc., as necessary and place in closed containers for disposal. (See Below).

Waste Disposal Method: Contaminated sawdust, vermiculite or porous surface must be disposed of in a permitted hazardous waste management facility. Recovered liquids may be reprocessed or incinerated or must be treated in a permitted hazardous waste management facility. Care must be taken when using or disposing of chemical materials and/or their containers to prevent environmental contamination. It is your duty to dispose of the chemical materials and/or their containers in accordance with the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act and all relevant state or local laws/regulations regarding disposal.

SECTION 8 · SPECIAL PROTECTION INFORMATION

Respiratory Protection: For emergencies or working in confined areas, wear self-contained breathing apparatus or supplied air respiratory protection. (Use the "buddy system" and wear a safety harness with lifeline). In other circumstances involving potentional overexposures, use NIOSH/MSHA-approved organic vapor respirator. (Observe limitations directed by manufacturer.) Respiratory protection program must be in accordance with 29CFR 1910.134.

Ventilation (Type): Mechanical (General) - Sufficient to maintain workplace concentration below permissible exposure limits.

Eye Protection: Splashproof goggles | **Gloves:** Polyethylene, neoprene or polyvinyl alcohol.

Other Protective Equipment: Safety shower and eye-wash fountain in immediate area. Personnel protective clothing and use of equipment must be in accordance with 29CFR 1910.133 and 29CFR 1910.132.

SECTION 9 · SPECIAL PRECAUTIONS

Precautions to be Taken During Handling and Storing:

- Do not use in poorly ventilated or confined spaces.
- Methylene chloride vapors are heavier than air and will collect in low areas.
- Keep container closed when not in use.
- Do not store in open, unlabeled or mislabeled containers.
- Liquid oxygen or other strong oxidants may form explosive mixtures with methylene chloride.
- This material or its vapors when in contact with flames, hot glowing surfaces or electric arcs can decompose to form hydrogen chloride gas and traces of phosgene.
- AVOID CONTAMINATION OF WATER SUPPLIES: Handling, storage, and use procedures must be carefully monitored to avoid spills or leaks. Any spill or leak has the potential to cause underground water contamination which may, if sufficiently severe, render a drinking water source unfit for human consumption. Contamination that does occur cannot be easily corrected.
- Caution should be taken not use in pressurized or totally enclosed system of light metal construction such as aluminum, magnesium, zinc or alloys thereof. Example, paint or adhesive spray system. (See form Sol. 8208.21 attached.)

Other Precautions:

AVOID PROLONGED OR REPEATED BREATHING OF VAPORS. High vapor concentrations can cause dizziness, unconsciousness or death. Long -term overexposure may cause liver/kidney damage.

- USE ONLY WITH ADEQUATE VENTILATION. Ventilation must be sufficient to limit employee exposure to methylene chloride below OSHA permissible exposure limits (8-hour TWA - 500ppm; ceiling - 1,000ppm; maximum peak - 2,000ppm, 5 minutes in any 2 hours).
- AVOID CONTACT WITH EYES. Will cause irritation and pain.
- AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. May cause irritation or dermatitis.
- DO NOT TAKE INTERNALLY. Swallowing may cause injury or death.

References:

1. NIOSH Registry of Toxic Effects of Chemical Substances, 1978
2. Industrial Hygiene and Toxicology, Volume II, Second Edition, F.A. Patty, 1963
3. Dangerous Properties of Industrial Materials, Fifth Edition, N.I. Sax, 1979
4. Industrial Toxicology, Hamilton and Hardy, 1974
5. Toxicity and Metabolisms of Industrial Solvents, Browning, 1965
6. Toxicology, the Basic Science of Poisons, Casarett and Doull, 1975
7. Federal Register, 45FR Hazardous Waste Management Systems Part III, Identification and Listing of Hazardous Wastes, Page 33084, May 19, 1980
8. EPA Science Advisory Board, Subcommittee on Airborne Carcinogens, September, 1980

Comments: As this solvent (methylene chloride) is used to clean and/or degrease a wide variety of metal and plastic parts, it should always be used in conjunction with properly designed and fully controlled solvent vapor degreasing equipment that is in compliance with the U.S. Environmental Protection Agency OAQPS Guidelines, "Control of Volatile Organic Emissions from Solvent Metal Cleaning", and/or all other applicable federal, state or local regulatory guidelines.

Methylene chloride is also used extensively in industry as a solvent, thinner, paint stripper, etc. It should always be used in conjunction with properly designed and fully controlled equipment that is in compliance with applicable federal, state and local regulatory guidelines.

Material Safety Data Sheet

MSD 8208.22

DETREX CHEMICAL INDUSTRIES, INC.
P.O. BOX 501.
DETROIT, MICHIGAN 48232

Approved by U.S. Dept. of Labor as "Essentially similar" to Form OSHA-20

Date: August, 1982	Edition: First
Chemical Name and Synonyms: Perchloroethylene; tetrachloroethylene CAS No.: 127-18-4	Trade Name and Synonyms: DETREX PERK, Perchlor, Perchloroethylene
Chemical Family: Halogenated Hydrocarbons	Formula: $CCl_2=CCl_2$
DOT Shipping Name: Tetrachloroethylene	DOT Hazard Class: ORM-A-UN1897

SECTION 1 · PHYSICAL DATA

Boiling Point @ 760 mm Hg:	Vapor Density (Air=1):	Specific Gravity (H_2O=1):	pH of Solutions:
250°F 121°C	5.83	(20°/20°C) 1.6	6.8 to 8.4
Freezing/Melting Point:	**Solubility (Weight % in Water):**	**Bulk Density:**	**Volume % Volatile:**
-8.2°F -22.3°C	@25°C 0.015%	13.6 lbs./gal. @ 20°C	Essentially 100
Vapor Pressure:	**Evaporation Rate**	**Heat of Solution:**	**Appearance and Odor:**
@ 20°C = 14.2mmHg	(ethyl ether=1): 0.09	Not Applicable	Clear, colorless liquid with ether-like odor.

SECTION 2 · HAZARDOUS INGREDIENTS

	%	Hazard Data
Perchloroethylene (Stabilized)	100	See Sections

SECTION 3 · FIRE AND EXPLOSION HAZARD DATA

Flash Point °F (Method Used)	Flammable Limits in Air (% by Volume)	Extinguishing Media:
None	None LEL: UEL:	For fires involving perchloroethylene, use water, dry chemical or carbon dioxide.

Special Fire Fighting Procedures: Fire fighters should wear pressure-demand self-contained breathing apparatus for possible exposure to hydrogen chloride and possible traces of phosgene.

Unusual Fire and Explosion Hazards: Perchloroethylene involved in fires can decompose to hydrogen chloride and possible traces of phosgene. See Detrex warning letter Form SoL 8208.21 attached.

SECTION 4 · HEALTH HAZARD DATA

Permissible Exposure Limits (TLV): See Section 5

Toxicity Data Ref. (1)	Classification (Poison, Irritant, Etc.)
LC_{Lo} Inhalation (rat) 4,000 ppm (4 hours)	Inhalation: Moderately Toxic
LD_{50} Dermal	Skin/Eye: Liquid mildly irritating to skin; eye irritant
LD_{50} Ingestion (rabbit) - 5,000 mg/kg	Ingestion: Slightly Toxic
Fish, LC_{50} (Lethal Concentration) 96hr. TLM 100-10 ppm	Aquatic: Toxic

Human Exposure Information/Data: Unconfirmed data[1] exists which indicate that perchloroethylene by ingestion may be more toxic to humans than indicated by the available data. Such unconfirmed data report poisonings at doses as low as 500 mg/kg.

24-HOUR EMERGENCY ASSISTANCE: (313) 358-5800

Section 4(Cont'd)- Permissible Exposure Limits

Current OSHA permissible exposure limits (29CFR 1910.1000) are 100 ppm (8-hour TWA); 100-200 ppm periodic excursions are allowed providing 8-hour TWA is at or below 100 ppm; 200-300 ppm excursions allowed only for maximum of 5 minutes in any 3-hour period; 300 ppm maximum allowable concentration (must not be exceeded).

ECTION 5 · EFFECTS OF OVEREXPOSURE

This section covers effects of overexposure for inhalation, eye/skin contact, ingestion and other types of overexposure information in the order of the most hazardous and the most likely route of overexposure.

Acute: Primarily a central nervous system depressant. Inhalation can cause irritation of the respiratory tract, dizziness, nausea, headache, loss of coordination and equilibrium, unconsciousness and if exposed to high concentrations in confined or poorly ventilated areas, even death.

Liquid splashed in the eye can result in discomfort, pain and irritation. Prolonged or repeated contact with liquid on the skin can cause irritation and dermatitis. The problem may be accentuated by liquid becoming trapped against the skin by contaminated clothing and shoes. Skin absorption can occur.

Chronic: Prolonged exposure above the OSHA permissible exposure limits may result in liver and kidney damage. Perchloroethylene has been extensively studied for cancer both in the U.S. and Europe by government, industry and academia. There is no documented evidence that perchloroethylene causes an increased cancer incidence in humans.

EMERGENCY AND FIRST AID PROCEDURES:

Inhalation: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

Eye or Skin Contact: Flush eyes and skin with plenty of water (soap and water for skin) for at least 15 minutes, while removing contaminated clothing and shoes. If irritation occurs, consult a physician.

Ingestion: If conscious, drink a quart of water. DO NOT induce vomiting. Take immediately to a hospital or physician. If unconscious, or in convulsions, take immediately to a hospital or physician. DO NOT give anything by mouth to an unconscious person.

Notes to Physician (Including Antidotes): NEVER administer adrenalin following perchloroethylene overexposure. Increased sensitivity of the heart to adrenalin may be caused by over-exposure to perchloroethylene.

SECTION 6 · REACTIVITY DATA

Stability: Stable	**Conditions to Avoid:** Avoid open flames, hot glowing surfaces or electric arc.
Hazardous Polymerization: Will not occur	**Conditions to Avoid:** None

Incompatibility (Materials to Avoid): Avoid contamination with caustic soda, caustic potash or oxidizing materials. Shock sensitive explosives may be formed. Also see Detrex wa: letter Form SoL 8208.21 attached.

Hazardous Decomposition Products: Hydrogen chloride and possibly traces of phosgene.

SECTION 7 · SPILL OR LEAK PROCEDURES (See Detrex Forms SoL 8208.14 and SoL 8208.15 attached)

Steps to be Taken If Material is Spilled or Released: Immediately evacuate the area and provide maximum ventilation. Unprotected personnel should move upwind of spill. Only personnel equipped with proper repiratory and skin/eye protection should be permitted in area. Dike area to contain spill. Take precautions as necessary to prevent contamination of ground and surface waters. Recover or absorb spilled material on sawdust or vermiculite and sweep into closed containers for disposal. After all visible traces have been removed, thoroughly wet vacuum the area. DO NOT flush to sewer. If area of spill is porous, remove as much contaminated earth and gravel, etc., as necessary and place in closed containers for disposal. (See Below)

Waste Disposal Method:

Contaminated sawdust, vermiculite or porous surface must be disposed of in a permitted hazardous waste management facility. Recovered liquids may be reprocessed or incinerated or must be treated in a permitted hazardous waste management facility. Care must be taken when using or disposing of chemical materials and/or their containers to prevent environmental contamination. It is your duty to dispose of the chemical materials and/or their containers in accordance with the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act and all relevant state or local laws/regula regarding disposal.

SECTION 8 · SPECIAL PROTECTION INFORMATION

Respiratory Protection: For emergencies or working in confined areas, wear self-contained breathing apparatus or supplied air respiratory protection. (Use the "buddy system" and wear a safety harness with lifeline). In other circumstances involving potentional overexposures, use NIOSH/MSHA-approved organic vapor respirator. (Observe limitations directed by manufacturer.) Respiratory protection program must be in accordance with 29CFR 1910.134.

Ventilation (Type): Mechanical (General) - Sufficient to maintain workplace concentration below permissible exposure limits.

Eye Protection: Splashproof goggles

Gloves: Polyethylene, neoprene or polyvinyl alcohol.

Other Protective Equipment: Safety shower and eye-wash fountain in immediate area. Personnel protective clothing and use of equipment must be in accordance with 29CFR 1910.133 and 29CFR 1910.132.

SECTION 9 · SPECIAL PRECAUTIONS

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- Do not use in poorly ventilated or confined spaces.
- Methylene chloride vapors are heavier than air and will collect in low areas.
- Keep container closed when not in use.
- Do not store in open, unlabeled or mislabeled containers.
- Liquid oxygen or other strong oxidants may form explosive mixtures with methylene chloride.
- This material or its vapors when in contact with flames, hot glowing surfaces or electric arcs can decompose to form hydrogen chloride gas and traces of phosgene.
- AVOID CONTAMINATION OF WATER SUPPLIES: Handling, storage, and use procedures must be carefully monitored to avoid spills or leaks. Any spill or leak has the potential to cause underground water contamination which may, if sufficiently severe, render a drinking water source unfit for human consumption. Contamination that does occur cannot be easily corrected.
- Caution should be taken not use in pressurized or totally enclosed system of light metal construction such as aluminum, magnesium, zinc or alloys thereof. Example, paint or adhesive spray system. (See form Sol. 8208.21 attached.)

Other Precautions:

AVOID PROLONGED OR REPEATED BREATHING OF VAPORS. High vapor concentrations can cause dizziness, unconsciousness or death. Long -term overexposure may cause liver/kidney damage.

- USE ONLY WITH ADEQUATE VENTILATION. Ventilation must be sufficient to limit employee exposure to methylene chloride below OSHA permissible exposure limits (8-hour TWA - 500ppm; ceiling - 1,000ppm; maximum peak - 2,000ppm, 5 minutes in any 2 hours).
- AVOID CONTACT WITH EYES. Will cause irritation and pain.
- AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. May cause irritation or dermatitis.
- DO NOT TAKE INTERNALLY. Swallowing may cause injury or death.

References:

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3. Dangerous Properties of Industrial Materials, Fifth Edition, N. I. Sax, 1979
4. Industrial Toxicology, Hamilton and Hardy, 1974
5. Toxicity and Metabolisms of Industrial Solvents, Browning, 1965
6. Toxicology, the Basic Science of Poisons, Casarett and Doull, 1975
7. Federal Register, 45FR Hazardous Waste Management Systems Part III, Identification and Listing of Hazardous Wastes, Page 33084, May 19, 1980
8. EPA Science Advisory Board, Subcommittee on Airborne Carcinogens, September, 1980

Comments: As this solvent (methylene chloride) is used to clean and/or degrease a wide variety of metal and plastic parts, it should always be used in conjunction with properly designed and fully controlled solvent vapor degreasing equipment that is in compliance with the U.S. Environmental Protection Agency OAQPS Guidelines, "Control of Volatile Organic Emissions from Solvent Metal Cleaning", and/or all other applicable federal, state or local regulatory guidelines.

Methylene chloride is also used extensively in industry as a solvent, thinner, paint stripper, etc. It should always be used in conjunction with properly designed and fully controlled equipment that is in compliance with applicable federal, state and local regulatory guidelines.

DU PONT

MATERIAL SAFETY DATA SHEET

IDENTIFICATION

Name:
Freon® TF Solvent
Freon® PCA

Chemical Family:
Halogenated Hydrocarbon

Synonyms
Trichlorotrifluoroethane
R-113, FC-113

Formula:
CCl_2FCClF_2

CAS Name:
Ethane, 1,1,2-Trichloro-1,2,2-Trifluoro

CAS Registry No.
76-13-1

Manufacturer/Distributor:
E. I. du Pont de Nemours & Co. (Inc.)

Medical Emergency Phone:
(800) 441-3637

Address:
Freon® Products Division
Wilmington, DE 19898

Transportation Emergency Phone:
CHEMTREC (800) 424-9300

PHYSICAL DATA

Boiling Point(°F): 117.6

Percent Volatile by Volume: 100%

Density: 1.57 g/cc @/77°F

Vapor Pressure: 334mm Hg @/77°F

Vapor Density (Air = 1): 6.5

Solubility in H_2O: 0.02% by wt. @ 77°F

pH Information: Neutral

Evaporation Rate (CCl_4 = 1): 0.1

Form: Liquid

Appearance: Clear

Color: Colorless

Odor: Slight Ethereal Odor

HAZARDOUS COMPONENTS

Material(s):
Trichlorotrifluoroethane

Approximate % :
100

HAZARDOUS REACTIVITY

Stability:
Material is stable. However, avoid open flames and high temperatures.

Incompatibility:
Alkali or alkaline earth metals - powdered Al, Zn, Be, etc.

Decomposition:
This compound can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrochloric and hydrofluoric acids - possible carbonyl halides.

Polymerization:
Will not occur

FIRE AND EXPLOSION DATA

Flash Point:
None

Method:
TOC

Autoignition Temperature:
Not Determined

Flammable Limits in Air, % by Vol.
Lower: Nonflammable
Upper: Nonflammable

Autodecomposition Temperature:
Not Determined

Fire and Explosion:
Drums may rupture under fire conditions. Decomposition may occur.

Extinguishing Media:
Nonflammable

Special Fire Fighting Instructions:
Self-contained breathing apparatus (SCBA) may be required if drums rupture and contents are spilled under fire conditions.

HEALTH HAZARD INFORMATION

Principal Health Hazards:

Inhalation: Vapor is heavier than air and can cause suffocation by reducing oxygen available for breathing. Breathing high concentrations of vapor may cause light-headedness, giddiness, shortness of breath, and may lead to narcosis, cardiac irregularities, unconsciousness or death. LC 50 Rats 52,000 ppm/4 hrs.

Note: In screening studies with experimental animals, exposure at approximately 5000 ppm (v/v) and above, followed by a large intravenous epinephrine challenge, has induced serious cardiac irregularities.

Skin: Not a corrosive or irritant after single contact; however, repeated liquid contact can cause defatting of the skin resulting in irritation. This material is poorly absorbed through the skin (Rabbit ALD >11,000 mg/kg).

Eye: Liquid contact can cause discomfort, usually no extended effect.

Oral: Although oral toxicity is low [LD 50 Rat 43000 mg/kg], ingestion of FC-113 is to be avoided.

Exposure Limits:

PEL (OSHA)	1,000 ppm
TLV® TWA (ACGIH)	1,000 ppm

Safety Precautions:
Avoid breathing vapors and prolonged skin exposure. Use only in well ventilated area.

First Aid:

Inhalation: Remove to fresh air, call a physician. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Do not give epinephrine or similar drugs.

Note to Physician: Because of a possible increased risk of eliciting cardiac dysrythmias, catecholamine drugs, such as epinephrine, should be considered only as a last resort in life threatening emergencies.

Eye: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

Skin: Flush with water. Get medical attention if irritation is present.

Oral: No specific intervention is indicated as the compound is not likely to be hazardous by ingestion. However, consult a physician if necessary. Do not induce vomiting as the hazard of aspirating the material into the lungs is a greater hazard than allowing it to progress through the intestinal tract.

Medical Conditions Possibly Aggravated by Exposure:

Cardiovascular Disease: See Principal Hazards: Inhalation Section.

Other Health Hazards:

Freon® 113 is not listed as a carcinogen by IARC, NTP or OSHA. Based on animal studies and human experiences this fluorocarbon poses no hazard to man relative to systemic toxicity, carcinogenicity, mutagenicity, or teratogenicity when occupational exposures are below its TLV®.

PROTECTION INFORMATION

Generally Applicable Control Measures:

Normal ventilation for standard manufacturing procedures is generally adequate. Local exhaust should be used when large amounts are released. Mechanical ventilation should be used in low places.

Personal Protective Equipment:

Butyl gloves should be used to avoid prolonged or repeated exposure. Chemical splash goggles should be available for use as needed to prevent eye contact. Under normal manufacturing conditions no respiratory protection is required when using this product. Self-contained breathing apparatus (SCBA) is required if a large spill occurs.

DISPOSAL INFORMATION

Spill, Leak or Release:
Ventilate area. Do not flush into sewers. Dike spill. Collect on absorbent material and transfer to steel drums for recovery or disposal. Comply with federal, state and local regulations on reporting releases.

Waste Disposal: Comply with federal, state and local regulations. Remove to a permitted waste disposal facility. EPA Hazardous Waste Nos. F001 and F002 may apply to waste materials.

SHIPPING INFORMATION

Domestic - Other Than Air (DOT)

Proper Shipping Name	Not Regulated

International Water or Air (IMO/ICAO)

Proper Shipping Name	Not Regulated

Other Information

Shipping Containers	Drums, tank trucks, tank cars
Storage Conditions	Clean, dry area. Do not heat above 125°F.

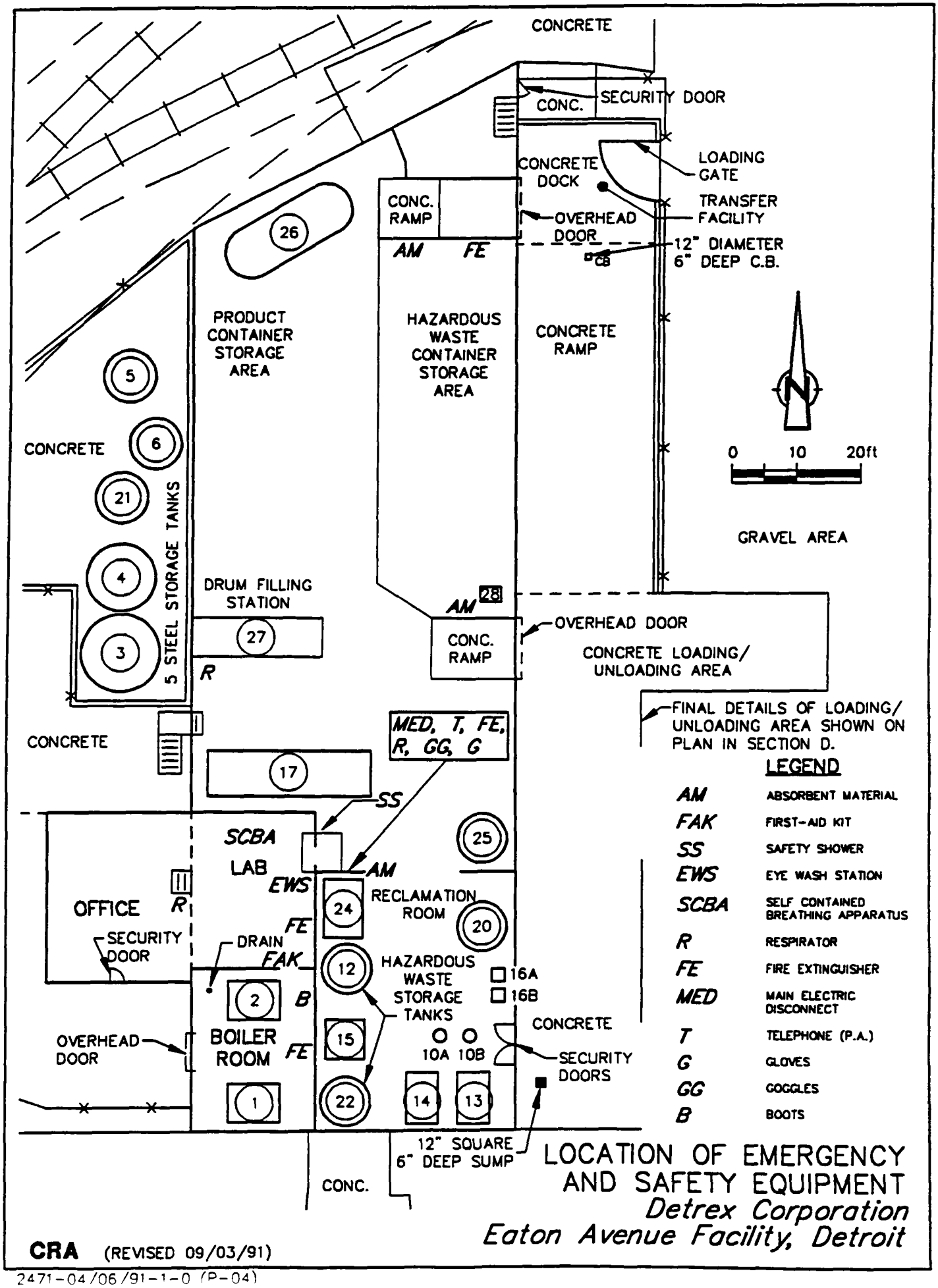
Date Revised: 10/85
Person responsible: T. D. Armstrong, C&P Dept., Freon® Products Lab, Chestnut Run, Bldg. 711, Wilmington, DE 19898
(302) 999-3847 or (302) 999-4338.

DU PONT

ATTACHMENT G-3

LOCATION OF EMERGENCY AND SAFETY EQUIPMENT

ATTACHMENT G-3



LOCATION OF EMERGENCY AND SAFETY EQUIPMENT

Detrex Corporation

Eaton Avenue Facility, Detroit

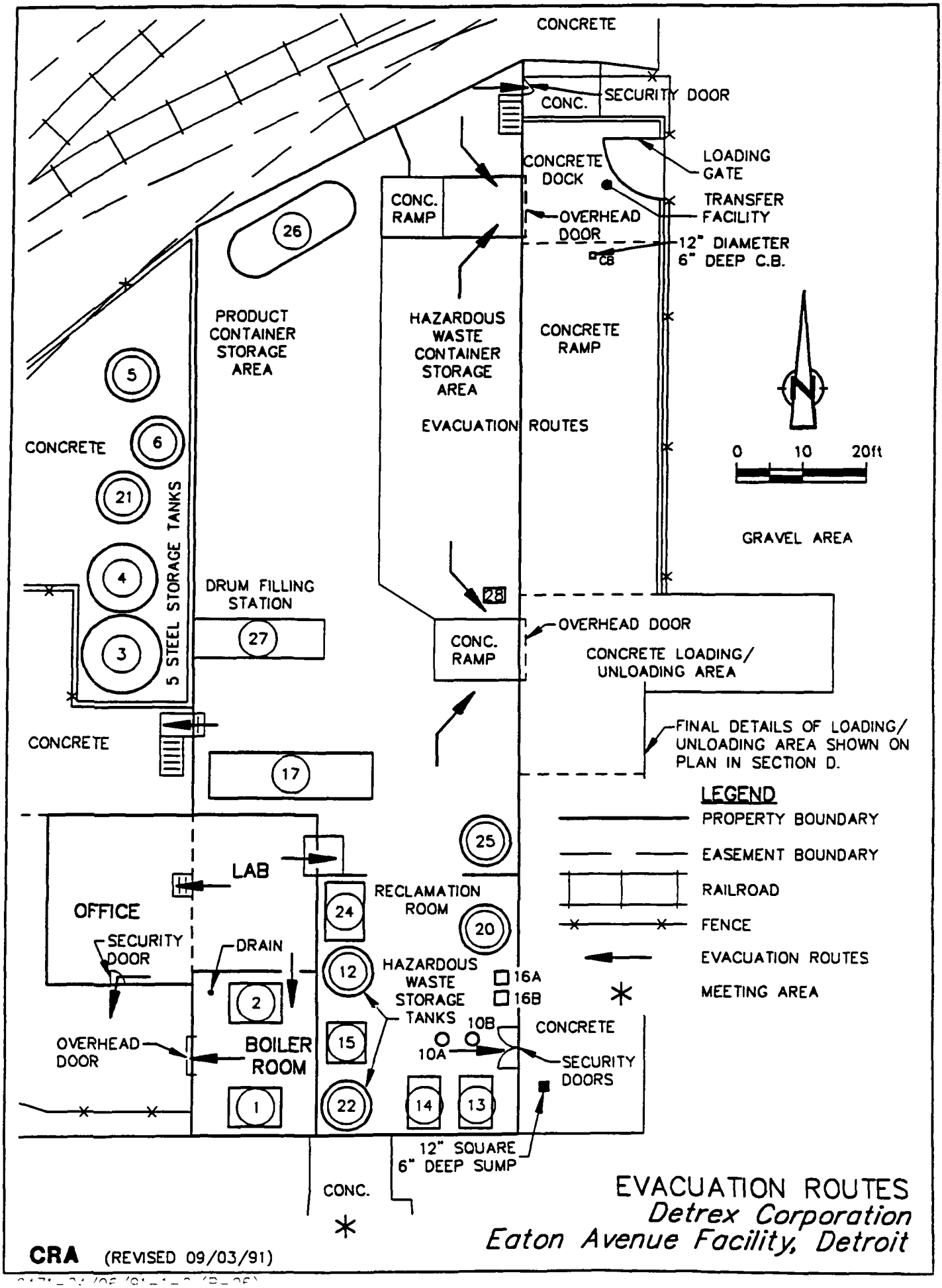
CRA (REVISED 09/03/91)

2471-04/06/91-1-0 (P-04)

ATTACHMENT G-4

EXCAVATION ROUTES

ATTACHMENT G-4



Attachment 5

Closure Plan

SECTION I

CLOSURE AND POST-CLOSURE PLAN

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SECTION I

CLOSURE AND POST-CLOSURE PLAN

The Eaton Avenue Facility specializes in the sale of halogenated solvent and the recovery (recycling) of spent solvents from sludges generated in degreasing operations. The facility operates under EPA Identification Number MID091605972. The Standard Industrial Classification (SIC) Codes for the facility are 2869 and 5161.

The hazardous waste management operations include container storage and tank storage. Wastes are received in container or bulk shipments. The wastes are processed through the recovery (recycling) system which primarily consist of distillation followed by drying. The recovered solvent product is drummed or stored in product tanks for re-sale and the still bottoms remaining after distillation are transferred to a 5,000 gallon generator accumulation tank. The still bottoms are accumulated for less than 90 days prior to shipment off site to a permitted facility.

All waste accepted at the facility and the waste bottoms remaining after the recovery (recycling) operation are classified as F001 or F002 hazardous wastes under 40 CFR Part 261. Detrex also recognizes the wastes as containing D-series compounds under the TCLP.

This section identifies operational activities which are necessary to completely close the hazardous waste container and tank storage areas and related equipment at the end of their intended operating lives. A post-closure plan is not required because this is not a disposal facility and all wastes are being removed at closure.

The closure plan and financial requirements are submitted pursuant to Michigan Act 64 Rule 299.9613 which incorporates 40 CFR §Part 264, Subpart G, by reference. The applicable section(s) of the Federal Regulations is referenced as appropriate.

Detrex Corporation will maintain an on-site copy of the approved closure plan, and all revisions to the plan, until the certification of closure completeness has been submitted and accepted by MDNR. Detrex will notify the Director at least 45 days prior to the date Detrex expects to begin final closure at the Eaton Avenue facility.

Upon completion of closure activities, Detrex Corporation will submit a certification to the MDNR Director verified by both Detrex Corporation and an independent registered professional engineer that the facility has been closed in accordance with the specifications in the approved closure plan. The closure document will be certified in accordance with 40 CFR § 270.11(d) and include, at minimum, the following.

1. Manifests (or some type of manifest/waste removal summary) of where and how much waste was shipped.

2. Certification statement by the owner/operator AND an independent registered engineer. All independent registered professional engineer certificates will have an original stamp on at least one copy.

3. Summary of decontamination procedures (pressure wash, steam clean, etc.) and how waste water was disposed.

4. Summary analysis (include time table, soil and groundwater results, weather conditions, runoff controls, equipment decontamination, etc.).

5. Results of all tests used to determine clean closure (chart, tables, lab sheets).

6. Statistical comparisons on sampling results compared to background.

7. Sampling and analysis procedures (specify references).

8. Final depth and elevations of excavations of wastes and soils.

9. Properly labelled and easily identified sampling grid stations (map); including background stations.

10. Groundwater data (and statistical evaluation) used to determine if groundwater degradation has occurred.

11. Summary of final restoration of excavated area, information on fill material used and/or future land use outline. If clean closure cannot be achieved (e.g. contaminated soils to water table and groundwater results show contamination) this summary item should be used to address the post closure program and/or corrective action.

12. A copy of the approved closure plan and letter of closure approval.

I-1 CLOSURE PLAN [40 CFR §270.14(b)(13), §264.112]

I-1a Closure Performance Standard [40 CFR §264.111]

This closure plan is designed to ensure that the facility will be closed in a manner that:

1) Minimizes the need for further maintenance; and

2) Controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, or hazardous constituents to the ground or surface waters or to the atmosphere.

The following sections present, in detail, efforts which will be made to satisfy the closure performance standard.

1-1b Partial Closure and Final Closure Activities [40 CFR §264.112(a)(1)]

At such times in the operating life of the facility that equipment may be updated, replaced or different operations may commence, partial closure of the facility in the form of most likely tank closure may take place. Closure procedures for partial closure would be essentially identical to those stipulated in this Closure Plan for final closure, as appropriate to the unit scheduled for partial closure. Waste inventory present at time of partial closure and/or waste generated during closure (i.e. decontamination fluids) would be managed in accordance with remaining facility operations. The waste would be processed through the solvent recovery unit or transported off-site to a permitted facility under the fuels blending program.

I-1c Maximum Waste Inventory [40 CFR §264.112(a)(2)]

The maximum hazardous waste inventory expected to be in storage at any given time is 13,750 gallons. This includes 8,250 gallons of container capacity and 5,500 gallons of tank capacity.

Table I-1 lists the various wastes handled at the facility, their EPA hazardous waste identification number, and their respective hazardous constituent/characteristic.

TABLE I-1

LIST OF HAZARDOUS WASTES

Hazardous Waste	*EPA Hazardous Waste Number*	*Hazardous Constituent/ Characteristic*
1,1,1 Trichloroethane	F001/F002	Toxic
Trichloroethylene	F001/F002	Toxic
Perchloroethylene	F001/F002	Toxic
Methylene Chloride	F001/F002	Toxic
Trichlorotrifluorethane	F001/F002	Toxic
Arsenic	D004	Toxic
Barium	D005	Toxic
Cadmium	D006	Toxic
Chromium	D007	Toxic
Lead	D008	Toxic
Mercury	D009	Toxic
Selenium	D010	Toxic
Silver	D011	Toxic
Benzene	D018	Toxic
Carbon Tetrachloroide	D019	Toxic
Chlorobenzene	D021	Toxic
Chloroform	D022	Toxic
1,4-Dichlorobenzene	D027	Toxic
1,2-Dichloroethane	D028	Toxic
1,1-Dichloroethylene	D029	Toxic
2,4-Dinitrotoluene	D030	Toxic
Hexachloroethane	D034	Toxic
Methyl Ethyl Ketone	D035	Toxic
Nitrobenzene	D036	Toxic
Pyridine	D038	Toxic
Tetrachloroethylene	D039	Toxic
Trichloroethylene	D040	Toxic
Vinyl Chloride	D043	Toxic

I-1d Inventory Removal and Disposal orDecontamination of Equipment [40 CFR §264.112(a)(3), §264.114]

At time of closure, assuming a third party is completing the closure, the maximum waste inventory will be transported to an off-site licensed hazardous waste management facility. The contents of the hazardous waste storage tanks would be transferred to a permitted hazardous waste tanker truck for transportation. Any material contained within the process unit at time of closure would be transferred to DOT-approved containers. The container inventory would be transferred utilizing a suitable drum pump and flexible hosing to a licensed hazardous waste tanker truck for transportation.

I-1d(1) Closure of Containers [40 CFR §264.178]

Following the removal of the container inventory, the container storage area and the entire secondary containment system will be swept. The sweepings will be placed in DOT-approved containers. The solid waste (i.e. sweepings) will be characterized as F001 and F002 wastes, and include the applicable D-series (TCLP) waste codes based on historical operations and transported off site to a licensed hazardous waste management facility. The area will be decontaminated by a floor wash/scrubbing operation followed by a triple rinse steam cleaning. Wash water generated will be collected, using pumps, sponges and/or absorbent material and placed in DOT-approved containers . The material will be characterized as F001 and F002 wastes, and include the applicable D-series (TCLP) waste codes based on the wastes stored at the facility. The rinsate sampling analysis, discussed below, will be used to confirm elevated levels of waste constituents. If no elevated levels above detection level are observed, the material will be discharged in accordance with the Sites Detroit Water and Sewage Department Wastewater Discharge permit. If detectable levels are observed the waste will be transported off site to a licensed hazardous waste management facility. Attachment I-3 delineates all areas to be decontaminated under closure.

It is estimated that approximately 300 gallons of waste wash water and one drum of solid waste will be generated during the decontamination process.

Decontamination will be verified by collecting a minimum of two samples of the rinsate (i.e. the initial rinsate and the final rinsate) and submitting the samples for analysis of the major constituents that were in storage. The parameters for which the rinsate/wash water will be analyzed are noted in Table I-2. Table I-2 lists the

practical quantification limits (PQLs) for the organic parameters that will be analyzed using U.S. EPA SW-846 Method 8240. The other organic and metals parameters listed in Table I-2 will be analyzed for using U.S. EPA SW-846 methods approved for the respective parameters.

Subsequent cleaning operations (further steam cleaning or water rinses) will be implemented as necessary until rinsate sampling and analysis indicates non-detectable levels have been reached.

It should be noted that severe staining on the concrete would also trigger more extensive cleaning. The rinsate samples will be collected in 3 x 40 mL glass vials and placed in coolers, packed with ice to approximately 4°C and shipped under chain-of-custody protocols to the preselected approved laboratory. One blind duplicate sample and one field blank sample will be collected for every ten rinsate samples collected as a check on laboratory and field QA/QC procedures. A trip blank will also be supplied by the laboratory and analyzed for the same parameters as the rinsate sample as a check on cross-contamination during shipment.

I-1d(2) Closure of Tanks [40 CFR §264.197]

Any tank sludges and tank scale existing in the storage tanks will be hand shovelled into DOT-approved containers. Such wastes, based on Detrex's former utilization of the tank, will be classified as F001 and F002 wastes, and include the applicable D-series (TCLP) waste codes. The containers will be subsequently be transported off site to a permitted facility.

Following removal of any remaining sludges and tank scale from the tank designated for closure, Detrex will decontaminate the interior and exterior of each tank. The decontamination protocol to be followed is summarized as follows:

a) Solvent rinse the interior and exterior of each tank with 1,1,1-Trichloroethane, and allow to air dry for 15 minutes;

b) High pressure, steam clean the interior and exterior of each tank, repeat three times and allow to air dry; and

c) Visually inspect the interior and exterior of each tank for residuals. If residuals are visually evident, repeat steps (a) and/or (b) until each tank is clean. After the final steam rinse, allow each tank to air dry for 24 hours.

All piping and other equipment associated with each hazardous waste tank will also be disassembled and decontaminated. The decontamination protocol will be the same as specified above for each tank.

TABLE I-2
PARAMETERS FOR ANALYSIS

PARAMETERS		*Practical Quantification Limits* [a] [b] *Low Water (µg/L)*	*Low Soil/Sediment (µg/kg)*
74-87-3	chloromethane	10	10
74-83-9	bromomethane	10	10
75-01-4	vinyl chloride	5	10
75-00-3	chloroethane	10	10
75-09-2	methylene chloride	5	5
67-64-1	acetone	100	100
75-15-0	carbon disulfide	1	5
75-35-4	1,1-dichloroethene	1	5
75-35-3	1,1-dichloroethane	1	5
540-59-0	1,2-dichlroethene (total)	1	5
67-66-3	chloroform	1	5
107-06-2	1,2-dichloroethane	1	5
78-93-3	2-butanone	100	100
71-55-6	1,1,1-trichloroethane	1	5
56-23-5	carbon tetrachloride	1	5
108-05-4	vinyl acetate	50	50
75-27-4	bromodichloromethane	1	5
78-87-5	1,2-dichloropropane	1	5
75-25-2	bromoform	1	5
591-78-6	2-hexanone	50	50
108-10-1	4-methyl-2-pentanone	50	50
79-01-6	trichloroethene	1	5
71-43-2	benzene	1	5
79-00-5	1,1,2-trichloroethane	1	5
10061-01-15	cis-1,3-dichloropropene	1	5
127-18-4	tetrachloroethene	1	5
79-34-5	1,1,2,2-tetrachloroethane	1	5
108-88-3	toluene	1	5
108-90-7	chlorobenzene	1	5
100-41-4	ethylbenzene	1	5
100-42-5	styrene	1	5
1330-20-7	xylenes (total)	1	5
124-48-1	dibromochloromethane	1	5
10061-02-6	trans-1,3 dichloropropene	1	5
110-75-8	2-chloroethyl vinyl ether	10	10
	ortho-dichlorobenzene	0.5	500
	trichlorotrifluorethane	5.0	50
	trichlorofluoromethane	5	50

Notes:

a Specific PQLs are highly matrix dependent. The PQLs listed herein are provided for guidance and may not always be achievable.

b PQLs listed for soil/sediment are based on wet weight. Normally data is reported on a dry weight basis; therefore, PQLs will be higher, based on the % moisture in each sample.

TABLE I-2 (Continued)

PARAMETERS FOR ANALYSIS

PARAMETERS

2,4-Dinitrotoluene
Hexachloroethane
Methyl Ethyl Ketone
Nitrobenzene
Pyridine
Arsenic
Barium
Cadmium
Chromium
Lead
Mercury
Selenium
Silver

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Following decontamination, the hazardous waste storage tank and all piping and other equipment associated with the tanks will be considered non-hazardous. Therefore, the handling of the tanks and all piping and other equipment after decontamination is not included under the closure cost estimate or closure schedule.

Tank decontamination will be conducted within the secondary containment area. The solvent rinse and wash water resulting from steam cleaning the interior of the tank will be collected directly from the tank into 5-gallon pails or equivalent. Decontamination of the secondary area will be scheduled to occur subsequent to the tank decontamination. Therefore, any decontamination fluids or steam mist which contacts the base of the secondary containment area during tank cleaning will be addressed during decontamination of the secondary containment area.

All solvent rinses and wash water generated will be transferred into DOT-approved containers for ultimate transportation off-site to a permitted facility. All wastes, based on Detrex's previous recycling operation, will be classified as F001 and F002 wastes, and include the applicable D-series (TCLP) waste codes unless sampling conducted as verification of cleanup reveals that no levels above each respective detection level exist, in which case the wastes will be managed as non-hazardous wastes.

I-1d(3) Closure of Loading/Unloading Area

The entire outdoor concrete loading/unloading area will be swept and subsequently cleaned according to the protocols described above for the container storage area and associated secondary containment system.

Soil sampling will be conducted as part of the closure. Boreholes will be drilled through the concrete at the location of the sump in the loading/unloading area, and at locations where any significant cracks or staining are observed. Soil samples will be collected using hollow stem augers. At each sampling location, the borehole will be advanced through the fill material, the native sand, and completed in the top of the clay. Split-spoon samples, for chemical analysis, will be collected at each borehole location. Samples will be collected at one foot intervals, with the last sample at each location being collected from the top of the clay unit. Following sampling completion, each borehole will be backfilled with the drill cuttings to the ground surface.

The soil samples will be analyzed for the parameters identified in Table I-2 using U.S EPA SW-846 methods approved for the respective parameters.

All protocols for soil sample selection, handling, and equipment cleaning are presented in Attachment I-4 of the closure plan. Decontamination of the augers, cutting bits, and other drilling equipment, and all sampling equipment will be conducted in an area constructed and designed to collect the decontamination solutions and prevent run-off and run-on. The decontamination solutions will be containerized, analyzed for the parameters identified in Table I-2, properly characterized, and subsequently managed in accordance with all federal and state regulations.

The analytical results of the sampling will be forwarded to the Michigan Department of Natural Resources (MDNR), and a plan of remediation developed if any detectable levels of the parameters identified in Table I-2 are observed. The plan will be reviewed and approved by the MDNR prior to being implemented.

I-1e Schedule of Closure [40 CFR §264.112(a)(4)]

Within 90 days after receipt of the final volume of hazardous wastes, and at the direction of Detrex Corporation, final closure activities will be initiated and completed within 180 days of this occurrence. The Director will be notified by Detrex 45 days before beginning final closure.

A proposed closure schedule is presented as Attachment I-2. Final closure will be certified by both Detrex Corporation and an independent professional engineer.

I-1f Extensions for Closure Time [40 CFR §264.113(a) and (b)]

Detrex Corporation does not anticipate requiring an extension for closure time for facility.

Revised by MDNR

I-4 FINANCIAL ASSURANCE MECHANISM FOR CLOSURE [40 CFR §270.14(b)(15) and 264.143]

Financial assurance for closure costs is provided by a surety bond.

I-5 LIABILITY INSURANCE [40 CFR §270.14(b)(17) and 264.147]

I-5a Sudden Accidental Occurrences [40 CFR §264.147(a)]

Financial assurance for sudden accidental insurance is provided by a demonstration that Detrex Corporation meets the financial test.

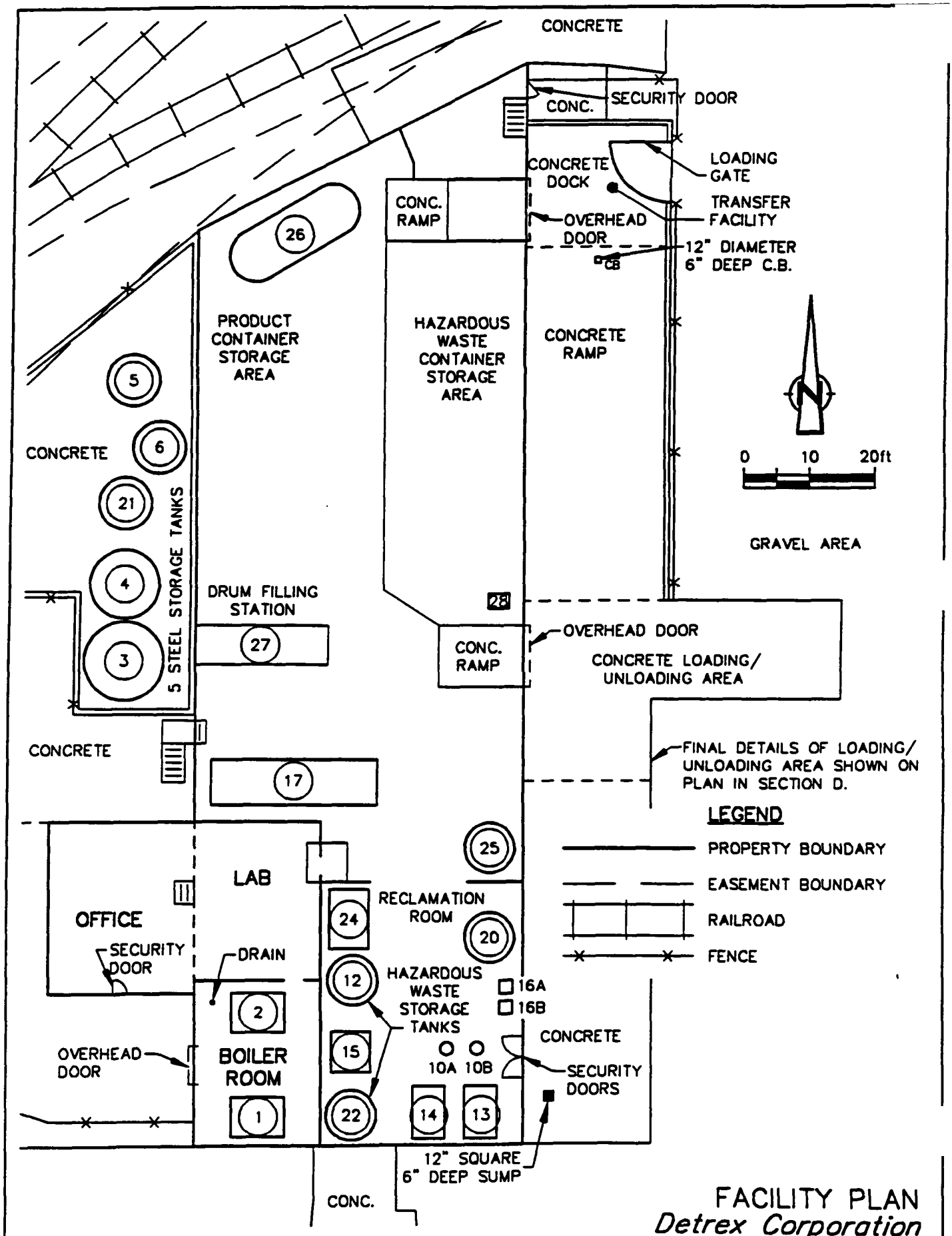
I-6 STATE ASSUMPTION OF RESPONSIBILITY [40 CFR §270.14(b)(18)]

Detrex Corporation does not intend to request State assumption of the legal or financial responsibilities for the Eaton Avenue facility.

ATTACHMENT I-1

FACILITY PLAN

ATTACHMENT I-1



FACILITY PLAN
Detrex Corporation
Eaton Avenue Facility, Detroit

CRA (REVISED 09/03/91)

Date: 09/03/91
Revision: 91-2

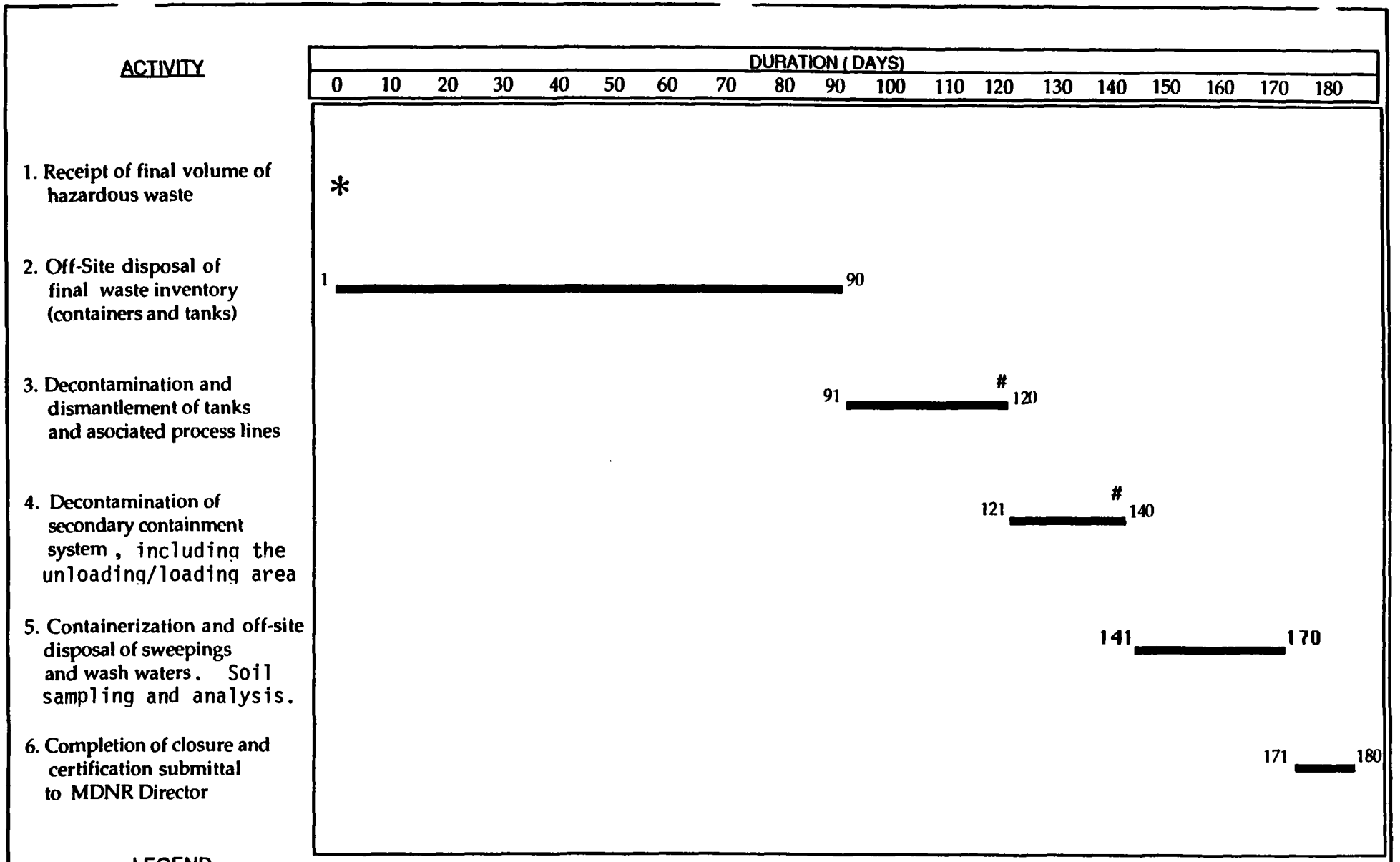
LIST OF PROCESS EQUIPMENT

I.D. No.	*Equipment Name*	*Description*
1.	Generator	Clayton Model E-100 Steam Generator. Unit burns natural gas to produce steam at the rate of 3450 lbs./hr. at 100 psig.
2.	Air Compressor	
3.	20,000 gal. Product Tank	20,000 gallon carbon steel storage tank for storage of 1,1,1 Trichloroethane.
4.	10,000 gal. Product Tank	10,000 gallon carbon steel storage tank for storage of Trichloroethylene
5.	4,500 gal. Product Tank	4,500 gallon carbon steel storage tank for storage of Perchloroethylene.
6.	4,500 gal. Product Tank	4,500 gallon carbon steel storage tank for storage of Trichloroethylene
10 A/B	2 - 600 gal. Receiver Tanks	Used for receiving product from Detrex stills. (Operated at atm. pressure).
12.	2,300 gal. Hazardous Waste tank storage tank	2,300 gallon carbon steel storage tank used for storage of F001 or F002 material prior to processing
13.	350 gal. Detrex Still	Detrex Model S-350. Used for recovering chlorinated solvents from spent solvents from degreasing operations (F001 material) via distillation. This unit can process approximately 2,000 gallons/day.
14.	350 gal. Detrex Still	Detrex Model S-600. Used for recovering chlorinated solvents from spent solvents from degreasing operations (F001 material) via distillation. This unit can process approximately 2,000 gallons/day.
15.	DCI Still	DCI Model Dyna-1-100 Solvent Recovery Still. Used to recover chlorinated solvents from still bottoms from recovery of same (F002 material) via live steam injection. This unit can process approximately 100 gallons per hour.
16 A/B	Drying Columns	Detrex Dual Column Drier. Used to remove water from recovered product (solvent) via adsorption.

Date: 09/03/91
Revision: 91-2

LIST OF PROCESS EQUIPMENT

I.D. No.	*Equipment Name*	*Description*
17.	5,000 gal. Still Bottom Tank	5,000 gallon carbon steel storage tank. Used for temporary accumulation of still bottoms from recovery of chlorinated solvents (F002 material).
20.	2,500 gal. Holding Tank	2,500 gallon 316 stainless steel storage tank used for storage of reclaimed solvent.
21.	4,500 gal. 1,1,1 Trichloroethane	4,500 gallon carbon steel storage tank for storage of 1,1,1 Trichloroethane.
22.	4,500 gal. Hazardous Waste Storage Tank	4,500 gallon carbon steel storage tank used for temporary storage of F001 or F002 material prior to being processed by Detrex stills.
24.	DCI Still	DCI Model Dyna-1-500 Solvent Recovery Still. Used to recover chlorinated solvents from still bottoms from recovery of same (F002 material) via live steam injection. This unit can process approximately 500 gallons per hour.
25.	3,000 gal. Holding Tank	3,000 gallon 316 stainless steel storage tank used for storage of reclaimed solvent.
26	SVRM - Carbon Absorption Unit	
27.	Drum Filling Station	Product Drumming Station. Used for filling 55-gallon drums with product. Unit can fill approximately 30 drums per hour and is operated as necessary.
28.	Product Blending Vessel	550 gallon carbon steel vessel utilized for product blending.



LEGEND

- ▬ ACTIVITY DURATION
- * EVENT
- # INSPECTION/SAMPLING EVENT

Attachment I-2

PROPOSED CLOSURE SCHEDULE

Detrex Corporation, Eaton Avenue Facility

CRA

2471 24/06/91-BMc-1

Revised by the MDNR

ATTACHMENT I-2

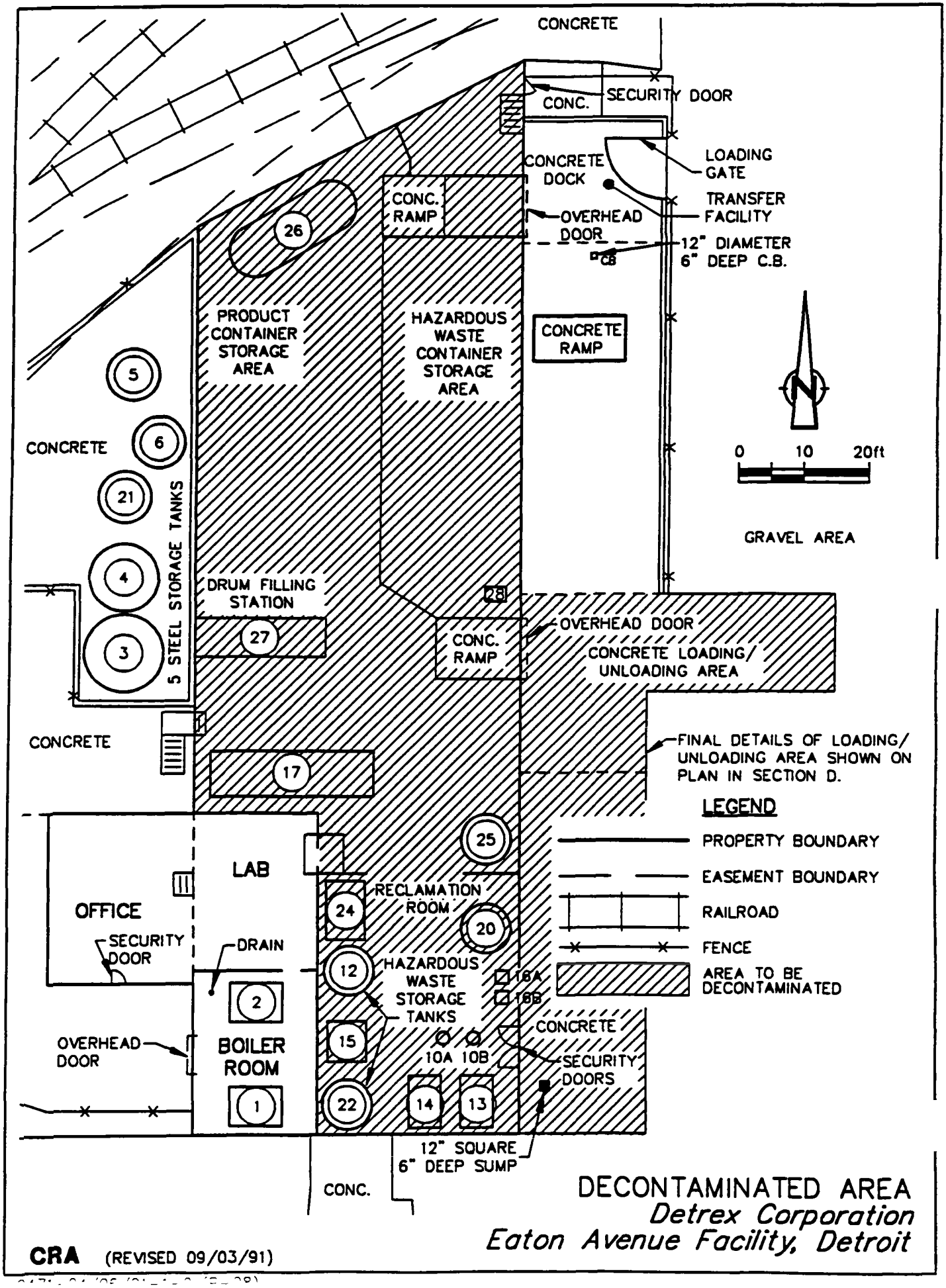
SCHEDULE OF CLOSURE

ATTACHMENT I-3

DECONTAMINATED

AREA

ATTACHMENT I-3



DECONTAMINATED AREA
Detrex Corporation
Eaton Avenue Facility, Detroit

CRA (REVISED 09/03/91)

Entire Attachment

Revised by MDNR

ATTACHMENT I-4

SAMPLING AND ANALYSIS PLAN

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A.3.0 SAMPLE COLLECTION AND ANALYSIS PROTOCOLS

A.3.1 GENERAL SAMPLING PROTOCOLS

The following protocols will be employed during all sampling throughout this program:

1. Prior to drilling the initial and all subsequent locations, the drilling rig and all drilling equipment will be cleaned according to the protocol established in Section A.4.0.

2. All sampling instruments and equipment used in collecting samples for chemical analysis will be cleaned in accordance with the protocol presented in Section A.4.0 prior to sampling at each location.

3. A new pair of disposable latex gloves will be used at each location to be sampled for chemical analyses. Additional glove changes will be undertaken as conditions warrant.

Additional protocols specific to each sampling method are presented in the following sections.

A.3.2 SUBSURFACE SOIL SAMPLING

Subsurface soil sampling will be conducted according to the following protocols:

1. Split-spoon soil samples collected for chemical analysis will be obtained and prepared in the following manner:

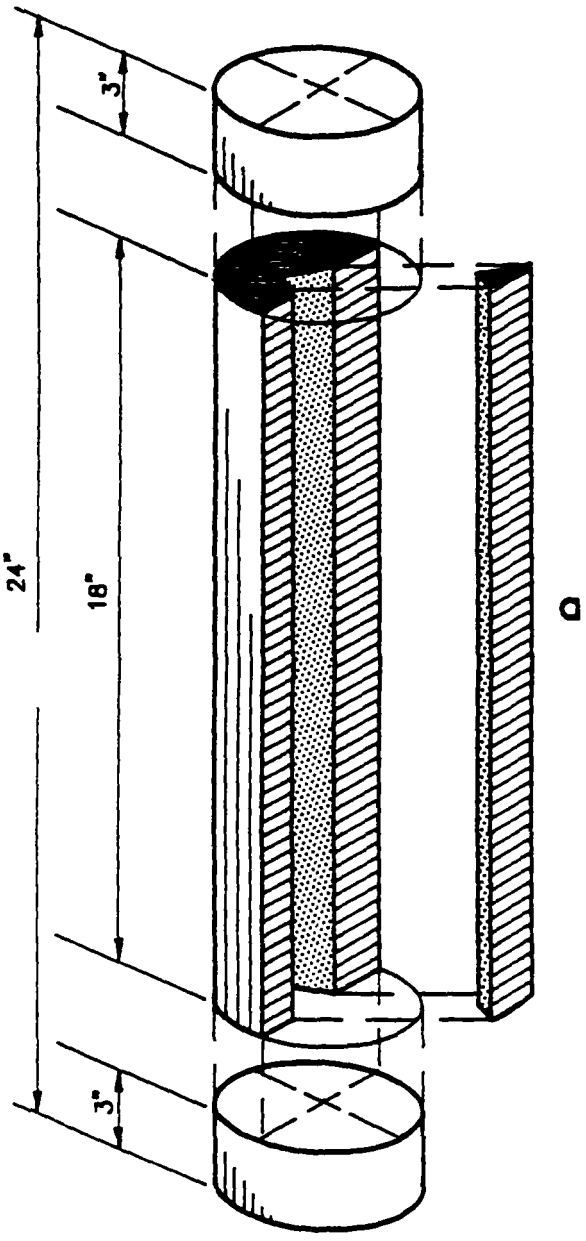
   a) The split-spoon sampler will be removed to a sample preservation station and opened.

   b) Using a clean cutting tool (stainless steel knife) a thin section will be removed from the top and bottom of the core and discarded, as shown on Figure A.1.

   c) The remaining core will be cut in half longitudinally. From the center of the core a continuous soil sample will be taken using a clean spatula.

2. Sample containers will be prepared using washing procedures that meet or exceed the requirements of the specified methods. Sample containers will be shipped to the site in sealed containers from a single lot of prepared jars.

3. A blind, duplicate sample will be collected.



TYPICAL SOIL CORE

a

PORTION OF SAMPLE FOR CHEMICAL ANALYSIS

- CONTACT WITH UNSTERILIZED MATERIALS IS NOT ACCEPTABLE
- CONTAINER: PRECLEANSED 100ml. AMBER GLASS
- GASKET – TEFLON
- STORAGE – REFRIGERATED (4°C)
- SHIPPING – ON ICE BY COURIER TO DESIGNATED LAB

figure A.1

SOIL SAMPLE SELECTION DETAIL

Detrex Corporation

Eaton Avenue Facility, Detroit

CRA

2471-30/07/91-10-0 (D-03)

A.3.4 SAMPLE LABELING AND CONTROL

Sample labeling and control will be consistent with MDNR and USEPA requirements and procedures. These procedures are discussed below.

ABLE A.1

FIELD QUALITY CONTROL PROCEDURES

Matrices	*Trip Blank*	*Field Blank/Rinsate*	*Blind Duplicate*	*Matrix Spike/ Matrix Spike Duplicates (1)*
Soil	--	--	1	1

Note:

(1) Additional sample (three times the designated value) will be collected for matrix spiking purposes.

A.3.4.2 Sample Shipment

All samples will be placed in coolers and iced to 4°C (±2°C) after collection and labeling. The groundwater and soil samples will be placed in separate coolers. All samples will be delivered to the laboratory within 24 hours of sample collection.

Samples will be transported directly to the analytical laboratory by Detrex or the sampling team.

Table A.2 presents a summary of sample collection, preservation and shipping requirements established for both water and soil matrices.

A.3.4.3 Chain-of-Custody-Records

Chain-of-custody records will be used to track all samples from the time of sampling to the arrival of samples at the laboratory.

ABLE A.2

SAMPLE COLLECTION, PRESERVATION AND SHIPPING PROTOCOL SUMMARY

Matrix	*Parameter*	*Bottles/Jars*	*Preservatives*	*Holding Time (1)*	*Shipping*	*Packaging*
Soil	TCL VOCs	- 250 ml glass jar with teflon lid	- iced to 4°C (± 2°C)	- 14 days	- personal delivery	- Cooler, Cushioning (i.e. bubble pack, foam)

Notes:

(1) Sample holding time will be calculated from the time of sample collection.

A.4.0 EQUIPMENT CLEANING PROTOCOLS

Prior to mobilization, the drilling rig and all associated equipment will be thoroughly cleaned to remove oil, grease, mud and other foreign matter. In addition, before initiating drilling at each location, the augers, cutting bits, samplers, drill steel and associated equipment will be thoroughly cleaned, at a Decon area established on-Site, to prevent potential cross-contamination from the previous drilling location. Rinse water from drill rig cleaning will be discharged to surface away from the borehole locations. The equipment will be inspected after cleaning and prior to initiation of drilling. Cleaning will be accomplished by flushing and wiping the components to remove all visible sediments followed by a thorough high pressure steam wash and rinsing. Special attention will be given to the threaded sections of the drill rods.

All equipment used for the collection of samples for chemical analysis including bailers, pumps and trowels or split-spoons will be cleaned between each sampling location/interval according to the following protocol:

- rinse with deionized water;
- rinse with isopropanol;
- rinse with deionized water; and
- allow to air dry.

The bottom three feet of the water level measuring equipment will be cleaned prior to use in each well with an isopropanol and deionized water rinse.

Rinse water from sample collection equipment decontamination will be containerized and characterized for eventual disposal in accordance with all federal and State regulations.

Equipment will be protected from all forms of solvent contact between final rinse and initial use.

Attachment 6

Closure Cost Estimate

I-3 CLOSURE COST ESTIMATE [40 CFR §270.13(b)(15), 264.142]

The closure cost information is presented in accordance with proper requirements. The estimate assumes complete third party costs. The total closure cost for the closure of the Detrex Corporation facility's hazardous waste storage area is estimated at $89,370 (1991 dollars). Attachment I-4 provides a closure cost estimate. Activities include removal of waste inventory, decontamination and closure certification.

The cost estimate assumptions made are:

1) All hazardous waste will be transported off site to a permitted facility in accordance with all State and Federal regulations.

2) Labor costs are presented at $29.00 per hour to account for labor costs and $34.00 per hour for supervisors. All labor rates reflect commercial rates and include fringe benefits, payroll burden and taxes.

3) Total costs include a 10% contingency for administrative and 25% contingency for miscellaneous operating costs.

This closure cost estimate will be maintained at this facility. It will be revised whenever a change in the closure plan affects the cost of closure. It will be adjusted as required by pertinent regulations.

ATTACHMENT I-4

CLOSURE COST ESTIMATE (1991 $)

Item	*Activity*	*Estimated Cost*
6.	Closure Certification	
	a) outside consultant to review final closure plan and certify closure	$ 5,000
	b) disbursements including office expenses and travel expenses	1,000
	Subtotal 6	$ 6,000
	Subtotal(1 to 6)	$ 66,198
	Administration (10%)	$ 6,620
	Contingency (25%)	$ 16,550
	Total	$ 89,368

ATTACHMENT I-4

CLOSURE COST ESTIMATE (1991 $)

Item	*Activity*	*Estimated Cost*
1.	Removal and Off-Site Disposal of Final Waste Inventory	
	a) transfer tank and drum inventory to bulk hazardous waste transport vehicles.	
	- labor: 4 man days @ $232/day	$ 928
	- supervision: 2 man days @ $272/day	544
	- protective safety equipment @ $100/man day	600
	Subtotal 1	$ 2,072
2.	Transportation and Disposal of Waste Inventory at Permitted Off-Site Facility	
	a) transportation 3 loads @ $2,200/load	$ 6,600
	b) disposal 13,750 gallons @ $2.60/gallon	35,750
	Subtotal 2	$ 42,350
3.	Drum Handling	
	a) rinse 150 drums and containerize rinsate	
	- labor: 4 man days @ $232/day	$ 928
	- supervision: 2 man days @ $272/day	544
	- protective safety equipment @ $100/man day	600
	- transport and dispose 4 drums @ $400/drum	1,600
	Subtotal 3	$ 3,672

ATTACHMENT I-4

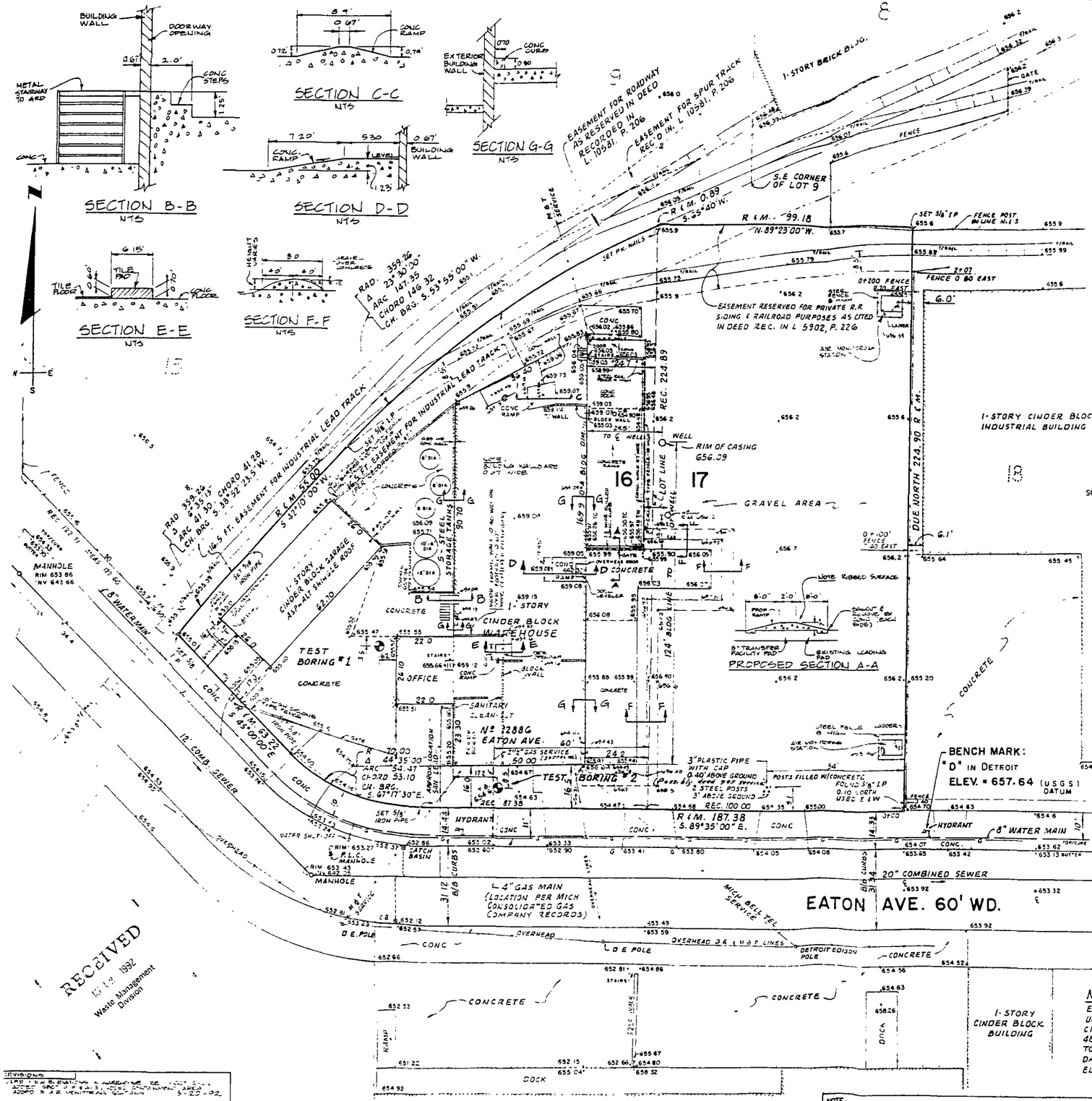
CLOSURE COST ESTIMATE (1991 $)

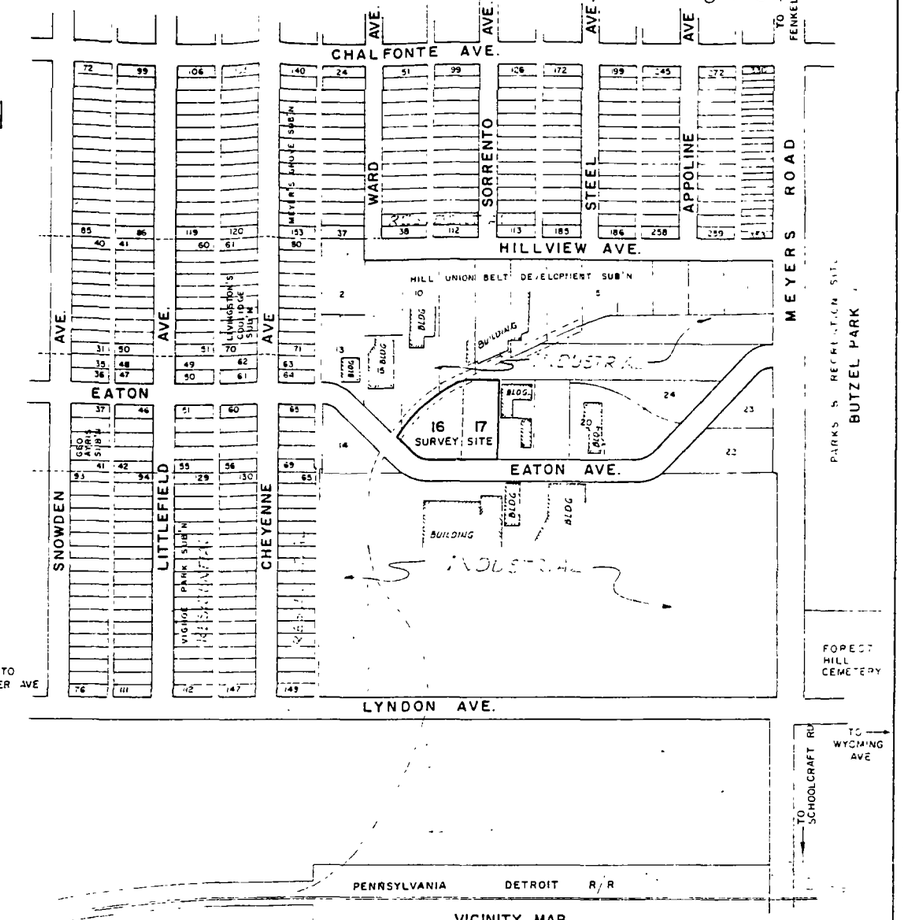
Item	*Activity*	*Estimated Cost*
4.	Tank and Process Line Decontamination	
	a) remove and drum tank sludge/scale	
	- labor: 1 man day @ $232/man day	$ 232
	- supervision: 1/2 man day @ $272/man day	136
	- protective safety equipment @ $100/man day	150
	- transport and dispose 3 drums @ $400/drum	1,200
	b) decontamination tank and process lines	
	- labor 2 man days @ $232/man days	464
	- supervision 1 man day @ $272/man day	272
	- equipment @ $400/day	400
	- protective safety equipment @ $100/man day	300
	- transport and dispose 4 drums @ $400	1,600
	Subtotal 4	$ 4,754
5.	Sweep and clean secondary containment area (including loading/unloading area)	
	- labor: 8 man days @ $232/man day	$ 1,856
	- supervision: 2 man days @ $272/man day	544
	- equipment: @ $400/day	800
	- rinsate sampling and analysis @ $350/sample	1,750
	- transport and dispose 6 drums @ $400/drum	2,400
	Subtotal 5	$ 7,350

Attachment 7

Facility Drawings, and Engineering Plans and Specifications

Drawing 7-1





VICINITY MAP

SCALE: 1" = 200

LEGAL DESCRIPTION

LOTS 16 AND 17 OF "HILL UNION BELT DEVELOPMENT SUBDIVISION", BEING THE N. 1/2 OF THE S.E. 1/4 OF THE N. W. 1/4 OF SEC. 20, T. 1 S., R. 11 E., CITY OF DETROIT, WAYNE COUNTY, MICHIGAN, ACCORDING TO THE PLAT THEREOF RECORDED IN THE OFFICE OF THE REGISTER OF DEEDS FOR WAYNE COUNTY, MICHIGAN IN LIBER 60 OF PLATS ON PAGE 62;

SUBJECT HOWEVER TO A PERMANENT EASEMENT HERETOFORE GRANTED TO THE PENNSYLVANIA, OHIO AND DETROIT RAILROAD OVER A STRIP OF LAND ON THE N'LY SIDE OF SAID LOTS FOR AN INDUSTRIAL RAILROAD TRACK AS PER DEED RECORDED IN L.2298 OF DEEDS ON P. 176-178 WCR, AND,

RESERVING TO THE SELLERS, THEIR HEIRS AND ASSIGNS, AN EASEMENT OVER AND ACROSS THE N.E.'LY AND N'LY REAR PORTIONS OF SAID LOTS 16 & 17 DESCRIBED AS ALL THAT PORTION OF SAID LOTS LYING N'LY AND N.W.'LY OF A LINE EXTENDING ACROSS SAID LOTS THAT IS 8½ FEET S'LY OF THE CENTER OF THE RAILROAD SIDING AS PRESENTLY INSTALLED AND IN USE CONNECTING WITH THE TRACK OF THE PENNSYLVANIA, OHIO AND DETROIT RAILROAD COMPANY; THE SAID EASEMENT TO COVER THE RIGHT TO USE THE SAME FOR PRIVATE RAILROAD SIDING AND RAILROAD SERVICES OVER SAME TO THE SAID PENNSYLVANIA, OHIO AND DETROIT RAILROAD, JOINTLY WITH ALL OTHER OWNERS OF LOTS 18, 19, 20, 21, 22, 23 AND 24 OF HILL UNION BELT DEVELOPMENT SUBDIVISION AFORESAID, SO THAT RAILROAD SERVICE MAY BE HAD BY ALL OTHER OWNERS ALONG THE LENGTH OF THE SIDING AS NOW INSTALLED AND IN USE.

NOTE:

ABOVE DESCRIPTION IS FROM DEED TO DETROIT REX PRODUCTS COMPANY DATED DEC. 30, 1941, RECORDED JANUARY 8, 1942 IN LIBER 5902, DEEDS, PAGE 226.

CERTIFICATION

WE HEREBY CERTIFY THAT WE HAVE SURVEYED THE PROPERTY HEREON DELINEATED AND THAT THE DISTANCES SHOWN ARE TRUE AND CORRECT BY ACTUAL FIELD MEASUREMENTS AND THAT THERE ARE NO ENCROACHMENTS UNLESS OTHERWISE SHOWN.

DATE: July 11, 1985

WARNER, CANTRELL & PADMOS, INC.

BY: Donald A. Beaupied

DONALD A. BEAUPIED, REG. LAND SURVEYOR #11512

NOTE:

ELEVATIONS SHOWN ARE BASED ON U.S.G.S. DATUM. TO OBTAIN CITY OF DETROIT DATUM SUBTRACT 480.27 FROM ELEVATIONS SHOWN TO OBTAIN U.S.C. & G.S. DATUM DATUM SUBTRACT 0.51 FROM ELEVATIONS SHOWN

NOTE:

THE WAYNE COUNTY AIR POLLUTION CONTROL OFFICE (224-4650) REPORTS THROUGH THEIR METEOROLOGIST, DAVID DERENZO, THAT THE PREVAILING WINDS ARE OUT OF THE SOUTHWEST. THIS INFORMATION IS BASED ON NATIONAL WEATHER SERVICE RECORDS ON FILE IN THEIR OFFICE.

DATE	July 11 1985
REVISIONS:	JULY 23 1985
	ADD TEST BORING & WELL LOCATION INFO APRIL 10 1989

PLAN OF SURVEY OF LOTS 16 & 17 OF "HILL UNION BELT DEVELOPMENT SUBDIVISION" BEING THE N ½ OF THE S.E. 1/4 OF THE N.W 1/4 OF SEC 20, T 1 S, R 11 E, CITY OF DETROIT, WAYNE CO., MICH (L. 60, P. 62)

SCALE: 1" = 20' | DATUM: U.S.G.S. "SEE NOTE ABOVE"

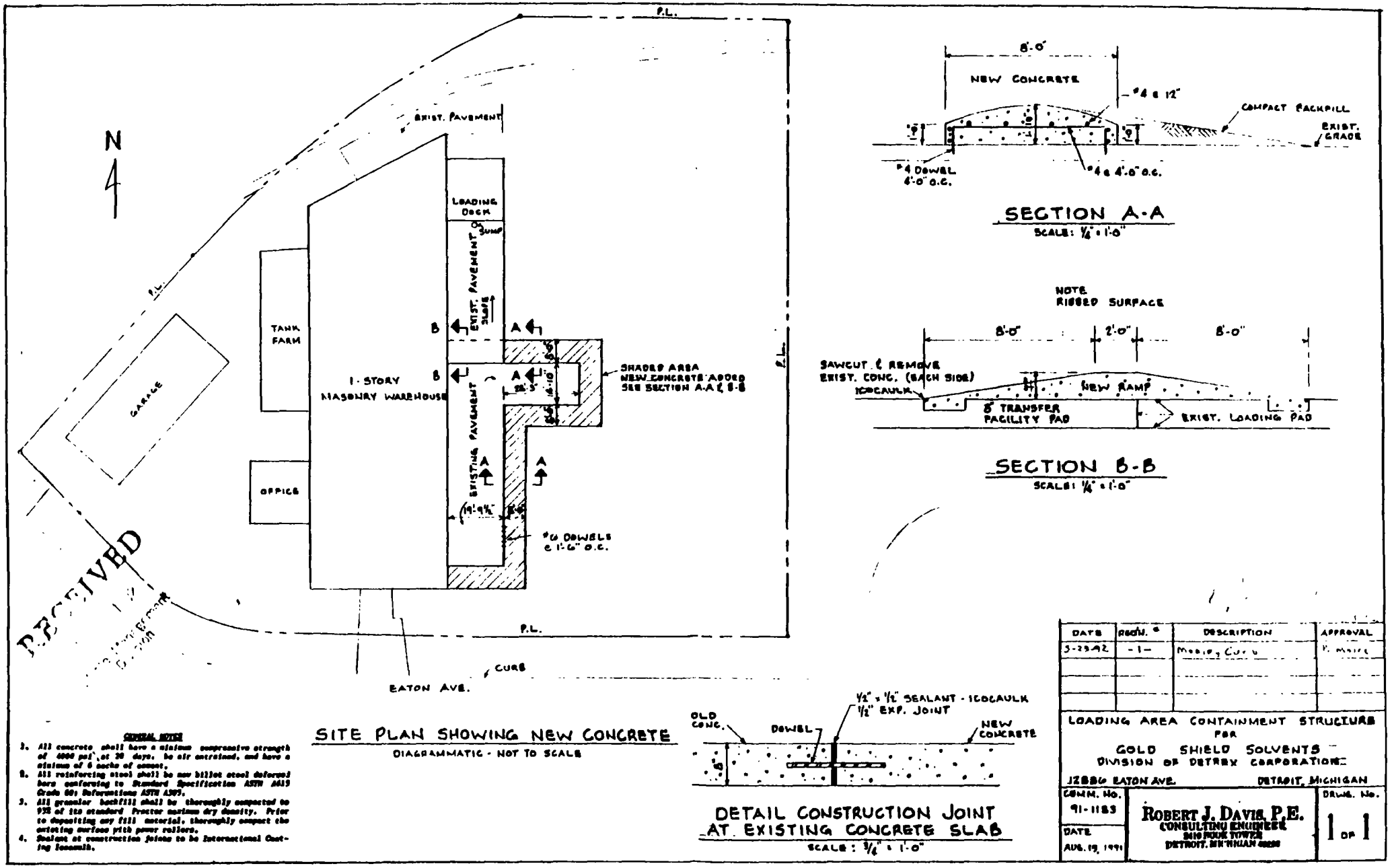
WARNER, CANTRELL & PADMOS, INC.
CIVIL ENGINEERS AND LAND SURVEYORS
20788 ORCHARD LAKE RD
313-478-9494 FARMINGTON HILLS MI 48024

JOB NO. 10-0462

PLAN FILE

N.B. G.J.

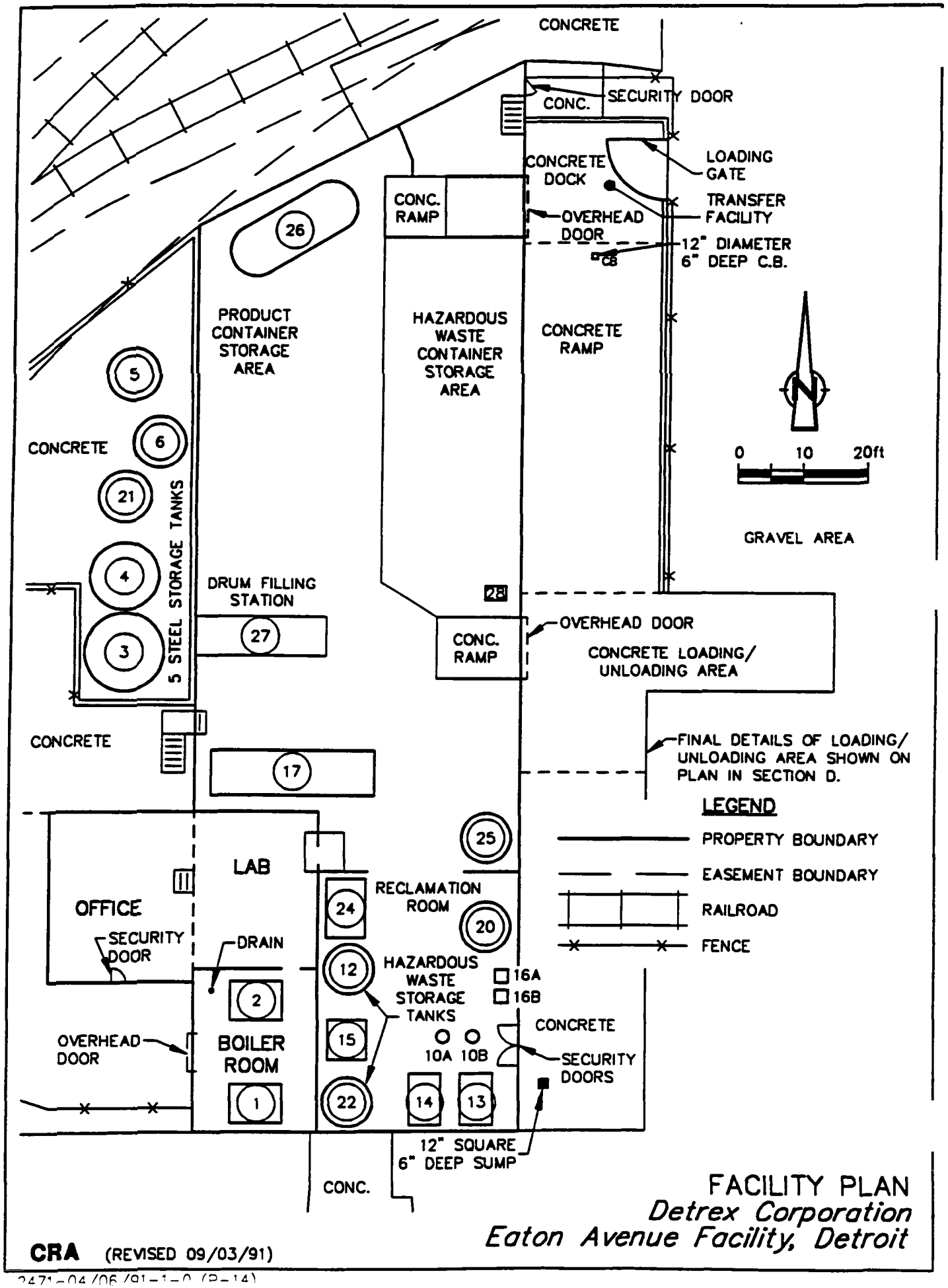
SHEET 1 OF 1


N
P.L.
EXIST. PAVEMENT
LOADING DOCK
SUMP
EXIST. PAVEMENT
SLOPE
TANK FARM
GARAGE
OFFICE
1-STORY MASONRY WAREHOUSE
B
A
SHADED AREA NEW CONCRETE ABOVE SEE SECTION A-A & B-B
EXISTING PAVEMENT
#6 DOWELS @ 1'-6" O.C.
EATON AVE.
CURB
RECEIVED
NEW CONCRETE
8'-0"
#4 @ 12"
COMPACT BACKFILL
EXIST. GRADE
#4 DOWEL 6'-0" O.C.
#4 @ 4'-0" O.C.
SECTION A-A
SCALE: 1/4" = 1'-0"
NOTE RIBBED SURFACE
8'-0"
2'-0"
8'-0"
SAWCUT & REMOVE EXIST. CONC. (EACH SIDE)
ICECAULK
NEW RAMP
5" TRANSFER FACILITY PAD
EXIST. LOADING PAD
SECTION B-B
SCALE: 1/4" = 1'-0"
SITE PLAN SHOWING NEW CONCRETE
DIAGRAMMATIC - NOT TO SCALE
OLD CONC.
DOWEL
1/2" x 1/2" SEALANT - ICECAULK
1/2" EXP. JOINT
NEW CONCRETE
DETAIL CONSTRUCTION JOINT AT EXISTING CONCRETE SLAB
SCALE: 3/4" = 1'-0"
GENERAL NOTES
1. All concrete shall have a minimum compressive strength of 4000 psi at 28 days, be air entrained, and have a minimum of 6 sacks of cement.
2. All reinforcing steel shall be new billet steel deformed bars conforming to Standard Specification ASTM A615 Grade 60; Deformations ASTM A305.
3. All granular backfill shall be thoroughly compacted to 95% of its standard Proctor maximum dry density. Prior to depositing any fill material, thoroughly compact the existing surface with power rollers.
4. Sealant at construction joints to be International Chemical Ice-Cauk.
DATE
REGN. #
DESCRIPTION
APPROVAL
3-25-92
-1-
Modify Curb
LOADING AREA CONTAINMENT STRUCTURE FOR GOLD SHIELD SOLVENTS DIVISION OF DETREX CORPORATION
12886 EATON AVE.
DETROIT, MICHIGAN
COMM. NO. 91-1183
DATE AUG. 19, 1991
ROBERT J. DAVIS, P.E.
CONSULTING ENGINEER
DRWG. NO.
1 OF 1

Drawing 7-2

Drawing 7-3

ATTACHMENT D-1



2471-04/06/91-1-0 (P-14)

Date: 09/03/91
Revision: 91-2

LIST OF PROCESS EQUIPMENT

I.D. No.	*Equipment Name*	*Description*
1.	Generator	Clayton Model E-100 Steam Generator. Unit burns natural gas to produce steam at the rate of 3450 lbs./hr. at 100 psig.
2.	Air Compressor	
3.	20,000 gal. Product Tank	20,000 gallon carbon steel storage tank for storage of 1,1,1 Trichloroethane.
4.	10,000 gal. Product Tank	10,000 gallon carbon steel storage tank for storage of Trichloroethylene
5.	4,500 gal. Product Tank	4,500 gallon carbon steel storage tank for storage of Perchloroethylene.
6.	4,500 gal. Product Tank	4,500 gallon carbon steel storage tank for storage of Trichloroethylene
10 A/B	2 - 600 gal. Receiver Tanks	Used for receiving product from Detrex stills. (Operated at atm. pressure).
12.	2,300 gal. Hazardous Waste tank storage tank	2,300 gallon carbon steel storage tank used for storage of F001 or F002 material prior to processing
13.	350 gal. Detrex Still	Detrex Model S-350. Used for recovering chlorinated solvents from spent solvents from degreasing operations (F001 material) via distillation. This unit can process approximately 2,000 gallons/day.
14.	350 gal. Detrex Still	Detrex Model S-600. Used for recovering chlorinated solvents from spent solvents from degreasing operations (F001 material) via distillation. This unit can process approximately 2,000 gallons/day.
15.	DCI Still	DCI Model Dyna-1-100 Solvent Recovery Still. Used to recover chlorinated solvents from still bottoms from recovery of same (F002 material) via live steam injection. This unit can process approximately 100 gallons per hour.
16 A/B	Drying Columns	Detrex Dual Column Drier. Used to remove water from recovered product (solvent) via adsorption.

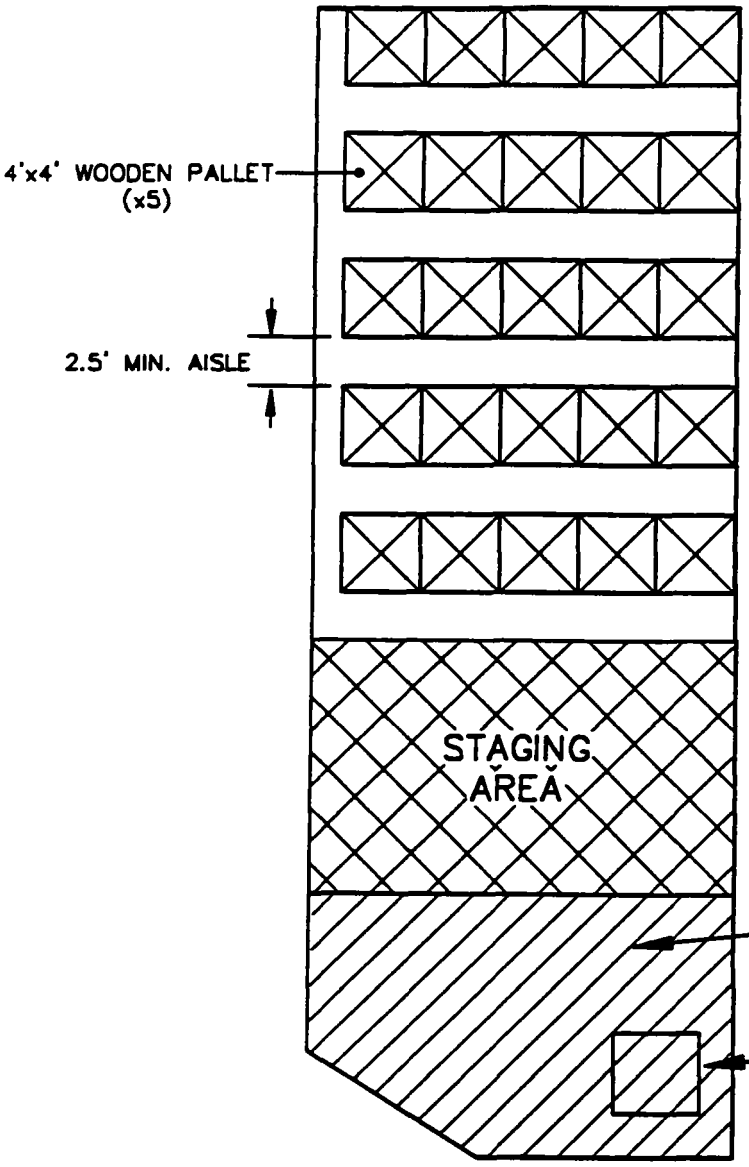
Date: 09/03/91
Revision: 91-2

LIST OF PROCESS EQUIPMENT

I.D. No.	*Equipment Name*	*Description*
17.	5,000 gal. Still Bottom Tank	5,000 gallon carbon steel storage tank. Used for temporary accumulation of still bottoms from recovery of chlorinated solvents (F002 material).
20.	2,500 gal. Holding Tank	2,500 gallon 316 stainless steel storage tank used for storage of reclaimed solvent.
21.	4,500 gal. 1,1,1 Trichloroethane	4,500 gallon carbon steel storage tank for storage of 1,1,1 Trichloroethane.
22.	4,500 gal. Hazardous Waste Storage Tank	4,500 gallon carbon steel storage tank used for temporary storage of F001 or F002 material prior to being processed by Detrex stills.
24.	DCI Still	DCI Model Dyna-1-500 Solvent Recovery Still. Used to recover chlorinated solvents from still bottoms from recovery of same (F002 material) via live steam injection. This unit can process approximately 500 gallons per hour.
25.	3,000 gal. Holding Tank	3,000 gallon 316 stainless steel storage tank used for storage of reclaimed solvent.
26	SVRM - Carbon Absorption Unit	
27.	Drum Filling Station	Product Drumming Station. Used for filling 55-gallon drums with product. Unit can fill approximately 30 drums per hour and is operated as necessary.
28.	Product Blending Vessel	550 gallon carbon steel vessel utilized for product blending.

Drawing 7-4

ATTACHMENT D-3

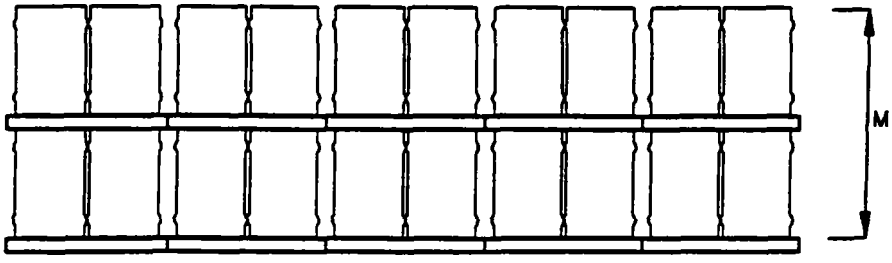


NOTES:

1) DRUMS STORED IN VERTICAL POSITION
2) DRUMS ARE PLACED UP TO 2 LAYERS HIGH IF NECESSARY
3) LOWER ROW OF DRUMS TO BE PLACED ON 4'x4' WOODEN PALLETS
4) A MINIMUM AISLE SPACE OF 2.5' BETWEEN ROWS IS TO BE MAINTAINED AT ALL TIMES

OTHER DOT APPROVED CONTAINERS TYPICALLY STORED HERE

PRODUCT BLENDING VESSEL

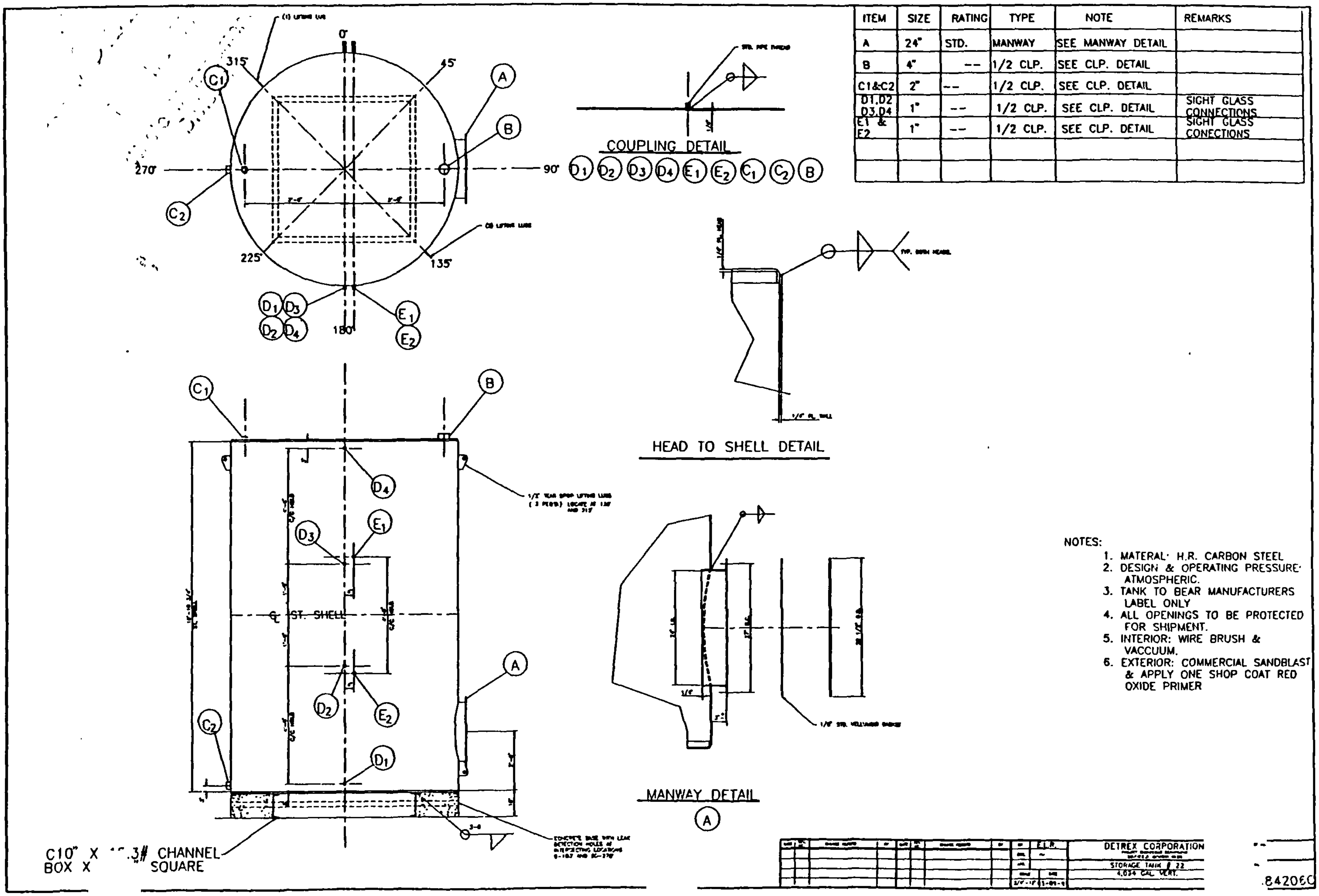


TYPICAL DRUM STACK PROFILE
(1"=5')

TYPICAL CONTAINER ARRANGEMENT
Detrex Corporation
Eaton Avenue Facility, Detroit

CRA (REVISED 09/03/91)

Drawing 7-5

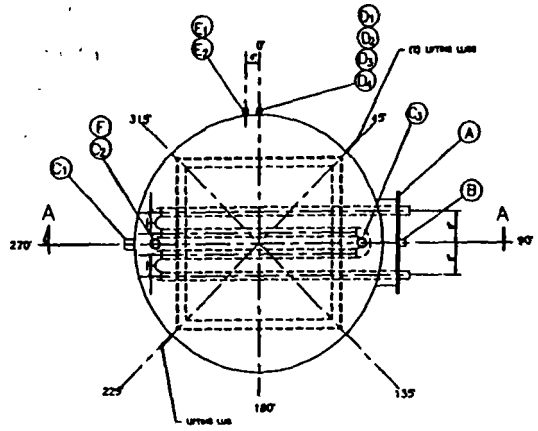


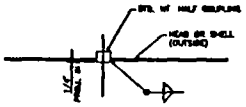
ITEM	SIZE	RATING	TYPE	NOTE	REMARKS
A	24"	STD.	MANWAY	SEE MANWAY DETAIL	
B	4"	--	1/2 CLP.	SEE CLP. DETAIL	
C1&C2	2"	--	1/2 CLP.	SEE CLP. DETAIL	
D1,D2 D3,D4	1"	--	1/2 CLP.	SEE CLP. DETAIL	SIGHT GLASS CONNECTIONS
E1 & E2	1"	--	1/2 CLP.	SEE CLP. DETAIL	SIGHT GLASS CONECTIONS

NOTES:

1. MATERAL: H.R. CARBON STEEL
2. DESIGN & OPERATING PRESSURE: ATMOSPHERIC.
3. TANK TO BEAR MANUFACTURERS LABEL ONLY
4. ALL OPENINGS TO BE PROTECTED FOR SHIPMENT.
5. INTERIOR: WIRE BRUSH & VACCUUM.
6. EXTERIOR: COMMERCIAL SANDBLAST & APPLY ONE SHOP COAT RED OXIDE PRIMER

Drawing 7-6

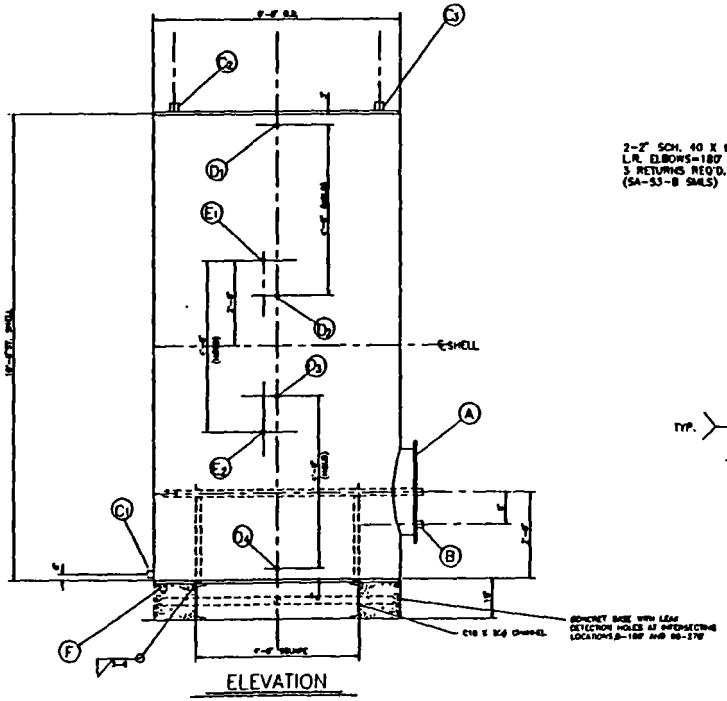


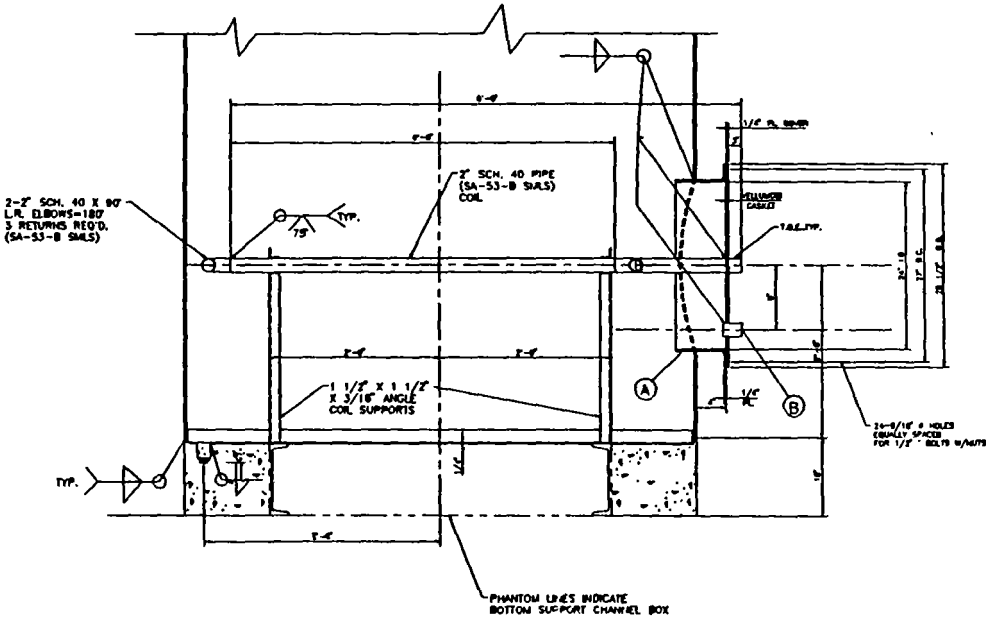


ITEM	RATING	PROJ. IN	QUANT.	REMARKS	NOYE
A	24" STD. U.L. MANWAY	1/4"	1	SEE SECTION A-A	MANHOLE W/COIL
B	1 1/2" STD. WT HALF CPLG	1/4"	1	SEE SECTION A-A	TEMP. PROBE
C1,C2&C3	2" STD. WT. HALF CPLG.	1/4"	1 EA.	SEE DETAIL "C"	
D1,D2,D3 & D4	1" STD. WT. HALF CPLG.	1/4"	1 EA.	SEE DETAIL "C"	SIGHT GLASS CONN
E1 & E2	1" STD. WT. HALF CPLG.	1/4"	1 EA.	SEE DETAIL "C"	SIGHT GLASS CONN
F	2" STD. WT. HALF CPLG.	0"	1	SEE SECTION A-A	DRAIN W/PLUG

NOTES

1. MATERAL: H.R.C.S.
2. TANK DESIGN & OPERATING PRESSURE: ATMOSPHERIC
3. TANK TO BE AIR TESTED W/ A SOAP-SUDS SOLUTION
4. COIL DESIGN & OPERATING PRESSURE: 150 P.S.I.G.
5. COIL HYDROSTATIC TEST PRESSURE: 225 P.S.I.G.
6. ALL OPENINGS TO BE PROTECTED FOR SHIPMENT
7. INTERIOR: WIRE BRUSH & VACUUM
8. EXTERIOR: COMMERCIAL SANDBLAST & APPLY ONE SHOP COAT RED OXIDE PRIMER



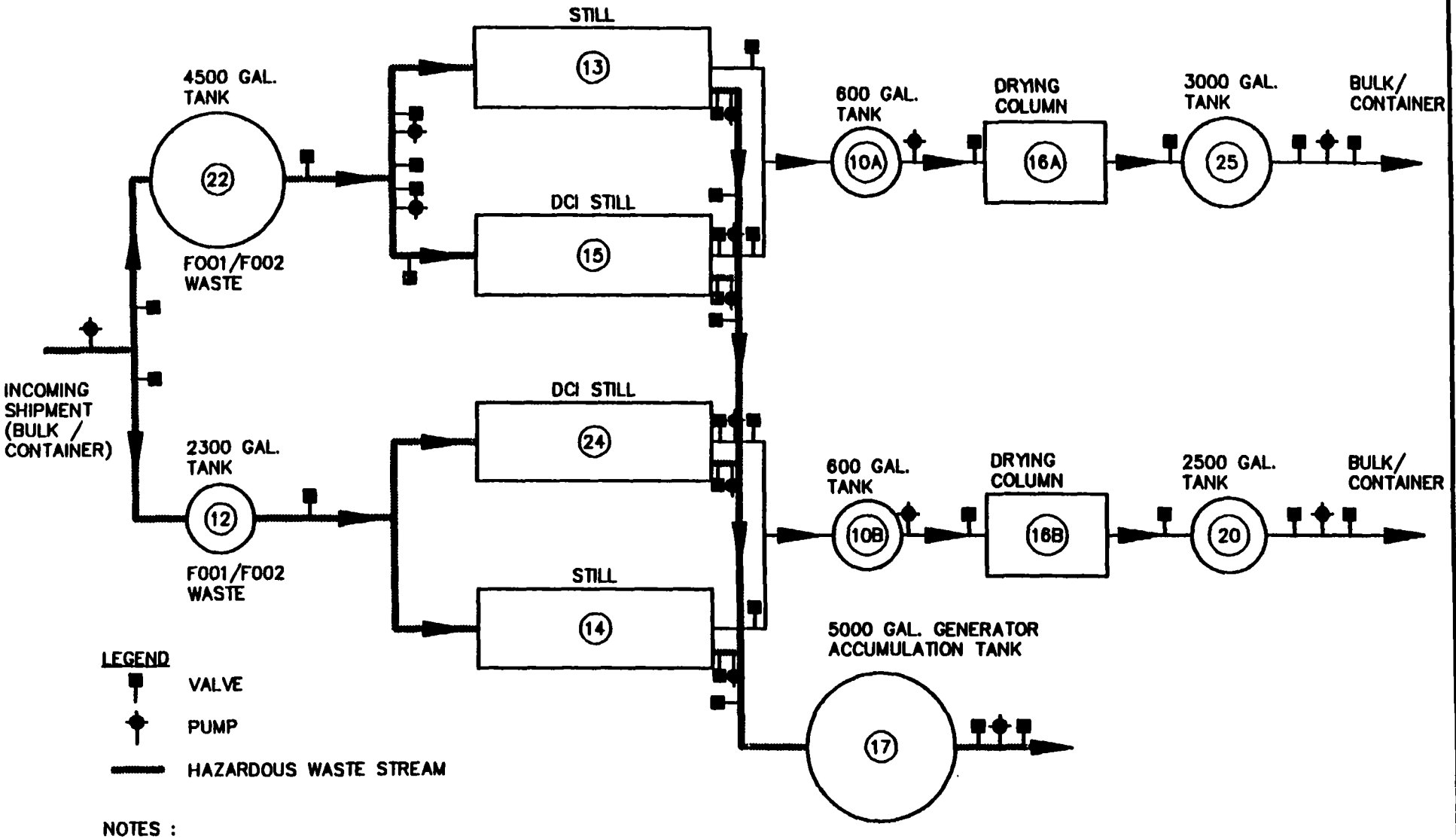


DETREX CORPORATION

STORAGE TANK # 12
2500 GAL. VERT.

HW8518C

Drawing 7-7



NOTES :
DCI STILL – AUTOMATIC FEED
DETREX STILL – MANUAL FEED
TANK 22 IS OPERATED AS 3600 GAL. TANK
TANK 12 IS OPERATED AS 1900 GAL. TANK

(REVISED 09/03/91)

PROCESS FLOW DIAGRAM
Detrex Corporation
Eaton Avenue Facility, D it

ATTACHMENT D-5

CRA

2471-30/0 1-0 (P-19)

CERTIFICATION

I certify under penalty of law that, based upon my review of the below listed documents, that the information provided, and design is accurate as drawn and installed in the same manner.

I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Documents:

1. Warner, Cantrell & Padmos, Inc.
   Drawing Name: Plan of Survey of Lots 16 & 17 of Hill Union Belt Development Subdivision.

   Drawing No.: (Job No.) 900408 Dated July 11, 1985
   Revision of: 3-20-92

2. Robert Davis, P.E.
   Drawing Name: Loading Area Containment Structure

   Drawing No.: Comm. No. 91-1183 Dated 8-15-91

   Revision No.: 1 Dated 3-23-92

3. Detrex Corporation
   Drawing Name: Storage Tank #12

   Drawing No.: HW8518C Dated 3-9-92
   Revision No.: No revisions

4. Detrex Corporation
   Drawing Name: Storage Tank #22

   Drawing No.: HM84206C Dated 3-9-92

   Revision No.: No revisions

Certified by:

Signature: I. H. Shamiyeh
Name: I. H. Shamiyeh
Company: Detrex Corporation

Professional Engineer
Registration No. 11222

State: Michigan

Date: 03/23/1992

Attachment 8

Acceptable Waste Types for Container and Tank Storage

ACCEPTABLE WASTE TYPES FOR CONTAINER AND TANK STORAGE

TABLE C-1

LIST OF HAZARDOUS WASTES

Hazardous Waste	*EPA Hazardous Waste Number* (1)	*Hazardous Constituent/Characteristic*	*EPA Process Code*	*Physical State*
1,1,1 Trichloroethane	F001	Toxic	S01/S02	Liquid
Trichloroethylene	F001	Toxic	S01/S02	Liquid
Perchloroethylene	F001	Toxic	S01/S02	Liquid
Methylene chloride	F001	Toxic	S01/S02	Liquid
Trichlorotrifluoroethane (Freon)	F001	Toxic	S01/S02	Liquid
1,1,1 Trichloroethane	F002	Toxic	S01/S02	Semi-Liquid*
Trichloroethylene	F002	Toxic	S01/S02	Semi-Liquid*
Perchloroethylene	F002	Toxic	S01/S02	Semi-Liquid*
Methylene chloride	F002	Toxic	S01/S02	Semi-Liquid*
Trichlorotrifluoroethane (Freon)	F002	Toxic	S01/S02	Semi-Liquid*

(1) Detrex recognizes, based on process knowledge, that these wastes may also be classified as one of the following D-series compounds based on Toxicity Characteristic Leaching Procedure: D004(Arsenic), D005(Barium), D006(Cadmium), D007 (Chromium), D008 (Lead), D009 (Mercury), D010 (Selenium), D011 (Silver), D018 (Benzene), D019 (Carbon Tetrachloride), D021 (Chlorobenzene), D022 (Chloroform), D027 (1,4-Dichlorobenzene), D028 (1,2-Dichloroethane), D029 (1,1-Dichloroethylene), D030 (2,4-Dinitrotoluene), D034 (Hexachloroethane), D035 (Methyl Ethyl Ketone), D036 (Nitrobenzene), D038 (Pyridine), D039 (Tetrachloroethylene), D040 (Trichloroethylene) and D043 (Vinyl Chloride).

* Note: Represents a waste stream that has been partially distilled at the customer's degreasing operation facility.

Attachment 9

Preventive Procedures

SECTION F

PROCEDURES TO PREVENT HAZARDS

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PROCEDURES TO PREVENT HAZARDS

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SECTION F

PROCEDURES TO PREVENT HAZARDS

This section of the operating license application provides a description of the procedures implemented at the Detrex Corporation facility in Detroit, Michigan to prevent the possibility of a hazard from occurring.

This information is provided pursuant to Michigan Act 64 Rule 299.9504(1)(c) which incorporates 40 CFR 270.14(b) (8) by reference. The applicable section(s) of the Federal Regulations (40 CFR) is referenced as appropriate.

F-4 PREVENTIVE PROCEDURES, STRUCTURES AND EQUIPMENT [40 CFR §270.14(b)(8)]

F-4a Loading/Unloading Operations [40 CFR §270.14(b)(8)(i)]

Hazardous waste loading/unloading operations, associated with the container storage area, consists of internal forklift or hand drum truck movement of containers to the recycling room and the unloading of incoming containerized waste. Forklifts are equipped with a special drum handling attachment for transferring drummed waste.

The unloading of containerized hazardous wastes occurs at the middle overhead door on the east side of the building. The delivery truck backs up to the raised loading area. The containers are unloaded using a forklift with a drum handling attachment or hand drum trucks. The door of the loading area is diked with a concrete ramp to maintain secondary containment while allowing for easy movement of containers.

Bulk shipments of hazardous waste are periodically received at the facility via tanker trucks. Trucks enter from Eaton Avenue and park on the concrete pad located at the east side of the facility next to the south overhead door. Bulk waste is pumped directly into hazardous waste storage tanks from the delivery tanker truck via a system of vacuum tubing with quick release couplings installed within the facility. All pumping is conducted under procedures designed to minimize the risk of a possible spill of the hazardous waste.

All unloading operations are conducted under the supervision of Detrex personnel and the area used for unloading is inspected at the conclusion of unloading operations to ensure no spillage has occurred. In addition, the transport vehicle is inspected to ensure all wastes have been removed and no spillage has occurred during transporting or material transfer.

F-4b Run-off Control [40 CFR §270.14(b)(8)(ii)]

The hazardous waste container and tank storage areas are located within an enclosed building. This prevents accumulation of run-on waters in the hazardous waste and tank storage areas. As presented in Section B of this operating license application, surface runoff is directed away from the building structure in all areas except along a portion of the east wall. A 12-inch square, 6-inch deep sump is located within the concrete

loading/unloading area to provide runoff control. The accumulated runoff is tested in accordance with a Detroit Water and Sewerage Industrial Wastewater Discharge Permit. If the water meets the conditions of the permit, it is discharged into the municipal sanitary sewer system through a drain located in the Boiler Room. If the water fails to meet the permit requirements for direct discharge, it will be collected and containerized for off-site disposal in accordance with Federal, State and local regulations. A 12-inch diameter, 6-inch deep catchbasin is located within the Transfer Facility, however this is independent of the TSD operation and no accumulated liquids are discharged to the ground.

Attachment 10

Tank Spill and Overflow Prevention

SECTION D

PROCESS INFORMATION

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PROCESS INFORMATION

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D-2d Tank Operation [40 CFR §264.194]

With the recent redesignation of the two former process tanks as hazardous waste storage tanks, Detrex intends to operate the two tanks at less than their nominal capacity. The total tank storage design capacity of the Eaton Avenue facility is 5,500 gallons. The total nominal capacity of the two tanks is 6,800 gallons. Tank 12 will be operated at a storage capacity of 1,900 gallons and Tank 22 will be operated at a storage capacity of 3,600 gallons.

A permanent painted marking has been placed on each tank and on the sight glass which provides level control. By visually ensuring the level in either tank does not rise above the marked level, Detrex will ensure the design capacity is not exceeded. The sight glass is inspected daily, at minimum, as well as at any time that material is being charged into the tanks.

Attachment 11

Ambient Air Monitoring Plan

Revised by MDNR

Air Monitoring Plan
DETREX CORPORATION
SOLVENTS FACILITY
EATON AVE
DETROIT, MICHIGAN

Objective:

Michigan Department of Natural Resources, Waste Management Division under administrative rules of the Hazardous Waste Management Act (Act 64 of 1979) regulate the treatment, storage and disposal of hazardous waste in the state of Michigan.

Rule 504.1 (1)(f) of the administrative rules requires that licensed hazardous waste facilities have an air monitoring program which complies with the requirements of this standard.

The following Air Monitoring Plan was developed and implemented by DETREX to comply with this standard. The following plan outlines the procedures and parameters this plan will take.

Purpose:

DETREX Corporation operates a hazardous waste facility in Detroit, Michigan located in Wayne County. Currently this facility has filed an application to the Michigan Department of Natural Resources to receive a permit as required under Act 64 and Federal guidelines as listed in 40 CFR 264.

As required under Act 64, DETREX has formulated this Air Monitoring Plan. The purpose of the Air Monitoring Plan is not only to comply with the standard, but to enable DETREX to assess air emissions from the facility in order to reduce emissions if any were found.

At the completion of nine months of sampling, if results are below the Wayne County Air Control Divisions minimum detection limits, then DETREX will submit a request to discontinue the Air Monitoring Plan. If analytical results show non-detectable results on contaminants, then DETREX will request that this contaminant be eliminated from the requires analytical plan.

At the completion of the one year (12 months) analysis DETREX will contact Wayne County Air Pollution Control Division and review the submitted plan and data. At that time discussion will take place to determine if continued or reduced monitoring should take place.

Parameters and Associated Limits:

DETREX will provide three sampling devices as approved by the Wayne County Department of Public Health Air Pollution Control Division Technical Services. Sampling pump units will be located in an enclosed vented stainless steel locked enclosure. A tygon tube will extend out of the enclosure from the pump to the sampling tube or device. Pump enclosures will be located approximately 3 meters (9.84 feet) above grade level, except for enclosure for Sampler #3. Sampler #3 will be located on the eve of the cinder block building. The sampling probe will be set approximately 3.5 meters (11.5 feet). All samplers will be set so that obstructions are not prohibiting air flow to the sampler. All trees, bushes, or other obstruction will be cut or trimmed so as to not limit the air flow to the sampler.

The pump will provide a 24 hour sample at 50-200 cc/m.

Number of Samplers:

DETREX will provide three (3) samplers positioned in the following location;

Sampler #1: North-East corner of Lot 17.
Sampler #2: South-East corner of Lot 17.
Sampler #3: South-West corner of Lot 16 (location on eve of 1-story cinder block building)

Attachment number #1 shows locations of samplers.

Sampling:

Frequency:

The Air Monitoring Program will start on January 1, 1992. The first sample will be implemented on January 6, 1992. The pumps will be set for a continuous 24 hour run at 12:00 am on the 6th of January. The pumps will be turned off January 7, 1992 at 12:00 am. Samples will be taken every 6th day commencing from January 6, 1992, until June of 1992. At that time beginning with the first scheduled sample of June and continuing until the first scheduled sample in September, samples will be taken every three (3) days.

The scheduled time for starting and stopping sampling will be at 12:00 am of the scheduled day.

Attachment #2 shows the actual days of sampling.

Parameter:

Wayne County Air Control Division has outlined the containments which they are requiring we test and monitor for. Below are the parameters and the minimum detection limits.

CONTAMINANT	DETECTION LIMIT
1,1,1 Trichloroethane	1.0 ug/M^3
Carbon Tetrachloride	0.25 ug/M^3
Methylene Chloride	1.0 ug/M^3
Tetrachloroethylene	0.1 ug/M^3
Trichloroethylene	0.1 ug/M^3

Laboratory Analysis:

Air samples will be sent to an analytical laboratory capable of processing samples by methods approved by U.S. EPA and listed in 40 CFR Part 50. Detection limits for analysis, at a minimum will be as follows:

CONTAMINANT	ANALYTICAL LIMIT
1,1,1 Trichloroethane Carbon Tetrachloride Methylene Chloride Tetrachloroethylene Trichloroethylene	As needed to obtain above levels of detection.

Attachment #3 is the QA/QC plan for RTI Labs, one of the facilities which DETREX will be using.

Sample Transportation:

All samples will be put into a cooler which contains a freezer pack. Samples will be transported by DETREX or contract carrier to the laboratory doing the analysis.

Data Reporting:

Information obtained from the analysis of the samples will be reported to the Wayne County Air Pollution Control Division, This report will be generated on computer disk, in a format supplied by Wayne County Air Control Division.

The report will be sent VIA United States Mail, by the 30th of each month. Data submitted will be for the preceding month.

Reporting software will be provided at no cost by Wayne County Air Control Division to DETREX. The program supplied will be used to provide expeditious data to Wayne County in a format which can be easily compiled and utilized.

Any unusual events will be noted in the Monitoring Log which will be kept at the facility. Unusual events may be the result of a defective air sampler, a damaged or defective air sampler, accidental discharge of solvent material, transfer of waste from rail car siding, constructing, or any other influence which may cause unusual high or low readings.

COMPLETION SCHEDULE:

October 1, 1991	Plan Approval by Wayne County
October 2, 1991	Order monitoring equipment
October 1, 1991	Order security enclosures
November, 1991	Install enclosures
December, 1991	Test monitoring procedures Train personnel in sampling techniques
January 1992	Implement full Air Monitoring Plan

Personnel:

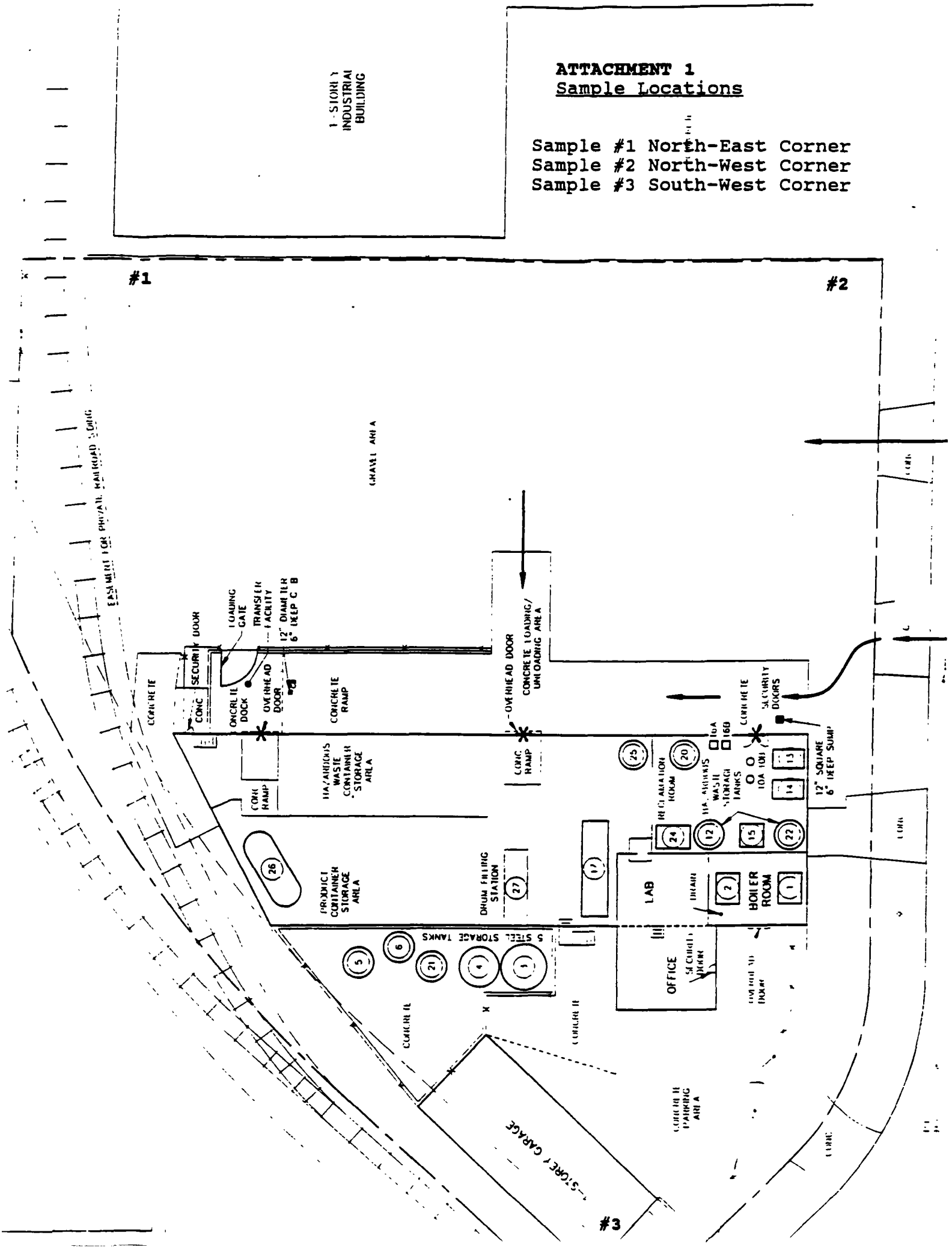
Facility personnel responsible for setting the equipment and removing the samples are the facility Manager and the Laboratory Quality Manager. These individuals will be trained by either and outside Environmental consultant firm which specializes in air monitoring, or/and the laboratory responsible for the analytical data.

Methodology:

DETREX will utilize approved EPA methods to obtaining samples.

ATTACHMENT 1
Sample Locations

Sample #1 North-East Corner
Sample #2 North-West Corner
Sample #3 South-West Corner



ATTACHMENT 2

SAMPLING FREQUENCY

SAMPLING SCHEDULE

January 6, 1992	Commence sampling every 6th day
January 12, 1992	
January 18, 1992	
January 24, 1992	
January 30, 1992	
February 5, 1992	
February 11, 1992	
February 17, 1992	
February 23, 1992	
February 29, 1992	Report for January monitoring due
March 6, 1992	
March 12, 1992	
March 18, 1992	
March 24, 1992	
March 30, 1992	Report for Febuary monitoring due
April 5, 1992	
April 11, 1992	
April 17, 1992	
April 23, 1992	
April 29, 1992	Report for March monitoring due
May 5, 1992	
May 11, 1992	
May 17, 1992	
May 23, 1992	
May 29, 1992	Report for APril monitoring due
June 4, 1992	Commence sampling every 3rd day
June 7, 1992	
June 10, 1992	
June 13, 1992	
June 16, 1992	
June 19, 1992	
June 22, 1992	
June 25, 1992	
June 28, 1992	Report for May monitoring due
July 1, 1992	
July 4, 1992	
July 7, 1992	
July 10, 1992	
July 13, 1992	
July 16, 1992	

ATTCHEMENT 2 (Cont)

July 19, 1992	
July 22, 1992	
July 25, 1992	
July 28, 1992	Report for June monitoring due
July 31, 1992	
August 3, 1992	
August 6, 1992	
August 9, 1992	
August 12, 1992	
August 15, 1992	
August 18, 1992	
August 21, 1992	
August 24, 1992	
August 27, 1992	
August 30, 1992	Report for July monitoring due
September 2, 1992	Commence sampling every 6th day
September 8, 1992	
September 14, 1992	
September 20, 1992	
September 26, 1992	Report for August monitoring due
October 2, 1992	
October 8, 1992	
October 14, 1992	
October 20, 1992	
October 26, 1992	Report for September monitoring due
November 1, 1992	
November 7, 1992	
November 13, 1992	
November 19, 1992	
November 25, 1992	Report for October Monitoring due
December 1, 1992	
December 7, 1992	
December 13, 1992	
December 19, 1992	
December 25, 1992	
December 31, 1992	Report for November monitoring due
1993	
January 29, 1993	Report for December 1992 due

ATTACHMENT 3

RTI (RESEARCH TECHNOLOGIES INTERNATIONAL)

RTI, Research Technologies International, Inc. is a full service chemical/metallurgical research and testing laboratory with state-of-the art instrumentation.

We are staffed with experienced and well trained chemists, technicians, professional engineers who are qualified to handle a wide array of R&D, routine analytical or evaluation projects at virtually every level of sophistication.

We are a service group dedicated to supplement the technical support groups of manufacturing companies who may not have the personnel or equipment to meet their needs in order to maintain a full QC or R&D program.

(RTI) is not only an analytical service group that generates data, but it also provides practical interpretation and recommendations to problems and issues. Our goal is to help improve the quality of product and to accomplish this in the most expeditious manner possible.

RTI is conveniently located in Livonia, Michigan, near the junction of I-96 and Merriman road. We offer to our metropolitan Detroit clients a sample pick-up service.

RESEARCH TECHNOLOGIES INTERNATIONAL
QUALITY ASSURANCE MANUAL
AUTHOR: NORMAN A. FRANK, P.E. MATERIALS SUPERVISOR
DATE OF RELEASE: 7 / 22 1991

Prepared by:

Signed Norman A. Frank

Norman A. Frank, P.E.
RTI

Signed Norman A. Frank

Quality Assurance Manager
RTI

Approved Larry L. Singh

General Manager
RTI

Date 8/7/91

RTI
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Date 8/7/91

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Date 8/7/91

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W. RTI Staff Training Registry Form
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AB. Records Retention Data

Date 6/1/91

1.0 QUALITY ASSURANCE PROCEDURES MANUAL

This section describes the RTI Quality Assurance Manual. It outlines the scope of the document and the overall quality policy for the laboratory. It lists the fields of testing activities in the laboratory and references detailed analysis procedures. The management responsibilities are also delineated herein.

1.1 SCOPE AND PURPOSE

A-The purpose of this quality system is to provide an economic means of assuring that requirements with regard to procedures, performance and equipment are fulfilled. It encompasses implied as well as specified quality attributes in each of these areas. The quality policy and system is documented in this manual and is accessible to those people involved in developing, reviewing and implementing the system, as well as the laboratory personnel.

B-All of the analyses and test procedures used by the laboratory and referenced by this document are in accordance with client specifications or standards and test methods recognized nationally or internationally. Where standard test methods do not exist for given applications, procedures are developed by RTI, and with client concurrence when appropriate, and referenced in Section 7.4. The management policies and Standard Operating Procedures are determined by Corporate policy, or by RTI Management.

C-The manual also includes a description of laboratory facilities, organization, and function. Detailed methods of operating, calibrating and maintaining equipment are referenced herein. Environmental control considerations are addressed. Test methods and procedures are referenced. Materials and sample handling guidelines and procedures are defined. The manual also describes laboratory data management and record keeping. Also actions to diagnose and correct deviations from the quality standards are outlined.

D-These quality procedures are reviewed annually by the General Manager and the Quality Assurance Manager. It is the primary responsibility of the General Manager and the QA Manager to implement these procedures as they are written, and make changes when necessary. Also each RTI employee is familiar with these procedures and is responsible for applying them in their daily activities.

1.2-TERMINOLOGY

The use of certain words convey the advisory nature of a particular procedure or guideline. The words "should" or "will" are intended to stress the significance and importance of a

procedure, and should be interpreted to be obligatory. However, the usage of the word "may" in any of the procedures, is intended to indicate guidelines which, while not essential, would, if incorporated, provide additional benefits to the quality system.

" QUALITY MEANS CLIENT SATISFACTION "

1.3-FIELDS OF TESTING ACTIVITY

The principal field of testing in the RTI laboratory is chemical and metallurgical analysis of solids, liquids or gases and the surface analysis of solids.

The Chemical analyses include the use of Gas Chromatography, Ion Chromatography, Inductively Coupled Plasma, Gas Chromatography/Mass Spectroscopy, and Infra Red.

The Metallurgical analyses include the use of Optical Microscopy, Mechanical Properties, Hardness and Optical Emission Spectroscopy.

The Surface Analysis includes the use of the Scanning Electron Microscope and the Energy Dispersive X-Ray. All these activities, and the resources used, are described in further detail in Sections 5.0 and 7.0 of the manual

1.4-MANAGEMENT OF QUALITY MANUAL

1.4.1-The management of this document is the job responsibility of the General Manager and the RTI Quality Assurance Manager. It is up to them to see the document is kept up to date with all changes in laboratory functions and procedures. They are also to insure that the manual is accessible and understandable to everyone whose activities are affected or influenced by the contents of this document. Additionally it is the responsibility of the QA Manager to see that this document as well as the SOP Manual are stored on floppy disks. All future revisions or issues of either document are to be stored on disks. The General Manager and Quality Assurance Manager shall be referred to as the RTI Quality Management Team.

1.4.2 This manual is reviewed annually by the RTI QA Manager and General Manager for completeness and consistency with actual quality practices. Documentation of the review is included on the following page. All laboratory staff members have personal responsibility to submit requests for changes to this document when changes in their activities need documentation. Also, any addition, any modification required by clients or accrediting agency will be incorporated into the manual when called to the attention of RTI Quality Management.

1.4.3 This document is recorded on computer disks which are accessible only to individuals with authority to develop or update

Date 7/22/91

MANUAL REVIEW

Date of Review	QA Manager Name	Remarks	Gen.Mgr. Init.

the procedures. This authority is held by RTI Quality Management and may be assigned one other individual at a time as needed to do the actual computer input. The General Manager, or Technical Director is usually given the authority to input QA data to the computer upon approval of the by RTI Quality Manager. The Quality Assurance Manual and associated procedures (SOP and TP) are accessible in paper form to all laboratory staff and Quality Assurance personnel.

The RTI individuals responsible for the quality manual are listed below. This list is updated as necessary to accommodate personnel changes.

General Manager: Jerry Singh
RTI Q.A. Mgr : Norman Frank

Each page of this Manual is numbered and dated, reflecting the most recent update. Every page of the Manual will be reviewed annually. This is to ensure that every part of the document is kept current and not allowed to become static. The annual review results by the QA Manager will be discussed in a group meeting with all the RTI personnel. Updates to the Manual are distributed to the persons holding a duplicate copy. This list is maintained in the QA Office.

1.4.4 The position of QA Manager at RTI will be one, for the time being, which rotates among the supervisors of-

Materials
Chemistry
Physical (Processing)
Surface Analysis

The individuals will function in that capacity for a period of six (6) months. Their tenure will be acknowledged by the "QA Manager Assignment Sheet", which is part of this Manual.

Date 9/1/91

QA MANAGER ASSIGNMENT SHEET

NAME	PERIOD	SIGNATURE
NORMAN FRANK	6/1 - 8/31 91	Norman A Frank
NORMAN FRANK	9/1 - 3/31 92	Norman A Frank

SECTION NUMBER 1.0
INCLUDES PAGES 1-1 to 1-5

DATE WRITTEN: 6-12-91
APPROVED BY: [signature]
DATE APPROVED: 6-12-91
LATEST REVISION DATE: 7-22-91
REVISION APPROVED BY: [signature]

Date 6/12/91

2.0- QUALITY POLICY, PLANNING AND ADMINISTRATION.

The following section describes RTIs' intentions with regard to quality. An organized approach for carrying out these intentions, within the Laboratory, is specified. All major quality parameters are addressed. Objectives are established for key elements of performance such as accuracy and repeatability of test results; training and qualification of personnel; safety levels; internal failure levels.

Clear lines of authority are established in this section to administer the quality program. The responsibility for quality of each Section within RTI is defined. Quality system audits, and the responsibility for performance reports are described. Also, documentation of quality reviews and audits are specified.

When a member of RTI Management Team finds that quality characteristics cannot be adequately measured or controlled within the existing quality system due to changes in the laboratory description or activities, they may call a quality planning meeting. This meeting will include members of the RTI staff, as well as representatives of the Corporate Quality Assurance Team. The following points may be reviewed in that meeting:

Identify new quality characteristics
Determine method of measuring new characteristics
Determine frequency of measuring new characteristics
Assign responsibility for control of new characteristics
Establish corrective action procedures appropriate to the new characteristics

Minutes of each meeting will be maintained in the files of the QA Office.

2.1- QUALITY POLICY

RTI QUALITY STATEMENT

Quality is defined by RTI as " customer satisfaction meeting the needs and desires of the customer by establishing and maintaining an environment which encourages every employee to continually improve product, processes and services throughout the Laboratory and the numerous organizations of our supplier community".

2.1.1-The management of RTI has made a commitment to quality. They have set a goal to involve each employee in the improvement of quality , reducing costs, and conformance to client

requirements; all to produce the most reliable and correct test results, analyses, or programs possible, a method of checks and balances is used to measure an individuals's compliance to stated quality objectives. This check and balance system is implemented by combining functional authority between various RTI personnel, internal auditing procedures, and participating in national collaborative testing programs. It is the policy of RTI to work as individuals to form a team who can develop, analyze, test and verify all manner of materials be they organic or inorganic in nature in order to meet the clients' needs. As the quality of the RTI personnel's input is important to the function of the Laboratory, so the quality of the input from the Sample Receiving Office is important to the Laboratory.

2.1.2-Activities should meet all client, or internal requirements while remaining cost effective. Reducing waste is also a consideration. Waste is not just in terms of excess material loss. At RTI Laboratory, reducing waste means both saving material costs by proper storage and handling, and saving man hours by performing quality work with efficiency. The work must be done and documented properly so that time is not wasted by repeating the work. The work must be done efficiently, or in a timely manner, so that those who need results to make decisions will not be unnecessarily delayed. Redundant testing should be avoided.

2.2-QUALITY OBJECTIVES

The following details the quality objectives of RTI.

1. Client satisfaction by delivering quality results in an expedient manner
2. Precise analytical results
3. Reproducable analytical results from equipment and instruments.
4. Insure safety and health of employees and the continued functionality of equipment or instruments.
5. Provide professional and technical development opportunities through training, education and added responsibility.
6. Maximize individual potential and analytical and testing efficiency by maintaining flexibility in the organizational structure and the quality system
7. Accurate analytical results

2.3 QUALITY SYSTEM

A quality system is the organizational structure, responsibilities, activities, resources, and events which combined, provide organized procedures and methods of implementation to ensure the capability of RTI to meet quality requirements. The Quality System, as defined in this manual, has been established to carry out the stated policies and objections.

In planning for quality, it is necessary to identify the features and characteristics that are important in any quality system to fulfill its intended purpose. The acceptance standards which apply to activities within the Laboratory must be known and available. Planning for future quality in these activities means that staff members must remain alert and aware of any updates to acceptance procedures. Test, audit and inspection by new acceptance criteria are an integral part of quality planning. Verification activities must be updated on a timely basis to reflect changes or problems in laboratory capabilities. Also, precision and accuracy requirements may change depending on client needs, desires,codes, or speciifications. This too will require quality planning decisions. In planning for quality, goals must be set and projects for improving quality should be specified. Quality planning should provide a continuing challenge to the RTI team to inprove and increase quality of service.

2.4-QUALITY PLANNING

2.4.1-QUALITY ASSURANCE CHARACTERISTICS

There are some quality features and characteristics that apply to the RTI Laboratory Quality System. However, each Laboratory activity has unique characteristics which must be identified. As laboratory capabilities change or activities are added, plans must be made to adjust the features of the quality system to accommodate them. This portion of the quality manual identifies those particular characteristics that apply to RTI Laboratory in general, and those which are unique to the different categories of laboratory activity These characteristics are used to plan the scope and application of the total system within the Laboratory.

2.4.2-ACCEPTANCE STANDARDS

Acceptance standards refer to the value range particular quality characteristics must fall within to be considered acceptable. The standards also apply to the acceptable value range of individual test results,and methods of test. Acceptance standards may also specify, either generally or specifically, either characteristics of performance, design, construction and identification. Where they exist, client specifications of these

standards take precedence over any other specifications or directions covering the required testing or analysis. These are listed as follows:

	STANDARDS		ACTIVITIES
1.	Customer Specification FORD, GM, Chrysler, Volkswagen, TRW	a)	Performance requirements
		b)	Testing of finished product
		c)	Compound description
		d)	
2.	American Society for Testing Materials (ASTM)	a)	General Testing Methods
		b)	Properties and performance specifications and standards
		c)	Processability assessing
3.	Society of Automotive Engines (SAE)	a)	Performance requirements
		b)	Testing of finished product
4.	Military, Federal & Naval Specifications	a)	Identification
		b)	Physical requirements
		c)	QA provision
5.	American Material Standards/ American Society for Quality Control (ANSI/ANSQ)	a)	Sampling and inspection
		b)	Performance Guidelines for QC Systems
6.	Material Safety Data Sheets (MSDS)		Handling of Materials
7.	International Standards Organization (ISO)		Same as ASTM to International trade
8.	EPA Protocols		SW 846 Methods for Waste Analysis Pub. by EPA
9.	Amer. Water Works Assn./ Amer. Pub. Health Assn.		Std. Methods for Water & Wastewater Analysis

Date 7/xx/91

A detailed inventory of specifications, acceptance standards and test methods follow below. These books are located in the library

ASTM

PART	YR.	TITLE
2	1979	Ferrous castings; Ferralloys
4	1979	Steel-Structural reinforcing
7	1978	DieCast Metals; Aluminum & Magnesium
8	1978	Non Ferrous Metals; Nickel, Lead, Tin Alloys
3	1991	Metals Test Methods and Analytical Procedures
12	1977	Chemical analysis of Metals
35	1978	Plastics; General Test Methods
41	1978	General Test Methods Non-metal; Laboratory Apparatus
42	1978	Analytical Methods; Spectroscopy

EPA

1A	1986	Test Methods for Evaluating Solid Waste
1B	1986	Test Methods for Evaluating Solid Waste
1C	1986	Test Methods for Evaluating Solid Waste
11		Test Methods for Evaluating Solid Waste-Fields Manual
03.01	1991	Metals-Mechanical Testing, Metallography

Date 7/22/91

FEDERAL REGISTER

PART	YEAR	TITLE
Vol. 136		
17th Ed.		Std. Methods for Analysis of Water & Wastewater

SAE HANDBOOKS

PART	YEAR	TITLE
Materials	1984	Vol. I
Index	1984	

CHRYSLER CORPORATION

Index	Vol. A

GENERAL MOTORS CORP.

GM - Engineering Materials and Processes Procedures
GM - General Motors - Engineering Materials and Processes -VOL-1
GM - General Motors - Engineering Materials and Processes -VOL-2

ASM

Handbook - 8th Edition VOL 1-11
Handbook - 9th Edition VOL 1-17
Handbook -10th Edition VOL 1-2

If the clients' or internationally recognized standards do not exist for an activity, the RTI Standard Operating Procedures will apply. These procedures must be approved by the General Manager, Technical Director,governing agencies,or clients. These may also include the Quality Assurance Mgr. of RTI. Other approval to be obtained depends on client requirements. The client always has the final say whether or not a particular standard, directive, code, or protocol meets their approval. However, at times it becomes necessary to use procedures and standards approved by nationally, or internationally recognized organizations. The organizations sponsoring the specifications mentioned previously, have a name and address to contact. These contacts can give further information concerning approval or questions regarding their organization.

2.4.3-TEST, INSPECTION, AUDIT

To ensure quality, reliability and safety, the quality plan will establish the inspection, analysis and audit methods at appropriate stages of laboratory activities. Auditing is an examination of evidence in predetermined area and time frames. The

scope depends on the delineation of area, time limits, quantity, and quality of evidential material, and on the directives of the laboratory management and clients. Auditing takes place between laboratory personnel and as a result of accreditation programs. The administration and description of these audits are described in Section 2.5.3.

2.4.3.1-Inspection of quality characteristics in the laboratory takes place using both human and computer resources. Individuals examine the quality system, laboratory activities and analysis results for inconsistencies and errors. Laboratory processes which are interfaced with computer data base allow inspection of discreet in-process values. It also allows inspection at more regular intervals than would be possible without computer interface.

2.4.3.2-Testing of quality systems involves knowing how much a given activity deviates from the required standards and specifications, and also how often the deviations occur. Statistical Process Control (SPC) guidelines can be used to measure the deviations. The amount of allowable deviation is established by the Standards and Specifications listed in Section 2.4.2.

2.4.4-PRECISION AND ACCURACY

Precision and accuracy requirements are established by standards and specifications, appropriate to each individual project. In addition, precision and accuracy in the results between technicians must fall within the requirements of each test specification.

2.4.5-QUALITY IMPROVEMENT PROJECTS

Proposed for future programs will be the following:

1. Key personnel will actively participate in local and regional meetings and seminars sponsored by ASQC, SAE, ASM or other technical societies involved with quality procedures.
2. Classes for Certified Quality Chemists, Engineers and Technicians.
3. Market Research Activities:
   a) interview clients to determine what aspects of RTI testing or analyzing may be improved.
   b) continue updating and increasing the list of potential clients.
4. Computerized Reporting:
   Continue to improve the methods of report writing and the interfacing at data bases of instrument and computer.
5. Laboratory Reagents Inventory:
   This allows for a complete audit trail of materials purchased, received, and consumed and their current status.

6. Training Plan:
   A comprehensive plan for training laboratory personnel initially and "after hire" in cross-training activities.

2.5-ADMINISTRATION

The administration of the quality system involves defining individual responsibilities, providing guidelines and specifications for performance reporting, identifying system audit scope and schedules, and establishing procedures for documenting the quality status.

2.5.1-QUALITY RESPONSIBILITY

Quality responsibility begins with the laboratory personnel and their supervisors. Most quality problems can be solved by due attention at this level. It is always necessary, however, to have an outside party examine the quality characteristics of any activity. This provides objectivity and ensures that quality evaluation is impartial. RTI uses Quality Assurance personnel outside the laboratory such as CPC and A2LA as advisors and auditors.The General Manager and the Quality Assurance Manager work together to determine quality standards and frequency of quality verification.

The RTI QA Manager has the responsibility to see that proper quality procedures are applied at all times in the laboratory . The Manager also coordinates the inter-laboratory and collaborative testing and analyzing, and provides feedback to RTI laboratory personnel. The QA Team examines the RTI QA Manual and issues final approval on any revision or changes. It also performs annual formal audits of the laboratory's quality requirements.

2.5.2.-PERFORMANCE REPORTING

The RTI Q.A. Mgr. reports annual audit findings to the General Manager. A copy of the format used for auditing is included in the Appendix. The General Manager and QA Manager are responsible for informing other appropriate laboratory personnel of results, and seeing that corrective action is taken when necessary.

Individuals are responsible for reporting any quality problems in their own work as they become aware; if the problems(s) cannot be readily solved, or if the problem influences the decisions of others, they will notify their supervisor. If quality problems arise with someone a person directly supervises, the Supervisor has the authority to correct it. If there is a quality problem with any other co-worker the following procedure should be followed:

Ask the co-worker about the perceived problem to be certain the problem does exist. If the problem exists, then attempt to help the co-worker find a solution.
If the co-worker does not respond by attempting to correct the problem, then the concerned individual should make the

problem known only to his or her own supervisor and document the fact. The proper course of action will depend on the severity of the quality problem. Corrective actions are described in more detail in Section 10.0

2.5.3-QUALITY SYSTEMS AUDITS

QA Team internal audits take place a minimum of once each year under the supervision and at the request of the QA Manager. They may occur more frequently at the request of the Laboratory Supervisors, General Manager or the clients(s). The form used for this is the ASSESSMENT CHECKLIST in the QA Office files.

Inter-laboratory and collaborative testing shall occur annually.

Laboratory proficiency testing may be conducted at any time at the request of the General Manager or QA Manager.

Monthly unannounced examination of laboratory documentation and procedures is performed by the QA Manager. The results of said examination(s) are kept on file in the QA/QC Office. An example of the form used is seen in the Appendix (S). Deficiencies revealed by the internal audit are to be corrected immediately (within 2 days), and the QA Audit Team informed so that the deficient audit report may be corrected.

2.5.4-QUALITY DOCUMENTATION

Quality documentation is on file and available to RTI employees, clients and accrediting agencies. Any information that is confidential or proprietary is not available to individuals without clearance based on "need to know". Clearance is to be granted only by the RTI General Manager or, in his absence, by the Technical Director. Quality documentation is kept on disks, notebooks, or in file cabinets in each area of the laboratory. Information relating to that area's discipline is available from computer terminals or notebooks. Information is "read only" to personnel not responsible for the input or accuracy of the information. This is implemented by the use of passwords, locked disks and locked files. All files containing restricted information will remain locked after working hours. Personnel records are locked any time the General Manager or Technical Director are not present.

Date_____

The following lists the current quality documentation and the individuals who are responsible for same:

DOCUMENT	LOCATION	RESPONSIBLE PERSON
1. RTI Q.A. Manual	QA/QC Office	Q.A. Manager
2. Personnel Records	G.M. Office	Gen. Manager
3. Inventory Lists	Labs & Computers	Department Supervisor
4. Maintenance Records	Labs & Computers	Department Supervisor
5. Testing documents (STDS-specs.)	QA/QC Office-Library	QA Manager
6. Mich. Occup. Safety Health (MIDSHA)	G.M. Office Library	Safety Coor.
7. Client Approvals	Library	QA Manager
8. R & D Project Files	File	Gen. Manager
9. Std. Oper. Proc.	Library	Gen. Manager
10. Health & Safety Manual	Library	Health & Safety Coordinator

SECTION NO. 2.0

INCLUDES PAGES 2-1 TO 2-10

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Date 7/22/91

3.0-RTI LABORATORY DESCRIPTION

This section describes RTI Laboratory facilities, functional responsibilities, and management policies and assignments.

3.1 LABORATORY FACILITY IDENTIFICATION

Research Technologies International
31628 Glendale Avenue
Livonia, Michigan 48150
(313) 422-8000

3.2 LABORATORY OPERATION & DESCRIPTIONS

RTI is 12,000 sq. feet of building space with 10,500 currently allocated to analytical methods by chemistry or metallurgy techniques. The building has a designated office for QA, a conference room where training can be conducted, PC based LAN system for LIMS data information storage and/or retrieval.

MATERIALS SECTION - 940 SQ. FT.

This area is provided for Materials testing, analysis and evaluation of metals and non-metals. There are three work stations, namely, Chemical Analysis, Mechanical Properties, and Metallography.

The following is a list of major pieces of equipment in this area:

Olympus Vanox Research Metallograph
Wilson Tukon Model MO Microhardness Tester
Buehler Low Speed Diamond Saw
Buehler Mounting Press
Buehler Two Head Polishing Table
Buehler Single Head Polishing Unit
Service Diamond Brinell Hardness Tester
Leco CS 46 Carbon/Sulfur Analyzer
MP4 Polaroid Macro Camera
Olympus OM-G 35 mm. SLR Camera w/macro lens
Nikon 20X/40X Binocular Microscope
Buehler 2 belt sander (Rough)
Buehler Double end fine Sander
Everett Abrasive Cut-off
Twin City Permascope
Wilson Rockwell
Twin Tester
Angstrom S-170 Arc/Spark Optical Emmission Spectrometer

Date 6/12/91

PROCESS LABORATORY 595 SQ FT.

One laboratory is for the conversion coating and paint application; this is the PROCESS LAB. The second laboratory is for Salt Spray and Humidity Testing.

The Process Laboratory contains five(5) tanks for washing or coating application.

The Salt Spray Laboratory currently is unoccupied.

SURFACE ANALYSIS 279 SQ FT.

This laboratory is concerned with surface evaluation of conversion coatings, electroplated coatings, fractography and failure analysis. It houses an ISI model ABT55 Scanning Electron Microscope with wet SEM capability and a PGT 4 Energy Dispersive X-Ray instrument. It also has Fullam Carbon and Gold Sputter coaters.

WET CHEMISTRY SECTION 1403 SQ.FT

This area is provided for the preparation of organic and inorganic samples received for analysis by instrumentation. In it are the following:

4 - Fume Hoods
3 - Millipore TCLP Extraction Tumblers
- Pensky Flash Point Unit
- Parr Bomb (1261, 1563)
- Despatch Oven
Brinkman pH Meter
IEC Centra 4B Centrifuge

GC-GC/MS Section 604 SQ.FT.

This Laboratory contains the Gas Chromatograph and Gas Chromatograph/Mass Spectrometer with ancillary equipment such as Purge and Trap. These instruments are used to analyze organic components of soil, water, waste samples, etc., which are generally required for EPA regulated type of work.

The following is a list of major pieces of equipment in this area:

Finnigan MAT Incos 50 mass spectrometer
HP 5890 Gas Chromatogr
Tekmar 4000 Purge and Trap
HP 5880 Gas Chromatograph
HP 5890 Gas Chromatograph
Tekmar LSC 2000 Purge and Trap
OIC Model 4420 ECD
OIC Model 4430 PID

Date 6/12/91

ICP Section 600 SQ. FT.

This area contains an Inductively Coupled Plasma Spectrometer which is used for elemental analysis of solutions at trace levels (ppm, ppb).

Ion Chromatograph is used for the analysis of anions such as Chloride, Fluoride, Nitrate, Nitrite, Phosphate and Sulfate.

The following is a list of the equipment located in this room:

Leeman ICP Model PS 1000
Dionex IC

FT-IR Section 243 SQ. Ft.

The Fourier Transmission Infrared Spectrometer is used in conjunction with the IR microscope. This instrument is used for the characterization of chemical compounds generally organic in nature. The instrument is capable of analyzing samples or surface films down to 10 micron in size.

The following is a list of the instrumentation located in this room:

Nicolet 5PC Spectrometer
SpectroTech IR Microscope

3.3-ORGANIZATIONAL STRUCTURE

The page which follows contains the organizational structure of RTI.

3.4 FUNCTIONAL RESPONSIBILITIES

The objectives and function of RTI is to respond to the needs of all clients, and the market place, by developing products, analyzing testing, or evaluating. The functional responsibilities are divided into areas: Analytical Chemistry, Materials Characterization (Metallography), Process/ Chemical Product Evaluation, and Surface Analysis.

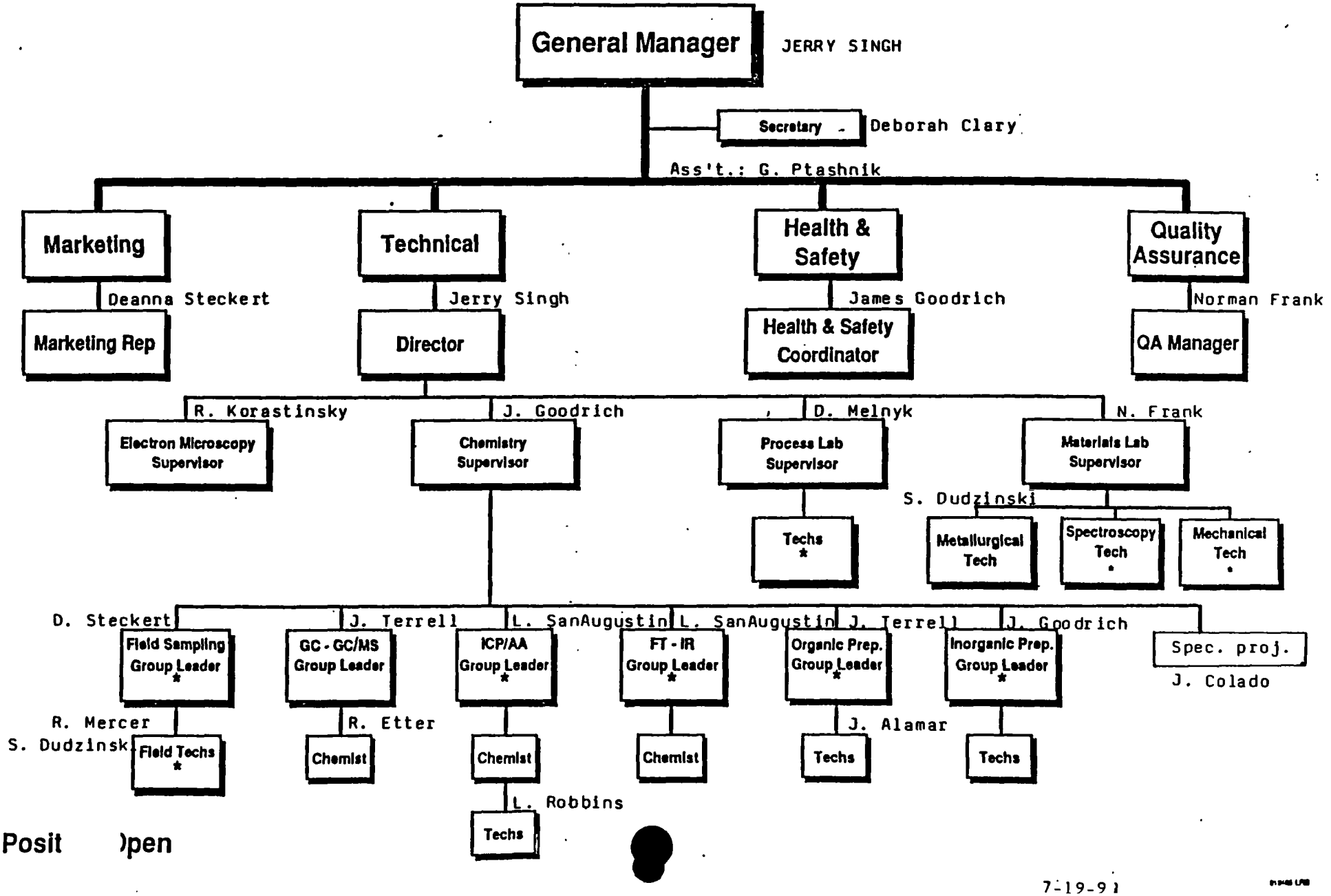
1. ANALYTICAL CHEMISTRY

This section is responsible for chemical analysis or testing of liquids, solids or gases, whether organic or inorganic, toxic or non-toxic. The sections are divided into six(6) groups (see organizational chart). The Group Leader of each is responsible for reporting and Quality Assurance within their group.

2. MATERIALS CHARACTERIZATION

This section is responsible for Materials (Metals and non-metals) evaluation, testing, and analyzing by current known techniques. The section is divided into three (3) groups (see

RESEARCH TECHNOLOGIES INTERNATIONAL, INC.
Organizational Chart



* Posit)pen

7-19-91

organizational chart). The Laboratory Technician of each group is responsible for reporting and quality assurance within their group.

3. PRODUCT/ PROCESS EVALUATION

This section is responsible for testing and evaluating conversion coating and non-metallic surface treatments as well as development of new and innovative products of these types. The Process Lab Supervisor is responsible for all reporting and Quality Assurance within his group.

4. SURFACE ANALYSIS

This section is concerned with the evaluation and analysis by microscopy and ion beam diffraction of surface treated materials and fracture, micro probe and failure analysis. The Surface Analysis Supervisor is responsible for reporting and quality assurance within his group.

3.5 MANAGEMENT POLICIES

1. Area and Property Access Restrictions - Access to any portion of the Laboratory proper is restricted to employees and authorized client representatives or any authorized computer management personnel. Authorization comes from the General Manager. All others must be escorted while on the premises. The use by non-employees of any laboratory equipment, instrument or computer must be authorized by a Supervisor or by the Technical Director. The distribution of keys, and any lock combinations is limited and at the discretion of the General Manager.

2. In order to minimize improper influence which might impact adversely upon actions of the laboratory personnel, it is the policy of RTI management to encourage personnel to identify quality problems when they arise, without fear of severe consequences. This is facilitated by management attitude toward the acknowledgement and correction of problems. This attitude is characterized by the following:

a) Stressing the need for checking work for accuracy as a higher priority than getting the work done fast.
b) Acknowledging employees for identifying problems early
c) Openness to employee suggestions. Recognition given for good ideas

3. The management of RTI is committed to providing paths of growth and expansion in the jobs of RTI staff members. This is facilitated by providing opportunities for additional training and responsibility. Plans for obtaining formal education may be coordinated around working hours, part time work, or temporary

leave of absence. This requires at least a three month notice from employee to his/her supervisor to coordinate educational plans which will result in less than a 40 hour work week.

4. Working hours are standard 40 hour work week with overtime available when needed. Individual hours can be flexible between 7:00 AM and 5:00 PM, with prior approval by the General Manager. Hours must be staggered between employees so that there is always someone available from 7AM to 5PM.

5. Smoking Policy- Smoking will be permitted in the Process Lab only.

6. The professional nature of RTI work requires interface with clients from time to time. Therefore, all RTI staff members should be prepared to appear suitably dressed when clients visit. It is important to present a good image to clients as well as co-workers.

7. Radio and tape playing are permitted within the separate labs as long as it does not interfere with co-workers concentration or attention. Earphones are not to used at any time staff members are at work.

3.6 TECHNICAL MANAGEMENT DEPUTY ASSIGNMENTS

This section assigns responsibility for exercise of the management function for the senior technical staff, and for quality assurance should the regularly assigned staff be absent. These assignments are based on the technical or management expertise of the individuals currently holding the positional listed.

STAFF POSITION	DEPUTY
QA Mgr.	Chem. Supv.
Techn. Dir.	Chem Supv. MAT'L. Supv.
Group Leaders	Chem Supv.

Date 6/12/91

3.7 PROPRIETARY RIGHTS AND CONFIDENTIAL INFORMATION

The nature of the business at RTI requires that employees work with confidential and proprietary information. This includes RTI and client information. Information concerning the projects' contents and time schedules for for completion are considered confidential. This information is released only to individuals or groups involved in requesting or completing projects. Any uncertainty about who has access to this information is decided by the General Manager.

All reports and data generated for written reports are totally confidential and are to be kept in a file cabinet which can be locked when responsible personnel are not in the building. Information in the computer system is confidential and is accessed only by password. Confidential computer disks will be kept in the General Manager's file cabinet.

Each RTI employee has signed an agreement with the Division concerning proprietary information. This agreement is kept in their personnel file.

SECTION NUMBER 3.0

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Date 8/7/91

4.0 RTI LABORATORY STAFF

This Section describes the RTI technical positions and qualifications, maintenance of personnel records, and personnel supervision. It also establishes a recruitment policy, describes training programs, incentive programs and describes typical career growth paths. As organizational structure, customer requirements or laboratory capabilities change, these descriptions may change.

4.1 JOB DESCRIPTIONS AND QUALIFICATIONS

The descriptions of the technical positions and the supervisory positions performed at this time as well as the qualifications of same are located in the QA Office with an example in the Appendix (L).

4.2 PERSONNEL RECORDS

Records concerning the qualifications, job performance, work experience and education of all RTi employees are kept in the personnel files under care of the General Manager. All records are confidential. However, any employee, or their supervisor, is free to examine their own files at any time. Updates to personnel records are made anytime an employee has a formal review. When an employee has received special training to perform specific tasks, awards, or further education, such information is noted in the employees's personnel file.

4.3 SUPERVISION OF PERSONNEL

The General Manager currently supervises the Technical Director, Marketing Representative, Quality Assurance Manager, and the Health & Safety Coordinator.

The Technical Director has functional authority to supervise the Supervisors of Chemistry, Electron Microscopy, Materials, and Process.

The Chemistry Supervisor oversees the leadership of the Group Leaders of Field Sampling, GC - GC/MS, ICP, FT-IR, Organic and Inorganic Preparation.

The Group Leader is responsible for the supervision of his/her staff of Technicians and Chemists.

4.4 RECRUITMENT POLICY

The RTI policy is to fill new or vacant positions by giving preference to current employees in the laboratory when the following conditions are met: 1) Job bids for RTI work have been submitted by employees who meet the minimum qualification for the job opening or, 2) when an agreement has been reached between a qualified employee and their supervisor to transfer to another Section. Selection of employees will be made on the basis of the bidder or applicant who best is qualified.

4.5 TRAINING PROGRAM

Training is accomplished by informal apprenticeship. New technicians work with more experienced personnel in learning routine lab tests and analyses. Experienced technicians are trained further by performing tasks which relate to development exercises specified by the department supervisor and by assisting other technicians in their activity area. The formal type of training is indicated in the Training Section of the various SOP's. All employees are offerred the opportunity to become proficient in their own area of activity; i.e.- chemistry, materials, physical/process, etc. by means of occasional classes held by RTI Senior personnel. Also, statistical control and quality assurance classes will be offerred from time to time on an unscheduled basis, but at least once annually. When appropriate, employees are allowed, and encouraged, to participate in off-site training through professional seminars, equipment and software user training programs, as well as taking classes for university credit. Attendance at these programs is registered in the Log Book for Formal Training.

All off-site training of personnel below Supervisor level which requires a company investment of more than $500.00 requires that the employee receiving the training, sign an agreement to pay back part or all of that investment if they voluntarily leave the company within one (1) year. A copy of this agreement is found in the Appendix.

Courses taken for college credit, if taken toward a degree, or if they apply to the current position or one of a higher status, may be reimbursed to the employee. The employee must get his/her immediate supervisor and the General Manager approval prior to signing up for the class.

4.5.1 CROSS TRAINING

When it is necessary to fill vacancies when they occur because of extended illness, vacations, or change of personnel, it is the policy of RTI that the Supervisor will temporaraly fill the position, or see that another person of equal qualification fills the position until the vacancy is refilled by return of the technician or their replacement.

the position until the vacancy is refilled by return of the technician or their replacement.

4.5.2 FORMAL TRAINING PROGRAM

The formal training of any employee shall be reported on the form shown in the Appendix (W) by the Department Supervisor and submitted to the QA Manager for keeping in the Training Log Book in the QA Office. These records shall be maintained for the duration of employment.

4.5.3 STAFF PERSONNEL TESTING QUALIFICATION

Because of the extensive background of the Chemistry, Materials, Electron Microscopy, and the Organic Lab. Group Leader, at this time it is considered by this organization appropriate that these people attend classes, lectures, seminars, etc. to increase their scope of knowledge. Attendance at any of these types of activities will be recorded by the Supervisor on the "Staff Training Registry" as seen in the Appendix.

4.6 INCENTIVE PROGRAM

Within RTI, incentive for increasing education and skill level is provided through a salary increase, or bonus, after completion of college credit courses and any CQT examinations. Details of the increase value is determined by the Technical Director and/or the General Manager.

Additionally, each employee shall have an annual review by their immediate superior, and their rating posted in their personnel file.

SECTION NO. 4.0

INCLUDES PAGES 4-1 TO 4-3

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Date 6/12/91

5.0 EQUIPMENT, TESTING AND MEASURING

This Section describes the available documentation concerning equipment inventory, maintenance, calibration and operation. The documentation is maintained in separate manuals, rather than as part of this Manual. Indexes to those other manuals are included here where appropriate, as well as lists that may help identify the available documentation.

5.1 INVENTORY

Inventory records are kept up to date, both on the computer and in the INVENTORY LOG BOOK. These records include inventory on equipment in-house, and notes concerning equipment on loan. In addition, details of equipment purchase information are available. Sample Receiving personnel have the responsibility for upkeep and maintenance of the INVENTORY LOG BOOK which contains information pertinent to all incoming equipment. This information includes date of purchase or receipt, date issued or opened and current balance. The General Manager will inspect the records on an unscheduled basis to verify these records are complete. See Section 11.1 for an explanation of what is meant, and the purpose of, inspecting on an unscheduled basis.

5.1.1 IN-HOUSE EQUIPMENT LIST

The in-house major items of test equipment and instrumentation required to perform all activities and covered by the QUALITY MANUAL are recorded in the Appendix (A). All Equipment Operation Manuals will be kept in a bench drawer adjacent the particular piece of equipment or instrument with the Master copy being kept in the QA Office.

5.1.2 INVENTORY RECORDS

In addition to the equipment lists, detailed records are kept on each piece of equipment or instrumentation in the laboratory. These are also maintained in the TEST EQUIPMENT CONTROL BOOK. A blank copy of the form used to record detailed equipemnt information is in the Appendix (R). It includes description and location of the equipment or instrument, and general calibration and maintenance information. The TEC form also includes reference standards used for calibration of equipment and traceability of standards to the National Bureau of Standards, or it's equivalent. The TEC form is required on every piece of testing equipment for equipment control reference, and is required by CPC and BOC Divisions of General Motors Corp.

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5.1.3 STANDARD OPERATING PROCEDURES

Detailed procedures for equipment operation are included in the Standard Operating Procedure Manual (SOP) located in the library. The Department Supervisor is responsible to see that if the operator/technician has a problem with any phase of the SOP he/she will take charge and see that the problem is solved.

As the Standard Operating Procedures are changed, the Department Supervisors are advised by inter-office memo of that fact. It is the responsibility of the Supervisors to see that their department personnel are made aware of those changes.

The following list indexes the operations procedures in that Manual. They are referenced by procedure number rather than page number.

The SOP number is a pre-coded letter followed by a two (2) digit number (i.e.- M-01-Materials #1). These codes refer only to the procedures that are resident on the computer. Any other procedures which may be listed are copies of manufacturers' procedures.

LIST OF STANDARD OPERATING PROCEDURES

SOP No.	for	INSTRUMENT	
M-01		Angstrom S-170	S/N 120
M-02		Leco CS 42	N/A
M-03		Baldwin UTM	
M-04		Rockwell Hardness Tester	S/N 1495
M-05		Brinell Hardness Tester	S/N
M-06		Microhardness Tester	S/N
M-07		Research Metallograph	S/N 201893
M-08		Macrocamera (MP-4)	S/N
C-01		Ion Chromatograph	S/N 844708
C-02		GC-GC/MS	S/N 14311-0687
C-03		Gas Chromatograph (601)	
C-04		Gas Chromatograph (602)	
C-05		FT IR	S/N 52296
C-06		ICP	
C-07		Mercury Vapor Analyzer	S/N 100
CT-01		Salt Spray Cabinet	
P-01		Processing Tanks	
SA-01		SEM ISI ABT55	S/N K220100
SA-02		EDX PGT System 4	S/N 405

5.2 MAINTENANCE

This Section provides information concerning maintenance schedules, procedures, preventive maintenance, and documentation. It also addresses procedures to follow when an item of equipment has been overloaded or misused.

Documentation is kept both on computer and in the MAINTENANCE MANUALS in the RTI laboratory. Maintenance procedure and documentation is the responsibility of the QA Manager and is evidenced in the SOP Manual. As changes become necessary, a copy of the change is posted on the Lunch Room bulletin board. The General Manager will inspect these records on an unscheduled basis to verify that these records are complete. See Section 11.1 for the description and purpose of inspection on an unscheduled basis.

5.2.1 EQUIPMENT REQUIRING PERIODIC MAINTENANCE

A list of the equipment or instrumentation requiring maintenance is kept in the TEC MANUAL and in the computer. Each piece of equipment or instrumentation is listed with an outline of necessary maintenance activities along with recommended frequencies. A sample of this list and a sample of the record keeping is included in the Appendix (O). Any person using equipment or instrumentation can request that maintenence be performed at any time, with approval of the Supervisor. Maintenance is performed by a laboratory member and any piece found to be defective will be taken out of service and tagged as stated in the malfunction procedures described in Section 5.2.3.

5.2.2 MAINTENANCE PROCEDURES

In addition to the general and routine maintenance procedures included in the TEC MANUAL, detailed and non-routine procedures are found in the SOP Manual.

5.2.3 EQUIPMENT MALFUNCTION PROCEDURES

When a piece of equipment or instrumentation malfunctions, is out of calibration, is overloaded, or mishandled, it is tagged with a tag, as shown in the Appendix (Y), until the problem is corrected and the equipment or instrument is re-calibrated. When an individual detects an equipment or instrument problem they will notify their immediate supervisor who will verify the problem is with the equipment/instrument and not with the operator. If the supervisor is not able to correct the malfunction, the company that manufactured the equipment/instrument or the Service Company that calibrated it shall be called and the problem worked out by telephone. Not being able to do so, the equipemnt/instrument is to be red tagged

and service personnel called in to correct it. This information is to be documented on the form seen as Appendix BB.

5.2.4 MAINTENANCE RESPONSIBILITY

It is the responsibiliy of the technician operating the particular piece of equipment to ensure that maintenance procedures or programs outlined by the manufacturer or in the SOP Manual are followed.It is the responsibility of the Department Supervisor to see that preventive maintenance continues on a daily basis.

5.3 CALIBRATION/VERIFICATION

This Section defines the calibration/verification program at RTI. It includes a list of calibrated or verified equipment/instrument and references associated calibration records and procedures. The checking of in-service testing equipment is described. Also, the policy and methods for the restricted use of reference standards are outlined.

Calibration documentation is the responsibility of the analyst The laboratory QA Manager will inspect these records on an unscheduled basis to verify these records are complete. See Section 11.1 for the description and purpose of inspection on an unscheduled basis.

5.3.1 CALIBRATION PROGRAM

The purpose of the calibration program is to ensure uniform and consistent calibration of all gauges, measuring and testing apparatus. It provides traceability to the National Bureau of Standards for all measuring equipment to determine an item's conformance to specified requirements. It also allows for proper documentation and acceptability of all measuring equipment/instrumentation, and to provide consistent methods of recall. When appropriate, a bench record of calibration data before and after calibration will be maintained by the technician. An example of what is expected in a calibration certificate is seen in the Appendix (K), and should contain no alterations of date, data, etc. It should contain the following:

a) Manufacturer and Serial Number
b) Name of facility doing the calibrating
c) Date of calibration
d) Reference Standard used
e) Standard traceability
f) Tolerance limits
g) Temperature at time of calibration

It is the responsibility of the QA Manager to administer the operation and follow-up of the calibration program, and ensure

the retention of the calibration records in the QA Office for a period no less than five (5) years. Where applicable, the traceability of a standard used for calibration will have a written statement on file in the QA Office to that effect.

Typically, an equipment calibration period and tolerances will be established by a control standard such as ASTM. Instrument calibration periods and tolerances will normally be established by operating procedures.

5.3.2 CALIBRATED EQUIPMENT LIST

The following presents a list of all equipment/instrumentation requiring calibration and the frequency of calibration.

Equipment Name	Information Recorded	Frequency of Calibration	Standards Used
Baldwin UTM	Load Verification	Annually	Load cell by O. S.
	Crosshead speed	Quarterly	Steel rule & timer
Rockwell Hardness Tester	Load	Annually	Cert. blocks by O. S.
	Test block results	On-use	Proper Block
Brinell Hardness	Load	Annually	Load cell by by O.S.
Micrometers	Length	Annually	by O. S.
Calipers	Length	Annually	by O. S.
Microhardness	Impression length	Annually	Std. Test block
GC 5880	Waste solvents	Weekly	Lab Std.
GC 601/602	ppm	On-use	Supelco Std.
GC/MS	ppm	On-use	Supelco Std.
ICP	ppm	On-use	Leeman, IC
	ppm	On-use	Lab Stds.
FTIR	ppm	Monthly	Polystyrene film
Arc/Spark Spectrometer	% by Wt.	Annually	NBS,Brammer Stds.

Note: If: 1)- calibration date falls on a holiday or week-end, then the calibration of equipment will be completed before the holiday or week-end.

2)- equipment/instrument is inoperable or not calibrating correctly, it will be "red tagged". The equipment/instrument will then be repaired in-house, or the manufacturer or service organization contacted for repair, after which the unit is re-calibrated and the "Calibration" sticker affixed. This information is recorded in the Instrument Maintenance Log book. All tests conducted since the last calibration of that instrument are examined to ascertain at what

point in time the instrument did go out of calibration. Since the Work Order reflects the identity of the instrument used to conduct a test or analysis the search is simplified. A corrective action report is then filled out, signed by the QA Manager, the technician and the Technical Director.(Appendix AA)

3)- the, instrument is to be operated after the expirey date of calibration, it must be "red tagged" until it is re-calibrated, after which the "Calibration" sticker is affixed. The operator/technician is accountable if the unit is operated without the "calibration" sticker being present.

4)- all instruments and equipment which require periodic calibration noted in this section shall be calibrated, or re-calibrated, when relocated or when out of calibration and a new certification sticker affixed thereto.

5.3.3 CALIBRATION RECORDS

Calibration records are to be kept in the computer under the SOP directory. Individual file cards identifying each instrument which requires calibration other than "daily or on use" shall be maintained in a file box of the QA Office under the supervisoion and control of the QA Manager. These file cards shall include: 1) SERIAL NUMBER; 2) DESCRIPTION OF THE INSTRUMENT; 3) CALIBRATION SCHEDULE; 4) METHOD (STANDARD) OF CALIBRATION; 5) DATE FOR NEXT CALIBRATION ; 6) WHAT DEVIATIONS ARE PERMITTED (IF ANY); 7) LAST CALIBRATION RESULTS.

An example of the card is seen in the Appendix.

The file cards are separated by monthly indexers, and the calibration card for any given instrument shall be inserted IN FRONT of the the month the calibration is due. This is to avoid missing the calibration date. SHOULD THE CALIBRATION DATE BE MISSED, the QA Manager shall "red tag" the instrument and no operator/technician shall use the instrument until it has been re-calibrated and the sticker affixed. As each instrument calibration card appears at the first of any month, the calibrating service company shall be called and an appoinment set up for calibration which will preceed the re-calibration date. This is the responsibility of the QA Manager.

5.3.4 CALIBRATION PROCEDURES

Calibration procedures are to be kept in the computer and in the RTI library. The ICP, IC, GC, and GC/MS Instruments are "Calibrated" via their software. The "calibration curves" are corrected or updated at the beginning of each day, except for the GC/MS for which it occurs every 12 hours. The following is a list of calibration procedures as they appear in the RTI SOP manual. They are referenced by procedure and the calibration page number. The calibration number is a letter code (CAL) followed by a Section identification letter (M-C-CT-SA) and a three digit number. For

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example: Leco CS-42 is CAL-M002

CAL. PROCEDURE for:	IDENTIFICATION
Leco CS-42	CAL M-001
Ion Chromatograph	CAL C-001
Gas Chromatograph/Mass Spect.	CAL C-002
Gas Chromatograph 601	CAL C-003
Gas Chromatograph 602	CAL C-004
Gas Chromatograph 5885	CAL C-005
Mercury Vapor Analyzer	CAL C-006
ICP	CAL C-007
FT IR	CAL C-008
Balance, Mettler	CAL C-009
SEM	CAL SA-001
EDX	CAL SA-002

The foregoing items of equipment will be calibrated in house in accordance with the Calibration Procedure outlined for that specific item, and a sticker (as seen in the Appendix-V) affixed to it.

5.3.5 VERIFICATION RECORDS

In all instances where an instrument/equipment is verified at a specific interval, the record of such verification shall be made in the bench log or log book applicable to the particular instrument/equipment. The maintenance of these log books is the responsibility of the technician who operates theinstrument/ equipment, and they shall be kept at or near same. The QA Manager shall review these records from time to time as an overview only. The Section Supervisor is responsible to see that the records are kept current. When a bench log book or verification log book is full, it is given to the Section Supervisor to be kept in that office for a period of five (5) years.

5.3.6 CHECKING OF IN-SERVICE TESTING EQUIPMENT

Equipment which may be calibrated by a manufacturer representative or by any other outside source on a periodic basis is listed below as in-service testing equipment along with the frequency of checking by the source.

EQUIPMENT	FREQUENCY
Baldwin UTM	Annually
Wilson Rockwell	Annually
Brinell Hardness	Annually
Master thermometer	Annually
Std. Weights	Annually
Wilson Tukon Microhardness	Annually
Angstrom OE Spectrometer	Annually
FT IR	BY MFGR. REP

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The foregoing items of equipment will be calibrated at the appropriate time as stated on the affixed sticker, as seen in the Appendix (V). When the instrument/equipment has indications of being out of calibration, an outside source or the Manufacturer's technician shall be called to conduct a re-calibration.

5.4 RESTRICTED USE OF REFERENCE STANDARDS AND MATERIALS

This section relates to the retention of Reference Standards for Measurement and for Materials.

5.4.1 REFERENCE STANDARDS OF MEASUREMENT

Reference Standards of measurement that are used/held by RTI for calibration only are to be restricted to that use and NO OTHER.They may be kept in tthe Leader/Supervisor Office and are to be calibrated by a qualified organization or person capable of providing traceability to NIST (NBS).

The asterisked items in 5.3.6, which are typically calibratyed on an annual basis, may require calibration at a time other than the specified date if they should show symptoms of being "out of calibration", or they are abused. Any standard with an expirey date must be reported to the QA Manager for special recording.

5.4.2 REFERENCE STANDARDS OF MATERIALS

All Reference Materials- chemicals, standard solutions, spectrometer standards and hazardous standards as listed in the SOP Manual Sections shall be of a composition which has been verified by the producer or a competent qualifying agency, with traceability to NIST (NBS).

Special procedures for handling these standards (where appropriate) are included in the SOP Manual.

Care, where specially necessary, will be taken to avoid contamination of chemical or metal standards. Small amounts of chemical standards should be poured from stock containers for use, rather than spatulas, pipets or other instruments being inserted directly into stock standards containers. Also, once material has been removed from a standards container, the remainder should not be returned to the container. The amount of waste saved by not returning chemical standards to the original container is negligible compared to possibly contaminating the whole stock standard.

5.5 EQUIPMENT PURCHASES AND ACCEPTANCE PROCEDURES

Equipment purchase may be iniated by any of the Laboratory Supervisors, and it must be approved by the General Manager.

Equipment purchases of more than $2000.00 must be initiated with an Appropriation form that must be submitted to the Corporate Appropriations Committee for approval. These can be initiated by persons at Supervisor level and forwarded to the Committee by the General Manager.

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Equipment/instrumentation can be received by anyone in the building, but they must log it in in the RECEIVING BOOK and notify the person to whom it was addressed. The Receiving Clerk checks the ticket, or copy of the invoice against the RTI P.O. and verifies that the equipment/instrument has been delivered as documented.

As long as any item has not been delivered, which has been ordered by P.O., it will be filed as "Purchases On Order". As items on order are received, they are checked off on the receiving ticket and stapled to any other receiving tickets from the same order in the" Purchases On Order" file. When an order is complete, all information concerning the order is moved from the Purchases On Order file to the "Completed Purchases" file. They will be filed according to vendor name and/or P.O. No.

Equipment/instrumentation received must be inspected and as soon as possible verified as to it's operational capability. If equipment/instrumentation is visibly damaged at delivery, then delivery is NOT accepted. The Secretary is notified as well as the General Manager. Proper and appropriate action will follow. If damage is discovered AFTER delivery receipt, the General Manager is notified and appropriate action to be taken.

The warrantee or service contract is referred to if equipment/instrumentation cannot be calibrated, or operated according to the manufacturers' or vendors' published claims.

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6.0 ENVIRONMENTAL CONTROL & SAFETY PROCEDURES

The following Sections describe features in the RTI Laboratory which aid in environmental control and personnel safety.

6.1 AMBIENT CONDITIONS IN THE TEST AREA

Unless otherwise specified, or required, testing and analyses of materials shall be carried out in an environment having a temperature of 72F + 3F. Humidity requirements do not apply unless a specific code, regulation, or standard requires it. Because of the high humidity created in the Salt Spray Laboratory when the cabinet doors are opened, it is necessary that the fans be turned on, and the door be closed. When required, the laboratory will report a wet/dry bulb humidity in the laboratory room in which testing is being done.

In those laboratories where temperature is a decided factor that may effect results of tests, (ICP/IC and GC-GC/MS) a calibrated thermometer shall be present. This may be in the form of a tubular type or a drum recorder. Should it be the tube type, the operator/technician in either laboratory will be responsible to register room temperature every hour on a recording sheet. This record is to be kept in the file of the respective offices. The QA Manager shall check on an irregular basis to see that the records are current, and properly stored. The laboratory report will reflect the temperature at the time the test was conducted.

To provide a condition in the GC/MS Lab and the ICP Lab wherein there will be no extraneous vapors, a door closer system is employed which means that the outer door to these two (2) Labs WILL be closed at all times. This action ensures the maintenance of a positive pressure and a more controllable laboratory temperature, as well as contamination of the air therein.

Whenever the temperature in either of these two (2) laboratories exceeds the maximum or minimum, the analytical procedures MUST cease. The reason for cessation shall be recorded in the Bench Log. Occurrance of this condition more than two (2) times in a single month shall be brought to the attention of the Chemistry Supervisor or Technical Director and appropriate action shall be taken to determione the cause and rectify it.

6.2 HAZARDOUS CHEMICALS

All materials which are regulated by EPA are stored or disposed of in accordance with EPA Regulation procedures. All flammable materials are stored in an explosion-proof cabinet.

Material Safety Data Sheets (MSDS) are available on all materials in the Laboratory. Material handling guidelines are based on the MSDS for personnel safety. A Safety meeting is held semi-

annually to address any personnel concerns about material handling and chemical safety. These meetings are conducted by the Safety Coordinator.

6.3 WASTE DISPOSAL

All non-sanitary water from the Laboratory is isolated and collected in a sump that is connected to the municipal sewer system. The water, we are capable of treating, if needed. The acid or base samples are neutralized and disposed of in the laboratory sinks with an abundance of running water. Samples containing heavy metals, and solvents or other regulated compounds are not disposed of through the Laboratory sink, but rather by DOT and EPA approved procedures.

Oily samples and coolants will be emptied into a 5 gallon bucket (labelled "NON HAZARDOUS WASTE) which will be disposed of in accordance with DOT or EPA Regulations.

Non-hazardous powder materials will be disposed of either in the trash or through the Laboratory sinks (with abundant water).

Samples are to be saved for a period of 60 days after the report is sent the client. Thereafter, they are disposed of in a manner that is prescribed by regulation or procedure.

6.4 PERSONNEL SAFETY

The following describes RTI procedures for personnel safety.

Safety/Quality meetings will be held once every six months (January and July) on the first Wednesday of the month. The purpose of the meetings being to address safety issues and quality performances in the RTI Laboratory. They also function as a form of Quality Control Program.

The Safety Coordinator is responsible for the conduct of the meetings and to oversee the health and safety issues relating to the health and welfare of the employees.

Safety Glasses- safety glasse should be worn when working at
1 Abrasive Saw
2 Sanders
3 Fume Hoods
4 Benches
5 Compressed gas cylinders
6 Ovens

Protective Clothing- protective clothing provided are:
chemical resistant gloves
heat protective gloves
Lab coats & chemical resistant aprons
dust mask
safety glasses

The above clothing items shall be worn in the areas indicated by signs and/or as necessary.

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Electrical- circuit breakers are located in the Utility Room adjacent the Rest rooms, and all breakers are labeled.

Eye Wash- eye washes are located in the Chemistry Laboratory and the Metallography Laboratory.

Shower- a shower is provided in the Chemistry Laboratory

Chemical Handling- all employees have access to the MSDS Sheets so he/she is aware of any potential dangers. The MSDS sheets will be maintained and kept current in the Sample Receiving file cabinet. For health and safety reasons, all personnel should treat all chemicals as though they were hazardous material. Should there be any doubt about the potential hazards, they must refer to the MSDS sheets.

Accident Procedures-(health, fire, tornado, & chemical spills) The number 911 is posted at all telephones for emergencies.

TORNADO: sit in the hall between the Procees and ICP Labs with back to the Process wall.

FIRE: head for the nearest exit. Each exit is indicated by the "EXIT" signs in the hallways. Go to the driveway of the building on the opposite side of the street. The Laboratory Manager, or his representative will count heads of all personnel. For this reason, it is necessary that employees who leave the biulding for any period of time to exceed one half hour shall call the front desk and notify the Secretary they are leaving. Likewise on their return they shall again call the front desk to notify of their return.

Fire extinguishers are located in areas about the Laboratory as prescribed by the Livonia Fire Marshall.

To aid in identifying which employees have escaped the building during an emergency, all employees are requested to sign out when leaving for any extended period of time.

CHEMICAL SPILLS: absorbant material is available in the Utility Room for cleaning up large chemical spills. If the spilled chemical is known to be non-hazardous, the absorbant may be disposed of in the trash.

If spilled, and the spilled chemical is unknown, it may be checked for pH with Litmus paper, and then neutralized. This to be followed by absorption and disposal. First Aid supplies are located in the Lunch Room.

6.5 HOUSEKEEPING

It shall be the responsibility of the department Supervisor to see that their laboratory areas are maintained such that there is no clutter and a minimum of disorganization.

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An outside service is used to maintain the condition of the floors, windows, lavatories, and offices.

The organization performing this tast shall be under the supervision of the General Manager, or Technical Director. It is appropriate that these people understand the need for following all the safety rules applicable to thwe RTI employees.

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7.0 TEST METHODS AND PROCEDURES

This Section indexes the documents where test procedures may be found for all of the RTI Laboratory tests. The most current methods of each are located in the RTI Library This Section also describes the maintenance of the testing documents. Non-standard test methods are addressed, as well as the procedures for selecting test methods and test sequences.

7.1 INDEX OF TESTING DOCUMENTS

a) Current SAE Handbooks
b) Current GM Engineering Standards
c) Current Ford Engineering Standards
d) RTI Standard Operating Procedures
e) RTI Test Procedures
f) EPA Protocal
g) DOT Regulations
h) Chrysler Corp. Index Vol. A

The following pages index the tests we are most likely to perform, and it's associated method (ASTM, EPA,or DOT).

LIST OF STANDARDS OR REGULATIONS

ASTM No	Part/Section	TITLE
METALLOGRAPHY		
E-930	03.01	Grain Observed, Largest, in Metall. Sect.
E-112	03.01	Grain Size, Determining Average
A-247	03.01	Graphite in Iron Castings, Eval. Microstrucure of
E-340	03.01	Macroetching of Metals & Alloys
E-381	03.01	Macroetch Testing, Insp., & Rating Steel Products, etc.
E-407	03.01	Microetching Metals & Alloys
E-3	03.01	Prep. of Metallographic Specimens
E-45	03.01	Inclusion Content of Steel, Determining
E-766	03.01	Magnification of SEM Using NBS-SRM-484
E-807	03.01	Metallographic Laboratory Evaluation
E-986	03.01	SEM Performance Characterization
E-1077	03.01	Decarburization of Steel Specimens, Estimating Depth

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MECHANICAL TESTING

E-384	03.10	Microhardness of Materials
E-883	03.01	Guides for Metallographic Photo-micrography
A-370	03.01	Method for Mechanical Testing of Steel Products
E-4	03.01	Verification of Testing Machines
E-10	03.01	Brinell Hardness of Metallic Materials
E-384	03.01	Microhardness of Materials
E-8	03.01	Tension Testing of Metallic Materials
B-557	03.01	Tension Testing Wrought & Cast Alum. & Mag. Alloy Products
E-517	03.01	Plastic Strain Ratio r for Sheet Metal
E-548	03.01	Generic Criteria for Evaluating Testing & Inspection Agencies
E-18	03.01	Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
E-20	41	Rec. Practice for Analysis by Microscopical Methods for Particle Size Distribution
E-44	2	Def. of Terms Relating to Heat Treatment of Metals
E-92	03.01	Test for Vickers Hardness of Metallic Materials

CHEMISTRY

E-137	42	Rec. Practice for Evaluation of Mass Spectrometers for Chemical Analysis
E-200	30	Preparation, Standardization, and Storage of Standard Solutions for Chemical Analysis
E-203	30	Test for Water Using Karl Fischer Reagent
E-227	42	Optical Emmission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point to Plane Technique
E-260	42	Rec. Practice for General Gas Chromatography Procedures
E-304	42	Rec. Practice for Evaluation of Mass Spectrometers for Chemical Analysis of Solids

E-403	42	Optical Emmission Spectrometric Analysis of Carbon and Low Alloy Steel by the Point to Plane Technique
E-607	42	Optical Emmission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point to Plane Technique

MISCELLANEOUS

G-1	10	Rec. Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens
G-46	10	Rec. Practice for Examination and Evaluation of Pitting Corrosion
E-466	10	Fatigue and Fatigue Resistance of Metallic Material B-
303	9	Copper Infiltrated Sintered Carbon Steel Structural Parts
B-213	9	Flow Rate Test of Metal Powders
B212	9	Apparent Density Test of Metal Powders
B-117	10	Salt Spray (fog) Testing

7.2 MAINTENANCE OF TESTING DOCUMENTS

All standards, ASTM reference books, and operating manuals are located in the RTI Library. These documents are reviewed annually by the QA Manager, and the review is recorded and filed under "Standard Reference Audits. Client procedures and standards are updated on a subscription basis, while others not on subscription basis will be updated as RTI is made aware or notified.

7.3 USE OF NON-STANDARD TEST METHODS

In the event that non-standard test methods are used-such as for research or development projects-said standards or methods should be indicated by the Supervisor of the department doing the research or development. The test or development reports should note the deviation from the standards and include a detailed description of procedures followed.

7.4 SELECTION OF TEST METHODS AND TESTING SEQUENCE

All operating procedures for instrumentation and equipment at RTI are outlined in the RTI Standard Operating Procedures. These procedures are kept in the RTI Library. As revisions become necessary, the QA Manager will insure that previous procedures are destroyed, and also that no copies are made and taken to the bench. Only original copies may go to the benches.

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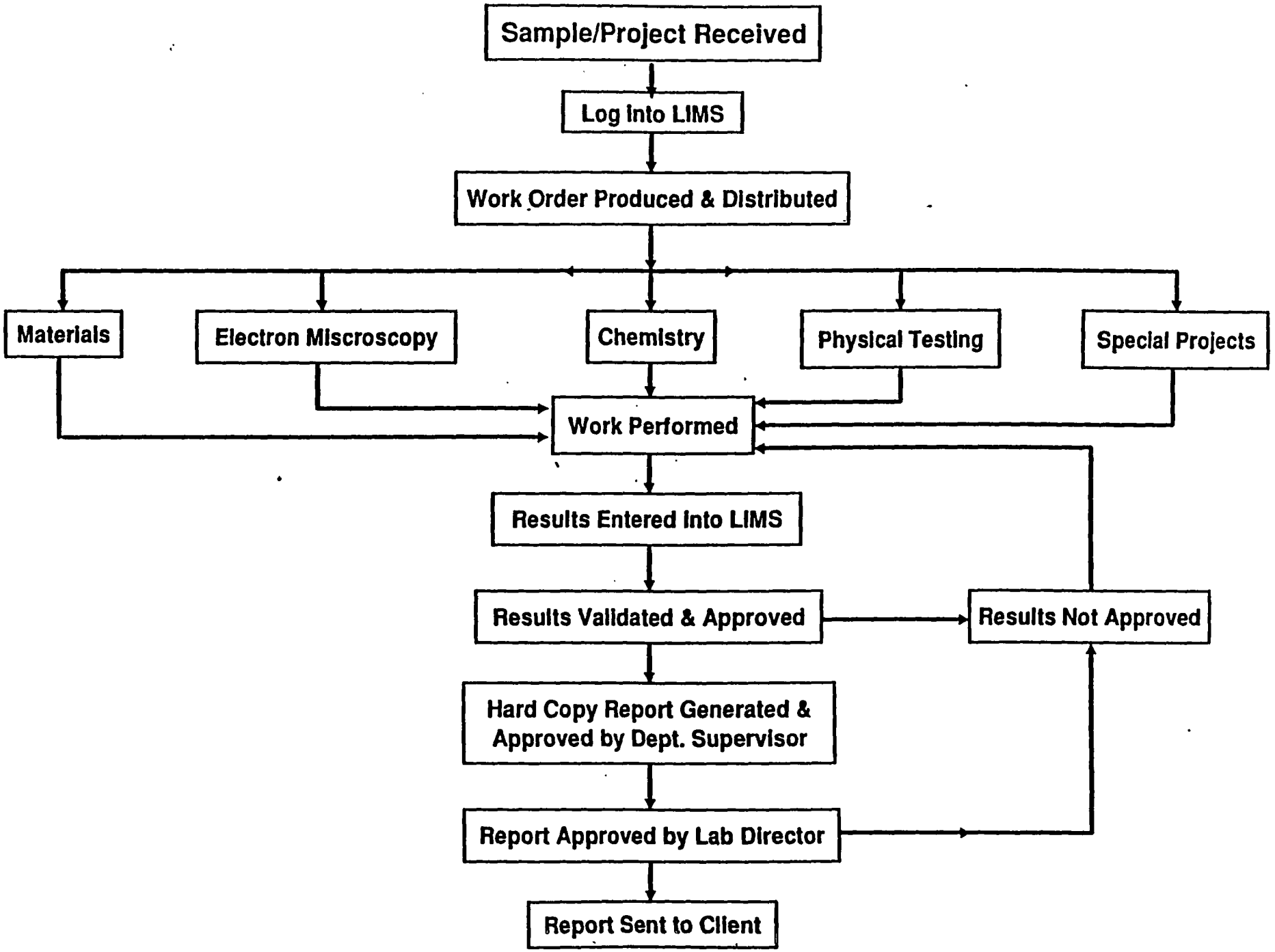
7.5 WORK FLOW

The chart on the following page illustrates the manner in which in-coming samples (materials) will move through the various departments and sections of RTI Laboratory.

WORK FLOW CHART



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8.0 MATERIALS AND SAMPLE HANDLING

This Section defines how raw materials and part samples in the RTI Laboratory are received, identified, stored, and disposed.

8.1 INCOMING MATERIAL HANDLING

Materials may be received from any of our many suppliers. When they are received the Secretary should be notified that they have been received and the order for same traced through Laboratory purchasing channels.

The person to whom it is addressed is responsible for seeing that the material is acceptable and properly identified, and that the MSDS sheets accompany the material or are forthcoming in the very near future. They are also responsible for proper storage and correct usage, and subsequent disposal of the material.

Materials are handled according to instructions on the MSDS sheets. Gloves and dust masks are available for use with materials which are irritating to the skin or lungs. Safety glasses and an eye wash are available for use when handling highly acidic or caustic materials, or as indicated by MSDS.

8.2 MATERIAL IDENTIFICATION

All materials when they are received are dated and recorded in the INVENTORY LOG of the Receiving Sample Room. Materials which have a critical shelf life are marked with an expiration date. All materials received are marked with the date of receipt.

8.3 MATERIAL STORAGE

All incoming materials are stored in the containers in which they are received, unless they are so large as not to fit into a cabinet or drawer, in which case they will be subdivided into smaller containers and properly identified.

8.4 MATERIAL DISPOSAL

All material which has not been used within the required life is to be disposed of in accordance with EPA or DOT Regulations.

8.5 SAMPLE PREPARATION

There are several categories of test samples. Each is prepared in a unique way. These are described in the RTI SOP Manual.

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Categories of test samples include:

- Samples of actual parts
- Segments of parts
- Waste from water systems
- Test Bars
- Coil, wire, or sheet stock
- Solvent samples
- Pretreatment bath samples
- Water hardness samples
- Waste samples

8.6 SAMPLE IDENTIFICATION

When a sample, or group of samples, is received at the Receiving Sample room, it is examined to ensure that its contents agree with the incoming inquirey or shipper.

The sample log-in program assigns a Laboratory Number (i.e. 91-0000) and the appropriate information is written into the record.

The record is to include: Date received; Target date; Sample ID; By whom submitted, Company (client) name;Object or reason for inquiry. An example of the screen print-out is in the Appendix (N). Additionally, the Work Order should include any instructions relating to specifications, directives, regulations, etc. The sample, or its container is marked by Magic Marker or other appropriate marking method or tagging method with the Laboratory Number.

8.7 SAMPLE STORAGE

After the samples have been properly recorded in the computer and the print-out produced, the print-out is set on the shelf with the sample(s) for pick up by the various Lab Technicians. Samples are grouped on the shelf by Department.

The "in-process" samples within any given Lab. section will be under the care and responsibility of the Technician or Supervisor who is to conduct the test or analysis. The person caring for the sample(s) shall ensure that the sample(s) is/are protected in such a way as to prevent corrosion where it may be relavent, to prevent dilution, stress, heat, or cold. Any special instructions given on the chain of custody sheet shall be observed, and if there is any question about the instructions, the client must be contacted for elaboration.

The residuals of the Materials Lab. and the Electron Microscopy Lab are to remain in those labs (properly identified by Lab. No.). The residuals from the Chemistry Lab are retained in the Corrosion Lab in numerical sequence by Lab No.

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8.8 SAMPLE DISPOSAL

Residual samples after testing are retained for a minimum of sixty days, unless there is a definite protocal requiring longer storage time. This may be indicated in the RTI SOP. All samples are disposed of in accordance with appropriate Regulations or Directives or Community codes.

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9.0 LABORATORY DATA MANAGEMENT

The RTI Laboratory generates, interprets, and stores large volumes of data. This data includes information on analysis procedures, test results, and sometimes on product development.The RTI Laboratory has various methods for accumulating and storing data but as much as possible is stored on computer. This Section describes the data management procedures and facilities in the Laboratory.

9.1 LABORATORY ANALYSES AND TEST RESULTS

This Section describes the methods of data collection and reporting of analyses and test results in the Laboratory.

9.1.1 DATA COLLECTION

Most analyses and test results are recorded manually in the bench log books as the tests are performed. This information is recorded on the test report forms included in the Appendix (T). The information on the report form is then entered into the computer for the Lab No. assigned to the project. In certain instances the instrumentation will produce a direct printout and this data is then put into the computer for the appropriate project Lab. No.

9.1.2 RESULT REPORTING

Formats for reporting results of tests or analyses may vary from department to department, but in all cases a hard copy report will be produced from the computer, where all reports are maintained for a period of seven (7) years.

When an outside source is used for analyses, the following items shall be stapled together: 1) RTI Work Order,2) requisition for outside work,3) original report of outside source including QA/QC data. This accumulated information is then used to produce the final report.

Should the results of any test or analysis be outside the applicable specification limits, the instrument/equipment must be checked for its calibration. The calibration being correct(ed) the test or analysis should be run once more. If the results are within 2% of the "standard" value, the test will be considered valid, and the results reported. Should there be a difference in values that exceeds the 2%, the Department Supervisor should have a second technician or analyst perform the test or analysis. Agreement on one of the previous results will be considered to be the correct one, and it is reported.

Failure to agree will require that the Manufacturer service department be called and an attempt made to correct the problem. Failing that, the unit shall be "Red Tagged", and not used until repairs and calibration are completed, and then the calibration sticker affixed to the instrument. All this information is to be

logged into the instrument maintenenace log book. The technician is responsible to see that the information is coirrectly logged. The QA Manager will conduct an audit of the maintenance log books on an infrequent basis to ensure records are being kept.

9.2 DATA VERIFICATION

This Section describes methods used in the Laboratory to verify the accuracy, repeatability and integrity of data collected. The types of data are those generated by computer in the instrument or equipment, as well as those collected manually by the technicians.

The accuracy of the data accumulated from the Optical Emmission Spectrometer, the Universal Testing Machine, the Rockwell Hardness Tester, the GC/MS, the ICP and the Dionex are verified through a Collaborative Testing Program to be in place by 7-1-91.

Data which is entered into the computer may be verified at the time of writing, or by the Technical Director at the time he signs the report.

Test results reporting may be verified by the signature of the QA Manager, or Technical Director.

9.3 COMPUTER DATA COLLECTION & PROCESSING SUMMARY

This Section summarizes the data collection and processing which are facilitated by use of a computer in the RTI Laboratory.

1. Word Processing-word processing is used for developing manuals and for correspondence. This aids in maintaining permanent records and allows updates to be made in a timely manner.

9.4 DATA/REPORTS STORAGE AND MANAGEMENT

RTI has developed its own laboratory information management system (LIMS) for handling of all data and reports on the work submitted for testing. This system is written in dBase code and now runs under FoxPro on a PC platform in a NOVELL network environment. The system is capable of tracking all data and information from sample log-in stage to final reporting and billing.

When the results are ready for distribution they are photocopied by the Secretary, the original mailed, the copy for filing identified with the letter "F" and filed in the cabinet at her station. These files contain the current year report copies as well as those of the preceeding year. Reports older than two (2) years are archived in the warehouse for a period of three (3) more years.

9.5 TEST REPORT REVIEW PROCESS

The reports generated in the separate departments are

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reviewed, signed, or initialed by the Technical Director. A minimum of 10% of the raw data (WorkSheets) are reviewed by the QA Manager.

The QA Manager will arbitrarily select a day of the week in which he will review all reports, or a maximum of 10, for that day by personal interview with the technicians or supervisors who performed the test or analysis. A record of the reviews will be maintained in the QA Office and signed by the QA Manager. The General Manager will audit these records on a semi-annual basis. A copy of the form used is seen in the Appendix.

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10.0 DIAGNOSTIC AND CORRECTIVE ACTIONS

This Section defines procedures and guidelines for identifying, diagnosing, and correcting quality problems. Proficiency and collaborative testing provide opportunities for identifying laboratory procedure quality problems at an early stage. Problems must be identified before incorrect critical decisions are made in the Laboratory. When problems do arise, this Section of the Quality Manual provides procedures for correcting them.

10.1 PROFICIENCY AND COMPARISON TESTING

Proficiency testing is conducted by the QA Manager once each quarter for those tests or analysis systems which have results which emanate from an instrument in the form of numbers or curves. If the expected results do not fall within the precision and accuracy requirements of the test specifications, proficiency tests are continued until specification tolerances are reached.

The proficiency test is conducted in the accordance with the following plan when testing problems are indicated by apparent poor results from the bench(s).

Step one: The technician (ICP, GC, OES, Dionex,etc) involved is asked by the QA Manager to analyze two (2) known standard materials under his supervision. If the results of the test(s) fall outside the expected range, then an equipment problem is indicated. This problem may be either a mechanical one, or an operating procedure problem. Operating procedures are reviewed, and the instrument re-calibrated.

If a potential problem is not then found, a more thorough study of the problem is initiated by the Technical Director or the General Manager. When the problem is found and fixed, it is verified by repeating theis "Step one". Accomplishing this, the proficiency testing returns to the regular schedule.

10.2 CORRECTIVE ACTION OF TEST PROCEDURES

When proficiency testing reveals inadequate testing procedures, the following corrective action will be taken by the Technical Director.

1. Determine the source of inadequacy (method, equipment or personnel
2. Adjust procedure
3. Retest procedure

Repeat the preceding three steps until the procedure has been verified as correct.

If the problem is mechanical or instrumental, involving laboratory equipemnt or instrument, the following steps are taken:

Date_____

1. Review the operations and calibration manual.

2. If the equipment/instrument is not being operated correctly, adjust the operations and verify that the problem has been corrected.

3. If the equipment/instrument is being operated correctly, but cannot be calibrated, the maintenance manual for the equipment/instrument will be referenced.

4. If following the procedures in the maintenance manual corrects the problem, the equipment/instrument will be re-calibrated. It will then be verified that the problem is solved, by statistical methods.

5. If following the procedures in the maintenance manual does not solve the problem, if those procedures cannot be understood, or if they so direct, then the manufacturer will be called. It may be that the telephone call can reveal the problem cause, and if not, the manufacturer service department asked to come in and repair the equipment/instrument. If the warrantee allows, an outside service organization may be called in to perform repairs. When the equipment/instrument is repaired, it must be re-calibrted. All maintenance or equipment repair activities will be recorded in the Instrument maintenance log book. The QA Manager will from time to time review the steps taken and the recording thereof.

10.3 TECHNICAL COMPLAINTS

Technical complaints are addressed by the RTI senior staff member with the most expertise in the field of complaint in addition to the QA and General Managers. A copy of the "Technical Complaint" form (seen as Appendix Z) is filled out. If the complaint is not valid, every attempt is made to satisfy the client by reporting the steps taken to ascertain the validity of the results presented. If the complaint is determined to be valid, then the cause for the complaint will be corrected immediately, and so reported on the form. Verification that the cause for a valid complaint has been corrected is the responsibility of the QA and General Managers. The "Technical Complaint" form will be filed by the Genral Manager's Secretary and kept under control of the Manager.

10.4 REPORT SUPPLEMENTS

Whenever a report or reports must be corrected, the new report shall be headed: "SUPPLEMENT TO LABORATORY NO._____.

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11.0 LABORATORY RECORDS

This section describes how RTI Laboratory records are maintanied, confidentiality and security features, and how historical files are handled.

11.1 MAINTENANCE OF RECORDS

Testing data and test reports are maintained in the computer and in the project files. When samples or projects are received they are assigned a Laboratory Number (or project number) and the test data, report informatiomn that is generated, and a copy of the report are placed in that file. Project files are located in a locked cabinet under the Secretary's supervision.

Calibration records are maintained in a CALIBRATION RECORD NOTEBOOK.

Records are held by the Laboratory for a minimum of three (3) years, unless otherwise specified by regulation or directive. At the end of three (3) years a review may take place to determine whether any records should be kept for an additional two (2) or three (3) years.

The updating and control of documents affecting quality are described below.

Customer Engineering Standards (i.e. GM and Ford) are on a subscription basis. When a customer has changes or additions to their standard, they are automatically sent to the Laboratory

SAE Handbooks and ASTM Standards are replaced as they may be needed.

RTI Equipment/Instrumentation- the SOP Manual is reviewed and updated annually by the General Manager and QA Manager. Whenever changes or additions are made to any equipment or instrument, prior to the annual review, the SOP Manual is revised.

11.2 CONFIDENTIALITY AND SECURITY

General directives for confidentiality and security in RTI Laboratory are described in Section 3.7. The security of laboratory records is described here. No restricted RTI documentation may leave the premises without approval of the General Manager. Other official documentation may be taken out of the Laboratory if there is a duplicate copy retained in the Laboratory, and upon approval of the General Manager.

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Duplicate files or computer disks of critical laboratory information are stored at Detrex Corporation Offices in Southfield.

11.3 HISTORICAL FILES

Historical information regarding any development work or any formulations are kept in the Technical Director's Office. Test result records more than two (2) years old are filed in storage boxes in the warehouse.

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12.0 SUBCONTRACTING

When purchasing any chemicals used for analysis in this Laboratory, a Certificate of Analysis and/or Material Safety Data Sheets are to be received with the shipment from the supplier. If the analysis of any material does not meet the required specifications as stated on the container, the material WILL be rejected and returned to the supplier explaining why the material was rejected.

Laboratories which are chosen to perform adjunct analyses for RTI are very selectivley chosen based on their compliance with the criteria established by such agencies as A2LA, CPC, EPA and major automotive manufacturers. These Laboratories are audited annually by the QA Manager and/or the Technical Director. An example of the form used for those audits is seen in the Appendix, and the completed forms will be kept in the QA Office.

The list of Laboratories currently used by RTI is kept on file in the QA Office.

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13.0 ANALYTICAL LABORATORY CONTROLS

13.1 LABORATORY BLANKS

13.1.1 DEFINITION AND PURPOSE

A laboratory blank usually consists of deionized water which is prepared and analyzed as if it were a sample. The laboratory blank is used as a check for contamination.

13.1.2 ANALYSIS FREQUENCY OF LABORATORY BLANKS

Laboratory blanks are analyzed after each grouping of 10 samples and at the end of the analytical run for most types of analyses. In other words, when 1-10 samples are analyzed, 1 laboratoiry blank is required. In an analytical run containing 11-20 samples, 2 laboratory blanks are required. Several exceptions are made however. The required frequency for laboratory blanks for GC and GC/MS analyses is one per batch of samples, regardless of the number of samples. There are some analytical methods for which the analysis of a laboratory blank is not meaningful. Specific ion electrodes, for example, will not stabilize in deionized water. Flashpoint is another example of a test for which a laboratory blank is not applicable. Analysts may choose to analyze more laboratory blanks than required.

13.1.3 ACCEPTANCE LIMITS FOR LABORATORY BLANKS

Laboratory blank values are considered to be acceptable if they are less than or equal to the detection limit of the test.

13.1.4 CORRECTIVE ACTION

Although a laboratory blank value is considered acceptable as long as it is less than or equal to the detection limit, an acceptable blank value is subtracted from the sample values associated with it (most usually the group of 10 or less samples analyzed since the last blank) in order to compensate for instrumental drift or analyst bias.

Ideally, when a laboratory blank value exceeds the detection limit, the analyst halts the analysis until he/she investigates the problem. If the problem is one of instrumental drift, the instrument is re-zeroed, and those samples analyzed since the last acceptable blank are re-analyzed.

If the problem is one of contamination, the source of the contamination is determined and actions taken to remove the contamination and to assure that this contamination does not affect sample results. It is generally desirable and feasible to produce

an analytical run in which no blank is above the detection limit. When such a desirable situationis not possible, it is permissible to subtract a blank that is greater than the detection limit from the sampleresults associated with it. These results are reported with a code "X"; code "X" indicates: "A blank over the detection limit of the test was subtracted from this result".

13.2 INSTRUMENT CALIBRATION

The purpose of this section is to provide an overview of instrument calibration procedures. Calibration procedures specific to each analytical method are located in the RTI SOP Manual.

13.2.1 ICP

The ICP only accepts a two (2) point calibration with a high standard and a blank. Three (3) standards and a blank are analyzed after calibration so that the assayed concentration values appear at the top of the printout. If the re-analysis of the high standard and the midrange standard produce standard concentration values which are not within 10% of the expected values, or the limits established using statistical analysis of historical data, the instrument is re-calibrated. A standard at the detection limit also checks the calibration.

13.2.2 GAS CHROMATOGRAPH (GC)

The GC is capable of storing calibration. If a calibration for a particular analyte is stored, then only a check standard at a high range (higher than anticipated sample concentrations), a blank, and a detection limit standard are analyzed. The check standard must read within 10% of the expected value, or the limits established using stistical analysis of historical data. If if does not read within 10%, or the limits of 3 sigma, the analyst prepares a new chack standard and analyzes it. If the new check standard does not fall within 10% of the expected value, then the analyst consults a supervisor who may determine that a new calibration should be entered into the GC. If the calibration is not stored in memory,then appropriate multi level standards are used for recalibration. A blank and a detection limit standard are also to be analyzed.

13.2.3 GAS CHROMATOGRAPH/MASS SPECTROMETER (GC/MS)

GC/MS calibrations are generally stored on the instrument. Five standards are used for the calibration. The check standards must read within 20% of the expected value, or the limits established using statistical analysis of historical data. Detection limit standards and blanks are also analyzed.

13.2.4 ATOMIC ABSORPTION

AA Spectrophotometers capable of computerized standardization are calibrated with a minimum of three (3) standards and a blank. After calibration, these same three (3) standards and blank are re-analyzed so that the assayed concentration values appear at the top of the printout. If this re-analysis of the high standard and midrange standard produces standard concentration values which are not within 10% of the expected values, the instrument is re-calibrated. A multi-point standard at the detection limit also checks the calibration.

When the AA is used for Mercury determinations it is calibrated with a minimum of four (4) element standards and a blank. A detection limit standard is also analyzed.

13.2.5 AUTOMATED COLORIMETRIC METHODS

Automated standards are calibrated with a minimum of four (4) standards and a blank. A detection limit standard is also analyzed during the analytical run.

13.2.6 SPECIFIC ION METER

Four (4) multi level standards are used to calibrate specific ion meters. A detection limit standard is also analyzed during the analytical run. Blanks are not analyzed since the meter response tends to drift indefinitely. The values of the standards used for calibration are noted on the analyst's worksheet.

13.3 DETECTION LIMITS

A standard at the detection limit is analyzed each time an analytical test is performed. The detection limits for each test method are established based on the statistical analysis of historical data on the matrix blanks and are maintained by the analysts and verified by the immediate supervisor.. This could mean that different detection limits prevail for various types of sample matrices being analyzed. A rule of 3 Sigma above the mean background noise is appolied to establish these detection limits.

If it is necessary to dilute a sample in order to avoid matrix interference or because of insufficient sample volume,and the concentration after the dilution is less than the detection limit, the concentration of that sample is reported as less than the result obtained from the multiplication of the detection limit times the dilution factor. The reported result should be accompanied by code "Y"; code "Y" indicates: "detection limit change due to dilution".

13.4 METHOD OF STANDARD ADDITIONS

The method of standard additions is a technique which is used to obtain more accurate concentration values on samples which contain interferences.

The sample is spiked with analyte at three different levels. The concentration of the sample plus the highest spike is kept within the linear range of the test. Samples with concentrations near the upper range of the test are therefore diluted before being spiked. The same sample dilution is used in each of the three spiked samples and the sample is analyzed unspiked at that same dilution. A best fit line is constructed with the theoretical concentration of the spike added (after dilution by the sample) aas the abscissa and the actual concentration reading of the spiked samples and the unspiked sample as the ordinate. The X intercept, after multiplication by the appropriate dilution factor, represents the concentraion of the sample unbiased by certain interferences.

Results determine using the method of standard additions are reported with a code "S"; cose "S indicates: "this result has been obtained using the method of standard additions".

13.5 PREPARATION OF REFERENCE CONTROLS (CHECK STANDARDS)

13.5.1 DEFINITION AND PURPOSE

A preparation reference control consists of a known concentration of standard reference material in an appropriate solvent. The preparation reference control is pertinent only to those tests for which samples are subjected to sample preparation techniques such as extraction, distillation or acid digestion; the preparation reference control is treated in the same manner as the samples. The purpose of the preparation reference control is to provide a check on the accuracy and precision of the preparation technique as well as the analytical measurement technique.
Preparation reference controls, in conjunction with reference controls provide a useful means of pinpointing whether there are problems with the preparation, the analytical measurement technique, or both.

13.5.2 ANALYSIS FREQUENCY OF PREPARATION REFERENCE CONTROLS

One preparation reference control is prepared each time a particular preparation is performed on a batch of samples. In the case where one particular preparation prepares the sample for numerous analyses, only one analyte is examined during a given period of time. For example, a certain acid digestion preparation may be capable of preparing samples for the analysis of many different metals; the preparation control for that digestion, however, targets only one of those metals. When adequate data is

accumulated for that particular metal, another metal is targeted as determined by the Quality Assurance Manager.

13.5.3 ACCEPTANCE LIMITS FOR PREPARATION REFERENCE CONTROLS

Acceptance limits for preparation reference limits are generated within the laboratory based on past standarddeviation data. Analysts are periodically issued listings of these control limits.

13.5.4 CORRECTIVE ACTION

When necessary, corrective actions applied are specific to and subject to the constraints of the particular analytical method.

13.6 REFERENCE CONTROLS (CHECK STANDARDS)

13.6.1 DEFINITION AND PURPOSE

A reference control consists of a known concentration standard reference material in an appropriate solvent. The purpose of the reference control is to provide a check on the accuracy and precision of an analytical measurement technique at specific intervals during an analytical run. The reference control is not subjected to any sample preparation techniques such as extraction, distillation or acid digestion. The preparation reference control provides information relative to such preparation procedures. Distinguishing between these two types of controls- the reference control and the preparation reference control- provides a means by which the analyst can determine whether the source of a particualr problem originates with the sample preparation or with the analytical measurement technique.

The reference control is also designed to be an independent check on the calibration standards. The reference control is prepared on a different day than the calibration standards for those analytes for which it is possible to store or preserve the control material. For those analytes for which it is not possible to preserve the control material, the reference control is prepared by a different analyst at the same time as the calibration standards. Whenever possible, stock solutions from different sources are used to prepare the calibration standards and the reference controls.

13.6.2 ANALYSIS FREQUENCY OF REFERENCE CONTROLS

Reference controls are analyzed at the end of every grouping of 10 samples and/or at the end of the analytical run. In other words, for 1-10 samples, 1 reference control is analyzed. For 11-20 samples, 2 reference controls are analyzed, etc.

Reference controls can only be analyzed when it is possible to prepare standard material; reference controls are not analyzed with samples being tested for suspeded solids, for example.

13.6.3 ACCEPTANCE LIMITS FOR REFERENCE CONTROLS

Acceptance Limits for reference limits are established by the QA Manager based on statistical analysis of performance data after consultation with the analysist and his/her immediate supervisor. These limits will be periodically reviewed by the QA Manager and updated, if needed, based on immediate past performance. Analysts are periodically issued listings of these control limits.

13.6.4 CORRECTIVE ACTION

Analysts re-analyze the group of samples which were analyzed immediately prior to the unacceptable reference control result, but after the last acceptable reference control result or the calibration.

13.7 REPEAT CONTROLS (DUPLICATES)

13.7.1 DEFINITION AND PURPOSE

A repeat control is analyzed by repeating the analysis of an actual sample that has already undergone preparation treatment such as digestion, distillation, etc. The purpose of the repeat control is to determine the effect that the matrix of the sample has on the reproducability of data.

13.7.2 CALCULATIONS NECESSARY FOR THE EVALUATION OF REPEAT CONTROLS (DUPLICATES)

The following information is reported on the quality control data sheet which is submitted with each batch of analytical results.

1. The RTI identification number of the sample which is used as the repeat control.
2. The assayed concentration of the sample the first time it was analyzed.
3. The assayed concentration of the sample the second time it was analyzed.
4. The absolute difference (AD) is defined as the absolute value of the difference between the two values.
5. The relative percent difference (RPD) is defined as the absolute value of the difference between the two values divided by the mean of the two values expressed as a percentage.

$$\frac{\#4 \times 100}{(\#2+\#3)/2}$$

13.7.3 ANALYSIS FREQUENCY OF REPEAT CONTROLS (DUPLICATES)

A range of 5-10% of the total samples in a month will be run as samples. A single sample is divided into two (2) segments and analyzed, and both values recorded. The absolute difference of the two (2) divided by the mean is the value recorded.

13.7.4 ACCEPTANCE LIMITS FOR REPEAT CONTROLS

1. Repeat values are always considered to be in control if the absolute difference (AD) between the two values is less than or equal to twice the detection limit. In the case of one value which is less than the detection limit and one value which is above the detection limit, the repeat controls are considered to be in control if the positive value is less than or equal to three times the detection limit. If these criteria are not met, then the repeat control values are not in control unless the criteria presented in paragraph #2 below are met.

2. For repeat control values which are not in control according to the criteria in paragraph #1 above, the relative percent difference (RPD) must be less than or equal to the limits which are issued by the Quality Assurance department in order for these repeat control values to be considered to be acceptable. These limits are based on statistical treatment of past performance.

13.7.5 CORRECTIVE ACTIONS FOR REPEAT CONTROLS (DUPLICATES)

A repeat control sample which has a percent recovery outside the acceptable range alerts the analyst to two (2) possibilities: 1) Uncertainty exists as to what should be considered an accurate result for the sample which was repeated; and 2) The results obtained for ALL the samples which were analyzed WITH the unacceptable repeat control may also be inaccurate. The analyst must therefore do as much as possible to obtain accurate results for the sample within that analytical run. The following steps help to achieve this goal. (These steps assume that there are no obvious indications that there is something wrong such as unacceptable reference controls, sample cayyover, severe instrument drift, etc.)

1. If there is another acceptable repeat control within the same analytical run as the unacceptable control, then the other results in the analytical run can be considered acceptable; the problem then is reduced to determining what value is accurate for the repeated sample itself.

2. If there is no other acceptable repeat control in the analytical run, then another sample is chosen for repeating. If this repeat control value is acceptable, then the results from the analytical run are considered valid. If it is not acceptable, the analyst repeats additional samples until an acceptable value is obtained or until all of the samples have been repeated.

3. At some point during this process, the analyst pauses to consider reasons why the samples are not repeating properly. One obvious problem could be the heterogeneity of the sample. If this is the case, then further preparation is performed on the sample in order to achieve a more uniform sample which can be diivided easily.

4. A third analysis is performed on all samples which have been repeated once with acceptable results. If this repeated value is close enough for one of the other values to be considered acceptable by the criteria discussed above, then the average of those two values is reported as the result for that sample. If this repeated value happens to be within an acceptable range of both the other values, then the average of all three of the values is reported. In the unlikely event that all three values are not close enough to eachother, a supervisor is consulted and the case is treated individually.

13.8 SURROGATE SPIKES

13.8.1 DEFINITION AND PURPOSE

A surrogate spike is a compound which behaves in the same manner as the analytes of interest when spiked into a sample. Surrogate compounds are often structurally similar to the analytes being tested. Surrogate spikes are added to most samples which are analyzed using the gas chromatograph/mass spectrometer (GC/MS); they are added prior to purging in the case of volatile compounds and prior to extraction in the case of semi-volatile compounds. The purpose of the surrogate spikes is to monitor the sample preparation procedure and to determine the effect of the sample matrix on the recovery of the analytes. Low recoveryies can indicate either a sloppy preparation procedure or a problem sample matrix which is preventing good recovery.

13.8.2 ANALYSIS FREQUENCY OF SURROGATE SPIKES

When applicable to a particular GC/MS analysis, surrogate spike compounds are added to each sample.

13.8.3 ACCEPTANCE LIMITS FOR SURROGATE SPIKES

Acceptance limits for surrogate spikes are based on standard deviation data from past performance. Analysts are periodically issued updates of the acceptance limits.

13.8.4 CORRECTIVE ACTION

If the surrogate spike recoveries are not within the acceptance limits, a new aliquot of sample is prepared after being spiked with surrogate standards. If the surrogate spike results are within the acceptance limits in the second preparation, only the concentrations obtained from this analysis should be reported as results. However, if these surrogate spike recoveries are also outside the acceptance limits, then the analytical results reported for that sample should be accompanied by an explanation that the sample matrix prevented accurate analysis.

13.9 SPIKED CONTROLS

13.9.1 DEFINITION AND PURPOSE

A spiked control is analyzed by adding a known concentration of analyte to an actual sample which has already undergone preparation treatment such as digestion, distillation, etc. The volume of the spiking solution does not exceed 1% of the volume of the sample. The purpose of the spiked control is to determine the effect that the matrix of the sample has on the analysis. The underlying assumption is that if there are problems recovering the added analyte during the analysis, then the results of the analysis of the sample itself are suspect.

13.9.2 CALCULATIONS NECESSARY FOR THE EVALUATION OF SPIKED CONTROLS

There are five pieces of information regarding the spiked controls which are reported on the quality control data sheet which is submitted with each batch of analytical results. These are:

1. The RTI identification number of the sample which is used for the spiked control.

2. The concentration of the analyte added to the sample expressed in terms of its final concentration after it has

been added, and therefore diluted, by the sample. This concentration can either represent the theoretical concentration added to the sample or the analyzed concentraion, depending on the type of analysis and the type sample.

This concentration is determined as follows:

a. For graphite furnace results and for metal results on solid waste and leachate samples, the concentration of the analyte added to the sample is considered to be the assayed concentration of that standard in deionized water. For example, if a deionized water blank is spiked with 0.1 mL of a 1000 mg/L standard of lead into 10 mL of deionized water and the result obtained upon analysis is 9.9 mg/L, then 9.9 mg/L is used as the "spike added" as long as the samples are spiked in exactly the same manner.

b. For results other than those generated by the graphite furnace or those which are not metal analyses on solid waste and leachate samples, the concentration of the analyte added to the sample is considered to be the theoretical concentration. For example, if 0.1 mL of a 1000 mg/L standard of lead is added to a 10 mL sample, then the "spike added" should be reported as 10mg/L.

3. The assayed concentration of the sample after the spike has been added.

4. The assayed concentration of the sample before the spike has been added. The result used is the actual value obtained from the analysis regardless of whether that value is below the detection limit or negative.

5. The percent recovery of the spike which is calculated as:

$$\frac{(\#3 - \#4)}{\#2} \times 100$$

The percent recovery is the result that is used to determine whether or not the spiked control is acceptable by virtue of whether it falls within the acceptance limits.

13.9.3 ANALYSIS FREQUENCY OF SPIKED CONTROLS

The analysis frequency required for the spiked controls depends both on the type of sample and the methodof analysis. Table I indicates the analysis frequency for the spiked controls according to the type of analysis performed. Spiked controls can only be analyzed when it is possible to prepare standard material; spiked controls arenot analyzed with samples being tested for suspended solids, for example.

Date 8/22/91

13.9.4 ACCEPTANCE LIMITS FOR SPIKED CONTROLS

Acceptance limits for spiked control are set in two (2) ways: 1) when it is determined that an outside agency such as the EPA requires certain limits on certain types of samples or analyses, these are the limits that are used; 2) when there are no fixed limits set by an agency to achieve, then limits are generated based on standard deviation data from past performance. These limits areperiodically updated as new confidence limits are calculated. The QA Manager would provide this information when enough new data has been accumulated and found to be statistically significant to update the previously established limits. Table I indicates whether the acceptance limits for the various types of analyses and samples have been set by an outside agency or whether thay are generated within the laboratory. If they are set by an outside agency, then the limits for the percent recovery are actually listed. If they are generated within the laboratory, then "generated" is listed. In the case of "generated", the analyst consults the most recent update of the control limit listings which is periodically issued.

Date 8/22/91

TABLE I
FREQUENCY AND ACCEPTANCE LIMITS FOR SPIKED CONTROLS

Analysis Type	Sample Type	Frequency	%Recovery Acceptance Limits
Graphite furnace	All except IH	All	90-110
ICP	Solid waste	All	Generated
ICP	Leachates	All	Generated
ICP	Water	1/batch or 1 every 20	Generated
Flame AA, Cold Vapor, Hydride	Solid waste	All	90-110
Flame AA, Cold Vapor, Hydrid	Leachates	All	90-110
Flame AA, Cold Vapor, hydride	Water	1/batch or 1 evry 20	Generated
All non-Atomic Absorption or non-ICP methods	All except IH	1/batch or 1 every 20	Generated

Date 8/22/91

13.9.5 DEFINITIONS FOR TABLE I

Solid Waste	All samples with the codes"W-Wet", "W-Dry or "Oil Prep" on the Work Sheet. Leachate All samples with the codes "EP Leachate","TCLP Leachate", or "ASTM Leachate" on the Worksheet.
Water	Samples which do NOT have the following codes on the worksheets: W-Wet,W-Dry Oil Prep, EP Leachate, TCLP Leachate, or ASTM Leachate.
1/batch or 1 every 20	A spiked control sample should be analyzed at the end of every grouping of 20 samples and at the end of the analytical run. In other words, for 1-20 samples, 1 spiked control is analyzed. For 21-40 samples, 2 spiked controls should be analyzed,etc.
Generated	Limits are generated within the laboratory based on past standard deviation data. Analysts are periodically issued listings of these control limits.

13.9.6 CORRECTIVE ACTIONS

A spiked control sample which has percent recovery outside of the specified limits alerts the analyst to two (2) possibilities: 1) The results obtained for the unspiked sample which was used as the spiked control may not be accurate; and 2) The results obtained for ALL the samples which were analyzed WITH the unacceptable spiked control may also not be accurate. The analyst does as much as possible to obtain accurate results for the samples within that analytical run. The following steps help to achieve this goal. (These steps assume that there are no obviuos indications that there is something wrong such as unacceptable reference controls, sample carryover, severe instrumental drift, etc.)

1. Optional step: The spiked control sample may be re-analyzed or re-prepared and analyzed if there is some doubt as to whether the original analysis was valid. If the percent recovery on this rerun falls within the limits, then the analytical run is acceptable.

2. If the percent recovery on the spiked control samp-le is still unacceptable after the rerun, the other results obtained during the analytical run are examined. If there are other spiked samples within the same analytical run which have an acceptable percent recovery, then the results for the other unspiked samples areconsidered acceptable and only the particular sample with the unacceptable percent recovery remains in question. However, if there are no other acceptable spiked controls in the run, then ALL results remain in question. Additional samples in the same analytical run are spiked until an acceptable percent recovery ona sample is obtained or until all of the samples are spiked.

3. At this point the analyst may consult a supervisor and/or further investigate the nature of the sample and the interferences which prevent acceptable percent recoveries on spiked samples; if applicable, he/she takes steps to remove these interferences from the sample. As a "real life" example, a sample was analyzed for cyanide; when this sample was spiked, it showed no recovery of the spike. Recovery approached about 50% when the sample was diluted 1:500. Since the method indicated that Chlorine was an interferent, the sample was checked for Chlorine and showed positive with test paper. The sample was then dechlorinated before analysis; when spiked again, recovery was acceptable with no dilution.

4. For samples for which it is not possible to remove interferents and therefore obtain a satisfactory percent recovery, the following rules apply:

a. If the percent recovery result is greater than the upper acceptance limit but the analytical result is below the detection limit, a result of less than the detection limit is reported and no further action is necessary. The rationale is that a high percent recovery indicates an enhanced signal. If the assayed concentration of the sample is less than the detection limit when it is enhanced by an interferent, then the assayed concentration minus the interferent would also be less than the detection limit.

b. If the percent recovery of a metal analyte is outside of the acceptance limits but greater than or equal to 40%, and the results do not meet the criteria in part "a" above, the method of standard addition is used to obtain the result. Section 13.4 describes the method of standard additions technique. The one spike analysis that has already been performed on this sample is considered to be one of the three (3) spikes necessary to perform the method of standard additions; therefore, only two (2) more analyses are necessary. When the method of standard additions is used to obtain a result, a code "S" is submitted with the result; code "S" indicates " This result was obtained by the Method of Standard Additions".

c. If the percent recovery of a non-metal analyte is outside the acceptance limits but is greater than or equal to 40%, and the results do not meet the criteria described in "a" above, a supervisor (or someone with past experience) is called upon to determine whether the method of standard additions is applicable to that particular analysis. When the method of standard additions is used to obtain a result, a code "S" is submitted with the result; code "S" indicates "This result was obtained by the Method of Standard Additions". For samples for which the method of standard additions is not applicable, the results are reported with an explanation that they may not be accurate due to interferences from the sample matrix.

d. Samples for which the percent recovery is less than 40% are diluted five (5) times and spiked again. If the resulting percent recovery is greater than or equal to 40%, then the procedures described in parts "a" through "c" above are followed on the diluted sample.

The method of standard additions, if applicable, is performed on the diluted sample and the results, including a result below the detection limit, are multiplied times the dilution factor.
A code "d" is included with the result if the detection limit has been raised; code "D" indicates "Detection limit change due to a dilution". If the percent recovery on the diluted sample is still less than 40%, a supervisor is consulted as to whether the sample should be diluted further.

13.10 STATISTICAL TREATMENT OF QUALITY CONTROL DATA

Control samples are prepared, analyzed, and reported by the analysts according to standard operating procedures. The control data are then entered into the RTI LIMS network for statistical treatment and control chart printing.

13.10.1 DETERMINATION OF ACCEPTANCE LIMITS FOR REPEAT CONTROLS

Replicate concentration values for a particular analyte are only entered into the computer when both of the values are greater than five times the detection limit of thatanalyte. The reason for excluding replicate concentrations that are five times or lower than the detection limit is that even small absolute differences cause very large relative percent differences at these low concentration levels. These high relative percenr differences (RPD) would cause the acceptance limits to be too high to be meaningful at higher sample concentration levels.

The computer program prompts for both the original sample concemtration and the replicate value. The relative percent difference (RPD) is calculated by the program. The acceptance limits are detrmined as follows:

$$WL = 2.51xR$$

$$CL = 3.27xR$$

where

R= average relative percent Difference (RPD)
WL= warning limit
CL= control or acceptance limit

13.10.2 UPDATING OF ACCEPTANCE LIMITS

The software program is written so that limits can be calculated after a minimum of five data entries. Limits based on such a small number of data points are considered only temporary; they are useful in supplying guidance regarding analytes which are seldom analyzed by the laboratory. Limits established for the more frequently analyzed parameters are always based on 30 or more data points after the first 30 data points have been collected. The limits are routinely updated at the end of every quarter and issued to the analysts at that time. However, if the Quality Assurance Manager believes that signiificant improvements have been made in a method and he wants to issue new limits before the routine update, it is possible to recalculate the limits at any time. When the limits are recalculated and updated, all of the data which has been collected on that disk for a particular parameter are included in the recalculation.

13.10.3 CONTROL CHARTS

The software program constructs charts based on the mean, warning, and control limits. The chart on the following page is typical and shows the limits based on the standard deviation, preparation reference, reference, spiked, and surrogate spike control values. These are plotted on this type chart. The second example shows a typical control chart on which relative percent differences for repeat controls are plotted. Data points are represented by each anlayst's last initial. The horizontal axis of the chart shows the file record number which was assigned to the data point which was plotted. That record number can be used to retrieve, eitherfrom the computer disk or from hard copy of the data on the disk, tha actual control value, the initials of the analyst who submitted that control value, and the date of analysis.In turn this is adequate information to retrieve the actual worksheet and full name of the analyst performing the test.

Control charts are printed after every 30 control values and are presented to the QA Manager. The QA Manager examines the charts for data points which are out of control or for trends which may be leading to an out of control situation. Documentation of the corrective action taken regarding control values which are outside of the acceptance limits are added during this examination. Copies of each control chart are distributed to the Laboratory Technical Director and the applicable department Supervisor.

13.10.4 DOCUMENTATION OF QUALITY CONTROL DATA

It is primarily the responsibility of the analyst to produce quality data. The analyst is responsible for analyzing control sample during each analytical run. He/she is familiar with the methods of preparation and the freqquency of analysis of these control samples as they are specified in the RTI SOP Manual. The analyst either ensures that the assayed control values are within the limits issued by the QA Manager or he/she takes the corrective actions prescribed in this Manual. Finally, he/she clearly documents the assayed control values obtained and the corrective action taken. The following pages contain a copy of the form which the analyst completes each time a particular test is performed and the form is completed when there are is a problem. These completed forms remain attached to the worksheets containing the sample results associated with the control values on the forms.

13.10.5 QUALITY CONTROL DATA I

This form is completed each time a test is conducted and completed. It requires not only that the analyst record the assayed control values, but also that there be documentation of the acceptance limits which were in effect at the time of the analysis. For frequently analyzed parameters, the QA Manager issues "Quality Control Data I" sheets which already list the acceptance limits for the specified parameter. Only control values which are within the acceptance limits are listed on this document. Percent recoveries for spiked samples which have limits set by an outside agency (generally either 90-110% or 75-125%) are NOT included on the "Quality Control Data I" sheet; these percent recoveries are listed on the worksheet itself.

13.10.6 QUALITY CONTROL DATA II

The analyst is required to complete this form when a control value is encountered which is outside of the acceptance limits. The control value is recorded that is outside of the acceptance limits, the corrective action taken is recorded, and then the acceptable control value recorded. If the corrective action deviates from what is prescribed in this QA Manual, then this form includes the signature of the authorized supervisor. Asd with the "Quality Control Data I" form, percent recoveries for spiked samples which have limits set by an outside agenoy are NOT included on the "Quality Control Data II" sheet; the corrective actions are recorded on the worksheet.

SECTION NUMBER 13.0
INCLUDES PAGES 13.1 TO 13.18

DATE WRITTEN: 6/12/91
APPROVED BY: [illegible]
DATE APPROVED: 6/12/91
LATEST REVISION DATE: 8/22/91
REVISION APPROVED BY: [illegible]

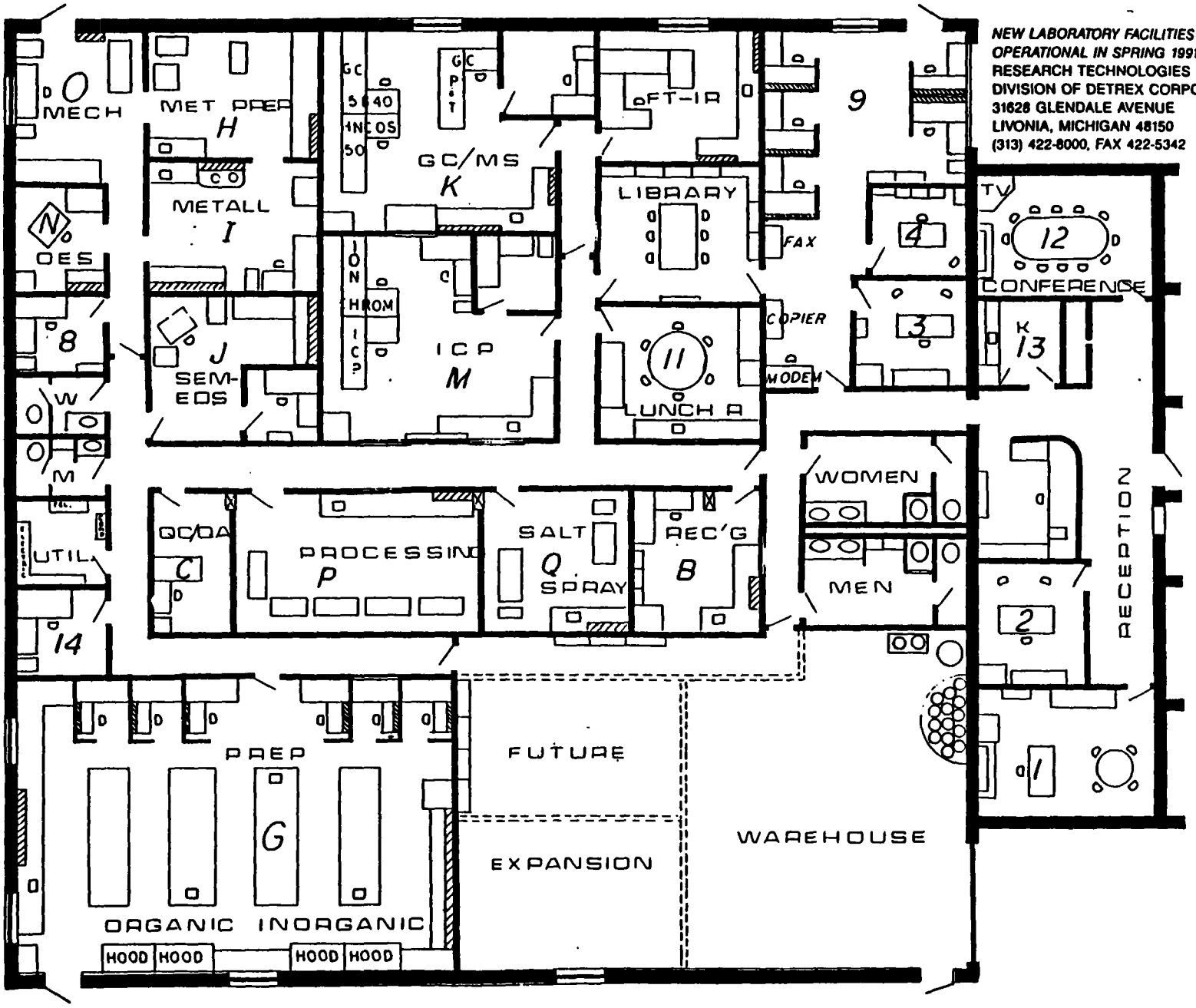
A P P E N D I C E S

	Item	MFG/Model No.	S/N	Loc.	Cal. Verif.	Outside Internal	STD	FREQ.	Purpose/Use
1	Metallograph	Olympus Vanox 01AH	201893	I	Cal.	Internal	Grid	Annual	Magnification & photography of prpared surfaces 15x-1000x
2	SEM	ISI-ABT 55	K-220100	J	Cal.	Internal	Gold Grid	Annual	Surface evaluations 10x-100,000x
3	EDX	PGT-System IV	405	J	Cal.	Internal	Al/CU	Annual	Qualitative analysis for elements atomic # > 5
4	Microhdn. Tester	Wilson Tukan MO	1058	I	Cal.	Outside	Std. Black ASTM-E92	Annual	Hardness measurements on a microscopic scale
5	Gas Chromatograph	HP 5890	2908A21432	K	Cal.	Internal	RTI std.	Daily	For waste solvent analysis
6	Gas Chromatograph	HP 5880	-	K	Cal.	Internal	RTI std.	Daily	For waste solvent analysis
7	GC/MS	Finnigan-Mat INCAS 50	14311-0687	K	Cal.	Internal	BFB or DFTPP	12 Hr/on use	For determination of priority pollutants
8	ICP	Leeman PS1000	1141	M	Cal.	Internal	Leeman Stds.	Daily	For elemental cation analysis
9	IC	Dionex	844708	M	Cal.	Internal	RTI std.	Daily	For anian analysis
10	FT IR	Nicolet 510P	M1900321-11K	L	Cal.	Internal	Nicolet	Daily	IR analysis of organics
11	Carb./Sulfur Anal.	Leco CS 46	770-100	O	Cal. Verif.	Internal Internal	Leco Std. Leco Std.	6 Mos. Daily	Carbon/Sulfur quantitative analysis
12	Rockwell Tester	Wilson 3TT-BB	1495	O	Cal. Verif.	Outside Internal	Wilson Std. Wilson Std.	Annual On Use	Macro hardness testing of materials
13	Brinell Tester	Diam. Service	DW9-6	O	Cal. Verif.	Outside Internal	Load Cell Det. Tstg.	Annual On Use	Hardness testing of non-ferrous alloys and irons
14	Tensile Tester	Baldwin 60TE	-	AH	Cal. Verif.	Outside Internal	Load Cell Spring	Annual 6 Mos.	Mechanical properties of materials
15	PARR-BTU	PARR 1261	401	G	Cal.	Internal	Benzoic Acid	6 Mos.	Determination of heat content of compounds
16	Brinell Scope	A/O	129444	AH	Cal. Verif. Cal.	Internal Internal Outside	Cal. scale Cal. scale -	Annual 6 Mos. Annual	Measurement of Brinell impression diameter Measurement of inside diameter where necessary
17	Calipers	Mitiloyo	none	AH	-	-	-	-	-
18	Micrometer	-	none	AH	Cal.	Outside	-	Annual	-
19	Std. Wt.	10 gram.	none	G	Cal.	Outside	-	Annual	Measure outside diameters where necessary
20	Hg Analyzer	Buck Model 400	100	G	Cal. Verif.	Internal	RTI Std.	Annual	Hq determination
21	Orion O2 Probe	97-08-00	146620	G	Cal. Verif.	Internal	Air	Annual	O2 for BOD determination
22	Spectro-Onometer	HACH	7705A30	G	Cal.	Internal	DI	Annual	for COD
23	C/S Stds.	Various	none	O	Verif.	Visual	No rust	Annual	Carbon & Sulfur analysis of steels
24	OE Spectro Meter Stds	Various	none	AH	Verif.	Visual	No rust	Annual	Analysis of aluminum alloys, steel & steel alloys
25	Mettler Bal	HL 52	A65867	G	Verif.	Internal	5 gm	Annual	Weight determination for ????? solution
26	Mettler Bal	B-5	198469	L	Verif.	Internal	5 gm	Annual	-
27	pH Meter	Brackman	4709373	G	Cal.	Internal	540 pH solutio	On Use	For determination of pH
28	ph Meter	Fisher Model 630	834	M	Cal.	Internal	Std pH solution	Annual	For determination of pH

SAMPLE

RTI

RESEARCH TECHNOLOGIES INTERNATIONAL



NEW LABORATORY FACILITIES
OPERATIONAL IN SPRING 1991 FOR
RESEARCH TECHNOLOGIES INTERNATIONAL
DIVISION OF DETREX CORPORATION
31628 GLENDALE AVENUE
LIVONIA, MICHIGAN 48150
(313) 422-8000, FAX 422-5342

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2-28-91

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CODE OF ETHICS

Each and every employee of RTI agrees to abide by the Code of Ethics as follows:

We, the employees of RTI, recognizing our responsibilities and obligations to promote the public welfare, and maintain honorable, fair and friendly relations in all business dealings, do pledge ourselves:

1. To always compete with fairness and honesty, seeking patronage on merit and service; to refrain from false, derogatory reference, written, oral, or printed of competitors and their products, and from the circulation of harmful rumors regarding any competitors products, or their personal or financial reputation; to strive by sincere and intelligent cooperation with our competitors, in all lawful ways, to increase the efficiency and service to our clients; to base our advertising exclusively on merit of our own products and the value of our own service without false derogatory reference to the products or services of our competitors.

2. To be guided by a spirit of justice, honor, and fairness in all our relations with business organizations, realizing that the standard of ethics maintained in our industry will vitally effect the standard observed in associated industries to encourage the adoption by them of similar codes as guides to govern their practices in their trades.

3. To represent our products and services truthfully in advertising, labelling and branding; avoiding therein all false or misleading statements or descriptions.

4. To avoid and actively strive to prevent all forms of commercial bribery or corruption by the employees of RTI, vendors and clients, and by the industry in general; and to this end we pledge our support to enforcement of locating and prosecuting individuals guilty of such practices.

5. To adhere faithfully to the rules of conduct herein set forth and to assist fellow employees in doing likewise, believing the Golden Rule is the only true guide to conduct in the relations among people.

6. To preserve, and ensure that all raw data, information and knowledge generated by RTI for a paying client will be the property of that client only, and under NO circumstance will it be released from the files and confines of RTI. It is the ethical and professional responsibility of each employee to maintain the confidentiality of all such matters.

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7. To produce, present and report all findings with utmost honesty and professionalism, without any bias or favoritism of any kind.

8. To adhere to the procedures and methodologies outlined for Quality Assurance of data generated at RTI, and to commit to the complete and thorough resolution of challenges to data produced.

9. Any violation of this Code shall be referred by the General Manager of RTI to the Executive Vice President of Detrex Corporation for consideration and action; and the outcome of which will be considered acceptable to all concerned as the final verdict.

SIGNED:

Jerry Singh	Deanna Steckert
Jim Goodrich	Norm Frank
Deborah Clary	Dick Korastinsky
Lily SanAugustin	Luanne Robbins
Joseph Terrell	Rene Etter
Steve Dudzinski	Richard Mercer
John Colado	Greg Ptashnik

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Date_____

SIGNATURE STATEMENT
RTI PERSONNEL

Date of Last Revision_____

I have read and understand the policies and procedures described in the latest revision of the RTI Quality Assurance Manual. I agree to comply with the procedures as written, and will inform the RTI Quality Management of any deviations from these procedures, and take personal responsibility in seeing that procedures are up to date.

RTI Quality Management Team:

General Manager_____
Business Manager_____
Health & Safety Coordinator_____
Technical Director_____

General Staff

Supervisor, Chemistry_____
Supervisor, Materials_____
Supervisor, Surface Analysis_____
Supervisor, Process_____
Group Leader, GC-GC/MS_____
Chemist, GC-GC/MS_____
Chemist ICP_____
Technician, ICP_____
Technician, Organic Prep._____
Technician, Inorganic Prep._____
Technician, Process_____
Technician, Metallography_____

Note: The date on this page should match the date of the last revision.

R T I

Quality Manual Revision Log				
Revision Description	Section No.	Date	Author Sign.	Manager Init.
Addition	1.4.2	7/12/91	[illegible]	[illegible]
Addition	2.5.3	7/12/91	[illegible]	[illegible]
Language Addition	4.5.1	7/12/91	[illegible]	[illegible]
Spelling	4.6	7/12/91	[illegible]	[illegible]
Addition	5.2.4	7/12/91	[illegible]	[illegible]
Addition	5.3.2	7/12/91	[illegible]	[illegible]
Addition	6.1	7/12/91	[illegible]	[illegible]
Correction	6.4	7/12/91	[illegible]	[illegible]
Addition	7.2	7/12/91	[illegible]	[illegible]
Addition	7.4	7/12/91	[illegible]	[illegible]
Addition	8.1	7/12/91	[illegible]	[illegible]
Correction (ap)	8.8	7/12/91	[illegible]	[illegible]
* Addition	TOC	7/22/91	[illegible]	[illegible]
* Addition	1 & 4.1	7/22/91	[illegible]	[illegible]
* Change	1.4.3	7/22/91	[illegible]	[illegible]

*Result of Chrysler Audit

RTI

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ANALYTICAL ORDER FORM

Purchase Order No. _____ Date: _____

Submitted by: COMPANY _____

STREET _____

CITY _____ STATE _____ ZIP _____

CONTACT _____ PHONE _____

FAX _____

SAMPLE

Sample Origin: COMPANY _____

CITY _____ STATE _____ ZIP _____

Bill To: _____

_____

PRIORITY: Routine _____ Rush _____ Hot Rush _____

Results Needed By: Date _____ Time _____

SAMPLE IDENTIFICATION _____

SAMPLE DESCRIPTION _____

_____

SAMPLE PHYSICAL STATE (Circle One)

Aqueous Oil & Organic Liquid Sludge Solid Multiphase

ANALYTICAL WORK REQUESTED

_____

_____

_____

==========

For RTI Use Only

CHAIN OF CUSTODY

Submitted By _____ Date&Time _____

Relinquished To _____ Date&Time _____

LABNO _____ SP _____ ST _____

31628 GLENDALE AVENUE • LIVONIA, MI 48150 • (313) 422-8000 • FAX (313) 422-5342

LAB WORK ORDER

Lab # _____

Submitting Company: _____ Date: _____
Submitting Person: _____ Time: _____
Submitting For: _____

Total # of Sample(s): _____ Customer Sample ID: _____

Description of Sample(s): _____

SAMPLE

Date Sampled: _____ Sample(s) Stored At: _____

Work To Be Performed: _____

Dept. Assigned To: _____ Chemist Assigned To: _____

Priority: ☐ Routine ☐ ASAP ☐ Immediate

Special Instructions: _____

Instrument Used: _____

Test Results: _____

QA/QC Data

Instrument Used: _____
Calibration Standard Used: _____
QC Sample Lab ID #: _____

Remarks: _____

	Received	Completed	Reported
Date			
Time			

Total Cost: _____ Sample Stored At: _____ Tech Initials: _____

Remarks: _____

R T I

DISCREPENT INSTRUMENT/EQUIPMENT

Item	Date of Malfunction	Repairs on Site?	Outside Source	Removed from Service	Returned to Service	Calibr ?

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RTI
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CERTIFICATION AND CALIBRATION LOG

ITEM	DATE OF CERT.	DATE OF NEXT CERT.	OUT OF SERVICE	REASON
ITM				
ROCKWELL	6/14/91	6/14/92		
RINELL	6/14/91	6/14/92		
UKON MO	6/24/91	6/24/92		
E SPECT.				
PECT. STD.	6/1/91	6/1/92		
/S STDS	6/1/91	6/1/92		
[illegible]				
S-46				
PLIPERS				
CROMETER.				
WELL SCOPE	6/1/91	6/1/91		
ST RTI				

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RESEARCH TECHNOLOGIES INTERNATIONAL

ITEM _____

DATE REMOVED FROM SERVICE _____

REASON FOR REMOVAL _____

_____

SERVICED BY _____

RETURNED TO SERVICE _____

_____

INITIALS

RESEARCH TECHNOLOGIES INTERNATIONAL

ITEM _____

DATE REMOVED FROM SERVICE _____

REASON FOR REMOVAL _____

_____

SERVICED BY _____

RETURNED TO SERVICE _____

_____

INITIALS

SAMPLE

Calibration Certificate

is to certify that the following Material Test Machine has been calibrated in ordance with ASTM E4 & MIL-STD-45662A within a tolerance of 1 % of Actual Readings.

Location: RTI
25998 Capitol
Redford, Michigan 48239
ATTN: Mr. Norm Frank

Manufacturer: Baldwin
Model: Southwark 60,000 lbs.
Serial No.: 37525
Transducer:
Clearance: .027"

ange: 60,000 lbs. 1 Div.= 50 lbs.

eadings (lbs.)	Applied Initial	Load Final	Error(Final) lbs.	%
6,000	U	5,984	- 16	-.27
10,000	N	10,009	+ 9	+.09
20,000	A	19,995	- 5	-.03
30,000	B	30,005	+ 5	+.02
40,000	L	40,035	+ 35	+.09
50,000	E	50,101	+101	+.20
60,000		60,263	+263	+.44

Range: 6,000 lbs. 1 Div.= 5 lbs.

Readings (lbs.)	Applied Initial	Load Final	Error(Final) lbs.	%
600	U	601	+ 1	+ .17
1,000	N	997	- 3	- .30
2,000	A	1,992	- 8	- .40
3,000	B	3,001	+ 1	+ .03
4,000	L	4,016	+16	+ .40
5,000	E	5,046	+46	+ .92
6,000		6,060	+60	+1.00

ange: 1 Div.=

eadings (lbs.)	Applied Initial	Load Final	Error(Final) lbs.	%

Range: 1 Div.=

Readings (lbs.)	Applied Initial	Load Final	Error(Final) lbs.	%

SAMPLE

quipment used as Standards: Load Cells[x] Standard Weights[ ]

anufacturer	Serial No.	Capacity (lbs.)	NBS Traceability under:	Calibration Date:	Recalibration Date:
TRAINSENSE	870816A	10,000	SJT.01/103953	11/3/88	11/3/90
TRAINSENSE	870816C	150,000	SJT.01/104310	11/3/88	11/6/90

G. D. Testing Corp.
P. O. Box 386
New Hudson, Mi. 48165

Temp: 72 Deg. F.
Date: 8/20/90
Due: August 1991

By: [signature]
Service Engineer

DATE	4/25/90
TESTER	3TC-BB 1496
BLOCKS USED	CLARK & WILSON

I = INITIAL READINGS
F = FINAL READINGS

COMPANY	~~MATERIAL CONSULT~~
	RTI
	25998 CAPITOL
	REDFORD, MI 48239

BLOCK		TESTS (ERROR FROM MEAN VALUE)				
B 95.5	I	-.5	-.5	-.6		
	F	-.2	-.3	-.2	-.2	-.1
B 61.4	I	-.9	-.9	-.9		
	F	-.3	-.3	-.2	-.2	-.3
B 38.9	I	-1.3	-1.2	-1.2		
	F	-.5	-.4	-.4	-.2	-.2
C 63.3	I	—	—	—		
	F	0	-.1	0	+.2	+.1
C 44.6	I	—	—	—		
	F	+.2	+.2	+.2	+.3	+.3
C 25.9	I	—	—	—		
	F	+.2	-.1	-.3	-.2	-.1
	I					
	F					
	I					
	F					
	I					
	F					
	I					
	F					

BLOCK		TESTS (ERROR FROM MEAN VALUE)				
30T 72.1	I	—	—	—		
	F	+.3	-.1	0	0	+.2
30T 54.4	I	—	—	—		
	F	+.1	+.2	+.2	+.1	+.2
30T 44.4	I	—	—	—		
	F	+.2	+.3	+.3	+.3	+.2
30N 80.0	I	—	—	—		
	F	0	0	0	-.1	+.1
30N 65.5	I	—	—	—		
	F	+.2	+.3	+.2	+.1	+.2
30N 47.3	I	—	—	—		
	F	-.1	+.2	+.2	+.2	
	I					
	F					
	I					
	F					
	I					
	F					
	I					
	F					

SAMPLE

MICRO BLOCK	LOAD (GRAMS)	OBJ.		MICRONS 1	2	3	4	KNOOP 1	2	3	4
			I								
			F								
			I								
			F								
			I								
			F								
			I								
			F								
			I								
			F								

SAMPLE

JOB DESCRIPTION

I. Title: Laboratory supervisor - chemistry

II. Qualifications: The position requires a minimum of a B.S. degree in chemistry from an accredited college or or university and eight years experience. A post-graduate degree will account for two to four years experience.

III. Duties:

A. Equipment and training.

1. Maintain and monitor the operation of gas chromatographs, GC/MS, purge and trap and other analytical equipment.

2. Train technicians and chemists in the operation of of analytical instrumentation, monitor calibration, data collection and reporting.

3. Train and monitor technicians in the use of ancillary equipment which includes analytical balances, rotary vacuum evaporator, coulometric water titrator and acid/base titrations.

B. Special contract research projects.

1. Develop protocol for special contract research projects.

2. Order materials for special projects.

3. Set up equipment for project.

4. Train technicians and/or chemists in project procedure.

5. Monitor data collection and recording.

6. Analyze data and write reports.

C. Interaction with clients.

1. Discuss the project with the client to determine what information is required by the client.

SAMPLE

2. All data generated for a client is the sole property of that client and shall not be discussed with any other client or any person outside of Research Technologies International.

3. Update the client with the status of the project if if the project extends beyond the anticipated date of completion.

4. The above procedures will be followed for individual samples for analysis and for special contract research projects.

D. Billing

1. All samples and special projects must be logged into the computer as received.

2. The amounts for the analysis of each sample must be entered into the computer daily.

3. The amounts for special projects will be billed monthly or as determined by the director.

F. Analysis

1. Determine that chemists and technicians are following the proper specified protocols and special contract research project protocol.

2. Develop new procedures as they become necessary and have them approved by the director.

3. Determine that all data generated are accompanied by quality control checks to assure precision and accuracy and maintain the required SPC charts.

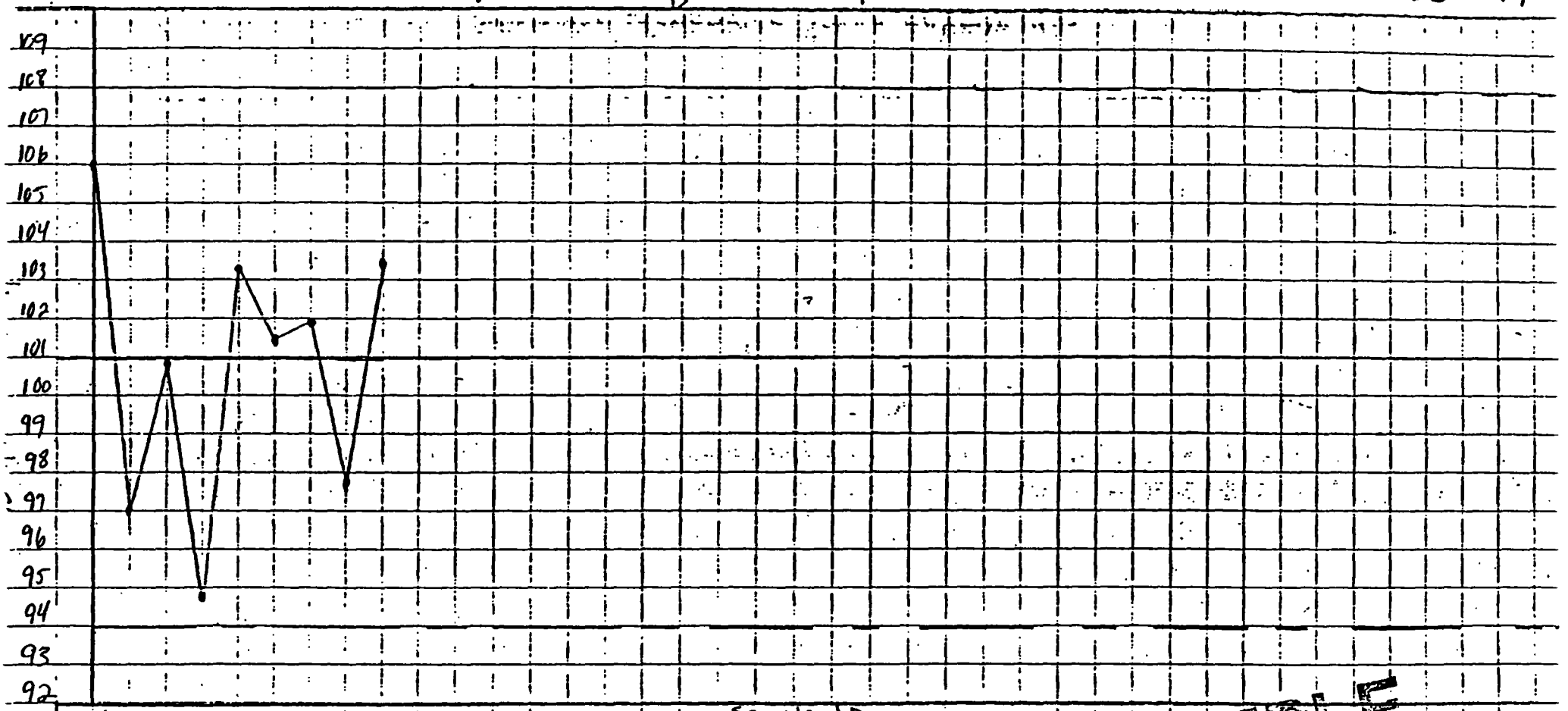
4. Special procedures will be discussed with the director before implementation.

5. Portions of the projects will be delegated to appropriate technicians and chemists as necessary for efficient operation.

6. All raw data and notes will be filed with the report.

RTI RESEARCH TECHNOLOGIES INTERNATIONAL ivision of DETREX CORPORATION

Accuracy (Check Std) for Zn by ICP. $\bar{P}$ = 101 UCL = 108 LCL = 94



Sample ID

...ple ID	91-1592A	91-0004A	91-0008A	91-0016A	91-0031A	91-0035A	90-0046A	std	91-0198A
...tual ...ding									

SAMPLE

Date: 07/22/91
Time: 10:55

Lab #: 91-5844A Logged In: 07/03/91

Submitter: Ron Hritzkowin, Manager, Gold
Representative: Ron Hritzkowin
Submitted For: [redacted]

SAMPLE

# of Sample(s): ___ Customer Sample ID:

Description of Sample(s): REJECT FROM, SYSTECH 7/2

Date Sampled: / / Sample(s) Stored At: _____

---------- Work To Be Performed ----------

DETERMINE CHLORINE (TOTAL) CONTENT. (per P.O. 9295)

Dept. Assigned To: _____ Chemist: RE

Priority- (Check One): ___ Routine ___ ASAP ___ Immediate

Special Instructions: _____

---------- Test Results ----------

---------- QA/QC Data ----------

Instrument: _____ Calib. Std.: _____ QC Sample ID #: _____

Remarks: _____

	Received	Completed	Reported
Date:			
Time:			

Total Cost: $ _____ Sample Stored At: _____ Tech. ____

Comments: _____

MAINTENANCE LOG

SAMPLE

4

6/7/89 → Problem: No emission current indicated on the emission current meter
→ Tried to change filament + cleaned gun cartridges
→ Problem still exists
→ Prior to use, the filament was jumping leaving a line streak across the photomicrograph.

6/20/89 → Service Call: Tom Clark + Art McCune
→ Problem: Filament osc. unstable + R10 heats up
→ Added resistor + capacitor across TR 1+2 (200 Ω, .022 uf) and replaced C-8
→ Job Status: Completed
→ Previously for about one week and a half, Glen Kahill worked on the SEM. Total time spent servicing SEM was two weeks.
→ EDS shows grounding problem indicating that something within the chamber is short circuiting the detector and consequently the counts.

7/18/89 → Service Call: Tom Clark
→ Problem: Lines in photos and filament current unstable
→ Replaced filament, cleaned O-rings on Robinson detector, adjust H.V. feedback, and checked leakback. ½ hour pumpdown = 6 min.
→ Job Status: Complete

MATERIALS LABORATORY INVENTORY

SAMPLE

DATE IN	ITEM	QTY	COMMENTS
7/3/91	Carbimet Discs 240	150 sheets	
"	" 320	150	
"	" 400	150	
"	" 600	150	
"	Phenolic Powder (Red)	2 lbs.	
"	" (Green)	1/2 lb.	
"	" (Black)	4 lbs.	
"	" (Green + Brwn)	3 lbs.	
"	Finament Powder (Green)	4 lbs.	
"	Met - X Powder	4 lbs.	
"	Epomet Powder	3 lbs	
"	Conductive Mtg. Powder	1/4 lb.	
"	Diallyl Phth. Powder	2 lbs.	
"	Al_2O_3 12 micron Powder	3 lbs.	
"	Al_2O_3 .05 micron Powder	1/2 lb.	
"	Gamma Alumina Pwdr. .05 micron	1/2 lb.	
"	Cerium Oxide Compound	6 oz.	
"	Sodium Hydroxide Pellets	4 lbs.	
"	Mineral Spirits	1 gal.	
"	Diamond Paste .25 micron	1 1/2 tubes	
"	" 1 micron	1 3/4 tubes	
"	" 3 micron	2 tubes	
"	" 6 micron	2 1/4 tubes	
"	Sample Klips - Plastic	100	
"	" S. Steel	100	
"	Shot - Stainless Steel	1 lb.	
"	Met - X Hardener	2 qts.	
"	Sample Kups	18	
"	Polishing Paper (for Al samples) 0	1/2 roll	
"	" 000 grit	1/2 roll	

TEST EQUIPMENT CONTROL BOOK

INSTRUMENT NAME: SANDER - DUAL BELT

Model/Cat. No. BUEHLER 1251
Serial No. 41 ET-273

Date Purchased JUNE, 1990 FR. MAT-CON
Date into Service JUNE, 1990
Room Location H

Instrument Function COARSE SANDING OF MATERIALS USING 80 and 120 GRIT PAPERS

Calibration Procedure NONE REQUIRED

SAMPLE

Maintenance Program/Schedule CLEAN AT LEAST EVERY 6 MOS. REMOVE SIDE PANELS TO CLEAN.

RTI
RESEARCH TECHNOLOGIES INTERNATIONAL

ASSESSMENT CHECKLIST

SURVEY SUMMARY							
	YES	NO	INC		YES	NO	INC
QUALITY SYSTEM				SAMPLE CONTROL			
FINAL REPORTS				CALIBRATION PROGRAM			
VERIFICATION PROGRAM				EQUIPMENT			
STANDARD PROCEDURES				TRAINING PROGRAM			
TEST PROCEDURES				TEST AREA ENVIRONMENT			
AUDIT PROGRAM				EQUIPMENT LIST			
SUB-CONTRACTOR CONTROL							

COMMENTS:

SUPPLIER REPRESENTATIVE(S) SIGNATURES/TITLE

SUPPLIER NAME:	DATE:	
SUPPLIER CODE:	APPROVED	
DIVISION:	C/APV'L	
ADDRESS:	REJECTED	

PHONE NUMBER:( )

A) QUALITY SYSTEM

		YES	NO	INC
1.	Quality Manual a Basis for System	___	___	___
2.	Manual Readily Available	___	___	___
3.	Manual Reviewed and Updated Regularly	___	___	___

B) SAMPLE CONTROL

		YES	NO	INC
1.	Samples Logged In	___	___	___
2.	Traceable Numbering System	___	___	___
3.	Samples Identified upon Receipt	___	___	___
4.	Laboratory Worksheets Completed:			
	a) Sample Description	___	___	___
	b) Tests Required	___	___	___
	c) Specifications to be Utilized	___	___	___
5.	Organized Receiving Area	___	___	___
6.	Adequate Sample Storage	___	___	___
7.	Sample Retention System	___	___	___
8.	Report Retention and Filing System	___	___	___

C) FINAL REPORTS

		YES	NO	INC
1.	Full Sample Description	___	___	___
	a) Part Number, if Applicable	___	___	___
	b) Quantity of Samples Provided	___	___	___
2.	Specifications Given:	___	___	___
	a) Include Revision Date	___	___	___
3.	All Data Given	___	___	___
4.	Requirements Given	___	___	___
5.	Signed and Dated	___	___	___
6.	Pages Numbered	___	___	___
7.	Each Page Marked with Unique Identification Number.	___	___	___
8.	Identification of Laboratory	___	___	___
9.	Identification of Client	___	___	___
10.	No Corrections or Additions	___	___	___
11.	States Deviations to Test Methods	___	___	___

D) CALIBRATION PROGRAM

		YES	NO	INC
1.	System to Control Calibrations	___	___	___
2.	All Calibration Tags in Place	___	___	___
3.	Traceable Standards	___	___	___
4.	Certifications Adequate:			
	a) Before and After Data	___	___	___
	b) Tolerances	___	___	___
	c) Traceability of Standards	___	___	___
	d) Calibration Procedure Referenced	___	___	___
5.	All Calibrations Current	___	___	___
6.	Performed Corrective Action:			
	a) Out of Calibration Condition	___	___	___
	b) Missed Calibrations	___	___	___
7.	Retention Area	___	___	___
8.	Written Procedures for In-house Calls	___	___	___
9.	Adequate Record Retention	___	___	___

E) VERIFICATION PROGRAM

		YES	NO	INC
1.	For all Items, Where Applicable	___	___	___
2.	All Items Documented/Retained	___	___	___
3.	Data Reviewed Regularly	___	___	___
4.	Qualification Program Established	___	___	___

F) EQUIPMENT

		YES	NO	INC
1.	Maintenance Procedures Available	___	___	___
2.	Maintenance Program Developed	___	___	___
3.	Maintenance Followed	___	___	___
4.	Maintenance Documented/Retained	___	___	___
5.	Equipment Manuals Available	___	___	___

G) STANDARD PROCEDURES

		YES	NO	INC
1.	Materials & Process Standards	___	___	___
	a) On the Update System	___	___	___
	b) Posted Promptly	___	___	___
2.	Applicable ASTM Standards	___	___	___
3.	SAE Handbooks	___	___	___
4.	Other Applicable Standards	___	___	___
5.	System for Control of Updates	___	___	___
6.	System for Control of "Copies"	___	___	___
7.	System to Make Personnel Aware of Revisions	___	___	___
8.	Accessible to Entire Staff	___	___	___
9.	Regular Review Process Documented	___	___	___

H) TRAINING PROGRAM

		YES	NO	INC
1.	Defined Training Program	___	___	___
2.	Designed to Maintain Skills & Competence	___	___	___
3.	All Training Documented/Retained	___	___	___
4.	Review Program in Place	___	___	___

I) TEST PROCEDURES

		YES	NO	INC
1.	For all Testing	___	___	___
2.	Follow Standard Procedure, if applicable	___	___	___
	a) Referenced with Revision dates	___	___	___
3.	Common Format	___	___	___
4.	Organized & Readily Available	___	___	___
5.	Regular Reviewed and Updated	___	___	___
6.	Proficiency Test	___	___	___

J) TEST AREA ENVIRONMENT

		YES	NO	INC
1.	Adequate Housekeeping	___	___	___
2.	Proper Environment Controls	___	___	___

K) AUDIT PROGRAM

		YES	NO	INC
1.	Documentation	___	___	___
2.	Frequencies Met	___	___	___
3.	Correction of Deficiencies	___	___	___

L) EQUIPMENT LIST	YES	NO	INC
1. Current	___	___	___
2. Accurate	___	___	___

M) SUB-CONTRACTOR CONTROL	YES	NO	INC
1. Regularly Reviewed.	___	___	___

RTI
RESEARCH TECHNOLOGIES INTERNATIONAL

REPORT OF ANALYTICAL SERVICES

TO: [redacted]
[redacted]
SOUTH LYON, MI 48178

Attn: Marcia Fournier

Report Date: 06/19/91

Lab Number: 91-5702A

Customer P.O. # 13976

Customer Invoice #

Customer File #

PART/SAMPLE IDENTIFICATION:

2 H2SO4 SAMPLES.
HIGH IRON & LOW IRON.

TEST RECORDS:

Received: 06/11/91 Sample Prep. Completed: 06/19/91 Test Completed: 06/19/91

WORK REQUESTED/PERFORMED:

CHROMIUM LEVELS.

THE RESULTS OF ALL TESTS and/or ANALYSES REQUESTED ARE REPORTED ON THE PAGES WHICH FOLLOW.

Number of pages including this page 2.

APPROVED: [signature] ANALYSTS: [signature]
[signature]

. data and information presented herein, while not guaranteed, are to the best of our knowledge accurate and .o warranty or guarantee implied or expressed is made regarding these analytical results, since securing and properly preserving representative samples and since the sample custody chain are beyond RTI control. The results provided by RTI are not intended to suggest product merchantability. The results also are not intended for use in infringement of any existing patent and RTI assumes no liability or responsibility for any such infringement.

31628 GLENDALE AVENUE • LIVONIA, MI 48150 • (313) 422-8000 • FAX (313) 422-5342

RTI
ARCH TECHNOLOGIES INTERNATIONAL

CONFIDENTIAL REPORT OF EVALUATION

Submitted by : Marcia Fournier

Lab. No. : 91-57Ø2A

Customer/Client : [redacted]

Report Date : Ø6/19/91

Part/Sample Identification : 2 liquid Sam
6/1Ø, 6/1Ø

Object : chrome levels per 13976

Results and Discussion :

The submitted samples were analyzed by Inductively Coupled Plasma
ssion Spectroscopy (I.C.P.). The results are as follows in
ppm.

Sample I.D.	Chromium Content
High Iron	549Ø
Low Iron	624Ø

Luanne Robbins

Luanne Robbins,
Laboratory Technician

SAMPLE

tribution :

, Deanna Steckert, Marcia Fournier

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RTI QUALITY ASSURANCE MANUAL REGISTRATION

Date Issued	Serial Number	ISSUED TO		Returned
		Company	Address	
6-12-91	001	RTI	MASTER COPY	
7-8-91	002	CHRYSLER CORP.	HIGHLAND PARK	
6-12-91	003	RTI	WORKING COPY	
	004			
	005			
	006			
	007			
	008			
	009			
	010			
	011			
	012			
	013			
	014			
	015			
	016			
	017			
	018			
	019			
	020			
	021			
	022			
	023			
	024			
	025			
	026			
	027			
	028			
	029			
	030			

SAMPLE

RTI FORMAL TRAINING REGISTRY

Date_____

Location_____ Period_____

Topic_____

_____

Instructor(s)_____

_____

Attendees:

Name	Initials

REMARKS_____

_____

_____

Instructor(s) Signature_____

_____

SAMPLE

CALIB. DATE
INITIALS
NEXT CALIB. DATE
CALIB. FRQ.

G.D. TESTING CORP.
(313) 486-2910
Serviced & Calibrated

Date_____Expires_____

Certified_____To_____

By:

SAMPLE

[redacted]

SAMPLE

RTI STAFF TRAINING REGISTRY

Date: Fr._____To_____ Location_____

Topic_____

Instructor(s)_____
_____
_____
_____
_____
_____

Attendee(s):

Name	Initials

REMARKS:_____
_____
_____

Y

INSTR./EQUIP. Balance, Mettler PT600 S/N 33703-093-04
LOCATION Wet Lab CALIBRATION FREQ. Annual
STD. USED : Cal. wts 1, 5, 10 gm
DEVIATION(S) PERMITTED : ± 0.01 gm
CAL. SOURCE : In house - cal. std wts. 1, 5, 10 gm
NBS TRACEABLE? Yes

CAL. DATE	NEXT CAL. DATE	ACCEPT/ REJECT	LAST CAL., COMMENTS, ETC.	QA SIGN-OFF
8/2/91	8/2/92	Accept	—	NAJ

INSTR./EQUIP. Tukon MO Micro Hardness S/N 1058
LOCATION III CALIBRATION FREQ. Annual
STD. USED : BLOCK # 858-8R ASTM-E384/MILSTD 45662A
DEVIATION(S) PERMITTED : ± 2.0 μ
CAL. SOURCE : GD Testing
NBS TRACEABLE? Yes

CAL. DATE	NEXT CAL. DATE	ACCEPT/ REJECT	LAST CAL., COMMENTS, ETC.	QA SIGN-OFF
6/14/91	6/14/92	Accept	—	NAJ.

TECHNICAL COMPLAINT

T.C.No._____

INFORMATION

(A) Date Received_____ By Whom_____

(C) Client_____

(D) Subject_____

(E) Has this occurred before?_____ If "Yes", when?_____

_____

(F) Was the client satisfied with resolution of complaint?

_____ If "No", why?_____

_____

_____

- -

RESEARCH

(G) If there was a prior complaint, is there a T.C.?_____

If "Yes", what was the number?_____

(H) Is this a repeat of a prior complaint?_____

(I) Is this a QA related problem?_____

(J) Was the valid complaint a result of incomplete, improper, or insufficient QA or QC action?_____ If "Yes", what corrective action was taken?_____

_____

- -

CORRECTIVE ACTION

(K) As determined by the QA Team, is the valid complaint regarding the accuracy of the results given the client?_____ Otherwise?_____ If "Yes" what corrective action was taken?_____

_____

_____

Check-list:

bench log___ Spike___ Surrogate___ Duplicate___ Blank___

SPC___ Calibration___ Verification___ Data Xfer from Work Order to Report___

(L) All segments of the QA program were in order?_____

If "No", were they corrected____ By whom?_____

- -

VALIDATION

The corrective action has been taken where deemed necessary and/or appropriate to the complaint.

_____ _____

Q.A. Manager General Manager

OUT OF CALIBRATION

Date_____ Instr./Equip._____
Location_____

Technician_____
Problem_____
_____
_____

Assistance from Supervisor?_____
Problem solved?_____
How?_____
_____
_____
Was instr./equip. recalibrated?_____ Is that recorded?_____

Assistance from outside source or Manufacturer?_____
Problem solved?_____
How?_____
_____
_____

Instr./equip. prblem not solved:_____
Service called for?_____
Instr./equip. Red Tagged?_____
Instr./equip. repaired on (date)_____
Instr./equip. calibrated on (date)_____
Instr./equip. returned to service (date)_____
Calibration sticker affixed_____

VALIDATION:

_____ _____
Technician Dep't. Supv.

_____
Q.A. Manager

RECORDS RETENTION

RECORD	Where Maintained	Retention Period	Who is Responsible
Test Reports	9.4	9.4	9.4
Calibration Certs.	5.3.1	5.3.1	5.3.1
Verification Records	5.3.5	5.3.5	5.3.5
Employee Training	4.5.2	4.5.2	4.5.2
Testing Documents	7.2	7.2	7.2
Instr./Equip. Maintenance Records	5.2.1	-----	5.2.4

NATURAL RESOURCES COMMISSION
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DAVID HOLLI
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JOEY M. SPANO

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES

Stevens T. Mason Building, P O. Box 30028, Lansing, MI 48909

ROLAND HARMES, Director

June 30, 1992

Mr. Bill Moore
Corporate Engineering & Risk Management
Detrex Corporation
P.O. Box 5111
Southfield, Michigan 48086-5111

Dear Mr. Moore:

SUBJECT: Act 64 Operating License; MID 092 605 972
Detrex Corporation
Solvents and Environmental Services Division

The Michigan Department of Natural Resources (Department) has completed its review of Detrex Corporation, Solvents and Environmental Services Division's (Detrex), hazardous waste storage facility operating license application, submitted pursuant to 1979 P.A. 64, as amended, Michigan's Hazardous Waste Management Act (Act 64). Based on that review and the results of the public hearing held on May 21, 1992, the Department has issued an Act 64 operating license to Detrex. The Act 64 operating license application review and the public participation procedures were conducted in accordance with Act 64.

A copy of the Act 64 operating license, the Notice of Final Decision, and the Responsiveness Summary are enclosed. If you have any questions or comments, please contact Ms. Ronda L. Hall, Environmental Engineer, Waste Management Division, at telephone number 517-373-9548.

Sincerely,

Roland Harmes
Director
517-373-2329

RECEIVED
JUL 6 1992
OF
U.S. EPA, REGION V.

Enclosures
cc: Senator Jackie Vaughn III
Representative Teola Hunter
Mr. Rich Traub/Ms. Shari Kolak, U.S. EPA
Mr. Dennis Drake, DNR
Mr. Ken Burda, DNR
Ms. De Montgomery, DNR
Mr. Steve Buda, DNR
Ms. Ronda L. Hall, DNR
Mr. Don Mbamah, DNR
Operating License File

R 1026
2/92

NOTICE OF FINAL DECISION

Act 64 Operating License

Detrex Corporation
Solvents and Environmental Services Division
MID 091 605 972

The Michigan Department of Natural Resources (MDNR) issued a hazardous waste management facility operating license to Detrex Corporation, Solvents and Environmental Division (Detrex), pursuant to 1979 P.A. 64, as amended, Michigan's Hazardous Waste Management Act (Act 64). The Act 64 operating license was issued on June 29, 1992, and allows Detrex to continue to operate a hazardous waste storage facility at 12886 Eaton Avenue in Detroit, Michigan. Detrex also received a federal permit issued by the U.S. Environmental Protection Agency (U.S. EPA), pursuant to the Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA). The HSWA permit became effective June 29, 1992. Both the Act 64 operating license and the HSWA permit will expire five years from the date of issuance.

The final Act 64 operating license and HSWA permit may be reviewed at the MDNR, Waste Management Division Office, located on the first floor of the John Hannah Building in Lansing, Michigan (contact Ms. Ronda L. Hall at 517-373-9548), and at the MDNR Southeast Michigan District Office, located at 38980 Seven Mile Road in Livonia, Michigan (contact Mr. Don Mbamah at 313-953-0241).

A copy of the license may be obtained, for the cost of reproduction, by contacting Ms. Jan Adams at 517-373-9875. Questions or comments concerning Detrex's Act 64 operating license should be directed to Ms. Ronda L. Hall at 517-373-9548.

RESPONSIVENESS SUMMARY

Draft Act 64 Operating License

Detrex Corporation
Solvents and Environmental Services Division
MID 091 605 972

On May 21, 1992, a public hearing was held to receive comments concerning the draft Act 64 operating license to be issued to Detrex Corporation, Solvents and Environmental Services Division, pursuant to 1979 P.A. 64, as amended, Michigan's Hazardous Waste Management Act (Act 64). Comments regarding the draft federal permit to be issued pursuant to 1976 42 U.S.C. 6901, as amended, the Resource Conservation and Recovery Act (RCRA) were also accepted. The federal permit regulates facility activities over which the state does not yet have regulatory authority. These activities include corrective action for any environmental contamination originating from solid waste management units at the facility; implementation of waste minimization practices; and compliance with the land disposal restrictions, the toxicity characteristic rule, and air emissions standards established under RCRA.

The public hearing and public comment period were announced in the Detroit Free Press and the Detroit News on April 16, 1992, and on radio stations WJR and WWJ. The public comment period extended from April 16, 1992, to June 5, 1992.

In accordance with R 299.9515 of the Act 64 Administrative Rules, this document was prepared to respond to significant comments submitted during the public comment period, and to describe any significant changes made to the draft operating license. No significant comments regarding the draft Act 64 operating license were submitted during the public comment period. The U.S. Environmental Protection Agency will be preparing and distributing a separate Responsiveness Summary for the federal permit.

MID 091 605 972

Detrex Corporation
Solvents and Environmental Services Division
Hazardous Waste Facility Operating License

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MID 091 605 972

Detrex Corporation
Solvents and Environmental Services Division
Hazardous Waste Facility Operating License

List of Attachments

Attachment Number	Name
1	Waste Analysis Plan
2	Inspection Schedule
3	Training Program
4	Contingency Plan
5	Closure Plan
6	Closure Cost Estimate
7	Facility Drawings, and Engineering Plans and Specifications
8	Acceptable Waste Types for Contain and Tank Storage
9	Preventive Procedures
10	Tank Spill and Overflow Prevention
11	Ambient Air Monitoring Plan

State of Michigan
Department of Natural Resources

HAZARDOUS WASTE FACILITY OPERATING LICENSE

Name of Licensee: Detrex Corporation, Solvents and Environmental Services Division

Name of Owner: Detrex Corporation

Name of Operator: Detrex Corporation, Solvents and Environmental Services Division

Name of Titleholder of Land: Detrex Corporation

Facility Name: Detrex Corporation, Solvents and Environmental Services Division

Facility Location: 12886 Eaton Avenue, Detroit, Michigan, 48227

EPA Identification Number: MID 091 605 972

Effective Date: June 29, 1992

Expiration Date: June 29, 1997

Authorized Activities

Pursuant to Michigan's Hazardous Waste Management Act, 1979 P.A. 64, as amended (Act 64), and rules promulgated thereunder by the Michigan Department of Natural Resources (MDNR), an operating license is issued to Detrex Corporation, Solvents and Environmental Services Division (hereafter called "the licensee") to operate a hazardous waste storage facility located in Detroit, Michigan, at latitude 42° 23' 50" and longitude 83° 10' 22". The licensee is authorized to conduct the following hazardous waste management activities:

X Storage	___ Treatment	___ Disposal
X Container	___ Tank	___ Injection Well
X Tank	___ Surface Impoundment	___ Landfill
___ Waste Pile	___ Incinerator	___ Land Application
___ Surface Impoundment	___ Other	___ Surface Impoundment

Applicable Regulations:

The conditions of this license were developed in accordance with the applicable provisions of the November 19, 1991, rules under Act 64, as amended:

X Part 2	X R 299.9614	___ R 299.9623 to R 299.9625
X Part 3	X R 299.9615	___ R 299.9626
X Part 5	___ R 299.9616	X R 299.9627
X R 299.9601 to R 299.9611	___ R 299.9617	X Part 7
X R 299.9612	___ R 299.9618	___ Part 8
X R 299.9613	___ R 299.9619 to R 299.9622	

License Approval:

The licensee shall comply with all terms and conditions of this license. This license consists of the conditions contained herein (including those in any attachments) and the applicable regulations contained in R 299.9101 through R 299.11008 as specified in the license. Applicable rules are those which are in effect on the date of issuance of this license.

This license is based on the information submitted in the revised operating license application submitted on June 26, 1991, and any subsequent amendments (hereafter referred to as "the application"). The facility shall be constructed and/or operated as specified in the application. Any inaccuracies found in this information provides grounds for the revocation or modification of this license [see R 299.9519(6)] and enforcement action. The licensee shall inform the Director of any deviation from or changes in the information in the application which would affect the licensee's ability to comply with the applicable rules or license conditions.

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

Issued this 29 day of June, 1992,

by _____.
Roland Harmes, Director

PART I

STANDARD CONDITIONS

A. TERMINOLOGY

Throughout this license, "Act 64" means Michigan's Hazardous Waste Management Act, 1979 P.A. 64, as amended, and "rules" means the Administrative Rules for Act 64, as amended. The term "Waste Management Division" means the division within the Michigan Department of Natural Resources (MDNR) responsible for administering Act 64, as amended, and its rules. Throughout this license, "Director" means the Director of the Department of Natural Resources.

B. EFFECT OF LICENSE

Any treatment, storage, or disposal of hazardous waste not specifically authorized in this license is prohibited. Issuance of this license does not convey property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of federal, state, or local law or regulations; 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 MDNR, or a defense to any order issued or any action brought under Act 64, Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [42 USC 9606(a)], or any other statutory or common law authority providing for the protection of the public health, welfare, or safety, or the environment. 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. LICENSE ACTIONS

The filing of a request for a license modification or revocation, or the notification of planned changes or anticipated noncompliance on the part of the licensee does not stay the applicability or enforceability of any license condition.

D. 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.

E. DUTIES AND REQUIREMENTS

1. Duty to Comply.

   (a) The licensee shall comply with Act 64, its rules and all conditions of this license.

   (b) Any license noncompliance constitutes a violation of Act 64 and is grounds for enforcement action, license revocation, license modification, or denial of a license renewal application.

2. Duty to Reapply. If the licensee wishes to continue an activity allowed by this license after the expiration date of this license, the licensee shall submit a complete application for a new license to the Chief of the Waste Management Division at least 180 days before this license expires.

3. License Expiration. To the extent consistent with Section 91(2) of Act 306, MCL 24.291(2), this license and all conditions herein will remain in effect beyond the license expiration date if the licensee has submitted a timely, complete application and, through no fault of the licensee, the Director has not issued a new license.

4. Need to Halt or Reduce Activity Not a Defense. It shall not be a defense for the licensee in an enforcement action that it would have been necessary to halt or reduce the licensed activity in order to maintain compliance with the conditions of this license.

5. Duty to Mitigate.

   (a) The licensee shall take all steps necessary to prevent and to correct any threat to, or impact on, the environment or human health, welfare, or safety resulting from, or that may result from, compliance or noncompliance with any condition in this license.

   (b) Upon notification from the Director 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 halt such activity and conduct other activities as required by the Director to eliminate said endangerment. The licensee shall not resume the halted activity without the prior written approval from the Director.

6. Proper Operation and Maintenance. The licensee shall at all times properly operate and maintain all facilities and related appurtenances which are installed or used by the licensee to achieve compliance with the conditions of this license. Proper operation and maintenance includes: effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls (including appropriate quality assurance procedures). This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the license.

7. Duty to Provide Information.

   (a) The licensee shall furnish to the Director, or any authorized representative, including, but not limited to, a contractor, within a reasonable time, any information that the Director or the authorized representative may request to determine:

      (i) Whether the management of hazardous waste may present an imminent and substantial hazard to the health of persons or to the natural resources, or is endangering or causing danger to public health or the environment;

      (ii) Whether cause exists for an enforcement action, license revocation, license modification, denial of a license renewal application, or to determine compliance with this license.

   (b) The licensee shall also furnish to the Director, or any authorized representative, upon request, copies of any record required to be kept by this license.

8. Inspection and Entry. The licensee shall allow the Director, or any authorized representative, including, but not limited to, a contractor, upon the presentation of credentials and other documents as may be required by law, to:

   (a) Enter at reasonable times upon the licensee's facility and any other locations where records are required to be kept under the conditions of this license;

   (b) Have access to and receive copies of, at reasonable times, any record required to be kept under the conditions of this license;

(c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this license; and

(d) Sample or monitor, at reasonable times, any substances or parameters at any location for the purpose of determining:

(i) Whether the management of hazardous waste may present an imminent and substantial hazard to the health of persons or to the natural resources, or is endangering or causing danger to public health or the environment;

(ii) Whether cause exists for an enforcement action, license revocation, license modification, denial of a license renewal application, or to determine compliance with this license.

If samples are taken for analysis, duplicate samples and a duplicate of the analytical results shall be furnished to the licensee upon request.

9. Monitoring and Records.

(a) Samples and measurements taken by the licensee for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample of the waste to be analyzed shall be the appropriate method from Appendix I of 40 CFR Part 261. Laboratory methods used by the licensee shall be those specified in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846 (1986) or an equivalent method included in any attachment to this license. Alternate methods for obtaining a representative sample or for alternate test methods may be used if approved in writing by the Director.

(b) The Director reserves authority to require specific monitoring for hazardous wastes or hazardous waste constituents in addition to those requirements detailed in this license, if the Director finds that additional monitoring is needed to demonstrate compliance with this license, Act 64, its rules, and any other applicable laws or rules.

(c) The licensee shall submit the results of all environmental monitoring required by this license in the form of an Environmental Monitoring Report to the Chief

of the Waste Management Division within 60 days of sample collection or within 7 days of receipt of the analytical results, whichever is sooner. In addition, the licensee shall submit results of air monitoring to the Wayne County Health Department, Air Pollution Control Division.

(d) The licensee shall provide environmental monitoring information or data which it generates to any person requesting such information or data. Such information or data shall be made available on the same day the licensee forwards this information to the Chief of the Waste Management Division and to the Wayne County Air Pollution Control Division.

(e) If the licensee conducts any additional environmental sampling or analysis beyond that required by this license, the results of such sampling or analysis shall be reported in accordance with Condition I.E.9.(c) of this license. Such increased frequency shall also be indicated in the Environmental Monitoring Report.

(f) The licensee shall preserve and retain all records and documents relating to this license, including, but not limited to, all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports and records required by this license, and records of all data used to complete the application for this license for a period of at least three years from the date of the sample, measurement, report, or record. The licensee shall notify the Director, in writing, at least 90 days prior to the destruction of such records and documents, and, upon request by the Director, the licensee shall deliver all such records and documents to the Director. This period may be extended by the Director at any time and is automatically extended during the course of any unresolved enforcement action regarding this facility.

(g) Records of monitoring information shall specify:

(i) The dates, exact place, and times of sampling or measurements;

(ii) The individuals who performed the sampling or measurements;

(iii) The dates analyses were performed;

(iv) The analytical techniques or methods used; and

(v) The results of such analyses.

10. Facility Modifications. The licensee shall give notice to the Chief of the Waste Management Division as soon as possible prior to any physical modifications to the licensed facility. In accordance with R 299.9519, the licensee shall request and obtain a license amendment prior to undertaking any modifications to the facility. The licensee shall obtain a construction permit prior to expanding, enlarging, or altering the facility.

11. Anticipated Noncompliance. The licensee shall give advance notice to the Chief of the Waste Management Division as soon as the licensee becomes aware of any changes or activity in the licensed facility which may result in noncompliance with license requirements.

12. Transfer of License. In accordance with R 299.9522, the licensee shall obtain the approval of the Director, by a modification to the license, prior to transferring ownership or operation of the facility to another person. In addition, the licensee shall comply with the requirements of R 299.9605 when transferring the ownership of the facility. The new owner/operator shall not accept hazardous waste at the facility unless the license modification has been issued by the Director.

13. Reporting of Noncompliance.

(a) The licensee shall immediately report to the Director any noncompliance with the license that may endanger human health or the environment. The licensee shall fulfill this reporting requirement by immediately contacting the Chief of the Waste Management Division at 517-373-2730, if the noncompliance occurs during the period 8:00 a.m. to 5:00 p.m., Monday through Friday, except State holidays, or by calling the Department of Natural Resources Pollution Emergency Alerting System (PEAS) at 1-800-292-4706 during all other times. This report shall include the following:

(i) Information concerning the release or discharge of any hazardous waste or hazardous waste constituent which may endanger public drinking water supplies or the environment.

(ii) Information concerning the release or discharge of any hazardous waste or hazardous waste constituent,

or of a fire or explosion at the facility, which could threaten the environment or human health.

(iii) A description of the occurrence and its cause, including:

(A) Name, address, and telephone number of the owner or operator;

(B) Name, address, and telephone number of the facility;

(C) Date, time, and type of incident;

(D) Name and quantity of materials involved;

(E) The extent of injuries, if any;

(F) An assessment of actual or potential hazard to the environment and human health where this is applicable; and

(G) Estimated quantity and disposition of recovered material that resulted from the incident.

(b) The licensee shall also follow-up the verbal report by providing a written report to the Chief of the Waste Management Division within five days of the time the licensee becomes aware of the circumstances. The written report shall contain all of the information in Condition I.E.13.(a)(iii) 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 licensee need not comply with the five day written notice requirement if the Chief of the Waste Management Division waives the requirement and the licensee submits a written report containing this information within 15 days of the time the licensee becomes aware of the circumstances.

14. Other Noncompliance. The licensee shall report all other instances of noncompliance not otherwise required to be reported above, 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 I.E.13. of this license.

15. Other Information. Whenever the licensee becomes aware that he/she failed to submit any relevant facts in the license application, or submitted incorrect information in a license application or in any report to the Director, the licensee shall promptly submit such facts or information.

16. Public Utility Notification. The licensee shall notify any public utility of any excavation, tunneling, or discharging of explosives or demolition of buildings that may affect the utility's facilities in accordance with Act 53 of the Public Acts of 1974, MCL 460.701 to 460.718, and comply with each of the requirements of that Act.

F. ENVIRONMENTAL AND HUMAN HEALTH STANDARDS

The licensee shall operate the facility in a manner that will prevent all of the following:

1. Endangerment or damage to human health, welfare, or the environment.

2. Violations of the federal Clean Water Act or the Michigan Water Resources Commission Act, 1929 P.A. 245, as amended.

3. Air emissions in violation of the federal Clean Air Act or the Michigan Air Pollution Act, 1965 P.A. 348, as amended.

4. Exposure of humans or the environment to harmful quantities of hazardous waste or hazardous waste constituents.

5. Pollution, impairment, or destruction of the natural resources of the state.

G. SIGNATORY REQUIREMENT

The licensee shall insure that all reports required by this license or other information requested by the Director are signed by a responsible corporate officer. A responsible corporate officer means (i) a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million, if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures, or (iii) by a duly authorized representative

of the corporation. A person is a duly authorized representative of the corporation only if:

1. The authorization is made in writing by a principal executive officer of at least the level of vice president.

2. The authorization specifies either an individual or a position having responsibility for overall operation of the regulated facility or activity.

3. The written authorization is submitted to the Director.

H. DOCUMENTS TO BE MAINTAINED AT FACILITY SITE

The licensee shall maintain at the facility, until closure is completed and certified by an independent registered professional engineer, the following documents and amendments required by this license:

1. Waste analysis plan.
2. Inspection schedules.
3. Personnel training documents and records.
4. Contingency plan.
5. Closure plan.
6. Cost estimate for facility closure.
7. Up-to-date closure financial assurance instrument(s).
8. Operating log.
9. Site security plan.
10. Facility engineering plans and specifications.
11. Recordkeeping procedures.
12. Up-to-date liability insurance instrument or financial test.
13. Environmental monitoring sampling and analysis plans.
14. Environmental monitoring data and statistical records.
15. Preventative procedures (personnel protection plan).

PART II

GENERAL FACILITY CONDITIONS

A. DESIGN AND OPERATION OF FACILITY

The licensee shall maintain and operate the facility to minimize the possibility of a fire, explosion, or any sudden or non-sudden release of any hazardous waste constituents to the environment, including air, soil, or waters of the state which could threaten human health or welfare or the environment.

B. REQUIRED NOTICE

1. The licensee shall notify the Director in writing at least four weeks in advance of the date the licensee expects to receive hazardous waste from a foreign source. Notice of subsequent shipments of the same waste from the same foreign source in the same calendar year is not required. When receiving such hazardous waste, the licensee shall comply with applicable laws, including, but not limited to, any treaties or other agreements entered into between the country in which the foreign source is located and the United States.

2. When the licensee is to receive hazardous waste from an off-site source (except where the licensee is also the generator), he must inform the generator in writing that he has the appropriate license for, and will accept, the waste the generator is shipping. The licensee must keep a copy of this written notice as part of the operating log (see Condition II.J.1.).

C. GENERAL WASTE ANALYSIS

The licensee shall follow the procedures described in the attached waste analysis plan, Attachment 1 of this license.

D. SECURITY

The licensee shall comply with the security requirements of R 299.9605 and 40 CFR §264.14, which is adopted by reference in R 299.11003.

E. GENERAL INSPECTION REQUIREMENTS

1. The licensee shall follow the inspection schedule, Attachment 2 of this license. The licensee shall remedy any deterioration or malfunction of equipment or structures which the inspection reveals and make these corrections on a schedule which ensures that the condition does not and will

not threaten human health or welfare or the environment. Where a hazard is imminent or has already occurred, full remedial action must be taken immediately, but in any event, full remedial action shall be taken within a reasonable time. The licensee shall record inspections in an inspection log or summary and keep these records for at least three years from the date of inspection. The licensee shall notify the Director, in writing, at least 90 days prior to the destruction of such records and documents, and, upon request by the Director, the licensee shall deliver all such records and documents to the Director. The records shall include:

(a) The date and time of the inspection;
(b) The name of the inspector;
(c) A notation of the observations made; and
(d) The date and nature of any repairs or other remedial actions.

2. The licensee shall inspect the cargo portion of each waste-hauling vehicle to verify that it is empty of hazardous waste before the vehicle leaves the facility. Records of all such inspections shall be maintained by the licensee for a period of six months after the inspection was made. If an inspection reveals that waste remains in the vehicle, the licensee shall take all steps necessary to assure that the waste is removed from the vehicle before it leaves the facility. Inspection and waste removal shall be accomplished only in accordance with the procedures in the inspection schedule, Attachment 2 of this license. This inspection requirement shall not apply to vehicles transporting waste that has been rejected, or waste that is manifested to another hazardous waste management facility.

F. PERSONNEL TRAINING

The licensee shall conduct personnel training as required by Act 64 and its rules. This training program shall follow the attached outline, Attachment 3 of this license. The licensee shall maintain training documents and records as required by R 299.9605 and 40 CFR §264.16(d), which is adopted by reference in R 299.11003.

G. PREPAREDNESS AND PREVENTION

1. Required Equipment. At a minimum, the licensee shall equip the facility with the equipment set forth in the contingency plan, Attachment 4 of this license.

2. Testing and Maintenance of Equipment. The licensee shall test and maintain the equipment specified in Condition

II.G.1. of this license to assure its proper operation in time of emergency.

3. Access to Communications or Alarm System. The licensee shall maintain access to the communications or alarm system as required by R 299.9606 and 40 CFR §264.34, which is adopted by reference in R 299.11003.

4. Required Aisle Space. At a minimum, the licensee shall maintain aisle space as required by R 299.9606 and 40 CFR §264.35, which is adopted by reference in R 299.11003.

5. Arrangements with Emergency Response Teams. The licensee shall attempt to make arrangements for emergency services with state and local authorities as required by R 299.9606 and 40 CFR §264.37, which is adopted by reference in R 299.11003. If state or local officials refuse to enter into the preparedness and prevention arrangements with the licensee, the licensee must document this refusal in the operating log.

H. CONTINGENCY PLAN

1. Implementation of Plan. The licensee shall immediately implement the contingency plan, Attachment 4 of this license, and follow the emergency procedures described in R 299.9607 and 40 CFR §264.56 whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which threatens or could threaten human health or welfare or the environment. The provisions of 40 CFR §264.56 are adopted by reference in R 299.11003.

2. Copies of Plan. The licensee shall provide copies of the contingency plan as required by R 299.9607 and 40 CFR §264.53, which is adopted by reference in R 299.11003.

3. Amendments to Plan. The licensee shall annually review and revise as necessary, the contingency plan, in accordance with R 299.9607 and 40 CFR §264.54, which is adopted by reference in R 299.11003. All proposed revisions to the contingency plan shall be submitted to the Director for approval. If approved, the revisions shall become part of this operating license.

4. Emergency Coordinator. The licensee shall comply with the requirements of R 299.9607 and 40 CFR §264.55, concerning the emergency coordinator. The provisions of 40 CFR §264.55 are adopted by reference in R 299.11003.

I. MANIFEST SYSTEM

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

J. RECORDKEEPING AND REPORTING

1. Operating Log (Record). The licensee shall maintain a written operating log at the facility in accordance with R 299.9609.

2. Biennial Report. The licensee shall comply with the biennial report requirements of R 299.9610.

K. CLOSURE

1. Performance Standard. The licensee shall close and partially close the facility in accordance with the closure plan, Attachment 5 of this license, R 299.9613 and 40 CFR §264.111, which is adopted by reference in R 299.11003, and all other applicable requirements of this license, and all other applicable laws.

2. Amendments to Closure Plan. The licensee shall amend the closure plan if, at any time during the active life of the facility, proposed changes in operation or facility design will affect the closure plan, increase closure costs, or whenever there is a change in the expected year of closure. The licensee shall not implement the proposed changes unless the amended closure plan is approved by the Director and all other necessary approvals have been obtained.

   The licensee shall submit a proposed amended copy of the closure plan to the Director at the same time a license modification is requested.

3. Notification of Closure. The licensee shall notify the Director at least 45 days prior to initiating closure.

4. Time Allowed for Closure. After receiving the final volume of hazardous waste, the licensee shall remove from the site all hazardous waste in accordance with the schedule specified in the closure plan, Attachment 5 of this license. After receiving the final volume of hazardous waste, the licensee shall complete final closure activities in accordance with the schedule specified in the closure plan, Attachment 5 of this license.

5. Disposal or Decontamination of Equipment. During final or partial closure, the licensee shall properly dispose or decontaminate all contaminated facility equipment, structures, and soil.

6. Certification of Closure. When closure or partial closure is complete, the licensee shall submit to the Director, within 60 days, certification both by the owner or operator and by an independent registered professional engineer that the facility has been closed or partially closed in accordance with the approved closure plan.

L. COST ESTIMATE FOR FACILITY CLOSURE

1. The licensee's current closure cost estimate, prepared in accordance with R 299.9702(1) and 40 CFR §264.142(a), which are adopted by reference in R 299.11003, is specified in Attachment 6 of this license.

2. The licensee shall adjust the closure cost estimate for inflation within 60 days prior to the anniversary of the date of the establishment of the financial instrument used to demonstrate financial assurance as required by R 299.9702(1) and 40 CFR §264.142(b), which are adopted by reference in R 299.11003. If the financial instrument used is the financial test, the licensee shall adjust the closure cost estimate for inflation within 30 days after the close of the firm's fiscal year. Whenever the current cost estimate increases to an amount greater than the current value of the associated financial instrument for reasons other than inflation, the licensee shall, within 60 days, increase the value of the instrument to an amount at least equal to the adjusted cost estimates. Evidence of such increases must be submitted to the Chief of the Waste Management Division during the 60 day period.

3. The licensee shall revise the closure cost estimate whenever there is a change in the facility's closure plan, as required by R 299.9702(1) and 40 CFR §264.142(c), which are adopted by reference in R 299.11003.

4. The licensee shall keep at the facility the latest closure cost estimates as required by R 299.9702(1) and 40 CFR §264.142(d), which are adopted by reference in R 299.11003.

M. FINANCIAL ASSURANCE FOR FACILITY CLOSURE

1. The licensee shall provide and continuously maintain a closure financial assurance instrument approved by the Director in at least the amount of the cost estimates

required by Condition II.L. of this license. The licensee shall submit all proposed changes in financial assurance instruments to the Director and obtain his approval prior to implementation. In addition, the licensee shall maintain copies at the facility and shall make these documents available for inspection upon request from a MDNR representative.

2. The licensee shall provide the Chief of the Waste Management Division with a signed original of an approved renewal or replacement closure financial assurance instrument 60 days prior to the expiration date of the current instruments. Failure to provide such documentation is a violation of this license and shall be cause for the Director to access all funds provided in any financial instrument not renewed in accordance with this condition and to initiate revocation of this license.

N. LIABILITY REQUIREMENTS

The licensee shall continuously maintain liability coverage for sudden and accidental occurrences as required by R 299.9710, except as otherwise allowed by that rule.

O. INCAPACITY OF OWNERS OR OPERATORS, GUARANTORS, OR FINANCIAL INSTITUTIONS

1. The licensee shall notify the Director by certified mail of the commencement of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming the licensee as debtor, within 10 days after commencement of the proceeding.

2. A licensee who fulfills the requirements of Act 64 and its rules by obtaining a trust fund, surety bond, letter of credit, certificate of deposit, or insurance policy shall be deemed to be without the required financial assurance or liability coverage in the event of bankruptcy of the trustee or issuing institution, or a suspension or revocation of the authority of the trustee institution to act as trustee or of the institution issuing the surety bond, letter of credit, certificate of deposit, or insurance policy to issue such instruments. The licensee shall establish other financial assurance or liability coverage within 60 days after such an event.

PART III

CONDITIONS FOR STORAGE IN CONTAINERS

A. COVERAGE OF LICENSE

1. The hazardous waste container storage area shown on Drawing 7-3 is covered by this license. Any expansion or enlargement beyond the facility boundary shown on Drawings 7-1 and 7-2 or beyond the 8,250 gallon storage design capacity requires a construction permit from the Director.

2. Drawings 7-1, 7-2, 7-3, and 7-4 are incorporated into this license as Attachment 7.

B. WASTE IDENTIFICATION AND QUANTITY

1. The licensee may store no more than a total volume of 8,250 gallons of the hazardous wastes listed in Attachment 8 in a maximum of 150 55-gallon containers, or an equivalent volume in other size containers, at the facility, subject to the terms of this license.

C. CONTAINER STORAGE TIME LIMIT

1. The licensee shall not store any container of hazardous waste for more than one year at the facility prior to the recycling of its contents on-site or shipment off-site to another appropriately licensed hazardous waste treatment or disposal facility.

2. The licensee shall maintain an accurate inventory of the wastes stored in containers, including the dates on which each container is received and either recycled on-site or shipped off-site to another appropriately licensed hazardous waste treatment or disposal facility.

D. CONDITION OF CONTAINERS

If a container holding hazardous waste is not in good condition (e.g., severe rusting, apparent structural defects) or if it begins to leak, the licensee shall transfer the hazardous waste from such container to a container that is in good condition, or otherwise manage the waste in compliance with the conditions of this license.

E. COMPATIBILITY OF WASTE WITH CONTAINERS

The licensee shall assure that the ability of the containers to contain the waste is not impaired as required by R 299.9614 and 40 CFR §264.172, which is adopted by reference in R 299.11003.

F. MANAGEMENT OF CONTAINERS

1. The licensee shall keep all containers holding hazardous waste closed during storage except when it is necessary to add or remove waste, and shall not open, handle, or store containers in a manner which may rupture the containers or cause them to leak, as required by R 299.9614 and 40 CFR §264.173, which is adopted by reference in R 299.11003.

2. The licensee is prohibited from storing containers of hazardous waste in locations at the facility other than the hazardous waste container storage area referenced in Condition III.A.1.

3. The licensee shall place containers into the hazardous waste container storage area only in accordance with the configuration shown in Drawing 7-4 in Attachment 7 of this license or an alternate configuration approved by the Chief of the Waste Management Division.

4. The licensee shall not stack containers of hazardous waste greater than two high.

G. CONTAINMENT

The licensee shall operate and maintain the containment system in accordance with the requirements of R 299.9614 and 40 CFR §264.175, which is adopted by reference in R 299.11003, and the attached plans and specifications, Attachment 7 of this license.

H. LABELING OF CONTAINERS

1. The licensee shall ensure that each container of hazardous waste is labeled or marked clearly with the words "Hazardous Waste" and the hazardous waste number, as required by R 299.9614, and the date it was accepted for storage so that compliance with the one year storage limit can be assessed. The labels on each container shall be clearly visible for inspection.

2. The licensee shall clearly mark each container of land disposal restricted waste to identify its contents and the

date it was accepted for storage, as required by R 299.9627 and 40 CFR §268.50(a)(2)(i), which is adopted by reference in R 299.11003.

I. 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 R 299.9614(1)(a) and 40 CFR §264.175(b)(5), which is adopted by reference in R 299.11003, and as specified in Attachments 4 and 9 of this license.

PART IV

CONDITIONS FOR STORAGE IN TANKS

A. COVERAGE OF LICENSE

1. The hazardous waste storage tanks shown on Drawings 7-5, 7-6, and 7-7 are covered by this license. Any expansion or enlargement beyond the facility boundary shown on Drawings 7-1 and 7-2 or beyond the 5,500 gallon tank storage design capacity requires a construction permit from the Director.

2. Drawings 7-1, 7-2, 7-5, 7-6, and 7-7 are incorporated into this license as Attachment 7.

B. STORED WASTE IDENTIFICATION AND QUANTITY

1. The licensee may store no more than a total volume of 1,900 gallons in Tank 12 and 3,600 gallons in Tank 22 of the hazardous wastes listed in Attachment 8 in the tanks identified as Tanks 12 and 22 in Attachment 7, subject to the terms of this license.

C. DESIGN, CONTAINMENT AND ASSESSMENT OF TANK SYSTEMS

The licensee shall operate and maintain all tanks and associated appurtenances, including piping and secondary containment structures, in accordance with the applicable requirements of R 299.9615 and 40 CFR §264.192, §264.193, and §264.194, which are adopted by reference in R 299.11003, and the attached plans and specifications, Attachment 7 of this license.

D. GENERAL OPERATING REQUIREMENTS

1. As required by R 299.9615 and 40 CFR §264.194(a), which is adopted by reference in R 299.11003, the licensee shall not place hazardous wastes or treatment reagents in a tank system if they could cause the tank, its ancillary equipment, or the containment system to rupture, leak, corrode, or otherwise fail.

2. The licensee shall use appropriate controls and practices to prevent spills and overflows from tank or containment systems, as required by R 299.9615 and 40 CFR §264.194(b), which is adopted by reference in R 299.11003, by methods specified in Attachment 10 of this license.

3. The licensee shall immediately remove from service any tank system or containment system from which there has been a leak or spill, or which is unfit for use, and shall comply with the requirements of R 299.9615 and 40 CFR §264.196, which is adopted by reference in R 299.11003.

E. PROHIBITION ON STORING OR TREATING REACTIVE WASTES OR MATERIALS IN TANK SYSTEMS

The licensee is prohibited from storing or treating reactive wastes or materials in tank systems at the facility.

F. PROHIBITION ON STORING OR TREATING INCOMPATIBLE WASTES OR MATERIALS

The licensee is prohibited from placing incompatible wastes in the same tank system or placing hazardous waste in a tank system that previously held an incompatible waste or material.

G. INVENTORY AND RECORDKEEPING REQUIREMENTS

1. The licensee shall maintain an accurate inventory of the hazardous waste stored in tanks, including the date on which the contents of the tank are processed.

2. The licensee shall label tanks in accordance with the provisions of NFPA Standard No. 704 as required by R 299.9615(4).

3. The licensee shall clearly mark each tank containing land disposal restricted waste to identify its contents, the quantity of each hazardous waste received, and the date each period of accumulation begins, or record such information in the facility operating record, as required by R 299.9627 and 40 CFR §268.50(a)(2)(ii), which is adopted by reference in R 299.11003.

4. The licensee shall not store any hazardous waste in tanks for more than one year prior to recycle of the waste on-site or shipment of the waste to another appropriately licensed waste management facility.

H. DISPOSITION OF LIQUIDS ACCUMULATED IN CONTAINMENT SYSTEM

The licensee shall remove spilled or leaked waste and accumulated precipitation from the secondary containment system within 24 hours of detection and manage the collected material in accordance with the requirements of R 299.9615(1) and 40 CFR §264.193(b)(4), which is adopted by reference in R 299.11003, and the procedures in Attachments 4 and 9 of this license.

I. COMPLIANCE WITH AIR EMISSION AND WASTE MANAGEMENT REQUIREMENTS FOR STORAGE AND TREATMENT IN TANKS

The licensee shall comply with the applicable air emission and waste management requirements for hazardous waste storage and treatment in tanks as specified in Conditions VI.C. of this license.

PART V

ENVIRONMENTAL MONITORING CONDITIONS

A. AMBIENT AIR MONITORING PROGRAM

1. The licensee shall conduct ambient air monitoring in accordance with R 299.9611(2)(b) and the program specified in Attachment 11 of this license.

2. The licensee shall report ambient air monitoring results as required by Condition I.E.9.(c) of this license.

PART VI

CONDITIONS FOR AIR EMISSIONS

A. COVERAGE OF LICENSE

The hazardous waste management equipment and air pollution control equipment regulated by the Wayne County Health Department, Air Pollution Control Division (WCAPCD), and by this license is:

1. Hazardous Waste Storage Tank Number 12 (WCAPCD Permit Number C-7031)

2. Hazardous Waste Storage Tank Number 22 (WCAPCD Permit Number C-7032)

3. Carbon Adsorption System (WCAPCD Permit Number C-8644)

B. GENERAL CONDITIONS

1. Not more than 30 days after completion of the installation of the equipment listed in Condition VI.A. of this license (the emission sources), the licensee shall apply, in writing, for WCAPCD Certificates of Operation. Written application shall be sent to: Mr. Michael Maillard, Chief, Enforcement Services, Wayne County Department of Health, Air Pollution Control Division, 640 Temple Street, Suite 700, Detroit, Michigan 48201-2558.

2. Trial operation of the emission sources shall be allowed for 90 days, provided such operation is in compliance with all of the terms and conditions contained in the WCAPCD Installation Permits. If a Certificate of Operation has not been issued for an emission source prior to the expiration of the trial operation period, an extension of trial operation may be requested of the WCAPCD Director.

3. Operation of an emission source shall permanently cease upon denial of the Certificate of Operation by the WCAPCD. Denial of a Certificate of Operation is an appealable action pursuant to Section 1401(A) of the Wayne County Air Pollution Control Ordinance, as amended.

4. The licensee shall demonstrate compliance with all WCAPCD regulation requirements and with all other applicable state and federal regulation requirements and with all general and special conditions of the Installation Permits prior to issuance of any Certificate of Operation.

5. The licensee shall not reconstruct, alter, modify, expand, or relocate the emission sources unless plans, specifications, and an application for an Installation Permit are submitted to and approved by the WCAPCD.

6. No emission source shall be operated for any other purpose or in any other manner than that for which the WCAPCD Installation Permit was approved and for which a WCAPCD Certificate of Operation has been issued, unless otherwise authorized in writing by the WCAPCD. Such emission source shall also be maintained in a state of good repair.

7. Operation of the emission sources shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant value or property, or which causes unreasonable interference with the comfortable enjoyment of life and property.

8. Operation of the emission sources shall not interfere with the attainment or maintenance of the air quality standard for any air contaminant.

9. Operation of the emission sources shall not result in significant deterioration of air quality.

10. The licensee shall provide notification of any abnormal conditions or malfunction of process or control equipment covered by this license, resulting in emissions in violation of the WCAPCD requirements or of any air permit conditions for more than two hours, to the Enforcement Section of the WCAPCD. Such notice shall be made as soon as reasonably possible, but not later than 9:00 a.m. of the next working day. The licensee shall also, within 10 days, submit to the WCAPCD Enforcement Section and to the Chief of the Waste Management Division, a written detailed report, including probable causes, duration of violation, remedial action taken, and the steps which are being undertaken to prevent a reoccurrence.

11. Approval of air permit applications by WCAPCD does not exempt the licensee from complying with any future regulations which may be promulgated.

12. Approval of air permits by WCAPCD does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law.

13. The licensee shall notify any public utility of any excavation, tunneling and discharging of explosives or demolition of buildings which may affect said utility's facilities in accordance with 1974 P.A. 53, as amended, being sections 460.701 to 460.718 of the Michigan Compiled Laws and comply with each of the requirements of that Act.

14. The restrictions and conditions of the Installation Permits shall apply to any person or legal entity which now or shall hereafter own or operate the emission sources for which the Installation Permits are issued. Any new owner or operator shall immediately notify the Director of the WCAPCD Enforcement Section, in writing, of such change in ownership or principal operator status of the emission sources.

15. If the installation, reconstruction, relocation, or alteration of the emission sources for which WCAPCD permits have been approved has not commenced within, or has been interrupted for, 18 months, these permits shall become void unless otherwise authorized by the WCAPCD.

C. SPECIAL CONDITIONS

1. Emissions of volatile organic compounds (VOCs) from the solvent reclaiming process shall not exceed 0.218 pounds per ton of reclaimed solvent nor 2.60 pounds per hour, based on trichloroethylene, and based on a minimum of 95 percent removal of VOC from the process exhaust gases.

2. Emissions of methylene chloride from the solvent reclaiming process shall not exceed 0.378 pounds per ton of reclaimed solvent nor 4.09 pounds per hour, based on a minimum of 95 percent removal of methylene chloride from the process exhaust gases.

3. Emissions of trichloroethylene from the solvent reclaiming process shall not exceed 0.218 pounds per ton of reclaimed solvent nor 2.60 pounds per hour, based on a minimum of 95 percent removal of trichloroethylene from the process exhaust gases.

4. Emissions of tetrachloroethylene from the solvent reclaiming process shall not exceed 0.180 pounds per ton of reclaimed solvent nor 2.37 pounds per hour, based on a minimum of 95 percent removal of tetrachloroethylene from the process exhaust gases.

5. Total combined emissions of methyl chloroform from the solvent reclaiming process shall not exceed 0.265 pounds per ton of reclaimed solvent nor 2.85 pounds per hour, based on a

minimum of 95 percent removal of methyl chloroform from the process exhaust gases.

6. Emissions from this process shall not exceed 150 odor units per cubic foot of exhaust gas.

7. The licensee shall not process more than 46,800 gallons per day, or 17.1 million gallons per year, of spent halogenated solvents.

8. The licensee shall not reclaim more that 8.37 million gallons of methylene chloride as product per year.

9. The licensee shall not reclaim more than 7.89 million gallons of trichloroethylene as product per year.

10. The licensee shall not operate the solvent recovery process unless all process tanks, storage tanks, and distillation units are exhausted to the carbon adsorption system and the adsorption system is operating properly.

11. The licensee shall install and maintain equipment to indicate the occurrence of breakthrough in the carbon adsorption system.

12. Prior to the occurrence of breakthrough from the carbon bed in service, that bed shall be regenerated and all process exhaust gases directed to the other carbon bed in the adsorption system.

13. The licensee shall not process any materials other than those listed in Attachment 8 of this license without prior notification to, and approval by, WCAPCD.

14. The carbon adsorption system shall be exhausted unobstructed vertically upward from a stack with a maximum diameter of 16 inches at an exit point not less than 50 feet above ground level.

15. The licensee shall comply with all applicable regulations of the Resource Conservation and Recovery Act, including those specified in 40 CFR Part 264, Subparts AA and BB, and 1979 P.A. 64, as amended.

16. The licensee shall maintain a written record of the total volume of all hazardous waste shipments received by this facility, and quantity of each solvent species reclaimed as product, during the preceding 12-month period. This record shall be made available for inspection immediately upon request by WCAPCD.

17. Stack testing shall be conducted at the licensee's expense and with prior approval of the WCAPCD to verify compliance with the emission limitations and control efficiency requirements specified in Conditions VI.C.1-5 and in 40 CFR Part 264, Subparts AA and BB. Testing shall be conducted within the period of trial operation as defined in Section 401(D) of the Wayne County Air Pollution Control Ordinance, with a written report of the results submitted to WCAPCD within 60 days of completion of testing.

18. After a determination by, and written notification from, the WCAPCD Director that emissions from the above referenced equipment are causing unreasonable interference with the common public right to live free from foul or noxious odors, the licensee shall take immediate action to abate the source of odors. The licensee shall submit an abatement program for permanent resolution of this problem within 30 days of notification by the WCAPCD.

PART VII

SCHEDULE OF COMPLIANCE

A. SCHEDULE OF COMPLIANCE CONDITIONS

The licensee shall comply with the conditions and submittal dates as specified below.

1. Within 30 days of the effective date of this license, the licensee shall upgrade the unloading/loading area secondary containment system by repairing any expansion joints and cracks, installing the new dike between the unloading/loading area and the transfer facility as shown in Attachment 7, Drawings 7-1 and 7-2, and provide the unloading/loading area secondary containment system with a protective coating.

2. Within 30 days of completing the activities outlined in Condition VII.A.1 of this license, the licensee shall submit a written report to the Chief, Waste Management Division, which summarizes all of these activities.

3. Within 30 days of request by the Chief of the Waste Management Division, the licensee shall submit a soil monitoring plan for review and approval.