HAZARDOUS WASTE FACILITY PERMIT

In compliance with the provisions of the Vermont Waste Management Act, as amended,
(10 V.S.A. Chapter 159)

GLOBALFOUNDRIES U.S. 2 LLC
Maple Street and River Road
Essex Junction, Vermont

is authorized to operate a hazardous waste treatment and storage facility and to perform certain corrective actions at the above location in accordance with the conditions and requirements set forth in this permit.

This permit shall become effective on the date of signing.

Signed this 18th day of November 2019

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Chuck Schwer, Director
Waste Management & Prevention Division
Department of Environmental Conservation
1 National Life Drive – Davis 1
Montpelier, Vermont 05620-3704

State of Vermont
Agency of Natural Resources

HAZARDOUS WASTE FACILITY PERMIT

10 V.S.A. Chapter 159
Vermont Hazardous Waste Management Regulations § 7-504

Applicant: GLOBALFOUNDRIES U.S. 2 LLC
Essex Junction, Vermont 05452-4299

EPA ID No: VTR000524868

Facility: GLOBALFOUNDRIES U.S. 2 LLC
1000 River Street
Essex Junction, Vermont

Permit Period: Ten (10) years from date of signing

FINDINGS OF FACT

1. GLOBALFOUNDRIES U.S. 2 LLC (hereafter called GLOBALFOUNDRIES) owns and operates a hazardous waste treatment and storage facility (hereafter called facility or GLOBALFOUNDRIES facility) located at 1000 River Street, Essex Junction, Vermont. A description and drawings of the GLOBALFOUNDRIES facility are provided in **Section 1** (RCRA Part A Application) and **Section 2** (Facility Description) of this permit.

2. GLOBALFOUNDRIES develops and manufactures semiconductors for computer and office product circuitry at its Essex Junction, Vermont facility, and generates the hazardous wastes identified in **Section 1** (Part A Application) and **Section 3** (Waste Characteristics and Waste Analysis) of this permit.

3 This permit governs hazardous waste storage, treatment, and corrective action activities for releases occurring on or after July 1, 2015, at the GLOBALFOUNDRIES facility pursuant to 10 V.S.A. Chapter 159 and the Vermont Hazardous Waste Management Regulations (hereafter called VHWMR).

4. The facility was first issued a hazardous waste facility permit on June 11, 1986, when owned and operated by the International Business Machines Corporation (hereafter called IBM). The facility was issued renewal permits on March 3, 1994, and May 7, 2007, and September 23, 2014, also while owned and operated by IBM.

5. On July 1, 2015, ownership of the facility was transferred to GLOBALFOUNDRIES.

6. A separately issued National Pollutant Discharge Elimination System ("NPDES") Wastewater Treatment and Discharge Permit will regulate the quantity and quality of wastewater discharged from the facility's industrial waste treatment plant and the treatment of any hazardous wastes introduced into that system.

7. Other permits issued to GLOBALFOUNDRIES by the Vermont Agency of Natural Resources are identified in **Section 1** (RCRA Part A Application) of this permit.

CONDITIONS

Part 1: General Conditions

1.1 For the purposes of this permit, the terms used herein shall have the same meaning as those in the VHWMR and 40 CFR Parts 124, 264, 266, 268 and 270, unless this permit specifically states otherwise. Where terms are not defined in the VHWMR, 40 CFR, or the permit, the meaning associated with such terms shall be defined by a standard dictionary reference or the generally accepted scientific or industrial meaning of the term.

1.2 As used in this permit, the term “permit” has the same meaning as “certification” as used in the VHWMR and 10 VSA § 6606.

1.3 As used in this permit, the term “Director” means:

Division Director - Waste Management & Prevention Division
Department of Environmental Conservation
Vermont Agency of Natural Resources

1.4 “Secretary” means the Secretary of the Vermont Agency of Natural Resources or his or her duly authorized representative. When implementing the provisions of **10 V. S. A. §§ 6608a and 6608b** relating to economic poisons and low-level radioactive wastes, the term Secretary includes the Secretary of Agriculture, Food & Markets and the Commissioner of Health.

1.5 “RCRA” means Resource Conservation and Recovery Act (RCRA) of 1976, (42 USC § 6901 et seq.).

1.6 Unless otherwise specified, when reference is made to a specific subchapter, section or subsection of the VHWMR, the reference is to the VHWMR which became effective December 31, 2016.

1.7 GLOBALFOUNDRIES shall maintain compliance with the VHWMR as amended. GLOBALFOUNDRIES shall modify the permit in accordance with **Condition 2.5** if an amendment to the VHWMR results in conflict between the permit and the amended VHWMR.

1.8 The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance is held invalid, such a determination shall not have any effect on the validity of the remainder of the permit, or on the application of the provision to other circumstances.

1.9 The permit does not convey any property rights of any sort, or any exclusive privilege.

1.10 This permit is not transferable to any person except after notice to the Secretary. The Secretary may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under **40 CFR § 270.40**.

1.11 GLOBALFOUNDRIES shall comply with all applicable statutes, rules, and regulations of any federal, state, or local authority as may be amended. This permit shall not be a shield to the continued conformance to regulatory requirements.

1.12 All hazardous waste received by GLOBALFOUNDRIES shall be managed according to the terms of this permit, as renewed and modified.

Part 2: Duration, Modification and Renewal of Permit

2.1 This permit shall be effective for 10 years from the date of signing.

2.2 If GLOBALFOUNDRIES wishes to continue an activity regulated by this permit after the expiration date of this permit, GLOBALFOUNDRIES must apply for and obtain a new permit.

2.3 If GLOBALFOUNDRIES wishes to continue an activity regulated by this permit after the expiration date of this permit, GLOBALFOUNDRIES shall submit a new application at least 180 days before the expiration date of this permit, unless permission for a later date has been granted by the Secretary. **(see 40 CFR § 270.10(h))**

2.4 This permit and all conditions will remain in effect beyond the permit's expiration date, if GLOBALFOUNDRIES has submitted an administratively complete application for a renewed permit at least 180 days before the expiration date of this permit, and, through no fault of GLOBALFOUNDRIES, the Secretary has not issued a new permit. Permits continued under this section remain fully effective and enforceable.

2.5 If any of the causes for modification found in **VHWMR §7-507(e)** apply, GLOBALFOUNDRIES shall seek a permit modification according to the procedures of **VHWMR §7-507** prior to making physical alterations or operational changes. Class I modifications for which prior approval is not required under **40 CFR § 270.42** may be implemented without prior notice or approval by the Secretary if notice of the modification is submitted to the Director within seven (7) calendar days after the change is put into effect.

2.6 This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by GLOBALFOUNDRIES for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

Part 3: Compliance and Enforcement

3.1 GLOBALFOUNDRIES shall allow the Secretary, or an authorized representative, upon the presentation of credentials and other documents as may be required by law to:

(a) Enter at reasonable times upon the GLOBALFOUNDRIES premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

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

(d) Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by RCRA, any substances or parameters at any location.

3.2 GLOBALFOUNDRIES shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. GLOBALFOUNDRIES may not treat, store, or dispose of hazardous waste in any modified portion of the facility except as provided in **40 CFR § 270.42**, until:

(a) GLOBALFOUNDRIES has submitted to the Director by certified mail or hand delivery a letter signed by GLOBALFOUNDRIES and a registered professional engineer stating that the facility has been constructed or modified in compliance with the permit; and

(b) (i) The Director has inspected the modified or newly constructed facility and finds it is in compliance with the conditions of the permit; or

(ii) Within 15 days of the date of submission of the letter in **paragraph (a)** of this condition, GLOBALFOUNDRIES has not received notice from the Director of his or her intent to inspect, prior inspection is waived and GLOBALFOUNDRIES may commence treatment, storage, or disposal of hazardous waste.

3.3 Notwithstanding any other provisions of this permit, enforcement actions may be brought pursuant to **10 V.S.A. Chapters 159, 201, and 211**.

3.4 It shall not be a defense for GLOBALFOUNDRIES in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3.5 Compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under **10 V.S.A. Chapters 159, 201, or 211**, or Sections 3008(a), 3008(h), 3013, or 7003 of the Resource Conservation and Recovery Act (RCRA) of 1976, (42 USC 6901 et seq.) or § 106(a), 104 or 107 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 (42 U.S.C. 9601 et seq.), or any other law providing for protection of public health or the environment.

3.6 In the event that the land on which the facility is located is transferred to a new owner, any actions or inactions of the land owner, or refusal by the land owner to provide access to GLOBALFOUNDRIES or the Secretary, shall not be a defense for GLOBALFOUNDRIES for any non-compliance with this permit or the VHWMR.

Part 4: Duties of the Permit Holder

4.1 GLOBALFOUNDRIES must comply with all conditions of this permit, except that GLOBALFOUNDRIES need not comply with the conditions of this permit to the extent and for the duration such noncompliance is authorized in an emergency permit. **(See VHWMR § 7-503)**. Any permit noncompliance, except under the terms of an emergency permit, constitutes a violation of the appropriate Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

4.2 In the event of noncompliance with the permit, GLOBALFOUNDRIES shall take all reasonable steps to minimize releases to the environment, and shall carry out such measures as are reasonable to prevent significant adverse impacts on human health or the environment.

4.3 GLOBALFOUNDRIES shall furnish to the Secretary, within a reasonable time, any relevant information which the Secretary may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. GLOBALFOUNDRIES shall also furnish to the Secretary, upon request, copies of records required to be kept by this permit.

4.4 GLOBALFOUNDRIES shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility.

4.5 The Contingency Plan contained in **Section 9** of this permit shall be reviewed by GLOBALFOUNDRIES and, if necessary amended, whenever:

(a) This permit is amended;

(b) The Contingency Plan is implemented;

(c) The facility changes (in its design, construction, operation, maintenance or other circumstances) in a way that materially increases the potential for fires, explosions, or the release of a hazardous waste or its constituents, or changes the response to an emergency;

(d) The list of emergency coordinators changes; or

(e) The list of emergency equipment changes.

4.6 GLOBALFOUNDRIES shall submit a copy of the Contingency Plan, and all amendments of that plan, to the local police department, fire department, hospital(s) and any other state or local emergency service provider(s) that may be called upon in the event of an emergency. A record of transmittal of the Contingency Plan to each service provider named above shall be maintained at the facility.

4.7 GLOBALFOUNDRIES shall attempt to maintain emergency service arrangements with the state and local authorities specified in **Condition 4.6**. If any of these authorities decline to enter into such an arrangement, GLOBALFOUNDRIES must document this refusal in the facility operating record.

4.8 GLOBALFOUNDRIES shall retain copies of all reports required by the terms and conditions of this permit and records of all data used to complete its permit application for at least three (3) years from the date of the report or the submission of the application. This retention period and other retention periods required by the terms and conditions of this permit shall be automatically extended during the pendency of any unresolved enforcement action involving GLOBALFOUNDRIES.

4.9 GLOBALFOUNDRIES shall maintain a written operating record, either at the facility or at an alternative location approved by the Secretary, which includes all applicable requirements of **40 CFR § 264.73** and any additional requirements listed below. The following information shall be maintained, as it becomes available, in the operating record until facility closure is completed in accordance with **Part 9** of this permit:

(a) A description and the quantity of each hazardous waste received at the facility and the method(s) and date(s) of its receipt, treatment or storage.

(b) A current inventory of each hazardous waste stored within the facility and the quantity at each location. This information must include cross-references to specific manifest document numbers, if the waste is accompanied by a manifest.

(c) Records and results of any waste screening or analysis performed (**Section 3** of this permit).

(d) The Contingency Plan and all amendments, and a notation of the time, date and details of any incident that requires implementation of the Contingency Plan (**Section 9** of this permit).

(e) Records and results of inspections (except these data need be kept only 3 years).

(f) Monitoring, testing or analytical data and corrective action where required by 40 CFR § 264.191, § 264.193, § 264.195 and § 264.1064.

(g) Notices to generators as specified in 40 CFR § 264.12(b) (notice of appropriate permits and waste acceptance).

(h) The closure plan initial closure cost estimate; and all subsequent closure cost estimates prepared under **Conditions 9.2 and 9.3**.

(i) Plans submitted in accordance with 10 V.S.A., § 6629 (Toxic Use Reduction and Hazardous Waste Reduction Plan).

(j) Records demonstrating that storage of hazardous waste at the facility was necessary for a period beyond one year for the purpose of accumulating such quantities of hazardous waste necessary to facilitate proper recovery, treatment or disposal. These records shall be required beginning when storage has been for a period of one year.

(k) A record of refusal by any state and local authority as stated under **Condition 4.7** of this section, who declines to enter into an arrangement to provide emergency services to the facility.

(l) Any certification provided to GLOBALFOUNDRIES by a qualified independent Vermont licensed professional engineer for the purpose of bringing a tank back in service in accordance with **Section 5** (Tank Storage Information) of this permit.

(m) A copy of the current information provided to state and local authorities and first responders for the purpose of emergency preparedness and prevention pursuant to **Condition 4.18**.

(n) The following records required to meet the 40 CFR Part 264 Subparts BB and CC Air Emission Standards:

    (i) A copy of the current list of equipment subject to monitoring under the Subpart BB and CC Standards;

(ii) A copy of the current annual fugitive emissions testing report and copies of the two previous annual fugitive emissions testing reports (these reports shall be kept for three years);

(iii) A copy of the current compilation of vapor pressures of the waste solvents stored in each hazardous waste storage tank;

(iv) A copy of the inspection log maintained pursuant to **Section 11, Attachment 11-1 (paragraph 14.5)** of this permit; and

(v) Copies of the drawings, referred to in the current list of equipment subject to monitoring and the current annual fugitive emissions testing report, which identify the location of each monitoring point.

4.10 GLOBALFOUNDRIES shall maintain the following personnel documents and records at the facility:

(a) A listing of the job title for each position at the facility related to hazardous waste management and the name of the employee filling that position;

(b) A written job description for each position listed above which includes the requisite skill, education, or other qualification, and duties of employees assigned to the position;

(c) A written description of the employee training required for each position listed in **Section 12** of this permit; and

(d) Records verifying that the employee training program contained in **Section 12** of this permit has been presented to, and completed by, appropriate facility personnel.

4.11 Training records on current personnel shall be kept until facility closure is completed in accordance with **Part 9** of this permit. Training records on former employees shall be kept for at least three (3) years from the date the employee last worked at the facility. Personnel training records may accompany personnel transferred within the company.

4.12 GLOBALFOUNDRIES shall follow the waste analysis procedures contained in **Section 3** of this permit.

4.13 Prior to accepting waste from a source, GLOBALFOUNDRIES shall follow the waste approval process described in the Waste Analysis Plan contained in **Section 3** of this permit. At a minimum, the waste approval process shall identify for each waste all of the information necessary for shipment to, and acceptance by, an appropriate treatment, storage and disposal facility. In addition, the waste approval process shall be followed in the event that GLOBALFOUNDRIES is notified or has reason to believe that the process generating the waste has changed.

4.14 All sampling, monitoring, and/or analysis performed in relation to activities covered by this permit shall be performed according to the appropriate method specified in the latest edition of "Test Methods for Evaluating Solid Waste, SW-846, Standard Methods of Wastewater Analysis", or an equivalent method, such as those developed by the American Society for Testing and Materials (ASTM) incorporated in the VHWMR by reference or approved by EPA through rulemaking or by the Secretary in writing. If other methods are to be used, GLOBALFOUNDRIES shall receive approval from the Secretary prior to utilizing the methods. The Secretary may reject any data that does not meet the requirements of EPA analytical methods and may require re-sampling and additional analysis.

4.15 GLOBALFOUNDRIES shall document the name(s), address(es), and telephone number(s) of any consultant(s) and/or analytical laboratory(ies) used to perform sampling, monitoring, and/or analysis activities related to this permit.

4.16 GLOBALFOUNDRIES shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, the certification required by **40 CFR § 264.73(b)(9)**, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report, certification, or application. This period may be extended by request of the Secretary at any time. GLOBALFOUNDRIES shall maintain records from all ground-water monitoring wells and associated ground-water surface elevations, for the active life of the facility, and for disposal facilities for the post-closure care period as well.

Records for monitoring information shall include:

(a) The date, exact place, and time of sampling or measurements;
(b) The individual(s) who performed the sampling or measurements;
(c) The date(s) analyses were performed;
(d) The individual(s) who performed the analyses;
(e) The analytical techniques or methods used; and
(f) The results of such analyses.

4.17 GLOBALFOUNDRIES shall submit to the Director, upon request, the results of all sampling and/or tests or other data generated pursuant to **Part 11** (Corrective Action) of this permit.

4.18 GLOBALFOUNDRIES shall provide written information regarding waste quantities, types, and locations at the facility, to state and local authorities (including SERCs and LEPCs) and first responders for the purpose of emergency preparedness and prevention, and place a copy of this information in the facility's operating record. Such information shall be updated as necessary, and the updates shall be provided to state and local authorities and first responders. The written information shall also describe the layout of

the facility, locations where personnel normally work, and entrances and possible evacuation routes.

Part 5: Facility Design and Operation

5.1 GLOBALFOUNDRIES shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by GLOBALFOUNDRIES to achieve compliance with the conditions of this permit. 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 permit.

5.2 GLOBALFOUNDRIES shall design, maintain and operate the facility in a manner which minimizes the possibility of a fire, explosion, or any unplanned, sudden or non-sudden release of a hazardous waste or hazardous waste constituents to air, soil, surface waters or groundwater which could threaten human health or the environment. At a minimum, GLOBALFOUNDRIES shall maintain and operate the facility in accordance with the preparedness and prevention procedures contained in **Section 8** of this permit.

5.3 GLOBALFOUNDRIES shall immediately carry out the provisions of the Contingency Plan contained in **Section 9** of this permit whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment.

5.4 Spills, leaks, drips and other discharges which occur as a result of the storage, loading, transfer, or other handling of hazardous waste shall be immediately cleaned up in accordance with the procedures in the Contingency Plan contained in **Section 9** of this permit. Any spill debris generated from such events shall be managed in accordance with this permit and the VHWMR.

5.5 GLOBALFOUNDRIES shall inspect the facility for malfunctions and deterioration, operator errors, and discharges which may be causing, or may lead to, release of hazardous waste constituents to the environment, or a threat to human health. GLOBALFOUNDRIES shall conduct these inspections often enough to identify problems in time to correct them before they harm human health or the environment. At a minimum, GLOBALFOUNDRIES shall follow the facility inspection schedules contained in **Section 7** of this permit.

5.6 GLOBALFOUNDRIES shall remedy any deterioration or malfunction of equipment or structures which the inspection reveals on a schedule which ensures that the problem does not lead to an environmental or human health hazard. Where a hazard is imminent or has already occurred, remedial action shall be taken immediately in accordance with the Contingency Plan contained in **Section 9** of this permit.

5.7 Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

5.8 All monitoring equipment required by this permit shall be properly installed, used and maintained and the appropriate monitoring methods used.

5.9 Hazardous waste treatment, storage, or disposal activities other than those specified in this permit are prohibited.

5.10 GLOBALFOUNDRIES may receive from off-site, store, treat and/or transfer for disposal only those hazardous wastes specified in **Section 1** (Part A Application) and **Section 3** (Waste Characteristics and Waste Analysis) of this permit.

5.11 GLOBALFOUNDRIES shall store, treat and/or transfer for disposal hazardous waste only in those areas specified in **Section 1** (RCRA Part A Application), **Section 2** (Facility Description), **Section 4** (Container Storage Information), and **Section 5** (Tank Storage Information) of this permit.

5.12 The maximum quantity of containerized hazardous waste that may be stored in the CDC Waste Storage Room at any point in time is 1104 55-gallon drums or its equivalent. No more than 545 of the drums, or drum equivalents, may consist of liquids.

5.13 The maximum quantity of containerized ignitable hazardous waste that may be stored in the CDC Flammable Waste Storage Room at any point in time is 96 55-gallon drums or its equivalent.

5.14 The maximum quantity of bulk liquid hazardous waste that may be stored at any point in time shall not exceed 60,000 gallons at the CDC Tank Farm and 9,000 gallons at the Building 963 hazardous waste tank.

5.15 GLOBALFOUNDRIES shall maintain aisle space between rows of containerized hazardous wastes stored at the facility that is sufficient to allow the unobstructed movement of personnel, fire protection equipment, spill control equipment and decontamination equipment. In no circumstance shall the aisle space be less than 24 inches wide.

5.16 GLOBALFOUNDRIES shall manage all containerized hazardous waste stored at the facility in accordance with the procedures contained in **Section 4** (Container Storage Information) and **Section 8** (Preparedness and Prevention) of this permit.

5.17 GLOBALFOUNDRIES shall manage all bulk liquid hazardous waste stored at the facility in accordance with the procedures contained in **Section 5** (Tank Storage Information) and **Section 8** (Preparedness and Prevention) of this permit.

5.18 GLOBALFOUNDRIES shall maintain at the facility the equipment identified in **Section 9** (Contingency Plan) of this permit.

5.19 GLOBALFOUNDRIES shall prevent the unknowing entry of, and minimize the possibility for unauthorized entry of, persons or livestock onto any portion of the facility. GLOBALFOUNDRIES shall maintain security devices and warning signs in accordance with the Security Plan contained in **Section 6** (Security Procedures) of this permit.

5.20 Using the procedures identified in **Sections 2, 4 and 5**, GLOBALFOUNDRIES may transfer characteristic hazardous waste listed in **Section 3** that meets the definition of Corrosive Liquids, Low TOC Ignitable Liquids (40 CFR 268.42 – less than 10 % Total Organic Carbon), High TOC Ignitable Liquids (40 CFR 268.42(b) – greater than or equal to 10% Total Organic Carbon), and wastes that are identified by the VT02 and VT08 hazardous waste codes to the biological wastewater treatment plant for treatment under that facility's NPDES permit.

5.21 GLOBALFOUNDRIES shall follow the procedures contained in **Section 11** of this permit for compliance with the Organic Air Emission Standards for Process Vents, Equipment Leaks, and Tanks, Containers, and Surface Impoundments.

5.22 Any work plans developed for the purposes of closure, post-closure, or corrective action shall be approved by the Secretary prior to implementation.

5.23 All wastes accepted by the GLOBALFOUNDRIES shall be shipped to a designated facility within one year, unless it can be demonstrated that insufficient quantities exist to facilitate proper recovery, treatment or disposal. Records demonstrating the storage of hazardous waste at the facility that was necessary for a period beyond one year shall be recorded in the written facility operating record pursuant to **Condition 4.9(j)**.

Part 6: Reporting Requirements

6.1 All applications, reports, or information submitted to the Director shall be signed and certified in accordance with **VHWMR § 7-108**.

6.2 All reports, notifications, and submissions required by this permit shall be sent to:

Division Director, Waste Management & Prevention Division
Vermont Agency of Natural Resources
1 National Life Drive – Davis 1
Montpelier, Vermont 05620-3704

6.3 Monitoring results shall be reported at the intervals specified elsewhere in this permit.

6.4 Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

6.5 Reporting noncompliance.

(a) GLOBALFOUNDRIES shall orally report any noncompliance which may endanger health or the environment immediately upon discovery of the noncompliance, including:

(i) Information concerning release of any hazardous waste that may cause an endangerment to public drinking water supplies.

(ii) Any information of a release or discharge of hazardous waste or of a fire or explosion at the facility, which could threaten the environment or human health outside the facility.

(b) The description of the occurrence and its cause shall include:

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

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

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

(iv) Name and quantity of material(s) involved;

(v) The extent of injuries, if any;

(vi) An assessment of actual or potential hazards to the environment and human health outside the facility, where this is applicable; and

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

(c) A written submission shall also be provided within five days of the time GLOBALFOUNDRIES becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. The Secretary may waive the five-day written notice requirement in favor of a written report within fifteen days.

6.6 If a significant discrepancy in a manifest is discovered, GLOBALFOUNDRIES must attempt to reconcile the discrepancy. If not resolved within fifteen days, GLOBALFOUNDRIES must submit a letter report, including a copy of the manifest, to the Director. (See **VHWMR § 7-704 (g)**)

6.7 An unmanifested waste report must be submitted to the Director within 15 days of receipt of unmanifested waste. (See **VHWMR § 7-704 (h)**)

6.8 A biennial report must be submitted by March 1st, or an alternative date specified by the Secretary, of each even numbered year covering facility activities during the previous odd numbered calendar year. The biennial report shall be submitted electronically in file and data formats compatible with the software that the EPA and Secretary use to process biennial report data.

6.9 GLOBALFOUNDRIES shall report all instances of noncompliance not reported under **Conditions 6.3, 6.4, and 6.5** of this permit, at the time monitoring reports are submitted. The reports shall contain the information listed in **Condition 6.5** of this permit.

6.10 Where GLOBALFOUNDRIES becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information.

Part 7: Waste Transport

7.1 GLOBALFOUNDRIES shall comply with the manifest requirements of VHWMR Subchapter 7.

7.2 Any hazardous waste removed from the facility shall be transported by a Vermont-permitted hazardous waste transporter, in accordance with the VHWMR, to an appropriate facility.

7.3 GLOBALFOUNDRIES shall not accept any shipment of hazardous waste which is not accompanied by a manifest, unless the waste is both generated and delivered by a conditionally exempt generator who is exempt from the manifest requirements of the Hazardous Waste Management Regulations pursuant to **VHWMR § 7-306(c)(3)**.

7.4 GLOBALFOUNDRIES shall notify the Director and the EPA Region I RCRA Import/Export Coordinator, in writing, at least four weeks in advance of the date GLOBALFOUNDRIES expects to receive hazardous waste from a non-U.S. source, as required by **40 CFR § 264.12(a)** and **VHWMR § 7-706**. Notice of subsequent shipments of the same waste from the same foreign source in the same calendar year is not required.

Part 8: Personnel Training

8.1 All facility personnel involved in the handling of hazardous waste shall successfully complete a program of classroom instruction or on-the-job training that prepares them to perform their hazardous waste management duties. This introductory training shall be conducted in accordance with the Training Plan contained in **Section 12** of this permit.

8.2 All facility personnel shall complete their introductory training within six (6) months after the date of their employment at the facility. An employee may not work in an unsupervised position until completing the introductory training program.

8.3 All facility personnel involved in the handling of hazardous waste shall take part in an annual training program which includes a review of the introductory training program. This annual training shall be conducted in accordance with the Training Plan contained in **Section 12** of this permit.

Part 9: Facility Closure

9.1 GLOBALFOUNDRIES shall close the facility in a manner that eliminates threats to human health or the environment due to the post-closure escape of a hazardous waste or its constituents, directly or through leachate or surface run-off, or the escape of waste decomposition products to the ground or surface waters or ambient air. At a minimum, closure shall be conducted in accordance with the Closure Plan contained in **Section 10** of this permit. The Closure Plan shall be amended whenever changes in operations or facility design affect the plan or when there is a change in the expected year of closure.

9.2 GLOBALFOUNDRIES shall maintain a written estimate of the cost of closing the facility and shall amend that estimate pursuant to **Condition 9.3** and whenever a change is made to the facility, facility operations, or to the existing Closure Plan contained in **Section 10** of this permit, that increases the estimate. Any amended closure cost estimate shall be equal to the cost of closing the facility at the point in the facility's operating life when the extent and manner of its operation would make closure the most expensive, as indicated in the Closure Plan.

9.3 GLOBALFOUNDRIES shall annually update the closure cost estimate for inflation according to applicable requirements of **40 CFR 264.142(b).** The initial closure cost estimate, and all subsequent closure cost estimates shall be maintained in the written facility operating record pursuant to **Condition 4.9(h)**.

9.4 GLOBALFOUNDRIES shall notify the Director in writing of its intent to close the facility at least six (6) months prior to the date on which it expects to begin final closure.

9.5 Within three (3) months after receiving the final volume of hazardous waste, GLOBALFOUNDRIES shall remove all waste from the facility in accordance with the

Closure Plan contained in **Section 10** of this permit. Within six (6) months after receiving the final volume of waste at the facility, GLOBALFOUNDRIES shall complete all closure activities in accordance with the Closure Plan.

9.6 Facility closure shall not be considered to have been completed until:

(a) GLOBALFOUNDRIES and an independent Vermont-licensed professional engineer have provided the Director written certification that the closure has been completed in accordance with the provisions of the Closure Plan; (b) The Secretary has inspected the facility; and
(c) The Secretary has given written approval of the closure.

Part 10: Financial Requirements

10.1 GLOBALFOUNDRIES shall maintain liability coverage for claims arising from sudden accidental occurrences, which occur as a result of the operations of the facility, that cause injury to persons and property in an amount of at least one million dollars ($1,000,000) per occurrence with an annual aggregate of at least two million dollars ($2,000,000) until closure of the facility has been completed. This liability coverage must be equivalent to the coverage held by GLOBALFOUNDRIES at the time of issuance of this permit, as evidenced by the documents included in **Section 10** of this permit.

10.2 GLOBALFOUNDRIES shall demonstrate liability coverage for claims arising from sudden accidental occurrences in the amount of at least $1 million per occurrence, with an annual aggregate of at least $2 million, exclusive of legal defense costs. This liability coverage shall be demonstrated using one of the financial assurance instruments specified in **40 CFR 264.147(a)**. Documentation of proof of insurance shall be included in **Section 10** of this permit.

10.3 GLOBALFOUNDRIES shall establish financial assurance for closure as required by **40 CFR 264.143**. GLOBALFOUNDRIES shall also establish financial assurance for corrective action. Financial assurance shall be in at least the total amount required by **Conditions 9.2 and 9.3** of this permit.

10.4 GLOBALFOUNDRIES shall maintain financial assurance for closure of the facility until closure has been certified in accordance with **40 CFR 264.l15** and the Director approves the release of the financial instrument in accordance with **40 CFR 241.143(i)**.

10.5 Any changes in the financial assurance mechanism shall be approved by the Secretary.

10.6 GLOBALFOUNDRIES shall notify the Director by certified mail of the commencement of any voluntary or involuntary proceeding under the United States Bankruptcy Code (Title 11, U.S. Code), naming the owner or operator as debtor, within 10 days after commencement of the proceeding.

10.7 In the event of the bankruptcy of or suspension of issuing authority of the trust fund trustee or trustee institution issuing any surety bond, letter of credit or insurance policy required by this permit, GLOBALFOUNDRIES shall establish other financial assurance or liability coverage within 60 days after the event and in accordance with **Condition 10.5** of this permit.

Part 11: Corrective Action

11.1 If GLOBALFOUNDRIES determines that hazardous waste or hazardous materials have been released or discharged to the environment at the facility or that there is a likelihood of a release or discharge of hazardous waste or hazardous materials to the environment, then GLOBALFOUNDRIES shall immediately notify the Director of any such release or discharge, and comply with the applicable requirements of the **VHWMR § 7-105, and 40 CFR Part 264 Subparts F and S**.

11.2 In the event of a release or discharge at the facility, GLOBALFOUNDRIES shall report the release or discharge to the Director and conduct an assessment of the release or discharge in accordance with **VHWMR § 7-105**. Information submitted must be sufficient to determine whether further investigation is necessary.

11.3 Corrective action may be required beyond the facility's boundary if the Secretary determines that it is necessary to protect human health and the environment.

ATTACHED SECTIONS

Section 1: RCRA Part A Application

Section 2: Facility Description

Section 3: Waste Characteristics and Waste Analysis

Section 4: Container Storage Information

Section 5: Tank Storage Information

Section 6: Security Procedures

Section 7: Facility Inspection Procedures

Section 8: Preparedness and Prevention

Section 9: Contingency Plan

Section 10: Closure Plan, Post Closure Plan, and Financial Requirements

Section 11: Organic Air Emission Compliance

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Hazardous Waste Permit Application

Essex Junction Facility of

GLOBALFOUNDRIES®

Essex Junction, Vermont

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ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
AASHTO	American Association of State Highway and Transportation Officials
ASME	American Society of Mechanical Engineers
BWTP	Biological Wastewater Treatment Plant
CDC	Chemical Distribution Center
CFR	Code of Federal Regulations
CMP	chemical mechanical polishing
CW	concentrated waste
CWDA	Chemical Waste Disposal Authorization
decon	decontamination
DOT	U.S. Department of Transportation
DOW	dilute organic waste
EPA	U.S. Environmental Protection Agency
FIA	Federal Insurance Administration
gpm	gallons per minute
IWTP	industrial wastewater treatment plant
m^3	cubic meters
mg/kg	milligrams per kilogram
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
OJT	On-the-Job Training
OVA	organic vapor analyzer
PCB	polychlorinated biphenyl
PPE	personal protective equipment
ppm	parts per million
psi	pounds per square inch
psig	pound-force per square inch gauge
QA/QC	quality assurance and quality control
RCRA	Resource Conservation and Recovery Act

SBR	sequential batch reactors
SDS	Safety Data Sheet
TOC	total organic carbon
TSDFs	treatment, storage, and disposal facilities
VHWMR	Vermont Hazardous Waste Management Regulations
VOC	volatile organic compound
WAP	waste analysis plan

EPA ID Number VTR000524868

OMB#: 2050-0034; Expires 7/31/2012

United States Environmental Protection Agency

HARDOUS WASTE PERMIT INFORMATION FORM

1. Facility Permit Contact	**First Name:** Andrea	**MI:** M	**Last Name:** McCullen
	Contact Title: RCRA Program Manager		
	Phone: 802-288-6030	**Ext.:**	**Email:** andrea.pomroy-mccullen@glol
2. Facility Permit Contact Mailing Address	**Street or P.O. Box:** 1000 River Road - B966		
	City, Town, or Village: Essex Junction		
	State: VT		
	Country: United States	**Zip Code:** 05452	
3. Operator Mailing Address and Telephone Number	**Street or P.O. Box:** 1000 River Road - B966		
	City, Town, or Village: Essex Junction		
	State: VT	**Phone:** 802-769-4747	
	Country: United States	**Zip Code:** 05452	
4. Facility Existence Date Facility	**Existence Date (mm/dd/yyyy):** 7/1/2015		

5. Other Environmental Permits

A. Facility Type *(Enter code)*	B. Permit Number	C. Description
P	AOP-12-022	Air pollution control operating permit (DEC#EJ91-0002)
N	3-1295 VT0000400	NPDES (permit status transferred from IBM)
E	96-2	Dam permit for wastewater holding tanks
E	WW-4-0398-22 PIN:EJ91-0002	CMP Pump Station
E	WW-4-0398-28 PIN:EJ91-0002	Sanitary backbone
E	Multiple	ACT 250

6. Nature of Business:

GLOBALFOUNDIES' Essex Junction facility develops, manufactures, and tests semiconductor products for a variety of computer and consumer applications. Wastes are also generated from support operations such as maintenance, utility services, construction and rearrangement, wastewater treatment operations, and other pollution abatement.

7. Process Codes and Design Capacities – Enter information in the Section on Form Page 3

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. If more lines are needed, attach a separate sheet of paper with the additional information. For "other" processes (i.e., D99, S99, T04 and X99), describe the process (including its design capacity) in the space provided in Item 8.

B. PROCESS DESIGN CAPACITY – For each code entered in Item 7.A; enter the capacity of the process.

1. **AMOUNT – Enter the amount. In a case where design capacity is not applicable (such as in a closure/post-closure or enforcement action) enter the total amount of waste for that process.**
2. **UNIT OF MEASURE – For each amount entered in Item 7.B(1), enter the code in Item 7.B(2) from the list of unit of measure codes below that describes the unit of measure used. Select only from the units of measure in this list.**

C. PROCESS TOTAL NUMBER OF UNITS – Enter the total number of units for each corresponding process code.

Process Code	Process	Appropriate Unit of Measure for Process Design Capacity
	Disposal	
D79	Underground Injection Well Disposal	Gallons; Liters; Gallons Per Day; or Liters Per Day
D80	Landfill	Acre-feet; Hectares-meter; Acres; Cubic Meters; Hectares; Cubic Yards
D81	Land Treatment	Acres or Hectares
D82	Ocean Disposal	Gallons Per Day or Liters Per Day
D83	Surface Impoundment Disposal	Gallons; Liters; Cubic Meters; or Cubic Yards
D99	Other Disposal	Any Unit of Measure Listed Below
	Storage	
S01	Container	Gallons; Liters; Cubic Meters; or Cubic Yards
S02	Tank Storage	Gallons; Liters; Cubic Meters; or Cubic Yards
S03	Waste Pile	Cubic Yards or Cubic Meters
S04	Surface Impoundment	Gallons; Liters; Cubic Meters; or Cubic Yards
S05	Drip Pad	Gallons; Liters; Cubic Meters; Hectares; or Cubic Yards
S06	Containment Building Storage	Cubic Yards or Cubic Meters
S99	Other Storage	Any Unit of Measure Listed Below
	Treatment	
T01	Tank Treatment	Gallons Per Day; Liters Per Day
T02	Surface Impoundment	Gallons Per Day; Liters Per Day
T03	Incinerator	Short Tons Per Hour; Metric Tons Per Hour; Gallons Per Hour; Liters Per Hour; BTUs Per Hour; Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Gallons Per Day; Metric Tons Per Hour; or Million BTU Per Hour
T04	Other Treatment	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Short Tons Per Day; BTUs Per Hour; Gallons Per Day; Liters Per Hour; or Million BTU Per Hour
T80	Boiler	Gallons; Liters; Gallons Per Hour; Liters Per Hour; BTUs Per Hour; or Million BTU Per Hour

Process Code	Process	Appropriate Unit of Measure for Process Design Capacity (for T81 – T94)
	Treatment (Continued)	
T81	Cement Kiln	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; BTU Per Hour; Liters Per Hour; Kilograms Per Hour; or Million BTU Per Hour
T82	Lime Kiln	
T83	Aggregate Kiln	
T84	Phosphate Kiln	
T85	Coke Oven	
T86	Blast Furnace	
T87	Smelting, Melting, or Refining Furnace	
T88	Titanium Dioxide Chloride Oxidation Reactor	
T89	Methane Reforming Furnace	
T90	Pulping Liquor Recovery Furnace	
T91	Combustion Device Used in the Recovery of Sulfur Values from Spent Sulfuric Acid	
T92	Halogen Acid Furnaces	
T93	Other Industrial Furnaces Listed in 40 CFR 260.10	
T94	Containment Building Treatment	Cubic Yards; Cubic Meters; Short Tons Per Hour; Gallons Per Hour; Liters Per Hour; BTU Per Hour; Pounds Per Hour; Short Tons Per Day; Kilograms Per Hour; Metric Tons Per Day; Gallons Per Day; Liters Per Day; Metric Tons Per Hour; or Million BTU Per Hour
	Miscellaneous (Subpart X)	
X01	Open Burning/Open Detonation	Any Unit of Measure Listed Below
X02	Mechanical Processing	Short Tons Per Hour; Metric Tons Per Hour; Short Tons Per Day; Metric Tons Per Day; Pounds Per Hour; Kilograms Per Hour; Gallons Per Hour; Liters Per Hour; or Gallons Per Day
X03	Thermal Unit	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; BTU Per Hour; or Million BTU Per Hour
X04	Geologic Repository	Cubic Yards; Cubic Meters; Acre-feet; Hectare-meter; Gallons; or Liters
X99	Other Subpart X	Any Unit of Measure Listed Below

Unit of Measure	Unit of Measure Code
Gallons	G
Gallons Per Hour	E
Gallons Per Day	U
Liters	L
Liters Per Hour	H
Liters Per Day	V
Short Tons Per Hour	D
Short Tons Per Day	N
Metric Tons Per Hour	W
Metric Tons Per Day	S
Pounds Per Hour	J
Kilograms Per Hour	X
Million BTU Per Hour	X
Cubic Yards	Y
Cubic Meters	C
Acres	B
Acre-feet	A
Hectares	Q
Hectare-meter	F
BTU Per Hour	I

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7. Process Codes and Design Capacities (Continued)

EX AMPLE FOR COMPLETING Item 7 (shown in line number X-1 below): A facility has a storage tank, which can hold 533.788 gallons.

Line Number		A. Process Code (From list above)			B. PROCESS DESIGN CAPACITY (1) Amount (Specify)	B. PROCESS DESIGN CAPACITY (2) Unit of Measure	C. Process Total Number of Units	For Official Use Only					
X	1	S	0	2	533.788	G	001						
1		S	0	2	10,000	G	006						
2		S	0	2	9,000	G	001						
3		S	0	1	5,280	G	001						
4		S	0	1	60,720	G	001						
5													
6													
7													
8													
9													
10													
11													
12													
13													

Note: If you need to list more than 13 process codes, attach an additional sheet(s) with the information in the same format as above. Number the line sequentially, taking into account any lines that will be used for "other" process (i.e., D99, S99, T04, and X99) in Item 8.

8. Other Processes (Follow instructions from Item 7 for D99, S99, T04, and X99 process codes)

Line Number (Enter #s in sequence with Item 7)		A. Process Code (From list above)			B. PROCESS DESIGN CAPACITY (1) Amount (Specify)	(2) Unit of Measure	C. Process Total Number of Units	For Official Use Only					
X	**2**	**T**	**0**	**4**	**100.00**	**U**	**001**						

9. Description of Hazardous Wastes - Enter Information in the Sections on Form Page 5

A. EPA HAZARDOUS WASTE NUMBER – Enter the four-digit number from 40 CFR, Part 261 Subpart D of each listed hazardous waste you will handle. For hazardous wastes which are not listed in 40 CFR, Part 261 Subpart D, enter the four-digit number(s) from 40 CFR Part 261, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. ESTIMATED ANNUAL QUANTITY – For each listed waste entered in Item 9.A, estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in Item 9.A, estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE – For each quantity entered in Item 9.B, enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS P		KILOGRAMS	K
TONS T		METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure, taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:

For listed hazardous waste: For each listed hazardous waste entered in Item 9.A, select the code(s) from the list of process codes contained in Items 7.A and 8.A on page 3 to indicate all the processes that will be used to store, treat, and/or dispose of all listed hazardous wastes.

For non-listed waste: For each characteristic or toxic contaminant entered in Item 9.A, select the code(s) from the list of process codes contained in Items 7.A and 8.A on page 3 to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.

NOTE: THREE SPACES ARE PROVIDED FOR ENTERING PROCESS CODES. IF MORE ARE NEEDED:

1. **Enter the first two as described above.**
2. **Enter "000" in the extreme right box of Item 9.D(1).**
3. **Use additional sheet, enter line number from previous sheet, and enter additional code(s) in Item 9.E.**

2. PROCESS DESCRIPTION: If code is not listed for a process that will be used, describe the process in Item 9.D(2) or in Item 9.E(2).

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER – Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. **Select one of the EPA Hazardous Waste Numbers and enter it in Item 9.A. On the same line complete Items 9.B, 9.C, and 9.D by estimating the total annual quantity of the waste and describing all the processes to be used to store, treat, and/or dispose of the waste.**
2. **In Item 9.A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In Item 9.D.2 on that line enter "included with above" and make no other entries on that line.**
3. **Repeat step 2 for each EPA Hazardous Waste Number that can be used to describe the hazardous waste.**

EXAMPLE FOR COMPLETING Item 9 (shown in line numbers X-1, X-2, X-3, and X-4 below) – A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operations. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

Line Number		A. EPA Hazardous Waste No. (Enter code)				B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES									
								(1) PROCESS CODES (Enter Code)									(2) PROCESS DESCRIPTION (If code is not entered in 9.D(1))
X	1	K	0	5	4	900	P	T	0	3	D	8	0				
X	2	D	0	0	2	400	P	T	0	3	D	8	0				
X	3	D	0	0	1	100	P	T	0	3	D	8	0				
X	4	D	0	0	2												Included With Above

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9. Description of Hazardous Wastes ***(Continued. Use additional sheet(s) as necessary; number pages as 5a, etc.)***

Line Number		A. EPA Hazardous Waste No. (Enter code)				B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter Code)									D. PROCESSES (2) PROCESS DESCRIPTION (If code is not entered in 9.D(1))
	1	D	0	0	1	See Biennial		S	0	1		S	0	2			
	2	D	0	0	2	and		S	0	1							
	3	D	0	0	3	International		S	0	1							
	4	D	0	0	4	Shipments		S	0	1		S	0	2			
	5	D	0	0	5	Reports		S	0	1		S	0	2			
	6	D	0	0	6	for typical		S	0	1		S	0	2			
	7	D	0	0	7	quantities		S	0	1		S	0	2			
	8	D	0	0	8	(see		S	0	1		S	0	2			
	9	D	0	0	9	Appendix C)		S	0	1							
1	0	D	0	1	0			S	0	1		S	0	2			
1	1	D	0	1	1			S	0	1		S	0	2			
1	2	D	0	1	8			S	0	1		S	0	2			
1	3	D	0	1	9			S	0	1		S	0	2			
1	4	D	0	2	1			S	0	1		S	0	2			
1	5	D	0	2	2			S	0	1		S	0	2			
1	6	D	0	2	3			S	0	1		S	0	2			
1	7	D	0	2	4			S	0	1		S	0	2			
1	8	D	0	2	5			S	0	1		S	0	2			
1	9	D	0	2	6			S	0	1		S	0	2			
2	0	D	0	2	7			S	0	1		S	0	2			
2	1	D	0	2	8			S	0	1		S	0	2			
2	2	D	0	2	9			S	0	1		S	0	2			
2	3	D	0	3	5			S	0	1		S	0	2			
2	4	D	0	3	9			S	0	1		S	0	2			
2	5	D	0	4	0			S	0	1		S	0	2			
2	6	D	0	4	3			S	0	1		S	0	2			
2	7	F	0	0	1			S	0	1		S	0	2			
2	8	F	0	0	2			S	0	1		S	0	2			
2	9	F	0	0	3			S	0	1		S	0	2			
3	0	F	0	0	4			S	0	1		S	0	2			
3	1	F	0	0	5			S	0	1		S	0	2			
3	2	F	0	0	6			S	0	1							
3	3	U	X	X	X			S	0	1		S	0	2			Any "U" code
3	4	P	X	X	X			S	0	1							Any "P" code
3	5	V	T	0	1			S	0	1							
3	6	V	T	0	2			S	0	1		S	0	2			

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9. Description of Hazardous Wastes ***(Continued. Use additional sheet(s) as necessary; number pages as 5a, etc.)***

Line Number		A. EPA Hazardous Waste No. (Enter code)				B. Estimated Annual Qty of Waste	C. Unit of Measure (Enter code)	D. PROCESSES									
								(1) PROCESS CODES (Enter Code)									(2) PROCESS DESCRIPTION (If code is not entered in 9.D.1)
3	7	V	T	0	3	See Biennial		S	0	1		S	0	2			
3	8	V	T	0	6	and		S	0	1							
3	9	V	T	0	8	International		S	0	1		S	0	2			
4	0	V	T	2	0	Shipments		S	0	1							
4	1	V	T	2	1	Reports		S	0	1							
4	2	V	T	2	2	for typical		S	0	1							
						quantities											
						(see											
						Appendix C)											

10. Map

Attach to this application a topographical map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all spring, rivers, and other surface water bodies in this map area. See instructions for precise requirements.

11. Facility Drawing

All existing facilities must include a scale drawing of the facility (see instructions for more detail).

12. Photo graphs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment, and disposal areas; and sites of future storage, treatment, or disposal areas (see instructions for more detail).

13. Co mments

Item 10: See Figures B-1 and B-6 in Appendix B.

Item 11: See Figure B-6 in Appendix B, Attachment 1-1, and Attachment 1-2.

Item 12: See Attachment 1-3.

Review BR Source Record

1. Reason for Submittal

BR / Notification. [Source B]

2. Site ID

EPA ID
VTR000524868

Activity Location
VT

3. Site Name

Name
GLOBALFOUNDRIES US 2 LLC-VERMONT FACILITY

4. Site Location

Street Number
1000

Street 1
RIVER ROAD - B966

Street 2
ESSEX JUNCTION

Zip
05452

City, Town or Village
ESSEX

State
VERMONT

Country
UNITED STATES

County
CHITTENDEN

5. Site Mailing Address

Street Number
1000

Street 1
RIVER RD-B966, MAIL STOP 966A

Street 2

Zip
05452

City, Town or Village
ESSEX JUNCTION

State
VERMONT

Country
UNITED STATES

6. Site Land Type

Land Type
Private

7. North American Industry Classification System (NAICS)

Primary NAICS

334413 - SEMICONDUCTOR AND RELATED DEVICE MANUFACTURING

Other NAICS

8. Site Contact Person

First Name
Andrea

Middle Initial

Last Name
McCullen

Title

Email
andrea.pomroy-mccullen@globalfoundries.com

Phone Number
802-288-6030

Extension

Fax
802-769-4139

8a. Site Contact Address

Street Number
1000

Street 1
RIVER RD-B966, MAIL STOP 966A

Street 2

Zip
05452

City, Town or Village
ESSEX JUNCTION

State
VERMONT

Country
UNITED STATES

9a. Legal Owner

Type	Name	Address	Date
Private	GLOBALFOUNDRIES US 2 LLC	2600 Great American Way, Santa Clara, CA 95054	03/05/2018

9b. Legal Operator

Type	Name	Address	Date
Private	GLOBALFOUNDRIES US 2 LLC	2600 Great American Way, Santa Clara, CA 95054	03/05/2018

10. Type of Federal Regulated Waste Activity

A. Hazardous Waste Activities

1. Generator of Hazardous Waste (Federal)
1 - Large Quantity Generator

2-3. Other Generator Activities
None Selected

4. Treater, Storer, or Disposer of Hazardous Waste
Yes

5. Receives Hazardous Waste from Off-site
Yes

6. Recycler of Hazardous Waste
None Selected

7. Exempt Boiler and / or Industrial Furnace
None Selected

B. Waste Codes for Federally Regulated Hazardous Wastes

A. Hazardous Waste Codes (Federal)

D-Codes:
D001 D002 D003 D004 D005 D006 D007 D008 D009 D010 D011 D018 D019 D021 D022 D023 D024 D025 D026 D027 D028 D029 D035 D039 D040 D043

F-Codes:
F001 F002 F003 F004 F005 F006

P-Codes:
P001 P002 P003 P004 P005 P006 P007 P008 P009 P010 P011 P012 P013 P014 P015 P016 P017 P018 P020 P021 P022 P023 P024 P026 P027 P028 P029 P030 P031 P033 P034 P036 P037 P038 P039 P040 P041 P042 P043 P044 P045 P046 P047 P048 P049 P050 P051 P054 P056 P057 P058 P059 P060 P062 P063 P064 P065 P066 P067 P068 P069 P070 P071 P072 P073 P074 P075 P076 P077 P078 P081 P082 P084 P085 P087 P088 P089 P092 P093 P094 P095 P096 P097 P098 P099 P101 P102 P103 P104 P105 P106 P108 P109 P110 P111 P112 P113 P114 P115 P116 P118 P119 P120 P121 P122 P123 P127 P128 P185 P188 P189 P190 P191 P192 P194 P196 P197 P198 P199 P201 P202 P203 P204 P205

U-Codes:
U001 U002 U003 U004 U005 U006 U007 U008 U009 U010 U011 U012 U014 U015 U016 U017 U018 U019 U020 U021 U022 U023 U024 U025 U026 U027 U028 U029 U030 U031 U032 U033 U034 U035 U036 U037 U038 U039 U041 U042 U043 U044 U045 U046 U047 U048 U049 U050 U051 U052 U053 U055 U056 U057 U058 U059 U060 U061 U062 U063 U064 U066 U067 U068 U069 U070 U071 U072 U073 U074 U075 U076 U077 U078 U079 U080 U081 U082 U083 U084 U085 U086 U087 U088 U089 U090 U091 U092 U093 U094 U095 U096 U097 U098 U099 U101 U102 U103 U105 U106 U107 U108 U109 U110 U111 U112 U113 U114 U115 U116 U117 U118 U119 U120 U121 U122 U123 U124 U125 U126 U127 U128 U129 U130 U131 U132 U133 U134 U135 U136 U137 U138 U140 U141 U142 U143 U144 U145 U146 U147 U148 U149 U150 U151 U152 U153 U154 U155 U156 U157 U158 U159 U160 U161 U162 U163 U164 U165 U166 U167 U168 U169 U170 U171 U172 U173 U174 U176 U177 U178 U179 U180 U181 U182 U183 U184 U185 U186 U187 U188 U189 U190 U191 U192 U193 U194 U196 U197 U200 U201 U203 U204 U205 U206 U207 U208 U209 U210 U211 U213 U214 U215 U216 U217 U218 U219 U220 U221 U222 U223 U225 U226 U227 U228 U234 U235 U236 U237 U238 U239 U240 U243 U244 U246 U247 U248 U249 U271 U278 U279 U280 U328 U353 U359 U364 U367 U372 U373 U378 U387 U389 U394 U395 U404 U409 U410 U411

C. Waste Codes for State Regulated (non-Federal) Hazardous Wastes

B. Hazardous Waste Codes (State)

VT01 VT02 VT03 VT06 VT08 VT20

11. Additional Regulated Waste Activities

A. Other Waste Activities

1. Transporter of Hazardous Waste
None Selected

2. Underground Injection Control
None Selected

3. United States Importer of Hazardous Waste
None Selected

4. Recognized Trader
None Selected

5. Importer/Exporter of SLABs
None Selected

B. Universal Waste Activities

1. Large Quantity Handler of Universal Waste

Accumulated/Managed

- Batteries
- Mercury containing equipment
- Lamps
- CATHODE RAY TUBES
- MERCURY THERMOSTATS
- PCB-CONTAINING LIGHT BALLASTS

2. Destination Facility for Universal Waste
None Selected

C. Used Oil Activities

1. Used Oil Transporter
None Selected

2. Used Oil Processor and / or Re-refiner
None Selected

3. Off-Specification Used Oil Burner
None Selected

4. Used Oil Fuel Marketer
None Selected

12. Eligible Academic Entities with Laboratories

1. Opting into or currently operating under 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories.

2. Withdrawing from 40 CFR Part 262 Subpart K for the management of hazardous wastes in laboratories.

No

14. LQG Consolidation of VSQG Waste

Your state does not participate in LQG Consolidation of VSQG Waste.

15. Notification of LQG Site Closure for a Central Accumulation Area (CAA) (optional) and Entire Facility

Your state does not participate in Notification of LQG Site Closure.

16. Notification of Hazardous Secondary Material (HSM) Activity

Your state does not participate in HSM.

17. Electronic Manifest Broker

Are you notifying as a person, as defined in 40 CFR 260.10, electing to use the EPA electronic manifest system to obtain, complete, and transmit an electronic manifest under a contractual relationship with a hazardous waste generator?

No

18. Comments

Public Comments

VT21 and VT22 not available from drop down

ATTACHMENT 1-1

HAZARDOUS WASTE MANAGEMENT AREAS

VTR000524868

LEGEND FOR SITE MAP
HAZARDOUS WASTE MANAGEMENT AREAS

A. CHEMICAL DISTRIBUTION CENTER

B. CLOSED B963 NBA AND XYLENE TANKS

C. CLOSED B963 VAULTED GENERAL SOLVENT TANK

D. CLOSED B967 VAULTED GENERAL SOLVENT TANKS

E. CLOSED INDUSTRIAL WASTE LANDFILL (PRE-RCRA)

F. B963 ABOVEGROUND STEEL LINED WASTE TANK

G. CLOSED B963 FREON/PERC/RINSE TANKS

H. CLOSED B970 GENERAL SOLVENT TANK

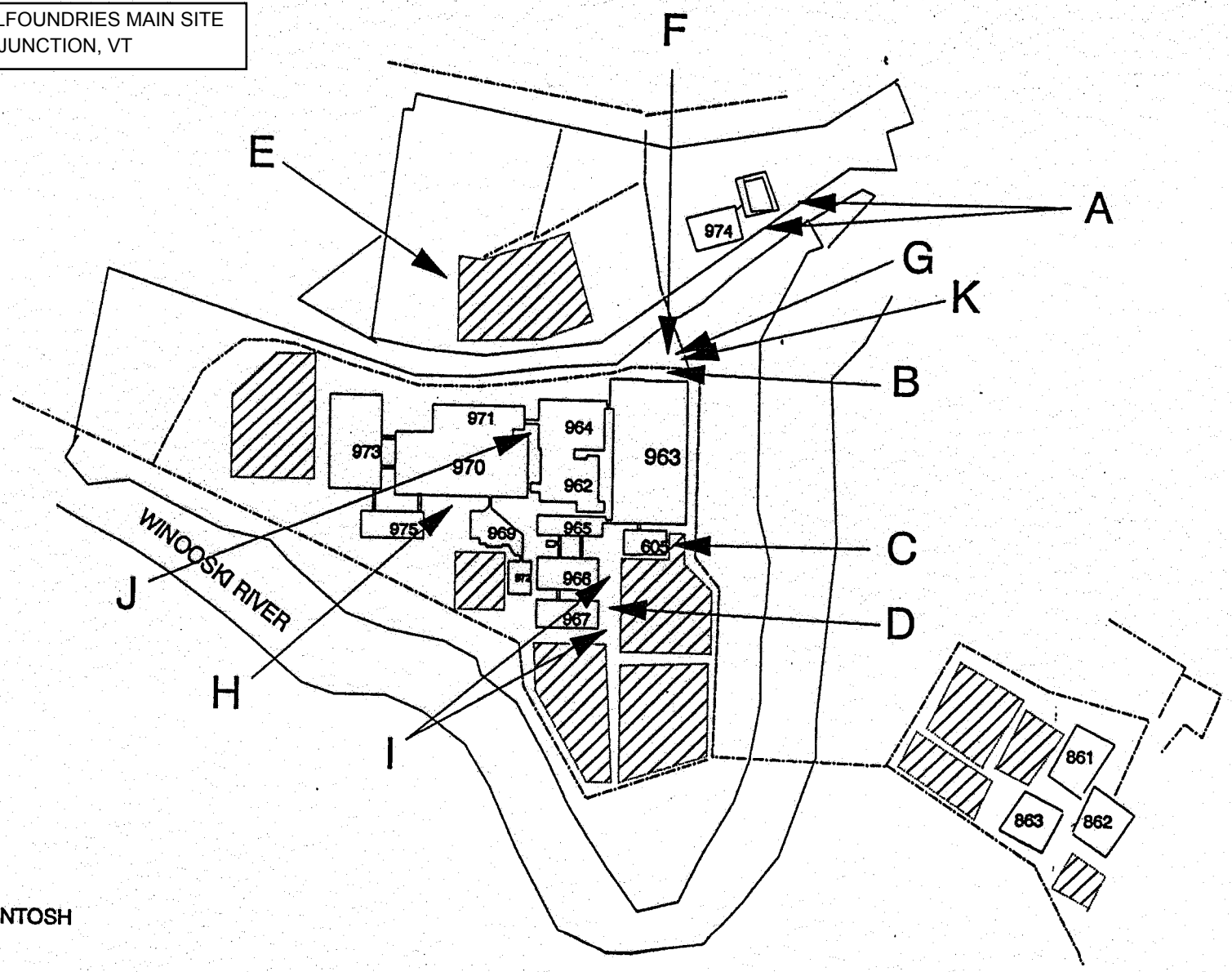
I. CLOSED B966/967 GENERAL SOLVENT TANKS

J. CLOSED FREON/METHYLENE CHLORIDE/
PERC/SPARE TANKS B970

K. CLOSED B 963 SPILL CONTAINMENT TANK

HAZARDOUS WASTE MANAGEMENT AREAS

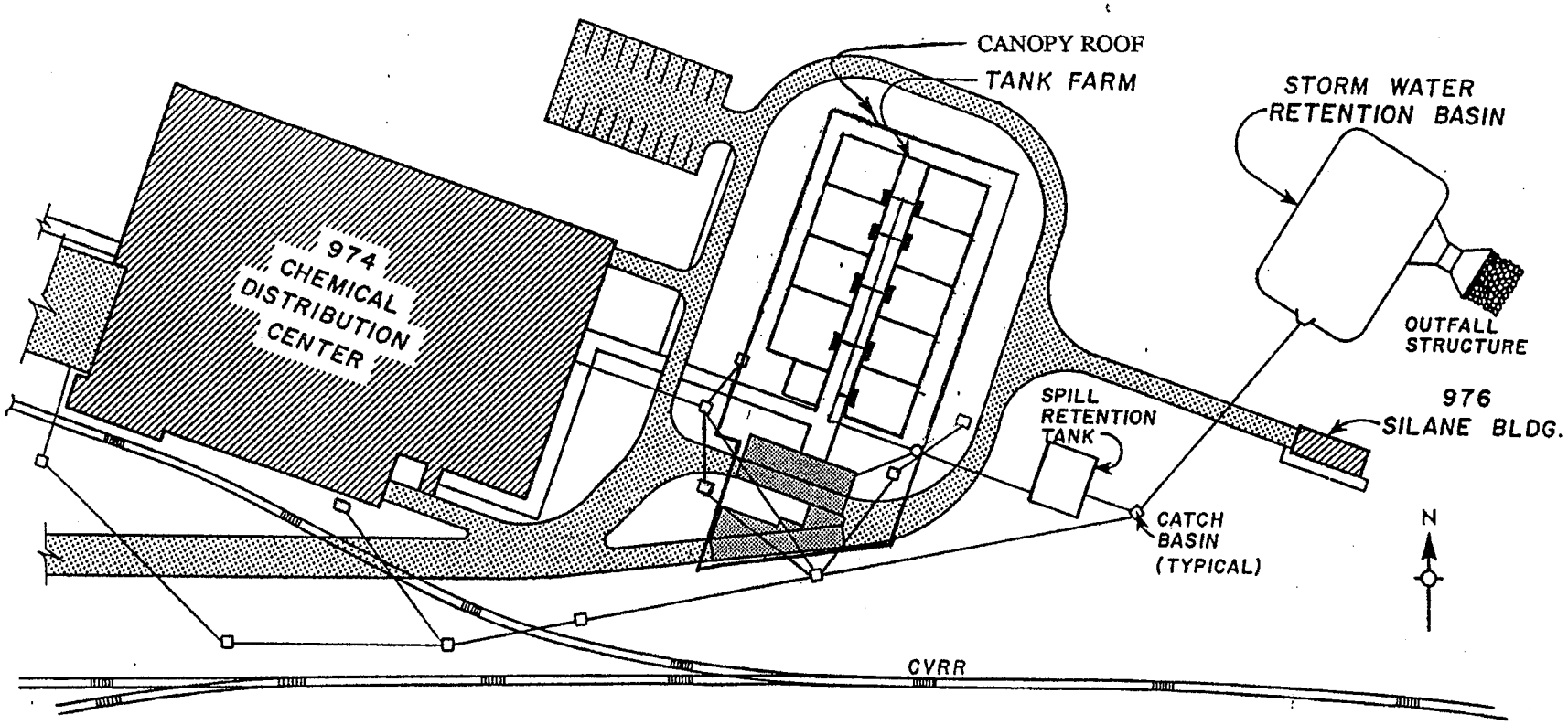
GLOBALFOUNDRIES MAIN SITE
ESSEX JUNCTION, VT



HW10/MCINTOSH

ATTACHMENT 1-2

CHEMICAL DISTRIBUTION CENTER VIRGIN AND WASTE STORAGE



BLDG. 974 CHEMICAL DISTRIBUTION CENTER

VIRGIN AND WASTE STORAGE

Location: 44° 28' 59" N. Lat.
73° 05' 37" W. Long.

Scale In Feet

60 30 0 60 120

ESSEX JUNCTION
VERMONT 05452

ATTACHMENT 1-3

PHOTOS - GLOBALFOUNDRIES, ESSEX JUNCTION, VT

GLOBALFOUNDRIES,
Essex Junction, VT

Aerial Photo

GLOBALFOUNDRIES, Essex Junction, VT – Chemical Distribution Center (CDC)
Tank Farm Load/Unload Station

GLOBALFOUNDRIES, Essex Junction, VT – Chemical Distribution Center (CDC) Tank Farm

GLOBALFOUNDRIES, Essex Junction, VT – Building 963 North Waste Storage Tank

GLOBALFOUNDRIES, Essex Junction, VT – Building 974 Chemical Distribution Center (CDC) Waste Storage Room

GLOBALFOUNDRIES, Essex Junction, VT – Building 974 Chemical Distribution Center (CDC) Flammable Waste Storage Room

GLOBALFOUNDRIES, Essex Junction, VT – Building 974 Chemical Distribution Center (CDC) Solvent Transfer Room

SECTION 2.0

FACILITY DESCRIPTION

2.1 INTRODUCTION

This section provides a general description of GLOBALFOUNDRIES U.S. 2 LLC's manufacturing and hazardous waste storage facilities, topographic maps, traffic patterns, information to address the location standards for storage facilities, and other information required by 40 Code of Federal Regulations (CFR) Part 270.14(b).

2.2 GENERAL DESCRIPTION

The GLOBALFOUNDRIES U.S. 2 LLC (GLOBALFOUNDRIES) facility is located in Chittenden County, Vermont, on approximately 729 acres that are divided by the Winooski River and connected by a company-owned bridge. The GLOBALFOUNDRIES facility is part of the Champlain Valley Technology and Innovation Park. The Champlain Valley Technology and Innovation Park currently includes GLOBALFOUNDRIES and tenants to GLOBALFOUNDRIES. In the future, the technology park may include non-GLOBALFOUNDRIES business entities (land parcels owned by non-GLOBALFOUNDRIES businesses within the technology park footprint). GLOBALFOUNDRIES develops, manufactures, and tests semiconductor products for a variety of computer and consumer applications. The manufacturing facility, including the hazardous waste storage and treatment units, is located on approximately 237 acres which lie west of the Winooski River in the town of Essex and the village of Essex Junction. The remaining 492 acres are located east of the river in the town of Williston and contain non-manufacturing buildings. Off-site leased locations may be used for satellite operations as business needs dictate, and these operations may generate hazardous waste. GLOBALFOUNDRIES is not currently using any off-site locations. In addition, hazardous waste may be generated by emergency incidents to which GLOBALFOUNDRIES Emergency Services responds. GLOBALFOUNDRIES also operates similar manufacturing facilities in New York State that could potentially send waste to this location for storage and shipment with similar wastes generated at this location.

The mailing address for this facility is:

GLOBALFOUNDRIES U.S. 2 LLC – Vermont Facility
1000 River Street – B966
Essex Junction, Vermont 05452

The manager responsible for hazardous waste management at the facility is:

Andrew Lacourciere, Northeast Regional Environmental Manager
Telephone (802)769-0580

GLOBALFOUNDRIES will maintain, at a minimum, the Facility Operating Record required under Permit Condition 4.9 in computerized records, in the environmental central files (on GLOBALFOUNDRIES premises), in the responsible engineers' and managers' files, and/or at the designated records retention facility. Unless otherwise indicated in the operating record, the handling code for all waste received is S01 (container storage) or S02 (tank storage).

2.3 TOPOGRAPHICAL MAPS AND OTHER FACILITY INFORMATION

Topographic maps of GLOBALFOUNDRIES and the surrounding area are provided in Appendix B. Figure B-6, Appendix B, shows the topography within 1,000 feet of the hazardous waste management facility with discharge structures, major buildings, and surface waters. Figure B-1 shows the location of withdrawal wells within 1,000 feet of the property line. There are no intake structures for withdrawal of water from the Winooski River.

2.3.1 Land Use

The land around GLOBALFOUNDRIES is used for residential, commercial, agricultural, and industrial purposes. Maps illustrating the land use are attached as Figures B-2, B-3, and B-4 in Appendix B. These figures show zoning maps from the Village of Essex Junction, the Town of Essex, and the Town of Williston. The facility is not located on Indian lands.

2.3.2 Wind Rose

A wind rose for the facility using data collected at the Burlington International Airport by Iowa Environmental Mesonet is included as Figure B-5.

2.3.3 Injection and Withdrawal Wells

GLOBALFOUNDRIES' facility has no injection wells. Withdrawal wells are illustrated in Figure B-1, Appendix B.

2.3.4 Buildings; Treatment, Storage and Disposal Areas; Other Structures

Buildings, treatment, storage, and disposal areas, and other structures on the property are shown in Figure B-6, Appendix B.

2.3.5 Recreation Areas

A GLOBALFOUNDRIES employee recreation area is located on 14 acres at the northwest corner of the facility.

2.3.6 Runoff Control System

All hazardous waste storage and loading/unloading areas are spill-contained to prevent runoff. Spills at the Chemical Distribution Center (CDC) container loading/unloading area will be contained in the trench system as shown in Figure D-2-D, while spills at the CDC tank loading/unloading area will be contained in the trench system as shown in Figure D-2-7. When trucks are present in these areas, the valves in the pipes will be closed. GLOBALFOUNDRIES will remove any spilled material by use of a vacuum truck or similar device, depending upon the type and volume of material spilled.

2.3.7 Access Control and Security

Primary access is through the intersection of internal roads with state routes 2A and 117. Gates at all entrances to the site allow GLOBALFOUNDRIES to control traffic flow to and from the site. Details of the access controls and security provisions for the facility are provided in Section 6.0.

2.3.8 Fire Control

GLOBALFOUNDRIES' fire protection water system is shown in Figure B-13, Appendix B. An automatic water sprinkler system is used to protect the facility. In addition, portable fire extinguishers and fire hoses are installed throughout the buildings. At the main site, two diesel fire pumps (1,500 and 2,000 gallons per minute [gpm]) provide flow to the private underground fire mains. These pumps obtain water from a 1,000,000-gallon private storage tank supplied from a Champlain Water District connection. There is also a direct connection of the underground fire main system to the Champlain Water District system for additional water supply capacity. In addition, a water-deluge system protects the CDC tank farm and the two load/unload areas at the CDC. The Williston facility fire protection system consists of one 1,500-gpm fire pump providing flow to the underground piping system. This pump is supplied from a direct connection to the Champlain Water District feed for the site.

GLOBALFOUNDRIES Emergency Services provides full-time fire-control coverage with trained fire personnel equipped with one pumper truck. Primary fire control responsibility for GLOBALFOUNDRIES rests with the Emergency Services Department. Additional fire control information is presented in Sections 8.0 and 9.0. Agreements with local authorities are presented in Attachment 9-1.

2.3.9 Seismic Consideration

This facility is not located in an area within 200 feet of a fault that has had displacement in Holocene time; therefore, the seismic standards do not apply.

2.3.10 Flood Plain Standard

The 100-year flood elevation is 288 feet above mean sea level. This is reported in "Flood Plain

Information, Winooski River, Towns of Essex and Williston, Vermont," prepared in 1973 for the Vermont Department of Water Resources by the U.S. Army Corps of Engineers. Hazardous waste management facilities at this GLOBALFOUNDRIES location have ground surfaces above 288 feet mean sea level. Consequently, the provisions of 40 CFR Part 264.18 (b) for facilities in flood plains do not apply. A Federal Insurance Administration (FIA) 100-year flood plain map for the Village of Essex Junction, Vermont, is enclosed as Figure B-12, Appendix B. This map shows flood plain information for the section of GLOBALFOUNDRIES property where the permitted facility is located.

2.3.11 Traffic Patterns

Vermont State Routes 2A and 117 intersect Interstate 89 and provide access to GLOBALFOUNDRIES' facilities. Hazardous waste is shipped from the site in semi-trailer loads or tanker trucks with combined gross weight of approximately 78,000 pounds. These vehicles enter routes 117 and 2A via the Maple Street Access Road or the River Street Access Road, respectively. Approximately 5-10 outgoing shipments of hazardous waste are made each month. Site roadways supporting these shipments generally have at least an 18-inch sub-base with a 3-inch minimum bituminous-concrete pavement designed to meet American Association of State Highway and Transportation Officials (AASHTO) HS-25 loading.

Incoming shipments of small quantities of hazardous waste from off-site may arrive in trucks via State Routes 15 or 117.

2.4 HAZARDOUS WASTE MANAGEMENT

GLOBALFOUNDRIES' waste management priority is to first try to eliminate or reduce waste at the source. All waste materials that are ultimately shipped offsite will be processed at a fully permitted facility approved to handle the specific types of waste.

The priority of methods to manage the wastes is:

1. Source reduction
2. Reuse
3. Reclamation/recycling
4. Treatment (i.e., high-temperature incineration, chemical/physical treatment)
5. Secure chemical landfill disposal

The waste management methods listed above in order of priority fulfill the generator requirements under Section 3002(b) of RCRA. This section requires the generator to select the method of treatment, storage, or disposal currently available that minimizes the present and future threat to human health and the environment. GLOBALFOUNDRIES submits an annual waste minimization update to the Vermont Waste Management & Prevention Division and/or EPA, and retains this report in the facility operating record. The most recent copy of the annual waste

minimization update can be found in Appendix C.

2.4.1 Hazardous Waste Generation

A variety of hazardous waste is produced as a result of wafer and module manufacturing, laboratory operations, research and development, rearrangement/construction activities, utility/maintenance services, off-spec virgin material, operation of pollution abatement systems, and miscellaneous site support operations. Summaries of GLOBALFOUNDRIES' wastes are found in Section 1.0 and Section 3.2, Chemical and Physical Nature of GLOBALFOUNDRIES' Waste.

2.4.2 Hazardous Waste Management Facility

GLOBALFOUNDRIES' hazardous waste management facility is made up of four storage units. Two of the storage units are container storage areas and two are tank storage systems.

2.4.2.1 Container Storage Areas

The two container storage areas are the waste storage room and the flammable waste storage room located in the Building 974 CDC. These two areas are used to store liquid, solid, and contained gaseous wastes in a variety of containers. GLOBALFOUNDRIES considers the boundaries of these container storage areas, and consequently the area subject to regulation as a RCRA storage facility, to be simply the physical limits of the two rooms.

2.4.2.2 Tank Storage Systems

The two tank storage systems are the outdoor tank farm at the Building 974 CDC and the single tank at Building 963. The CDC tank farm consists of six aboveground 10,000-gallon tanks used to store wastes piped from manufacturing operations. A Transfer Room is located within the CDC building to allow transfer of containerized wastes to these tanks (see Section 4.0).

The General Solvent #3 tank at the CDC Tank Farm has a connection to the biological wastewater treatment plant (BWTP), allowing on-site treatment of selected bulk wastes as needed. There is also a tie-in from the Transfer Room to this piping to the BWTP to allow transfer of containerized wastes directly to the BWTP without an initial transfer to the General Solvent #3 tank. An aspiration system is also tied in to the Transfer Room piping to allow for drummed waste to be sent directly to the BWTP for treatment. This waste piping between the CDC and the BWTP is not currently protected from freezing, so it is not used during the winter months.

GLOBALFOUNDRIES considers the boundaries of these two tank storage systems and, consequently, the area subject to regulation as a RCRA storage facility, to include the tanks (including the area where wastes are loaded for off-site transportation), the piping between the tanks and the BWTP, the CDC Transfer Room, secondary containment systems and all ancillary

equipment (e.g., pumps, valves, and piping) located between the tanks and the various points of generation within the manufacturing buildings. Satellite waste generation and accumulation areas are located in buildings throughout GLOBALFOUNDRIES' facilities. Because these satellite areas accumulate small quantities of hazardous waste that are shipped to the CDC within 3 days of filling a container or are treated as short-term storage areas, they are not part of the regulated RCRA storage facility.

The entire GLOBALFOUNDRIES manufacturing facility and the hazardous waste storage units are shown with a building legend on a topographical map on Figure B-6 (Appendix B).

2.4.3 Wastewater Treatment Facility and Storm Water Discharge

GLOBALFOUNDRIES discharge of treated industrial wastewater and stormwater runoff to the Winooski River are regulated under a National Pollutant Discharge Elimination System (NPDES) permit. Hazardous waste may be treated by the NPDES-permitted wastewater treatment facility through chemical mechanical polishing (CMP) microfiltration, biological treatment, and industrial wastewater treatment. A brief description of the treatment processes follows. Drawings showing a general overview of the drain systems (including stormwater) may be found in Appendix B, Figures B-7, B-8, B-9, B-10, and B-11. Plant effluent water is discharged to the Winooski River under a NPDES permit.

2.4.3.1 Chemical Mechanical Polishing Waste Treatment

Site CMP wastewater is collected and transported to the wastewater treatment facility in a site-wide system of gravity drains, holding tanks, and force mains. CMP wastewater is pumped to three cascading reaction tanks where pH is adjusted and coagulant and polymer are added. The resulting mixture is filtered or settled and then discharged to either the industrial wastewater treatment plant (IWTP) or the biological wastewater treatment plant (BWTP) or both. The sludge resulting from the CMP treatment process is combined with the industrial and biological sludge for disposal.

2.4.3.2 Biological Wastewater Treatment Plant

The three major waste streams treated at the BWTP are concentrated waste (CW), dilute organic waste (DOW), and sanitary waste. Each of the primary waste streams is collected and transferred to the BWTP. Source segregation of the wastes allows use of the biological process (as opposed to off-site treatment) while maintaining the incremental loading within the design limits of the treatment system.

The waste streams amenable to biological treatment are pumped from lift stations throughout the site to two blend tanks at the BWTP. The waste is monitored for temperature, incoming flow, and pH. All three waste streams are mixed and equalized in two blend tanks and then transferred to one of three sequential batch reactors (SBR). The SBR treatment process uses a sequence of reaction

steps to biodegrade chemical and biological components. Decanted liquid from the SBRs is discharged to the head of the industrial wastewater treatment system. Solids from the SBRs are periodically wasted to one of two gravity thickeners.

Concentrated Waste

The concentrated waste stream primarily consists of hydrofluoric acid and ammonia-based process wastewaters. The fluoride in the CW waste is treated by flash mixing with lime slurry in blend tanks to produce calcium fluoride, a solid which precipitates in the treatment system and is accumulated in the sludge. These inorganic wastes are biodegradable and treated by the microorganisms in the BWTP process.

Dilute Organic Waste

The DOW waste stream primarily consists of steam condensate from air emissions control equipment, isopropanol, other organic process waste and rinse water, and high total organic carbon (TOC) waste, including, but not limited to, photolithography waste. Ethylene glycol and propylene glycol solutions may also be treated through this process. Glycol solutions are directed to the BWTP for treatment either from the General Solvent #3 tank or from the CDC transfer room. These organic wastes are biodegradable and treated and consumed by the microorganisms in the BWTP process.

Sanitary Waste

The sanitary waste stream consists of discharges from the site cafeterias and restrooms. Petroleum and water mixtures may also be introduced to the treatment process through this system. In addition, DOW and CW wastes could be transported to the BWTP through the sanitary waste system in the event of an emergency. These typical sanitary wastes are biodegradable and treated by the microorganisms in the BWTP process.

2.4.3.3 Industrial Wastewater Treatment Plant

Site industrial wastewater consists of corrosive and metal-bearing wastes. It is collected and transported to the wastewater treatment facility in a site-wide system of gravity drains, holding tanks, and force mains. The IWTP treatment process consists of a sodium bisulfite pretreatment step to reduce hydrogen peroxide, hexavalent chrome, and chlorine. This is followed by acid and base neutralization, solids precipitation, and a final pH adjustment step.

Sludge resulting from the wastewater treatment facility processes is sent to filter presses for dewatering. The dried sludge is shipped off-site for disposal.

2.4.3.4 Movement of Hazardous Waste to the Wastewater Treatment Facility (including CMP, BWTP, and IWTP)

Liquid hazardous wastes may be trucked to the wastewater treatment facility for introduction to the appropriate part of the treatment process (CMP, BWTP, or IWTP). Containerized wastes may also be transported to the wastewater treatment facility to eliminate extra handling and to facilitate introduction of treatable wastes to the appropriate treatment process (CMP, BWTP, or IWTP).

Containerized wastes transported to the wastewater treatment facility are managed in a way to minimize spills or leakages from reaching the environment. All buildings and roadways within the wastewater treatment facility are considered secondary containment, since they are designed to collect spillage and redirect the material to the head works of the IWTP.

Containerized wastes may also be transferred to the appropriate part of the treatment process through the CDC transfer room, site drain systems, drum wash station in the CDC, etc. on an as-generated basis.

2.4.4 Waste Management for On-site Tenants within the Champlain Valley Technology and Innovation Park

Tenants to GLOBALFOUNDRIES operating within the Champlain Valley Technology and Innovation Park are required to follow all local, state, and federal regulations regarding waste management. Tenants to GLOBALFOUNDRIES operating within the Champlain Valley Technology and Innovation Park are also required to follow the waste characterization requirements specified in Section 3.4 of this permit.

2.4.4.1 On-Site Tenant Waste Management

Tenants are defined as businesses operating on GLOBALFOUNDRIES owned property within the Champlain Valley Technology and Innovation Park, where GLOBALFOUNDRIES serves as a Landlord. Tenant waste may be transferred for storage to the CDC and managed under GLOBALFOUNDRIES hazardous waste permit. Tenant waste may also be sent directly to a permitted offsite disposal facility by the tenant.

If tenant waste is managed at the CDC, the following procedures will be followed:

- Tenant waste in containers will be transported from the tenant location to the CDC, without the use of a manifest, in accordance with the Vermont Hazardous Waste Management Regulations (VHWMR) §7-702(c)(2) manifest exemption for transport on a contiguous piece of property under the control of the same person.
- GLOBALFOUNDRIES will receive the tenant waste in containers at the CDC and handle according to GLOBALFOUNDRIES procedures outlined within this permit. The tenant waste will be stored in GLOBALFOUNDRIES permitted facility under the tenant's EPA ID number. Tenant waste requiring offsite shipment from GLOBALFOUNDRIES permitted facility will be manifested under the tenant’s EPA ID number.

- Tenant waste compatible with GLOBALFOUNDRIES bulk waste and consolidated with or connected to GLOBALFOUNDRIES bulk waste tank systems will be combined with GLOBALFOUNDRIES waste and will be managed under GLOBALFOUNDRIES EPA ID number.

Tenants are required to follow the GLOBALFOUNDRIES contingency plan and are provided with a current copy. Tenants are also included on the GLOBALFOUNDRIES facility mailing list to ensure that they are aware of any updates or changes to the contingency plan or other relevant changes to GLOBALFOUNDRIES hazardous waste permit. Any wastewater generated from tenant operations that is managed under GLOBALFOUNDRIES NPDES permit would follow any applicable GLOBALFOUNDRIES procedures. Treatment of tenant wastewater does not impact the wastewater treatment unit exemption found at 40 CFR 264.1(g)(6) and 40 CFR 270.1(c)(2)(v).

2.5 CORRECTIVE ACTIONS

GLOBALFOUNDRIES is responsible for the remediation of and corrective actions for any releases of hazardous material to the environment that occur after the transfer of ownership that occurred on July 1, 2015. IBM Corporation is responsible for the remediation of and corrective actions for all releases that occurred prior to the transfer of ownership that occurred on July 1, 2015 (historical releases); the ownership of the historical corrective action portion of the facility is maintained by IBM Corporation. The property is owned by GLOBALFOUNDRIES however there are two Groundwater remediation discharge points which are permitted to IBM. IBM's corrective action responsibility is documented in State of Vermont Consent Order docket number 620-6-15CNCV. Discharge points related to treated water from IBM's corrective action systems are documented in IBM's NPDES permit # 3-1559. **APPENDIX 2.1 IBM permitted discharge points**, shows the location of the 2 permitted discharge points.

SECTION 3.0

WASTE CHARACTERISTICS AND WASTE ANALYSIS

3.1 INTRODUCTION

This section describes the chemical and physical nature of the hazardous wastes stored and treated at GLOBALFOUNDRIES. The processes described in Section 3.2.1 are used to allow proper characterization of wastes, which then provides the necessary information to properly manage the waste streams.

3.2 CHEMICAL AND PHYSICAL NATURE OF GLOBALFOUNDRIES' WASTE

GLOBALFOUNDRIES' major hazardous waste streams may include, but are not limited to, the following:

- Solvent-based waste from photochemical processes
- General solvents from other production processes and miscellaneous laboratory, maintenance, and/or remediation operations
- Soil from release response
- Wipes, personal protective equipment (PPE), etc., contaminated with solvents, corrosives, or other hazardous wastes
- Oil and oil-contaminated materials from maintenance operations
- Solutions containing ethylene glycol and materials contaminated with ethylene glycol

The list of wastes that GLOBALFOUNDRIES manages and stores is provided in Table 3-1. Table 3-1 also gives the basis for the hazard classification and associated waste codes for each waste stream. Due to the dynamic nature of GLOBALFOUNDRIES' processes and the potential for GLOBALFOUNDRIES tenants or non-GLOBALFOUNDRIES business entities within the technology park to generate hazardous wastes or for other GLOBALFOUNDRIES locations to send waste for storage and consolidated shipment, GLOBALFOUNDRIES may manage a wide variety of hazardous waste codes. In Table 3-1, the "XX" or "XXX" notation represents any combination of characters.

Hazardous wastes generated and stored at GLOBALFOUNDRIES are listed in the most current Biennial Hazardous Waste Report and Annual Report of International Shipments of Hazardous Waste. These reports are enclosed as Appendix C.

Table 3-1 Wastes, Basis For Hazard Classification, Associated Waste Codes		
Waste Type	**Basis for Hazard Classification**	**Associated Waste Codes**
Tanks		
General Solvents	Characteristic, Listed	DXXX, FXXX, VTXX, UXXX
Ethylene Glycol	Listed	VT08
Propylene Glycol Methyl Ether Acetate (PGMEA)	Characteristic	D001
N-Butyl Acetate	Characteristic	D001
Gamma Butyrolactone	Characteristic	D001
Photoresist Waste	Characteristic	D001, D023, D024, D025, D026
Containers/Tanks		
Spent Adsorption Carbon	Characteristic, Listed	FXXX, DXXX, VTXX, UXXX
Solid Organics	Characteristic, Listed	DXXX, FXXX, UXXX, VTXX, PXXX
Inorganic Acids	Characteristic, Listed	DXXX, UXXX, PXXX, VTXX
Organic Acids	Characteristic, Listed	DXXX, UXXX, PXXX, VTXX
Inorganic Bases	Characteristic, Listed	DXXX, UXXX, PXXX, VTXX
Organic Bases	Characteristic, Listed	DXXX, UXXX, PXXX, VTXX
Liquid Organics	Characteristic, Listed	DXXX, FXXX, UXXX, VTXX, PXXX
Inorganic Salts and Metals	Characteristic, Listed	DXXX, UXXX, PXXX
Organic Salts and Organo-Metallics	Characteristic, Listed	DXXX, UXXX, PXXX, VTXX
Arsenic Wastes	Characteristic	D004, D007, D008, DXXX
Waste Oils	Characteristic, Listed	DXXX, VTXX
Mercury Wastes	Characteristic	D009
PCB Articles	Listed	VT01
PFOS/PFOA	Listed	VT21, VT22
Waste Sludge	Characteristic, Listed	DXXX, VTXX, FXXX
Oxidizers	Characteristic, Listed	D001, UXXX
Spill	Characteristic, Listed	DXXX, FXXX, PXXX, UXXX, VTXX
Contaminated Materials (Including Soil)		

Ethylene Glycol	Listed	VT08
Table 3-1 Wastes, Basis For Hazard Classification, Associated Waste Codes (continued)		
Lab Packs	Characteristic, Listed	DXXX, FXXX, UXXX, PXXX, VTXX
Contaminated Debris	Characteristic, Listed	DXXX, FXXX, UXXX, PXXX, VTXX
Contained Gases	Characteristic, Listed	DXXX, FXXX, UXXX, PXXX, VTXX

3.2.1 Waste Characterization and Handling

The processes described within this section are utilized by GLOBALFOUNDRIES to authorize, characterize, and track the use of chemicals and generation of all waste. These processes provide the basis for generator knowledge used during waste characterization. GLOBALFOUNDRIES utilizes unique waste stream numbers to categorize and manage waste. Wastes are assigned to a waste stream that represents the waste being generated. If a waste stream does not exist that fits the waste being generated either a new waste stream is created or an existing waste stream is updated to meet the regulatory requirements of the waste.

In addition, detailed characterization documents are maintained as part of the facility operating record for GLOBALFOUNDRIES' 40 to 60 major recurring waste streams. The characterizations include applicable waste codes, underlying hazardous constituents, and land disposal information pertinent to each waste stream. The characterizations are updated as needed and the updates are based on either waste analysis or generator knowledge.

3.2.1.1 Chemical Authorization Process

Before any chemical is brought to GLOBALFOUNDRIES for use by GLOBALFOUNDRIES personnel or contractors working on behalf of GLOBALFOUNDRIES, the chemical is identified and authorized through the company's online chemical information and authorization management system. This system also provides access to supplier Safety Data Sheets (SDSs), which contain information about the chemical's health and safety hazards, storage compatibility, and handling characteristics. The authorization review process includes consideration of how any waste to be generated will be managed. Additional information may be obtained from the requester or the chemical supplier when necessary to properly characterize the waste expected to be generated.

3.2.1.2 Environmental Impact Assessment Process

Installation or modification of chemical-using equipment proposed to discharge waste to any drains leading to the bulk hazardous waste storage tanks is managed via an online environmental impact assessment system. The hazardous waste engineer or hazardous materials coordinator must review and approve all such bulk waste discharges. These reviews are conducted on an ongoing, real-time basis to ensure that compatibility is assessed and that waste codes or land disposal restrictions for the wastes in the bulk storage tanks are updated if needed. Additional information may be obtained from prior chemical authorization reviews, from equipment or process engineers,

or from laboratory analysis, when necessary to properly characterize the waste expected to be generated.

3.2.1.3 Chemical Waste Disposal Authorization Process

The primary tool for control and characterization of containerized hazardous waste is the Chemical Waste Disposal Authorization (CWDA) form (see Attachment 3-1 for a sample CWDA form; the location of information on this form may vary as the waste management application evolves). The CWDA is completed and reviewed online. The waste generator supplies a description of the waste and information on its components and the process generating it. The hazardous waste engineer or hazardous materials coordinator then reviews the CWDA, using additional information from SDSs, prior chemical authorization reviews, the generator, and/or laboratory analysis if needed. The hazardous waste engineer or hazardous materials coordinator assigns the waste to an appropriate existing waste stream or a new waste stream and defines container and storage requirements before approving the CWDA. The generator is notified that the CWDA is approved, and manages the waste according to the defined requirements. When a container of the waste is sent to the Chemical Distribution Center (CDC), the container is then consolidated or stored and ultimately disposed of according to the information on the CWDA. CWDAs are approved for a specific period of time, generally for no longer than one year. If waste generation will continue beyond this period, the CWDA must be resubmitted for approval. A change in the waste composition requires an immediate update to the CWDA and re-evaluation by the hazardous waste engineer or hazardous materials coordinator. Routine expiration and renewal of CWDAs provides for regular verification of waste stream composition, characterization, and handling requirements.

Containerized wastes to be consolidated into a bulk waste storage tank through the CDC Transfer Room would either be accompanied by a CWDA or evaluated on a case-by-case basis by the hazardous waste engineer or hazardous materials coordinator. Wastes piped directly to a bulk waste tank system are reviewed using the 3.2.1.2 “Environmental Impact Assessment Process”.

3.2.1.4 Contaminated Material Entering CDC From Decon Facility

GLOBALFOUNDRIES operates a decontamination (decon) facility under the large-quantity generator requirements of Vermont Hazardous Waste Management Regulations (VHWMR) Section 7-311(h) and 40 CFR Part 265 Subpart DD for containment buildings. The decon facility is not part of the permitted hazardous waste management facility. Tasks performed in the decon facility may include the cleaning of chemically contaminated equipment and containers; the sorting, treatment, and consolidation of contaminated trash; the collection of used batteries; and other operations. Hazardous wastes routinely handled by the decon facility are tracked through the CWDA process. The decon facility may also handle certain unique wastes, such as filter modules or other chemical-containing articles from discarded equipment, or items segregated from contaminated trash during processing. Decon facility procedures require that when such materials are transferred to the CDC, they are accompanied by a completed “Contaminated Material Entering CDC from Decon Facility” form. These materials are held in the waste staging area at the CDC for evaluation by the hazardous waste engineer or hazardous materials coordinator, including laboratory analysis as necessary for proper characterization. Typically these materials are

consolidated, or are managed as lab pack wastes and are logged into lab pack bins via the electronic inventory associated with each bin.

3.2.1.5 Lab Pack Waste Characterization

Containerized waste managed as lab pack waste is reviewed by the hazardous waste engineer or hazardous materials coordinator (via CWDA or in the CDC waste staging area as described above) and assigned to a lab pack waste category (for example, oxidizer, corrosive acid, corrosive base, flammable organic, etc.) based on its properties and handling requirements. Lab pack wastes are then segregated by category into separate bins. Bins containing hazardous waste bear a "Hazardous Waste" label. Contents of each lab pack bin are listed in an electronic inventory associated with that bin. Hazardous waste codes are assigned to individual lab pack wastes at the time of shipment preparation.

3.2.1.6 Waste Characterization for Wastes Treated at the Wastewater Treatment Facility

Wastes that are to be treated at the wastewater treatment facility will be assessed by the hazardous waste engineer and wastewater treatment plant chief operator using knowledge from the chemical authorization, environmental impact assessment, and CWDA processes described above. This assessment is completed prior to treatment to ensure that only wastes permitted under the National Pollutant Discharge Elimination System program are treated. GLOBALFOUNDRIES reserves the right to use knowledge of certain wastes streams to determine acceptability of treatment in the system.

GLOBALFOUNDRIES is authorized to treat VT02 and VT08 Vermont-listed hazardous waste at the biological wastewater treatment plant (BWTP). GLOBALFOUNDRIES will not treat any other Vermont or federal RCRA-listed waste without obtaining permission from the proper authorities first.

3.2.2 Waste Labeling

Empty containers issued by the CDC for waste collection or accumulation will have a barcode label affixed which identifies the unique container number, CWDA number, and other waste stream and container tracking information. The hazardous waste labeling requirements are met either by the use of a separate label or by including these requirements on the barcode label.

Wastes not requiring a CDC issued container will be accompanied by an approved CWDA or a completed "Contaminated Material Entering CDC from Decon Facility" form.

Aboveground tanks are labeled with the name of the waste stream as defined for characterization purposes (general solvent tanks are labeled as General Solvent). This procedure supplies operating personnel with necessary information to permit safe handling. Details of GLOBALFOUNDRIES' waste storage tank and container management practices and personnel training are provided in Sections 5.0, 4.0, and 12.0, respectively.

3.3 WASTE ANALYSIS PLAN

Where laboratory analysis is required, methods are in compliance with VHWMR Section 7-219. Alternate methods may be used with the concurrence of the VT DEC's Waste Management & Prevention Division.

For GLOBALFOUNDRIES' 40 to 60 major recurring waste streams, waste analysis plans (WAP) are documented as part of the facility operating record and are updated as needed. Each waste analysis plan describes how GLOBALFOUNDRIES will compile all information necessary to store, treat, and dispose of its hazardous waste properly. These WAPs may include the use of generator knowledge and/or laboratory analysis. Where laboratory analysis is required, specific parameters, test methods, and sampling methods are listed. These analyses provide all information required to ensure proper management of GLOBALFOUNDRIES wastes. See Attachment 3-2 for an example of a WAP.

Unique or intermittent waste streams are characterized through the processes outlined in Section 3.2.1, which may include the use of generator knowledge and/or laboratory analysis.

3.3.1 Parameters and Rationale

Periodic analyses of hazardous wastes are not generally needed because of the characterization process for all wastes generated (described in Section 3.2.1) and the extensive documentation already established for wastes routinely generated. However, analyses are conducted when:

A. A current waste stream is changing, making previous analytical results outdated.

B. A new waste stream is being reviewed for proper disposal and process knowledge is not deemed sufficient.

C. A current waste stream is highly variable and must be characterized prior to offsite shipment.

D. The waste to be managed is unique or its characteristics are unknown.

E. To confirm existing generator knowledge.

New or unknown waste streams will be evaluated by process knowledge or analyzed for the parameters needed to fully characterize the waste. If analysis is done, the parameters will be selected based on the physical nature of the waste, on the suspected source and/or constituents of the waste, and on the judgment of the hazardous waste engineer. Supplemental analysis will be conducted as needed if preliminary data do not result in adequate waste characterization.

3.3.2 Sampling Methods

Sampling methods for each category of waste stored at GLOBALFOUNDRIES are summarized below.

3.3.2.1 Tanks

The tank liquid will be recirculated through the discharge pump in a closed loop for a minimum of 30 minutes. The recirculation provides for a 0.6-tank volume change prior to sampling. The system allows GLOBALFOUNDRIES to provide a representative sample for analysis.

Samples shall be taken from the tank using one of the following methods:

1. The sample can be collected from the pump discharge pipe during recirculation. Attachment 3-3 provides a schematic typical of the recirculation system used at GLOBALFOUNDRIES.

2. The sample can be collected by lowering a sampling device into the tank through a 6- to 10-inch-diameter sampling port in the waste tank manhole cover.

3.3.2.2 Containers

For liquids and/or sludges, a Coliwasa sampler or equivalent device shall be used. For drummed contaminated soils and similar debris, a split-tube sampler, thief sampler, scoop sampler, or equivalent device will be used.

3.3.2.3 Unknowns and New Waste Streams

Waste will be classified as “unknown” whenever there is a reasonable doubt as to the contents, i.e., illegible, missing, or apparently incorrect labels. Unknown wastes and new waste streams that require analysis will be sampled by means appropriate to the nature of the waste. This may include any of the solid and liquid waste sampling methods described earlier.

3.3.2.4 Contaminated Soil

Depending on the volume and nature of soil, a minimum of three (3) and a maximum of fifteen (15) discrete soil samples shall be collected and composited into a single sample for analysis. Samples shall be collected with a trowel or scoop. The locations and numbers of samples will be chosen and compositing procedures will be conducted to ensure that a representative sample is obtained for analysis.

IBM retains responsibility for any soil contamination associated with its historical operations. The Essex Junction site was an IBM electronics manufacturing facility from 1957 through June 30,

2015. Past usage of solvents in the production process has resulted in impacts to soil and groundwater from releases of these chemicals associated with facility operations. There are currently five (5) study areas which contaminated soil owned by IBM could be excavated and managed as hazardous waste:

1. The former Industrial Waste Sludge Landfill, where IBM disposed of its industrial waste treatment plant sludge directly in unlined trenches from 1971 to 1978.
2. The Chemical Distribution Center, which has served as the main chemical storage area at the facility since 1981.
3. The Building 900 Area, which was the location of the former Chemical Operations Building and Chemical Storage Shed and Waste Storage Area before 1981.
4. Building 963 Area, where several underground chemical storage tanks, underground chemical distribution and waste pipelines, and a perchloroethylene distillation system were formerly located.
5. The Fire Training Area (FTA), where petroleum products and organic solvents were burned in unlined pits during fire training exercises from the mid-1960's until the mid-1980's. The FTA also includes the Soil Staging Area, which was designed to store steel roll-off containers that contained solvent contaminated soil excavated on the IBM site, and a collection system to collect all rainfall and snowmelt which runs off these containers.

3.3.3 Quality Assurance and Quality Control (QA/QC)

Strict adherence to QA/QC protocols will be maintained throughout the sampling and analysis of all wastes. These protocols will be consistent with those presented in U.S. Environmental Protection Agency (EPA) SW-846 or equivalent, and will include the following:

- Sample containers and sampling equipment
- Sample labeling
- Chain-of-custody documentation
- Sample storage and transport
- Sample analysis and data validation

Applicable laboratory QA/QC protocols will be available upon request from the laboratory.

3.4 REQUIREMENTS FOR OTHER WASTES GENERATED

3.4.1 Wastes from Offsite GLOBALFOUNDRIES locations

Offsite locations may be used for satellite operations as business needs dictate, and these operations may generate hazardous waste. GLOBALFOUNDRIES is not currently using any offsite locations. In addition, hazardous waste may be generated by emergency incidents to which GLOBALFOUNDRIES Emergency Services responds. GLOBALFOUNDRIES also operates

similar manufacturing facilities in New York State that could potentially send waste to this location for storage and shipment with similar wastes generated at this location.

The processes described above for control of chemicals and characterization of waste are used for the GLOBALFOUNDRIES Essex Junction facility as well as for any satellite GLOBALFOUNDRIES locations. Similar but equivalent processes are used at the other GLOBALFOUNDRIES manufacturing facilities. All hazardous waste generated offsite is sent to the CDC under a hazardous waste manifest and will be stored in the tank storage or container storage units.

3.4.2 Tenant Waste

Tenants generating waste on GLOBALFOUNDRIES property will follow one of the following processes for characterization of waste:

1. Follow the GLOBALFOUNDRIES processes described within this section; or

2. Provide GLOBALFOUNDRIES with equivalent data to that provided by the processes described within this section. Specifically, information on the process generating the waste and the composition of the waste will be provided; or

3. Manage, characterize, and ship waste directly from the tenant location without utilizing GLOBALFOUNDRIES' tank storage or container storage units.

ATTACHMENT 3-1

SAMPLE CWDA

Chemical Waste Disposal Authorization

CWDA NUMBER	STATUS	APPROVAL DATE	EXPIRATION DATE
30589	APPROVED TO GENERATE	02/19/2019	09/26/2019

REQUESTER INFO

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WASTE GENERATION INFORMATION
Waste State: SOLID
Description: ARSENIC CONTAMINATED SOLID/DUST
Process: ARSENIC CONTAMINATED DUST FROM GLASS SHOP SANDBLASTING OPERATIONS
Volume: 55 GALLONS EVERY 3 WEEKS **Duration:** INDEFINITE

CHEMICAL INFORMATION
Have Chemicals: N
Waste is a Mixture: Y

WASTE COMPONENT INFORMATION
Description: ARSENIC
Concentration: UNKNOWN **Range:** UNKNOWN

WASTE GENERATOR/CDC INFORMATION
General Instructions
"HAZ: SUBMIT A ""NEW CONTAINER"" REQUEST ON THIS SYSTEM TO ORDER A CDC ISSUED CONTAINER (DRUM). THE DRUM MUST HAVE A YELLOW HAZARDOUS WASTE LABEL PRIOR TO USE. DO NOT ACCUMULATE WASTE, RETURN THE DRUM TO THE CDC WITHIN 72 HOURS OF WHEN WASTE IS FIRST PUT IN THE DRUM. A CONTAINER PICKUP REQUEST MUST BE SUBMITTED THROUGH THIS SYSTEM TO NOTIFY THE CDC THAT THE CONTAINER IS READY FOR PICK-UP. THE WASTE CONTAINER MUST THEN BE MOVED TO AN APPROVED CHEMICAL DROP AREA AND A SIGNED COPY OF THIS CWDA MUST BE ATTACHED."
CDC/Decon Instructions
CDC USE ONLY - PLACE DRUM IN INVENTORY. PROVIDE A FIBER DRUM TO BE PLACED INSIDE A METAL DRUM. FIBER DRUM DOES NOT NEED TO BE LABELED. ALL LABELING MUST BE ON THE OUTER DRUM.
General Comments
ADDED TEAM MEMBERS THAT ARE PART OF THE AEC TEAM RESPONSIBLE FOR GENERATING.

REMOVED TEAMMATE WHO MOVED TO IWTP
Storage Requirements
STORE WITH POISONS. SEGREGATE FROM ALL OTHER CLASSES.
Waste Stream: (BURL0367) - DUST COLLECTOR WASTE;
Required Labels: (HAZARDOUS WASTE) (BAR CODE) (SIGNED CWDA) (POISON)
Authorized Drop-off Locations:
(B962 C-5/C-6)
Container Types:
(1 Cubic Yard Box) (30 Gallon Drum, Fiberboard, Open Top) (55 Gallon Drum, Fiberboard, Open Top) (55 Gallon Drum, Metal, Open Top, 46 Lbs)

Requester Notification: 30 days
Line1 Notification: 15 days
Line2 Notification: 7 days
EPA Waste Codes: D004;D007;D008
State Waste Codes: OUTS319H[TX]
Hazardous Constituents: SILVER[0007440-22-4];ANTIMONY[0007440-36-0]
Previous CWDA #: 30390
Rejection Notes:

ATTACHMENT 3-2

SAMPLE WASTE ANALYSIS PLAN (WAP)

Waste Analysis Plan

Waste Stream: MUV Waste
Waste Stream #: 320
Date: October 6, 1994
Reviewed: 12/21/2018

Description of Waste Stream

This waste stream consists of bulk solvent waste from mid UV (MUV) lithography processes. Solvent is collected through a central piping system and stored in a 10,000 gallon storage tank at the CDC prior to off-site disposal.

This waste stream is primarily comprised of Propylene Glycol Methyl Ether Acetate (PGMEA). The second largest constituent is g-Butyrolactone (GBL), due to the use of GBL/nBA for wafer prewet. The third largest constituent is n-Butyl Acetate (nBA). This waste stream also contains components from all photoresists, adhesion promoters, and anti-reflective coatings discharged to the MUV drain.

Parameters for Analysis and Corresponding Test Methods

Analysis is not required. Confirmatory analysis may be performed using the following methods:

Parameter	**Test Method**
Solvent scan (major constituents)	8015
Water	Karl Fischer
Volatile organics	8260-Total
Semi-volatile organics	8270-Total
o-Cresol	8270
p-Cresol	8270
m-Cresol	8270
Cresols,Total	8270
Metals	6010-TCLP
Mercury	7470-TCLP
PFOA/PFOS (2018 only)	537 - EPA drinking water method currently there is no waste method

Rationale for Selection of Parameters and Test Methods (Existing Knowledge)

MUV waste is collected in a dedicated drain system. Constituents which are added to this system are identified using generator knowledge and are reviewed for characterization based on information obtained during the chemical authorization process. These reviews have identified no chemical constituents which meet the definition of F, K, U, or P listed, reactive, or corrosive.

Generator knowledge is obtained from a review of tool information from process engineering and from a list of MUV photochemicals currently in use. See listing of chemicals used in these processes in the characterization folder on the p: drive. This information is used to determine what chemicals are being discharged into the MUV waste tank. Parameters for analysis are selected to provide additional information on the presence or concentration of certain constituents which cannot be determined with generator knowledge or for which confirmatory testing is desired.

Generator knowledge is used to identify potential Universal Treatment Standard (UTS) constituents which could reasonably be expected to be present in the MUV waste stream.

Sampling Method

Sampling is not required. Optional samples may be obtained per the procedure outlined in the RCRA facility certification.

Frequency of Analysis/Review of Generator Knowledge

The characterization of the MUV (formerly n-Butyl Acetate) waste stream will be reviewed annually. Suspected or known changes in the waste will trigger immediate review.

Waste Characterization

Waste Stream: MUV Waste
Waste Stream #: 320
Date: October 6, 1994
Reviewed: 12/21/2018

Waste Codes

D001 - Ignitability
D023 - o-Cresol
D024 - m-Cresol
D025 - p-Cresol
D026 – Cresols
VX51 – Vermont Specific Recycling Tax Rate*

*NOTE: The Vermont VX51 code is applicable only when the MUV waste stream is sent to Chemrec, Inc. in Cowansville, QC or Safety-Kleen in Linden, NJ for hazardous waste recycling. See "VX51 Recycling Tax Rate" folder for additional information.

Land Disposal Restrictions

MUV Waste is restricted form land disposal as a nonwastewater as follows:

D001 - High TOC Ignitable Subcategory, Nonwastewater:
Treatment standard is RORGS; CMBST; or POLYM.

D023 - o-Cresol:
Treatment standard is 5.6 mg/kg and meet 268.48 standards[1].

D024 - m-Cresol:
Treatment standard is 5.6 mg/kg and meet 268.48 standards[1].

D025 - p-Cresol:
Treatment standard is 5.6 mg/kg and meet 268.48 standards[1].

D026 - Cresol-mixed isomers (sum of o-, m-, and p-cresol concentrations):
Treatment standard is 11.2 mg/kg and meet 268.48 standards[1].

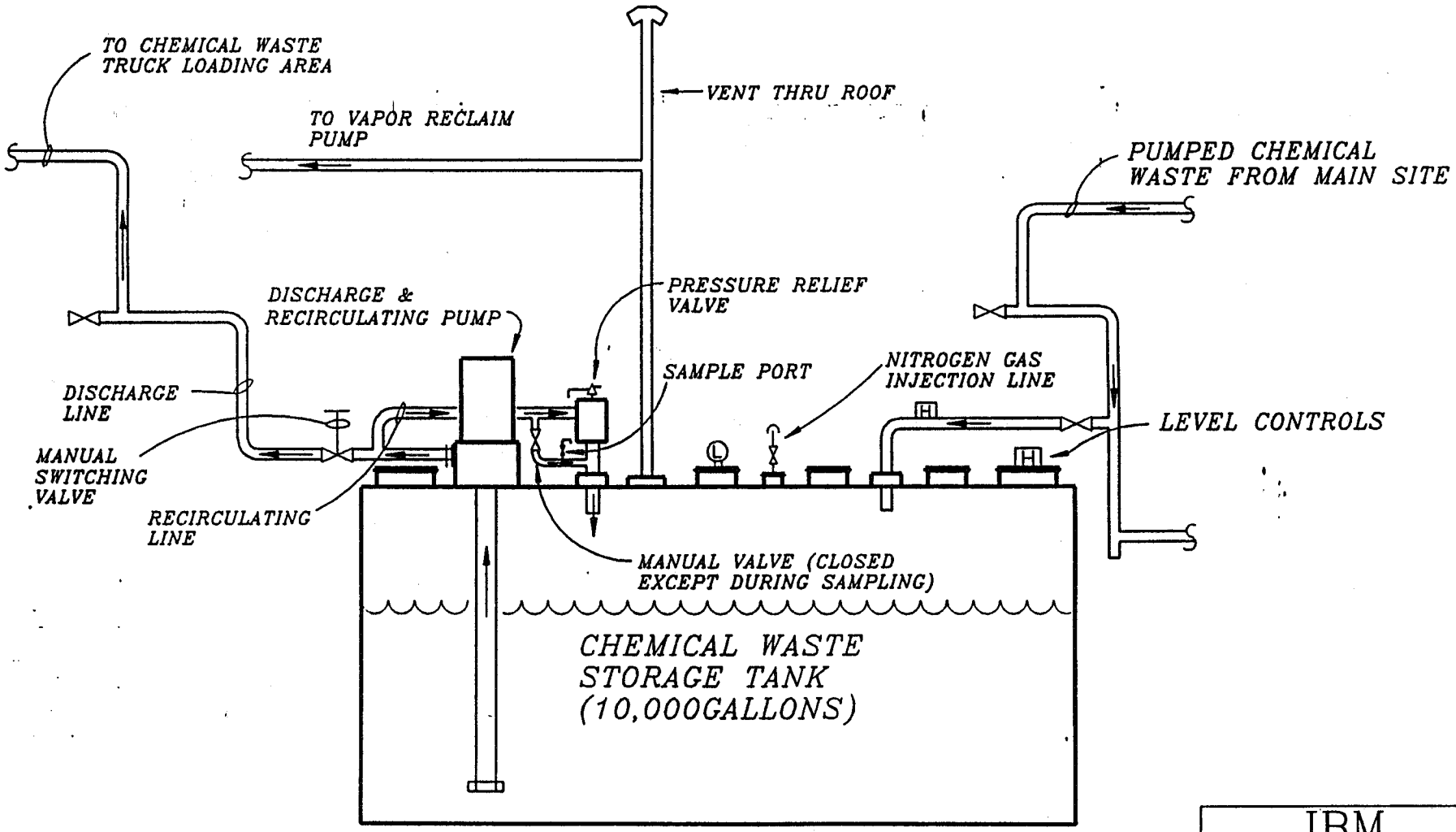
[1] "These wastes, when rendered nonhazardous and then subsequently managed in CWA, CWA-equivalent, or Class I SDWA systems are not subject to treatment standards. (See 148.1(d) and 268.1 (c)(3 and (4)).", Footnote 8 to Table "Treatment Standards for Hazardous Waste", 40 CFR 268.40.

Underlying Hazardous Constituents

71-36-3	n-Butanol
74-87-3	Chloromethane
80-62-6	Methyl Methacrylate
100-41-4	Ethylbenzene
108-88-3	Toluene
108-94-1	Cyclohexanone
110-86-1	Pyridine
123-91-1	1,4-Dioxane
1330-20-7	Xylene

ATTACHMENT 3-3

TANK SAMPLING SYSTEM



TYPICAL FOR EACH OF EIGHT (8) WASTE STORAGE TANKS.

IBM
GENERAL TECNOLOGY DIVISION
ESSEX JUNCTION, VERMONT

WASTE STORAGE TANK TYPICAL PIPING & SAMPLING PROCEDURES

SCALE NOT TO SCALE	DRAWN BY:	APPROVED	DATE
DWG. NO.	BUILDING	FL	ZONE	TRADE	NUMBER

SECTION 4.0

CONTAINER STORAGE INFORMATION

4.1 INTRODUCTION

This section discusses specific process information for the storage of containers at GLOBALFOUNDRIES. Containers of nonflammable wastes are stored in Building 974 Chemical Distribution Center (CDC) waste storage room. Flammable wastes are stored in spill-containment pallets or tubs in the CDC flammable waste storage room. See Figure D-2-E for the layout of the CDC, including the waste storage and flammable waste storage rooms. Containers holding hazardous waste are kept closed during storage, except when it is necessary to add or remove wastes. Containers may be equipped with pressure relief valves for safety purposes (during normal operations, the valves remain closed).

The primary storage containers for wastes will be 30- or 55-gallon drums. In addition, wastes may be stored in cardboard cartons, fiber packs, power packs, lab packs, original containers, and other containers that are compatible with the wastes stored. A determination of the exact container that will be used to accumulate and store the wastes is made during the waste characterization and handling review process described in Section 3.2.1.

Containers shall be:

A. Approved new or reconditioned Department of Transportation (DOT) containers, or

B. Containers that originally contained the material, or

C. DOT approved packaging for the particular waste being stored, or

D. Lined in some manner with material compatible with the waste being stored, or

E. Accumulated in uncovered containment tubs prior to shipment in lab pack containers (with an electronic inventory list itemizing the contents of each tub,) or

F. Safety cans or equivalent.

A summary of the wastes that may be generated at the site and stored in the CDC is provided in Table 3-1.

Containers holding hazardous waste will not be stored in the permitted storage facility for more than 1 year. All containers are labeled with hazardous waste labels to identify the contents. In addition, polychlorinated biphenyl (PCB) containers have the standard PCB label, as required by 40 CFR 761.40 and .45.

4.2 CONTAINER MANAGEMENT PRACTICES

Containers are filled at waste-generating locations throughout the main site manufacturing buildings and off-site buildings. Once the containers are full, they are moved within 3 days to the CDC or to a designated short-term hazardous waste storage area. If the containers are taken to a designated short-term storage area, they are then transferred by truck within 90 days to the CDC building. At the CDC, a forklift truck transfers the nonflammable containers to the CDC waste storage room receiving area. Flammable wastes are taken directly to the flammable waste storage room after being weighed. Forklift trucks are rated as Double E (explosion proof - no sources of ignition).

The CDC waste storage room receiving area is provided to allow operations staff to weigh the container, place the container into the inventory, and log the appropriate containers out during shipment to off-site reclamation/treatment/disposal companies. Containers of nonflammable material may occasionally remain in the receiving area for more than 3 days (for example, if the container is received on a weekend or during a holiday); however, containers normally flow through the area in one work shift. Containers that have been in the receiving area for more than 3 days will be processed as soon as practicable during the next non-holiday and/or non-weekend work shift.

A GLOBALFOUNDRIES coded number and all pertinent data concerning the container is placed in an inventory system prior to transferring the container into storage. The inventory system allows CDC personnel to track storage volumes in each storage room and maintain the inventory within applicable storage limitations.

Containers may be transferred to the staging area in the CDC waste storage room if the contents of the containers need to be verified prior to being placed into storage. The containers will remain in the staging area until a determination has been made as to the applicability of the hazardous waste regulations. Containers placed into staging are not considered to be part of the inventory system. Wastes that are staged will be handled according to the results of the analytical testing or from knowledge gained from review of the waste stream.

4.2.1 CDC Waste Storage Room

Containers of nonflammable wastes are received, staged, accumulated, and stored in a 5,325-square-foot room in the CDC building. See Figure D-1-1 for details of the waste storage room. There are 1,498 square feet dedicated to container storage. Containers may be stacked three-high on pallets. The maximum storage capacity for the CDC waste storage room for nonflammable liquid, solid, and gaseous wastes is 60,720 gallons, equivalent to a total volume of 1,104 55-gallon containers. The maximum number of organic liquid wastes that will be stored in this room is 29,975 gallons, equivalent to 545 55-gallon drums. Two-foot-wide drum inspection aisles are provided between rows. Forklift truck aisles account for 1,260 square feet. The remainder of the space is devoted to a cooler, chemical waste staging and accumulation of specific wastes, and lab pack materials. To ensure worker safety, air in the waste room is exhausted at the rate of six air changes per hour and can be increased to twelve in the event of an emergency.

4.2.2 CDC Flammable Waste Storage Room

All flammable wastes are kept in the flammable waste storage room, which has been designed for flammable material storage. See Figure D-1-2 for a drawing of the flammable waste storage room. The containers are stored on spill-contained pallets in steel pallet racks four levels high. The maximum volume of flammable liquid waste stored in the flammable waste storage room at one time is 5,280 gallons, equivalent to 96 55-gallon drums. The rest of the room stores production (virgin) chemicals. The flammable waste storage room has the same exhaust air changes as the waste storage room.

4.2.3 CDC Transfer Room

GLOBALFOUNDRIES uses the transfer room within the CDC to consolidate compatible wastes for bulk shipments or biological treatment. The transfer room consists of one dump sink tied to the General Solvent #4 Waste Tank system, one sink tied to the Biological Waste Treatment Plant (Dilute Organic Waste (DOW)) system, and one sink is a spare sink (currently tied to a non-hazardous bulk waste tank). An aspiration system is also present at the CDC as part of the transfer station operations to allow for the discharge of drummed waste to the Biological Waste Treatment Plant system through the DOW dump sink. Compatibility determinations are made during the waste characterization and handling review process (Section 3.0).

4.2.4 Containers of Solid Wastes

Solid wastes are stored in DOT-approved 55-gallon drums, 30-gallon drums, cardboard cartons, fiber packs, power packs, lab packs, and other containers that are compatible with the wastes stored. These wastes may be stored in the same rows as liquid and gaseous wastes in the same compatibility class. Other miscellaneous wastes such as dry neutralized acid spills, clean-up rags, and broken glass contaminated with arsenic are collected on occasion and stored as solid wastes. There are no free liquids in these containers.

4.2.5 Containers of Gaseous Wastes

Gaseous wastes are stored in the original manufacturer’s container or other containers that are compatible with the wastes stored. These wastes are stored in either the waste storage room or the flammable waste storage room depending upon whether the gas is considered flammable. These wastes may be stored in the same rows as liquid and solid wastes in the same compatibility class.

4.2.6 Small Quantity and Laboratory Wastes

When small containers of lab pack wastes are brought to the CDC, they are segregated by compatibility into open (uncovered) tubs until sufficient volumes have been accumulated for shipment. This avoids double-handling of the individual lab pack wastes when the disposal vendor packs the wastes for shipment, and allows GLOBALFOUNDRIES to (visually) ensure that no waste is leaking from any of the small containers. A hazardous waste label is located on the outside

of the tub in lieu of placing a hazardous waste label on every individual lab pack waste. An electronic inventory list of the lab pack wastes in each tub is maintained.

In preparation for off-site shipment, waste chemicals will be packaged in containers meeting DOT specifications. In addition, the packaging will be compatible with the selected treatment or disposal method approved for the wastes. An inventory of the contents of each drum will be prepared as wastes are packaged. After packaging, all containers will be securely closed, and proper labels that meet EPA, Vermont, and DOT requirements will be applied to each container.

4.3 SECONDARY CONTAINMENT FOR CONTAINERS

4.3.1 CDC Waste Storage Room Secondary Containment Systems

There are two secondary containment systems for containerized waste stored in the CDC waste storage room. These systems are described below.

4.3.1.1 CDC Waste Storage Room Organic Liquid Containment

The floor of the waste storage room is constructed of 4,000-pounds-per-square-inch (psi) reinforced concrete 6 inches thick with a design load of 500 pounds per square foot (see Attachment 4-1). The base is compacted gravel. The floor is protected with three coats of Tennant No. 4700 chemical-resistant urethane coating (see Attachment 4-2), last applied in November 1995. The concrete block walls, the door trenches, and the floor slope to prevent liquids from escaping the room. The floor is sufficiently impervious to contain leaks and spills until they can be removed or directed to the CDC container storage secondary containment tank.

The floor of the CDC waste storage room is sloped from the walls to two floor drains at the center of the room. (See Figures D-1-1 and D-1-3 for details of the floor slope and drains.) The floor drains discharge through a double-walled piping system to a 3,000-gallon vaulted tank located in the empty-drum storage room (see Figure D-2-C). The tank has a capacity of more than 10 percent of the maximum volume of organic liquid stored in the waste storage room, as required by 40 CFR Part 264.175. The inner pipe is a 3-inch Schedule 40 carbon steel pipe. The outer pipe is a 6-inch Schedule 10 carbon steel pipe. The tank vault is also made of carbon steel. All connections are welded and have been tested through use of x-ray and water-tightness testing. The tank is monitored by a level indicator/leak detection device that activates an alarm in Building 974. Information on the tank and operation is provided in Section 5.4.

No containers are stored in direct contact with the floor. Containers are stored on pallets, the room is enclosed with a roof and walls, and the floor is sloped to drain to ensure that containers do not sit in contact with spills or rain water. The floor drains and pipes described above prevent accumulation of liquid on the floor.

4.3.1.2 CDC Waste Storage Room Containment Pallets or Tubs

Secondary containment for liquid acids, liquid caustics, poisons, and PCB containers is provided through the use of steel or plastic containment pallets or tubs (described in Section 4.3.4).

4.3.2 CDC Flammable Waste Storage Room Secondary Containment

Spill-containment pallets and tubs (described in Section 4.3.4) provide secondary containment within the flammable waste storage room.

4.3.3 CDC Loading/Unloading Area Secondary Containment

Spills occurring in the CDC loading/unloading area will be contained in the trench system as shown on Figure D-2-D. When trucks are present in the loading dock area, the valve in the pipe leading from the trench will be closed. When trucks are not in the area, the valve will remain open to remove stormwater from the area.

4.3.4 Spill Containment Pallets and Tubs

The flammable wastes stored in the flammable waste storage room and the liquid acids, liquid caustics, poisons, and PCBs stored in the CDC waste storage room are placed in spill-containment pallets that provide approximately 93 gallons of storage or in spill-containment tubs that provide 62 gallons of storage.

The spill-containment volume provided by the pallets is calculated as follows:

Volume of the Containment Pallet
4 ft x 4 ft x 1.89 ft = 30.24 ft^3
1 ft^3 = 7.48 gallons
30.24 ft^3 x 7.48 gallons/ ft^3 = 226 gallons

Volume of the Drums
$(1\ ft)^2 \times \pi \times 1.89$ ft x 3 drums = 17.81 ft^3
1 ft^3 = 7.48 gallons
17.81 ft^3 x 7.48 gallons = 133.22 gallons

Total Volume Contained
Volume of Pallet-Volume Drums = Volume Contained
226 gallons - 133.22 gallons = 92.78 gallons

The pallets hold 55-gallon drums; thus the spill-contained pallet provides 168 percent of the volume of a drum.

The spill-containment volume provided by the tubs is calculated as follows:

Volume of the Containment Tub
2.85 ft x 2.19 ft x 1.33 ft = 8.30 ft^3
1 ft^3 = 7.48 gallons
8.30 ft^3 x 7.48 gallons/ ft^3 = 62.08 gallons

The tubs hold a single 55-gallon drum; thus the spill-contained tub provides approximately 113 percent of the volume of a drum.

The pallet and tub trays are made of materials designed to be compatible with the waste being contained. The pallets are also designed to elevate the containers within the spill containment to allow any leakage to be witnessed readily during inspections.

4.3.5 Control of Run-on

The CDC waste storage room and flammable waste storage room are indoors and totally enclosed, with the floors at least one foot above grade. In addition, the ground slopes away from the building. Run-on, therefore, cannot occur in these two storage rooms.

4.3.6 Removal of Liquids from Existing Containment Systems

In the event of an organic liquid chemical spill in the CDC waste storage room, the spilled liquid would flow to a floor drain and then to the containment tank. As described in Section 5.0, the CDC container storage secondary containment tank has a level sensor set to report liquid accumulation. The level-indicating panel is monitored daily, so personnel in the area would be notified of the spill. If a spill was detected, personnel would go to the room to find and stop the leak. The CDC container storage secondary containment tank would be evaluated and disposition of the material would depend on the results of that evaluation and would follow all regulations. An air-operated pump would be attached to the tank draw-off line and the contents would be pumped out for waste storage or shipment.

In the event of a chemical spill in the flammable waste storage room or in the containment pallets associated with acid, caustic, PCB, or poison storage within the waste storage room, the spill would be contained by the spill-containment pallets or tubs. The nature of the spilled material would be evaluated and the disposition of the material would be determined based on that evaluation.

The containment pallets and tubs are monitored at least weekly as part of the normal inspection routine, and spills would be noticed at that time. Spilled material would be removed in the safest manner possible, containers would be re-packed as necessary, and the pallet would be decontaminated. At no time shall released hazardous waste remain in the spill-containment pallets or tubs for more than 3 days after discovery.

ATTACHMENT 4-1

CDC WASTE STORAGE ROOM FLOOR CAPACITY

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

STEPHEN C. KNIGHT, JR., P.E.

ROGER W. DORWART, P.E.
ELROY L. LANGDELL, P.E.
GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
MARTIN W. HAIN, P.E.

TEL: 802-879-6343
FAX: 802-879-6376

November 18, 1991

Mr. Raymond McIntosh
International Business Machines Corporation
Department 723, Building 615-2
Essex Junction, Vermont 05452

Re: Building 974 Waste Storage Floor Capacity

Dear Roy:

In accordance with your request I have reviewed the safe floor load capacity for the waste storage room. The following observations are made:

1. The Hazardous Waste Permit dated November 1, 1990 and submitted to the Agency of Natural Resources stated in Section 4.3.1 that the waste storage room slab is constructed of 3000 psi reinforced concrete 6 inches thick with a design load of 250 pounds per square foot.

2. A review of the original drawings confirm's that the slab is 6 inches thick with 6x6 W2.9 x W2.9 welded were fabric. All construction joints are dowelled with 3/4" diameter smooth dowels x 1'-3, spaced at 1'-0 o.c. Below the slab is an 8" layer of crushed stone (capillary barrier) and 2'-3' of compacted sand. All sand is compacted to a minimum of 95% optimum modified density. (ASTM D1557).

3. A review of the actual field test reports for this project and a discussion with our personnel who did the quality control testing indicates that all subbase materials were compacted properly and all concrete strength were greater than 4000 psi compressive strength. (See attached field test reports).

4. A visual inspection of the slab in the waste storage area reveals that the slab is in good condition with no signs of excessive cracking or deflections.

5. The floor of the waste room is arranged such that there are 2'-6"± isles between rows of pallets. 4'-0" square pallets are loaded with 4-55 gal. drums and stacked 3 pallets high. The heaviest material stored appears to be contaminated earth which weights about 800 lb/barrel. Because of the isle space between rows of pallets we can conservatively assume that the pallet load is distributed over a 20 square foot area. This loading will result in about a 480 pound per square foot equivalent slab loading.

As a result of these observations the following conclusions and recommendations are made:

1. This floor slab is adequate for 500 pound per square foot floor loading in my opinion.

2. It is recommended that the posting in this room be changed to 500 pound per square foot.

Enclosed are field test reports for the subbase soil material, compaction tests and concrete test results for the slab placed in the waste storage room. Please call if you have questions concerning this report.

Very truly yours,

Elroy Langdell

Elroy L. Langdell, P.E.
Vice President
KNIGHT CONSULTING ENGINEERS, INC.

STATE OF VERMONT
ELROY L. LANGDELL
No. 1777
REGISTERED
PROFESSIONAL ENGINEER

ELL/kdb

File: 91253-14-4

KNIGHT CONSULTING ENGINEERS, INC.

Sheet No. 7 of 8

PROJECT IBM CHEMICAL DIST.

Date 6-20-80

FOR G. CETTER

By MO

MOISTURE – DENSITY CURVE

LABORATORY COMPACTION TEST

☐ Standard (ASTM D 698)

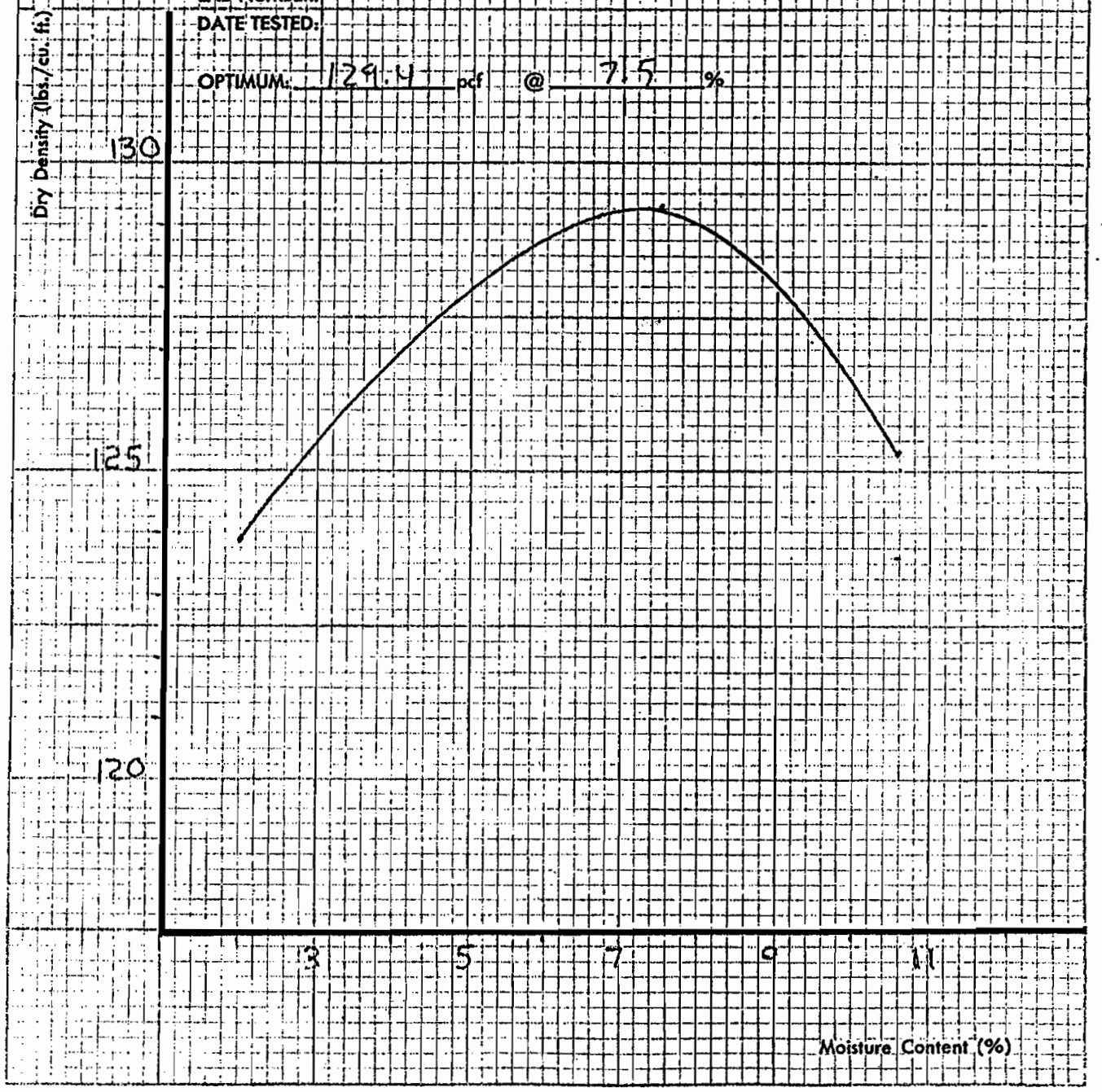
☑ Modified (ASTM D 1557)

SAMPLE: MEDIUM BROWN SAND - SAMPLED AT SITE

LAB NUMBER:

DATE TESTED:

OPTIMUM: 129.4 pcf @ 7.5 %



KNIGHT CONSULTING ENGINEERS, INC.

PROJECT IBM CDC BLDG.

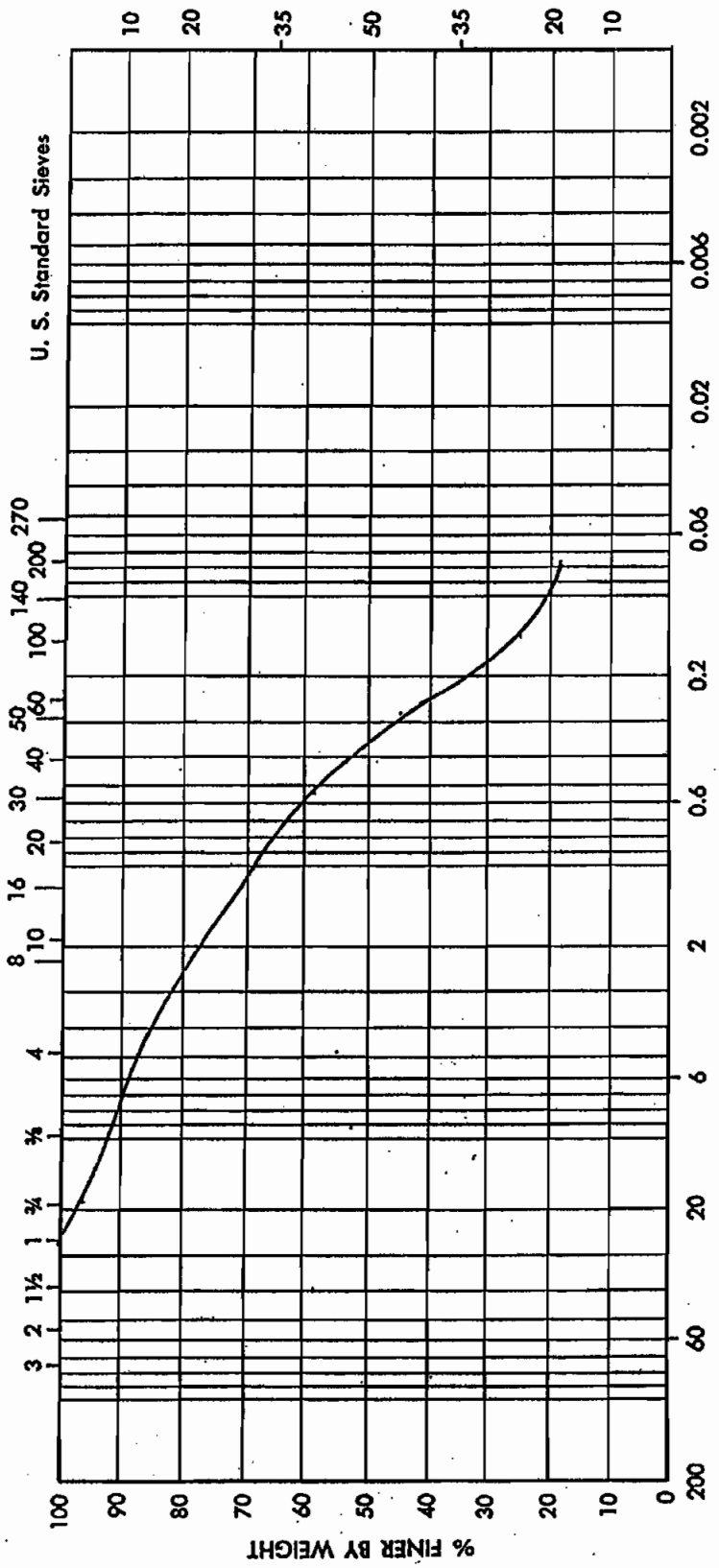
FOR: G. GOTTER ASSOCIATES

Sheet No. 8 of 8

Date 6-20-80

By JPS

GRAIN SIZE DISTRIBUTION CURVE



SIEVE SIZE	% FINER	SIEVE SIZE	% FINER
1"	100	#8	79.6
¾"	96.3	#16	70.8
½"	94.4	#30	58.6
⅜"	92.6	#50	35.0
#4	86.9	#100	24.9
		#200	19.4

MEDIUM BROWN SAND SATURATED AT SITE

CLASSIFICATION — SILTY GRAVEL

KNIGHT CONSULTING ENGINEERS, INC.

Sheet No. 5 of 8

PROJECT IBM CDC BLDG

Date 6-20-80

FOR G SETTER ASSOCIATES

By FRS

MOISTURE—DENSITY CURVE

LABORATORY COMPACTION TEST

☐ Standard (ASTM D 698)

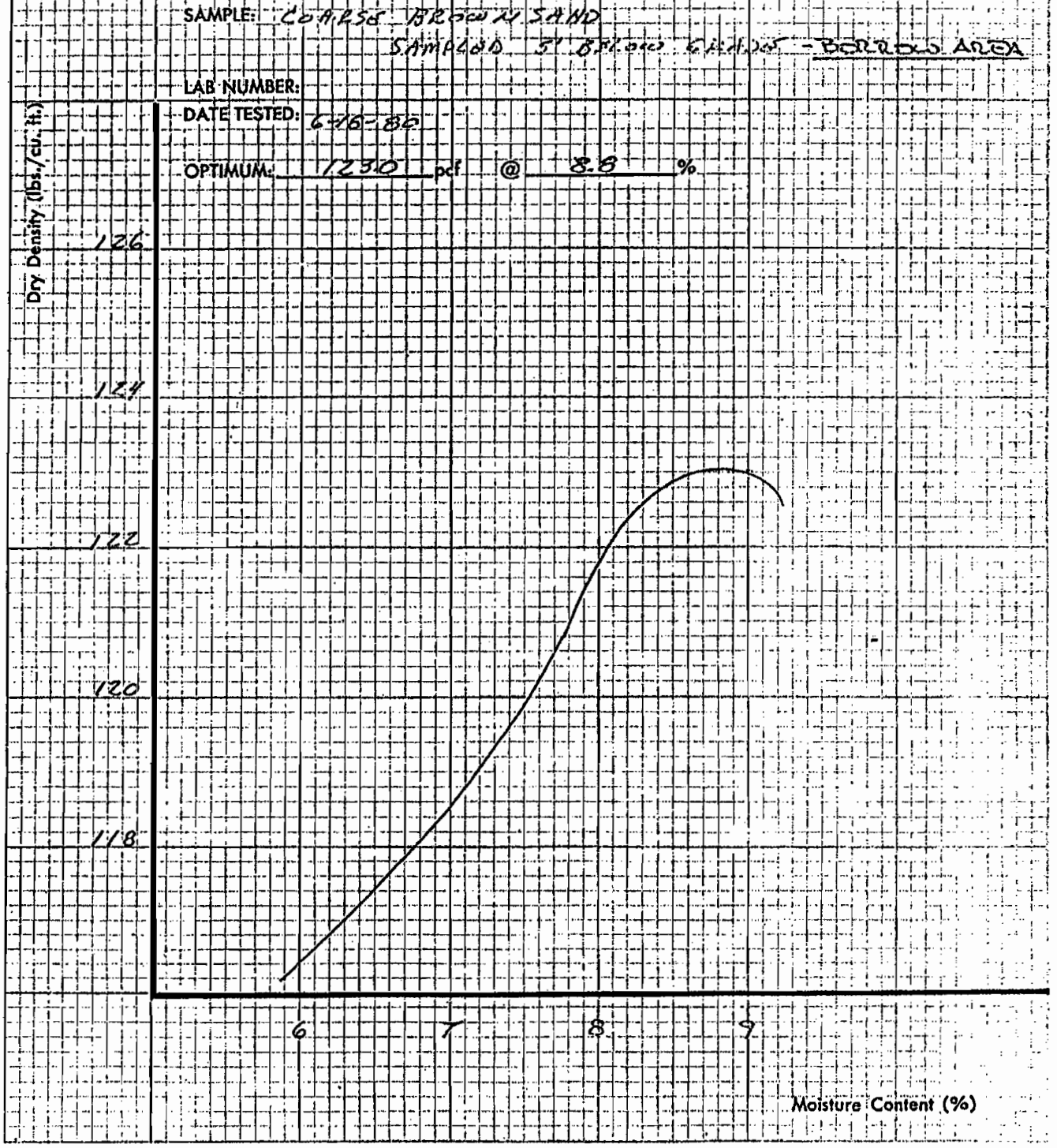
☒ Modified (ASTM D 1557)

SAMPLE: COARSE BROWN SAND
SAMPLED 5' BELOW GRADE - BORROW AREA

LAB NUMBER:

DATE TESTED: 6-16-80

OPTIMUM: 123.0 pcf @ 8.8 %



KNIGHT CONSULTING ENGINEERS, INC.

PROJECT IBM CDC B206

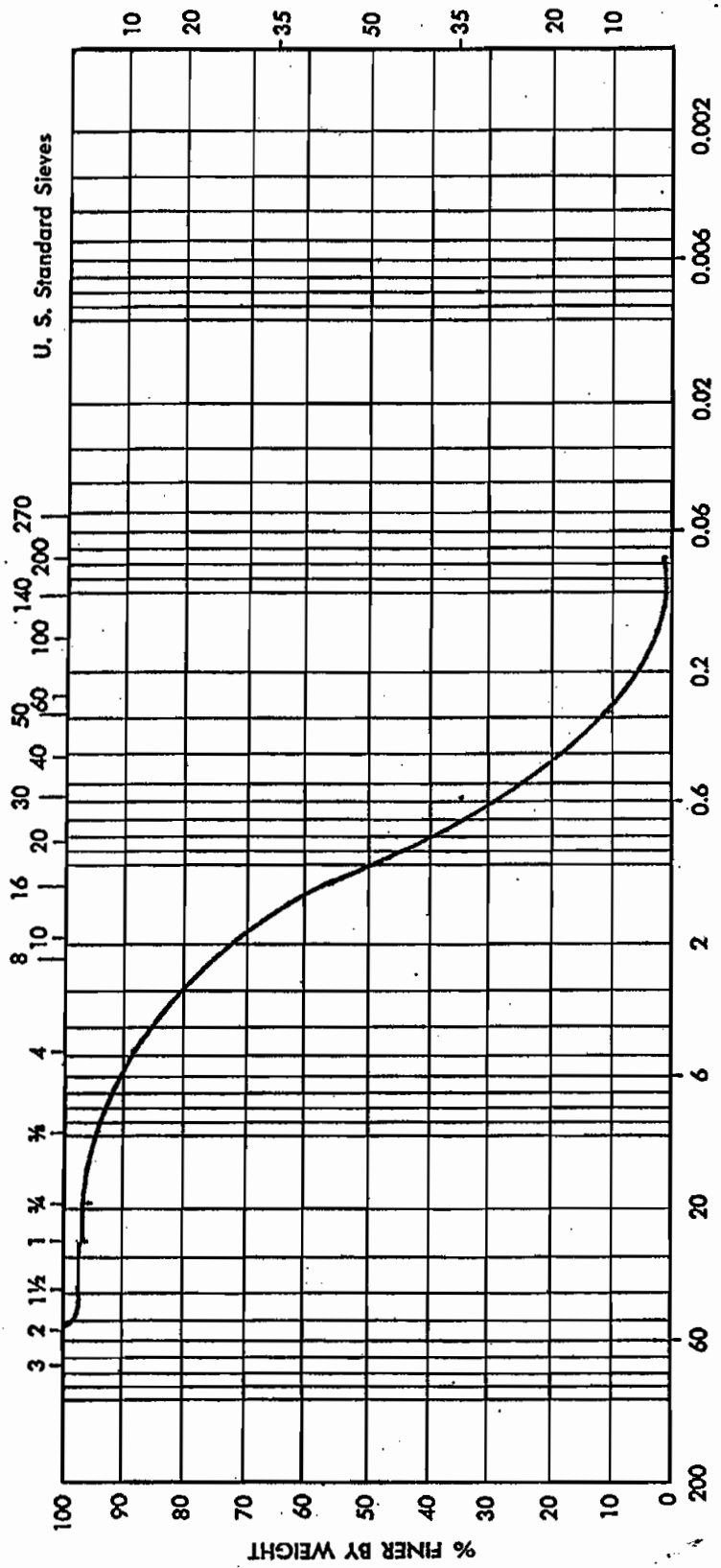
FOR: G. GOTTOR ASSOCIATES

Sheet No. 6 of 8

Date 6-20-80

By MO'C

GRAIN SIZE DISTRIBUTION CURVE



SAMPLE (T. 576.10

)ÇE#E #	CUM.WT.R.	CUM.WT.%	ZFINER
2.000	.00	00.00	100.00
1.000	19.50	3.38	96.61
.750	25.50	4242	95.57
.500	32.60	5265	94.34
.375	32.60	5.65	94.34
4.000	64.60	11.21	88.78

SAMPLE WT. 576.10

SIEVE #	CUM.WT.R.	CUM.WT.Z	ZFINER
8.000	139.80	24.26	75.73
16.000	244.50	42.44	57.55
30.000	377.50	65.52	34.47
50.000	516.20	89.60	10.39
100.000	560.30	97.25	2.74
200.000	567.90	98.57	1.42

CORSE BROWN SAND - SAMPLED 5' BELOW GRADE

- BORROW AREA

CLASSIFICATION - GRAVELLY SAND

NOTE - ACCEPTED FOR BUILDING FILL

IM OCP 1278

KNIGHT CONSULTING ENGINEERS, INC.
BOX 2304
SO. BURLINGTON, VERMONT

FIELD COMPACTION REPORT

FOR Gustav Getter Associates, P.C.

PROJECT CDC Building - Phase III

TEST NUMBER	192	193	194	195
DATE TESTED	1-27-81	1-27-81	1-27-81	1-27-81
SOIL DESCRIPTION	- - - - - - - -	- - - SITE MATERIAL - - - -		- - - - - - -
LOCATION	- - - - - - - -	- - BETWEEN COLUMN LINES - -		- - - - - - -
	10a to 11/ B_1 to D_1	8 to 9/D_1 to E	7 to 8/ D_1 to E	6 to 7/ D_1 to E
ELEVATION	- - - - - - - -	- - FINISH SUB-GRADE - - -		- - - - - - -
IN-PLACE DRY DENSITY (pcf)	114	120	123.5	122.5
MOISTURE CONTENT (%)	7	7.5	7.5	8.5
OPTIMUM DRY DENSITY (pcf)	123	123	123	123
OPTIMUM MOISTURE CONTENT (%)	8.8	8.8	8.8	8.8
PERCENT OPTIMUM DENSITY ACHIEVED	92.5 *	97.5	100	99.5

Distribution: 1 copy each - Getter, IBM-RECD, Mr. Casile

REMARKS:
* Contractor instructed to recompact area.

Submitted by: Patricia J. Reed
rrb

KNIGHT CONSULTING ENGINEERS, INC.
P. O. BOX 2304
SO. BURLINGTON, VERMONT

For: Gustav Getter Associates, P.C.

Project: CDC Bldg. - Phase III

Concrete Supplier: S.T.Griswold

CONCRETE CONTROL REPORT

Date Placed	Truck No.	Location	Time	Weather	Cylinders	Slump	Conc. Temp.	Density (pcf)	Air	Compr. Strength (psi) 7 day	14 day	28 day
2-17-81	60	Utility	10:45	Fair	-	3½"	67		4½			
	65	Corridor	11:30	Lt.Wind	81A ***	3½"	64	149	4	3380		
		Slab at		52 deg.	81B			149		3460		
		Road Crossing			81C			151			3840	
					81D			150				4090
2-17-81	65	Utility	1:00	Fair	82A	3"	70	148	5	3220		
		Connector		Lt.Wind	82B			148		3430		
		Grade Beams		55 deg.	82C			148				4080
		Lines 22,23			82D			148				3940
		from DD+10'										
	61	to GG	2:10		-	3	68		5			
2-18-81	64	Slab Over	11:00	Cloudy	83A***	3¼"	67	149	5½	3360		
		Pipe Corridor		Lt.Wind	83B			149		3290		
		Bldg.lines		50 deg.	83C			147				3980
		D to D+8'			83D			148				3690
2-18-81	61	Interior	8:05	Fair, Lt.	--	4	--		--			
	64	floor slabs: Col.Lines	8:30	wind,50-60° Enclosed	--	4	74		4			
	60	5 to 6/C+7'	10:00	area	84A	4¼	75	149	4	4210		
		to D_1;BtoB$_1$+5'			84B			148		4160		
		toC/1b+6' to 2;			84C			150				4530
		B_1+5'toC/1 to			84D			149				4260
✓	63	1b+6'; 6 to 7/ D+10'toE	11:00		--	3½	73		4			

Remarks: *** ANTI-HYDRO CONCRETE

DISTRIBUTION: 1 copy each- Mr. Kniffin,Mr. Casile,Mr.Vossler, S.T.Griswold Co.

KNIGHT CONSUL ENGINEERS, INC.
P. O. BOX 2304
For: Gustav Getter Associates, P.C. SO. BURLINGTON, VERMONT

Project: CDC Bldg. - Phase III

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CONCRETE CONTROL REPORT

Date Placed	Truck No.	Location	Time	Weather	Cylinders	Slump	Conc. Temp.	Density (pcf)	Air	Compr. Strength (psi) 7 day	14 day	28 day
2-16-81	60	Interior	8:50	Enclosed	-	4	68		4			
	64	Floor slabs	9:10	Area	77A	4	68	148	4	4050		
		Col.lines		30-40 deg.	77B			148		3890		
		8 to 10/D_1 to E			77C			149				4740
		4 to 5/D_1 to E &			77D			149				4930
	60	5 to 6/EtoF	9:35		-	3 3/4"	70		4			
	64		10:00		-	3½"	69		4			
	60	"	11:20	"	78A	4	73	148	4	3910		
					78B			147		3820		
					78C			148				4490
					78D			148				4630
	64		12:00		-	4	71		4			
	60		12:40		-	3	72		4			
2-16-81	61	Wall at	2:30	Enclosed	79A	3	65	148	4	3860		
		Line 11+8'		Area	79B			148		3930		
		from DtoD+9'		35 deg.	79C			148				4780
					79D			148				4470
2-17-81	63	Interior	10:10	Enclosed	-	4¼"	73		4			
	61	Floor slabs:	11:50	Area	80A	3"	72	149	4	4070		
		col. lines		50 deg.	80B			148		4160		
		B to B_1+5'/8a+10'			80C			149				4860
		to 10+4;7 to 8/			80D			149				4900
		C+7; to D+15'										
	64		12:50		-	4	70		4			

Remarks: Distribution: 1 copy each- Mr. Kniffin, Mr. Casile, Mr. Vossler, S.T.Griswold Co.

KNIGHT CONSUL' ENGINEERS, INC.
P. O. BOX 2304
SO. BURLINGTON, VERMONT

For: Gustav Getter Associates, P.C.

Project: CDC Bldg. - Phase III

Concrete Supplier: S. T. Griswold

CONCRETE CONTROL REPORT

Date Placed	Truck No.	Location	Time	Weather	Cylinders	Slump	Conc. Temp.	Density (pcf)	Air	Compr. Strength (psi) 7 day	14 day	28 day
2-19-81	64	Spill retention structure Tank support piers west side, northern 1/4	10:00	Cloudy, mod. wind, 50±°	--	3½	68		5			
2-20-81	63	Interior floor slab from Col. Lines D_3+12' to E+4'/ 5_a to 6 and Misc. Column box outs & interior wall section at Line 3/E_2+16' to F	10:00	Rain, Lt. wind, 50's Enclosed area	88A 88B 88C 88D	3	72	149 149 147 147	4	3660 3750		 4790 4700
2-20-81	65	Utility connector grade beams- Lines 22 & 23 from JJ to MM+10'	11:30	Rain, Lt. wind 57°	89A 89B 89C 89D	3 3/4	67	148 147 148 148	4½	3410 3500		 4260 4420
	68		1:00		--	3 3/4	68		4½			

Remarks:

DISTRIBUTION: 1 copy each - Mr. Kniffin, Mr. Casile, Mr. Vossler, S. T. Griswold & Co., Inc.

KNIGHT CONSU. ... ENGINEERS, INC.
P. O. BO. 2304
SO. BURLINGTON, VERMONT

For: Gustav Getter Associates, P.C.

Project: CDC Bldg. Phase III

Concrete Supplier:

CONCRETE CONTROL REPORT

Date Placed	Truck No.	Location	Time	Weather	Cylinders	Slump	Conc. Temp.	Density (pcf)	Air	Compr. Strength (psi) 7 day	14 day	28 day
3-2-81	65	Utility Connector slab on ground from S to T &	10:30	Enclosed Area 40±deg.	101A	3"	66	149	4%	3270		
					101B			149		3290		
					101C			149				4320
					101D			150				4560
	61	No. tower Section	11:50		-	3½	67		-			
3-3-81	60	Interior Floor slabs col.lines 4a to 5/E to F 2a to 4/D to E & 2a+5' to 4/D+12'	10:00	Enclosed Area 20±deg.	102A	4	59	149	4	3630		
					102B			150		3780		
					102C			151				5160
					102D			151				5220
					102E *			150		3220**		
					102F							
	64	to D 3 &	11:30		-	3 3/4"	61		4			
	65	wall extended at line D/11	1:30		-	4	60		4			
3-3-81	61	Utility Connector Grade beams Lines 22&23	1:30	Fair Lt.Wind 25-30 deg.	103A	4¼"	64	148	4½	2780		
					103B			148		2650		
					103C			149				3820
					103D			149				3730
	64	from MM+10' to QQ+10'	2:15			4"	66		-			

Remarks: Distribution: 1 copy each-G.Getter Assoc. Mr. Vossler, Mr. Casile & S.T.Griswold
*E&F to be field cured.
** Appears to be frozen.

IM QCP 1079

ATTACHMENT 4-2

TENNANT FLOOR COATING

INSTRUCTION BULLETIN

TENNANT® 4700 CHEMICAL RESISTANT URETHANE

SECTION I - GUIDELINES FOR SAFETY

Read and follow all precautions on labels.

FIRE AND STORAGE SAFETY PRECAUTIONS

SMOKING: Do not allow smoking or the use of matches in the area where material is being applied or curing.

STORAGE: Keep heat, sparks, and open flames (electrical equipment, pilot lights, etc.) away from container storage and application sites. Post appropriate warning signs around application area. Use only with adequate forced air ventilation to maintain solvent vapor concentrations below prescribed O.S.H.A. standards for L.E.L. and P.E.L. In case of fire, use foam, dry chemical or CO_2 extinguishers.

Place solvent-soaked items, such as used applicators, in metal containers outside of building.

Keep containers tightly closed when not in use. Store in a cool, dry place.

SPILLAGE: In case of spillage, absorb and then dispose of material in accordance with applicable local, state, and federal regulations.

PERSONNEL SAFETY PRECAUTIONS

VAPORS: Avoid breathing organic vapors. Wear a vapor/particulate respirator (U.S. Bureau of Mines BE-23, NIOSH 23C, 3M 8709 or equivalent) during application and until the work area has been exhausted of all vapors.

NOTE: Pregnant women and individuals with chronic respiratory problems or prior respiratory reaction to isocyanates must not be exposed to vapors during urethane application. Individuals that wear contact lenses or have allergies also should avoid exposure. Individuals with a heart condition or poor health must not be exposed to vapors during TENNANT® 510 removal procedure.

TRACTION: When removing old coatings (using TENNANT® 510), curing membranes (using TENNANT® 528 or 531), or treating concrete (using TENNANT® 409), the floor becomes very slippery. Use caution when walking on the floor during these procedures, and post appropriate warning signs around the application area.

PROTECTIVE CLOTHING: Avoid contact with eyes, skin, and clothing. Wear safety goggles designed to protect against splash of liquids. Wear protective gloves, protective clothing, and shoes or boots which will not absorb materials.

INGESTION: Do not swallow materials.

FIRST AID

INHALATION: Remove person to fresh air. If breathing difficulty persists, consult a physician and have label information available.

EYE CONTACT: Flush immediately with plenty of water for 15 minutes. Call a physician.

SKIN CONTACT: Wash thoroughly with soap and water.

INGESTION: Call a physician immediately. Do not induce vomiting unless the material safety data sheet instructs you to do so.

OTHER PRECAUTIONS

NON SLIP GRIT: Tennant Company coatings provide a smooth, non-porous surface. Conditions of liquid spillage on such surfaces can create a slippery condition. Use Tennant Company safe walk grit in slip hazard areas.

ODOR CONTAMINATION: To protect against possible odor contamination, remove any odor-sensitive material such as foods or fibers from the area while applying any products containing solvent and until no vapors remain in the air.

SPILLAGE: If TENNANT® 409 is accidentally spilled on metal surfaces, it should be removed immediately to prevent pitting of the metal.

If TENNANT® 510 is ac[illegible]tally spilled on painted surfaces, rubber or plastic materials, other than those desired, it should b[illegible]ediately in order to prevent material damage.

SECTION II - WHERE TO USE TENNANT® 4700

TENNANT® 4700 chemical resistant urethane was designed for use as a concrete floor coating in chemically harsh environments. These areas include battery charging rooms, aircraft maintenance hangars, food storage lockers.

4700 is a three-coat CRU which is applied over clean, dry, sound concrete.

SECTION III - CONCRETE FLOOR PREPARATION

REMOVE ALL DIRT, OIL, GREASE, CURING MEMBRANES, OR EXISTING COATINGS.

Remove dirt, oil, grease, membranes, and coatings from the floor to expose a clean, bare concrete surface.

COMPACTED DIRT: First, remove compacted dirt with a TENNANT® K-4 machine equipped with a REVO®-Tool or wire brush, or with a spud bar. THEN proceed as follows.

SURFACE DIRT, GREASE OR OIL: Scrub with Tennant Company cleaners in a mechanized scrubber. If using a TENNANT® SRS® machine, use a cleaner recommended for that machine.

MIX: Mix the appropriate concentration of cleaner by using the dilution chart on the cleaner label.

APPLY: Use maximum solution flow of cleaner to the floor with the vacuum off, squeegee up, and maximum brush down pressure.

SOAK: Allow solution to remain on the floor for about 10 - 15 minutes.

REPEAT: Make a second pass using reduced solution flow, with same brush pressure, vacuum off and squeegee up.

REPEAT: The final pass should be made with the vacuum on, squeegee down and 1/2 solution flow.

SCRUB AND RINSE: Scrub and rinse with clear water as above.

CHECK FLOOR: Use Test Kit to ensure the floor is free of any contamination. (See Test Kit Procedure.)

GO TO 409 PRE-KOTE CLEANER STEPS.

HEAVY GREASE OR PENETRATED OIL: Remove heavy grease or penetrated oil using TENNANT® 528 Cleaner and Remover or 531 Curing Membrane Remover.

VENTILATION: Provide good ventilation and air movement while using 528 or 531.

MIX: Use 531 as supplied or mix 528 with petroleum solvent (140° F flash point or above...mineral spirits, Shell Cyclo-Sol 63 or equal) at one part 528 to nine parts solvent.

APPLY: Apply 531 or mixed 528 liberally to the floor surface with a mop, broom, or low pressure spray at 100 square feet per gallon.

SOAK: Allow to soak, keeping floor wet 30 minutes or more.

AGITATE: Agitate solution with a Tennant Company scrubber or disc machine equipped with an abrasive bristle brush.

FLOOD SURFACE: Flood surface with Tennant Company detergent (600 or 653) solution at three ounces per gallon of water.

REAGITATE: Reagitate as above and PICK UP residue with scrubber or wet vacuum.

SCRUB AND RINSE: Scrub and rinse with clear water and pick up residue as above.

CHECK FLOOR: Use Test Kit to ensure the floor is free of any contamination. (See Test Kit Procedure.)

GO TO 409 PRE-KOTE CLEANER STEPS.

CURING MEMBRANES: Remove curing membranes using TENNANT® 528 Cleaner and Remover or 531 Curing Membrane Remover.

VENTILATE: Provide good ventilation and air movement while using 528 or 531.

CAUTION: Curing membranes become very slippery as they dissolve from the floor surface. Wear shoes or boots and use caution when walking on the floor during this procedure.

MIX: Use 531 as supplied or mix 528 with a high flash (140° F or above), high solvency (90KB or above) aromatic hydrocarbon solvent (such as Shell Cyclo-Sol 63 or equal) at one part 528 to nine parts solvent.

APPLY: Apply 531 or mixed 528 liberally to the floor surface with a mop, broom, or low pressure spray at the rate of 100 square feet per gallon.

SOAK: Allow to soak, keeping floor wet 30 minutes or more.

AGITATE: Agitate solution with a Tennant Company scrubber or disc machine equipped with an abrasive bristle brush.

FLOOD SURFACE: Flood TENNANT® detergent (600 or 653) at three ounces

SCRUB AND RINSE: Scrub and rinse with clear water and pick up as above.

CHECK FLOOR: Use Test Kit to ensure the floor is free of above contamination. (See Test Kit Procedure.)

GO TO 409 PRE-KOTE CLEANER STEPS.

EXISTING COATINGS: Existing coatings are removed with either TENNANT® 510 Remover, or by sanding to expose clean, bare concrete surface.

510 PROCEDURE

VENTILATION: Provide good ventilation and air movement while using TENNANT® 510 Remover.

CAUTION: Floor coatings become very slippery as they dissolve from the floor surface. Wear protective shoes c boots and use caution when walking on the floor during this procedure.

HEAVY BUILDUP: For heavy buildup of floor coatings, sand the floor with a buffer using #3-1/2 open-coat sandpaper.

APPLY: Spread 510 liberally and evenly with a lamb's-wool applicator at approximately 50 ft^2 per gallon. WET A AREA which can be easily picked up in 20 - 30 minutes. DO NOT REWORK 510 once it has been applied.

SOAK: Let soak 20 - 30 minutes until coating has lifted or it is well softened. If 510 begins to dry out, apply mor

SCRAPE: Scrape off the 510 residue with masonry scrapers. Scoop the waste into containers for proper dispos

FLOOD SURFACE: While the floor is still wet, flood the surface with TENNANT® detergent (600 or 653) solution at three ounces per gallon of water.

AGITATE: Agitate with a scrubber equipped with an abrasive bristle brush.

REAGITATE: Reagitate as above and PICK UP residue with a scrubber or wet vacuum.

MULTIPLE COATS: Multiple coats of finish may require reapplication of 510. Repeat above procedure until finis is removed.

SCRUB AND RINSE: Scrub and rinse with clear water and pick up residue as above.

SOLVENT: Flood the floor with TENNANT® 528 or 531 solution at 100 square feet per gallon.

AGITATE: Agitate with an abrasive brush or scrubbing brush. Solvent should remain on the floor for 15 minutes.

CLEANER: While the floor is still wet, flood the surface with TENNANT® 600 cleaner at four ounces per gallon of water.

AGITATE: Agitate with an abrasive brush or scrubbing brush.

REMOVE: Use a neoprene blade squeegee on an automatic scrubber or wet vacuum to remove floor waste residue.

SCRUB: Repeat cleaner scrub and removal.

CHECK FLOOR: Use Test Kit to ensure the floor is free of above contamination. (See Test Kit Procedure.)

GO TO 409 PRE-KOTE CLEANER STEPS.

SANDING PROCEDURE:

SAND: Use #3 closed-coat sandpaper. For tough to remove coatings, it may be necessary to start with #3-1/2 open-coat sandpaper to remove most of the coating. Follow this with #3 closed-coat sandpaper.

CHECK FLOOR: Use Test Kit to ensure the floor is free of contamination. (See Test Kit Procedure.)

GO TO 409 PRE-KOTE CLEANER STEPS.

TREAT THE FLOOR WITH 409 PRE-KOTE CLEANER to remove concrete dust. Treat the floor to remove concrete dus or free calcium deposits and open the floor for better adhesion of the coating.

MIX: Mix 409 concentrate with water in a clean container at a ratio of one part 409 to nine parts of water. F dense machine trowelled concrete, mix one part 409 to seven parts water. For chemically hardened floors, , one part 409 to five parts of water.

APPLY: Apply mixed solution to floor liberally and uniformly over the area at 100 square feet per gallon with a low-pressure spray, a garden-type sprinkling can, or by mop from a container.

SOAK: Allow solution to work for 2 - [illegible] minutes, but do not let floor dry out.

SCRUB: Scrub floor with a Tenn[illegible] scrubber or disc machine equipped with an abrasive bristle brush. Keep floor wet with additional w[illegible] sary.

FLOOD SURFACE: Flood surface with TENNANT* detergent (1:00 or 653) solution at three ounces per gallon of water.

REAGITATE: Reagitate as above and PICK UP residue with scrubber or wet vacuum.

SCRUB AND RINSE: Scrub and rinse with clear water and pick up residue as above.

REPEAT: Repeat scrub and rinse to ensure removal of all residue. White residue upon drying shows inadequate rinse.

CHECK FLOOR: Texture of floor should feel like fine sandpaper. If surface is still smooth and glossy, repeat above 409 procedure.

DRY: Let floor dry completely (preferably overnight). Forced air ventilation will accelerate drying.

BEFORE COATING FLOOR, CHECK FLOOR MOISTURE CONTENT USING TEST KIT INSTRUCTIONS. RESIDUAL MOISTURE IN THE CONCRETE WILL PREVENT GOOD ADHESION OF THE COATING.

SECTION IV - COATING THE FLOOR

CHECK FLOOR: Floor temperatures must be 60°F or above during the CRU application.

COAT: Five gallon units of CRU contain both Parts A and B. Two coats of CRU are necessary to achieve maximum chemical resistance.

MIX: Mix only enough of parts A and B for use within a three-hour period.

REMOVE THE UPPER INSERT (Part B) from the pail.

PREMIX PART A by using a slow speed drill (500 rpm or less) with a paint mixing paddle or Jiffy Mixer (Tennant Company part number 08643-5).

POUR CONTENTS from the insert into Part A.

MIX 4700 CONTINUOUSLY for five minutes by using a slow speed drill as above.

ALLOW THE BLENDED MATERIAL to stand for ten minutes prior to using.

VENTILATION: Provide sufficient forced air ventilation during application and until the area has been exhausted of all vapors (usually until coating is dry).

APPLY FIRST COAT: Apply the first coat of 4700 by pouring blended material into an applicator tray and applying at the rate of 300 to 350 square feet per gallon. Use a paint roller with a medium nap cover for application.

Dip roller into coating and lightly roll out excess on screen in tray. Then apply an 8 to 10 foot long path on the concrete, making one forward and one backward stroke. Redip roller and make a second pass adjacent to the first. Repeat with third pass.

Wipe out ridges and level the coating with one cross pass. Avoid overworking the material.

DRY: Let the first coat dry 16-24 hours until the coating is hard. If recoat time exceeds 48 hours, dry buff the surface to remove the gloss before applying the next coat. To buff, use a TENNANT* K-4 machine with abrasive bristle brush or a disc buffer with an 80-100 mesh sanding screen. Sweep the surface thoroughly. Then tack rag the surface with a lightly dampened, lint-free cloth to remove fine dust.

APPLY SECOND COAT: Apply a second coat of 4700 in the same manner as described above at a coverage rate of 300 to 350 square feet per gallon.

DRY: Let the second coat dry 6 - 8 hours until the coating is hard.

APPLY THIRD COAT: Apply a third coat of 4700 in the same manner as previously described at a coverage rate of 300 to 350 square feet per gallon.

DRY: Allow the coating to dry a minimum of 24 hours before opening to foot traffic. Maximum chemical resistance is achieved after two weeks cure time.

OPTIONS

TRACTION GRIT: To improve traction in potential slip hazard areas, TENNANT* 292 aluminum oxide grit may be added to the second to last coat of 4700.

TENNANT

MATERIAL SAFETY DATA SHEET

Issue Date: 12/13/88

TENNANT COMPANY
701 NORTH LILAC DRIVE
MINNEAPOLIS, MN 55440

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         SPECIFIC
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EMERGENCY PHONE NUMBER:

Chemtrec: 800-424-9300(24 hrs.)
(District of Columbia) 483-7616(24 hrs.)
Tennant Company: 612-540-1381(days)
612-544-5163(nights)
612-738-9734(nights)
CANADA: CANUTEC 613-996-6666(24hrs.)

I. IDENTIFICATION

PRODUCT NAME/NUMBER: 4700-CHEMICAL RESISTANT TILE-LIKE GLAZE COATING PART A

PART NUMBER: 08569

MATERIAL USE: Two-Component Urethane for Concrete Floors

CHEMICAL FAMILY: Polyester

DEPARTMENT OF TRANSPORTATION
U.N. #: NA1993 HAZARD CLASSIFICATION: Combustible Liquid
SHIPPING NAME: Combustible Liquid N.O.S.

II. PHYSICAL DATA

BOILING POINT: 295F. / 146C.

FREEZE POINT: N.A. /N.A.

DENSITY: 1.0 g/ml

% VOLATILE: 69% by wt

SOLUBILITY IN WATER: Not Soluble

VAPOR PRESSURE: 3.7 mm Hg @ 20 Deg.C.

ODOR THRESHOLD: N/A

pH: N.A.

PHYSICAL FORM: Liquid

VAPOR DENSITY: Heavier , THAN AIR

APPEARANCE AND ODOR: Clear/Ester-like

COEFFICIENT OF H2O/OIL DISTRIBUTION: N.A.

EVAPORATION RATE: Slower, THAN n-BUTYL ACETATE

MECHANICAL IMPACT: N.A.

STATIC DISCHARGE: N.A.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

III. INGREDIENTS

ITEM (CAS#)	WT.%	OSHA PEL	TLVs TWA	TLVs STEL	LD/50 mg/kg	LC/50
Propylene Glycol Monomethyl Ether Acetate (108-65-6)	60-70	N.A.	N.A.	N.A.	5000 (skin rabbit) 8532 (oral rat)	N.A.
Hydroxyl Terminated Polyester (25322-69-4)	25-35	N.A.	N.A.	N.A.	N.A.	N.A.
Xylene (1330-20-7)	1-5	100ppm	100ppm	150ppm	5000 (oral rat)	N.A.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

N.E. - Not Established

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 108F./ 42C.(SETA FLASH) FLAMMABLE LIMITS: L.E.L. 1.0% U.E.L. 7.0%

AUTOIGNITION TEMPERATURE: N.A.

EXTINGUISHING MEDIA:
Use National Fire Protection Association (N.F.P.A.) Class B extinguishers (Carbon dioxide, dry chemical or foam).

SPECIAL FIRE FIGHTING PROCEDURES:
Water may be ineffective, but may be used to cool closed containers to prevent pressure buildup or possible autoignition when exposed to extreme heat (fog nozzles preferred). Wear self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Closed containers may explode when exposed to extreme heat. Do not apply to hot surfaces.

V. REACTIVITY DATA

STABILITY: Stable HAZARDOUS POLYMERIZATION: Will Not Occur

CONDITIONS TO AVOID:
N.A.

INCOMPATIBILITY (Materials to avoid):
Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS:
Carbon dioxide, carbon monoxide and nitrogen oxides in varying quantities.

VI. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: See Section II for individual ingredients.

EFFECTS OF OVEREXPOSURE: PRIMARY ROUTE(S) OF ENTRY: Inhalation X Skin Contact X

SKIN CONTACT AND ABSORPTION:
Contains materials which may cause skin irritation.

EYE CONTACT:
Contains materials which may cause eye irritation and eye injury.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

INGESTION (Swallowing):
Contains materials which can cause a burning sensation, vomiting, diarrhea, drowsiness and tissue damage. Aspiration of material into lungs can cause chemical pneumonitis which can be fatal.

INHALATION (Breathing):
Repeated exposures may cause irritation to the upper respiratory tract and liver or kidney effects.

CARCINOGENICITY:
No specific information available.

CHRONIC EFFECTS OF OVEREXPOSURE:
No specific information available.

EMERGENCY AND FIRST AID PROCEDURES

SKIN CONTACT:
Wash thoroughly with soap and water.

EYE CONTACT:
Flush immediately with water for 15 minutes; CALL A PHYSICIAN.

INGESTION (Swallowing):
CALL A PHYSICIAN or POISON CONTROL CENTER. DO NOT attempt to induce vomiting and have this document available.

INHALATION (Breathing):
Remove to fresh air. Restore breathing if required. If breathing difficulty persists or occurs later, consult a physician and have this document available.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Remove all sources of ignition (flames, hot surfaces and electrical, static or frictional sparks). Avoid breathing vapors. Ventilate area. Remove with inert absorbent/scrub with soap and water.

WASTE DISPOSAL METHOD:
Dispose of in accordance with federal, state and local regulations.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type):
Wear a chemical respirator approved for organic vapors (NIOSH 23C or equivalent) during the application and until the work area has been exhausted of all vapors.

VENTILATION:
Provide local exhaust ventilation to keep vapor concentrations below TLV (see Section II).

PROTECTIVE GLOVES:
Impervious gloves; i.e., rubber

EYE PROTECTION:
Chemical splash goggles

SKIN PROTECTION:
Impervious gloves; i.e., rubber

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
Store in a cool dry place. Store large quantities in buildings designed and protected for storage of NFPA Class II Combustible Liquids.

OTHER PRECAUTIONS:
Do not take internally. Avoid prolonged contact with skin; contaminated clothing should be removed immediately. Avoid free fall of liquid in excess of a few inches.

This Material Safety Data Sheet (MSDS) has been prepared in compliance with the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

The information and recommendations contained herein are based upon data believed to be correct. However, no guaranty or warranty of any kind expressed or implied is made with respect to the information contained herein.

For further information contact:

Tennant Company
Attn: Norman W. Gill
Technical Service Department
701 North Lilac Drive
Minneapolis, MN 55440

NOTE - N.A. or N/A denotes Not Available or Not Applicable

TENNANT

MATERIAL SAFETY DATA SHEET

Issue Date: 12/13/88

TENNANT COMPANY
701 NORTH LILAC DRIVE
MINNEAPOLIS, MN 55440

N.F.P.A. HEALTH 3 FIRE 2 REACT. X SPECIFIC 0

EMERGENCY PHONE NUMBER:

Chemtrec: 800-424-9300(24 hrs.)
(District of Columbia) 483-7616(24 hrs.)
Tennant Company: 612-540-1381(days)
612-544-5163(nights)
612-738-9734(nights)
CANADA: CANUTEC 613-996-6666(24hrs.)

I. IDENTIFICATION

PRODUCT NAME/NUMBER: 4700-CRU TILE-LIKE GLAZE COATING PART B

PART NUMBER: 08569

MATERIAL USE: Two-Component Urethane for Concrete Floors

CHEMICAL FAMILY: Urethane Prepolymer

DEPARTMENT OF TRANSPORTATION
U.N. #: NA1993 HAZARD CLASSIFICATION: Combustible Liquid
SHIPPING NAME: Combustible Liquid N.O.S.

II. PHYSICAL DATA

BOILING POINT: 295F. / 146C.

FREEZE POINT: N.A. /N.A.

DENSITY: 1.0 g/ml

% VOLATILE: 46% by wt

SOLUBILITY IN WATER: Not Soluble

VAPOR PRESSURE: 3.7 mm Hg @ 20 Deg.C.

ODOR THRESHOLD: N/A

pH: N.A.

PHYSICAL FORM: Liquid

VAPOR DENSITY: Heavier , THAN AIR

APPEARANCE AND ODOR: Clear/Ester-like

COEFFICIENT OF H2O/OIL DISTRIBUTION: N.A.

EVAPORATION RATE: Slower, THAN n-BUTYL ACETATE

MECHANICAL IMPACT: N.A.

STATIC DISCHARGE: N.A.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

III. INGREDIENTS

ITEM (CAS#)	WT.%	OSHA PEL	TLVs TWA	TLVs STEL	LD/50 mg/kg	LC/50
Propylene Glycol Monomethyl Ether Acetate (108-65-6)	35-45	N.A.	N.A.	N.A.	5000 (skin rabbit) 8532 (oral rat)	N.A.
Xylene (1330-20-7)	5-10	100ppm	100ppm	150ppm	5000 (oral rat)	N.A.
1,6-Hexamethylene Diisocyanate Based Adduct (4035-89-6)	50-60	N.A.	N.A.	N.A.	710000 (oral rat) 75000 (dermal rabbit)	137-1150 mg/m3 (INH rat)

NOTE - N.A. or N/A denotes Not Available or Not Applicable

N.E. - Not Established

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 108F./ 42C.(SETA FLASH) FLAMMABLE LIMITS: L.E.L. 1.0% U.E.L. 7.0

AUTOIGNITION TEMPERATURE: N.A.

EXTINGUISHING MEDIA:
Use National Fire Protection Association (N.F.P.A.) Class B extinguishers (Carbon dioxide, dry chemical or foam).

SPECIAL FIRE FIGHTING PROCEDURES:
Water may be ineffective, but may be used to cool closed containers to prevent pressure buildup or possible autoignition when exposed to extreme heat (fog nozzles preferred). Wear self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Closed containers may explode when exposed to extreme heat. Do not apply to hot surfaces.

V. REACTIVITY DATA

STABILITY: Stable HAZARDOUS POLYMERIZATION: Will Not Occur

CONDITIONS TO AVOID:
N.A.

INCOMPATIBILITY (Materials to avoid):
Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS:
Carbon dioxide, carbon monoxide and nitrogen oxides in varying quantities.

VI. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: See Section II for individual ingredients.

EFFECTS OF OVEREXPOSURE: PRIMARY ROUTE(S) OF ENTRY: Inhalation X Skin Contact X

SKIN CONTACT AND ABSORPTION:
Contains materials which may cause skin irritation.

EYE CONTACT:
Contains materials which may cause eye irritation and eye injury.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

INGESTION (Swallowing):
Contains materials which can cause a burning sensation, vomiting, diarrhea, drowsiness and tissue damage. Aspiration of material into lungs can cause chemical pneumonitis which can be fatal.

INHALATION (Breathing):
Repeated exposures may cause irritation to the upper respiratory tract and liver or kidney effects.

CARCINOGENICITY:
No specific information available.

CHRONIC EFFECTS OF OVEREXPOSURE:
No specific information available.

EMERGENCY AND FIRST AID PROCEDURES

SKIN CONTACT:
Wash thoroughly with soap and water.

EYE CONTACT:
Flush immediately with water for 15 minutes; CALL A PHYSICIAN.

INGESTION (Swallowing):
CALL A PHYSICIAN or POISON CONTROL CENTER. DO NOT attempt to induce vomiting and have this document available.

INHALATION (Breathing):
Remove to fresh air. Restore breathing if required. If breathing difficulty persists or occurs later, consult a physician and have this document available.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Remove all sources of ignition (flames, hot surfaces and electrical, static or frictional sparks). Avoid breathing vapors. Ventilate area. Remove with inert absorbent/scrub with soap and water.

WASTE DISPOSAL METHOD:
Dispose of in accordance with federal, state and local regulations.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type):
Wear a chemical respirator approved for organic vapors (NIOSH 23C or equivalent) during the application and until the work area has been exhausted of all vapors.

VENTILATION:
Provide local exhaust ventilation to keep vapor concentrations below TLV (see Section II).

PROTECTIVE GLOVES:
Impervious gloves; i.e., rubber

EYE PROTECTION:
Chemical splash goggles

SKIN PROTECTION:
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The information and recommendations contained herein are based upon data believed to be correct. However, no guaranty or warranty of any kind expressed or implied is made with respect to the information contained herein.

For further information contact:

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Attn: Norman W. Gill
Technical Service Department
701 North Lilac Drive
Minneapolis, MN 55440

NOTE - N.A. or N/A denotes Not Available or Not Applicable

SECTION 5.0

TANK STORAGE INFORMATION

5.1 INTRODUCTION

This section describes GLOBALFOUNDRIES' two waste storage tank systems located at the Building 974 Chemical Distribution Center (CDC) tank farm and at the north end of Building 963, and also gives information on the CDC container storage secondary containment tank at the CDC.

5.2 CDC TANK FARM

Bulk organic solvent wastes are stored in 10,000-gallon aboveground tanks at the CDC. There are five tanks which currently provide storage for general solvents as described in Table 3-1 and one out of service tank. The specific types of wastes allowed in each individual bulk tank are determined through the waste characterization and handling process described in Section 3.2.1. Table 5-1 provides a description of the physical characteristics of the tanks and Table 5-2 provides the volume of the tanks and the specific gravity of waste currently stored in them.

The tanks have been designed in accordance with the Rules of UL12C and were fabricated and stamped in accordance with the provisions of the American Society of Mechanical Engineers (ASME) Code Rules, Section VIII, Division 1, 1980 and 1995. The tanks are compatible with the wastes they contain and have a design working pressure of 20 pounds per square inch (psi). The Waste Mid UV Resist, Former Waste Deep UV Resist (Out of Service), General Solvent 1, and General Solvent 4 tanks are constructed of SA 285C carbon steel, while the Waste Deep UV Resist (Former General Solvent 2) and General Solvent 3 tanks are SA 240 type 304 stainless steel (see Figure D-2-1, Appendix D for tank details.) The tank assessment reports for these tanks, required per 40 CFR Parts 264.192 and 264.193, can be found in Appendix A. These reports were originally completed for IBM and will continue to be accepted by GLOBALFOUNDRIES.

Each tank is heated and insulated to prevent freezing of the contents during the winter. Heat is applied to the tanks with electrical heat tracing. The heat tracing system is provided with an external tank sensing thermostat, which energizes the heat tracing when the temperature falls below 55 degrees F. The heat tracing is then deactivated when the temperature reaches 55 degrees F or higher. All cables, connections, and thermostats are Factory Mutual approved for Class I, Division 2 areas. The insulation is covered with a 0.016-inch thick aluminum jacket. Heat tracing may be deactivated for tanks that are not in use or have been taken out of service.

The tanks are supported by three 120-degree steel saddles welded to the tank shell and placed on reinforced concrete with 3/8-inch bolts. The two end saddles are on slide mounts. For details on the support structures, see Figures D-2-1 and D-2-5, Appendix D. The tanks are placed in carbon-steel-lined containment vaults located on one-foot-thick reinforced concrete pads.

Table 5-1 Physical Characteristics of CDC Storage Tanks		
	Waste Mid UV, General Solvent 1, Out of Service Solvent Tank, and General Solvent 4 Tanks	**Waste Deep UV and General Solvent 3 Tanks**
Shell Material	Carbon Steel	304 Stainless Steel
Shell Thickness	¼ inches	¼ inches
Diameter	120 inches	120 inches
Length	15 feet	15 feet
Seams long and girth	Double Butt Weld	Double Butt Weld
End Thickness	3/16 inch	.215 inches
End Material	SA285C	SA 240

Nozzles and Inspection Openings			
Number	**Size (inches)**	**Waste Mid UV, General Solvent 1, Out Of Service, and General Solvent 4 Tanks**	**Waste Deep UV and General Solvent 3 Tanks**
1	10	SA53B	SA 312/182
1	5	SA53B	SA 312/182
1	6	SA53B	SA 312/182
2	2	SA53B	SA 312/182
2	2	SA53B	SA 312/182
2	24 (manhole)	SA285C	SA 240
Supports: three 120-degree saddles			

5.3 BUILDING 963 NORTH TANK

Bulk organic solvent wastes may also be stored in one, 9,000-gallon closed, aboveground tank located in a steel lined containment vault north of Building 963. The specific gravity of the general solvent stored in the Building 963 Tank is 0.8-1.1. The physical characteristics of the tank are outlined in Table 5-3.

The tank was fabricated and stamped in accordance with the ASME rules. The tank consists of the 9,000-gallon tank mounted on three saddles and located in a stainless steel lined concrete containment vault. See Figure D-2-2 (Appendix D) for containment vault details. The tank assessment report for this tank, per 40 CFR Parts 264.192 and 264.193, can be found in Appendix A. The tank assessment report also contains tank design drawings and specifications.

Table 5-2 Tank Capacity and Specific Gravity of Waste Stored In CDC Tanks		
Tank Name	**Tank Capacity (gallons)**	**Specific Gravity**
Waste Mid UV Resist / PGMEA (formerly called N Butyl Acetate #1)	10,000	0.88 - 1.1
General Solvent # 1	10,000	0.8 - 1.1
Out of Service Solvent Tank (Former Waste Deep UV Resist)	10,000	0.8 - 1.1
General Solvent # 3 (currently storing glycol solutions)	10,000	0.8 - 1.1
General Solvent # 4	10,000	0.8 - 1.1
Waste Deep UV Resist/PGMEA (Formerly General Solvent 2)	10,000	0.8 - 1.1

Table 5-3 Physical Characteristics of Building 963 North Tank	
Shell Material	Stainless Steel
Shell Thickness	¼ inch
Diameter	108 inches
Length	19 feet
Seams	Welded
End Thickness	¼ inch
End Material	Stainless Steel
Nozzles and Inspection Openings	
Number	**Diameter (inches)**
4	4
1	8
1	10
2	24 (manhole)

5.4 CDC CONTAINER STORAGE SECONDARY CONTAINMENT TANK

As discussed in Section 4.3, a 3,000-gallon tank within the Empty Drum Storage Room in the CDC provides secondary containment for organic liquids stored in the CDC Waste Storage Room. Table 5-4 provides details of the tank servicing the CDC Waste Storage Room. The tank is located in a carbon-steel-lined vault within the Empty Drum Storage Room of the CDC building. The tank

is constructed of welded carbon steel, built and tested in accordance with U.L. 142 standards. The shell and ends are #7 gauge. See Figure D-2-C (Appendix D) for additional tank details. The tank rests on three standard carbon steel cradles.

Table 5-4
CDC Container Storage Secondary Containment Tank Capacity and Dimensions

Tank Name	Capacity (gallons)	Diameter (inches)	Length (inches)
CDC Container Storage Secondary Containment	3,000	64	216

5.5 TANK CORROSION AND EROSION

Four of the six organic waste tanks at the CDC and the waste tank at Building 963 are carbon steel tanks. Carbon steel is resistant to organic wastes that are stored at GLOBALFOUNDRIES. The Waste Deep UV Resist and Waste General Solvent 3 tanks are stainless (304) steel and are also resistant to the organics stored in them. These tanks are inspected to ensure proper operation. A discussion of the inspection procedures is provided in Section 7.4.

Any waste tank that is determined to be unfit for operation due to a leak or being otherwise unfit for use must be taken out of service. The tank must not be returned to service unless GLOBALFOUNDRIES has repaired the system and obtained a certification by a qualified independent Vermont licensed professional engineer in accordance with §7-108(d) of the Vermont Hazardous Waste Management Regulations that the repaired system is capable of handling hazardous wastes without release for the intended life of the system. This certification must be placed in the operating record and maintained until closure of the facility.

The CDC container storage secondary containment tank is carbon steel, which is resistant to the organic and inorganic materials that may be stored within the CDC Waste Storage Room. The tank is not used for routine storage and would only be used in the event of a release.

5.6 TANK MANAGEMENT PRACTICES

This section provides the tank management practices for GLOBALFOUNDRIES' two tank storage systems (i.e., the CDC tank farm and the Building 963 tank) and also for the CDC container storage secondary containment tank.

5.6.1 Tank Piping

5.6.1.1 CDC Tank Farm

Organic solvent wastes are pumped to the bulk tanks from the various manufacturing buildings through 2-inch pipes. (See Figure D-2-4 for a process flow diagram of the bulk tanks.) Wastes may also be received from the CDC Transfer Room. The CDC Transfer Room is described in Section 4.2.3.

When the tank levels reach a predetermined point, the tanks are pumped out and wastes are shipped to treatment, incineration, or reclamation facilities. (See Figure D-2-4, Appendix D for details of the tank farm piping.) Piping secondary containment is provided by double-walled piping and a pan-type system that discharges to the tank containment basins. Calculations are provided in Attachment 5-1 and Attachment 5-2 that demonstrate the ability of the secondary containment of the tanks and the piping containment pans to protect surrounding earth likely to come in contact with the waste if the waste is released from the system.

Details on the construction of the waste piping between the tank farm and the manufacturing facility (at Building 963) are provided in Figures D-2-11 through D-2-14. The waste piping route within the manufacturing buildings is shown in Figure D-2-16. Characteristic and listed wastes (n-Butyl acetate, IPA, ethylene glycol solutions, etc.) may be pumped to the Biological Waste Treatment Plant (BWTP) if the tank contents are determined to be treatable under the GLOBALFOUNDRIES National Pollutant Discharge Elimination System permit. The piping route from the CDC tank farm to the BWTP is shown in Figure D-2-15. The waste piping schematic for the tank farm is in Figure D-2-4.

The system as designed meets the requirements of 40 CFR 264.192 and 193, and 40 CFR 270.16 for new tank systems. The leak-detection monitoring system and the double-walled piping system provide adequate protection of human health and the environment. GLOBALFOUNDRIES provides secondary containment through the use of double-walled piping, flanges, welded joints and connections, and automatic shut-off devices for the piping system to safeguard the environment.

5.6.1.2 Building 963 North Tank

Organic solvent can be diverted from the various manufacturing buildings to the building 963 north tank (instead of being pumped to the CDC tank farm) in the event of a leak within the piping trestle, CDC, or CDC tank farm or to perform maintenance, repairs, or internal tank inspections within the trestle or CDC tank farm. Once the use of the tank is complete, the tank contents can either be pumped over to the CDC for storage in General Solvent #4, vacuumed out using a vacuum truck and brought to the CDC for storage, or vacuumed out directly to a tank truck for shipment to treatment, incineration, or reclamation facilities.

The waste piping schematic for the building 963 north tank is provided in Figure D-2-A. Piping secondary containment is provided by double-walled piping that discharges to the tank containment vault. The containment vault is designed at 170% of the tank capacity, as calculated in Section 5.6.6.3, which allows adequate protection to surrounding earth from both tank and waste piping releases.

The system as designed meets the requirements of 40 CFR 264.192 and 193, and 40 CFR 270.16 for new tank systems. The leak-detection monitoring system and the double-walled piping system provide adequate protection of human health and the environment. GLOBALFOUNDRIES provides secondary containment through the use of double-walled piping, flanges, welded joints and connections, and automatic shut-off devices for the piping system to safeguard the environment.

5.6.2 Level Controls

5.6.2.1 CDC Tank Farm

The six CDC waste tanks are equipped with liquid level sensors to monitor tank volume. The level sensors transmit a signal to the CDC Control Center where a digital display provides volume read-outs in gallons. High levels are indicated by warning lights on the tank control panel at the CDC Control Center. The high-level set point is approximately 70 percent of the tank volume or 7,000 gallons. Personnel in the Control Center monitor the tank control panel. In addition, a high level switch is mounted in one of the manways of the tanks that will shut a valve on the fill line to the tank in the event that the volume of waste in the tank exceeds 9,000 gallons.

5.6.2.2 Building 963 North Tank

The 9,000 gallon tank at Building 963 is equipped with a liquid level sensor. The level sensor transmits a signal to the Building 963 Chemical Control Center where a digital display provides volume read-outs in gallons. The tank has a high-level alarm which activates a pager notification when the volume in the tank reaches 5,000 gallons. The Building 963 tank is also equipped with a high-high-level switch that will stop the flow of waste to the tank if the volume of waste in the tank reaches 8,000 gallons. The building 963 tank level display and alarm are located in the Building 963 Chemical Control Center. Personnel monitor the level control daily when the tank is in use.

5.6.2.3 CDC Container Storage Secondary Containment Tank

The level in the CDC container storage secondary containment tank is monitored by liquid level sensors. The level sensors transmit a signal to the CDC Control Center. A pager notification is also activated when liquid starts to accumulate in the tank or containment vault. See Figure D-2-C (Appendix D) for details on the CDC container storage secondary containment tank.

5.6.3 Tank Venting

5.6.3.1 CDC Tank Farm

The six CDC waste tanks are equipped with 2-inch combination vacuum relief valves and flame arrestors made of carbon steel. All tanks are equipped with 6-inch emergency pressure relief vents made of aluminum with stainless steel trim and pallet.

5.6.3.2 Building 963 North Tank

The tank at Building 963 is equipped with a conservation vent and flame arrestor.

5.6.3.3 CDC Container Storage Secondary Containment Tank

The CDC container storage secondary containment tank is equipped with a 2-inch vent pipe of black steel.

5.6.4 Waste Shutoff

The six CDC waste tanks and the tank at Building 963 are equipped with manual and automatic valves to stop the incoming waste flow if a high level condition exists. (See Figures D-2-A and D-2-B for piping and instrumentation diagrams of the tanks).

5.6.5 Waste Transfer and Removal

5.6.5.1 CDC Tank Farm

Typically, when the tanks at the CDC tank farm reach a level of 8,000 to 9,000 gallons, the wastes are pumped to tank trucks for shipping to off-site treatment and reclamation facilities. The tanks are equipped with vertical multistage turbine type unloading pumps rated for 100 gallons per minute. The pumps are powered by 460-volt, 3-phase, totally enclosed vertical solid shaft, Class I, Group D motors. There is an unload pump for each individual waste tank mounted in the top of each tank. The pump controller switch locations are in the CDC Control Center and at the tank farm truck-loading station. Figure D-2-4 and D-2-7 (Appendix D) provides details of the tanker loading station. To ensure that hazardous wastes will not be stored for more than 1 year, the maximum waste volume stored in each tank within a 12-month period is turned over yearly.

Waste chemical piping in the tank farm is standard-weight black iron steel, ASTM A-53, Grade A, or Schedule 10 stainless steel with butt-welded joints.

5.6.5.2 Building 963 North Tank

The Building 963 tank is equipped with a vertical multistage turbine type unloading pump rated for 40 gallons per minute. The pump is powered by 480-volt, three-phase, totally enclosed vertical solid shaft, Class I, Group D motors. The pump is mounted in the tank top with the suction level extending to within 6 inches of the tank bottom. The remaining waste in the tank bottom is removed through the use of a vacuum truck or equivalent means. The operation of the pump is controlled by a power disconnect switch located by the tank pad. The tank is typically pumped out when it reaches 6,000 gallons. The waste is pumped to storage at the CDC. To ensure that hazardous wastes will not be stored for more than 1 year, the maximum waste volume stored in the tank within a 12-month period is turned over yearly.

5.6.5.3 CDC Container Storage Secondary Containment Tank

The CDC container storage secondary containment tank is equipped with a draw-off pipe that extends to within 3 inches of the tank bottom. The remaining waste in the tank bottom is removed through the use of a vacuum truck or equivalent means.

5.6.6 Secondary Containment

5.6.6.1 CDC Tank Farm

The waste tanks at the CDC tank farm are located in steel-lined, reinforced-concrete spill-containment basins. (See Figures D-2-6 and D-2-7, Appendix D, for details of the tank basins and spill control structures.) The basins are constructed of 3,000-pound-force per square inch gauge (psig) concrete lined with weathering steel. Each basin holds one or two tanks and provides a containment volume of 16,930 gallons.

Waste tanks are typically filled up to 9,000 gallons maximum prior to unloading. Thus a tank failure would typically result in a maximum of a 9,000-gallon spill, which would leave approximately 7,930 gallons in the containment basins for freeboard.

Run-on is prevented by a canopy roof that prevents the accumulation of precipitation in the secondary containment basins. Run-on is also prevented by basin walls which extend one foot above the surrounding area, the soil sloping away from the basins, and 6-inch sub drains. (Details of the secondary containment basins can be found in Figures D-2-6 and D-2-8 in Appendix D.)

The secondary containment basins are connected to a 74,052-gallon open-top reinforced-concrete spill-retention vault. For the layout of the containment basins and spill retention vault, see Figure D-2-7 in Appendix D. The spill retention vault is not considered part of the secondary containment system and is, therefore, not subject to Section 264.193 requirements. Instead, it provides tertiary containment that would be needed only in the event of flooding caused by the fire-prevention system.

5.6.6.2 Load/Unload Stations

The CDC tank farm load/unload station is contained in the trench system as shown on Figure D-2-7.

5.6.6.3 Building 963 North Tank

The Building 963 solvent waste tank is housed in an aboveground vault. The tank is situated within a steel-lined vault; thus, a tank failure would be contained by the vault. (See Figure D-2-2, Appendix D for details.)

The containment that the vault provides for the Building 963 tank is calculated as follows:

6.5 ft x 12.5 ft x 25.0 ft = 2,031.25 cubic feet

2,031.25 x 7.48 gallons/cubic foot = 15,193.75 gallons

Therefore the vault provides 168 percent of the volume of the tank.

The vault is equipped with a sump for spill collection and detection. A spill in the vault at Building 963 would be pumped by lowering a suction line into the sump. The suction line would be connected to a pump. The spill material would be transported for storage to the CDC tank farm or sent directly offsite for disposal.

ATTACHMENT 5-1

LATERAL MIGRATION TANK SYSTEM LEAKS

International Business Machines Corporation

Essex Junction, Vermont 05452
802/769-0111

August 23, 1990

Mr. John C. Miller
Hazardous Waste Management Program
Vermont Agency of Natural Resources
103 South Main Street
Waterbury, VT 05676

Dear Mr. Miller:

As you have discussed with Ray Mcintosh of IBM, Section 264.193 requires that secondary containment systems for tanks be able to contain the lateral as well as vertical migration of waste. IBM believes that the secondary containment system used at the tank storage facility will contain the lateral migration of wastes should a release occur.

Attached is a summary of the analysis ERM performed that demonstrates that the secondary containment for the IBM tank farm is able to contain the lateral migration of waste. Velocities of the waste stream from a leak were calculated to determine if a leak would travel outside of the secondary containment. The analysis showed that the maximum distance a waste stream could travel would be approximately 3.8 feet. The minimum distance from the secondary containment wall to the tank edge is five feet. Therefore, the secondary containment provides sufficient containment to prevent lateral migration of waste in the event of a leak occurring in the tanks.

I have included the engineering calculations associated with this determination as an attachment. If you have any questions on this, please feel free to call Ray Mcintosh at (802) 871-4272.

Sincerely yours,

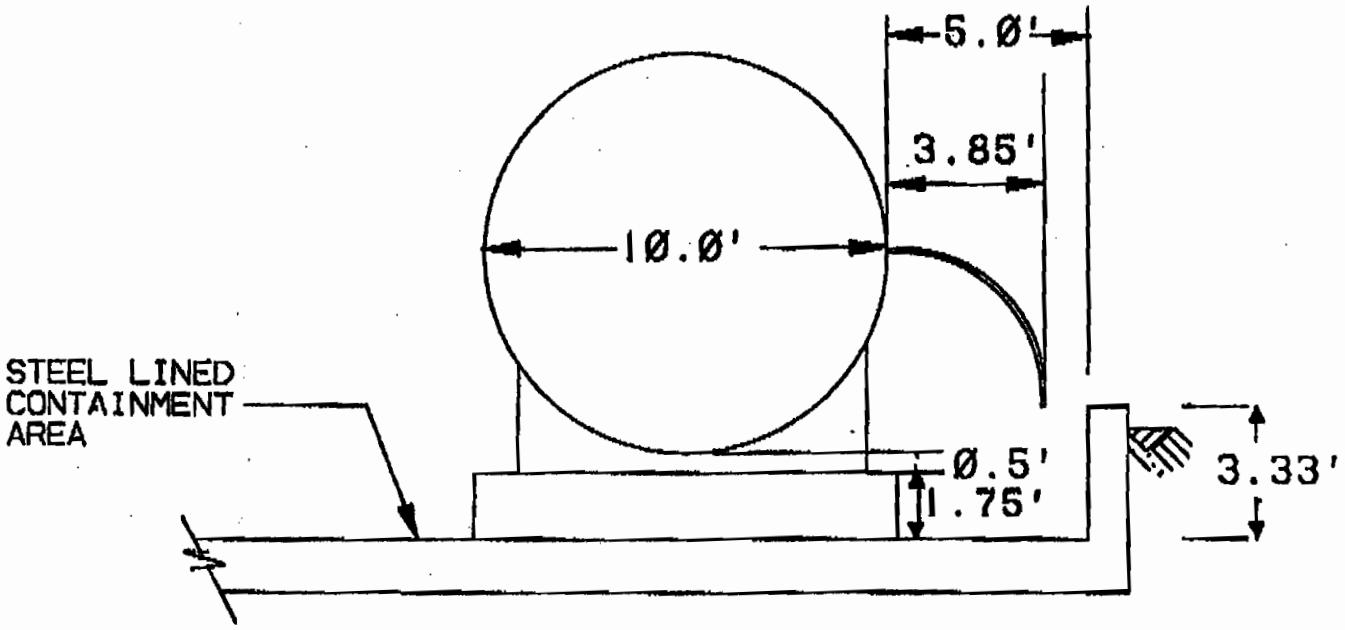
for D. Sargent

D. B. Sargent

DBS:bfb

ATTACHMENT

cc: J. Gallagher ERM



TANK LEAK FLOW DIAGRAM

ENGINEERING ANALYSIS OF LATERAL MIGRATION

The following engineering analysis was used to demonstrate that the secondary containment structures surrounding the waste tanks at the IBM tank farm will prevent the lateral migration of waste from the tanks in the event that a leak occurs. A worst-case scenario was used that assumed that a leak caused by would be a 1/4 inch diameter hole at the mid-point of the tank. The tanks are located in the secondary containment areas so the distance from the edge of the secondary containment structure to any tank is a minimum of five feet. The equation for flow through an orifice was used to approximate the flow from a leak in the tank wall.

The analysis was broken down into two parts. The first part determined the total time it would take a stream of waste to fall the distance from the leak to an elevation below the top of the secondary containment wall. This was calculated using the following formula:

$$d = 1/2at^2 + v_0t + d_0$$

where:

d = distance to top of dike wall (ft) =3'.33 ft
v_0 = initial downward velocity (ft/sec) = 0 ft/sec
d_0 = initial height of stream = 1.66' + 0.5' + 5' = 7.16'
a = acceleration due to gravity = -32.2 ft/s^2
t = time to fall from the leak to below the secondary containment wall

Rearranging this equation to solve for t:

$$t = ((7\ 16'-3.33')/(32.2)(1/2))^{1/2} = (3.833*2/32.2)^{1/2}$$
$$t = 0.487 \text{ sec}$$

The second part of the analysis determined the velocity of fluid travelling through the 1/4" diameter hole in the tank wall. The following equation was used to describe the volumetric flow rate of the fluid leaving the tank:

$$q = 0.0438\ (d_0)^2\ C\ (h_L)^{1/2}$$ (Crane Co., "Flow of Fluids Through Valves Fittings and Pipe", 1965)

where:

q = volumetric flow rate (cfs)
d_0 = orifice diameter (in.)
C = flow coefficient = 0.6 (ave.)
h_L = pressure drop across the orifice (ft of fluid)

This equation for q divided by the area, A, of the 1/4 inch diameter hole in the tank wall, gives the velocity, V, of the waste stream. This equation assumes that the density and viscosity of the fluid leaving the tank is approximately equal to water.

Since the maximum operating volume of the waste tanks is 9,000 gallons, the maximum level of liquid in the tanks will be 7.7'. This means that the maximum static head at the midpoint of the tank and the pressure drop across the orifice, h_L, will be:

7.7 ft - 5.0 ft = 2.7 ft

Therefore, the velocity, V, of the waste stream from the tanks will be:

$q = 0.0438\ (.25)^2\ 0.6\ (2.7)^{1/2}$
$q = 2.698 \times 10^{-3}$ cfs
A = area of 1/4" diameter orifice (sf) = 3.408×10^{-4} sf
V = q/A = 7.91 ft/sec

This means that the total distance travelled by the stream when it is at the same elevation as the top of the dike wall is

7.91 ft/sec x 0.487 sec = 3.85 ft

Since the minimum distance from the edge of the dike wall to the edge of the tanks is 5' 0", a lateral leak will be contained within the secondary containment structure (see attached drawing).

ATTACHMENT 5-2

PAN-TYPE SECONDARY CONTAINMENT FOR PIPING

ERM-New England, inc.

205 Portland Street • Boston, Massachusetts 02114 • (617) 742-8228

August 8, 1990

Mr. John C. Miller
Hazardous Waste Management Program
Vermont Agency of Natural Resources
103 South Main Street
Waterbury, Vermont 05676

Subj: IBM - Tank Farm Piping Secondary Containment

Dear Mr. Miller:

At the July 25, 1990 meeting held at IBM - Essex Junction on the recertification of IBM's RCRA permit, Ray McIntosh of IBM indicated that ERM would provide you with an explanation to show the adequacy of the pan-type secondary containment system used for the tank farm piping. This letter provides that explanation.

Regulatory Requirements

Auxiliary equipment, such as piping and pumps, associated with tank storage must have secondary containment (40 CFR 264.193(f)). The secondary containment must prevent any migration of wastes out of the system to the soil, ground water or surface water.

Secondary Containment Description and Hydraulic Analysis

Pipes within IBM's tank farm are secondarily contained by pans constructed under the pipes. The pans are made of welded stainless steel and are approximately seven feet, eight inches wide by six inches high. They are designed to contain spills or leaks from the tank farm piping and are sloped to drain and remove any liquids

A hydraulic analysis of the pans indicates that at the maximum flow rates supplied by the waste solvent transfer pumps (5 gpm), no wastes will escape over the sides of the pans prior to draining from the end of the pan into the secondary containment of the tanks. The analysis also showed that the flow that can be contained by the pans is greater than the flow that could be delivered by all of the waste solvent transfer pumps combined.

If you have any questions on this, please feel free to call me or Ray McIntosh at IBM.

Sincerely,

ERM-NEW ENGLAND, INC.

John W. Gallagher
Project Manager

JWG:nal:201-01

cc: Ray McIntosh, IBM

ERM-New England, Inc. 205 Portland Street • Boston, Massachusetts 02114 • (617) 742-8228

Project IBM
Subject PAN FLOWS
W.O. No. ____ Sheet ____ of ____
By ____ Date ____
Chkd. by VE Date 8/8/90

FOR FLOW $q = .0438\, d^2 \sqrt{\frac{h_L}{K_e + f\frac{L}{D}}}$

ASUME MAX L ≈ 50 FT

$q = 5$ gpm $= .668$ CFM $= .0111$ CFS

PANS ARE 6" HIGH BY 7 2/3' WIDE

ASSUME FLOW AT 1" HIGH

$d^2 = 4 \times 7.66 \times .08 \times 144 / \pi = 112.3$

$d^2 = 4 A / \pi$

$D = \sqrt{4A/\pi}$

$D = (4 \times 7.66 \times .08 / \pi)^{1/2} = .883$

ASSUME SHARP EDGED EXIT = $K = 1.0 = K_e$

HYD RADIUS $= .08 \times 7.66 / 7.66 + (.08 \times 2) = .0783$ FT

EQUIV DIAMETER $= d = 4 \times .0783 \times 12 = 3.75$ IN

RELATIVE ROUGHNESS $= \epsilon/D = .00017$

$\epsilon = .00015$ STEEL

$f = .013$

ASSUME LAMINAR FLOW

$$q = .0438 \times 112.3 \sqrt{\frac{.083}{1.0 + \frac{.013 \times 50}{.883}}}$$

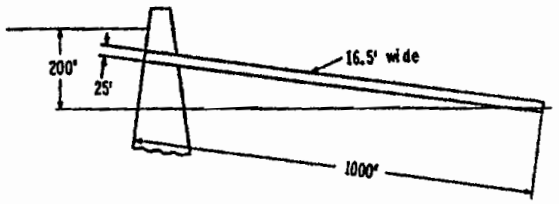
$q = 1.075$ CFS $= 482$ gpm

∴ FOR A FLUID IN THE PAN 1" THICK TRAVELLING FOR 50 FT IN THE PAN COULD HANDLE A FLOW OF 482 GPM.

Application of Hydraulic Radius to Flow Problems

Example 4-25 . . . Rectangular Duct

Given: A rectangular concrete overflow aqueduct, 25 feet high and 16.5 feet wide, has an absolute roughness (ϵ) of 0.01 foot.



Find: The discharge rate in cubic feet per second when the liquid in the reservoir has reached the maximum height indicated in the above sketch. Assume the average temperature of the water is 60 F.

Solution:

1. $$q = 0.0438\, d^2 \sqrt{\frac{h_L}{K_e + K_a}} = \sqrt{\frac{h_L}{K_e + f\frac{L}{D}}}$$ .....page 3-4

where;

K_e = resistance of entrance and exit

K_a = resistance of aqueduct

To determine the flow rate, calculate the equivalent diameters for actual flow area.

$$a = \frac{\pi d^2}{4}, \text{ therefore, } d^2 = \frac{4a}{\pi}$$

$$A = \frac{\pi D^2}{4}, \text{ therefore, } D = \sqrt{\frac{4A}{\pi}}$$

To determine the friction factor from the Moody diagram, an equivalent diameter four times the hydraulic radius is used; refer to page 3-5.

$$\text{hydraulic radius} = \frac{\text{cross sectional flow area}}{\text{wetted perimeter}}$$

$$R_e = 22\,700 \frac{q\rho}{d\mu}$$ .....page 3-2

2. $$d^2 = \frac{4a}{\pi} = \frac{4 \times 25 \times 16.5 \times 144}{\pi} = 75\,600$$

3. $$D = \sqrt{\frac{4A}{\pi}} = \sqrt{\frac{4 \times 25 \times 16.5}{\pi}} = 22.9$$

4. Assuming a sharp edged entrance,

$K = 0.5$ .....page A-26

Assuming a sharp edged exit to atmosphere,

$K = 1.0$ .....page A-26

Then, resistance of entrance and exit,

$K_e = 1.0 + 0.5 = 1.5$

5. Hydraulic radius $= \dfrac{16.5 \times 25}{2\,(16.5 + 25)} = 4.97$ ft

6. Equivalent diameter, $d = 4 \times 4.97 \times 12$

$d = 239$ in.

7. Relative roughness, $\epsilon/D = 0.0005$ ..page A-23

8. $f = 0.017$ .....{fully turbulent flow assumed; page A-23

9. $$q = 0.0438 \times 75\,600 \sqrt{\frac{200}{1.5 + \frac{0.017 \times 1000}{22.9}}}$$

$q = 31\,300$

10. Calculate R_e and check, $f = 0.017$ for 31 300 cfs flow.

11. $\rho = 62.34$ .....page A-6

12. $\mu = 1.1$ .....page A-3

13. $$R_e = \frac{22\,700 \times 31\,300 \times 62.34}{239 \times 1.1}$$

$R_e = 168\,400\,000$ or 1.684×10^8

14. $f = 0.017$ .....for calculated R_e; page A-24

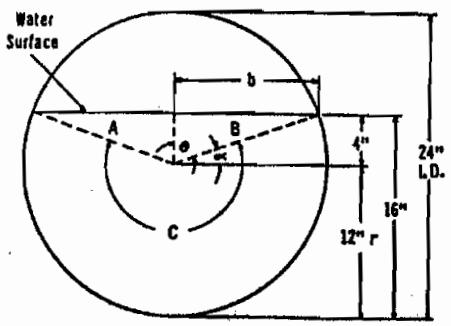
15. Since the friction factor assumed in Step *8* and that determined in Step *14* are in agreement, the discharge flow will be 31 300 cfs.

16. If the assumed friction factor and the friction factor based on the calculated Reynolds number were not in reasonable agreement, the former should be adjusted and calculations repeated until reasonable agreement is reached.

Application of Hydraulic Radius to Flow Problems — continued

Example 4-26...Pipe Partially Filled With Flowing Water

Given: A cast iron water pipe is two-thirds full of flowing water (60 F). The pipe has an inside diameter of 24 inches and a slope of ¾-inch per foot. Note the sketch that follows.



Find: The flow rate in gallons per minute.

Solution:

1. $Q = 19.65\, d^2 \sqrt{\dfrac{h_L D}{f L}}$ .....page 3-4

To determine the flow rate in a partially full pipe, calculate the equivalent pipe diameters for the actual flow area.

$$a = \frac{\pi d^2}{4}, \text{ therefore, } d^2 = \frac{4a}{\pi}$$

$$A = \frac{\pi D^2}{4}, \text{ therefore, } D = \sqrt{\frac{4A}{\pi}}$$

To determine the friction factor from the Moody diagram, an equivalent diameter four times the hydraulic radius is used; refer to page 3-5.

$$\text{hydraulic radius} = \frac{\text{cross sectional flow area}}{\text{wetted perimeter}}$$

$R_e = 50.6 \dfrac{Q\rho}{d\mu}$ .....page 3-2 or 3-8

2. Depth of flowing water equals:

$\frac{2}{3}(24) = 16$ in.

3. $\text{Cos } \theta = \dfrac{4}{r} = \dfrac{4}{12} = 0.333$

$\theta = 70°32'$

$\alpha = 90° - 70°32' = 19°28' = 19.47°$

4. $\text{Area C} = \dfrac{\pi d^2}{4}\left[\dfrac{180 + (2 \times 19.47)}{360}\right]$

$\text{Area C} = \dfrac{\pi 24^2}{4}\left(\dfrac{218.94}{360}\right) = 275 \text{ in}^2$

5. $b = \sqrt{r^2 - 4^2} = \sqrt{12^2 - 16} = 11.31$ in.

6. Area A = Area B = ½ (4 b) = ½ (4 × 11.31)

Area A or B = 22.6 in²

7. The cross sectional area of flow equals:

$A + B + C = 22.6 + 22.6 + 275$

$= 320.2 \text{ in}^2$

8. $d^2 = \dfrac{4a}{\pi} = \dfrac{4 \times 320.2}{\pi} = 408$

$D = \sqrt{\dfrac{4A}{\pi}} = \sqrt{\dfrac{4 \times 320.2}{\pi \times 144}} = 1.683$

9. $h_L = \Delta h = \dfrac{0.75}{12} = 0.0625$ ft per ft

10. The wetted perimeter equals:

$\pi d \left(\dfrac{218.94}{360}\right)$

or, $\pi\, 24 \left(\dfrac{218.94}{360}\right) = 45.9$ in.

11. Hydraulic radius $= \dfrac{320.2}{45.9} = 6.98$ in.

12. Equivalent diameter $d = 4 \times 6.98 = 27.92$ in.

13. Relative roughness $\dfrac{\epsilon}{D} = 0.000\,36$ ....page A-23

14. $f = 0.0155$ .....{assuming fully turbulent flow; page A-23

15. $Q = 19.65 \times 408 \sqrt{\dfrac{0.0625 \times 1.683}{0.0155 \times 1}}$

$Q = 20\,900$

16. Calculate the Reynolds number to check the friction factor assumed in Step *14*.

17. $\rho = 62.34$ .....page A-6

18. $\mu = 1.1$ .....page A-3

19. $R_e = \dfrac{50.6 \times 20\,900 \times 62.34}{27.92 \times 1.1}$

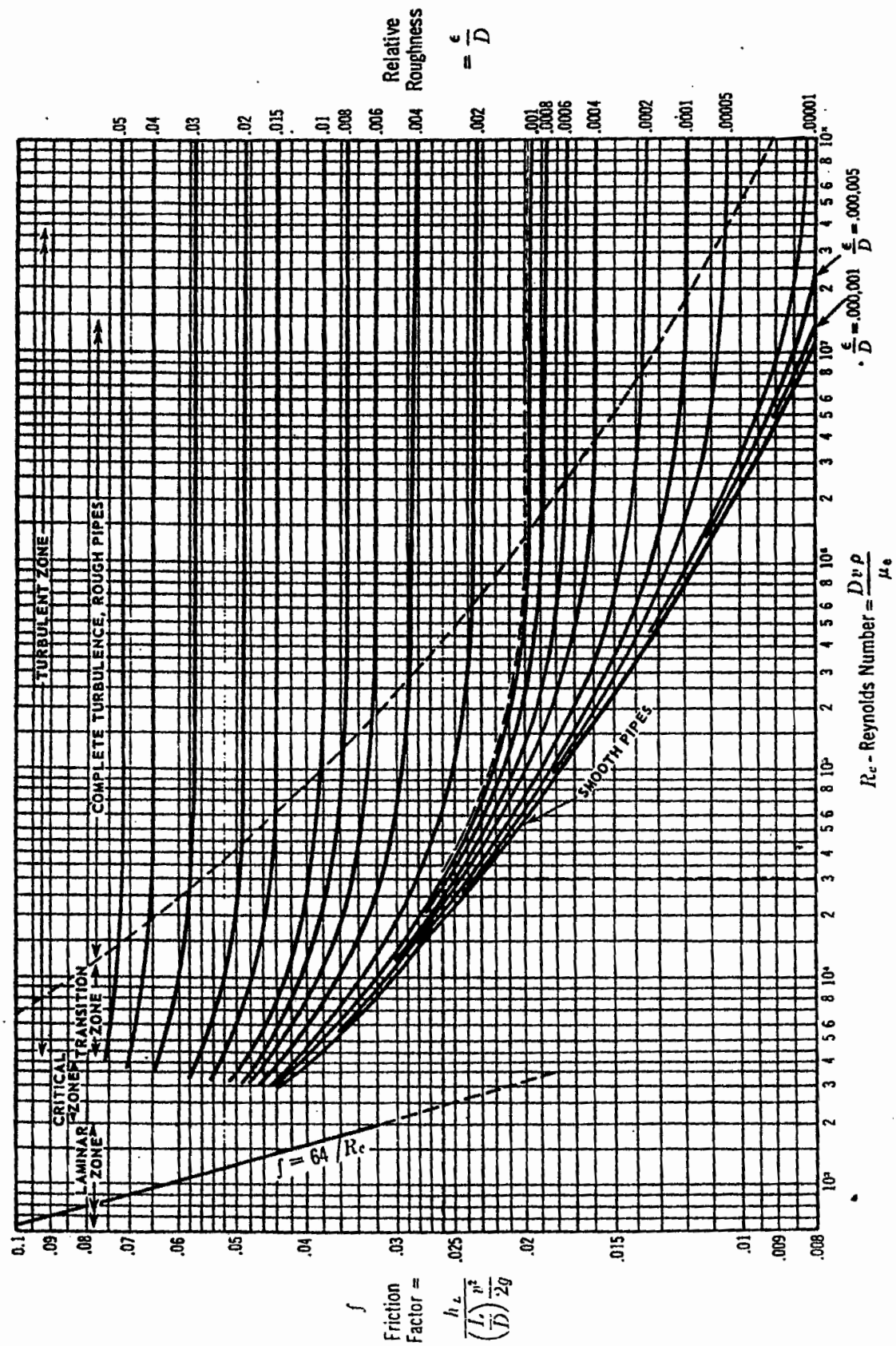
$R_e = 2\,150\,000$ or 2.15×10^6

20. $f = 0.0155$ .....page A-24

21. Since the friction factor assumed in Step *14* and that determined in Step 20 are in agreement, the flow rate will be 20 900 gpm.

22. If the assumed friction factor, and the friction factor based on the calculated Reynolds number, were not in reasonable agreement, the former should be adjusted and the calculations repeated until reasonable agreement is reached.

Friction Factors for Any Type of Commercial Pipe[18]



For other forms of the R_e equation, see page 3-2.

Data extracted from *Friction Factors for Pipe Flow* by L. F. Moody, with permission of the publisher, The American Society of Mechanical Engineers, 29 West 39th Street, New York 18, N. Y.

Problem: Determine the friction factor for 10-inch cast iron pipe (10.16" I.D.) at a Reynolds number flow of 30,000.

Solution: The relative roughness (see page A-23) is 0.001. Then, the friction factor (f) equals 0.026.

SECTION 6.0

SECURITY

6.1 INTRODUCTION

The GLOBALFOUNDRIES facility is secured and operated to prevent unknowing entry and to minimize the possibility of unauthorized entry of persons or livestock. The following sections outline the procedures and equipment GLOBALFOUNDRIES uses to provide security at the facility and meet the requirements of 40 CFR Part 264.14.

6.2 SITE ACCESS, SECURITY, AND SURVEILLANCE

The Security Department is staffed with trained personnel to enforce security measures onsite and to monitor movement into and out of the facility on a 24-hour-per-day basis. Security measures include the following:

1. Entry to the active portions of the facility is controlled.

2. Security guards patrol the entire facility. Random patrols are conducted. Surveillance cameras display in the Security Control Center, which is staffed 24 hours per day.

3. Gates are installed at entrances to GLOBALFOUNDRIES roads for access control.

4. Employees and contractors are required to wear identification badges at all times.

5. All visitors are escorted by their hosts.

6.3 CDC ACCESS, SECURITY, AND SURVEILLANCE

The Chemical Distribution Center (CDC) is secured by the following measures:

1. A 10-foot-high chain-link fence surrounds the CDC and tank farm to prevent unauthorized entry. Entry is obtained through an electronic badge lock or a controlled-access security key during non-working hours.

2. The tank farm, including the load/unload stations, is enclosed by chain link mesh. Gates and doors are locked whenever CDC personnel are not present. The load/unload stations have double swing gates at the ends of each station.

3. The fenced area, CDC, and tank farm are monitored by closed-circuit TV cameras.

4. Two doors at the CDC are equipped with electronic badge locks and all other exterior doors are equipped with alarms. All CDC container storage areas are within the CDC building.

5. To further control access, a special entrance is provided at the CDC for truckers. This entrance permits access to a restricted area that is equipped with a telephone to summon GLOBALFOUNDRIES personnel. After they are summoned by telephone, GLOBALFOUNDRIES personnel supervise the loading and unloading operation.

6. Signs that read “WARNING: AUTHORIZED PERSONNEL ONLY” are posted at each approach and entrance of the CDC building and tank farm. These warning signs may be read at a distance of 25 feet. “NO SMOKING” signs are posted in areas in which ignitable wastes are stored.

6.4 BUILDING 963 NORTH WASTE TANK ACCESS, SECURITY, AND SURVEILLANCE

The Building 963 north waste tank is secured by the following measures:

1. The Building 963 north waste tank is enclosed by chain link mesh. The gate is locked whenever authorized personnel are not present. Site security is also alerted by a silent alarm whenever the gate is opened.

2. The area is monitored by a closed-circuit TV camera.

3. A sign that reads “WARNING: AUTHORIZED PERSONNEL ONLY” is posted at the entrance into the fenced area. This warning sign may be read at a distance of 25 feet. A “NO SMOKING” sign is also posted outside the fenced area.

SECTION 7.0

FACILITY INSPECTION PROCEDURES

7.1 INTRODUCTION

GLOBALFOUNDRIES inspects the storage and treatment facilities and related systems regularly in compliance with 40 CFR Part 264.15 and Vermont Hazardous Waste Regulations Section 7-309 for malfunctions, deterioration, operational errors, and hazardous waste leaks that may lead to a release of hazardous waste to the environment or threaten human health. Records of these inspections are kept as part of the facility operating record for a minimum of three years.

7.2 INSPECTION SCHEDULE

Table 7-1 provides the written inspection schedule GLOBALFOUNDRIES has developed and follows for inspecting monitoring equipment, safety and emergency equipment, security devices, operating and structural equipment, storage equipment (tanks), and storage areas. The schedule includes inspections of the container storage areas in the Chemical Distribution Center (CDC), the Building 963 north tank, and the CDC tank farm.

7.3 CONTAINER STORAGE AREA INSPECTIONS

Container storage areas are inspected daily during regular business days for items listed in Table 7-1. Container storage area inspections are recorded on inspection logs or on an electronic version of the inspection logs entitled “Chemical Distribution Center Inspection Log,” “Flammable Waste Storage Area Waste Drum Inspection Log,” and “Transfer Room Inspection Log” which are attached in Appendix E.

Inspectors tour the container storage areas and check for proper container placement, storage height, evidence of container deterioration, aisle space, and leaking containers. The status of each inspection item is checked; appropriate remedial action is noted for inspection items with unacceptable status.

7.4 TANK INSPECTIONS

All GLOBALFOUNDRIES hazardous waste storage tanks are above ground. Six waste tanks are located in the Building 974 Chemical Distribution Center’s tank farm, and one waste tank is located at the north end of Building 963. Tank management practices are provided in Section 5.0. These tanks are protected by electrical heat tape, insulation, and metal jackets to ensure the wastes do not freeze. Because of this freeze-protection equipment, the exterior surface of the tanks is not visible for inspection. Tank wall integrity is determined by wall thickness measurements through ports provided for that purpose and internal tank inspections according to the procedure provided in Section 7.4.2, and through periodic inspections for leaks.

Tanks and secondary containment systems are inspected at least once each operating day as required by 40 CFR 264.195 for evidence of leaks at their exterior metal jackets, in containment areas, and at all aboveground pipes, valves, and fittings within the CDC Tank Farm. Overfilling is prevented by automatic liquid-level monitors and alarms. Liquid-level monitoring provides additional evidence of sudden drops in tank volumes. Operation of the liquid-level monitoring system and data generated by the system are checked at least once each operating day, and tank volumes are recorded. Proper operation of conservation vents and inspection of other tank-roof plumbing and catwalk areas are included in the inspection schedule listed in Table 7-1. Inspection results are recorded on an inspection log sheet or on an electronic version of the inspection log sheet attached in Appendix E.

7.4.1 Internal and External Tank Wall Inspections

General Solvent tanks 2 and 3 were replaced in 1997/1998, and the Building 963 north tank was replaced in 2009.

All waste tanks have had internal and external inspections performed under the direction of an independent professional engineer, following the procedures in Steel Tank Institute Standard SP001, “Standard for Inspection of Aboveground Storage Tanks" (4th Edition, 2006 or most recent). Tank interiors were inspected for wall thinning, scaling, pitting and corrosion of wall surfaces, butt-welded joints, and connections between tank walls and tank fittings. GLOBALFOUNDRIES also uses external tank wall thickness measurements to monitor loss of wall thickness and aid in the determination of the suitability for continued service of the tanks. The tanks were inspected most recently as follows:

- General Solvent tanks 1 and 4 were inspected in September 2007.
- The Deep UV tank was repaired, lined, and inspected in July 2010.
- The Mid UV tank was inspected in June 2014.
- Building 963 north tank was replaced in 2009, and the tank certification and associated inspection are included in Appendix A.
- General Solvent tanks 2 and 3 were inspected in 2011.

The above inspection reports are included in Appendix A.

Tank inspection reports will be retained in the facility operating record for a minimum of three years.

7.4.2 Future Tank Wall Inspections

Tank wall thickness tests (including both internal and external inspection) will be performed at a maximum interval of ten years on the hazardous waste tanks currently in use. The tests will be performed at this interval until the tests indicate that the next inspection should be performed sooner than the ten year test interval. When this condition occurs, the tanks with a recommendation

to perform an inspection prior to the ten-year test interval will be inspected based on the time interval recommended in the latest inspection report. Tanks that have been taken out of service due to a leak or being otherwise unfit for use will not be inspected, since they cannot be used until repairs and recertification are complete.

External tests will be performed by measuring the thickness of the tank through the inspection ports in the external insulation jackets, located on the sides of the tanks. Internal inspections will be performed by draining the tanks and entering the tank to monitor the interior thickness of the tank and to inspect the internal condition of the tank. By comparing the results of the previous tank thickness tests to the new data and looking at the internal tank condition, GLOBALFOUNDRIES and/or the independent professional engineer can determine the suitability for continued service of the tank and recommend when the next inspection should be performed.

If any tanks have to be replaced, the new tanks will be installed in accordance with the requirements of 40 CFR 264.192 - Design and Installation of New Tank Systems or Components. The testing schedule for new tanks will be conducted at intervals noted for existing tanks.

7.5 REMEDIAL ACTION

Equipment deterioration or malfunction observed during inspections will be remedied on a normal maintenance schedule when the observed problem will not result in the release of hazardous wastes and does not threaten human health or the environment. This will ensure that the problem does not lead to an environmental or human health hazard.

Where a hazard is imminent or has occurred, remedial action will be taken immediately following the procedures defined in the Contingency Plan. If necessary, notification of appropriate authorities will be made as described in the Contingency Plan. Every effort will be made to contain and remove any hazardous wastes that are released during an emergency. Affected areas will be decontaminated after the hazardous wastes are removed.

Table 7-1 Inspection Schedule			
Area / Equipment	**Specific Item**	**Types Of Problems**	**Frequency of Inspection**
Monitoring equipment	Liquid level transmitters (tanks)	Transmitter signal	Daily
	High level alarm	High level alarm condition	Daily
Safety and emergency	55-gallon drums (steel, stainless steel)	Corrosion, structural damage	Daily
	Emergency shower and eyewash	Water pressure, leaking, drainage	Daily
	Fire extinguishers	Needs recharging	Monthly
	Fire alarm system	Power failure	Annual
	Telephone system	Power failure	In regular use
	Public address (PA) system	Power failure, speakers	Annual
	Emergency lighting system	Backup power failure	Monthly
	First aid equipment and supplies	Items out of stock or inoperative	Weekly/As used
	Fire mains	Flow	Annual
	Sprinklers	Pressure, alarm reporting	Quarterly
Security devices	Storage tank fence	Corrosion, damage to chain link fence	Daily
	Storage tank gate and lock	Corrosion, damage to chain link fence, sticking or corroding, lock unlocked , locks, doors open	Daily
	Door controls and alarms	Power failure, inoperative, damaged, tampered with	Daily
Operating and structural equipment	Tank structural supports	Concrete deterioration and cracking	Daily
	Piping and valves	Leaks, corrosion or deterioration	Daily

Table 7-1 Inspection Schedule (continued)			
	Storage areas	Leaks, spills	Daily
Container waste storage room	Container placement and stacking	Aisle space, height of stack	Daily
	Sealing of containers	Open lids	Daily
	Labeling of containers	Improper identification, date missing, codes missing	Daily
	Containers	Corrosion, leaking, structural defects, bulging, dirty (soil)	Daily
	Segregation of incompatible waste	Storage of incompatible wastes in the same area	Daily
	Pallets	Damaged	Daily
	Base of foundation	Cracks, spalling, uneven settlement, erosion, wet spots	Daily
	Debris and refuse	Aesthetics, clogged drains	Daily
	Warning signs	Damaged, missing, illegible	Daily
	Incoming staging area	Trash, debris, visible signs of leaks	Daily when in use
	Lab packs	Improper identification, dates missing, labels missing	Daily
	Receiving area	Trash, debris, visible signs of leaks	Daily when in use
	Safety equipment	Missing, damaged	Daily
Flammable waste storage room	Container placement and stacking	Containers placed properly in pallets and on racks	Daily
	Sealing of containers	Open lids	Daily

Table 7-1 Inspection Schedule (continued)			
	Labeling of containers	Improper identification, dates missing, codes missing	Daily
	Containers	Corrosion, leakage, structural defects	Daily
	Segregation of incompatible wastes	Storage of incompatible wastes in the same area	Daily
	Debris and refuse	Aesthetics, clogged drains	Daily
	Secondary containment pallets	Damage, corrosion, indication of leaks	Daily
	Housekeeping	Trash, debris	Daily
	Safety Equipment	Missing, damaged	Daily
Tank storage area	Base, foundation or containment area	Cracks, uneven settlement, buckling, corrosion, wet spots, leaks, debris	Daily
	Eye wash	Frozen, schedule checked	Daily
	Warning signs	Damaged, missing, illegible	Daily
	Pipes	Leaks, corrosion or deterioration	Daily
	Valves	Leaks, corrosion or deterioration	Daily
	Fittings	Leaks, corrosion or deterioration	Daily
	Pump pad	Leaks, corrosion	Daily
	Secondary containment system	Indication of releases or spills	Daily
	Alarms	Any alarms or monitoring data generated indicating operation problems (including high level alarms)	Daily
Tanks (externally)	Ladder	Damaged, structural stability	Daily
	Foundation / structural supports	Cracks, uneven settlement, buckling, corrosion, wet spots	Daily

Table 7-1 Inspection Schedule (continued)			
	Pipe connections	External corrosion, cracks, distortion	Daily
	Tank cover	Malfunction of seals, corrosion	Daily
	Tank Bottom	Corrosion, discoloration, cracks, buckling	Daily
	Tank condition	Any indications of tank failure (corrosion) or spills of waste	Daily
	Tank walls	Loss of metal thickness	Per Section 7.4.2
	Anchor Bolts	Distortion, corrosion	Daily
	Nozzles	Cracks, corrosion	Daily
	Cat walks	Corrosion, distortion, grates out of position	Daily
	Tank closure devices	Organic emissions	Annual (see Section 11.0)
Tanks (internally)	Tank condition	Any indications of tank failure (corrosion)	Per Section 7.4.2
	Tank walls	Loss of metal thickness	Per Section 7.4.2
Tank System Ancillary Equipment	Pipes, Pumps, Valves, Fittings	Organic emissions	Per Section 11.0

SECTION 8.0

PREPAREDNESS AND PREVENTION

8.1 INTRODUCTION

GLOBALFOUNDRIES' hazardous waste storage facility is designed, maintained, and operated to minimize the possibility of a fire, explosion, or any other unplanned sudden or non-sudden release of hazardous waste to the air, soil, or surface water.

8.2 INTERNAL AND EXTERNAL COMMUNICATION SYSTEMS

The entire GLOBALFOUNDRIES site is equipped with telephones for internal and external communications and a central public address system for general and emergency announcements. The Chemical Distribution Center (CDC) has its own public address systems for emergency announcements. All GLOBALFOUNDRIES personnel have access to telephones to communicate emergencies. Security and Emergency Services personnel are supplied with hand-held two-way radios. A central GLOBALFOUNDRIES paging system provides immediate summons through FM transmission to personnel who carry receivers. This paging system is activated by telephone. The CDC public address system is shown in Figures D-2-H and D-2-K.

8.3 FIRE DETECTION AND CONTROL EQUIPMENT

Fire extinguishers are inspected monthly and maintained by the GLOBALFOUNDRIES Emergency Services Department in compliance with the National Fire Protection Association Standard 10 to assure that they will operate properly in a time of emergency. Each portable fire extinguisher is numbered, and assigned locations are inspected monthly. A computer inventory of the status of all fire extinguishers, including those at the storage units, is maintained by the Emergency Services Department. Fire mains have adequate water pressure and volume to supply the building sprinkler systems. Fire mains are flow tested annually and sprinkler system pressure and alarm reporting is inspected quarterly. The public address system is also tested during annual evacuation drills, and fire detection systems are tested annually. Self-contained breathing apparatus is inspected monthly by the Emergency Services Department.

Fire protection systems for the CDC building and the CDC Tank Farm are shown in Figures D-2-G, D-2-I, D-2-J, D-2-K, and D-2-L. The figures show locations of fire protection devices, evacuation routes, eyewashes, sprinkler systems, and detection systems.

8.4 PREPAREDNESS AND PREVENTION DURING LOAD/UNLOAD OPERATIONS

Two types of loading and unloading operations occur at GLOBALFOUNDRIES: bulk unloading of hazardous waste from CDC storage tanks, and loading of liquid and solid hazardous waste stored in containers. For all deliveries and shipments, truck wheels are chocked and, where appropriate, vehicles are grounded to ensure safe operations.

8.4.1 CDC Tank Farm and Building 963 North Tank

A heat-actuated water-deluge system protects the CDC tank farm and the tank farm's two load/unload areas. Load/unload areas at the CDC are protected by two interconnected steel-lined secondary containment vaults with a total volume of 22,015 gallons. A large fire extinguisher mounted on a hand truck is positioned at the load/unload area. Ramp areas are concrete structures with room for transport access. The load/unload area at the north end of Building 963 is protected by a concrete secondary containment vault. The vault is lined as described in Figure D-2-3. The Building 963 north tank is protected with an automatic sprinkler system.

8.4.2 Containers

Containers within the CDC are loaded and unloaded with gas- or electric-powered forklifts that are rated as Double E (no source of ignition). Single container transfers are made with forklifts fitted with drum-handling devices.

The CDC is equipped with a truck dock and adjustable metal ramp. This dock and ramp allow safe and efficient loading and unloading of containers with forklifts. The truck dock is spill-contained. Refer to Figure D-2-D.

The aisle space allowed for use by the forklift trucks in the configuration described in Figure D-1-1 is 9 feet 6 inches minimum. The forklift trucks have unobstructed movement all along the aisles. Movement of containers is easily accomplished in the configuration. Emergency equipment (other than the building sprinkler system) is hand carried or moved through the use of forklift trucks. The aisle spaces allow easy access to all areas.

8.5 RUNOFF CONTROL

No runoff from GLOBALFOUNDRIES' hazardous waste management areas will occur. Containers are managed within GLOBALFOUNDRIES' buildings, and the CDC tank farm and the Building 963 north tank are covered to prevent the accumulation of precipitation and generation of runoff. GLOBALFOUNDRIES' storage facilities are not in the 100-year flood plain.

8.6 PREVENTION OF CONTAMINATION OF WATER SUPPLIES

Contamination of potential water supplies, including surface water and groundwater, is prevented by steel-lined spill containment for tanks. These are located at the CDC, the CDC tank farm, the Building 963 north tank, and the CDC load/unload areas. Details of these systems and GLOBALFOUNDRIES' procedures are provided in Sections 2.0, 4.0, and 5.0.

8.7 MITIGATION OF EQUIPMENT FAILURE AND POWER OUTAGES

A 325,000-watt diesel electrical generator, which starts automatically, protects the CDC from electrical power failure. Pumps, tank liquid level indicators, public address systems, power

exhausts, alarms, heat tapes, and lighting at the CDC are powered during an electrical interruption. This emergency unit is capable of supplying full electrical service to the CDC. It is inspected and maintained by GLOBALFOUNDRIES' Facilities Department or contractors. The diesel generator is tested periodically to ensure it works properly.

8.8 PERSONNEL PROTECTION PROCEDURES

GLOBALFOUNDRIES employees who may come in contact with hazardous waste are provided with the following safeguards:

- Work areas are equipped with eyewashes and emergency showers (See Figures D-2-G and D-2-K).

- Self contained breathing apparatus (SCBAs), telephones, fire alarms, fire extinguishers, sprinkler systems, fire hoses, and public address systems are available as provided in Section 9.0 - Contingency Plan (see Figures D-2-G, D-2-H, D-2-I, D-2-J, D-2-K, and D-2-L).

Locations of spill response materials and equipment are shown in Figures D-2-E and D-2-F.

All personnel are properly trained, including participation in internal chemical safety courses. All personnel wear appropriate personal protective equipment whenever operations are performed which might result in employee exposure to hazardous waste. Employee work areas are well ventilated; emergency power venting is provided where toxic gases may be present. OSHA requirements in 29 CFR 1910 Subpart I - Personal Protective Equipment are met at this facility.

8.9 MANAGEMENT OF IGNITABLE WASTES

Bulk tanks at the CDC and drums in the CDC's flammable waste storage room are used to store ignitable wastes. These ignitable wastes are compatible with their containers and are stored to prevent contact with materials or conditions that may cause the waste to ignite. Additional container management practices can be found in Section 4.0.

No smoking or open flames are permitted near stored ignitable waste. Signs warning against smoking and the presence of unauthorized personnel are posted. Spark-proof tools are used when working with containers of ignitable wastes. The ignitable wastes stored are listed in Section 3.0.

Figures B-1 and B-6 demonstrate that all of GLOBALFOUNDRIES' ignitable waste is stored at least 15 meters (50 feet) from the site's property line. Ignitable wastes stored in tanks meet the buffer zone requirements for stable liquids (operating pressure 2.5 pound-force per square inch gauge [psig] or less) found in the National Fire Protection Association's 1980 "Flammable and Combustible Liquids Code" (NFPA 30-21, Table 2.1) for horizontal tanks with emergency relief venting. These storage tanks are designed to relieve pressures and vacuums in excess of 0.5 psig. The GLOBALFOUNDRIES Emergency Services Department provides primary emergency response to the CDC tank farm; additional support may be requested from local municipal

departments. Details on the tank farm, including tank construction and buffer zones, can be found in Section 5.0.

8.10 MANAGEMENT OF INCOMPATIBLE WASTES

Waste-generating departments or areas fill out a Chemical Waste Disposal Authorization (CWDA) Form and submit the form to the hazardous waste engineer or hazardous materials coordinator for review and approval (bulk waste streams are piped directly to storage tanks and are reviewed for handling during the design of processes). Compatibility of the waste being generated and the container to be used to store the waste is evaluated during the CWDA review process. The CWDA form used to authorize the disposal of chemicals is included in Attachment 3-1. Further information regarding waste handling may be found in Section 3.2.1.

8.10.1 Management of Incompatible Wastes in Containers at the CDC

Containers storing wastes that are incompatible with wastes in other containers stored at the CDC are segregated within the room. In the event of a release, liquid organic waste would be contained in a 3,000-gallon spill tank located in the Empty Drum Room. Liquid acids, liquid caustics, poisons, and PCB materials are segregated from liquid organics and each other through the use of spill containment pallets (see Section 4.3.4).

At the CDC, ignitable wastes are stored in the flammable waste storage room and are protected by pallet containment trays and fire walls.

At no time shall hazardous waste be placed in an unwashed container that previously held an incompatible waste or material.

Additional container management practices can be found in Section 4.0.

8.10.2 Management of Incompatible Waste in Tanks

Wastes stored at the CDC tank farm and at the Building 963 north tank are compatible with the tank material. These wastes are separated for reclamation and treatment purposes only. Each waste stream has a separate piping system (see Section 5.0). These tanks are routinely inspected to ensure safe operation.

Wastes transferred to the bulk storage tanks through the CDC transfer room are evaluated for compatibility during the CWDA review process.

8.11 MANAGEMENT OF REACTIVE WASTES

No reactive wastes are stored in the waste storage tanks. Any reactive wastes in containers are stored at the CDC to protect them from any materials or conditions that may cause them to react.

SECTION 9.0

CONTINGENCY PLAN

9.1 INTRODUCTION

This Contingency Plan describes the actions to be taken by GLOBALFOUNDRIES personnel in response to fires, explosions, or the release of hazardous waste. Copies of the Contingency Plan are kept electronically. Hardcopies are also available at the CDC and with the emergency services organization.

Additional information has been included in this plan to meet the requirements of 40 CFR 270.14(b)(7) and 264 Subpart D. The Contingency Plan will be amended whenever the facility's permit is revised, the plan fails in an emergency, changes in the facility's operations alter the plan, or changes occur in the list of emergency coordinators or emergency equipment. The hazardous waste engineer is responsible for these changes and for ensuring that all copies are up to date.

9.2 GENERAL INFORMATION

The Vermont facility is owned and operated by GLOBALFOUNDRIES U.S. 2 LLC whose headquarters are located in Santa Clara, CA. The Vermont facility is a manufacturer and developer of semiconductors for a variety of electronic applications. The facility is located in Chittenden County in the Town of Essex, the Village of Essex Junction, and the Town of Williston, Vermont. The Contingency Plan has been sent to local emergency organizations. Documentation regarding the distribution of the Contingency Plan can be found in the facility operating record. Agreements with local authorities are included in Attachment 9-1. The agreements include UVM Medical Center (formerly Fletcher Allen Health Care Center), Essex Rescue, Williston Police Department, Essex Police Department, Essex Junction Fire Department, and Williston Fire Department.

Chemical spill control for the GLOBALFOUNDRIES site is coordinated by the Emergency Services Department, located in Building 900. All releases of chemicals within the manufacturing areas, including satellite accumulation sites, are responded to and controlled by the procedures, personnel, and equipment detailed in the various sections of this Contingency Plan. This assures that control of all chemical clean-up and disposal is exercised by trained personnel who are properly equipped and informed of all hazardous waste handling and reporting procedures.

9.3 EMERGENCY COORDINATORS

Emergency coordination for the entire GLOBALFOUNDRIES site is provided by the Emergency Services Department on a 24-hour-per-day, seven-day-per week-basis. On-duty Emergency Responders may be reached at any time by telephoning the Security Dispatch Center at (802) 769-2222.

Emergency coordination is managed by Mr. James Mulligan Director of Environmental Health Safety and Security. Mr. James Mulligan or other managers who cover emergency operations in his absence, have the authority to commit GLOBALFOUNDRIES resources that are required to implement this Contingency Plan. A Duty Manager list is available to the Security Dispatch Center and Emergency Services Department for weekend and holiday coverage. Covering managers are available 24 hours per day, seven days per week. The Emergency Services Department has the primary role of emergency coordination.

Home address and home and business telephone numbers for Mr. Zachary Peatman are as follows:

NAME	ADDRESS	HOME/CELL PHONE	OFFICE PHONE
James Mulligan	17 Copperfield Drive Waterford, NY 12188	1-518-326-6992	1-518-305-6176 1-518-366-4521

Should a fire, explosion, or other incident with the potential to release hazardous waste and which may threaten human health or the environment occur at GLOBALFOUNDRIES, Chemical / Environmental Programs personnel will respond and provide assistance for control of hazardous waste releases and corrective actions. Emergency personnel are familiar with the Contingency Plan, site operations and activities, storage and characteristics of site hazardous waste, and the hazardous waste management facility layout.

9.4 IMPLEMENTATION OF THE CONTINGENCY PLAN

This Contingency Plan will be implemented whenever a fire, explosion, or other incident threatens to or actually ignites hazardous waste, releases toxic liquids, vapors, or gases, or causes soil, ground, or surface water contamination outside of the facility.

9.5 EMERGENCY RESPONSE PROCEDURES – INTERNAL NOTIFICATION

Emergencies are reported to Emergency Services personnel by dialing 3-3333, from a GLOBALFOUNDRIES internal telephone, or 769-3333 from an external telephone. Upon receiving an emergency call, the Security Dispatch Center notifies on-duty Emergency Services personnel, who in turn respond to the scene, perform an evaluation, and initiate actions to mitigate the incident. If additional resources are required, the Emergency Responder will request activation of the Emergency Response Team and Emergency Medical Team and will summon staff via radio dispatch system or the public address system. Additional resources may also be requested from the building operations team via telephone. Based on the nature of the incident, personnel from the following areas may be requested to provide technical support: Integrated Health Services, Site Operations Engineering, Chemical / Environmental Programs, and other departments as needed.

For a fire or an explosion involving hazardous wastes, the Emergency Responder will report the fire per the incident notification matrix to the dispatch center and request additional resources from the appropriate local fire department. Upon arrival of support units, a unified command will be established and all incident activities will be managed via this command system.

The Emergency Responders are trained to the level of Hazardous Material Technician/Incident Command under 29 CFR 1910.120. For incidents involving the release of hazardous wastes, the Emergency Responder notifies Facilities Maintenance and the Spill Control Engineer. Equipment, personnel, or outside contractors are brought in to remove the hazardous waste and to decontaminate the affected area. Upon completion of the emergency response, hazardous substances, health hazards, and materials contaminated with them (such as contaminated soil or other elements of the natural environment) at the site of the incident are assessed and removed as required. GLOBALFOUNDRIES shall conduct the cleanup using GLOBALFOUNDRIES employees or outside contractors trained in accordance with 29 CFR 1910.120.

9.6 IDENTIFICATION OF HAZARDOUS WASTES

In an emergency, hazardous waste will be identified by the storage area where the release occurs, and by the chemical name and/or hazard label on tanks, drums, and pipes.

9.7 ASSESSMENT

The Emergency Responder, with assistance from the Site Environmental and/or Integrated Health Services Departments and the Spill Control Engineer where required, will establish the identity, quantity, source, and extent of the release and will assess the possible hazards associated with the release of hazardous waste or a fire or an explosion involving hazardous waste. This assessment will include the extent of soil and groundwater contamination, the effects of any toxic, irritating, or asphyxiating gases generated, and the effects of any hazardous surface run-off from water or other agents used to control fire or explosion.

9.8 EXTERNAL NOTIFICATION

If the emergency creates an imminent hazard to human health outside of the site property limits, the Emergency Responder will notify the appropriate local fire department chief and inform the appropriate GLOBALFOUNDRIES management. The Emergency Services Department manager or, in her/his absence, the covering manager will inform local officials and provide help to those officials to decide if evacuation of local areas is required.

Depending upon the extent and quantity of hazardous waste released, the appropriate federal, state, and local officials listed in Table 9-1 are notified. Notification will be made within 24 hours, giving the following information:

1. Name and telephone number of the reporter.
2. Name and address of the facility.

3. Time and type of incident.
4. Name and quantity of materials involved, to the extent that this information is known.
5. The extent of any injuries.
6. The hazards to human health or the environment outside of the property limits.

Table 9-1 Emergency Notification	
Organization	**Telephone Number**
National Response Center	800-424-8802
Vermont Emergency Management (24-hour emergency number)	800-641-5005
Essex Junction Fire Department	878-6944 (or 911)
Essex Police Department	878-8331 (or 911)
Williston Police Department	878-6611
Essex Rescue	878-4859 (or 911)
UVM Medical Center (MCHV Main Campus - Radio Room)	847-2434
Williston Fire Department	878-5622
GLOBALFOUNDRIES Security Department	769-2558
NOTE: The National Response Center notifies the EPA regional office of calls it receives.	

9.9 CONTROL PROCEDURES

Potential events that might threaten human health or the environment outside of the facility and involve hazardous waste are summarized as follows:

1. A fire or an explosion at the Chemical Distribution Center (CDC);
2. A fire or an explosion at a hazardous waste storage tank;
3. A release of hazardous waste from containers stored within the CDC; or
4. The release of hazardous waste from a hazardous waste storage tank.

Areas affected by a fire, explosion, or a release of hazardous waste will remain inoperative until decontamination and repairs have restored the area to its normal operating capacity.

Control procedures for each of those events are outlined below.

9.9.1 Fire or Explosion within the CDC

The CDC is protected by sprinkler systems, fire hoses, fire extinguishers, smoke detectors, sprinkler-system flow and manual fire alarms, fire walls and doors, and a 2,000-gallon foam system for the flammable storage room. The building can be approached easily by fire-fighting and other emergency equipment. If a fire occurs within the CDC, notification will be made to the Security and the Emergency Services Departments by one of the following methods:

1. Employee telephone call to the emergency extension.
2. Automatic alarms activated by either water flow in the sprinkler system or smoke or flame detectors.
3. Employee-activated fire alarms, pull stations.

If notification comes from an automatic alarm or fire alarm pull station, audible and visible alarms will automatically initiate an evacuation of the area. If notification comes by phone to the Security Dispatch Center, employees are instructed by the public address system to evacuate the building. During any emergency at the site, primary actions will be taken to preserve human health and life; efforts to protect the environment will be a secondary consideration. Emergency Services will respond to the scene and assess the extent of the fire. Emergency Services, with the assistance of local agencies as needed, will control and extinguish the fire. Emergency Services will assist the local fire chief in deciding if evacuation of local residences is required.

If an explosion occurs without a related fire, Emergency Services will contain the release of hazardous waste with commercial absorbents or other methods until the arrival of the Spill Control Engineer. Fire-fighting equipment will be used to prevent the ignition of ignitable hazardous waste. The Spill Control Engineer or other responsible personnel will assist with equipment, personnel, and/or contract resources to remove released waste and decontaminate the affected area.

9.9.2 Fire or Explosion at a Hazardous Waste Storage Tank

Hazardous waste storage tanks at the CDC tank farm are protected by a water deluge system that can be operated from the exterior of the CDC building, and the tanks are spill-contained for the volume of hazardous waste stored. A dry sprinkler system is installed to protect the Building 963 north above-ground waste tank, which is also spill-contained. A fire or an explosion at either type of hazardous waste storage tank will be controlled with the following procedure. The Emergency Responder will arrive at the scene of the fire or explosion and evacuate nearby areas. Concurrently, Emergency Services will assist the local fire chief in deciding if evacuation of local residences is required. When the fire is extinguished or when an explosion does not result in a fire, the Spill Control Engineer will assist the Emergency Responder in determining the character, quantity, source, and the extent of the hazardous waste release. The Spill Control Engineer or other responsible personnel will assist with equipment, personnel, and/or contract resources for the removal of hazardous waste and the decontamination of affected areas.

9.9.3 Hazardous Waste Release within the CDC

Hazardous waste storage areas within the CDC are spill-contained as follows (see Section 4.3 for more details):

- Organic liquids in the CDC waste storage room are contained by a 3,000-gallon storage tank connected to floor drains;
- Liquid acids, liquid caustics, poisons, and PCB wastes in the waste storage room are contained by use of spill-containment pallets;
- Wastes in the flammable waste storage room are contained by use of spill-containment pallets.

Whenever a container leak is discovered, CDC personnel will respond in a defensive fashion. The Emergency Responder is summoned to the scene to manage the released waste and to decontaminate the affected area. The Emergency Responder and/or the Integrated Health Services Department will determine if power venting or self-contained breathing apparatus are required to control and remove toxic hazardous wastes. If waste is found to be leaking from a damaged container, the waste will be secured in an overpack drum or containment vessel, or transferred to spare containers that are stored at the CDC. This transfer will be made with container-handling equipment that is normally used at the CDC.

The end point of emergency response (including decontamination) will be determined on a case-by-case basis by Emergency Services personnel. Spilled material will be removed within 24 hours or as soon as practicable.

9.9.4 Release of Hazardous Waste from Storage Tanks

All hazardous waste storage tanks at GLOBALFOUNDRIES are spill-contained within steel containment structures. The containment is provided for 150% of the volume of the tanks. These tanks have no bottom fittings or ports; all plumbing connections are made at the tops of the tanks. If a release occurs at a storage tank, the Emergency Responder will determine the site of the release. If the rupture or leak can be isolated to a fitting, valve, pump, or other ancillary equipment, flow to the tank will be stopped, and the failed unit will be replaced. Should the release occur from the tank walls, the contents will be transferred to a spare tank with a pump or vacuum trailer unit. In most cases this tank will be the Building 963 north tank, if it is not in use at the time. If the Building 963 north tank is in use, special provisions can be made to transfer the waste to an undamaged tank at the CDC. Specifications for the CDC tanks and for the Building 963 north tank are included in Section 5.0. The damaged tank will remain out of service until it is repaired, or the tank will be replaced. Emergency response may consist of temporary patching materials being added to the tank to stop or reduce the amount of material leaving the tank to the containment. Emergency Services has equipment on hand to accomplish this task, and trains regularly in its operation.

No contingency is provided for collisions with mobile equipment because mobile equipment cannot be operated near these tanks. Valves in the secondary containment system are closed and

locked unless the system is being drained. Leaks in the containment are repaired immediately. Transfers of hazardous waste from storage tanks at the CDC tank farm and the Building 963 north tank occur at load/unload stations, which are spill-contained. Should a release occur during loading/unloading of a hazardous waste, spill containment located at the CDC or Building 963 station will collect the liquid waste. Either the GLOBALFOUNDRIES vacuum trailer or a similar device provided by a local hazardous waste spill control firm would be used to remove the waste from the containment. Commercial absorbents would be used to remove any residue in the concrete containment areas. GLOBALFOUNDRIES Emergency Services Department personnel will stand by with appropriate fire-fighting equipment during the cleanup operation to prevent ignition of the released waste and assure proper handling of flammable wastes. Collected liquid waste will be transferred to containers or a spare tank located either at the CDC or at Building 963 north tank. Contaminated absorbents will be placed in approved drums for eventual disposal at an appropriate hazardous waste treatment or disposal facility. The end point of emergency response (including decontamination) will be determined on a case-by-case basis by Emergency Services personnel. Spilled material will be removed within 24 hours or as soon as practicable.

9.10 PREVENTION OF RECURRENCE OR SPREAD OF FIRES, EXPLOSIONS, OR RELEASES

During an emergency, the Emergency Responder, in consultation with the Emergency Coordinator, will take every reasonable action to prevent the occurrence, recurrence, or expansion of fire, explosion, or hazardous waste release. This action will include the transfer or isolation of containers, the ceasing of operations or processing, or the collection or containment of released hazardous waste. Lift stations pumping solvent waste from manufacturing tools into the bulk waste systems have high level alarms to prevent overflow of waste chemicals in the manufacturing areas as the result of a CDC shutdown. Pneumatically actuated valves in the solvent waste manifold upstream of the Building 963-Building 974 trestle are programmed to automatically divert bulk solvent waste flow to the Building 963 north tank when a leak detection alarm in the trestle is not cleared within a specified time.

9.11 STORAGE AND TREATMENT OF RELEASED MATERIAL

Recovered hazardous waste and hazardous waste generated during the cleanup and decontamination process will be packaged in drums and/or tankers for shipment to permitted off-site waste management facilities. If sufficient storage capacity is not available on the site, transport vehicles will be arranged on an emergency basis through existing agreements between GLOBALFOUNDRIES and transport/disposal vendors.

9.12 INCOMPATIBLE WASTES

In the event of an emergency, wastes that may be incompatible with released materials will remain segregated until cleanup procedures have been completed.

9.13 CONTAINER SPILLS AND LEAKS

Container spills and leaks have been addressed in earlier parts of this section.

9.14 TANK SPILLS AND LEAKAGE

Tank spills and leakage have been addressed in earlier parts of this section.

9.15 WASTE PILES

GLOBALFOUNDRIES does not operate a hazardous waste pile. Therefore, this section does not apply.

9.16 DISPOSAL OF CONTAMINATED MATERIAL

Contaminated materials will be analyzed, if necessary, and if characterized as hazardous, they will be properly manifested and sent to an approved disposal facility. Attachment 9-2 provides the procedure used by the Emergency Services Department for decontamination of equipment used during emergency response; this document is attached for reference only and may be changed or updated outside the permit modification process.

9.17 EMERGENCY EQUIPMENT

This section lists and describes emergency equipment available at GLOBALFOUNDRIES. The kinds of equipment described are (1) communications, (2) first aid, (3) emergency vehicles, (4) electrical, (5) generators, and (6) fire (GLOBALFOUNDRIES and local). Building locations may be found in Figure B-6.

9.17.1 Communication Equipment

9.17.1.1 Public Address System

The public address system is a general coverage type. The primary voice distribution amplifiers are located in Building 965 with additional paging amplifiers in all major buildings on-site. Public address systems for the CDC and the CDC tank farm are provided in Figures D-2-H and D-2-K.

9.17.1.2 Microphone Outlets

1. Primary console with zone control in Building 969.
2. Secondary console with zone control in Building 900.
3. Microphone only in Building 954 with zone control provided by one of the consoles.

9.17.1.3 Speaker Arrangement

The Vermont facility is divided into paging zones, typically buildings, controlled by the Security Control Center in Building 969-1. Touch screens on the consoles allow the officer on duty to page either an individual zone, group of zones, or all zones.

9.17.1.4 Telephone System

The telephone system is equipped with batteries able to support a peak load for four hours. Telephone systems for the CDC and the CDC tank farm are included in Figures D-2-H and D-2-K.

9.17.1.5 Security / Emergency Services Radio System

The Security and Emergency Services Departments have exclusive ownership and control of this radio system. All requests for its use must be approved by Security and Emergency Services management.

The system operates as follows:

Radio Frequencies	transmit:
	935.13750 MHz
	935.15000 MHz
	935.16250 MHz
	935.17500 MHz
	receive:
	896.13750 MHz
	896.15000 MHz
	896.16250 MHz
	896.17500 MHz
Call Sign	WPLR 921

Available radio equipment is listed in Table 9-2.

9.17.2 First Aid Equipment

GLOBALFOUNDRIES Emergency Services is a First Response Emergency Medical Service licensed at the Advanced level by the Vermont Department of Health and maintains emergency medical equipment and supplies to provide emergency medical care at this level. Emergency medical response equipment is housed on each of Emergency Services' response vehicles.

Table 9-2 Radio Equipment	
Type	**Location**
Mobile Radios	In each emergency vehicle In the maintenance vehicle
Portable Radios or pager	Security/Emergency Dispatch Center (Building 969) Maintenance Departments Security/Emergency Services Departments (Building 900) Emergency Response Crew Call Staff and Emergency Medical Response Call Staff

9.17.3 Emergency Response Equipment

9.17.3.1 Self-Contained Breathing Apparatus (SCBA)

A self-contained breathing apparatus may be used safely in any atmosphere except one that poisons through or irritates the skin. SCBA units can be used within chemical-resistant suits for absorption hazards. SCBA units are strategically located in emergency response vehicles. Trained emergency response personnel have access to these units at Building 900, the emergency response building.

9.17.3.2 Emergency Vehicles

GLOBALFOUNDRIES maintains special emergency vehicles to provide added protection to employees and buildings. GLOBALFOUNDRIES emergency vehicles include:

- One fire engine
- One utility vehicle
- One hazardous materials response vehicle

When an emergency warrants an ambulance service, Emergency Services may call upon the Essex Rescue Squad or other Ambulance District #3 ambulance according to the VT EMS District #3 response system. The nature of the emergency and location to which units shall respond will be provided to all requested resources upon dispatch. GLOBALFOUNDRIES Security Department personnel may meet the incoming ambulance service and escort them to the response location as needed.

9.17.4 Electrical Equipment

Electrical cords and portable lighting are available and maintained for emergency use. Emergency power is provided by emergency generators listed in Table 9-3.

Table 9-3 Emergency Generators		
Generator	**Voltage**	**Location**
460 KW Caterpillar	480/277	Industrial Waste, Building 054
100 KW Caterpillar	480/277	Industrial Waste, Building 053
300 KW Caterpillar	480/277	Generator Room, Building 965-1
200 KW Onaon	480/277	Generator Room, Building 967-1
530 KW Caterpillar	460/277	Generator Room, Building 971-1
1100 KW Caterpillar	480/277	Generator Room, Building 971-1
1100 KW Caterpillar	480/277	Generator Room, Building 971-1
1000 KW Detroit Diesel	460/277	Building 962, Column M-17
1000 KW Caterpillar	480/277	Building 962, Column M-17
275 KW Cummings	480/277	Generator Room, Building 975-1
105 KW Caterpillar	480/277	Generator Room, Building 972-3
1075 KW Waukesha	480/277	Generator Room, Building 973-1
1000 KW Cummings	480/277	Chiller Room, Building 973-1
315 KW Caterpillar	480/277	Boiler Room, Building 974-1
350 KW Caterpillar	480/277	Utility Plant, Building 801
300 KW Caterpillar	480/277	Generator Room, Building 966-1
500 KW Caterpillar	480/277	Building 986-1
1000 KW Caterpillar	480/277	Building 963
175 KW Caterpillar Portable		Building 900
30 KW Ford-Onaon Portable		Building 900

9.17.5 Fire Equipment

GLOBALFOUNDRIES is equipped with the following kinds of fire equipment:

- A fire-sprinkler alarm system
- Hand extinguishers
- Fire hose drop system
- Fire-fighting equipment (company and local)

9.17.5.1 Fire-Sprinkler Alarm System

A sprinkler alarm system is installed in all main site and Williston buildings. When a sprinkler is activated, an alarm is sounded at the Security Dispatch Center through the fire detection system. The fire detection system is shown in Figures D-2-I and D-2-K.

9.17.5.2 Fire Sprinkler System

All buildings are protected by automatic sprinkler systems. These systems meet National Fire Protection Association and Factory Mutual standards. A 1,500-gallon-per-minute (gpm) and a 2,000-gpm fire pump provide flow to the underground fire control system. These pumps obtain water from a 1,000,000-gallon private storage tank supplied from a Champlain Water District connection. A 12-inch connection to the Champlain Water District at Maple Street provides additional water supply. A water-deluge system with 40 nozzle heads protects the two load/unload areas at the CDC. The water-deluge system is capable of supplying 1,500 gpm for a two-hour minimum duration. For fire protection, the load/unload area at the north end of Building 963 is served by three fire water hydrants in the area as well as an automatic sprinkler system. The Williston facility fire protection system consists of one 1,500-gpm fire pump providing flow to the underground piping system. This pump is supplied from a 10-inch connection to the Champlain Water District feed for the site.

9.17.5.3 Hand Extinguishers

Four types of hand extinguishers are available for training emergency personnel and for extinguishing fires throughout the GLOBALFOUNDRIES site, including all satellite locations. The types of extinguishers located in each building are matched to the hazard classifications present. Locations of fire protection devices are shown in Figures D-2-G and D-2-K. The four types of extinguishers are as follows:

- Pressurized Water. A 2.5-gallon extinguisher that has a valve on the outside through which air pressure may be applied to the water. This unit has a pressure gauge located at the top for visual inspection. It has a hand-grip, squeeze-type valve that may be operated or shut off as necessary.
- Carbon Dioxide (CO_2). A 15-lb extinguisher operated by removing the locking pin and pressing the trigger or trigger lever. It has an effective range of 5 to 7 feet and can be discharged in 17 seconds. The CO_2 extinguisher is most effective on Class C (electrical) fires but is also very efficient for extinguishing Class B (flammable liquid) fires.
- Dry Chemical. The dry chemical extinguisher agent is a specially treated sodium bicarbonate in dry powder form with components added for producing free flow and water-repelling action. The extinguisher is charged with nitrogen, which expels the dry chemical. The discharge, controlled by a shutoff valve, has an effective range of 5 to 7 feet, depending on the size of the extinguisher.

- GLOBALFOUNDRIES uses the 5-lb and 20-lb sizes of Metal Fyr (trade name of the Fyr Fyter Company) Powder, a special-purpose extinguishing agent for use on magnesium metal fires. The powder is spread with a scoop over the burning metal until it is completely covered.

9.17.5.4 Fire Hose Drop System

Fire hose drops, strategically placed throughout the facility, are connected to the sprinkler system. Each response vehicle is equipped with a high-rise pack, consisting of 100 feet of 1½-inch double-jacketed hose, equipped with a fire-fighting nozzle (variable pattern) for use in fighting interior fires.

9.17.6 Spill Response Equipment

GLOBALFOUNDRIES is equipped with appropriate protective clothing and neutralizing materials to protect emergency response personnel and provide chemical control in the event of a hazardous material spill. Equipment and material are maintained on the Emergency Response vehicles stationed at the Emergency Services Building 900. These vehicles are stocked with the following materials:

- Sorbent pads or equivalent for acid spills
- Sorbent pads or equivalent for alkali spills
- Speedi-dri or equivalent mineral absorbent

The equipment listed in Table 9-4 is available for emergencies and is either carried on a mobile vehicle or stored at other site locations as indicated on Figures D-2-E and D-2-F. Emergency chemicals are listed in Table 9-5.

Table 9-4
Emergency Response Equipment

Maintained by Emergency Services	Maintained by Industrial Wastewater Treatment Plant
SCBA Air bottles (spare) Personal Protective Equipment (Levels A-D) Hydrant wrench Assorted hand tools Spill-containment equipment (absorbent materials, booms, etc.) Sample collection containers and equipment First aid kits Decontamination equipment Confined space rescue equipment Fire extinguishers Chemical identification equipment (pH paper, colorimetric tubes, etc.)	Vacuum trailer – 800-gallon capacity 150-gpm air-powered diaphragm pump Assorted hoses, fittings, and test balls

Atmosphere testing equipment Leak repair equipment Incident command equipment	

Table 9-5 Emergency Chemicals	
Location	**Inventory**
Chemical Distribution Center	Sodium bicarbonate Speedi-dri
Industrial Wastewater Treatment Plant	Oil-absorbent pads and booms

9.18 COORDINATION AGREEMENTS

Local fire department personnel have attended a tour of the site and a briefing on the potentially hazardous facilities at the site. In addition, the site has emergency agreements for post-emergency response oil spill cleanup and decontamination contractors. Also, a contract is available for chemical analysis on an emergency basis. Attachment 9-1 contains the agreements with local authorities for responsibilities associated with emergency response.

9.19 EMERGENCY EVACUATION PLAN

Each department manager prepares an evacuation plan procedure for his or her department. Department plans are updated as required. The Evacuation Plan is implemented whenever there is a threat to employee health or safety.

9.19.1 Evacuation Procedure

1. An evacuation is announced over the public address system by a warbled tone which is used exclusively for that purpose. The tone is followed by a verbal announcement of instructions to evacuate.
2. Department personnel assemble the group and lead them out of the building to an assembly point at least 250 feet from the building. The evacuation area for the CDC is on the west side at the loading dock trailer turnaround area. Figure D-2-G shows the primary and secondary evacuation routes for the CDC. Figure D-2-K shows the evacuation routes for the Tank Farm. Department members are counted and missing members are reported to the manager.
3. Disabled persons are assisted to a safe place by assigned department personnel under a buddy system.
4. Designated personnel assure that power, gas, and chemicals are secure. After completing the shutdown, these personnel evacuate the building.

5. A two-man search team checks the immediate department area for missing personnel. Washrooms, lockers, cribs, and conference rooms are searched by Emergency Services personnel.
6. Evacuations are conducted in an orderly manner at a rapid walk.

9.19.2 Evacuation Drills

Evacuation drills are held twice annually. Prior to the drills, management personnel are given special instructions.

9.20 REQUIRED REPORTS

Each emergency at GLOBALFOUNDRIES is recorded in an emergency incident report, which documents the type of emergency, date, and details of the incident. Emergency Services files the incident report in a computerized incident management database. The incident report coordinator ensures that incident reports are distributed to responsible managers for follow-up and corrective action, and analyzes the incident data for trends. Actions taken are documented in the incident management database. Incidents involving hazardous waste which threaten human health or adversely affect the environment are reported in writing within 10 days to the Vermont State Hazardous Waste management section with the following information:

1. Name, address, and telephone number of the reporter.
2. Name, address, and telephone number of the facility.
3. Date, time and type of incident.
4. Name and quantity of material released.
5. The extent of injuries.
6. Assessment of the actual or potential hazard to human health and to the environment.
7. The estimated quantity and the disposition of recovered material that resulted from the incident.

ATTACHMENT 9-1
AGREEMENTS WITH LOCAL AUTHORITIES

GLOBALFOUNDRIES®

May 20, 2015

SUBJECT: Arrangements with Local Authorities per 40 CFR 264.37

To Whom It May Concern:

As you may be aware, IBM is transferring ownership of its Essex Junction manufacturing facility to GLOBALFOUNDRIES U.S. 2 LLC (GLOBALFOUNDRIES). The anticipated date of transfer of ownership is July 1, 2015.

Pursuant to 40 CFR 264.37, GLOBALFOUNDRIES is required to make arrangements with police departments, fire departments, emergency response teams, hospitals, and ambulance services to help ensure proper response in the event of an emergency. Emergency response personnel, both state and local (i.e. fire, police, ambulance, and hospital), must be made aware of:

- access to and the layout of the facility,
- properties of the hazardous waste handled at the facility,
- types of possible injuries, and
- evacuation routes.

Chemical spill control for the GLOBALFOUNDRIES site is coordinated by the on-site Emergency Services Department, located in Building 900. All releases of chemicals within the manufacturing areas, including satellite accumulation sites, are responded to and controlled by the procedures, personnel, and equipment detailed in the various sections of the attached RCRA Contingency Plan. This assures that control of all chemical clean-up and disposal is exercised by trained personnel who are properly equipped and informed of all hazardous waste handling and reporting procedures. Emergency coordination for the entire GLOBALFOUNDRIES site is provided by the Emergency Services Department on a 24-hour-per-day, seven-day-per week-basis.

The information in this letter and the attached RCRA Contingency Plan is provided should additional response support be needed by your department and to allow you to better plan for an emergency response at this facility. The plan contains the listing of our emergency coordinators. Those coordinators may be reached 24 hours a day in the event of an emergency. The plan includes a map showing work areas, storage areas, evacuation routes, employee emergency assembly areas, and entrance roads to the facility.

GENERAL FACILITY INFORMATION:

GLOBALFOUNDRIES develops, manufactures, and tests semiconductor products for a variety of computer and consumer applications. The manufacturing facility, including the permitted hazardous waste storage facility, is located on approximately 237 acres which lie west of the Winooski River in the town of Essex and the village of Essex Junction. The remaining 492 acres are located east of the river in the town of Williston and contain non-manufacturing buildings. The location consists of GLOBALFOUNDRIES employees along with a variety of tenants and contractors. We are a large quantity hazardous waste generator as well as a permitted treatment, storage, and disposal facility. The GLOBALFOUNDRIES facility is secured and operated to prevent unknowing entry and to minimize the possibility of unauthorized entry of persons or livestock. The Security Department is staffed with trained personnel to enforce security measures onsite and to monitor movement into and out of the facility on a 24 hour per day basis. The Chemical Distribution Center (CDC) is secured by a 10 foot-high chain link fence surrounds the CDC and tank farm to prevent unauthorized entry.

Please sign below and return the signed copy of this arrangement in the envelope provided by **June 15, 2015**.

If you have questions or comments regarding this letter or the RCRA Contingency Plan, please contact David Kost at (802) 288-6226 or *dlkost@us.ibm.com*.

Sincerely,

Steve Groseclose,
Director, Risk Management, Sustainability & Real Estate
GLOBALFOUNDRIES U.S. 2 LLC

SIGNATURE REQUIRED (Please Return to GLOBALFOUNDRIES by June 15, 2015)

I have received the RCRA Contingency Plan for the Essex Junction manufacturing facility from GLOBALFOUNDRIES. I have read and understand the emergency response process as outlined in the RCRA Contingency Plan.

KENNETH N. MURTON, JR. — 5/29/15

Signature — Date

FIRE CHIEF

Title

WILLISTON FIRE DEPARTMENT

Organization

Enclosures: GLOBALFOUNDRIES RCRA Contingency Plan, Essex Junction, VT Facility and Applicable Attachments

cc: UVM Medical Center (formerly Fletcher Allen Health Care Center)
Essex Rescue
Williston Police Department
Essex Police Department
Essex Junction Fire Department
Williston Fire Department

GENERAL FACILITY INFORMATION:

GLOBALFOUNDRIES develops, manufactures, and tests semiconductor products for a variety of computer and consumer applications. The manufacturing facility, including the permitted hazardous waste storage facility, is located on approximately 237 acres which lie west of the Winooski River in the town of Essex and the village of Essex Junction. The remaining 492 acres are located east of the river in the town of Williston and contain non-manufacturing buildings. The location consists of GLOBALFOUNDRIES employees along with a variety of tenants and contractors. We are a large quantity hazardous waste generator as well as a permitted treatment, storage, and disposal facility. The GLOBALFOUNDRIES facility is secured and operated to prevent unknowing entry and to minimize the possibility of unauthorized entry of persons or livestock. The Security Department is staffed with trained personnel to enforce security measures onsite and to monitor movement into and out of the facility on a 24 hour per day basis. The Chemical Distribution Center (CDC) is secured by a 10 foot-high chain link fence surrounds the CDC and tank farm to prevent unauthorized entry.

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Signature _____ Date 7-19-15

Title FIRE CHIEF

Organization ESSEX JUNCTION FIRE DEPARTMENT

GENERAL FACILITY INFORMATION:

GLOBALFOUNDRIES develops, manufactures, and tests semiconductor products for a variety of computer and consumer applications. The manufacturing facility, including the permitted hazardous waste storage facility, is located on approximately 237 acres which lie west of the Winooski River in the town of Essex and the village of Essex Junction. The remaining 492 acres are located east of the river in the town of Williston and contain non-manufacturing buildings. The location consists of GLOBALFOUNDRIES employees along with a variety of tenants and contractors. We are a large quantity hazardous waste generator as well as a permitted treatment, storage, and disposal facility. The GLOBALFOUNDRIES facility is secured and operated to prevent unknowing entry and to minimize the possibility of unauthorized entry of persons or livestock. The Security Department is staffed with trained personnel to enforce security measures onsite and to monitor movement into and out of the facility on a 24 hour per day basis. The Chemical Distribution Center (CDC) is secured by a 10 foot-high chain link fence surrounds the CDC and tank farm to prevent unauthorized entry.

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Sincerely,

Steve Groseclose,
Director, Risk Management, Sustainability & Real Estate
GLOBALFOUNDRIES U.S. 2 LLC

SIGNATURE REQUIRED (Please Return to GLOBALFOUNDRIES by June 15, 2015)

I have received the RCRA Contingency Plan for the Essex Junction manufacturing facility from GLOBALFOUNDRIES. I have read and understand the emergency response process as outlined in the RCRA Contingency Plan.

Signature

8/7/2015
Date

Chief of Police
Title

Essex Police Department
Organization

GENERAL FACILITY INFORMATION:

GLOBALFOUNDRIES develops, manufactures, and tests semiconductor products for a variety of computer and consumer applications. The manufacturing facility, including the permitted hazardous waste storage facility, is located on approximately 237 acres which lie west of the Winooski River in the town of Essex and the village of Essex Junction. The remaining 492 acres are located east of the river in the town of Williston and contain non-manufacturing buildings. The location consists of GLOBALFOUNDRIES employees along with a variety of tenants and contractors. We are a large quantity hazardous waste generator as well as a permitted treatment, storage, and disposal facility. The GLOBALFOUNDRIES facility is secured and operated to prevent unknowing entry and to minimize the possibility of unauthorized entry of persons or livestock. The Security Department is staffed with trained personnel to enforce security measures onsite and to monitor movement into and out of the facility on a 24 hour per day basis. The Chemical Distribution Center (CDC) is secured by a 10 foot-high chain link fence surrounds the CDC and tank farm to prevent unauthorized entry.

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Steve Groseclose,
Director, Risk Management, Sustainability & Real Estate
GLOBALFOUNDRIES U.S. 2 LLC

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I have received the RCRA Contingency Plan for the Essex Junction manufacturing facility from GLOBALFOUNDRIES. I have read and understand the emergency response process as outlined in the RCRA Contingency Plan.

Dalia Mantz
Signature

5-27-15
Date

Executive Director
Title

Essex Rescue
Organization

GENERAL FACILITY INFORMATION:

GLOBALFOUNDRIES develops, manufactures, and tests semiconductor products for a variety of computer and consumer applications. The manufacturing facility, including the permitted hazardous waste storage facility, is located on approximately 237 acres which lie west of the Winooski River in the town of Essex and the village of Essex Junction. The remaining 492 acres are located east of the river in the town of Williston and contain non-manufacturing buildings. The location consists of GLOBALFOUNDRIES employees along with a variety of tenants and contractors. We are a large quantity hazardous waste generator as well as a permitted treatment, storage, and disposal facility. The GLOBALFOUNDRIES facility is secured and operated to prevent unknowing entry and to minimize the possibility of unauthorized entry of persons or livestock. The Security Department is staffed with trained personnel to enforce security measures onsite and to monitor movement into and out of the facility on a 24 hour per day basis. The Chemical Distribution Center (CDC) is secured by a 10 foot-high chain link fence surrounds the CDC and tank farm to prevent unauthorized entry.

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Sincerely,

Steve Groseclose,
Director, Risk Management, Sustainability & Real Estate
GLOBALFOUNDRIES U.S. 2 LLC

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Signature

5/29/2015
Date

Police Chief
Title

Williston Police Dept
Organization

GENERAL FACILITY INFORMATION:

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GLOBALFOUNDRIES U.S. 2 LLC

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I have received the RCRA Contingency Plan for the Essex Junction manufacturing facility from GLOBALFOUNDRIES. I have read and understand the emergency response process as outlined in the RCRA Contingency Plan.

Signature _____ Date 6/8/15

Title OEH COORDINATOR

Organization UVM MEDICAL CTR

ATTACHMENT 9-2
DECONTAMINATION PLAN

Decontamination Plan

Global Foundries Fire Department

Policy 600-51

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Decontamination Plan
Global Foundries Fire Department
Policy 600-51

Introduction

Personnel responding to hazardous substance incidents, including WMD incidents, may become contaminated in a number of ways including:

- Contacting vapors, gases, mists, or particulates in the air
- Being splashed by materials while sampling or opening containers
- Being splashed by materials while containing or cleaning up a spill
- Walking through puddles of liquids or on contaminated soil
- Using contaminated instruments or equipment
- Secondary contamination deliberately planned to injure or delay responders

Protective clothing and respirators help prevent the wearer from becoming exposed to contaminants; while utilization of good work practices help reduce contamination on protective clothing, instruments, and equipment.

Even with these safeguards, contamination may occur. Harmful materials can be transferred into clean areas, exposing unprotected personnel. In removing contaminated clothing, personnel may be exposed through contact or inhalation. To prevent such occurrences, methods to reduce contamination, and decontamination procedures should be developed and established before entry is made into contaminated area by an emergency responder and must continue (modified when necessary) throughout site operations.

Decontamination consists of physically removing contaminants or changing their chemical nature to innocuous substances. How extensive decontamination must be depends on a number of factors, the most important being the type of contaminants involved. The more harmful the contaminant, the more extensive and thorough decontamination must be. Less harmful contaminants may require less decontamination.

Combining decontamination, the correct method of doffing personnel protective equipment, and the use of site work zones minimizes cross contamination from protective clothing to wearer, equipment to personnel, and one area to another. Only general guidance can be given on methods and techniques for decontamination. The exact procedure to use must be determined after evaluating a number of factors specific to the incident.

Preliminary Considerations

Initial Planning

The initial decontamination plan assumes all personnel and equipment leaving the exclusion zone (area of potential contamination) are grossly contaminated.

A system is then set up for personnel decontamination to wash and rinse, at least once, all the protective equipment worn. This is done in combination with a sequential doffing of protective equipment, starting at the first station with the most heavily contaminated item and progressing to the last station with the least contaminated article.

The spread of contaminants during the washing/doffing process is further reduced by separating each decontamination station by a minimum of 3 feet. Ideally, contamination should decrease as a person moves from one station to another, further along in line.
While planning site operations, methods should be developed to prevent the contamination of people and equipment. For example, using a remote sampling techniques, not opening containers by hand, bagging monitoring instruments, using drum grapples, watering down dusty areas, and not walking through areas of obvious contamination would reduce the probability of becoming contaminated and require a less elaborate decontamination procedure.

The initial decontamination plan is based on a worst-case situation or assumes no information is available about the incident. Specific conditions at the site are then evacuated, including:

- Type of Contaminant
- The Amount of Contamination
- Levels of Protection Required
- Type of Protective Clothing Worn

The initial decontamination plan is modified, eliminating unnecessary stations or otherwise adapting it to site conditions. For instance, the initial plan might require a complete wash and rinse of chemical protective garments. If disposable garments are worn, the wash/rinse step could be omitted. Wearing disposable boot covers and gloves could eliminate washing and rinsing these items and reduce the number of stations needed.

Contamination Reduction Corridor

An area within the contamination reduction zone is designated as the contamination reduction corridor (CRC). The CRC controls access into and out of the exclusion zone and confines decontamination activities to a limited area. The site of the corridor depends on the number of stations in the decontamination procedure, overall dimensions of the work control zones, and amount of space available at the site. A corridor of 75 feet by 15 feet should be adequate for maximum decontamination. Whenever possible, it should be a straight path.

The CRC boundaries should be conspicuously marked with entry and exit restricted and anyone entering or exiting the exclusion zone must go through the CRC. The far end is the boundary with the exclusion zone. Personnel operating in the CRC should be wearing the level of protection designated for the decontamination crew. Another corridor may be required for heavy equipment needing decontamination. Within the CRC, distinct areas are set aside for decontamination of personnel, portable field equipment, removed clothing, etc... These areas should be marked and personnel restricted to those wearing the appropriate level of protection. All activities within this corridor are confined to decontamination.

Personnel protective clothing, respirators, monitoring equipment, and sampling supplies are all maintained outside of the CRC. Personnel don their protective equipment away from the CRC and enter the exclusion zone through a separate access control point.

Extent of Decontamination Required

Modifications of Initial Plan

The original decontamination plan must be adapted to specific conditions found at incidents. These conditions may require more or less personnel decontamination than planned, depending on a number of factors.

Type of Contaminant: The extent of personnel decontamination depends on the effects of the contaminants have on the body. Contaminants do not exhibit the same degree of toxicity (or other hazard). Whenever this is known or suspected that personnel can become contaminated with highly toxic or skin destructive substances, a full decontamination process should be followed. If less hazardous materials are involved, the procedure can be downgraded.

Amount of Contamination: The amount of contamination on protective clothing is usually determined visually. If it is badly contaminated, a thorough decontamination is generally required. Gross material remaining on the protective clothing for any extended period of time may degrade or permeate it. This likelihood increases with higher air concentrations and greater amounts of liquid contamination. Gross contamination also increases the probability of personnel contact. Swipe tests may help determine the type and quantity of surface contaminants.

Level of Protection: The level of Protection and specific pieces of clothing worn by entry personnel, determine on a preliminary basis the layout of the decontamination line. Each level of protection presents different problems. Clothing variations and different levels of protection may require adding or deleting stations in the original decontamination procedure.

Work Function: The work each entry person does determines the potential for contact with hazardous materials. This can influence the layout of the decontamination line. In large incidents different decontamination lines could be set up to accommodate different job functions.

Location of Contamination: Contamination on the upper areas of protective clothing poses a greater risk to the worker because compounds may generate a hazardous concentration in the breathing zone for both for the worker and the decontamination personnel. There is also an increased probability of contact with skin when doffing the upper part of clothing.

Reason for Leaving Site: The reason for leaving the exclusion zone also determines the need and extent of decontamination. A worker leaving the exclusion zone to pick up or drop off tools or instruments and immediately returning may not require decontamination. Individuals departing the CRC for a break, lunch, or at the end of the day must be thoroughly decontaminated.

Effectiveness of Decontamination

There is no method to immediately determine how effective decontamination is in removing contaminants. Discolorations, stains, corrosive effects, and substances adhering to objects may indicate contaminants have not

been removed. However, observable effects only indicate surface contamination and not permeation (absorption) into clothing. Also many contaminants are not easily observed.

A method of determining effectiveness of surface decontamination is swipe testing. Cloth or paper patches - swipes - are wiped over predetermined surfaces of the suspect object and analyzed in a laboratory. Both the inner and outer surfaces of protective clothing should be swipe tested. Positive indications of both sets of swipes would indicate surface contamination has not been removed and substances have penetrated or permeated through the garment. Swipe tests can also be done on skin or inside clothing. Permeation of protective garments requires laboratory analysis of a piece of the material.

Both swipe and permeation testing provide after-the -fact information. Along with the visual observations, results of these tests can help evaluate the effectiveness of decontamination procedures.

Equipment

Decontamination equipment, materials, and supplies are generally selected based on availability. Other considerations are ease of equipment decontamination or disposability. Most equipment and supplies can be easily procured. For example, soft-bristle scrub brushes or long handle brushes are used to remove contaminants. Water in buckets or garden sprayers are used for rinsing. Large galvanized wash tubs or stock tanks can hold wash and rinse solutions. Children's wading pools can also be used. Large plastic garbage cans or other similar containers lined with plastic bags store contaminated clothing and equipment. Contaminated liquids can be stored temporarily in metal or plastic cans or drums. Other gear includes paper or cloth towels for drying protective clothing and equipment.

Decontamination Solution

Personnel protective equipment, sampling tools, and other equipment are usually decontaminated by scrubbing with detergent and water using a soft bristle brush followed by rinsing with generous amounts of water. While this process may not be fully effective in removing some contaminants or in few cases, contaminants react with water); it is a relatively safe option compared with using a chemical decontamination solution. This requires the contaminant be identified. A decon chemical is then needed that will change the contaminant into a less harmful substance. Especially troublesome are unknown substances or mixtures from a variety of known or unknown substances. The appropriate decontamination solution must be selected in consultation with an experienced chemist.

Establishment of Procedures

Once decontamination procedures have been established, all personnel requiring decontamination must be given precise instructions (and practice, if necessary). Compliance must be frequently checked. The time it takes for decontamination must be ascertained. Personnel wearing SCBA's must leave their work area with sufficient air to walk to CRC and go through decontamination.

Decontamination During Medical Emergencies

Basic Considerations

Part of overall planning for incident response is managing medical emergencies. The plan should provide for:

- Response Team members fully trained in first aid and CPR
- Arrangements with the nearest medical facility for transportation and treatment of injured, and for treatment of personnel suffering from exposure to chemicals.
- Consultation services with a toxicologist
- Emergency eye washes, showers, and/or wash stations.
- First aid kits, blankets, stretcher, and resuscitator.

In addition, the plan should establish methods for decontaminating personnel with medial problems and injuries. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt life-saving first aid and medical treatment is required, decontamination procedures should be modified. Whenever possible, response personnel should accompany contaminated victims to the medical facility to advice on matters involving decontamination.

Physical Injury

Physical injuries can range from a sprained ankle to a compound fracture, from a minor cut to massive bleeding. Depending on the seriousness of the injury, treatment may be given at the site by trained response personnel. For more serious injuries, additional assistance may be required at the site or the victim may have to be treated at a medical facility.

Life saving care should be instituted immediately without considering decontamination. The outer garments can be removed (depending on the weather) if they do not cause delays, interfere with treatment, or aggravate the problem. Respirators and backpack assemblies must always be removed. Fully encapsulating suits or chemical resistant clothing can be cut away. If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or blankets to help prevent contaminating the inside of ambulances or medical personnel. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the victim at the site. One exception would be if it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed.

Heat Stress

Heat-related illnesses range from heat fatigue to heat stroke, the most serious. Heat stoke requires prompt treatment to prevent irreversible damage or death. Protective clothing may have to be cut off. Less serious forms of heat stress require prompt attention or they may lead to heat stroke. Unless the victim is obviously contaminated decontamination should be omitted or minimized and treatment begun immediately. Minor heat exhaustion should be promptly treated to prevent degrading conditions to heat stroke. This includes monitoring

patient condition, prompt cooling, and high flow oxygen. Monitoring temperature, blood pressure, pulse rate and oxygen saturation are required.

Chemical Exposure

Exposure to chemicals can be divided into two categories:

- Injuries from direct contact, such as acid burns or inhalation of toxic chemicals.
- Potential injury due to gross contamination on clothing or equipment.

For inhaled contaminants treatment can only be performed by qualified physicians. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract the substances effect. First aid treatment usually is flooding the affected area with water; however, for a few chemicals, water may cause more severe problems.

When protective clothing is grossly contaminated, contaminants may be transferred to treatment personnel or the wearer and cause injuries. Unless severe medical problems have occurred simultaneously with splashes, the protective clothing should be washed off as rapidly as possible and carefully removed.

Protection for Decontamination Workers

The Level of Protection worn by decontamination workers is determined by:

- Expected or visible contamination on workers
- Type of contaminant and associated respiratory and skin hazards
- Total vapor/gas concentrations in the contamination reduction corridor
- Particulate and specific inorganic vapors in the CRC
- Results of swipe tests

Level B Use

In situations where site workers may be contaminated with unknowns, highly volatile liquids, or highly toxic materials, decontamination workers should wear a minimum of Level B protection. Level B protection includes SCBA, hard hat with face shield, chemical resistant gloves, and protective covering.

Decontamination of Equipment

In so far as possible, measures should be taken to prevent contamination of sampling and monitoring equipment. Sampling devices become contaminated, but monitoring instruments, unless they are splashed, usually do not. Once contaminated, instruments are difficult to clean without damaging them. Any delicate instrument which cannot be easily decontaminated should be protected while it is being used. It should be placed in a clear plastic bag, and the bag taped and secured around the instrument. Openings are made in the bag for sample intake.

Decontamination Procedures:

Sampling Devices**:** Sampling devices may require special cleaning. Where possible, covering the devices should reduce the exposure.

Tools**:** Wooden tools are difficult to decontaminate because they absorb chemicals. They should be kept on site and handled only by protected workers. At the end of the response, wooden tools should be discarded.

Respirators: Certain parts of contaminated respirators, such as the harness assembly and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in soap and water and scrubbed with a brush. Regulators must be maintained according to manufacturer's recommendations. Persons responsible for decontaminating respirators should be thoroughly trained in respirator maintenance.

Heavy Equipment**:** Bulldozers, trucks, back hoes, bulking chambers, and other heavy equipment are difficult to decontaminate. The method generally used is to wash them with water under high pressure, and/or to scrub accessible parts with detergent/water solution under pressure, if possible. In some cases, shovels, scoops and lifts have been sand blasted or steam cleaned. Particular care must be given to those components in direct contact with contaminants such as tires and scoops. Swipe tests should be utilized to measure effectiveness.

Sanitizing of Personnel Protective Equipment

Respirators, reusable protective clothing, and other personal articles not only must be decontaminated before being reused, but also sanitized. The inside of masks and clothing becomes soiled due to exhalation, body oils, and perspiration. The manufacturer's instructions should be used to sanitize the respirator mask. If practical, protective clothing should be machine washed after a through decontamination; otherwise it must be cleaned by hand.

Persistent Contamination

In some instances, clothing and equipment will become contaminated with substances that cannot be removed by normal decontamination procedures. A solvent may be used to remove such contamination from equipment if it does not destroy or degrade the protective material. If persistent contamination is expected, disposable garments should be used. Testing for persistent contamination of protective clothing and appropriate decontamination must be done by qualified laboratory personnel.

Disposal of Contaminated Materials

All materials and equipment used for decontamination must be disposed of properly. Clothing, tools, buckets, brushes, and all other equipment that is contaminated must be secured in drums or other containers and labeled. Clothing not completely decontaminated on-site should be secured in plastic bags before removed from the site.

Contaminated wash and rinse solutions should be contained by using step in containers (for example, containment barrels) to hold spent solutions. The spent solutions are transferred to drums, which are labeled and disposed of with other substances on site.

Level A, B, and Coverall Decontamination

Equipment Worn

The decontamination procedure outlined is for workers wearing Level A & B protection (with taped joints between gloves, boots, and suit) consisting of:

- Fully encapsulating suit with boots and gloves, or coverall suits
- Self Contained Breathing Apparatus
- Hard Hat (Optional)
- Chemical resistant, steel toe and shank boots
- Boot covers
- Inner and outer gloves

Decontamination Set-up

Proper decontamination follows a step-by-step process to ensure that all harmful/dangerous residues on personnel and equipment are contained within the hot zone and the decontamination area.

Decontamination Area

The decontamination area, prior to any entry of personnel into the hot zone, shall be set-up in the warm zone at the edge of the hot zone.

Every attempt shall be made to set up the Decon Area uphill and upwind from the hot zone. This allows runoff, if any, to flow from the Decon Area back into the hot zone.

There shall be an exit from the hot zone into the Decon Area, and an entrance from the Decon Area back into the hot zone. This allows personnel who have undergone partial decon to exchange air cylinders and re-enter the hot zone to complete tasks.

The Decon Area shall provide a pathway leading away from the contaminated area toward an exit into the Cold Zone. A decreasing level of contamination will be experienced as a person travels through the Decon Area.

Decontamination Area Set-up

The Decontamination Officer is responsible for the proper set-up of the Decon Area, and shall ensure that adequate resources are available to complete Decon. Decon solutions should be determined at this time by consultation with the Incident Commander and the Safety Officer.

The Decon Officer shall utilize the Decon Equipment & Set-up Check Sheet.

Decon equipment shall be removed from the apparatus and placed near the designated Decon Area.

Set-up large plastic sheets, and place all stations on the plastic. The Decon officer must ensure that all supplies and equipment are in their designated positions.

Isolate the area utilizing traffic cones and do not pass tape.

Adequate water supply for showers and hoses shall be in place.

Definitions:

Cold Zone	The designated area where no contamination is present
Contamination Reduction Corridor:	Corridor designated within the decontaminated area to enter and exit the hot zone.
Contamination Reduction Zone:	Area within the “Warm Zone” where decontamination takes place
Exclusion Zone:	Area where Personal Protective Garments must be worn to prevent contamination
Hot Zone:	Area where contamination is anticipated
PPE:	Personal Protective Equipment
SCBA:	Self Contained Breathing Apparatus

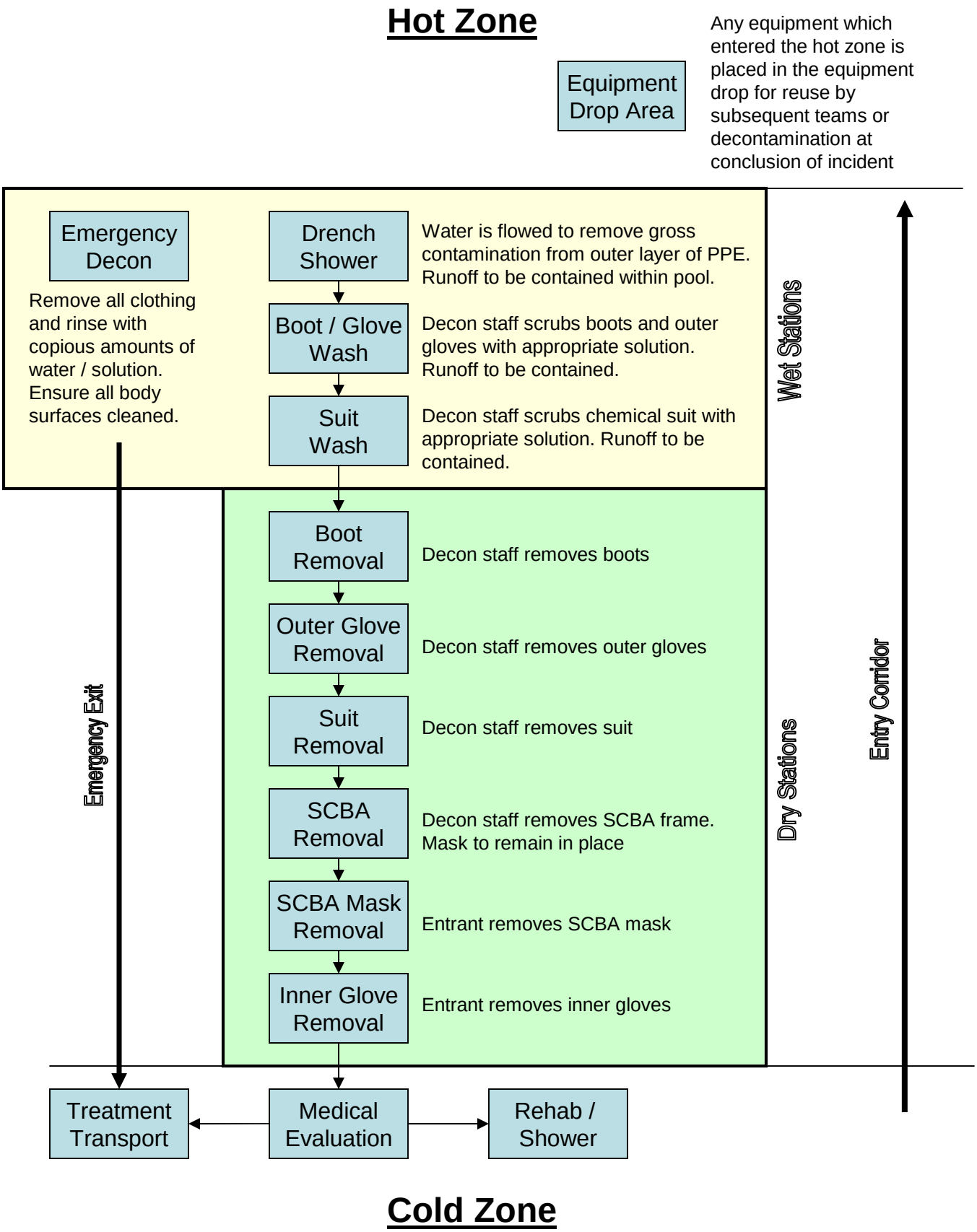
Revisions:

Version	Date	Comments
Revision 1.0	May 2015	Original as adopted from IBM Emergency Services Documentation

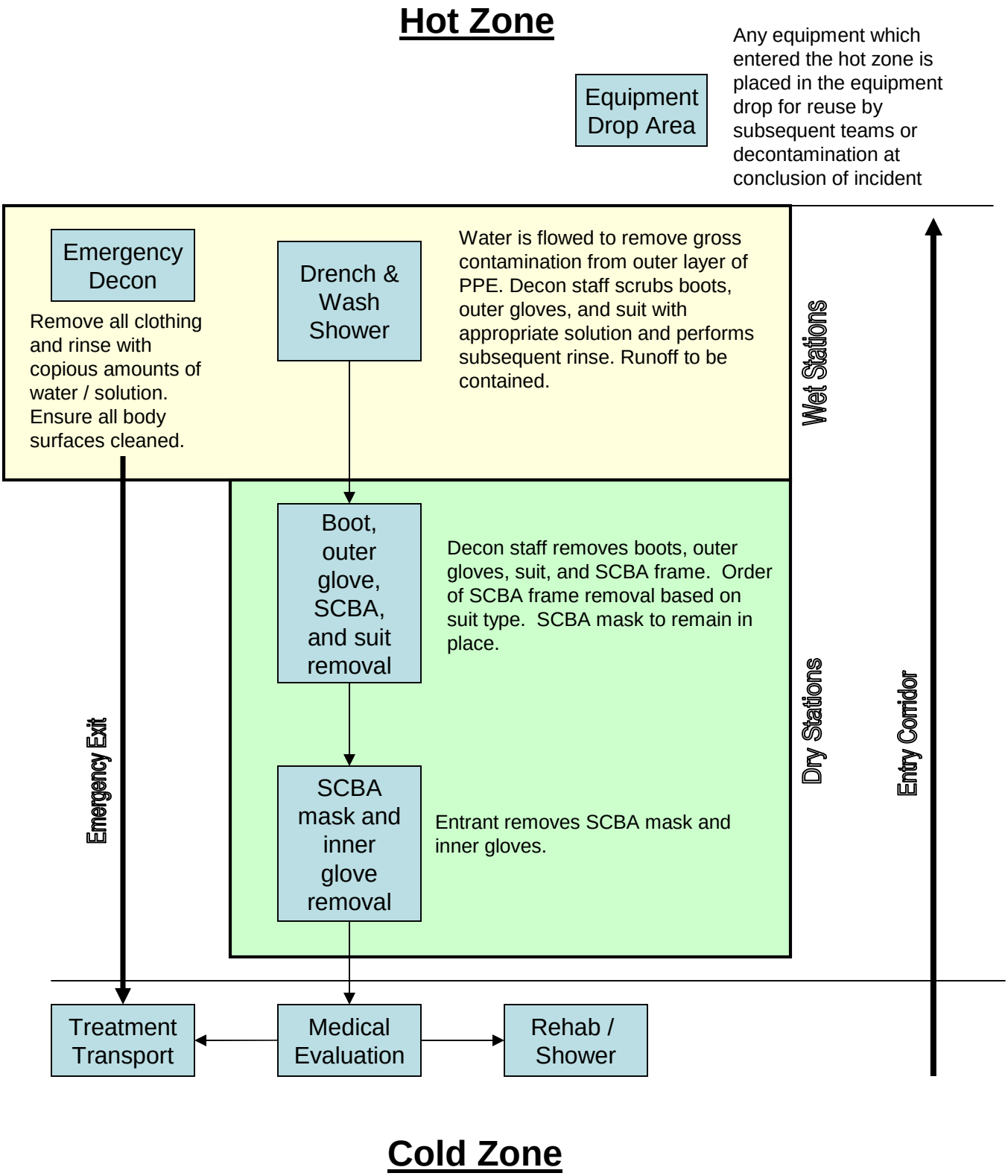
Appendix A: Decon Layouts:

Maximum Decon Layout
Minimum Decon Layout
Field Shower Support Requirements
Patient Wash Configuration
Field Shower Configuration
Incorporation of Field Shower

Maximum Decon Layout

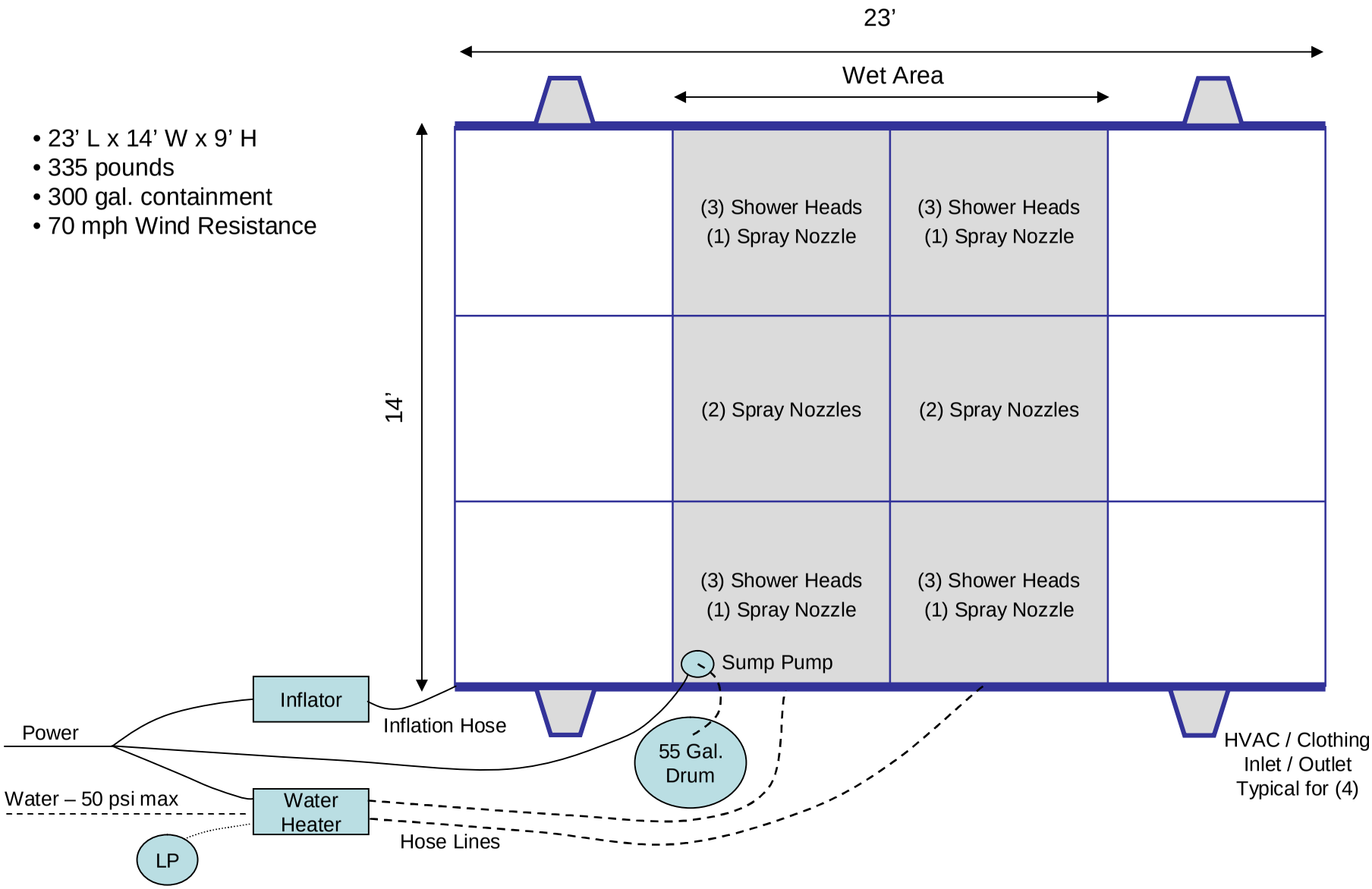


Minimum Decon Layout

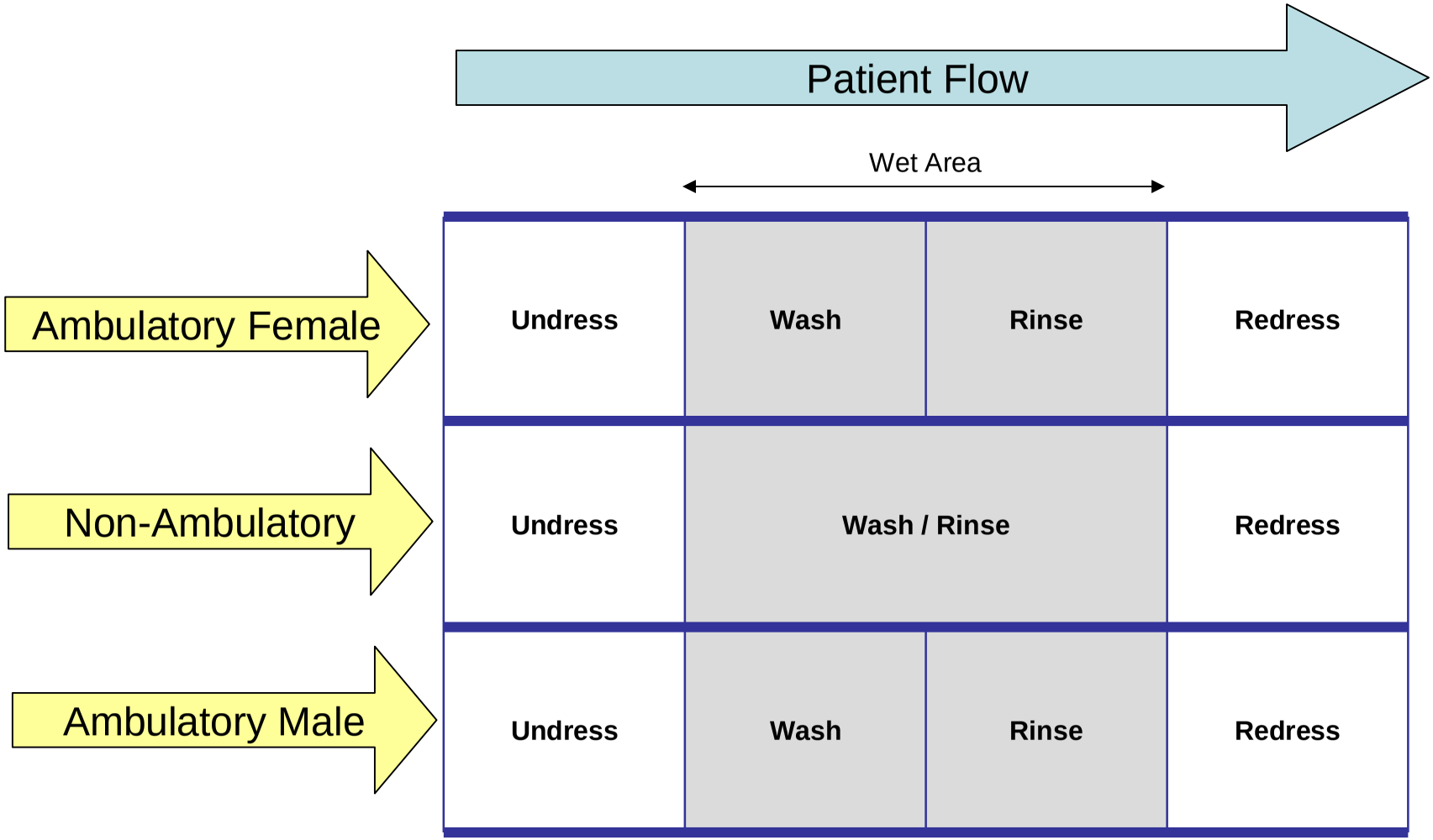


Field Shower Support Requirements

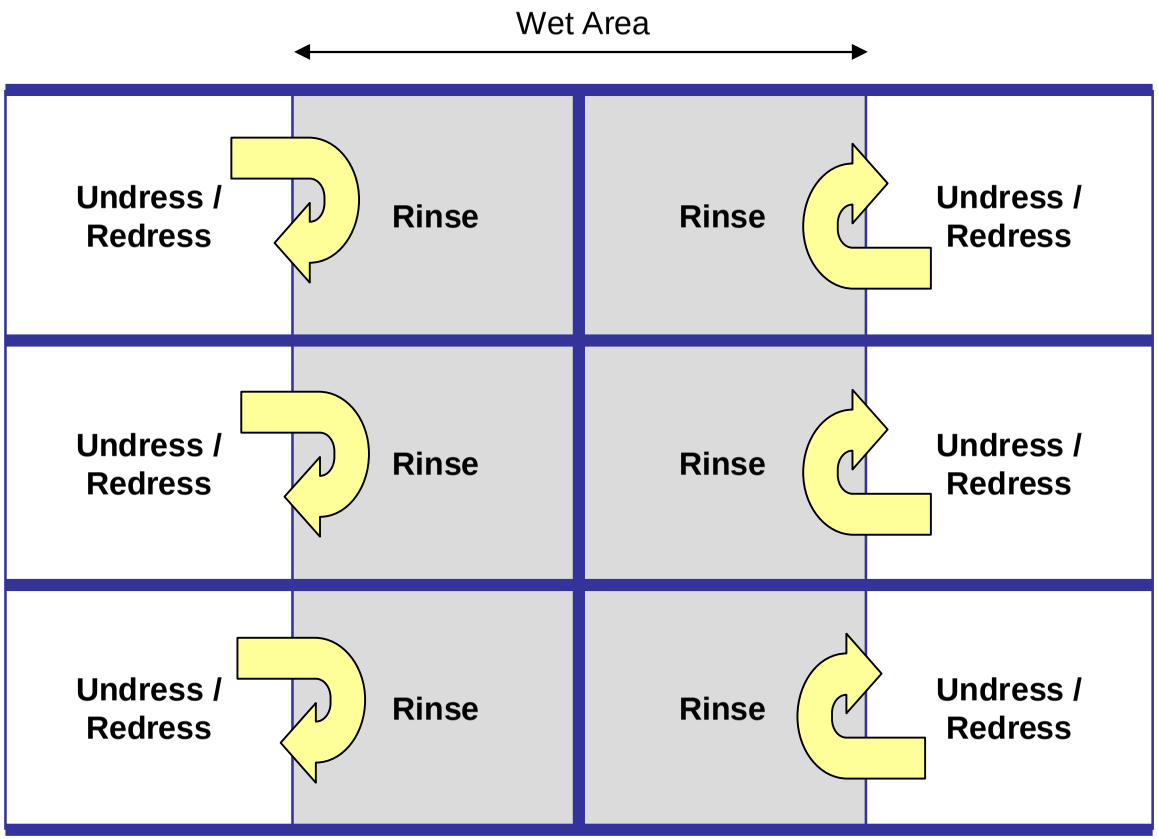
- 23’ L x 14’ W x 9’ H
- 335 pounds
- 300 gal. containment
- 70 mph Wind Resistance



Patient Wash Configuration

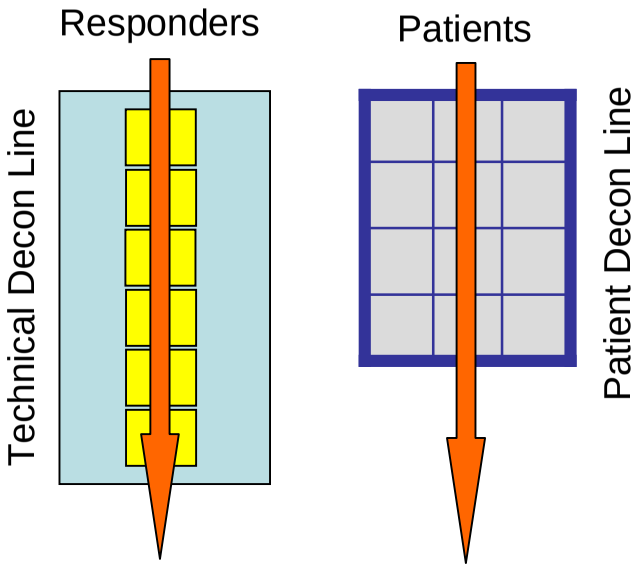


Field Shower Configuration

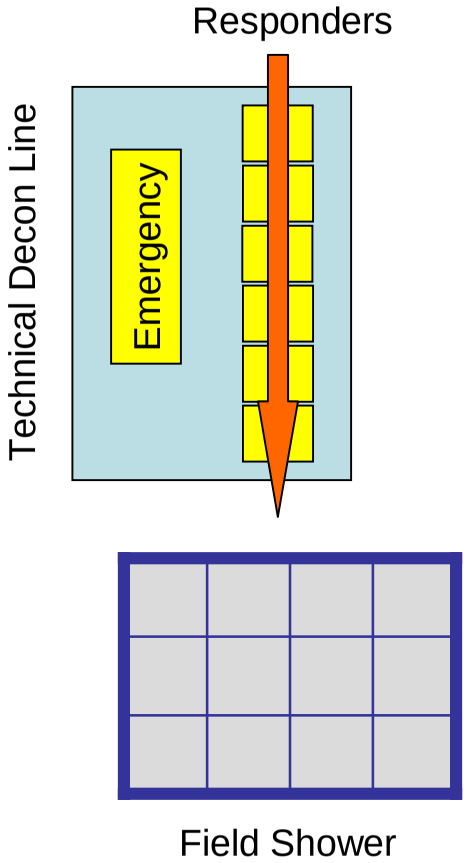


Incorporation of Field Shower

Technical Decon w/ Patient Decon



Technical Decon w/ Field Shower



SECTION 10.0

CLOSURE PLAN, POST-CLOSURE PLAN, AND FINANCIAL REQUIREMENTS

10.1 INTRODUCTION

This section describes the procedures GLOBALFOUNDRIES will use to close the facility partially (i.e. closure of one or more hazardous waste management units, such as a tank) during its operating life or to close the facility completely (i.e. final closure). This plan addresses all RCRA hazardous waste management units subject to this permit. GLOBALFOUNDRIES will retain a copy of the approved closure plan and any revisions to the plan at this facility until a certification of final closure has been submitted to and approved by the Vermont Agency of Natural Resources Secretary (Secretary). A Pre-closure Notification Form will be completed in conformance with Vermont's Hazardous Waste Generator Closure Procedure and must be submitted to the Secretary at least 90 days prior to the commencement of closure activities. In the event of partial closure, a unit specific partial closure plan may be required based on the Pre-closure Notification Form.

Closure activities discussed throughout this document are applicable to final and/or partial closure unless otherwise noted.

10.2 DESCRIPTION OF CLOSURE PLAN

10.2.1 Closure Performance Standard

This closure plan will minimize or eliminate post-closure maintenance and threats to human health and to the environment. The hazardous waste closure activities will be conducted in accordance with applicable Vermont (VHWMR § 7-309(c)), federal RCRA (40 CFR § 264.197) and other applicable regulations and guidance documents. GLOBALFOUNDRIES will update the closure plan whenever modifications to the facility make revisions necessary.

GLOBALFOUNDRIES is responsible for the remediation of any release of hazardous material that occurs after the July 1, 2015 transfer of facility ownership. IBM Corporation is responsible for remediation of any hazardous material release prior to the July 1, 2015 transfer of facility ownership. Including historic corrective action documented in State of Vermont Consent Order docket number 620-6-15CNCV. Discharge points, i.e. treated ground water, from the outlet of the corrective action remediation system(s) are also regulated under IBM's NPDES permit # 3-1559.

10.2.2 Closure Completion Guidelines

For the purpose of this plan, a 30-year life will be assumed for this facility, making the expected time of final closure March 1, 2048.

Facility closure shall not be considered to have been completed until:

(a) GLOBALFOUNDRIES and an independent Vermont-licensed professional engineer have provided the Secretary written certification that the closure has been completed in accordance with the provisions of the Closure Plan;
(b) The Secretary has inspected the facility (if applicable); and
(c) The Secretary has given written approval of the closure.

10.2.3 Maximum Waste Inventory

Current maximum waste inventory for each permitted hazardous waste management unit is identified below. Waste inventories will either be treated on-site or shipped off-site to a permitted reclamation, treatment, or disposal facilities in accordance with this permit and all applicable regulations. The final disposition method and facility for each waste type will be selected based on the waste characterization and relative cost. However, for the purposes of the closure cost estimate included as Table 10-2 of this plan, it has been assumed that all wastes will be transported off-site for disposal.

The maximum waste inventory for the facility is equivalent to the sum of the following volumes:

1. 5,280 gallons of hazardous waste in the CDC flammable waste storage room (equivalent to 96 55-gallon drums)

2. 60,720 gallons of hazardous waste in the CDC waste storage room (equivalent to 1,104 55-gallon containers, of which 545 55-gallon drums may contain liquid hazardous waste)

3. Above-ground waste tanks:

General Solvent	(3 tanks) 30,000 gallons
Mid-UV waste	(1 tank) 10,000 gallons
(Former Deep-UV waste Out Of Service)	(1 tank) 10,000 gallons
Deep-UV waste (former General Solvent)	(1 tank) 10,000 gallons
Building 963 north	(1 tank) 9,000 gallons
TOTAL	**(7 tanks) 69,000 gallons**

Spill containment tanks are normally empty and are not included in the site waste storage capacity.

10.2.4 Health and Safety Approach

All closure activities will be conducted in accordance with appropriate health and safety procedures, including the Emergency Response Plan, and Occupational Safety and Health Administration (OSHA) regulation 29 CFR 1910.120. Confined space entry procedures will be conducted in accordance with 29 CFR 1910.146. GLOBALFOUNDRIES will ensure all personnel involved in closure activities have current 40-Hour OSHA training and use appropriate personal protective equipment (PPE). Initial assessment of working conditions will be completed prior to initiation of closure activities. Assessment of working conditions will continue throughout closure activities; air monitoring will be performed with a portable air monitoring device appropriate for the potential VOCs. Such devices as portable photoionization detector (PID), a flame ionization detector (FID) to evaluate whether respiratory protection is required and, if so, the level of respiratory protection required. . It is anticipated that no concentrations of total volatile organic compounds (VOCs) in air will be found above background concentrations, and therefore no respiratory protection should be necessary. Personnel responsible for safety under OSHA will determine additional appropriate actions. Spill equipment will be available for use in case of an inadvertent release of waste materials or wash water during decontamination activities.

10.2.5 Preparation for Closure

10.2.5.1 Containerized Waste Removal

Containerized hazardous wastes will be handled and removed from permitted hazardous waste management storage rooms in accordance with this permit and applicable regulatory requirements and guidance. Waste will be loaded directly on trucks or rail cars with forklifts designed for moving either pallets that are securely loaded with multiple containers, or fitted with drum-handling devices for single-drum transfers.

All containers will be prepared for shipment and sealed in accordance with applicable Vermont, EPA and DOT requirements. All secondary containment trays used for storing containerized hazardous wastes in the permitted hazardous waste management units will be power-washed. The “power-wash” process will consist of power washing three times using industrial detergent and hot water prior to removal from the units. The resulting wash water will be collected in a portable container for analysis, characterization and disposal. A representative sample of the wash-water resulting from the third power wash will be analyzed for potential contaminants in order to verify they are below LDR Universal Treatment Standards for wastewaters.

10.2.5.2 Bulk Waste Removal

Prior to conducting any tank closure activities, all flow to the waste tanks will be shut off at the manufacturing buildings, and any waste contained in ancillary equipment and piping located between the manufacturing buildings and waste tanks will be drained into the tanks. Waste contained in the tanks will then be removed and transferred to trucks or rail cars using standard waste transfer practices, and shipped to off-site reclamation, treatment, or disposal facilities

permitted to accept such waste. After the waste has been removed from the tanks, the ancillary equipment and piping will be flushed with water and detergent three times. A representative sample of the each resulting wash-water will be collected for analysis and characterization. After the wash-water has been pumped out, the manway cover of each tank will be removed and the air present within the tanks will be tested for potentially explosive concentrations of vapors, oxygen content, and the presence of VOCs. As needed, tank entry will occur to manually remove residual liquid, sludge and scaling. Residual waste liquid, sludge and scaling removed from the tanks will either be accumulated in 55-gallon drums and transferred to trucks, or transferred directly to rail cars using standard waste transfer practices, and shipped to off-site reclamation, treatment, or disposal facilities permitted to accept such waste.

10.2.6 Decontamination Approach for Concrete and Coated Concrete

This section pertains to the decontamination of concrete and coated concrete structures including storage room walls and floors and secondary containment within the CDC tank farm. Decontamination of concrete and coated concrete will be conducted to achieve 40 CFR 268.45 Treatment standards for hazardous debris.

Prior to decontamination, any concrete will be visually inspected for evidence of releases, stains, and cracks and/or expansion joints. If no stains are observed in the vicinity of cracks and/or expansion joints, the cracks and/or expansions joints will be sealed with grout or cement. If staining is observed in the vicinity of cracks and or expansion joints, further investigation of the area will be conducted prior to sealing and decontamination. Such investigation may include testing of underlying soils.

Spill-control equipment consisting of absorbent materials, brooms, and shovels will be readily available near each hazardous waste management unit when decontamination activities are being conducted in the event that a spill occurs.

The following decontamination steps will be followed for concrete and coated concrete materials:

- Temporary berms and dikes will be placed in doorways (as applicable) and around the perimeter of the units to contain all wash-waters generated during decontamination activities.
- Surfaces of the units (i.e., concrete columns and walls), up to a height of 4 feet above the floor surface, along with the floor surfaces will be dry-swept and the resulting waste materials collected and containerized in 55-gallon steel drums for characterization, transportation, and off-site disposal.
- Surfaces of the units will be decontaminated as follows:
    - CDC Waste Storage room will be power-washed using an industrial detergent and hot water.

    - Since wastes stored in the CDC Flammable Waste Storage room are stored within secondary containment pallets and tubs, the room provides tertiary containment. The surfaces of the unit will be visually evaluated to determine if decontamination is required. Due to the room design for fire safety, decontamination would involve mopping and/or wiping surfaces with a detergent (decon per treatment standards for hazardous debris 40 CFR 268.45). Power-washing is not feasible due to the exterior wall design, the storage of virgin chemicals in the same area and no immediate means of wash water collection.
    - CDC Tank Farm surfaces of secondary containment will be power-washed using an industrial detergent and hot water.
- Wash-water from the cleaning operations will be collected in a portable bulk container for characterization and subsequent disposal at an off-site facility permitted to accept such waste. Within the CDC waste storage room, washwater will drain to the secondary containment tank, from which it will be transferred to a portable bulk container for characterization and subsequent disposal.

Post decontamination inspection of concrete will be performed to verify that decontamination is complete, any concrete will be visually inspected for evidence of releases, stains, and cracks and/or expansion joints. If post decontamination staining is observed in the vicinity of cracks and or expansion the area may be decontaminated a second time. After a second decontamination if stains are observed in the vicinity of cracks and or expansion joints then confirmatory sampling of the concrete and underlying soil will be conducted to verify that the contamination is at an acceptable level per 40 CFR 268.48 LDR Universal Treatment Standards.

10.2.7 Decontamination Approach for Metal

This section pertains to the decontamination of steel structures including bulk storage tanks, ancillary equipment, piping and secondary containment lining within the CDC tank farm.

Spill-control equipment consisting of absorbent materials, brooms, and shovels will be readily available near each hazardous waste management unit when decontamination activities are being conducted in the event a spill occurs.

The following decontamination steps will be followed for metal:

- Surfaces will be decontaminated as follows:
    - Ancillary equipment (i.e piping, pumps, valves, etc.) that came into contact with hazardous material will be decontaminated by flushing (with water and detergent) three times.
    - Interior tank surfaces will be power-washed. If tank entry is required, such entry will be performed using confined-space entry procedures. Qualified tank cleaning personnel will be outfitted with appropriate PPE (i.e., Level C or B), including respiratory protection.
    - The secondary containment structures for the bulk waste storage tanks will be swept and then visually inspected for evidence of releases, stains, and/or cracks.

Any resulting waste materials collected will be containerized in 55 gallon steel drums for characterization, transportation, and off-site disposal.
Prior to pressure-washing, deterioration of metal or welds will be sealed or welded to prevent seepage.

- All wash waters will be collected in a portable tank located near the unit being decontaminated for characterization and subsequent disposal at an off-site facility permitted to accept such waste.
- If the metal cannot be decontaminated until visibly clean and if analysis of a representative sample of the third wash-water shows residual contamination is at unacceptable levels, or if it is determined that decontamination is not practical, the metal will be transported and disposed of at an off-site disposal facility permitted to accept such waste.

The concrete secondary containment structures for the bulk storage tanks were lined with steel in 1989, which was tested for water tightness upon installation. The steel liners shall be sampled and removed and the concrete below them shall subsequently be inspected, decontaminated and sampled according to Section 10.2.6.

Post decontamination inspection of metal surfaces (e.g. bulk storage tanks, ancillary equipment, piping and secondary containment lining) will be visually inspected to verify that decontamination is complete.

10.2.8 Confirmatory Sampling

10.2.8.1 Concrete Confirmatory Sampling

Once decontamination/power-washing has been completed and if staining is observed a representative sample of the third wash-water or concrete core or chip samples will be collected for analysis in accordance with applicable regulations and guidance documents. Sample locations will be biased to grid squares where visible stains or cracks are found in the concrete, based on visual inspection of the concrete performed after decontamination.

10.2.8.2 Metal Confirmatory Sampling

After decontamination activities, a representative sample of the third wash-water will be collected for analysis. The sample will be collected to confirm that the residual contamination is at an acceptable level.

If the residual contamination is at an acceptable level per 40 CFR 268.48 LDR Universal Treatment Standards, the metal will be considered to be non-hazardous waste and will be removed and disposed of at an off-site facility permitted to accept such waste. Alternatively, based on additional evaluation of the characterization data, the metal may be sent to a scrap

metal recycler. If any of the sample concentrations exceed acceptable levels, the metal will be decontaminated again and re-sampled until sample concentrations are acceptable.

Alternatively, at any time during the sampling activities, GLOBALFOUNDRIES or another third party representative, contractor may elect to remove the metal and dispose of it as a hazardous waste (based on characterization and in accordance with applicable regulations) at a permitted off-site disposal facility.

10.2.9 Removal

10.2.9.1 Concrete Removal

Prior to demolition and removal, concrete will be visually inspected, decontaminated and sampled per section 10.2.6. If the contaminant concentrations in the concrete samples are below the standards set forth in section 10.2.6 and do not exhibit any RCRA hazardous waste characteristics, the concrete will be considered as non-hazardous waste and will be rubblized, removed and disposed of at a permitted off-site facility. Alternatively, the concrete may be used as fill upon written approval from the Vermont Solid Waste Management Program. If any of the sample concentrations exceed the standards set forth in 10.2.6, the structure will be decontaminated again and re-sampled. If the contaminant concentrations in the second sample exceed the standards set forth in 10.2.6 the concrete will be managed as hazardous waste.

Alternatively, at any time during the sampling activities, GLOBALFOUNDRIES or a third party representative may elect to remove the concrete and dispose of it as a hazardous waste, in accordance with applicable regulations, at a permitted off-site disposal facility.

Concrete will be rubblized. For practical purposes, concrete debris may be marked (e.g., with orange spray paint) and visually segregated and stockpiled on-site after demolition of selected building sections. Concrete debris will be transferred to stockpiles underlain and overlain with plastic sheeting and/or lined roll-off boxes.

10.2.9.2 Metal Removal

Metal piping, tanks, and structures will be disassembled or cut into pieces, as needed, and removed for recycling or disposal based on confirmatory wash-water sampling results. If the metal cannot be adequately decontaminated, it will be transferred to stockpiles underlain and overlain with plastic sheeting and/or lined roll-off boxes. For the purposes of developing the cost estimate for disposal of metal for this closure plan, it was assumed that the tanks and piping would be disposed of as non-hazardous scrap metal in accordance with VHWMR §7-204(e).

10.2.9.3 Soil Removal

If soil contamination is identified or suspected during closure, soil will be evaluated and managed in accordance with the Agency's **Investigation and Remediation of Contaminated Properties Rule**.

10.2.10 Hazardous Waste Management Approach

10.2.10.1 Hazardous Waste Characterization

Characterization data for all waste materials generated during closure activities (e.g., floor sweepings, wash-water, concrete) will be compared to the standards in Vermont Hazardous Waste Management Regulations Subchapter 2, §7-205 (Ignitability), §7-206 (Corrosivity), §7-207 (Reactivity) and §7-208 (Toxicity) Table 1, entitled, "Maximum Concentration for the Toxicity Characteristic" (also known as TCLP limits), excluding pesticides and herbicides. Listed hazardous waste codes will be applied based on a combination of site history and analysis as required. If appropriate, generator knowledge and previous waste stream characterization information may be utilized to determine if wastes are characteristically and/or listed hazardous waste. Should the results of the waste characterization process show that the waste does not exhibit a characteristic of hazardous waste and no evidence exists to support the application of a hazardous waste listing, the waste may be managed as non-hazardous waste.

A minimum of one representative sample of each waste generated during closure of each hazardous waste management unit will be collected and analyzed. The samples will be collected and analyzed using EPA Method SW-846 test methods to determine appropriate waste disposal methods. Waste characterization and disposition will be documented in the Closure Certification Report.

10.2.10.2 Off-Site Disposal Procedures

Shipments of waste materials from the site will be made in accordance with applicable waste management and transportation regulations. The materials will be transported using a waste transporter permitted according to Vermont regulations. Shipments will be disposed of at off-site facilities permitted to accept such waste.

Information about all wastes streams generated during closure; the disposal option selected for each waste stream; and the waste transporters, disposal facilities, and scrap facilities to which waste was shipped will be documented in the Closure Certification Report. Copies of all shipping documents, including hazardous waste manifests, used to transport wastes shipped off-site will be provided as attachments to the Closure Certification Report.

10.3 SCHEDULE FOR CLOSURE

See Table 10-1.

Table 10-1
Closure Schedule

Task	Scheduled Completion (Days after receipt of last hazardous waste)
Pre-closure notification form submitted	90 days prior to closure commencement
Start of final closure (begin inventory removal)	30
Removal of tank and container waste inventory (treated on-site or shipped off-site)	90
Decontamination of tanks and associated piping, pumps, valves, and ancillary equipment	150
Decontamination of CDC Waste Storage Room, CDC Transfer Room, and CDC Flammable Waste Storage Room	150
Decontamination of secondary containment system	170
Treatment / disposal of wash solutions	180
Disassembly of piping, pumps, valves, and ancillary equipment	180
Removal of aboveground waste storage tanks and secondary containment tank and structures	180

10.4 POST CLOSURE PLANS

IBM's (previous property owner) industrial landfill was closed prior to November 19, 1980. Post-closure plans are not required.

10.5 NOTICE IN DEED AND NOTICE TO LOCAL LAND AUTHORITY

IBM's (previous property owner) industrial landfill was closed prior to November 19, 1980. Requirements for a notice in the property deed and notification of local land authority do not apply.

Some general property use restrictions have been identified as part of the transfer of ownership of the property from IBM Corporation to GLOBALFOUNDRIES U.S. 2 LLC.

10.6 CLOSURE COST ESTIMATE

The final closure cost in updated 2019 dollars for the disposal of the maximum hazardous waste inventory and decontamination and closure of the hazardous waste management facility is estimated to be $5,056,003 (Table 10-2). The costs were projected from current waste disposal costs and all third-party costs associated with closure activities. The costs provided in Table 10-2

include all project oversight and labor costs, and expenses associated with the waste sampling and profiling; waste disposal; tank, equipment and secondary containment area decontamination; some estimated soil excavation and disposal; verification sampling, and final reporting and third-party certification activities. These costs reflect the most expensive costs associated with the closure of the hazardous waste storage facility (e.g., the tanks contain the maximum capacity of waste, the storage areas contain the maximum number of containers of waste allowed under the permit) (containerized and bulk waste composition are based on 2006 usage). See Attachment 10-1 for the detailed closure cost estimates compiled for GLOBALFOUNDRIES by a third-party consultant in 2007. These estimates are the basis for the costs identified in Table 10-2 and have since been adjusted annually for inflation.

The more expensive disposal option was selected whenever multiple disposal options were available for a waste stream (e.g., disposal of soil or concrete wastes generated during closure was assumed to be hazardous waste disposal). Steel tanks and equipment were not considered to be scrap and therefore no salvage value was assumed, but rather they were assumed to be disposed of as either hazardous or non-hazardous waste as previously discussed. Table 10-2 summarizes these costs. In conformance with GLOBALFOUNDRIES current operating practices, it is likely that some waste streams will be sold for reclamation or fuel blending at final closure; however, the costs included in Table 10-2 reflect off-site disposal of all wastes associated with the closure activities.

This closure cost estimate will be revised whenever changes occur in the closure plan that affect closure costs, and, at a minimum, the closure cost estimate will also be adjusted annually to account for inflation. A copy of the closure cost estimate will be filed at GLOBALFOUNDRIES and submitted to the Secretary at least annually. The annually updated closure cost estimate will be used in the demonstration of financial assurance required by 40 CFR 264.143, as included in Appendix F.

Table 10-2 Overall Cost Estimate for RCRA Closure Activities	
	Estimated Cost (Updated 2019 Dollars)
CDC WASTE STORAGE ROOM (INCLUDES CDC TRANSFER ROOM)	
Engineering	$164,302.96
Construction	$329,841
Transportation & Disposal – Max Inventory	$456,886
Transportation & Disposal – Closure Wastes	$359,688
Laboratory Analytical	$84,005
TOTAL CDC WASTE STORAGE ROOM	$1,394,722
CDC FLAMMABLE WASTE STORAGE ROOM	
Engineering	$53,121
Construction	$38,296
Transportation & Disposal – Max Inventory	$39,729
Transportation & Disposal – Closure Wastes	$39,334
Laboratory Analytical	$13,589
TOTAL CDC FLAMMABLE WASTE STORAGE ROOM	$184,069
CDC TANK FARM	
Engineering	$196,422
Construction	$1,295,770
Transportation & Disposal – Max Inventory	$144,537
Transportation & Disposal – Closure Wastes	$897,366
Laboratory Analytical	$90,923
TOTAL CDC TANK FARM	$2,625,018
BUILDING 963 NORTH TANK	
Engineering	$39,532
Construction	$56,827
Transportation & Disposal – Max Inventory	$21,681
Transportation & Disposal – Closure Wastes	$62,324
Laboratory Analytical	$12,354
TOTAL BUILDING 963 NORTH TANK	$192,716
SUBTOTAL	$4,396,525
TOTAL CONTINGENCY (15%)	$659,479
TOTAL CLOSURE COSTS	**$5,056,003**

ATTACHMENT 10-1

2007 BASIS FOR CLOSURE COST ESTIMATE

OVERALL COST ESTIMATE

7/11/2007

RCRA CLOSURE ACTIVITIES
INTERNATIONAL BUSINESS MACHINE
ESSEX JUNCTION, VERMONT

WASTE STORAGE UNIT	ENGINEERING	CONSTRUCTION	TRANSPORTATION & DISPOSAL	LABORATORY ANALYTICAL	TOTAL
CDC Container Storage Area	$133,000	$267,000	$661,000	$68,000	$1,129,000
CDC Flammable Waste Storage Room	$43,000	$31,000	$64,000	$11,000	$149,000
CDC Tank Farm	$159,000	$493,000	$724,000	$80,000	$1,456,000
AST Northeast of Building 963	$32,000	$46,000	$68,000	$10,000	$156,000
Subtotal	$367,000	$837,000	$1,517,000	$169,000	
Contingency (15%)	$55,000	$126,000	$228,000	$25,000	
TOTAL	$422,000	$963,000	$1,745,000	$194,000	**$3,320,000**

COST ESTIMATE

CHEMICAL DISTRIBUTION CENTER CONTAINER STORAGE AREA (INCLUDING SOLVENT TRANSFER ROOM)
INTERNATIONAL BUSINESS MACHINE
ESSEX JUNCTION, VERMONT

	Closure Units	*Approximate Quantity*	*Unit Price*	*Maximum Total Price*
Engineering Costs				
Preparation of SOW	-	-	-	$24,306
Engineering/Oversight - Waste Removal	-	-	-	$14,444
Engineering/Oversight - Decontamination	-	-	-	$13,685
Engineering/Oversight - Verification	-	-	-	$14,444
Engineering/Oversight - Decommission	-	-	-	$18,860
Engineering/Oversight - Investigation, if necessary	-	-	-	$13,064
Engineering/Oversight - Remediation, if necessary	-	-	-	$16,818
Field Equipment - Sampling, PPE, Drilling Subcontractor	-	-	-	$8,000
Certification	-	-	-	$9,736
		Engineering Costs Sub-Total		**$133,357**
Construction Subcontractor Costs				
Decontamination Pad	Each	1	$2,105	$2,105
Decontamination - Floor	Sq. Ft.	5425	$5	$27,125
Concrete Removal (8-inch thick) - Handling / Segregation / Loading	Ton	276	$150	$41,400
Soil Excavation (3-foot depth)	Ton	900	$25	$22,500
Backfill and Grading	Ton	900	$12	$10,800
Restoration (Concrete replacement)	Sq. Ft.	5425	$30	$162,750
		Construction Subcontractor Costs Sub-Total		**$266,680**
Transportation and Disposal Costs				
Hazardous Waste (55-gal drums)	Each	1104	$335	$369,840
Wash solution (0.5 gal / ft^2)	Gal.	2700	$1.10	$2,970
Concrete (Hazardous)	Ton	276	$245	$67,620
Soil (Hazardous)	Ton	900	$245	$220,500
		Transportation and Disposal Costs Sub-Total		**$660,930**
Analytical Laboratory Costs				
Investigation/Confirmatory Samples (1)				
Appendix IX VOCs, SVOCs, metals	Ea.	106	$433	$45,898
PCBs	Ea.	106	$50	$5,300
Appendix IX Pesticides/Herbicides	Ea.	10	$203	$2,030
Waste Characterization				
Liquid Waste in Drums	Ea.	10	$909	$9,090
Concrete	Ea.	2	$909	$1,818
Soil	Ea.	2	$909	$1,818
Decontamination Wash Water	Ea.	2	$909	$1,818
		Analytical Laboratory Costs Sub-Total		**$67,772**
			Total Costs	**$1,128,739**

Notes:

(1) Per The Vermont Hazardous Waste Generator and Facility Closure Guidance Document revised May 2005.
The Container Storage Area includes the Solvent Transfer Room.

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COST ESTIMATE

CHEMICAL DISTRIBUTION CENTER FLAMMABLE WASTE STORAGE ROOM
INTERNATIONAL BUSINESS MACHINE
ESSEX JUNCTION, VERMONT

	Closure Units	*Approximate Quantity*	*Unit Price*	*Maximum Total Price*
Engineering Costs				
Preparation of SOW	-	-	-	$6,698
Engineering/Oversight - Waste Removal	-	-	-	$4,393
Engineering/Oversight - Decontamination	-	-	-	$3,669
Engineering/Oversight - Verification	-	-	-	$3,795
Engineering/Oversight - Decommission	-	-	-	$3,174
Engineering/Oversight - Investigation, if necessary	-	-	-	$5,014
Engineering/Oversight - Remediation, if necessary	-	-	-	$6,302
Field Equipment - Sampling, PPE, Drilling Subcontractor	-	-	-	$4,750
Certification	-	-	-	$4,888
			Engineering Costs Sub-Total	**$42,682**
Construction Subcontractor Costs				
Decontamination Pad	Each	1	$2,105	$2,105
Decontamination - Floor	Sq. Ft.	600	$5	$3,000
Concrete Removal (8-inch thick) - Handling / Segregation / Loading	Ton	30	$150	$4,500
Soil Excavation (3-foot depth)	Ton	100	$25	$2,500
Backfill and Grading	Ton	100	$12	$1,200
Restoration (Concrete Replacement)	Sq. Ft.	600	$30	$18,000
			Construction Subcontractor Costs Sub-Total	**$31,305**
Transportation and Disposal Costs				
Hazardous Waste (55-gal drums)	Each	96	$335	$32,160
Wash solution (0.5 gal / ft^2)	Gal.	300	$1.50	$450
Concrete (Hazardous)	Ton	30	$245	$7,350
Soil (Hazardous)	Ton	100	$245	$24,500
			Transportation and Disposal Costs Sub-Total	**$64,460**
Analytical Laboratory Costs				
Investigation/Confirmatory Samples (1)				
Appendix IX VOCs, SVOCs, metals	Ea.	12	$433	$5,196
PCBs	Ea.	12	$50	$600
Appendix IX Pesticides/Herbicides	Ea.	2	$203	$406
Waste Characterization				
Liquid Waste in Drums	Ea.	2	$909	$1,818
Concrete	Ea.	1	$909	$909
Soil	Ea.	1	$909	$909
Decontamination Wash Water	Ea.	1	$909	$909
			Analytical Laboratory Costs Sub-Total	**$10,747**
			Total Costs	**$149,194**

Notes:

(1) Per The Vermont Hazardous Waste Generator and Facility Closure Guidance Document revised May 2005.

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COST ESTIMATE

CHEMICAL DISTRIBUTION CENTER ABOVEGROUND STORAGE TANK FARM
INTERNATIONAL BUSINESS MACHINE
ESSEX JUNCTION, VERMONT

	Closure Units	*Approximate Quantity*	*Unit Price*	*Maximum Total Price*
Engineering Costs				
Preparation of SOW	-	-	-	$31,492
Engineering/Oversight - Waste Removal	-	-	-	$19,159
Engineering/Oversight - Decontamination	-	-	-	$15,410
Engineering/Oversight - Verification	-	-	-	$11,891
Engineering/Oversight - Decommission	-	-	-	$23,092
Engineering/Oversight - Investigation, if necessary	-	-	-	$15,663
Engineering/Oversight - Remediation, if necessary	-	-	-	$16,210
Field Equipment - Sampling, PPE, Drilling Subcontractor	-	-	-	$16,000
Certification	-	-	-	$9,736
		Engineering Costs Sub-Total		**$158,653**
Construction Subcontractor Costs				
Decontamination Pad	Each	1	$2,105	$2,105
Decontamination - Tanks (triple rinse) / Secondary Containment	Each	7	$7,600	$53,200
Decontamination - Piping (2-inch SS) and ancillary valves/pumps	L.F.	12100	$5	$60,500
Steel Removal - Tanks	Each	7	$7,500	$52,500
Steel Removal - Piping (all pipes summed and removed together)	L.F.	2300	$33	$75,900
Steel Removal - Secondary Containment	Ton	245	$250	$61,250
Concrete Removal (12-inch thick floor and sidewalls) - Handling / Segregation / Loading	Ton	791	$150	$118,650
Soil Excavation (3-foot depth)	Ton	1250	$25	$31,250
Backfill and Grading	Ton	1250	$12	$15,000
Restoration (Soil cap)	Sq. Ft.	7400	$3	$22,200
		Construction Subcontractor Costs Sub-Total		**$492,555**
Transportation and Disposal Costs				
Hazardous Waste - Bulk General Solvent	Gal.	30000	$1.95	$58,500
Hazardous Waste - Mid-UV Waste	Gal.	20000	$1.95	$39,000
Hazardous Waste - Deep-UV Waste	Gal.	10000	$1.95	$19,500
Hazardous Waste - Ethylene Glycol	Gal.	10000	$1.95	$19,500
Wash solution (2,400 gal/tank & 1.5 gal/ft^2 for concrete & 1 gal/ft of pipe)	Gal.	33380	$1.10	$36,718
Concrete (Hazardous)	Ton	791	$245	$193,795
Steel (tanks) - Non-hazardous	Ton	273	$35	$9,555
Steel (secondary containment, piping) - Hazardous	Ton	267	$150	$40,050
Vapor Phase Carbon (7 55-gal drums) - Hazardous	Drum	7	$135.00	$945
Soil (Hazardous)	Ton	1250	$245	$306,250
		Transportation and Disposal Costs Sub-Total		**$723,813**
Analytical Laboratory Costs				
Investigation/Confirmatory Samples (1)				
Appendix IX VOCs, SVOCs, metals	Ea.	111	$433	$48,063
PCBs	Ea.	111	$50	$5,550
Appendix IX Pesticides/Herbicides	Ea.	11	$203	$2,233
Waste Characterization				
Liquid Waste in Tanks	Ea.	9	$909	$8,181
Concrete	Ea.	7	$909	$6,363
Soil	Ea.	2	$909	$1,818
Steel	Ea.	1	$909	$909
Vapor Phase Carbon	Ea.	1	$909	$909
Decontamination Wash Water	Ea.	7	$909	$6,363
		Analytical Laboratory Costs Sub-Total		**$80,389**
			Total Costs	**$1,455,410**

Notes:

(1) Per The Vermont Hazardous Waste Generator and Facility Closure Guidance Document revised May 2005.

7/11/2007

COST ESTIMATE

BUILDING 963 ABOVEGROUND STORAGE TANK
INTERNATIONAL BUSINESS MACHINE
ESSEX JUNCTION, VERMONT

	Closure Units	*Approximate Quantity*	*Unit Price*	*Maximum Total Price*
Engineering Costs				
Preparation of SOW	-	-	-	$4,800
Engineering/Oversight - Waste Removal	-	-	-	$3,703
Engineering/Oversight - Decontamination	-	-	-	$2,875
Engineering/Oversight - Verification	-	-	-	$2,507
Engineering/Oversight - Decommission	-	-	-	$1,886
Engineering/Oversight - Investigation, if necessary	-	-	-	$3,945
Engineering/Oversight - Remediation, if necessary	-	-	-	$3,646
Field Equipment - Sampling, PPE, Drilling Subcontractor	-	-	-	$4,750
Certification	-	-	-	$4,178
		Engineering Costs Sub-Total		**$32,289**
Construction Subcontractor Costs				
Decontamination Pad	Each	1	$2,105	$2,105
Decontamination - Tank/Secondary Cont.	Each	1	$7,600	$7,600
Decontamination - Piping and ancillary valves/pumps	L.F.	200	$5	$1,000
Steel Removal - Tanks	Each	1	$7,500	$7,500
Steel Removal - Piping	L.F.	200	$33	$6,600
Steel Removal - Secondary Containment	Ton	25	$250	$6,250
Concrete Removal (12-inch thick floor and sidewalls) - Handling / Segregation / Loading	Ton	60	$150	$9,000
Soil Excavation (3-foot depth)	Ton	105	$25	$2,625
Backfill and Grading	Ton	105	$12	$1,260
Restoration (Soil cap)	Sq. Ft.	625	$3	$1,875
		Construction Subcontractor Costs Sub-Total		**$45,815**
Transportation and Disposal Costs				
Hazardous Waste - Bulk Waste	Gal.	9000	$1.95	$17,550
Wash solution (2,400 gal/tank & 1.5 gal/ft^2 for concrete & 1 gal/ft of pipe)	Gal.	3538	$1.10	$3,891
Concrete (Hazardous)	Ton	60	$245	$14,700
Steel (tanks) - Non-hazardous	Ton	35	$35	$1,225
Steel (secondary containment, piping) - Hazardous	Ton	32	$150	$4,800
Soil (Hazardous)	Ton	105	$245	$25,725
		Transportation and Disposal Costs Sub-Total		**$67,891**
Analytical Laboratory Costs				
Investigation/Confirmatory Samples (1)				
Appendix IX VOCs, SVOCs, metals	Ea.	12	$433	$5,196
PCBs	Ea.	12	$50	$600
Appendix IX Pesticides/Herbicides	Ea.	2	$203	$406
Waste Characterization				
Liquid Waste in Tank	Ea.	1	$909	$909
Concrete	Ea.	1	$909	$909
Soil	Ea.	1	$909	$909
Decontamination Wash Water	Ea.	1	$909	$909
		Analytical Laboratory Costs Sub-Total		**$9,838**
			Total Costs	**$155,833**

Notes:

(1) Per The Vermont Hazardous Waste Generator and Facility Closure Guidance Document revised May 2005.

SECTION 11.0

ORGANIC AIR EMISSION COMPLIANCE

11.1 INTRODUCTION

The following section outlines the steps GLOBALFOUNDRIES will follow to comply with the organic air emission standards for process vents, equipment leaks, and tanks, containers, and surface impoundments.
Provided first is a summary of the standards and a broad overview of the actions that GLOBALFOUNDRIES has implemented to address them. Attachment 11-1 is a detailed compliance plan that outlines the Subpart BB and Subpart CC standards and the actions GLOBALFOUNDRIES will implement to comply with these standards. No detailed compliance plan for the Subpart AA standards for process vents is given because they are not applicable to GLOBALFOUNDRIES' hazardous waste management activities at this time.

11.2 SUMMARY OF THE STANDARDS

On June 21, 1990, EPA promulgated standards effective on December 21, 1990, limiting organic air emissions from specific hazardous waste processes. The rule was the first action of a multi-phased regulatory effort to control organic air emissions from hazardous waste management operations. It established standards limiting organic emissions from 1) process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, and air or steam stripping operations, and 2) leaks from equipment that contains or contacts hazardous waste streams. The standards for process vents are given in 40 CFR 264, Subpart AA, and the standards for equipment leaks are given in 40 CFR 264, Subpart BB.

On November 25, 1996, EPA published the second phase of regulatory standards for air emissions from tanks, containers, and surface impoundments. This rule was clarified and amended by the EPA on December 8, 1997. The requirements for units covered under these standards became effective December 6, 1996, and are contained in 40 CFR 264, Subpart CC.

11.3 SUBPART AA - AIR EMISSION STANDARDS FOR PROCESS VENTS

This section provides a description as required by 40 CFR 270.24 for process vents. 40 CFR 264, Subpart AA gives standards that limit organic emissions from process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, and air or steam stripping operations. Although GLOBALFOUNDRIES has process vents on its storage tanks, these standards do not apply. The rationale for this is provided below.

11.3.1 Tank Vents

EPA excluded emissions from tanks in the June 21, 1990, rule. Emissions from tanks are addressed in the November 25, 1996, Subpart CC rulemaking. Consequently, the standards for process vents

in 40 CFR 264, Subpart AA do not apply to GLOBALFOUNDRIES' tank systems and no action is needed.

11.4 SUBPART BB - AIR EMISSION STANDARDS FOR EQUIPMENT LEAKS

This section provides a description as required by 40 CFR 270.25 for equipment leaks. 40 CFR 264, Subpart BB equipment leak standards apply to emissions from valves, pumps, compressors, pressure-relief devices, sampling systems, and open-ended valves or lines. GLOBALFOUNDRIES has determined through analysis and generator knowledge that its hazardous waste streams contain or may contain greater than 10 percent by weight organic constituents per 40 CFR 264.1050(b)(1). Based on this, Subpart BB equipment standards apply to GLOBALFOUNDRIES hazardous waste handling equipment. GLOBALFOUNDRIES has implemented a system to identify and mark affected equipment, implemented a program to monitor and repair leaks, and developed a recordkeeping system. Records required to meet the Subpart BB standards are compiled in the facility operating record and are described in Attachment 11-1.

Per 40 CFR 270.25(e), Attachment 11-1 provides information regarding closed vent systems and control devices as required by 40 CFR 264.1060. The solvent wastes that GLOBALFOUNDRIES stores are considered light liquids (i.e., their vapor pressure is greater than 0.3 kilopascal at 20 degrees Celsius). Consequently, GLOBALFOUNDRIES's pumps are in light liquid service and are subject to these standards. At this time, GLOBALFOUNDRIES uses a carbon adsorption system for tank vents. Because the Subpart BB Air Emission Standards do not apply to tank vents, GLOBALFOUNDRIES's compliance with tank vent requirements is discussed in the Subpart CC plan in Section 16.0 of Attachment 11-1.

11.5 SUBPART CC - AIR EMISSION STANDARDS FOR TANKS, SURFACE IMPOUNDMENTS, AND CONTAINERS

This section provides a description as required by 40 CFR 270.27 for tanks, surface impoundments, and containers. The 40 CFR 264, Subpart CC air emission standards apply to tanks, surface impoundments, and containers. The Subpart CC standards specify emissions-control measures based on the vapor pressure of the stored waste and the container or tank volume. Using knowledge of the processes and chemicals generating wastes, GLOBALFOUNDRIES has determined that hazardous wastes stored in onsite tanks and containers have an average volatile organic concentration greater than 500 parts per million (ppm) by weight and are therefore subject to 40 CFR 264, Subpart CC. Records required to meet the Subpart CC standards are compiled in the facility operating record and are described in Attachment 11-1.

The requirements for surface impoundments are not applicable as GLOBALFOUNDRIES does not operate any surface impoundments at the Essex Junction facility.

ATTACHMENT 11-1

COMPLIANCE PLAN

AIR EMISSION STANDARDS FOR EQUIPMENT LEAKS

ATTACHMENT 11-1

COMPLIANCE PLAN
AIR EMISSION STANDARDS FOR EQUIPMENT LEAKS

1.0 INTRODUCTION

This section provides a compliance plan for the 40 CFR 264 Subpart BB - Air Emission Standards for Equipment Leaks and 40 CFR Subpart CC- Air Emissions Standards for Tanks, Surface Impoundments, and Containers. GLOBALFOUNDRIES has implemented this plan to comply with these standards. GLOBALFOUNDRIES will continue with the monitoring plan and frequency performed previously by IBM.

2.0 STANDARDS: PUMPS IN LIGHT LIQUID SERVICE

The solvent wastes that GLOBALFOUNDRIES stores are considered light liquids (i.e., their vapor pressure is greater than 0.3 kiloPascal at 20 degrees Celsius). Consequently, GLOBALFOUNDRIES' pumps are in light liquid service and are subject to these standards.

This section 1) describes how GLOBALFOUNDRIES will monitor pumps, 2) defines what constitutes a leak from a pump, 3) provides the schedule that GLOBALFOUNDRIES will follow to repair leaks, and 4) defines pump types that are exempt from some of the monitoring requirements.

2.1 Monitoring Requirements

GLOBALFOUNDRIES' pumps that are not exempt will be monitored monthly for leaks using Method 21 volatile organic compound (VOC) monitoring instrumentation, and will be inspected weekly for liquids dripping from the pump seals.

2.2 Definition of a Leak

A leak is defined as an instrument reading 10,000 parts per million (ppm) or greater with Method 21 VOC monitoring instrumentation.

2.3 Leak Repair Schedule

If a leak is detected, it will be repaired as soon as possible, but no later than 15 days after detection. Also, a first attempt at repairing the leaking pump will be made within five days. There are, however, some exemptions to the repair schedule requirement that allow GLOBALFOUNDRIES to postpone repair work: if it is technically infeasible to do the work, if the pump cannot be put out of service, or if the repair requires the use of a dual mechanical seal. If GLOBALFOUNDRIES postpones repair work, the reason for this will be noted in the facility operating record.

2.4 Exempt Pump Types

Three types of pumps are exempt from the monthly monitoring requirements and weekly inspections: first, pumps equipped with dual mechanical seals that have barrier fluid systems; second, pumps with no external shafts that penetrate the pump housing; and third, pumps equipped with a closed-vent system to capture leaks.

GLOBALFOUNDRIES' diaphragm pumps fall into the second exemption category, as they have no external shafts that penetrate their housing. These pumps will be monitored on an annual basis. Other exempt pumps identified by GLOBALFOUNDRIES will be monitored annually.

3.0 STANDARDS: COMPRESSORS

Compressors in light liquid service must be equipped with a seal system to prevent leaks. Because GLOBALFOUNDRIES has no compressors that are part of the hazardous waste management facility, this standard is not applicable. However, if a compressor is used in the future, it will be equipped with a seal system to prevent leaks.

4.0 STANDARDS: PRESSURE RELIEF DEVICES IN GAS/VAPOR SERVICE

GLOBALFOUNDRIES' pressure relief devices on the tanks will 1) be operated so there are no detectable emissions (demonstrated by a Method 21 instrument reading of less than 500 ppm), and 2) be returned to a condition of no detectable emissions within five days after a pressure release. Pressure relief devices that are equipped with a closed-vent system capable of capturing leaks are exempt from the two requirements listed above.

5.0 STANDARDS: SAMPLING SYSTEMS

Sampling systems must be equipped with a closed-purge or closed-vent system so no emissions occur. In situ sampling systems are exempt.

If GLOBALFOUNDRIES retrofits its tanks for sampling, closed-purge, closed-vent, or in situ sampling systems that meet the requirements of this section will be used.

6.0 STANDARDS: OPEN-ENDED VALVES OR LINES

All of GLOBALFOUNDRIES' open-ended valves or lines were fitted with caps, blind flanges, plugs, or second valves by December 21, 1990.

7.0 STANDARDS: VALVES IN GAS/VAPOR SERVICE OR IN LIGHT LIQUID SERVICE

This section 1) describes how GLOBALFOUNDRIES will monitor valves, 2) defines what constitutes a leak from a valve, 3) provides the schedule that GLOBALFOUNDRIES will follow to repair leaks, and 4) defines valve types that are exempt from the monthly monitoring requirements.

Sections 11.0 and 12.0 below also provide alternative monitoring schedules for valves that GLOBALFOUNDRIES may follow.

7.1 Monitoring Requirements

Valves will be monitored monthly for leaks. If no leaks are detected for two successive months, monitoring may be reduced to quarterly. Alternative monitoring schedules for valves that GLOBALFOUNDRIES may follow are outlined in Sections 11.0 and 12.0.

7.2 Definition of a Leak

A leak is defined as an instrument reading 10,000 ppm or greater with Method 21 instrumentation.

7.3 Leak Repair Schedule

If a leak is detected, it will be repaired by GLOBALFOUNDRIES as soon as possible, but no later than 15 days after detection. Also, a first attempt at repairing the valve will be made within five days.

7.4 Exempt Valve Types

Three types of valves do not have to be monitored monthly. The first type is valves that have no external actuating mechanisms, such as a sealed-bellows valve, that can be operated at emission readings of less than 500 ppm above background. These valves will be monitored annually.

The second type is valves that are considered as unsafe-to-monitor because monitoring personnel would be exposed to an immediate danger. For unsafe-to-monitor valves, GLOBALFOUNDRIES will develop a written plan that provides some alternative monitoring frequency. This plan will be added to the facility operating record.

The third type is valves that are considered difficult-to-monitor because personnel would have to be lifted more than 2 meters above the ground to conduct the monitoring. GLOBALFOUNDRIES will monitor these valves at least annually.

8.0 STANDARDS: PUMPS AND VALVES IN HEAVY LIQUID SERVICE, PRESSURE RELIEF DEVICES IN LIGHT LIQUID OR HEAVY LIQUID SERVICE, AND FLANGES AND OTHER CONNECTIONS

These standards 1) require that monitoring be conducted within five days if there is evidence of a leak, 2) define what is a leak, 3) require that leaks be repaired within 15 days after detection and that a first attempt to repair a leak be made within five days, and 4) describe the leak repair methods that should be used.

GLOBALFOUNDRIES' wastes are not heavy liquids. Therefore, the portions of this section that refer to heavy liquids do not apply. However, this section adds monitoring requirements for pressure-relief devices and flanges and other connectors.

Flanges and other connectors will be monitored for evidence of potential leaks per 40 CFR 264.1058. If there is any evidence of a leak (e.g., solvent odor), monitoring with Method 21 VOC monitoring instrumentation will be completed within five days. However, no routine monitoring with Method 21 VOC monitoring instrumentation will be done. Also, flanges and other connections are not required to be marked. These requirements are also outlined in FAXBACK 11802 and the compliance method descriptions outlined in Attachment 11-2.

9.0 STANDARDS: DELAY OF REPAIR

This section outlines the reasons why GLOBALFOUNDRIES may delay repairs when a leak has occurred. Repair work may be delayed 1) for equipment if it is technically infeasible to do the repair work without shutting down the hazardous waste management unit; 2) for equipment that can be put out of service and that no longer contacts hazardous waste; 3) for valves if the repair work will cause more of a problem than the leak, or if by delaying the repairs, any material that would be purged from the valve can be collected or recovered; 4) for pumps if the repair requires the use of a dual mechanical seal that includes a barrier fluid (in any event the repair must be completed as soon as practicable but not later than six months after the leak is detected); and 5) for valves if a valve assembly replacement is needed but none is available.

If repair work is delayed, GLOBALFOUNDRIES will maintain an appropriate log and retain the records as part of the facility operating record.

10.0 STANDARDS: CLOSED-VENT SYSTEMS AND CONTROL DEVICES

At this time, the only control device that GLOBALFOUNDRIES is using is a carbon adsorption system for tank vents. Because the Subpart BB Air Emission Standards do not apply to tank vents, GLOBALFOUNDRIES' compliance with tank vent requirements is discussed in the Subpart CC plan in Section 16.0.

11.0 ALTERNATIVE STANDARDS FOR VALVES IN GAS/VAPOR SERVICE OR LIGHT LIQUID SERVICE: PERCENT OF VALVES ALLOWED TO LEAK

If no more than 2% of GLOBALFOUNDRIES' valves leak, annual leak detection monitoring can be used.

If GLOBALFOUNDRIES demonstrates that no more than 2% of the facility's valves leak, this alternative annual monitoring program may be used.

12.0 ALTERNATIVE STANDARDS FOR VALVES IN GAS/VAPOR SERVICE OR IN LIGHT LIQUID SERVICE: SKIP PERIOD LEAK DETECTION AND REPAIR

40 CFR Section 264.1062 provides another alternative to the monthly/quarterly monitoring requirements. If two consecutive quarterly monitoring rounds show that no more than 2% of GLOBALFOUNDRIES' valves leak, monitoring can be done every six months, or if five consecutive quarterly monitoring rounds show that no more than 2% of the valves leak, monitoring can be done annually.

GLOBALFOUNDRIES has elected to use this monitoring program for the facility's valves. Valves are currently monitored annually. The previous owner, IBM, demonstrated compliance with the above requirements of no more than 2% of valves leaking for five consecutive monitoring rounds during the original implementation of this program. Each annual report is reviewed to insure that this standard remains applicable. IBM previously submitted the results of these tests to the State of Vermont through the year 2000. Subsequent reports are in the facility operating record. New valves will be monitored after installation and then incorporated into the annual monitoring and review schedule for less than 2% of valves leaking.

13.0 TEST METHODS AND PROCEDURES

This section gives the test methods and procedures that will be followed by GLOBALFOUNDRIES for Subpart BB. This includes the practices that GLOBALFOUNDRIES will follow for 1) monitoring in accordance with Method 21, 2) demonstrating no detectable emissions, 3) identifying equipment that contacts hazardous wastes, 4) determining if a hazardous waste is a light liquid, and 5) performing tests to determine if control devices achieve 95% reductions in emissions.

13.1 Method 21

Method 21 will be used to determine VOC leaks from equipment. The method is from Clean Air Act regulations applied to the synthetic chemical manufacturing industry (40 CFR Part 60) and centers around the use of a VOC instrument detector such as an organic vapor analyzer (OVA).

GLOBALFOUNDRIES will use the appropriate equipment to comply with the Method 21 background using Method 21 instrumentation.

13.2 No Detectable Emissions

No detectable emissions are defined as a reading of less than 500 ppm above background using Method 21 instrumentation.

13.3 Light Liquid Determination

To determine if GLOBALFOUNDRIES' liquid organic wastes are light liquids, ASTM Method D-2879-86, another standard reference method, or process knowledge will be used.

13.4 Equipment Identification

Each piece of affected equipment that comes in contact with hazardous waste and has an organic content of 10% or greater must be identified. To determine if wastes contain greater than 10% organics, GLOBALFOUNDRIES will use process knowledge or testing.

GLOBALFOUNDRIES' solvent waste streams have been determined to be above the 10% organics cut-off; therefore, Subpart BB applies. Using this knowledge, GLOBALFOUNDRIES will only perform testing to demonstrate that a waste stream does not contain 10% organics and is not subject to these regulations. No plans are currently in place to do sampling.

13.5 Emission Reduction Requirement

GLOBALFOUNDRIES has no RCRA-regulated emission reduction equipment; however, if equipment is required on RCRA-regulated units in the future, GLOBALFOUNDRIES will install and monitor emission reduction equipment to achieve at least 95% recovery of organic vapors.

14.0 SUBPART BB RECORDKEEPING REQUIREMENTS

GLOBALFOUNDRIES will implement the following recordkeeping to comply with these leak detection regulations. This includes the following information that, if applicable, will be collected by GLOBALFOUNDRIES and kept as part of the facility operating record:

1. Records for equipment,
2. Implementation schedules for closed-vent and control devices,
3. Test results for closed-vent and control devices,
4. Leaking equipment identification,
5. Leaking equipment recordkeeping,
6. Control device recordkeeping requirements,
7. Special control device recordkeeping requirements,

8. Equipment recordkeeping logs,
9. Unsafe-to-monitor and difficult-to-monitor valves,
10. Records for alternative valve monitoring,
11. Criteria to indicate pump and compressor seal failures,
12. Information to support exemptions,
13. Record retention requirements, and
14. Recordkeeping requirements under the Clean Air Act.

Each of these items and the specific recordkeeping requirements associated with each is presented below.

14.1 Records for Equipment

GLOBALFOUNDRIES will keep the following information for each piece of affected equipment in the facility operating records, if applicable:

1. The equipment and hazardous waste management unit ID numbers,
2. The approximate location of the equipment,
3. Type of equipment,
4. Percent of organics in the waste stream,
5. Physical state of the hazardous waste (e.g., gas, vapor, or liquid), and
6. The method used to comply with the Subpart BB leak detection requirements.

14.2 Implementation Schedules for Closed-Vent and Control Devices

For facilities that are required to install closed-vent or control devices for emissions and cannot do so by the effective date of these regulations, an implementation schedule has to be developed and incorporated into the facility operating record.

Because GLOBALFOUNDRIES is not required to install any closed-vent or other types of control devices at this time, developing an implementation schedule is not needed. However, should a schedule of this type be needed in the future, it will be added to the facility operating record.

14.3 Test Results for Closed-Vent and Control Devices

This provision is not currently applicable. If it becomes applicable in the future, records of test results that demonstrate that regulated closed-vent and other control devices meet the 95% removal performance standard will be kept in the facility operating record.

14.4 Leaking Equipment Identification

When a leak is detected from a piece of equipment, GLOBALFOUNDRIES will identify the leaking equipment in an inspection log according to the recordkeeping requirements of 14.5 below

and take appropriate action to resolve the leak within the required time frame.

14.5 Leaking Equipment Recordkeeping

When a leak is detected, the following information will be recorded by GLOBALFOUNDRIES in an inspection log and kept in the facility operating record:

1. The monitoring instrument and operator identification and the equipment identification number,
2. Date that evidence of a potential leak was found,
3. Date that the leak was detected and the dates of each attempt to repair the leak,
4. Repair methods that were used,
5. A notation of "Above 10,000" if an instrument reading of above 10,000 ppm was recorded after an attempt to repair the leak was made,
6. A notation of "Repair delayed" and the reason for the delay if a leak is not repaired within 15 days,
7. If the repair of a valve is delayed, documentation that shows that the delay was allowed according to the reasons listed in Section 9.0 – Standards: Delay of Repair,
8. A signature by a designated person that a repair could not be made without shutting down the hazardous waste management unit,
9. The expected date that a leak will be repaired if it is not repaired within 15 days, and
10. The date that the leak was successfully repaired.

14.6 Control Device Recordkeeping Requirements

This provision is not currently applicable. If it becomes applicable in the future, design, monitoring, operating, and inspection information for regulated closed-vent systems and control devices will be recorded in the facility operating record.

14.7 Special Control Device Recordkeeping Requirements

The Subpart BB regulations give recordkeeping requirements for thermal vapor incinerators, catalytic vapor incinerators, flares, boilers, process heaters, condensers, and carbon adsorption. For other types of control devices not specified in the regulations, U.S. Environmental Protection Agency (EPA) will provide the necessary recordkeeping requirements.

GLOBALFOUNDRIES has no equipment that would be considered a "special control device;" therefore, this recordkeeping requirement does not apply. However, should

GLOBALFOUNDRIES utilize control equipment that falls into this category, all EPA-specified recordkeeping requirements will be followed.

14.8 Equipment Recordkeeping

For equipment that is subject to the leak detection requirements, the following information will be kept as part of the facility operating record:

1. A list of equipment identification numbers (this will not include flanges and connectors),
2. A list of the equipment identification numbers (that is signed by an GLOBALFOUNDRIES official) for equipment that is designated as having no detectable emissions and that is exempt for certain monitoring requirements,
3. A list of the identification numbers for pressure relief devices,
4. For compliance tests to show no detectable emissions from pumps, compressors, pressure relief devices and valves, the dates of the tests, the background level measured, and the maximum level measured during the test, and
5. A list of equipment in vacuum service.

14.9 Unsafe-to-Monitor and Difficult-to-Monitor Valves

GLOBALFOUNDRIES, as part of the facility operating record, will keep a list of the identification numbers of the unsafe-to-monitor and difficult-to-monitor valves and the reason that they were designated as such.

14.10 Records for Alternative Valve Monitoring

If an alternative monitoring program (i.e., other than monthly) is followed, the schedule of monitoring and the percent of valves found leaking during the monitoring period will be recorded in the facility operating record.

Valves are now monitored annually after previously meeting the skip period leak detection requirements in Section 12.0. IBM previously submitted the results of these tests to the State of Vermont through the year 2000. Subsequent reports are maintained in the facility operating record.

14.11 Criteria to Indicate Pump and Compressor Seal Failure

The criteria that are used to indicate the failure of pump and compressor seals will be developed by GLOBALFOUNDRIES and will be recorded in a log that is kept as part of the facility operating record.

GLOBALFOUNDRIES currently does not have any equipment with these seals and this

information will not be generated unless such equipment is scheduled for installation.

14.12 Information to Support Exemptions

The following information will be recorded by GLOBALFOUNDRIES in a log and kept as part of the facility operating record to support any exemptions to the equipment leak regulations:

1. An analysis determining the design capacity of the hazardous waste management unit,
2. A statement listing the hazardous waste influent and effluent streams and an analysis determining if these hazardous wastes are heavy liquids, and
3. An up-to-date analysis used to determine which equipment is regulated by Subpart BB, and information used to demonstrate exemptions.

This information will not be generated unless an exemption is needed.

14.13 Record Retention Requirements

The records for leaking equipment and control devices will be kept by GLOBALFOUNDRIES for a minimum of three years.

14.14 Recordkeeping Requirements Under Clean Air Act Regulations

The regulations in Subpart BB are similar to regulations for equipment leaks under the Clean Air Act (40 CFR Part 60, Subpart VV and Part 61, Subpart V). If a facility is subject to those Clean Air Act regulations, the documentation that duplicates the RCRA leak detection recordkeeping requirements can be used to comply.

15.0 SUBPART BB REPORTING REQUIREMENTS

In the event that GLOBALFOUNDRIES does not repair its equipment, as required by Subpart BB, or allowable emissions from control devices are exceeded, a report will be submitted to the EPA and State.

The report will give the facility EPA ID number, name, and address; the equipment ID numbers of any valves, pumps, or compressors not repaired as required by the regulations; dates that the hazardous waste management unit was shut down; and records regarding control devices that exceeded allowable emissions.

If equipment is repaired within the time frames allowed by these regulations and control devices operated as required, no report to EPA or the State is required or will be submitted by GLOBALFOUNDRIES.

16.0 TANK STANDARDS

Level 1 tank controls are required for the Chemical Distribution Center (CDC) storage tanks and Building 963 north storage tank based on tank capacity and vapor pressure of the hazardous wastes. The tank capacities are 10,000 gallons each for the CDC tanks and 9,000 gallons for the Building 963 north tank. For tanks with capacities less than 75 cubic meters (m^3) (19,813 gallons), the organic vapor pressure limit for the tank is 76.6 kiloPascals (575 millimeters of mercury). If the vapor pressure of the waste in the tank is less than this limit, Level 1 controls are indicated. Vapor pressures may be reviewed using an EPA-approved test method or knowledge of the waste. GLOBALFOUNDRIES has elected to use the latter method.

GLOBALFOUNDRIES' bulk waste storage tanks are within the criteria for Level 1 controls. GLOBALFOUNDRIES' review of the vapor pressures for the possible types of wastes contained in each of the bulk storage tanks at the CDC is maintained as part of the facility operating record. The Building 963 north tank is a backup tank that, when used, could contain any of the waste streams routinely found in the CDC bulk storage tanks. Vapor pressures are reviewed using generator knowledge per the following methodology:

- Identify all compounds possible in the waste using analytical data and generator knowledge.
- Compare the vapor pressure for each compound at the lowest and highest expected temperatures, approximately 50° F and 110° F, with the vapor pressure limit identified in 40 CFR 265.1085(b)(1)(i)(C).

The CDC and Building 963 north tanks are of fixed-roof design with openings equipped with closure devices. Tank closure devices are inspected annually per 40 CFR 264.1084(c)(4). The CDC tanks are vented through activated carbon canisters; however, the control device for this vent for purposes of Subpart CC compliance is a pressure-relief vent on the discharge from the carbon canisters. Details on the CDC bulk storage tank pressure-vacuum relief vents and their settings are outlined in IBM's May 18, 1998, response to the EPA's request for information on RCRA Organic Air Emissions Standards and in IBM's August 24, 2004, notification to the Vermont Waste Management Division of a Class 1 permit modification documenting replacement of some of these closure devices. A low-flow nitrogen purge was added to the carbon canisters as part of the 2004 modifications. The purpose of this purge is to prevent ignition of the carbon in the event of exothermic adsorption of ketones. The purge discharges through the closure device downstream of the carbon canisters, in compliance with the provisions of 40 CFR 264.1084(c)(3)(ii) / 265.1085(c)(3)(ii).

16.1 Tank Repair Schedule

GLOBALFOUNDRIES will repair any defects detected during an inspection as soon as possible, but no later than 45 days after detection. Also, a first attempt at repairing the defect will be made within five days. There is, however, an exemption to the repair schedule requirement that allows GLOBALFOUNDRIES to postpone repair work if repair requires emptying or temporary removal

from service of the tank and no alternative tank capacity is available at the site to accept hazardous waste normally managed in the tank. If GLOBALFOUNDRIES postpones repair work, the reason for this will be noted in the facility operating record and the repair will be made the next time the process or unit that is generating the hazardous waste managed in the tank stops operation.

17.0 SURFACE IMPOUNDMENT STANDARDS

There are no surface impoundments at the GLOBALFOUNDRIES facility. Therefore, this section of the standard does not apply.

18.0 CONTAINER STANDARDS

Containers at GLOBALFOUNDRIES fall into three categories of control: exempt, Level 1, or Level 2. The containers being stored at the permitted facility are kept in the CDC waste storage room and the CDC flammable waste storage room. Satellite waste generation and accumulation areas and short-term storage areas are located throughout GLOBALFOUNDRIES' main site and offsite leased facilities (should any be utilized in the future).

Containers of less than 0.1 m^3 (26.4 gallons) are exempt from Subpart CC regulation. This includes the trash bags used to accumulate solvent-contaminated trash at the facility and most of the containers awaiting lab pack disposal.

Containers larger than 0.1 m^3 but less than 0.46 m^3 (121.5 gallons) used for hazardous waste accumulation or storage must meet Level 1 standards. These containers all meet the applicable U.S. Department of Transportation (DOT) regulations for packaging and primarily consist of 55-gallon drums. The non-exempt containers awaiting lab packing also all meet the applicable DOT regulations for packaging.

The standards for containers larger than 0.46 m^3 are contingent on whether the container is in "light material service" or not. GLOBALFOUNDRIES currently uses two types of containers larger than 0.46 m^3 for hazardous waste storage: contaminated soil hoppers and 3-foot by 3-foot by 3-foot containers for spent mercury vapor lamps and bulbs, contaminated soil and/or debris, and other wastes.

The soil hoppers are used to collect excavation soils removed during spill response clean-up activities and would be evaluated on a case-by-case basis to determine the applicability of Subpart CC standards.

The 3-foot by 3-foot by 3-foot containers are DOT-approved containers and meet the requirements for both Level 1 and Level 2 container standards. GLOBALFOUNDRIES has not made a formal determination of whether the VOC concentration of the wastes stored in these containers is less than the 500-ppm threshold; therefore, since these containers are greater than 0.46 m^3, they must meet Level 2 standards. If such a determination is made in the future and finds the average VOC

concentration is less than the 500-ppm threshold, GLOBALFOUNDRIES may elect to use containers meeting Level 1 standards.

18.1 Container Repair Schedule

GLOBALFOUNDRIES will repair any defects detected for a container as soon as possible, but no later than five days after detection. Also, a first attempt at repairing the defect will be made within 24 hours. If the defect cannot be repaired within five days, the waste will be removed from the container and the container will not be used to manage hazardous waste until the defect is repaired.

19.0 TEST METHODS AND PROCEDURES

This section gives the test methods and procedures that will be followed by GLOBALFOUNDRIES for Subpart CC. This includes the practices that GLOBALFOUNDRIES will follow for 1) monitoring in accordance with Method 21; 2) demonstration of no detectable emissions; 3) determining the VOC concentration of a hazardous waste; and 4) determining if control devices achieve 95% emission reduction.

19.1 Method 21

Method 21 will be used to determine VOC leaks from equipment. The method is from Clean Air Act regulations applied to the synthetic chemical manufacturing industry (40 CFR Part 60) and centers around the use of a VOC instrument detector such as an OVA.

GLOBALFOUNDRIES will use the appropriate equipment to comply with the Method 21 background using Method 21 instrumentation.

19.2 No Detectable Emissions

No detectable emissions are defined as a reading of less than 500 ppm above background using Method 21 instrumentation.

19.3 Volatile Organic Determination

To determine the volatile organic concentration of GLOBALFOUNDRIES' liquid organic wastes, Method 8260, other standard reference methods, or process knowledge will be used.

19.4 Emission Reduction Demonstration

Emissions control equipment performance may be demonstrated using the methods and procedures identified in 40 CFR 264.1034 or through the use of process knowledge and design data.

GLOBALFOUNDRIES maintains these data on file. However, as the method of compliance with

Subpart CC tank standards for the CDC tanks is conservation vents, this demonstration is not required for the activated carbon vent system installed upstream of the conservation vents.

20.0 SUBPART CC RECORDKEEPING REQUIREMENTS

GLOBALFOUNDRIES has implemented the following recordkeeping to comply with the requirements of Subpart CC. This includes the information that, if applicable, will be kept as part of the facility operating record:

1. Records for tanks,
2. Vapor pressure determinations,
3. Unsafe-to-monitor covers,
4. Defect identification,
5. Defect recordkeeping,
6. Control device recordkeeping requirements,
7. Control device design information,
8. Analysis and monitoring records.

These records required under Subpart CC will be maintained in the facility files for a minimum of three years.

ATTACHMENT 11-2

COMPLIANCE METHOD DESCRIPTIONS

METHOD OF COMPLIANCE FOR SUBPART BB

Valves

1. These valves shall be monitored monthly using Reference Method 21, and must maintain a reading of less than 10,000 ppm. Any valve for which a leak is not detected for two successive months may be monitored the first month of each succeeding quarter until a leak is detected. If a leak is detected, the Permittee must resume monitoring the valve monthly until a leak is not detected for two successive months. All leaks must be repaired and in compliance no later than 15 calendar days after leak detection, and a first attempt at repair must be made no later than 5 calendar days after leak detection. [40 C.F.R. 264.1057(a)-(e)]

2. These valves are considered leakless and achieve a no-detectable emissions limit (<500 ppm above background as measured by Reference Method 21) and must have performance tests conducted initially upon designation, annually, and as requested by the Regional Administrator. [40 C.F.R. 264.1057(f)]

3. These valves are considered to meet a performance level of 2 percent of all valves leaking for a single hazardous waste management unit and must comply with the required notification, monitoring, and repair program. [40 C.F.R. 264.1061]

4. The Permittee must comply with a skip-period leak detection and repair program for these valves. [40 C.F.R. 264.1062]

5. These valves are designated unsafe to monitor or difficult to monitor [40 C.F.R. 264.1057(g)-(h)]. Use 5U for unsafe and 5D for difficult. These valves shall be monitored at the frequencies specified in Table 2 and the Permittee must attach an additional written monitoring plan to meet the requirements of 40 C.F.R. 264.1057(g)-(h).

6. These open-ended valves or lines shall comply with the requirements in 40 C.F.R 264.1056.

7. These valves shall be considered in heavy liquid service and shall be monitored visually, audibly, by olfactory methods, or other detection methods at least monthly, and shall comply with the required repair program if evidence of a leak is found. [40 C.F.R. 264.1058]

Pumps

8. This method applies if the pump is in light liquid service and does not fall under one of the three categories in numbers 9, 10, and 11.

   These pumps shall be inspected weekly and monitored monthly using Reference Method 21, and must maintain a reading less than 10,000 ppm and must comply with the leak repair program as specified in 40 C.F.R. 264.1052(c).

9. These pumps have a dual mechanical seal system that includes a barrier fluid between two seals and they must comply with the inspection and repair requirements of 40 C.F.R. 264.1052(d). The Permittee must attach detailed design, installation, and maintenance specifications and standard operating procedures for these pumps.

10. These pumps are designated for no-detectable emissions limit (<500 ppm above background as measured by Reference Method 21) and must be monitored initially upon designation, annually, and as requested by the Regional Administrator. [40 C.F.R. 264.1052(e)]

11. These pumps are equipped with closed vent systems capable of transporting any leakage from the seal or seals to a control device and must comply with the monitoring and inspection requirements of 40 C.F.R. 264.1060. [40 C.F.R. 264.1052(f)]

12. This method applies if the pump is in heavy liquid service. These pumps shall be monitored visually, audibly, by olfactory methods or other detection methods and comply with the required repair program if evidence of a leak is found. [40 C.F.R. 264.1058]

Compressors

13. This method applies only if the compressor does not fall under one of the two categories in numbers 14 or 15.

    These compressors must be equipped with a sensor that detects failure of the seal system, barrier fluid system, or both, where the sensor is checked daily or has an audible alarm that is checked monthly and the Permittee complies with the specified leak repair program. [40 C.F.R. 264.1053(a)-(g)]

14. These compressors shall be equipped with closed vent systems and control devices that comply with the monitoring requirements of 40 C.F.R. 264.1060. [40 C.F.R. 264.1053(h)]

15. These compressors operate with no detectable emissions. They shall be tested for compliance using Reference Method 21 initially upon designation, annually, and as requested by the Regional Administrator. [40 C.F.R. 264.1053(i)]

Pressure Relief Devices

16. This method applies only if the pressure relief device does not fall under the category in number 17.

    These pressure relief devices must be operated with no detectable emissions (<500 ppm above background, as measured by Reference Method 21) and must be monitored initially upon designation, annually, and at other times as requested by the Regional Administrator. [40 C.F.R. 264.1054(a)]

17. These pressure relief devices shall be equipped with a closed vent system capable of capturing and transporting leakage to a control device that meets the monitoring requirements of 40 C.F.R. 264.1060. [40 C.F.R. 264.1054(c)]

Closed Vent Systems and Control Devices

The Permittee shall monitor these closed vent systems and control devices in accordance with a monitoring schedule specified in a specific monitoring plan that the Permittee shall attach [40 C.F.R. 264.1060 and 264.1033]. The following options for inspection and monitoring are available:

18. These closed vent systems that are designed to be operated with no detectable emissions (<500 ppm above background, as measured by Reference Method 21), which have joints, seams or other connections that are permanently or semi-permanently sealed shall be visually inspected at least once per year to check for defects. [40 C.F.R. 264.1060 and 264.1033(l)(1)]

19. These closed vent systems that are designed to be operated with no detectable emissions (<500 ppm above background, as measured by Reference Method 21) shall be monitored annually and at other times request by the Regional Administrator using Method 21. [40 C.F.R. 264.1060 and 264.1033(l)(1)]

20. These closed vent systems that are designed to operate below atmospheric pressure shall be visually inspected initially and at least once per year. [40 C.F.R. 264.1060 and 264.1033(l)(2)]

21. These closed vent systems have been designated as unsafe to monitor and are exempt from the inspection and monitoring requirements except that all components are required to be monitored as frequently as possible during safe-to-monitor times. [40 C.F.R. 264.1060 and 264.1033(o)]

22. Each control device's monitor readings shall be inspected at least daily. [40 C.F.R. 264.1060 and 264.1033(f)(3)]

Sampling Connection Systems

23. All sampling connection systems shall comply with the standards in 40 C.F.R. 264.1055.

Flanges and Other Connectors

24. These flanges and connectors shall be monitored visually, audibly, by olfactory methods or other detection methods at least monthly and shall comply with the required repair program if evidence of a leak is found. [40 C.F.R. 264.1058]

25. These connectors are inaccessible or are ceramic or ceramic lined and are exempt from monitoring and recordkeeping requirements. [40 C.F.R. 264.1058(e)]

Exempt Equipment

26. This equipment which contains or contacts hazardous waste with an organic concentration of at least 10 percent by weight for less than 300 hours per calendar year is excluded from the requirements of Secs. 264.1052 through 264.1060. [40 C.F.R. 264.1050(f)]

METHODS OF COMPLIANCE WITH SUBPART CC STANDARDS

Tanks

1. These tanks shall comply with Level 1 controls which require tanks to have a fixed roof with no visible cracks, holes, gaps, or other spaces in accordance with 264.1084(c). The tank shall be visually inspected for defects initially prior to the tank becoming subject to the requirements and at least once every year thereafter. [40 C.F.R. 264.1084(c)]

2. These tanks are fixed-roof tanks equipped with an internal floating roof and shall comply with Tank Level 2 controls in accordance with 264.1084(e). The internal floating roof shall be visually inspected for defects at least once every 12 months after initial fill unless complying with the alternative inspection procedures in 40 C.F.R. 264.1084(e)(3)(iii). [40 C.F.R. 264.1084(d)(1)]

3. These tanks are equipped with an external floating roof and shall comply with Tank Level 2 controls in accordance with 264.1084(f). The external floating roof seal gaps shall be measured in accordance with the procedures contained in 264.1084(f)(3)(i) within 60 days and at least once every 5 years thereafter. The external floating roof shall be visually inspected for defects at least once every 12 months after initial fill. [40 C.F.R. 264.1084(d)(2)]

4. These tanks are vented through a closed-vent system to a control device and shall comply with Tank Level 2 controls in accordance with 264.1084(g). The tank shall be equipped with a fixed roof and closure devices which shall be visually inspected for defects initially and at least once every year. The closed-vent system and control device shall be inspected and monitored in accordance with 264.1087. [40 C.F.R. 264.1084(d)(3)]

5. These tanks are pressure tanks which shall comply with Tank Level 2 controls in accordance with 264.1084(h). [40 C.F.R. 264.1084(d)(4)]

6. These tanks are located inside an enclosure that is vented through a closed-vent system to an enclosed combustion control device and shall comply with Tank Level 2 controls in accordance with 264.1084(i). The closed-vent system and control device shall be inspected and monitored in accordance with 264.1087. [40 C.F.R. 264.1084(d)(5)]

7. These tanks have covers which have been specified as "unsafe to inspect and monitor" and shall comply with the requirements of 264.1084(l)(1). [40 C.F.R. 264.1084(f) & (g)]

Surface Impoundments

8. These surface impoundments shall have a floating membrane cover in accordance with 264.1085(c). The floating membrane cover shall be visually inspected for defects initially and at least once each year. [40 C.F.R. 264.1085(b)(1)]

9. These surface impoundments shall have a cover that is vented through a closed-vent system to a control device in accordance with 264.1085(d). The surface impoundment cover and its closure devices shall be visually inspected for defects initially and at least once each year. The closed-vent system and control device shall be inspected and monitored in accordance with 264.1087. [40 C.F.R. 264.1085(b)(2)]

10. These surface impoundments have covers which have been designated as "unsafe to inspect and monitor" and shall comply with the requirements of 264.1085(g). [40 C.F.R. 264.1085(c) & (d)]

Containers

11. These containers have a design capacity greater than 0.1 m^3 and less than or equal to 0.46 m^3 and meet the applicable U.S. DOT regulations under the Container Level 1 standards. The container shall be visually inspected for defects at the time the container first manages hazardous waste or is accepted at a facility. If a container remains at a facility for 1 year or more, it shall be visually inspected for defects at least once every 12 months. [40 C.F.R. 264.1086(b)(1)(i) & (c)(1)(i)]

12. These containers have a design capacity greater than 0.1 m^3 and less than or equal to 0.46 m^3 and are equipped with a cover and closure devices which form a continuous barrier over container openings. The container and its cover and closure devices shall be visually inspected for defects at the time the container first manages hazardous waste or is accepted a t a facility. If a container remains at a facility for 1 year or more, it shall be visually inspected for defects at least once every 12 months. [40 C.F.R. 264.1086(b)(1)(i) & (c)(1)(ii)]

13. These containers have a design capacity greater than 0.1 m^3 and less than or equal to 0.46 m^3 and are open-top containers in which an organic-vapor suppressing barrier is placed on or over the hazardous waste in the container. The container and its cover and closure devices shall be visually inspected for defects at the time the container first manages hazardous waste or is accepted at a facility. If a container remains at a facility for 1 year or more, it shall be visually inspected for defects at least once every 12 months. [40 C.F.R. 264.1086(b)(1)(i) & c(1)(iii)]

14. These containers have a design capacity greater than 0.46 m^3, are not in light material service and meet the applicable U.S. DOT regulations under the Container Level 1 standards. The container shall be visually inspected for defects at the time the container first manages hazardous waste or is accepted at a facility. If a container remains at a facility for 1 year or more, it shall be visually inspected for defects at least once every 12 months. [40 C.F.R. 264.1086(b)(1)(ii) & (c)(1)(i)]

15. These containers have a design capacity greater than 0.46 m^3, are not in light material service and are equipped with a cover and closure devices which form a continuous barrier over container openings. The container and its cover and closure devices shall be visually inspected for defects at the time the container first manages hazardous waste or is accepted a t a facility. If a container remains at a facility for 1 year or more, it shall be visually inspected for defects at least once every 12 months. [40 C.F.R. 264.1086(b)(1)(ii) & (c)(1)(ii)]

16. These containers have a design capacity greater than 0.46 m^3, are not in light material service and are open-top containers in which an organic-vapor suppressing barrier is placed on or over the hazardous waste in the container. The container and its cover and closure devices shall be visually inspected for defects at the time the container first manages hazardous waste or is accepted a t a facility. If a container remains at a facility for 1 year or more, it shall be visually inspected for defects at least once every 12 months. [40 C.F.R. 264.1086(b)(1)(ii) & c(1)(iii)]

17. These containers have a design capacity greater than 0.46 m^3, are in light material service and meet the applicable U.S. DOT regulations under the Container Level 2 standards. The container shall be visually inspected for defects at the time the container first manages hazardous waste or is accepted a t a facility. If a container remains at a facility for 1 year or more, it shall be visually inspected for defects at least once every 12 months. [40 C.F.R. 264.1086(b)(1)(iii) & (d)(1)(i)]

18. These containers have a design capacity greater than 0.46 m^3, are in light material service and operate with no detectable organic emissions as defined in 40 C.F.R. 265.1081. The container and its cover and closure devices shall be visually inspected for defects at the time the container first manages hazardous waste or is accepted at a facility. If a container remains at a facility for 1 year or more, it shall be visually inspected for defects at least once every 12 months. [40 C.F.R. 264.1086(b)(1)(iii) & (d)(1)(ii)]

19. These containers have a design capacity greater than 0.46 m^3, are in light material service and that have been demonstrated within the preceding 12 months to be vapor-tight using 40 C.F.R. Part 60, Appendix A, Method 27. The container and its cover and closure devices shall be visually inspected for defects at the time the container first manages hazardous waste or is accepted a t a facility. If a container remains at a facility for 1 year or more, it shall be visually inspected for defects at least once every 12 months. [40 C.F.R. 264.1086(b)(1)(iii) & (d)(1)(iii)]

20. These containers have a design capacity greater than 0.1 m^3 that are used for treatment of a hazardous waste by a waste stabilization process and are vented directly through a closed-vent system to a control device in accordance with 264.1086(e)(2)(ii). The closed-vent system and control devices shall be inspected and monitored as specified in 264.1087. [40 C.F.R. 264.1086(b)(2) & (e)(1)(i)]

21. These containers have a design capacity greater than 0.1 m^3 that are used for treatment of a hazardous waste by a waste stabilization process and are vented inside an enclosure which is exhausted through a closed-vent system to a control device in accordance with 264.1086(e)(2)(i) & (ii). The closed-vent system and control devices shall be inspected and monitored as specified in 264.1087. [40 C.F.R. 264.1086(b)(2) & (e)(1)(ii)]

SECTION 12.0

PERSONNEL TRAINING

12.1 INTRODUCTION

GLOBALFOUNDRIES has an established training program so that personnel can perform their duties in compliance with RCRA requirements at GLOBALFOUNDRIES' facility. This section describes that program.

12.2 TRAINING

The regulations require that employees working in the hazardous waste area complete a training program designed to teach them to respond effectively to emergencies and to comply with the requirements of the federal RCRA regulations and Vermont Hazardous Waste Regulations. Within 6 months and annually thereafter, each employee working in this area is given training that complies with 40 CFR 264.16. Records of the training in hazardous waste management are kept in the environmental central files or the responsible manager's files.

GLOBALFOUNDRIES provides training either using internal personnel or contractors specialized in the hazardous waste field. Internal training is provided by the GLOBALFOUNDRIES Environmental Programs Department and/or the Chemical Distribution Center (CDC) Department personnel. The individuals who provide the training have backgrounds suited for the specific topic that is being presented. Job experience and/or formal education provide the basis for the decisions on suitable background for a specific training requirement. GLOBALFOUNDRIES selects those individuals or companies who best meet the needs of the training requirement at that particular time.

12.3 TRAINING PROGRAM, CONTENT, FREQUENCY, AND TECHNIQUE

Personnel training at GLOBALFOUNDRIES is divided into two major categories: on-the-job training and classroom training.

On-the-job training is used for new or newly assigned personnel. This training includes instructions, descriptions, and demonstrations of daily operations, emergency systems and alarms, and emergency response procedures by managers, engineers, or senior operators. As part of on-the job-training, new or newly assigned employees are instructed to review department procedures and processes relevant to the subject matter.

Formal personnel training is conducted onsite, offsite, or online. This training concentrates on chemical safety and handling, protective breathing equipment, and hazardous waste regulations. Additional courses may be offered in a GLOBALFOUNDRIES classroom program. Tables 12-1 and 12-2 list the initial and continuing (refresher) courses required to work in the hazardous waste areas.

Attachment 12-1 includes typical course outlines for the initial and continuing training classes. The continuing training classes contain content similar to the initial training, but in an abbreviated format.

12.3.1 Implementation of Training Program

Courses may be given periodically to each GLOBALFOUNDRIES employee who handles or manages hazardous waste. Employees complete the Introductory Training Program Requirements outlined in Table 12-1 within 6 months of their assignment to a hazardous waste management area. These employees do not work without supervision until such training is received.

The hazardous waste engineer or manager is responsible for reviewing the RCRA training records for all employees in the Hazardous Waste Management Facility (HWMF) and determining which courses are necessary to meet the regulatory requirements or providing training in hazardous waste management. The training director varies based on the course; the person in charge of the course is qualified in that aspect of hazardous waste procedures. The organizations/individuals responsible for the training courses are listed in Tables 12-1 and 12-2. Overall training and competence is the responsibility of the employee's manager.

12.4 JOB TITLES AND DUTIES

Job descriptions for those personnel whose duties are directly involved with the management or handling of hazardous waste are provided in Attachment 12-2. These personnel are associated with the Chemical Distribution Center, Chemical Services, Emergency Services, and Environmental Programs Departments. The descriptions identify general responsibilities assigned to particular individuals who are potentially involved with the handling of wastes at GLOBALFOUNDRIES.

12.4.1 Relevance of Training to Job Positions

The training program described above provides each employee who handles or manages hazardous wastes a comprehensive overview of the regulatory program and its relationship to his or her job. Safety; spill response procedures (including shutdown); the inspection, maintenance, and use of emergency and monitoring equipment; emergency systems; and contingency plan implementation are emphasized.

12.5 RECORDKEEPING

The following information on training is kept as part of the facility operating record:

1. Job titles and the names of employees filling those positions
2. Written job descriptions
3. Descriptions of introductory and continuing training
4. Records that document the training received by personnel, including the number of hours for each course/training event

Training records on current personnel are kept until the closure of the facility. Records for former employees are kept for 3 years from the date they last worked at the facility.

Table 12-1
Introductory Training Program Requirements

Introductory Training Program Course	Regulatory Citations	Organization or Individual Responsible for Course	Number of Hours per Course[a]	Key Hazardous Waste Positions[b]	HazMat Shipping Expert[c]	Non-Shipping Hazardous Waste Positions[d]
Orientation	29 CFR 1910.1200 29 CFR 1910.120(p)(2)	Department Managers	1-4	X	X	X
On-the-Job Training (OJT)	40 CFR 264.16(a)	Supervisor or Senior Person Assigned to New Employee	8-24[e]	X	X	X
HAZWOPER Operations	29 CFR 1910.120(p)(7)(i) 29 CFR 1910.1200 VHWMR 7-308(b)(15) 40 CFR 264.16(a)	Safety Department U.S. Health Services	24-40[f]	X	X	X
Basic Hazardous Materials (DOT)	49 CFR 171-179 VHWMR 7-309(b)	Hazardous Materials Coordinator	2-8[g]	X		
DOT Surface Transportation	49 CFR 171-179 VHWMR 7-309(b)	Hazardous Materials Coordinator	2-40[g]		X	

[a] Suggested number of hours.

[b] Key hazardous waste positions include Hazardous Waste Engineer.

[c] HazMat Shipping Expert is Hazardous Materials Coordinator and Technician Specialist (hazardous waste operations).

[d] Non-shipping hazardous waste positions include Technician Specialist (materials handling), Technician Specialist (chemical systems maintenance), Site Emergency Coordinator, Emergency Responder, and Spill Control Engineer.

[e] Number of OJT hours varies and depends on the type of position.

[f] Number of hours depends on which course is taken. Commercially available courses are 24 to 40 hours.

[g] Course can be classroom-taught, online, or self-study using a textbook.

General Notes:

1. Courses identified above are provided by GLOBALFOUNDRIES or by a vendor who contracts with GLOBALFOUNDRIES to provide training at the facility. Commercially available equivalent courses may be substituted for any of the above courses.
2. Many other courses (e.g., Forklift Class and Annual Certification, Self Contained Breathing Apparatus (SCBA) and Hoseline (or SCBA and Airline), Respirator, Chemical Safety (or Safety Awareness), Personal Protective Equipment, Accumulation Area Management, Confined Space Entry, Chemical Information System Training, RCRA Seminar) are available and may be taken to supplement the training listed here.

Table 12-2
Continuing Training Program Requirements

Continuing Training Program Course	Regulatory Citations	Training Director	Frequency	Number of Hours per Course[a, b]	Key Hazardous Waste Positions[c]	HazMat Shipping Expert[d]	Non-Shipping Hazardous Waste Positions[e]
OSHA/RCRA Annual Refresher Training	29 CFR 1910.120 and 1910.1200 VHWMR 7-308(b)(15)(E) 40 CFR 264.16(c)	Safety Department U.S. Health Services	Annually	1-8[f]	X	X	X
Basic Hazardous Materials (DOT)	49 CFR 171-179 VHWMR 7-309(b)	Hazardous Materials Coordinator	Once every 3 years	2-8[f,g]	X		
DOT Surface Transportation Refresher	49 CFR 171-179 VHWMR 7-309(b)	Hazardous Materials Coordinator	Once every 3 years	8 or more[g]		X	

[a] Suggested number of hours.

[b] Number of hours depends on whether a GLOBALFOUNDRIES-sponsored course or a commercially-available course is taken.

[c] Key hazardous waste positions include Hazardous Waste Engineer.

[d] HazMat Shipping Expert is Hazardous Materials Coordinator and Technician Specialist (hazardous waste operations).

[e] Non-shipping hazardous waste positions include Technician Specialist (materials handling), Technician Specialist (chemical systems maintenance), Site Emergency Coordinator, Emergency Responder, and Spill Control Engineer.

[f] May be included in the OSHA/RCRA Annual Refresher Training.

[g] Course can be classroom-taught or online.

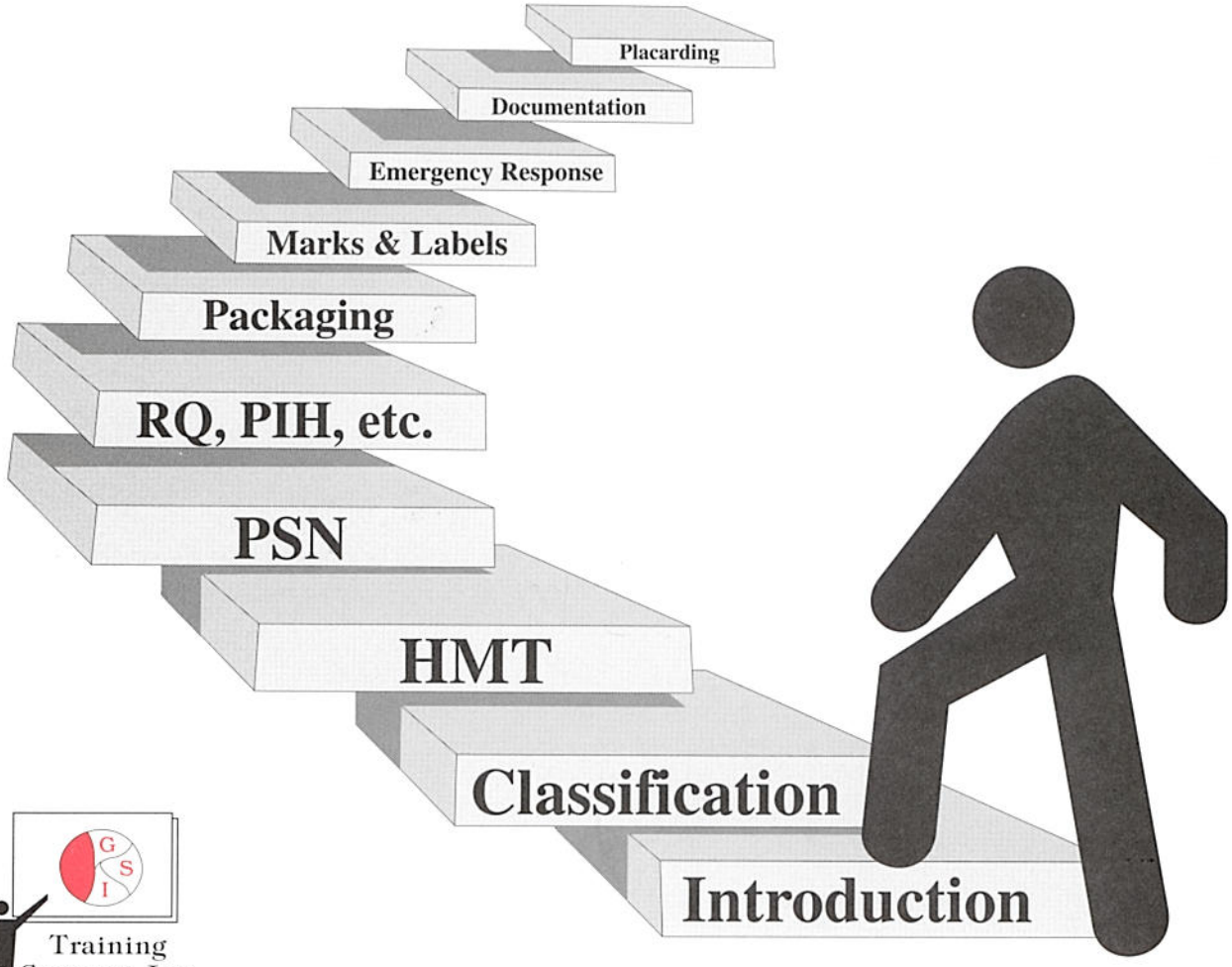
General Notes:

1. Courses identified above are provided by GLOBALFOUNDRIES or by a vendor who contracts with GLOBALFOUNDRIES to provide training at the facility. Commercially available equivalent courses may be substituted for any of the above courses.
2. Many other courses (e.g., Forklift Class and Annual Certification, Self Contained Breathing Apparatus (SCBA) and Hoseline (or SCBA and Airline), Respirator, Chemical Safety (or Safety Awareness), Personal Protective Equipment, Accumulation Area Management, Confined Space Entry, Chemical Information System Training, RCRA Seminar) are available and may be taken to supplement the training listed here.

ATTACHMENT 12-1

TRAINING OUTLINES

10 Steps
to
Safety & DOT HazMat Compliance



Training Services, Inc.

Training Services, Inc.
822 STATE HWY T
Branson, MO 65616
Telephone: (417) 334-7060

Regulatory Compliance Training

Recurrent Training

doesn't have to be a recurrent nightmare.

GSI Training Services will assist your organization with the training requirements found in subpart H of part 172 by providing courses that will meet or exceed the specifications found there. The courses listed below are not an exhaustive list as courses may be customized to the experience level of your employees and your particular needs. For further information on these courses or customized classes for your organization, please call **800-231-7336**.

GSI Training Services' **49 CFR** Highway Transportation of Hazardous Materials Training Certification Course
GSI Training Services' **40/49 CFR** Highway Transportation of Hazardous Wastes Training Certification Course
GSI Training Services' **IATA/ICAO/FAA** Air Transportation of Dangerous Goods Training Certification Course
GSI Training Services' **IMDG** Transportation of Dangerous Goods via Water Training Certification Course
Also available from GSI Training Services
Hazmat and Auditing and Compliance Assessments.
For more information, check our website at **www.gsitraining.com**

COMPUTER BASED COMPLIANCE TRAINING

GSI Computer Services' Computer Based Training Courses will readily assist your company as you seek to comply with the training and testing requirements in subpart H of part 172. These courses are divided into 12 modules. A 90 MHz Pentium CPU or equivalent compatible computer with a minimum of 32 MB RAM running Windows 95 or Windows NT 4 Service Pack 4 or better is required. A minimum of 40 MB of hard disk space, a mouse and 256 color graphics are also required. The courses and their descriptions listed below give a brief overview of what is available to fulfill your particular needs. For further information on these courses, please call **800-280-7071.**

49 CFR Transportation of Hazardous Materials Highway

Computer Based Training (CBT) Certification dealing with the Transportation of Hazardous Materials on the ground. (49 CFR Regulations, 10 Steps to DOT Safety & ComplianceTextbook, ERG, module instructions, exam, and answer sheet)

40/49 CFR Transportation of Hazardous Wastes Highway

Computer Based Training Certification dealing with the Transportation of Hazardous Wastes on the ground. (49 CFR Regulations, 10 Steps to DOT Safety & ComplianceTextbook, ERG, module instructions, exam, and answer sheet)

IATA/ICAO Transportation of Dangerous Goods

Computer Based Training Certification dealing with the air Transportation of Dangerous Goods. (IATA Regualtions, 10 Steps to IATA/ICAO Safety & Compliance Textbook, ERG, module instructions, exam, and answer sheet)

IMDG Transportation of Dangerous Goods

Computer Based Training Certification dealing with the Transportation of Dangerous Goods via water. (Training Copy of IMDG Regulations, 10 Steps to Safety & IMDG Compliance Textbook, ERG, module instructions, exam, and answer sheet.)

General Awareness and Familiarization Module

CBT module provides General Awarness/Familiarization training outlined in §172.704(a)(1)

DEC Master (Shipper's Declaration Software)

Create and print out shipper's declarations while maintaining a searchable database of shipper's declarations.

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Appendix C - Checklists
Appendix D - Emergency response page
Appendix E - Registration and Fee Assessment
Appendix F - Incident Reporting Requirements
Appendix G - Hazardous Wastes
Appendix H - Bulk

[ ] - indicates a reference in 49 CFR.
{ } - indicates a reference in this textbook.

Initial 40-hour HAZWOPER
"General Site Worker"
TRAINING AGENDA

This classroom instruction is designed for all employees engaged in hazardous waste operations, emergency response or other activities in which they may be potentially exposed to on-site hazardous substances, health hazards or safety hazards. This 40 hours of instruction, focusing on hazard recognition, evaluation and control, meets the requirements of 29 CFR 1910.120(e)(1)(i) and includes the following topics:

Day 1

1. ***Introduction to OSHA and principles of health and safety***
   - The Occupational Safety and Health Act and its application

2. ***Introduction to the HAZWOPER standard***
   - HAZWOPER application, definitions and the principles of working safely in the "uncontrolled work environment"
   - Components of the HAZWOPER standard

3. ***Hazardous Substances and Toxicity Recognition***
   - Principles of toxicology, including routes of entry and toxicological terms
   - Health hazards (irritants, sensitizers, toxins, and carcinogens)

4. ***Personal protective equipment***
   - A review of the OSHA standards, including the job hazard analysis and selection process
   - Benefits and limitations of PPE
   - Chemical protective clothing selection and limitations (permeation, degradation, penetration)
   - EPA/HAZWOPER levels of protection for site workers
   - Dress-out exercise

Review of Day 1 topics

Day 2

5. ***Hazardous Substances and Physical Hazard Recognition***
   - Physical hazards (flammable, reactive, and corrosive materials)
   - Compressed gas cylinder safety

6. ***Sources of information***
   - Introduction to the Hazard Communication standard requirements
   - NFPA, HMIS and DOT labeling systems
   - NIOSH Pocket Guide to Chemical Hazards

7. ***Respiratory Hazards and Respiratory Protection***
   - A review of the OSHA standard and the requirements for a respiratory protection program
   - Air purifying respirator basics (types, uses and limitations, inspections and donning and doffing)
   - Self-contained breathing apparatus basics
   - Fit testing
   - Proper care and maintenance
   - Dress-out exercise

8. ***Temperature, Sun and Lightning Hazard Recognition***
   - Temperature Stress and working safely in hot environments
   - Sun safety and UVR protection

Review of Day 2 topics

Day 3

9. Introduction to Physical Hazard Recognition

- Walking/working surfaces (ladders safety, fall protection, and working around heavy equipment)
- Electrical hazards
- Noise hazards
- Drum handling and sampling safety

10. Permit-required Confined Space Entry

- A review of the OSHA standard, definitions, confined space entry hazards and general requirements
- Roles and responsibilities of the entrant, attendant and entry supervisor
- The elements of a permit-required confined space entry program and permit process

11. Excavation and Trenching Safety

- A review of the standard, definitions, and hazards associated with excavation and trenching
- General requirements and preplanning
- Utility safety

12. Bloodborne Pathogen Hazard Recognition

- The OSHA Bloodborne Pathogen Standard
- Bloodborne Pathogen and Exposure Control Planning

13. Environmental and Bio-irritant Hazard Recognition

- Poisonous plants
- Ticks, mosquitoes, bees, rabid animals and other bio-irritants

Review of Day 3 topics

Day 4

14. Underground Storage Tank (UST) safety

- Physical and chemical hazards associated with UST removal/replacement
- Eliminating flammable environments (inerting and purging)

15. Asbestos Hazard Awareness

- Asbestos Containing Building Materials
- Health Effects

16. Medical surveillance programs

- A review of paragraph (f) of the HAZWOPER standard
- Frequency and type of medical surveillance required by employees covered under the standard
- On-site medical surveillance for site workers

17. Decontamination

- A review of paragraph (k) of the HAZWOPER standard and the principles of decontamination
- Site control, zoning, and the elements of a decontamination plan relative to levels of protection
- Dress out exercise

18. Planning

- Site Health and Safety Plan requirements
- Emergency Response Plan requirements
- Priorities and objectives in emergency situations ("Six emergency response objectives")

Review of Day 4 topics

Day 5

19. Site control and team organization

- A review of paragraph (d) of the HAZWOPER standard
- On site communication and control; Team organization for site work and a review of the Incident Command System (ICS) for emergency response management

20. Instrumentation

- General principles, uses and limitations of Instrumentation
- Photo Ionization Detectors and Flame Ionization Detectors
- Explosion (LEL/O2) meters
- Colorimetric testing devices

Hazardous waste site simulation

Review/critique of simulation

Final review and exam

SIGNET NORTH AMERICA

GLOBALFOUNDRIES 40-HOUR HAZMAT TECHNICIAN COURSE SCHEDULE

DAY ONE	
08:00 – 09:00 **09:00 – 12:00**	Introductions & Course Objectives Hazmat Laws and Regulations
13:00 -17:00	Hazard Class Review
Supplies Needed	
External Resources Needed For This Day	

DAY TWO	
08:00 – 10:00 **10:00 – 12:00**	Hazard Class Review Toxicology, ERG, NIOSH
13:00 – 15:00 **15:00 – 17:00**	2 Minute Drill, WISER, SDS online Air Monitoring
Supplies Needed	
External Resources Needed For This Day	

DAY THREE	
08:00 – 10:00 **10:00 – 12:00**	Air Monitoring Continued SCBA / Respiratory Protection
13:00 – 17:00	Chemical Protective Clothing
Supplies Needed	
External Resources Needed For This Day	

DAY FOUR	
08:00 – 12:00	Hazmat ICS / GLOBALFOUNDRIES ERT Positions Establishing Control Zones – evacuation and shelter in place
13:00 – 17:00	Decontamination
Supplies Needed	
External Resources Needed For This Day	

DAY FIVE	
08:00 – 09:00 **09:00 – 11:00** **11:00 – 12:00**	Written Exam Review Final Exam Organize equipment and personnel for afternoon drill
Supplies Needed	
13:00 – 17:00	Practical Exercise
Supplies Needed	
External Resources Needed For This Day	

Global Foundries HAZWOPER and RCRA/VTHWMR Annual Training

Day 1 – Hazardous Waste / Hazardous Material Positions and Emergency Response Team

7:00 – 8:15 AM Introductions / Review of Past Year Experiences
Laws and Regulations Review – OSHA, EPA, and DOT
OSHA and RCRA Statistics Update
Hazards and Hazard Recognition

8:15 – 8:30 AM Break

8:30 – 10:00 AM Basic Toxicology
Physical and Chemical Properties
Fire and Flammability
Emergency Response Guidebook (ERG) – Tour / Exercise

10:00 – 10:15 AM Break

10:15 – 11:00 AM HAZWOPER Review
- Site Characterization
- Air Monitoring Equipment (overview)
- Medical Surveillance
- Site Safety and Health Plan
- Operations Basics

Hazard Communication Standard / CIS Website
- Global Harmonized System of Classifying and Labeling of Chemicals (GHS)
- SDS Exercise

11:00 – 11:30 AM Lunch

11:30 – 1:30 PM RCRA Review (General)
- Hazardous Waste Definition / Characterization
- Generator Status
- Waste Handling / Labeling / Containers
- Hazardous Waste Manifests

RCRA Review (Global Foundries Fab 9)
- GF Waste Handling Practices
- Accumulation Areas / Time and Storage Limitations / CWDA

Leak Detection and Repair (LDAR)

1:30 – 1:45 PM Break

1:45 – 2:30 PM PPE and Respiratory Protection

2:30 – 3:30 PM Jeopardy Game / Test

Global Foundries HAZWOPER and RCRA/VTHWMR Annual Training

Day 2 – Emergency Response Team

7:00 – 8:30 AM	Introduction Hazmat Response Cycle
8:30 – 8:45 AM	Break
8:45 – 10:00 AM	Air Monitoring Equipment – Operation and Procedures Instrumentation Exercise Indicator Papers
10:00 – 10:15 AM	Break
10:15 – 11:00 AM	PPE – the Levels of Protection utilized at GF
11:00 – 11:30 AM	Lunch
11:30 – 1:30 PM	Review of the SCBA – Scott 4.5 Presentation
1:30 – 1:45 PM	Break
1:45 – 2:30 PM	Table-top Exercise – Spill Response
2:30 – 3:30 PM	Debrief and Summary

ATTACHMENT 12-2

PERSONNEL JOB DESCRIPTIONS

ATTACHMENT 12-2

PERSONNEL JOB DESCRIPTIONS

1. TECHNICIAN SPECIALIST (MATERIALS HANDLING)

Responsibilities: Direct handling of hazardous and non-hazardous waste, including proper segregation and transportation on-site; performing inspections as required.

2. TECHNICIAN SPECIALIST (HAZARDOUS WASTE OPERATIONS)

Responsibilities: Direct handling of hazardous and non-hazardous waste, including the physical separation, consolidation, segregation, sampling, labeling, packaging, and manifesting of waste; performing required inspections; and maintaining required records.

3. HAZARDOUS MATERIALS COORDINATOR

Responsibilities: Compliance with DOT; maintenance and use of waste management software program; providing RCRA and/or DOT training to other site employees as required; and maintaining applicable records and documentation.

4. TECHNICIAN SPECIALIST (CHEMICAL SYSTEMS MAINTENANCE)

Responsibilities: Installing, debugging, testing, operating, repairing and performing preventative maintenance on various RCRA-permitted waste and corrective action systems.

5. HAZARDOUS WASTE ENGINEER

Responsibilities: Interpreting hazardous waste regulations; directing site personnel for compliance with RCRA regulations; overall engineering support for the RCRA program; maintaining the site operating record; coordinating or providing training as required; performing required inspections as necessary; and verifying that appropriate notifications are given to applicable federal, state, and local agencies as required.

6. SITE EMERGENCY COORDINATOR

Responsibilities: Overseeing the entire hazardous waste emergency response effort including ensuring adequate emergency response is implemented.

7. EMERGENCY RESPONDER

Responsibilities: Responding to all site emergencies including evaluation of emergency and direction of emergency teams; performing normal emergency control duties such as fire / safety hazards; inspecting emergency equipment; and inspecting fire detection and extinguisher equipment.

8. SPILL CONTROL ENGINEER

Responsibilities: Responding to site emergencies with potential environmental impact; evaluating the emergency to determine reporting requirements to local, state, and federal agencies; providing guidance to emergency personnel on waste cleanup activities; and coordinating the submission of follow-up written notifications as required.

APPENDIX A

TANK REPORTS

Aboveground Storage Tank Inspection Report
General Solvent #1/Tank Farm
General Solvent #4/Tank Farm
Inspection Dates: September 12 and 13, 2007

OUT-OF-SERVICE ABOVEGROUND STORAGE TANK INSPECTION REPORT

KNIGHT CONSULTING ENGINEERS
IBM ESSEX JUNCTION
RIVER ROAD, ESSEX JUNCTION, VERMONT
Inspection Dates: September 12 & 13, 2007

Prepared for:

Martin Hain, P.E.
Knight Consulting Engineers
51 Knight Lane, Williston, Vermont 05495
Phone: 802-879-6343

Prepared by:

AARON ENVIRONMENTAL
189 Atwater Street
Plantsville, CT 06479
860-276-1201

September 21, 2007

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Ultrasonic Thickness Data

Tank Photographs

Monthly & Annual Inspection Checklists

Solvent Waste Tank Testing Report, Knight Consulting Engineers, Inc., December 10, 2004

Solvent Waste Tank Inspection Report, Knight Consulting Engineers, Inc., August 16, 1990

Preface

Throughout this document, `Customer' or `Client' refers to Knight Consulting Engineers (KCE) and/or IBM Corporation; and `Consultant', `Engineer' or `AARON' refers to AARON Environmental.

The field observations and research reported herein are considered sufficient in detail and scope to form a reasonable basis for an out-of-service evaluation of the referenced tank(s). The methods used to acquire the information as well as compile and analyze the data are considered current and widely accepted methods in the industry. These methods have been developed to provide the Client with information regarding apparent indications of existing or potential conditions relating to the tank(s) and are limited to the accessibility to the tank(s) and information available at the time of the site visit and inspection. Conclusions listed in this document may have been based in-part on information provided by the current facility owner, their agents and/or third parties (including, but not limited to, state and local authorities); pursuant to this, the accuracy of said information is not guaranteed by AARON.

LIMITATIONS

Notwithstanding anything contained in this report, nothing herein shall be construed as a representation, warranty or guarantee, either expressed or implied, regarding the future structural integrity, life expectancy, or performance of any of the items evaluated. This report and the analysis provided is in all respects subject to and shall be interpreted within the limitations and parameters of the test procedures performed. In the event testing is performed using a sampling procedure, this report and any analysis shall be limited to those areas actually tested and the type of test conducted, and the customer is cautioned not to extrapolate the results of the test samples.

I. INSPECTION PROCEDURES

The aboveground storage tank(s) were inspected following portions of the applicable procedures contained in the Steel Tank Institute (STI) Standard SP001 4th Edition "Standard for Inspection of Aboveground Storage Tanks".

Where applicable, AARON provided the following inspection and testing services on the tank(s):

1. Perform the periodic inspections (monthly and annual) described in the STI Standard.

2. Visually inspect the outside of each tank in detail. At a minimum, the following tank components were inspected (where applicable):

    a. Primary Tank
    b. Secondary Tank
    c. Tank Supports
    d. Tank Anchors
    e. Tank Foundation and external supports
    f. Tank gauges and alarms
    g. Insulation covering
    h. Tank appurtenances
    i. Normal Vents
    j. Emergency Vents
    k. Release Prevention Barriers
    l. Spill Control Systems

3. Visually inspect the interior of each tank in detail. At a minimum, the following areas of concern were addressed (where applicable):
    a. Identify, inspect and record AST internal appurtenances
    b. Inspect for mechanical damage, corrosion, cracking, etc.
    c. Inspect for deteriorating or corroding internal attachments and piping
    d. Visually inspect welds
    e. Ultrasonic thickness measurements
    f. Vacuum box examination of questionable welds

4. Inspect the tank based on its construction, per the following:

    a. Single Wall Tank, Not in Contact with the Ground
        i. Either conduct ultrasonic testing (from the exterior) to determine the shell thickness as described in the STI Standard, or visually examine the interior of the tank as described in the STI Standard.

To obtain the residual metal thickness readings, a Panametrics 36DL Plus datalogging ultrasonic digital thickness gauge with a D790 or D791 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The meter is capable of collecting readings using a scan mode or single point mode. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material. Field data was stored in the unit and downloaded to a computer using Panametrics' WINplus interface software.

This report documents the findings of our inspections. It is intended to provide the tank owner/operator with an assessment of the tank's current condition, recommendations for improvements to maintain the long term integrity of the structure and an opinion of the tank's suitability for continued service.

II. GENERAL SITE AND TANK DESCRIPTION

AARON Environmental (AARON) was asked to conduct an out-of-service inspection of two aboveground waste solvent storage tanks located at IBM Corporation, River Road, Essex Junction, VT. The tanks were inspected on September 12 and 13, 2007. The subject tanks are described in the table below.

TANK ID / LOCATION	SIZE (GALLONS)	TANK CONSTRUCTION MATERIAL	MANWAY ACCESS	PRODUCT STORED
GENERAL SOLVENT #1 / TANK FARM	10,000	SINGLE WALL STEEL WITH CONCRETE/STEEL CONTAINMENT DIKE	YES	WASTE SOLVENT
GENERAL SOLVENT #4 / TANK FARM	10,000	SINGLE WALL STEEL WITH CONCRETE/ STEEL CONTAINMENT DIKE	YES	WASTE SOLVENT

The subject tanks were identified as shop-fabricated, welded, carbon steel construction. The age, size, orientation, and appurtenances of the tank are described in further detail in Section III of this report.

Two historical reports by Knight Consulting Engineers addressing prior inspections of the subject tank were provided to AARON for review. One report dated August 16, 1990 included both interior and exterior ultrasonic thickness data for the subject tank, referred to as General Solvent #1 and General Solvent #4. The second report dated December 10, 2004 included only external thickness data for the same tanks. Copies of both documents are attached to this report.

III. INSPECTION SUMMARY

The following sections provide a summary of the inspection completed for each tank. The visual and ultrasonic thickness (if applicable) summaries are also provided for each tank.

Tank #1 (General Solvent Waste)

This 10,000-gallon tank is a horizontal, cylindrical design with a diameter of 120 inches and an overall length 180 inches (15 feet), and is used to store waste solvent. The tank consists of single wall carbon steel, welded construction and rests within a covered concrete secondary containment structure. The containment dike is steel lined and has a calculated containment capacity of 23,170 gallons. There was no nameplate observed on the tank; however, the tank is insulated and a nameplate may not be visible. The age of the tank could not be verified based on field data but was reportedly installed in 1980 when the Chemical Distribution facility was built.

For the purposes of this inspection, the subject tank is considered to be single wall, not in contact with the ground. The tank is equipped with a manway and was inspected both externally and internally.

The tank is equipped with the following fittings and equipment located along the centerline:

24” ID access manway, tight bolted with high-level warning alarm switch
2” tank top flanged fitting inlet/outlet
6” tank top flanged fitting with emergency venting
2” tank top flanged fitting with an inlet for nitrogen
6” tank top flanged fitting with a level indicator
2” tank top flanged fitting with a normal vent
4” tank top flanged fitting
Tank top fitting with pump
24” ID diameter manway

The following details were observed as part of the overall tank inspection. The tank inspection summary is provided following the STI periodic inspection criteria (monthly and annual), formal external inspection criteria, and additional inspection items. The periodic inspection items for this tank are described as follows:

<u>Monthly Inspection Checklist</u>

1. Tank Containment
   1.1. The tank was emptied and cleaned prior to our inspection. No liquid was present on the tank bottom.
   1.2. The containment area was inspected for debris and fire hazards. None were observed.
   1.3. The drain associated with the secondary containment area was clear of debris and appeared to be in working order.
   1.4. Containment egress pathways were inspected. No problems were identified.
2. Leak Detection
   2.1. The tank and containment area were inspected for signs of leakage. No leaks were observed.
3. Tank Attachments and Appurtances
   3.1. The tank stairs and topside access platform were inspected. These structures are secure with no signs of significant corrosion or damage.
   3.2. The tank liquid level gauge was inspected. The tank was empty during our inspection so the proper and accurate operation of the gauge was not verified.
   3.3. Tank openings were inspected to confirm proper sealing. Openings appeared to be properly sealed.
4. Other Conditions
   4.1. No conditions were identified which would be considered unsafe or that would significantly affect the site SPCC Plan.

Annual Inspection Checklist

1. Tank Containment
   1.1. The steel lined concrete secondary containment structure was inspected and found to be in satisfactory condition.
   1.2. The drainage pipe and/or valves associated with the secondary containment structures were inspected and found to be in satisfactory condition.
2. Tank Foundation and Supports
   2.1. No signs of tank settlement or foundation washout were identified.
   2.2. The concrete containment structure is not visible because there is a steel lining over it. The steel lining (i.e., overlay) was observed to be in good condition. Cracking and/or spalling were not identified. There is no ring wall associated with the subject tank.
   2.3. The tank rests on steel support saddles which rest on elevated concrete foundations which are covered with steel plate. Portions of the steel saddles have some limited paint failure. The foundations are in good condition.
   2.4. The area around the concrete containment structure is located under a roof. Drainage is not a concern.
   2.5. The tank stairs and platform are bonded to the steel building structure which is bonded to an earth ground rod. The grounding equipment was observed to be in good condition.
3. Cathodic Protection System
   3.1. There is no cathodic protection system associated with the subject tank. There is no buried steel associated with the tank or piping.
4. Tank External Coating
   4.1. The tank has beige topcoat paint. The entire tank shell is covered with insulation; therefore routine inspection of the painted surfaces is not possible. Some paint failure was observed on the steel support saddles.
5. Tank Shells/Heads
   5.1. Evidence of shell/head distortions, buckling, denting or bulging was not observed.
   5.2. Evidence of shell/head corrosion was not observed.
6. Tank Manways, Piping and Equipment within Secondary Containment
   6.1. The tank manhole and bolts were observed in good condition with no significant signs of wear or corrosion.
   6.2. The piping and equipment associated with the subject tank and located within the secondary containment was inspected and found to be in good condition.
7. Tank Roof
   7.1. Not applicable, the tank is a horizontal cylindrical design.
8. Venting
   8.1. The normal vents are in good condition and free from obstructions.
   8.2. The tank has emergency venting which appeared to be in good condition and working properly.
9. Insulated Tanks
   9.1. The tank shell is insulated. No missing insulation was identified.
   9.2. Areas of moisture associated with the insulation were not identified.
   9.3. No mold was observed.
   9.4. No damage to the insulation was observed.
   9.5. The tank is located under a roof; therefore, the insulating material is protected from precipitation.

10. Level and Overfill Prevention Instrumentation of Shop Fabricated Tanks
    10.1. The tank level sensing device was inspected, found to be in good condition but not tested for proper operation.
    10.2. The overfill prevention device includes an electronic high level warning alarm. This device is in good condition but was not tested for proper operation.
11. Electrical Equipment
    11.1. The tank grounding cable and/or connections were inspected and found to be in good condition.
    11.2. Heat trace tape is located on the exterior of the tank under the insulation layer. This was not visible and was not inspected. Other electrical wiring associated with the tank equipment is in good condition.

<u>Formal External Inspection</u>

1. General
    1.1. A formal external inspection was performed by an STI certified inspector.
    1.2. The subject aboveground storage tank (AST) is single wall carbon, horizontal, cylindrical design. The tank is 120 inches in diameter, 15 feet long with a nominal capacity of 10,000 gallons and is used to store waste solvent. The tank was reportedly installed in 1980.
    1.3. According to facility personnel, the subject tank has been evaluated for integrity in the past. Refer to the historical reports from Knight Consulting Engineers attached to this report.
    1.4. There was no nameplate observed on the tank; however, according to available information Eastern Tank Fabricators of Wallington, New Jersey, fabricated the tank in 1980.
    1.5. The fabrication of the AST was inspected using UL 142 as a baseline.
    1.6. The AST foundations were inspected for indications of settlement, cracking, exposed rebar, and general disrepair. No evidence of the above conditions was observed.
    1.7. The AST supports were inspected for indications of cracking, spalling, and general disrepair. The supports include three steel saddles which are not bolted to the concrete foundation. The supports have some isolated paint failure.
    1.8. The subject tank is located within a concrete secondary containment structure which is lined with plate steel. An electronic high level warning alarm is located in the tank. The containment area associated with the tank was inspected and found to be in good condition.
        1.8.1. No breaches or damage were identified with the containment structure.
        1.8.2. There were no foreign materials or liquid located within the containment structure. One other AST, of the same size is located within a common containment area.
        1.8.3. There is a drainage system associated with the containment structure. There were no penetrations observed which would lead to failure of the secondary containment.
    1.9. Ancillary equipment was inspected for condition and operability.
        1.9.1. Piping and piping connections were inspected for visible signs of stress or leakage such as severe corrosion, rusted bolted connections, or other severe degradation. Piping and piping connections were observed to be in good condition.

1.9.2. The tank has a 2" diameter normal vent which terminates just above the building roof top and was observed to be in good condition. The tank has a 6" diameter emergency vent. The tank utilizes a nitrogen blanket system and does not normally vent.

1.9.3. The tank level systems were out-of-service during our inspection and were not tested for operation.

1.10. The tank system is grounded. The ground systems were observed to be in good condition.

1.11. The stairs and topside platform were inspected and found to be in good condition with no indications of significant corrosion or damage.

1.12. The tank has beige topcoat paint. The majority of the tank shells and heads are covered with insulation and are not visible for inspection. The steel supports have minor paint failure.

2. Original Shell Thickness of the AST
   2.1. Original tank documentation was provided for review and is attached to this report.
   2.2. The tank manufacturer was Eastern Tank Fabricators of Wallington, NJ.
   2.3. The tank was manufactured to the ASME Pressure Vessel Code.
   2.4. According to the manufacturer's data, the original shell thickness was ¼ inches (0.25 inches). The original head thickness was 3/16 inches (0.1875 inches).
   2.5. The tank was rated for a maximum working pressure of 20 psi at a maximum temperature of 100 degrees F.
3. Horizontal ASTs
   3.1. Shell plates, welds and ancillary equipment were inspected for indications of exterior corrosion, bucking, distortion of stress, cracking, pinholes and mechanical damage.
      3.1.1. The insulating material and jacketing was not removed. With the exception of several four-inch diameter access ports, the exterior surfaces of the tank shell were not inspected.
   3.2. The tank shell was inspected for indications of changes that may have been made to the AST after it was fabricated. No evidence of changes to the original tanks was identified; however, the tank heads and shell surfaces could not be visually inspected due to the presence of insulation.

<u>Formal Internal Inspection</u>

1. General
   1.1. A formal internal inspection was performed by an STI certified inspector.
   1.1. The tank was cleaned by the owner prior to our inspection. Approximately 40% of the upper interior surfaces of the tank were covered with scale. The scale was removed in several locations to inspect the steel surface; however, the accumulation of scale prevented a thorough inspection.
2. Horizontal AST Internal Inspection
   2.1. Internal appurtenances were documented and visually inspected. Carbon steel appurtenances had moderate corrosion. No mechanical damage, cracking or other concerns were identified.
   2.2. Welds were visually inspected. No problems were identified.
   2.3. Ultrasonic Thickness Scanning (UTS) was performed on the interior surfaces of the tank shell and heads. Data collected ranged from 0.239 to 0.259 inches.
      2.3.1. The entire interior shell has uniform corrosion with pitting that ranged from 0.01

to 0.02 inches.

2.3.2. No significant or isolated pitting beyond that was identified.

2.4. The fabrication of the AST was inspected using UL 142 as a baseline.

Suitability for Continued Service

Based on the STI criteria and result of the current inspection, the subject tank is suitable for continued service. The interval until the next certified inspection is 20 years. Federal, state and/or local regulations may require more frequent inspections of the subject AST.

Recordkeeping

1. AST records should be retained for the life of the AST system.
2. Monthly Inspection Checklists should be completed by the owner/operator and retained for a minimum of 36 months.
3. Annual Inspection Checklists should be completed by the owner/operator and retained for a minimum of 3 years.
4. Certified Inspection Reports should be retained for the life of the AST system.

Tank #4 (General Solvent Waste)

This 10,000-gallon tank is a horizontal, cylindrical design with a diameter of 120 inches and an overall length 180 inches (15 feet), and is used to store waste solvent. The tank consists of single wall carbon steel, welded construction and rests within a covered concrete secondary containment structure. The containment dike is steel lined and has a calculated containment capacity of 23,170 gallons. There was no nameplate observed on the tank; however, the tank is insulated and a nameplate may not be visible. The age of the tank could not be verified based on field data but was reportedly installed in 1981 when the Chemical Distribution facility was built.

For the purposes of this inspection, the subject tank is considered to be single wall, not in contact with the ground. The tank is equipped with a manway and was inspected both externally and internally.

The tank is equipped with the following fittings and equipment located along the centerline:

24” ID access manway, tight bolted with high-level warning alarm switch
2” tank top flanged fitting inlet/outlet
6” tank top flanged fitting with emergency venting
2” tank top flanged fitting with an inlet for nitrogen
6” tank top flanged fitting with a level indicator
2” tank top flanged fitting with a normal vent
4” tank top flanged fitting
Tank top fitting with pump
24” ID diameter manway

The following details were observed as part of the overall tank inspection. The tank inspection

summary is provided following the STI periodic inspection criteria (monthly and annual), formal external inspection criteria, and additional inspection items. The periodic inspection items for this tank are described as follows:

Monthly Inspection Checklist

1. Tank Containment
   1.1. The tank was emptied and cleaned prior to our inspection. No liquid was present on the tank bottom.
   1.2. The containment area was inspected for debris and fire hazards. None were observed.
   1.3. The drain associated with the secondary containment area was clear of debris and appeared to be in working order.
   1.4. Containment egress pathways were inspected. No problems were identified.
2. Leak Detection
   2.1. The tank and containment area were inspected for signs of leakage. No leaks were observed.
3. Tank Attachments and Appurtances
   3.1. The tank stairs and topside access platform were inspected. These structures are secure with no signs of significant corrosion or damage.
   3.2. The tank liquid level gauge was inspected. The tank was empty during our inspection so the proper and accurate operation of the gauge was not verified.
   3.3. Tank openings were inspected to confirm proper sealing. Openings appeared to be properly sealed.
4. Other Conditions
   4.1. No conditions were identified which would be considered unsafe or that would significantly affect the site SPCC Plan.

Annual Inspection Checklist

1. Tank Containment
   1.1. The steel lined concrete secondary containment structure was inspected and found to be in satisfactory condition.
   1.2. The drainage pipe and/or valves associated with the secondary containment structures were inspected and found to be in satisfactory condition.
2. Tank Foundation and Supports
   2.1. No signs of tank settlement or foundation washout were identified.
   2.2. The concrete containment structure is not visible because there is a steel lining over it. The steel lining (i.e., overlay) was observed to be in good condition. Cracking and/or spalling were not identified. There is no ring wall associated with the subject tank.
   2.3. The tank rests on steel support saddles, which rest on elevated concrete foundations, which are covered, with steel plate. Portions of the steel saddles have some limited paint failure. The foundations are in good condition.
   2.4. The area around the concrete containment structure is located under a roof. Drainage is not a concern.
   2.5. The tank stairs and platform are bonded to the steel building structure that is bonded to an earth ground rod. The grounding equipment was observed to be in good condition.
3. Cathodic Protection System
   3.1. There is no cathodic protection system associated with the subject tank. There is no

buried steel associated with the tank or piping.

4. Tank External Coating
   4.1. The tank has beige topcoat paint. The entire tank shell is covered with insulation; therefore routine inspection of the painted surfaces is not possible. Some paint failure was observed on the steel support saddles.
5. Tank Shells/Heads
   5.1. Evidence of shell/head distortions, buckling, denting or bulging was not observed.
   5.2. Evidence of shell/head corrosion was not observed.
6. Tank Manways, Piping and Equipment within Secondary Containment
   6.1. The tank manhole and bolts were observed in good condition with no significant signs of wear or corrosion.
   6.2. The piping and equipment associated with the subject tank and located within the secondary containment was inspected and found to be in good condition.
7. Tank Roof
   7.1. Not applicable, the tank is a horizontal cylindrical design.
8. Venting
   8.1. The normal vents are in good condition and free from obstructions.
   8.2. The tank has emergency venting that appeared to be in good condition and working properly.
9. Insulated Tanks
   9.1. The tank shell is insulated. No missing insulation was identified.
   9.2. Areas of moisture associated with the insulation were not identified.
   9.3. No mold was observed.
   9.4. No damage to the insulation was observed.
   9.5. The tank is located under a roof; therefore, the insulating material is protected from precipitation.
10. Level and Overfill Prevention Instrumentation of Shop Fabricated Tanks
    10.1. The tank level sensing device was inspected, found to be in good condition but not tested for proper operation.
    10.2. The overfill prevention device includes an electronic high level warning alarm. This device is in good condition but was not tested for proper operation.
11. Electrical Equipment
    11.1. The tank grounding cable and/or connections were inspected and found to be in good condition.
    11.2. Heat trace tape is located on the exterior of the tank under the insulation layer. This was not visible and was not inspected. Other electrical wiring associated with the tank equipment is in good condition.

<u>Formal External Inspection</u>

1. General
   1.1. A formal external inspection was performed by an STI certified inspector.
   1.2. The subject aboveground storage tank (AST) is single wall carbon, horizontal, cylindrical design. The tank is 120 inches in diameter, 15 feet long with a nominal capacity of 10,000 gallons and is used to store waste solvent. The tank was reportedly installed in 1981.
   1.3. According to facility personnel, the subject tank has been evaluated for integrity in the past. Refer to the historical reports from Knight Consulting Engineers attached to this

report.

1.4. There was no nameplate observed on the tank; however, according to available information Eastern Tank Fabricators of Wallington, New Jersey, fabricated the tank in 1981.

1.5. The fabrication of the AST was inspected using UL 142 as a baseline.

1.6. The AST foundations were inspected for indications of settlement, cracking, exposed rebar, and general disrepair. No evidence of the above conditions was observed.

1.7. The AST supports were inspected for indications of cracking, spalling, and general disrepair. The supports include three steel saddles that are not bolted to the concrete foundation. The supports have some isolated paint failure.

1.8. The subject tank is located within a concrete secondary containment structure that is lined with plate steel. An electronic high-level warning alarm is located in the tank. The containment area associated with the tank was inspected and found to be in good condition.

1.8.1. No breaches or damage were identified with the containment structure.

1.8.2. There were no foreign materials or liquid located within the containment structure. One other AST, of the same size is located within a common containment area.

1.8.3. There is a drainage system associated with the containment structure. There were no penetrations observed which would lead to failure of the secondary containment.

1.9. Ancillary equipment was inspected for condition and operability.

1.9.1. Piping and piping connections were inspected for visible signs of stress or leakage such as severe corrosion, rusted bolted connections, or other severe degradation. Piping and piping connections were observed to be in good condition.

1.9.2. The tank has a 2” diameter normal vent that terminates just above the building rooftop and was observed to be in good condition. The tank has a 6” diameter emergency vent. The roof top weighted vent cap could not be checked for free operation due to the presence of a bee’s nest. The tank utilizes a nitrogen blanket system and does not normally vent.

1.9.3. The tank level systems were out-of-service during our inspection and were not tested for operation.

1.10. The tank system is grounded. The ground systems were observed to be in good condition.

1.11. The stairs and topside platform were inspected and found to be in good condition with no indications of significant corrosion or damage.

1.12. The tank has beige topcoat paint. The majority of the tank shells and heads are covered with insulation and are not visible for inspection. The steel supports have minor paint failure.

2. Original Shell Thickness of the AST

2.1. Original tank documentation was provided for review and is attached to this report.

2.2. The tank manufacturer was Eastern Tank Fabricators of Wallington, NJ.

2.3. The tank was manufactured to the ASME Pressure Vessel Code.

2.4. According to the manufacturer’s data, the original shell thickness was ¼ inches (0.25 inches). The original head thickness was 3/16 inches (0.1875 inches).

2.5. The tank was rated for a maximum working pressure of 20 psi at a maximum temperature of 100 degrees F.

3. Horizontal ASTs
   3.1. Shell plates, welds and ancillary equipment were inspected for indications of exterior corrosion, bucking, distortion of stress, cracking, pinholes and mechanical damage.
      3.1.1. The insulating material and jacketing was not removed. With the exception of several four-inch diameter access ports, the exterior surfaces of the tank shell were not inspected.
   3.2. The tank shell was inspected for indications of changes that may have been made to the AST after it was fabricated. No evidence of changes to the original tanks was identified; however, the tank heads and shell surfaces could not be visually inspected due to the presence of insulation.

Formal Internal Inspection

1. General
   1.1. A formal internal inspection was performed by an STI certified inspector.
   1.2. The tank was cleaned by the owner prior to our inspection.
2. Horizontal AST Internal Inspection
   2.1. Internal appurtenances were documented and visually inspected. Carbon steel appurtenances had moderate corrosion. No mechanical damage, cracking or other concerns were identified.
   2.2. Welds were visually inspected. No problems were identified.
   2.3. Ultrasonic Thickness Scanning (UTS) was performed on the interior surfaces of the tank shell and heads. Data collected ranged from 0.247 to 0.274 inches.
      2.3.1. The entire interior shell has uniform corrosion with pitting that ranged from 0.01 to 0.02 inches.
      2.3.2. Significant pitting along the lower tank shell, at the 5 and 7 o'clock positions, was observed. Pits were measured up to a maximum of 0.05 inches in this area. The pitting extended over an area roughly 12 inches in height.
   2.4. The fabrication of the AST was inspected using UL 142 as a baseline.

Suitability for Continued Service

Based on the STI criteria and result of the current inspection, the subject tank is suitable for continued service. The interval until the next certified inspection is 10 years. Federal, state and/or local regulations may require more frequent inspections of the subject AST.

Recordkeeping

1. AST records should be retained for the life of the AST system.
2. Monthly Inspection Checklists should be completed by the owner/operator and retained for a minimum of 36 months.
3. Annual Inspection Checklists should be completed by the owner/operator and retained for a minimum of 3 years.
4. Certified Inspection Reports should be retained for the life of the AST system.

IV. ULTRASONIC THICKNESS MEASUREMENTS SUMMARY

To obtain the residual metal thickness readings, a Panametrics 36DL Plus datalogging ultrasonic digital thickness gauge with a D790 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material.

Refer to the attachment of this report for a tank sketch and UT thickness measurements.

V. REQUIREMENTS FOR CONTINUED SERVICE

The following items are based on the requirements of SP-001 and UL 142. These documents are industry standards. Additional regulatory requirements may apply to the subject AST.

Tank GS-1 – (1) 10,000-gallon tank

1. Paint failure on the steel saddles should be repaired.
2. Based on the STI Standard (SP-001), the interval until the next certified inspection is not to exceed 20 years. If the facility uses an alternate Standard or chooses to provide "equivalent environmental protection" in lieu of routine integrity testing, the method and schedule for such should be included in the facility's SPCC Plan.

Tank GS-4 – (1) 10,000-gallon tank

1. Paint failure on the steel saddles should be repaired.
2. The emergency vent termination fitting at the roof level has a bee's nest present. The nest should be removed so the proper operation of the vent device can be tested.
3. The lower portion of the tank shell has moderate to significant pitting. Numerous pits were measured as deep as 0.05 inches or 20% of the tank's original thickness.
    a. Repairs are not required at this time and the tank may continue in service. The interval until the next certified inspection is not to exceed 10 years.
4. Based on the STI Standard (SP-001), the interval until the next certified inspection is not to exceed 10 years. If the facility uses an alternate Standard or chooses to provide "equivalent environmental protection" in lieu of routine integrity testing, the method and schedule for such should be included in the facility's SPCC Plan.

If the facility's SPCC Plan requires the use of routine "integrity testing" using the STI procedure SP-001, then the following routine inspections should be completed as described by the owner/operator. Specific inspection items may be modified for tank specific use as necessary; however, deviations from or alterations of the STI Standard should be discussed in the facility SPCC Plan.

Shop Fabricated Steel Tanks

The Steel Tank Institute (STI) Standard for Inspection requires the owner or operator of an aboveground tank to perform and document periodic inspections. Refer to the attached

checklists. These documents should be completed by the owner or operator on a monthly and annual basis. All records should be maintained.

VI. RECOMMENDATIONS

The following recommendations are based on good engineering practices and industry standards; however, they are not specific regulatory requirements or requirements for continued service.

Tank #1 – (1) 10,000-gallon tank

1. Prior to the next scheduled internal inspection, the tank should be cleaned and the interior power washed to remove the scale material. The presence of significant quantities of scale prohibits a complete evaluation of the tank interior surfaces.

Tank #4 – (1) 10,000-gallon tank

2. The lower portion of the tank shell has moderate to significant pitting. Numerous pits were measured as deep as 0.05 inches or 20% of the tank's original thickness.
    a. The interior of the tank should be cleaned of residual material. A repair to the interior shell surfaces or lining the tank interior is recommended.
    b. If repairs are not made, the interval until the next certified inspection is not to exceed 10 years. If repairs are made, the interval until the next certified inspection can be extended to 20 years.

All tanks should be clearly labeled with the product stored, capacity of the tank and an NFPA hazard label, as a minimum. Piping should be labeled with the product and flow direction.

Although not required by STI, we recommend that aboveground storage tanks greater than 5,000 gallon in capacity, be inspected by a certified inspector every 10 years.

PROFESSIONAL OPINION

The subject above ground storage tank(s) at the IBM Essex Junction facility, Essex Junction, VT have been inspected using procedures found in STI SP001-05 publication "Standard for the Inspection of Aboveground Storage Tanks".

It is the professional opinion of this firm that the structural integrity of the subject steel tank(s) is acceptable. Unless a different interval is indicated in this report, a certified inspection should be completed within 10 years of the date of this inspection, no later than September 2017.

This is not to be construed as an expressed or implied warranty of future performance.

Should you have any questions or comments concerning this inspection report, please do not hesitate to contact the undersigned at 860-276-1201.

Sincerely,

Richard J. Vocke (ext. 105)
Engineering Manager
AST Inspector (STI #AST-536-03)

Joseph Paterak
Sr. Field Technician

Attachments

Thickness Measurements Only

PANAMETRICS Ultrasonic Thickness Gage

File Name: IBM GS-1
File Type: Incremental
File Description: General Solvent Waste
Location Note:
Inspector ID: JP

Survey Date: 9/13/2007
Erase Protection: ON

Data Point ID	Thickness	Units	Flags	Setup	Comments	Date	Active	Modified
001	0.274	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
002	0.238	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
003	0.276	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
004	0.267	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
005	0.268	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
006	0.282	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
007	0.262	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
008	0.264	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
009	0.282	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
010	no access	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No

Report Date: 9/20/2007

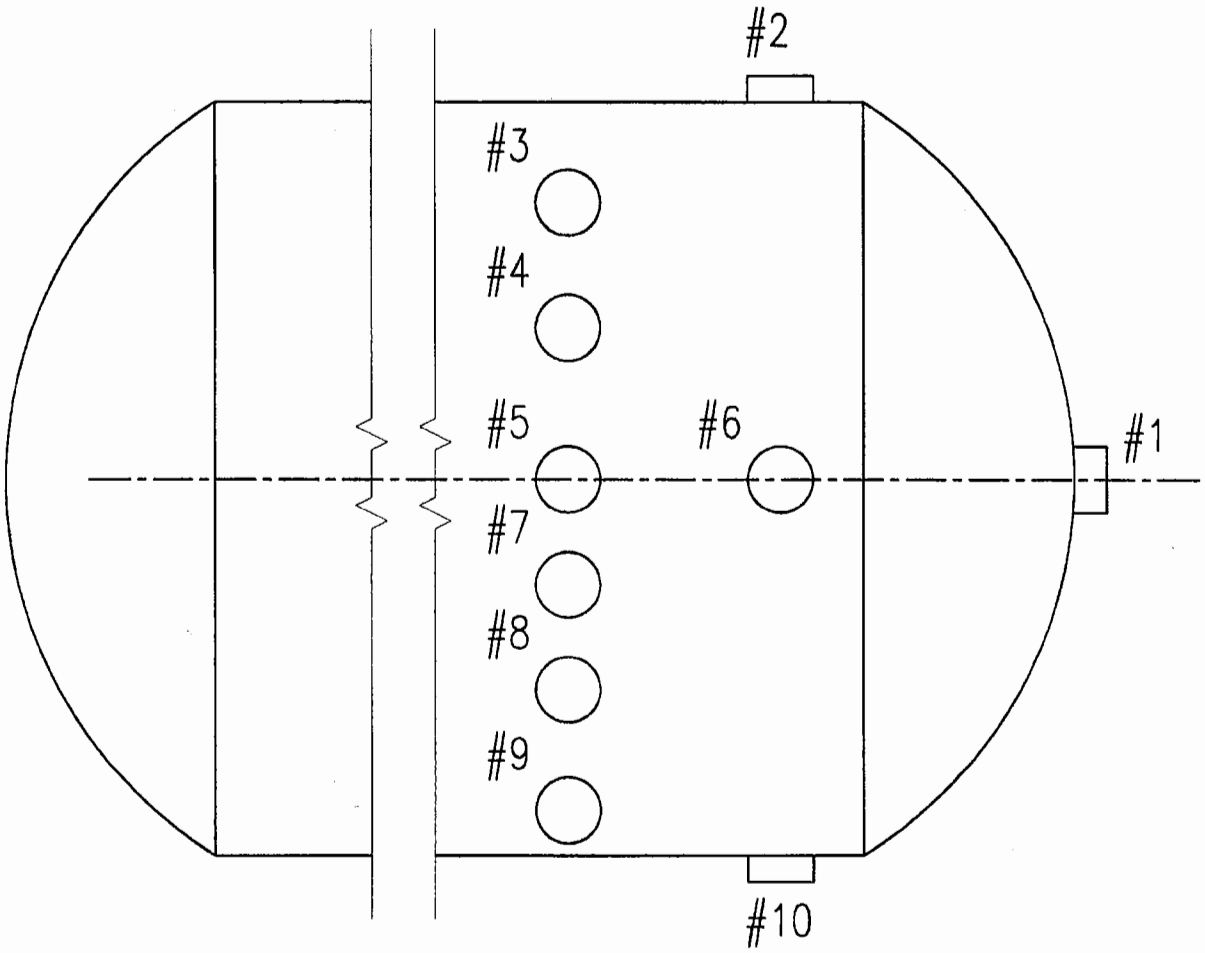
Thickness Measurements Only

PANAMETRICS Ultrasonic Thickness Gage

File Name: IBM GS-4
File Type: Incremental
File Description: General Solvent Waste
Location Note:
Inspector ID: JP

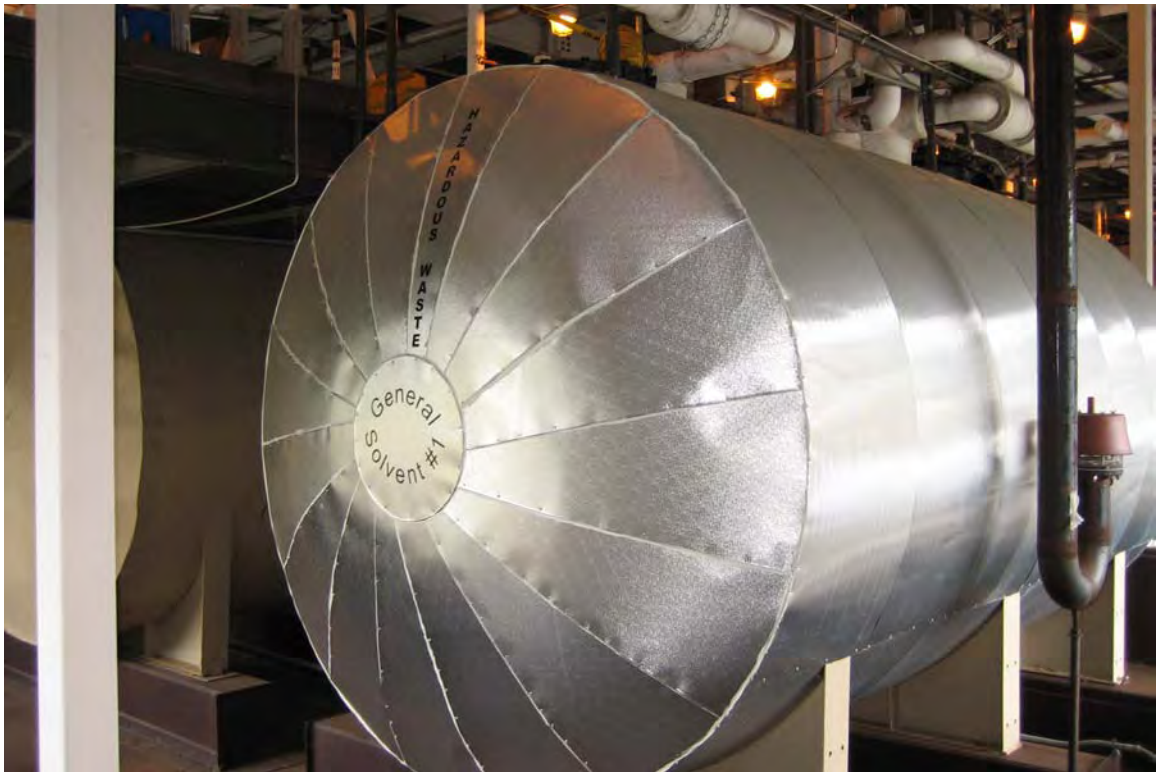
Survey Date: 9/13/2007
Erase Protection: ON

Data Point ID	Thickness	Units	Flags	Setup	Comments	Date	Active	Modified
001	no access	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
002	no access	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
003	0.280	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
004	0.275	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
005	0.266	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
006	0.234	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
007	0.266	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
008	0.274	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
009	0.278	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No
010	no access	IN	M-m-WF	02	Test Port	9/13/2007	Yes	No



IBM TANK THICKNESS TESTING SKETCH #1	SHEET NO:	
	DWN BY: MWH	CHK BY: MWH
	PROJ. NO: 04492	
	DATE: 12/9/04	
KCE KNIGHT CONSULTING ENGINEERS, INC. P.O. BOX 29, WILLISTON VT 05495 (802) 879-6343	SCALE: NTS	
	FILE: Sketch #1	

IBM Essex Junction - September 13, 2007



General Solvent Tank #1

General Solvent Tank #1 - top side

IBM Essex Junction - September 13, 2007

General Solvent Tank #1 - Steel support saddles

General Solvent Tank #1 - Steel support saddles

IBM Essex Junction - September 13, 2007

General Solvent Tank #1 - Interior bottom

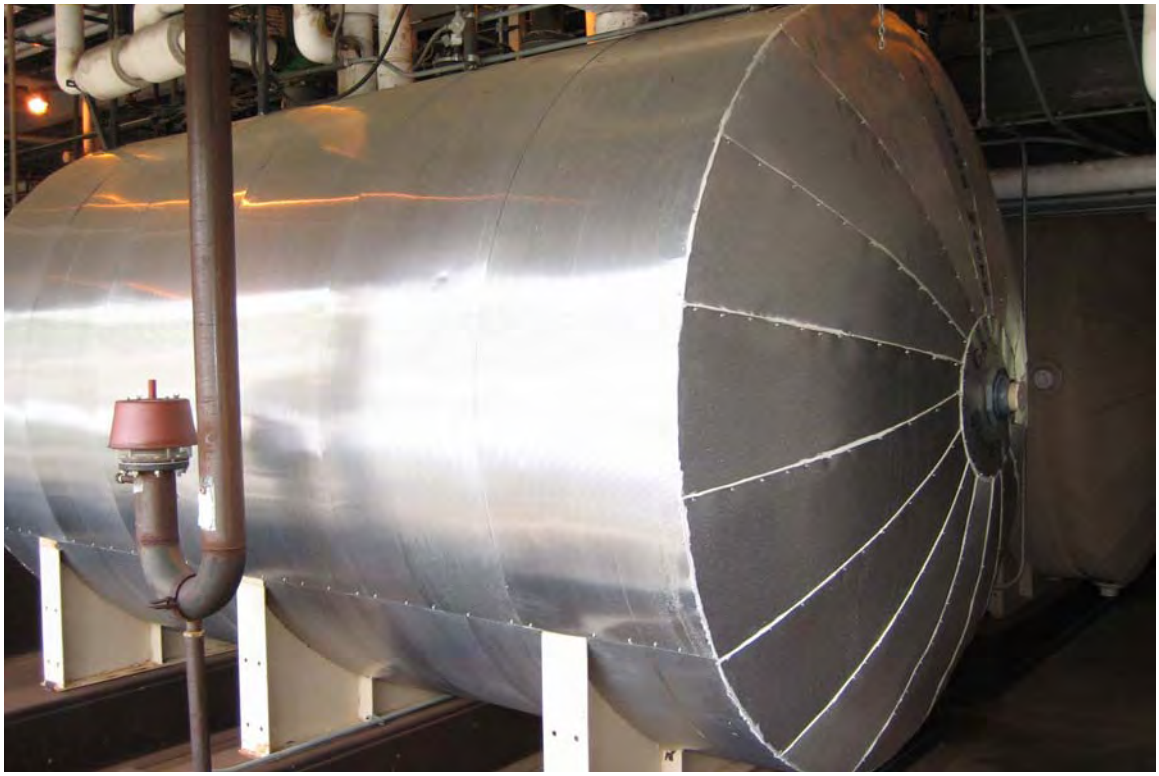
General Solvent Tank #1 - Tank weld

IBM Essex Junction - September 13, 2007

General Solvent Tank #1 - Interior top of shell, scale

General Solvent Tank #1 - Interior view of shell sidewall

IBM Essex Junction - September 13, 2007



General Solvent Tank #4

General Solvent Tank #4 - top side

IBM Essex Junction - September 13, 2007

General Solvent Tank #4 - Steel support saddles

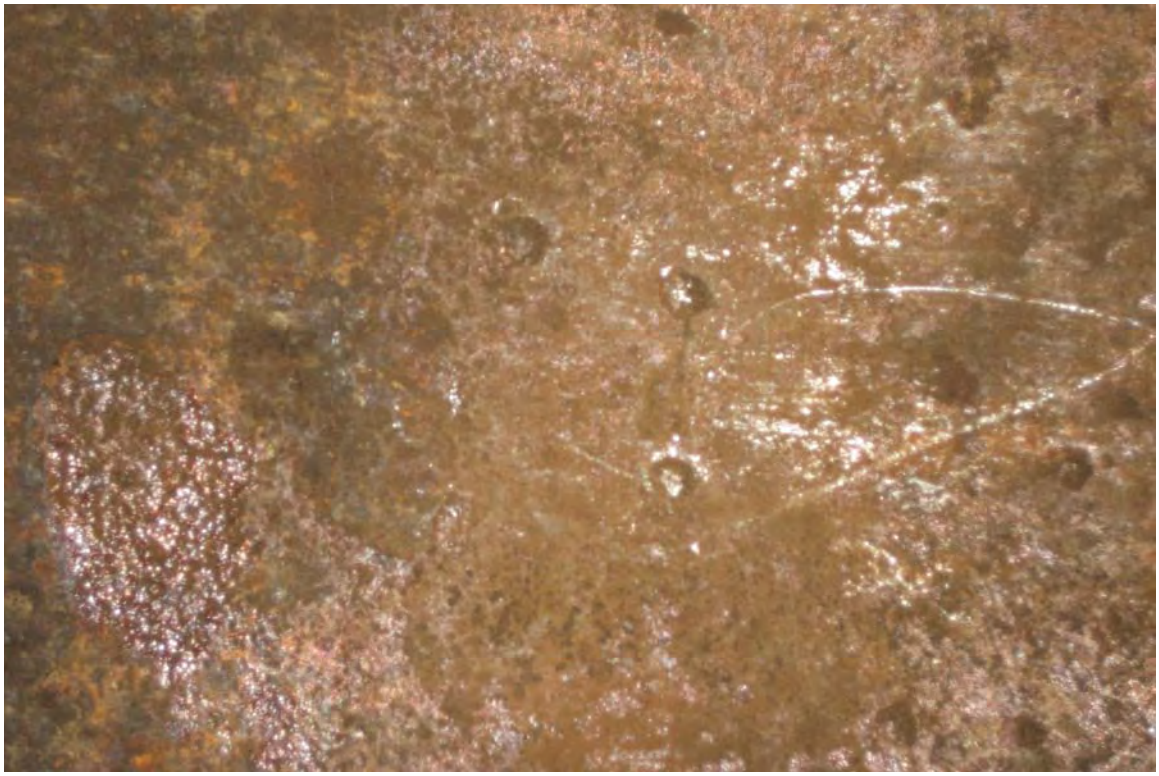
General Solvent Tank #4 - Steel support saddles

IBM Essex Junction - September 13, 2007

General Solvent Tank #4 - Interior tank bottom

General Solvent Tank #4 - Tank weld

IBM Essex Junction - September 13, 2007



General Solvent Tank #4 - Interior shell surface with pits

General Solvent Tank #4 - Interior shell view

STI SP001 Monthly Inspection Checklist

General Inspection Information:

Inspection Date: _____ Retain Until Date: _____ (36 months from inspection date)

Prior Inspection Date: _____ Inspector Name: _____

Tanks Inspected (ID #'s): _____

Inspection Guidance:

- For equipment not included in this standard, follow the manufacturer recommended inspection/testing schedules and procedures.
- The periodic AST Inspection is intended for monitoring the external AST condition and its containment structure. This visual inspection does not require a certified inspector. It shall be performed by an owner's inspector who is familiar with the site and can identify changes and developing problems.
- Upon discovery of water in the primary tank, secondary containment area, interstice, or spill container, remove promptly or take other corrective action. Before discharge to the environment, inspect the liquid for regulated products or other contaminants and disposed of it properly.
- (*) designates an item in a non-conformance status. This indicates that action is required to address a problem.
- Non-conforming items important to tank or containment integrity require evaluation by an engineer experienced in AST design, a certified inspector, or a tank manufacturer who will determine the corrective action. Note the non-conformance and corresponding corrective action in the comment section.
- Retain the completed checklists for 36 months.
- **In the event of severe weather (snow, ice, wind storms) or maintenance (such as painting) that could affect the operation of critical components (normal and emergency vents, valves), an inspection of these components is required immediately following the event.**

Item	Status		Comments
1.0 Tank Containment			
1.1 Water in primary tank, secondary containment, interstice, or spill container?	☐Yes*	☐No	
1.2 Debris or fire hazard in containment?	☐Yes*	☐No	
1.3 Drain valves operable and in a closed position?	☐Yes	☐No*	
1.4 Containment egress pathways clear and gates/doors operable?	☐Yes	☐No*	

2.0 Leak Detection			
2.1 Visible signs of leakage around the tank, concrete pad, containment, ringwall or ground?	☐Yes*	☐No	
3.0 Tank Attachments and Appurtances			
3.1 Ladder and platform structure secure with no sign of severe corrosion or damage?	☐Yes	☐No*	
3.2 Tank Liquid level gauge readable and in good condition?	☐Yes	☐No*	
3.3 Check all tank openings are properly sealed	☐Yes	☐No*	
4.0 Other Conditions			
4.1 Are there other conditions that should be addressed for continued safe operation or that may affect the site SPCC plan?	☐Yes*	☐No	

Additional Comments:

STI SP001 Annual Inspection Checklist

General Inspection Information:

Inspection Date: _____ Retain Until Date: _____ (36 months from inspection date)

Prior Inspection Date: _____ Inspector Name: _____

Tanks Inspected (ID #'s): _____

Inspection Guidance:

- For equipment not included in this standard, follow the manufacturer recommended inspection/testing schedules and procedures.
- The periodic AST Inspection is intended for monitoring the external AST condition and its containment structure. This visual inspection does not require a certified inspector. It shall be performed by an owner's inspector who is familiar with the site and can identify changes and developing problems.
- Inspect the AST shell and associated piping, valves, and pumps including inspection of the coating for Paint Failure.
- Inspect:
  1. Earthen containment structures including examination for holes, washout, and cracking in addition to liner degradation and tank settling.
  2. Concrete containment structures and tank foundations/supports including examination for holes, washout, settling, paint failure, in addition to examination for corrosion and leakage.
  3. Steel containment structures and tank foundations/supports including examination for washout, settling, cracking, and for paint failure, in addition to examination for corrosion and leakage.
- Inspection of cathodic protection system, if applicable, includes the wire connections for galvanic systems and visual inspection of the operational components (power switch, meters, and alarms) of impressed current systems.
- Remove promptly upon discovery standing water or liquid in the primary tank, secondary containment area, interstice, or spill container. Before discharge to the environment, inspect the liquid for regulated products or other contaminants and disposed of it properly.
- In order to comply with EPA SPCC (Spill Prevention, Control and Countermeasure) rules, a facility must regularly test liquid level sensing devices to ensure proper operation (40 CFR 112.8(c)(8)(v)).
- (*) designates an item in a non-conformance status. This indicates that action is required to address a problem.
- Non-conforming items <u>important to tank or containment integrity</u> require evaluation by an engineer experienced in AST design, a certified inspector, or a tank manufacturer who will determine the corrective action. Note the non-conformance and corresponding corrective action in the comment section.
- Retain the completed checklists for 36 months.
- Complete this checklist on an annual basis supplemental to the owner monthly-performed inspection checklists.
- **Note: If a change has occurred to the tank system or containment that may affect the SPCC plan, the condition should be evaluated against the current plan requirement by a Professional Engineer knowledgeable in SPCC development and implementation.**

Item	Status	Comments
1.0 Tank Containment		
1.1 Containment structure in satisfactory condition?	☐Yes ☐No*	
1.2 Drainage pipes/valves fit for continued service	☐Yes ☐No* ☐ N/A	
2.0 Tank Foundation and Supports		
2.1 Evidence of tank settlement or foundation washout?	☐Yes* ☐No	
2.2 Cracking or spalling of concrete pad or ring wall?	☐Yes* ☐No	
2.3 Tank supports in satisfactory condition?	☐Yes ☐No*	
2.4 Water able to drain away from tank?	☐Yes ☐No*	
2.5 Grounding strap secured and in good condition?	☐Yes ☐No*	
3.0 Cathodic Protection		
3.1 CP system functional?	☐Yes ☐No* ☐n/a	
3.2 Rectifier Reading:		
4.0 Tank External Coating		
4.1 Evidence of paint failure?	☐Yes* ☐No	
5.0 Tank Shell/Heads		
5.1 Noticeable shell/head distortions, buckling, denting or bulging?	☐Yes* ☐No	
5.2 Evidence of shell/head corrosion or cracking?	☐Yes* ☐No	
6.0 Tank Manways, Piping and Equipment within Secondary Containment		
6.1 Flanged connection bolts tight and fully engaged with no sign of wear or corrosion?	☐Yes ☐No*	
7.0 Tank Roof		
7.1 Standing water on roof?	☐Yes* ☐No	
7.2 Evidence of coating cracking, crazing, peeling, blistering?	☐Yes* ☐No	
7.3 Holes in roof?	☐Yes* ☐No	

Item	Status	Comments
8.0 Venting		
8.1 Vents free of obstructions?	☐Yes ☐No*	
8.2 Emergency vent operable? Lift as required?	☐Yes ☐No*	
9.0 Insulated Tanks		
9.1 Insulation missing?	☐Yes* ☐No	
9.2 Are there noticable areas of moisture on the insulation?	☐Yes* ☐No	
9.3 Mold on insulation?	☐Yes* ☐No	
9.4 Insulation exhibiting damage?	☐Yes* ☐No	
9.5 Is the insulation sufficiently protected from water intrusion?	☐Yes ☐No*	
10.0 Level and Overfill Prevention Instrumentation of Shop-Fabricated Tanks		
10.1 Has the tank liquid level sensing device been tested to ensure proper operation?	☐Yes ☐No*	
10.2 Does the tank liquid level sensing device operate as required?	☐Yes ☐No*	
10.3 Are overfill prevention devices in proper working condition?	☐Yes ☐No* ☐N/A	
11.0 Electrical Equipment		
11.1 Are tank grounding lines in good condition?	☐Yes ☐No* ☐N/A	
11.2 Is electrical wiring for control boxes/lights in good condition?	☐Yes ☐No* ☐N/A	

Additional Comments:

Aboveground Storage Tank Inspection Report
General Solvent #2 Waste Tank
Inspection Dates: June 21 and 22, 2011

Knowledge | Commitment | Experience

September 2, 2011

PC Construction
Attn: Lisa Martinez

Re: Inspection of General Solvent #2 Waste Tank

Dear Lisa:

On June 21 and 22, 2011, the above referenced tank was inspected by personnel of Aaron Environmental working as a sub-contractor for Knight Consulting Engineers, Inc. The inspection was routine in nature and not triggered by a specific event such as mechanical damage or leakage. The tank was taken out of service, emptied and cleaned prior to the inspection.

A report prepared by Aaron Environmental dated August 18, 2011, containing their findings and recommendations as a result of this inspection is attached. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations.

Sincerely,

STATE OF VERMONT
MARTIN W. HAIN
No. 5490
REGISTERED
PROFESSIONAL ENGINEER

Martin W. Hain, P.E.
President
Knight Consulting Engineers, Inc.

File: C:\11172\GS2.doc

OUT-OF-SERVICE ABOVEGROUND STORAGE TANK INSPECTION REPORT

KNIGHT CONSULTING ENGINEERS
IBM ESSEX JUNCTION
RIVER STREET, ESSEX JUNCTION, VERMONT
Inspection Dates: June 21 & 22, 2011

Prepared for:

Martin Hain, P.E.
Knight Consulting Engineers
51 Knight Lane, Williston, Vermont 05495
Phone: 802-879-6343

Prepared by:

AARON ENVIRONMENTAL

189 Atwater Street
Plantsville, CT 06479
860-276-1201

August 18, 2011

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Preface

Throughout this document, `Customer' or `Client' refers to Knight Consulting Engineers (KCE) and/or IBM Corporation; and `Consultant', `Engineer' or `AARON' refers to AARON Environmental.

The field observations and research reported herein are considered sufficient in detail and scope to form a reasonable basis for an out-of-service evaluation of the referenced tank(s). The methods used to acquire the information as well as compile and analyze the data are considered current and widely accepted methods in the industry. These methods have been developed to provide the Client with information regarding apparent indications of existing or potential conditions relating to the tank(s) and are limited to the accessibility to the tank(s) and information available at the time of the site visit and inspection. Conclusions listed in this document may have been based in-part on information provided by the current facility owner, their agents and/or third parties (including, but not limited to, state and local authorities); pursuant to this, the accuracy of said information is not guaranteed by AARON.

LIMITATIONS

Notwithstanding anything contained in this report, nothing herein shall be construed as a representation, warranty or guarantee, either expressed or implied, regarding the future structural integrity, life expectancy, or performance of any of the items evaluated. This report and the analysis provided is in all respects subject to and shall be interpreted within the limitations and parameters of the test procedures performed. In the event testing is performed using a sampling procedure, this report and any analysis shall be limited to those areas actually tested and the type of test conducted, and the customer is cautioned not to extrapolate the results of the test samples.

I. INSPECTION PROCEDURES

The aboveground storage tank(s) were inspected following portions of the applicable procedures contained in the Steel Tank Institute (STI) Standard SP001 4th Edition "Standard for Inspection of Aboveground Storage Tanks".

Where applicable, AARON provided the following inspection and testing services on the tank(s):

1. Perform the periodic inspections (monthly and annual) described in the STI Standard.

2. Visually inspect the outside of each tank in detail. At a minimum, the following tank components were inspected (where applicable):

    a. Primary Tank
    b. Secondary Tank
    c. Tank Supports
    d. Tank Anchors
    e. Tank Foundation and external supports
    f. Tank gauges and alarms
    g. Insulation covering
    h. Tank appurtenances
    i. Normal Vents
    j. Emergency Vents
    k. Release Prevention Barriers
    l. Spill Control Systems

3. Visually inspect the interior of each tank in detail. At a minimum, the following areas of concern were addressed (where applicable):
    a. Identify, inspect and record AST internal appurtenances
    b. Inspect for mechanical damage, corrosion, cracking, etc.
    c. Inspect for deteriorating or corroding internal attachments and piping
    d. Visually inspect welds
    e. Ultrasonic thickness measurements
    f. Vacuum box examination of questionable welds

4. Inspect the tank based on its construction, per the following:

    a. Single Wall Tank, Not in Contact with the Ground
        i. Either conduct ultrasonic testing (from the exterior) to determine the shell thickness as described in the STI Standard, or visually examine the interior of the tank as described in the STI Standard.

To obtain the residual metal thickness readings, a Panametrics 36DL Plus datalogging ultrasonic digital thickness gauge with a D790 or D791 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The meter is capable of collecting readings using a scan mode or single point mode. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material. Field data was stored in the unit and downloaded to a computer using Panametrics' WINplus interface software.

This report documents the findings of our inspections. It is intended to provide the tank owner/operator with an assessment of the tank's current condition, recommendations for improvements to maintain the long term integrity of the structure and an opinion of the tank's suitability for continued service.

II. GENERAL SITE AND TANK DESCRIPTION

AARON Environmental (AARON) was asked to conduct an out-of-service inspection of one aboveground waste solvent storage tanks located at IBM Corporation, River Street, Essex Junction, VT. The tanks were inspected on June 21 and 22, 2011. The subject tank is described in the table below.

TANK ID / LOCATION	SIZE (GALLONS)	TANK CONSTRUCTION MATERIAL	MANWAY ACCESS	PRODUCT STORED
GENERAL SOLVENT #2	10,000	SINGLE WALL STAINLESS STEEL WITH CONCRETE/STEEL CONTAINMENT DIKE	YES	WASTE SOLVENT

The subject tanks were identified as shop-fabricated, welded, Stainless steel construction. The age, size, orientation, and appurtenances of the tank are described in further detail in Section III of this report.

Two historical reports by Knight Consulting Engineers addressing prior inspections of the subject tanks were provided to AARON for review. One report dated December 10, 2004 included exterior ultrasonic thickness data for the subject tank, referred to as General Solvent #2.

III. INSPECTION SUMMARY

The following sections provide a summary of the inspection completed for the tank. The visual and ultrasonic thickness (if applicable) summaries are also provided for the tank.

General Solvent #2

This 10,000-gallon tank is a horizontal, cylindrical design with a diameter of 120 inches and an overall length 180 inches (15 feet), and is used to store waste solvent. The tank consists of single wall Stainless steel, welded construction and rests within a covered concrete secondary containment structure. The containment dike is steel lined and has a calculated containment capacity of 23,170 gallons. There was no nameplate observed on the tank; however, the tank is insulated and a nameplate may not be visible. The age of the tank was verified based on Form U-1A installed in 1996 according to the Manufacturers Data Report for Pressure Vessels.

For the purposes of this inspection, the subject tank is considered to be single wall, not in contact with the ground. The tank is equipped with a manway and was inspected both externally and internally.

The tank is equipped with the following fittings and equipment located along the centerline:

24" ID access manway, tight bolted with high-level warning alarm switch
2" tank top flanged fitting inlet/outlet
6" tank top flanged fitting with emergency venting
2" tank top flanged fitting with an inlet for nitrogen
6" tank top flanged fitting with a level indicator
2" tank top flanged fitting with a normal vent
4" tank top flanged fitting
Tank top fitting with pump
24" ID diameter manway

The following details were observed as part of the overall tank inspection. The tank inspection summary is provided following the STI periodic inspection criteria (monthly and annual), formal external inspection criteria, and additional inspection items. The periodic inspection items for this tank are described as follows:

Monthly Inspection Checklist

1. Tank Containment
   1.1. The tank was emptied and cleaned prior to our inspection. No liquid was present on the tank bottom.
   1.2. The containment area was inspected for debris and fire hazards. None were observed.
   1.3. The drain associated with the secondary containment area was clear of debris and appeared to be in working order.
   1.4. Containment egress pathways were inspected. No problems were identified.
2. Leak Detection
   2.1. The tank and containment area were inspected for signs of leakage. No leaks were observed.

3. Tank Attachments and Appurtances
   3.1. The tank stairs and topside access platform were inspected. These structures are secure with no signs of significant corrosion or damage.
   3.2. The tank liquid level gauge was inspected. The tank was empty during our inspection so the proper and accurate operation of the gauge was not verified.
   3.3. Tank openings were inspected to confirm proper sealing. Openings appeared to be properly sealed.
4. Other Conditions
   4.1. No conditions were identified which would be considered unsafe or that would significantly affect the site SPCC Plan.

Annual Inspection Checklist

1. Tank Containment
   1.1. The steel lined concrete secondary containment structure was inspected and found to be in satisfactory condition.
   1.2. The drainage pipe and/or valves associated with the secondary containment structures were inspected and found to be in satisfactory condition.
2. Tank Foundation and Supports
   2.1. No signs of tank settlement or foundation washout were identified.
   2.2. The concrete containment structure is not visible because there is a steel lining over it. The steel lining (i.e., overlay) was observed to be in good condition. Cracking and/or spalling were not identified. There is no ring wall associated with the subject tank.
   2.3. The tank rests on steel support saddles which rest on elevated concrete foundations which are covered with steel plate. Portions of the steel saddles have some limited paint failure. The foundations are in good condition.
   2.4. The area around the concrete containment structure is located under a roof. Drainage is not a concern.
   2.5. The tank stairs and platform are bonded to the steel building structure which is bonded to an earth ground rod. The grounding equipment was observed to be in good condition.
3. Cathodic Protection System
   3.1. There is no cathodic protection system associated with the subject tank. There is no buried steel associated with the tank or piping.
4. Tank External Coating
   4.1. The S.S. tank had no paint. The entire tank shell is covered with insulation. Some paint failure was observed on the steel support saddles.
5. Tank Shells/Heads
   5.1. Evidence of shell/head distortions, buckling, denting or bulging was not observed.
   5.2. Evidence of shell/head corrosion was not observed.
6. Tank Manways, Piping and Equipment within Secondary Containment
   6.1. The tank manhole and bolts were observed in good condition with no significant signs of wear or corrosion.
   6.2. The piping and equipment associated with the subject tank and located within the secondary containment was inspected and found to be in good condition.
7. Tank Roof
   7.1. Not applicable, the tank is a horizontal cylindrical design.
8. Venting
   8.1. The normal vents are in good condition and free from obstructions.
   8.2. The tank has emergency venting which appeared to be in good condition and working properly.
9. Insulated Tanks
   9.1. The tank shell is insulated. No missing insulation was identified.
   9.2. Areas of moisture associated with the insulation were not identified.
   9.3. No mold was observed.
   9.4. No damage to the insulation was observed.
   9.5. The tank is located under a roof; therefore, the insulating material is protected from precipitation.

10. Level and Overfill Prevention Instrumentation of Shop Fabricated Tanks
    10.1. The tank level sensing device was inspected, found to be in good condition but not tested for proper operation.
    10.2. The overfill prevention device includes an electronic high level warning alarm. This device is in good condition but was not tested for proper operation.
11. Electrical Equipment
    11.1. The tank grounding cable and/or connections were inspected and found to be in good condition. There were some electrical conduits that were not sealed and would not meet NFPA 30 flammable and combustible liquid codes.
    11.2. Heat trace tape is located on the exterior of the tank under the insulation layer. This was not visible and was not inspected. Other electrical wiring associated with the tank equipment is in good condition.

Formal External Inspection

1. General
    1.1. A formal external inspection was performed by an STI certified inspector.
    1.2. The subject aboveground storage tank (AST) is single wall stainless steel, horizontal, cylindrical design. The tank is 120 inches in diameter, 15 feet long with a nominal capacity of 10,000 gallons and is used to store waste solvent. The tank was reportedly installed in 1996.
    1.3. According to facility personnel, the subject tank has been evaluated for integrity in the past. Refer to the historical reports from Knight Consulting Engineers.
    1.4. There was no nameplate observed on the tank; however, according to available information the tank was built by Stainless Fabrication Inc. Springfield, MO, fabricated the tank in 1996.
    1.5. The fabrication of the AST was inspected using UL 142 as a baseline.
    1.6. The AST foundations were inspected for indications of settlement, cracking, exposed rebar, and general disrepair. No evidence of the above conditions was observed.
    1.7. The AST supports were inspected for indications of cracking, spalling, and general disrepair. The supports include three steel saddles which are not bolted to the concrete foundation. The supports have some isolated paint failure.
    1.8. The subject tank is located within a concrete secondary containment structure which is lined with plate steel. An electronic high level warning alarm is located in the tank. The containment area associated with the tank was inspected and found to be in good condition.
        1.8.1. No breaches or damage were identified with the containment structure.
        1.8.2. There were no foreign materials or liquid located within the containment structure.
        1.8.3. There is a drainage system associated with the containment structure. There were no penetrations observed which would lead to failure of the secondary containment.
    1.9. Ancillary equipment was inspected for condition and operability.
        1.9.1. Piping and piping connections were inspected for visible signs of stress or leakage such as severe corrosion, rusted bolted connections, or other severe degradation. Piping and piping connections were observed to be in good condition.
        1.9.2. The tank has a 2" diameter normal vent which terminates just above the building roof top and was observed to be in good condition. The tank has a 6" diameter

emergency vent and was observed to be in good condition.

1.9.3. The tank level systems were out-of-service during our inspection and were not tested for operation.

1.10. The tank system is grounded. The ground systems were observed to be in good condition.

1.11. The stairs and topside platform were inspected and found to be in good condition with no indications of significant corrosion or damage.

1.12. The tank has beige topcoat paint. The majority of the tank shells and heads are covered with insulation and are not visible for inspection. The steel supports have minor paint failure.

2. Original Shell Thickness of the AST
   - 2.1. Original tank documentation was provided for review and is attached to this report.
   - 2.2. The tank manufacturer was Stainless Fabrication Inc. .
   - 2.3. The tank was manufactured to the ASME Pressure Vessel Code.
   - 2.4. According to the manufacturer's data, the original shell thickness was ¼ inches (0.25 inches). The original head thickness was 1/4 inches (0.250 inches).
   - 2.5. The tank was rated for a maximum working pressure of 20 psi at a maximum temperature of 140 degrees F.
3. Horizontal ASTs
   - 3.1. Shell plates, welds and ancillary equipment were inspected for indications of exterior corrosion, bucking, distortion of stress, cracking, pinholes and mechanical damage.
     - 3.1.1. The insulating material and jacketing was not removed. With the exception of several four-inch diameter access ports, the exterior surfaces of the tank shell were not inspected.
   - 3.2. The tank shell was inspected for indications of changes that may have been made to the AST after it was fabricated. No evidence of changes to the original tanks was identified; however, the tank heads and shell surfaces could not be visually inspected due to the presence of insulation.

<u>Formal Internal Inspection</u>

1. General
   - 1.1. A formal internal inspection was performed by an STI certified inspector.
   - 1.1. The tank was cleaned by the owner prior to our inspection.
2. Horizontal AST Internal Inspection
   - 2.1. Internal appurtenances were documented and visually inspected. Stainless steel appurtenances were in good condition. No mechanical damage, cracking or other concerns were identified.
   - 2.2. Welds were visually inspected. No problems were identified.
   - 2.3. Ultrasonic Thickness Scanning (UTS) was performed on the interior surfaces of the tank heads. Data collected ranged from 0.218 to 0.224 inches.
     - 2.3.1. The entire interior shell had no scale. Data collected ranged from 0.251 to 0.255 inches.
     - 2.3.2. No pitting was identified.
   - 2.4. The fabrication of the AST was inspected using UL 142 as a baseline.

Suitability for Continued Service

Based on the STI criteria and result of the current inspection, the subject tank is suitable for continued service. The interval until the next certified inspection is 10 years. Federal, state and/or local regulations may require more frequent inspections of the subject AST.

Recordkeeping

1. AST records should be retained for the life of the AST system.
2. Monthly Inspection Checklists should be completed by the owner/operator and retained for a minimum of 36 months.
3. Annual Inspection Checklists should be completed by the owner/operator and retained for a minimum of 3 years.
4. Certified Inspection Reports should be retained for the life of the AST system.

IV. ULTRASONIC THICKNESS MEASUREMENTS SUMMARY

To obtain the residual metal thickness readings, a Panametrics 36DL Plus datalogging ultrasonic digital thickness gauge with a D790 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material.

Refer to the attachment of this report for a tank sketch and UT thickness measurements.

V. REQUIREMENTS FOR CONTINUED SERVICE

The following items are based on the requirements of SP-001 and UL 142. These documents are industry standards. Additional regulatory requirements may apply to the subject AST.

General Solvent #2 (1) 10,000-gallon tank

1. Based on the STI Standard (SP-001), the interval until the next certified inspection is not to exceed 10 years. If the facility uses an alternate Standard or chooses to provide "equivalent environmental protection" in lieu of routine integrity testing, the method and schedule for such should be included in the facility's SPCC Plan.

If the facility's SPCC Plan requires the use of routine "integrity testing" using the STI procedure SP-001, then the following routine inspections should be completed as described by the owner/operator. Specific inspection items may be modified for tank specific use as necessary; however, deviations from or alterations of the STI Standard should be discussed in the facility SPCC Plan.

Shop Fabricated Steel Tanks

The Steel Tank Institute (STI) Standard for Inspection requires the owner or operator of an aboveground tank to perform and document periodic inspections. Refer to the attached checklists. These documents should be completed by the owner or operator on a monthly and annual basis. All records should be maintained.

VI. RECOMMENDATIONS

The following recommendations are based on good engineering practices and industry standards; however, they are not specific regulatory requirements or requirements for continued service.

General Solvent #2 (1) 10,000-gallon tank

1. There was some isolated paint failure located on the tank saddles.
   a. The saddles should be prepped and repainted.
   b. The electrical conduits should be sealed.

PROFESSIONAL OPINION

The subject above ground storage tank(s) at the IBM Essex Junction facility, Essex Junction, VT have been inspected using procedures found in STI SP001 4th edition publication "Standard for the Inspection of Aboveground Storage Tanks".

It is the professional opinion of this firm that the structural integrity of the subject stailess steel tank is acceptable. Unless a different interval is indicated in this report, a certified inspection should be completed within 10 years of the date of this inspection, no later than June 2021.

This is not to be construed as an expressed or implied warranty of future performance.

Should you have any questions or comments concerning this inspection report, please do not hesitate to contact the undersigned at 860-276-1201.

Sincerely,

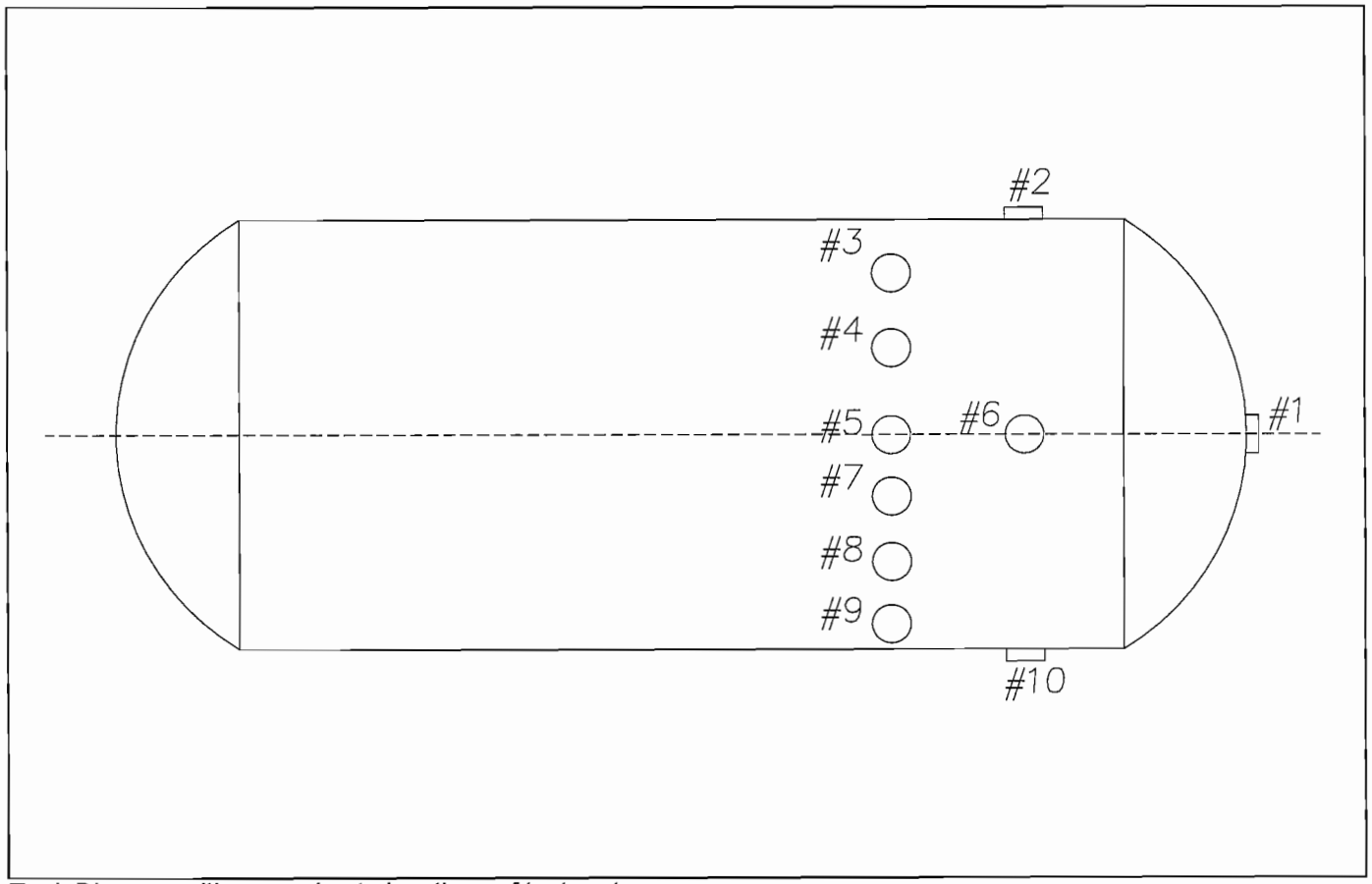
Joseph Paterak (ext. 109)
AST Inspector (STI #AST-RO9117)

Attachments

External Thickness Measurements

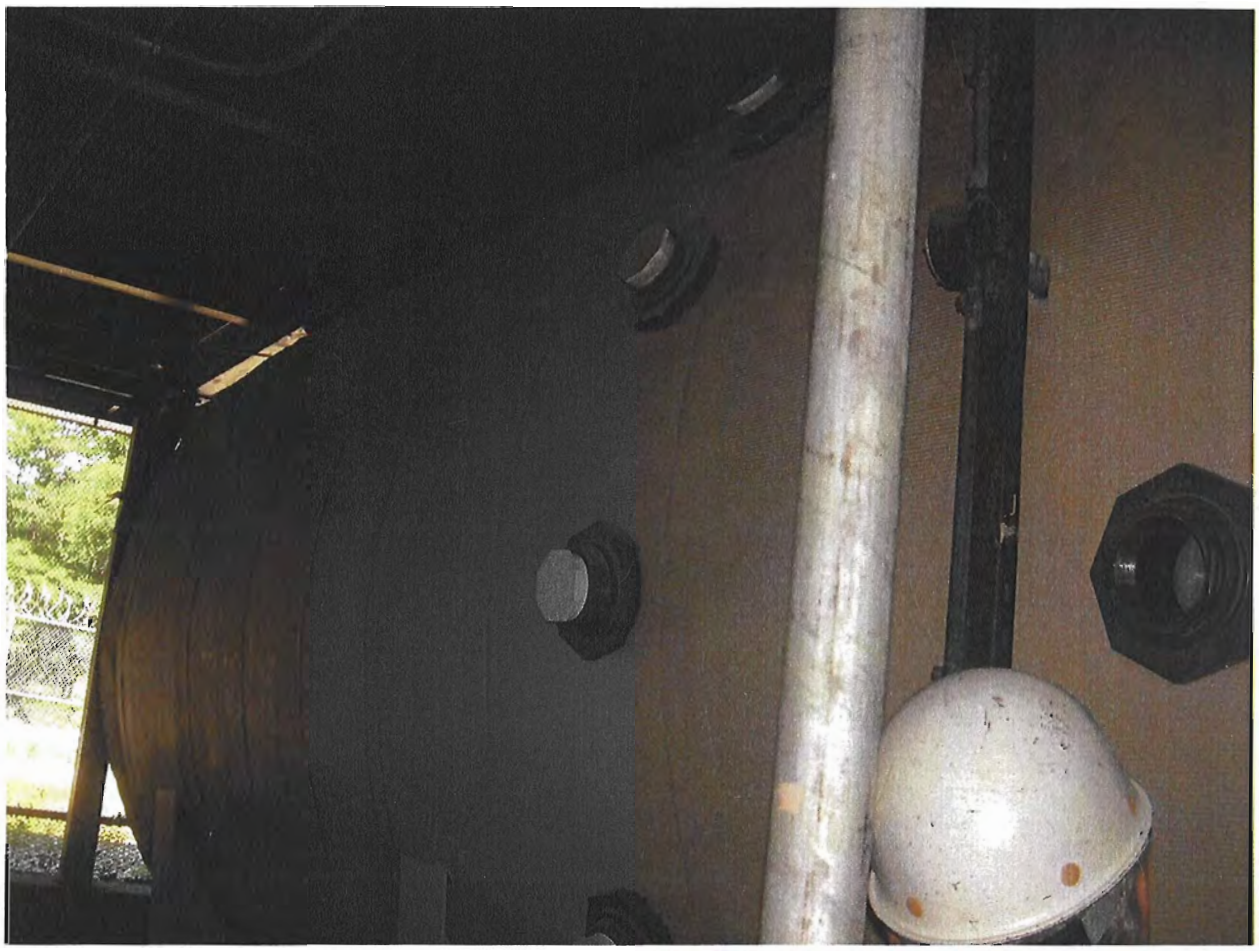
Tank Name: General Solvent #2
Inspector: Joe Paterak
Survey Date: 6/22/2011

External Inspection Readings	
Data Point ID	**Thickness (in.)**
#1	0.265
#2	no access
#3	0.263
#4	0.252
#5	0.289
#6	0.265
#7	0.279
#8	0.254
#9	0.247
#10	0.271



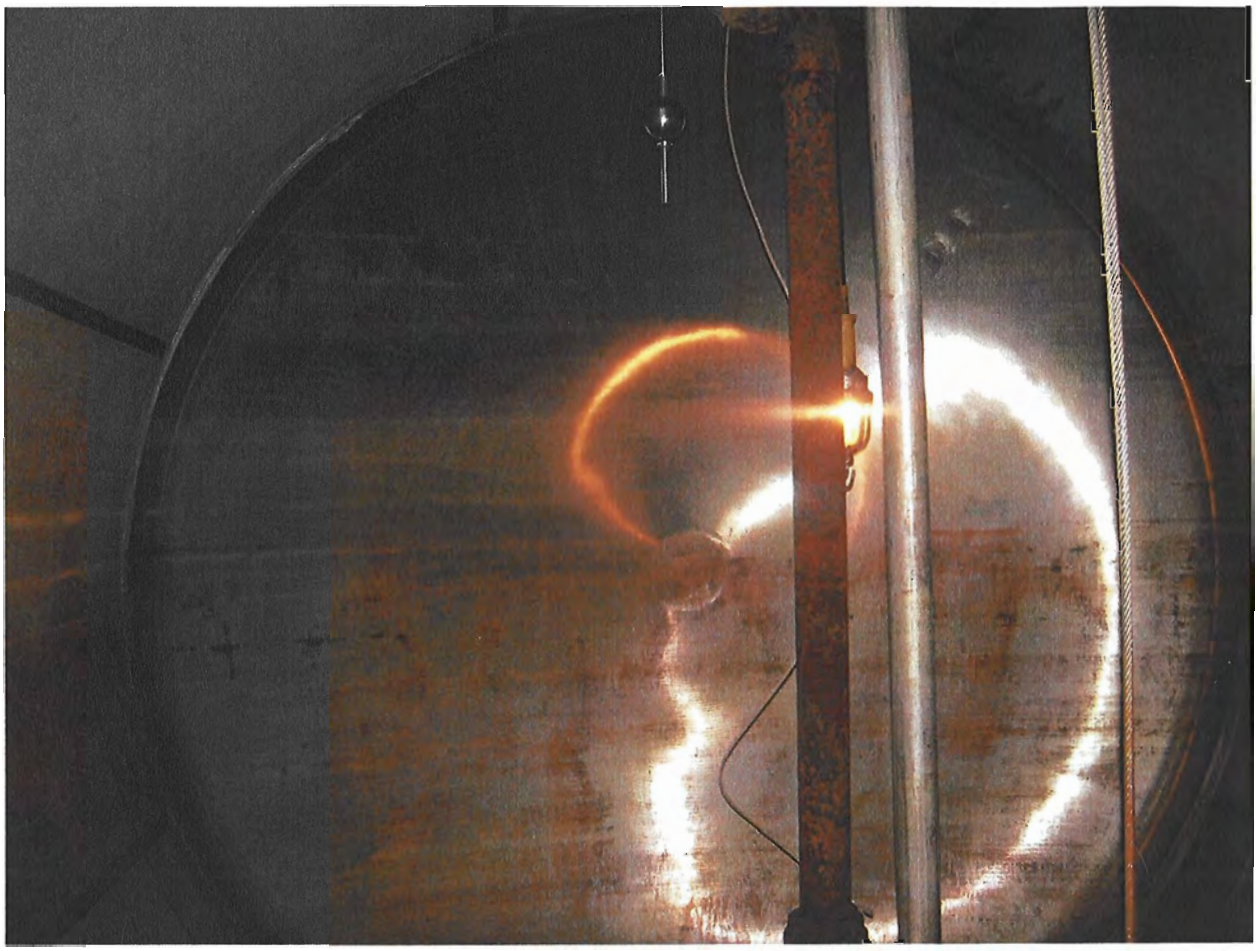
Tank Diagram with approximate locations of test ports.

TANK EXTERIOR

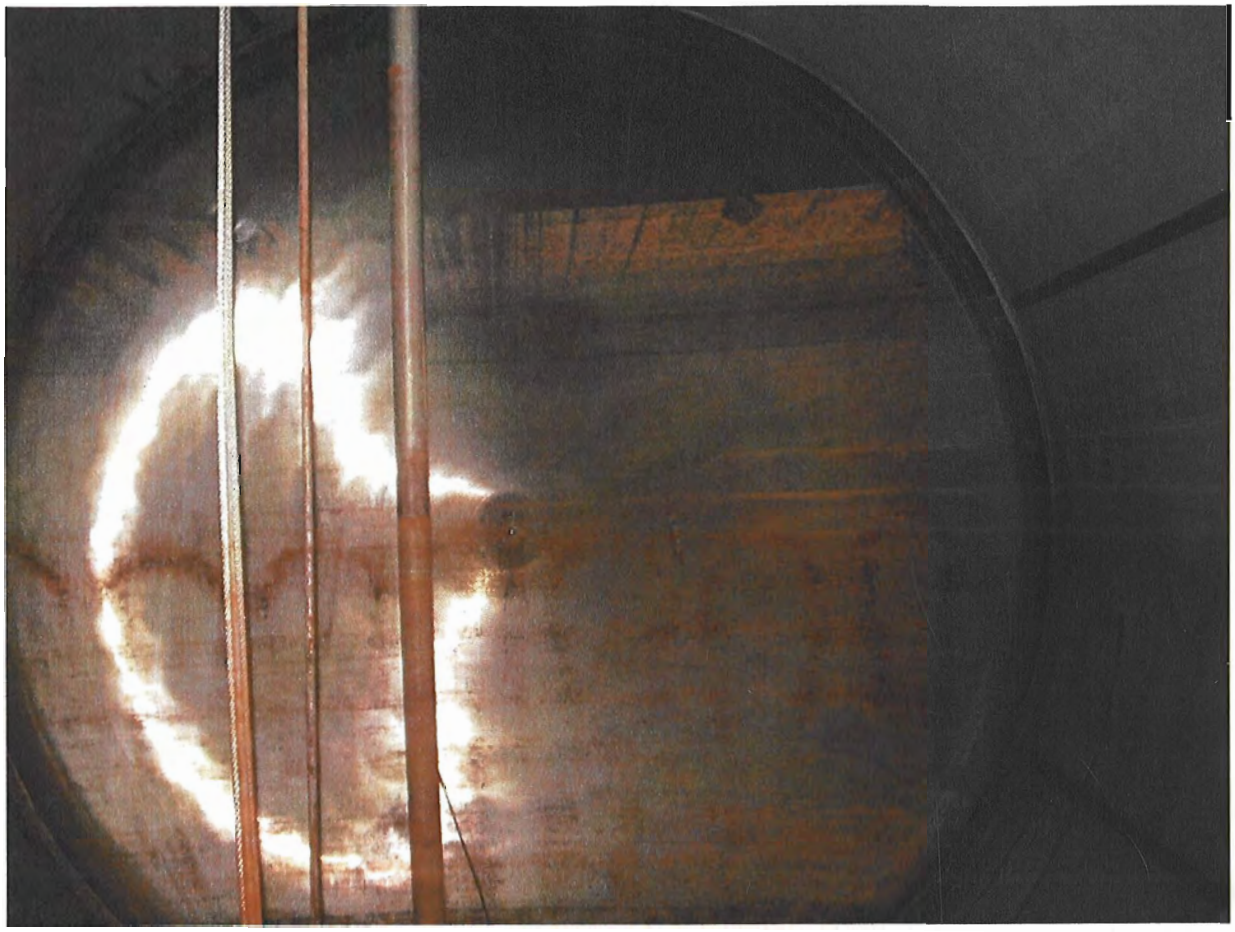


TANK SADDLE (WITH MINOR CORROSION)

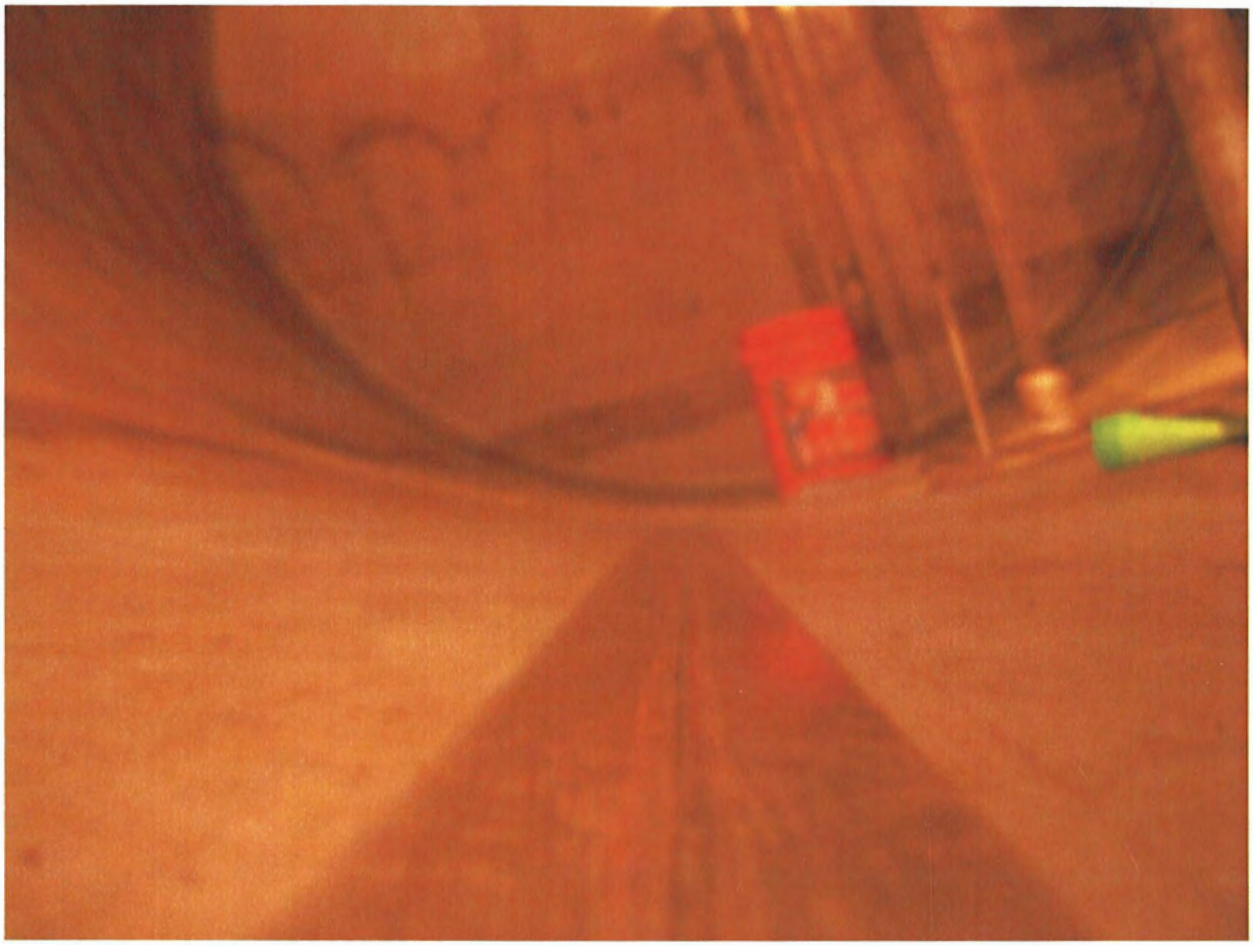
TANK HEAD (INTERIOR)



TANK HEAD (INTERIOR)



TANK BOTTOM (INTERIOR)



TANK TOP (INTERIOR)

Aboveground Storage Tank Inspection Report
General Solvent #3 Waste Tank
Inspection Dates: July 12 and 13, 2011

Knowledge | Commitment | Experience

September 2, 2011

PC Construction
Attn: Lisa Martinez

Re: Inspection of General Solvent #3 Waste Tank

Dear Lisa:

On July 12 and 13, 2011, the above referenced tank was inspected by personnel of Aaron Environmental working as a sub-contractor for Knight Consulting Engineers, Inc. The inspection was routine in nature and not triggered by a specific event such as mechanical damage or leakage. The tank was taken out of service, emptied and cleaned prior to the inspection.

A report prepared by Aaron Environmental dated August 24, 2011, containing their findings and recommendations as a result of this inspection is attached. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations.

Sincerely,

STATE OF VERMONT
MARTIN W. HAIN
No. 5490
REGISTERED
PROFESSIONAL ENGINEER

Martin W. Hain, P.E.
President
Knight Consulting Engineers, Inc.

File: C:\11172\GS3.doc

OUT-OF-SERVICE ABOVEGROUND STORAGE TANK INSPECTION REPORT

KNIGHT CONSULTING ENGINEERS
IBM ESSEX JUNCTION
RIVER STREET, ESSEX JUNCTION, VERMONT

Inspection Dates: July 12 &13, 2011

Prepared for:

Martin Hain, P.E.
Knight Consulting Engineers
51 Knight Lane, Williston, Vermont 05495
Phone: 802-879-6343

Prepared by:

AARON ENVIRONMENTAL

189 Atwater Street
Plantsville, CT 06479
860-276-1201

August 24, 2011

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Ultrasonic Thickness Data

Tank Photographs

Preface

Throughout this document, `Customer' or `Client' refers to Knight Consulting Engineers (KCE) and/or IBM Corporation; and `Consultant', `Engineer' or `AARON' refers to AARON Environmental.

The field observations and research reported herein are considered sufficient in detail and scope to form a reasonable basis for an out-of-service evaluation of the referenced tank(s). The methods used to acquire the information as well as compile and analyze the data are considered current and widely accepted methods in the industry. These methods have been developed to provide the Client with information regarding apparent indications of existing or potential conditions relating to the tank(s) and are limited to the accessibility to the tank(s) and information available at the time of the site visit and inspection. Conclusions listed in this document may have been based in-part on information provided by the current facility owner, their agents and/or third parties (including, but not limited to, state and local authorities); pursuant to this, the accuracy of said information is not guaranteed by AARON.

LIMITATIONS

Notwithstanding anything contained in this report, nothing herein shall be construed as a representation, warranty or guarantee, either expressed or implied, regarding the future structural integrity, life expectancy, or performance of any of the items evaluated. This report and the analysis provided is in all respects subject to and shall be interpreted within the limitations and parameters of the test procedures performed. In the event testing is performed using a sampling procedure, this report and any analysis shall be limited to those areas actually tested and the type of test conducted, and the customer is cautioned not to extrapolate the results of the test samples.

I. INSPECTION PROCEDURES

The aboveground storage tank(s) were inspected following portions of the applicable procedures contained in the Steel Tank Institute (STI) Standard SP001 4th Edition "Standard for Inspection of Aboveground Storage Tanks".

Where applicable, AARON provided the following inspection and testing services on the tank(s):

1. Perform the periodic inspections (monthly and annual) described in the STI Standard.

2. Visually inspect the outside of each tank in detail. At a minimum, the following tank components were inspected (where applicable):

    a. Primary Tank
    b. Secondary Tank
    c. Tank Supports
    d. Tank Anchors
    e. Tank Foundation and external supports
    f. Tank gauges and alarms
    g. Insulation covering
    h. Tank appurtenances
    i. Normal Vents
    j. Emergency Vents
    k. Release Prevention Barriers
    l. Spill Control Systems

3. Visually inspect the interior of each tank in detail. At a minimum, the following areas of concern were addressed (where applicable):
    a. Identify, inspect and record AST internal appurtenances
    b. Inspect for mechanical damage, corrosion, cracking, etc.
    c. Inspect for deteriorating or corroding internal attachments and piping
    d. Visually inspect welds
    e. Ultrasonic thickness measurements
    f. Vacuum box examination of questionable welds

4. Inspect the tank based on its construction, per the following:

    a. Single Wall Tank, Not in Contact with the Ground
        i. Either conduct ultrasonic testing (from the exterior) to determine the shell thickness as described in the STI Standard, or visually examine the interior of the tank as described in the STI Standard.

To obtain the residual metal thickness readings, a Panametrics 36DL Plus datalogging ultrasonic digital thickness gauge with a D790 or D791 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The meter is capable of collecting readings using a scan mode or single point mode. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material. Field data was stored in the unit and downloaded to a computer using Panametrics' WINplus interface software.

This report documents the findings of our inspections. It is intended to provide the tank owner/operator with an assessment of the tank's current condition, recommendations for improvements to maintain the long term integrity of the structure and an opinion of the tank's suitability for continued service.

II. GENERAL SITE AND TANK DESCRIPTION

AARON Environmental (AARON) was asked to conduct an out-of-service inspection of one aboveground waste solvent storage tanks located at IBM Corporation, River Street, Essex Junction, VT. The tanks were inspected on July 12 and 13, 2011. The subject tank is described in the table below.

TANK ID / LOCATION	SIZE (GALLONS)	TANK CONSTRUCTION MATERIAL	MANWAY ACCESS	PRODUCT STORED
GENERAL SOLVENT #3	10,000	SINGLE WALL STAINLESS STEEL WITH CONCRETE/STEEL CONTAINMENT DIKE	YES	WASTE SOLVENT

The subject tanks were identified as shop-fabricated, welded, Stainless steel construction. The age, size, orientation, and appurtenances of the tank are described in further detail in Section III of this report.

Two historical reports by Knight Consulting Engineers addressing prior inspections of the subject tanks were provided to AARON for review. One report dated December 10, 2004 included exterior ultrasonic thickness data for the subject tank, referred to as General Solvent #3.

III. INSPECTION SUMMARY

The following sections provide a summary of the inspection completed for the tank. The visual and ultrasonic thickness (if applicable) summaries are also provided for the tank.

General Solvent #3

This 10,000-gallon tank is a horizontal, cylindrical design with a diameter of 120 inches and an overall length 180 inches (15 feet), and is used to store waste solvent. The tank consists of single wall Stainless steel, welded construction and rests within a covered concrete secondary containment structure. The containment dike is steel lined and has a calculated containment capacity of 23,170 gallons. There was no nameplate observed on the tank; however, the tank is insulated and a nameplate may not be visible. The age of the tank was verified based on Form U-1A installed in 1996 according to the Manufacturers Data Report for Pressure Vessels.

For the purposes of this inspection, the subject tank is considered to be single wall, not in contact with the ground. The tank is equipped with a manway and was inspected both externally and internally.

The tank is equipped with the following fittings and equipment located along the centerline:

24" ID access manway, tight bolted with high-level warning alarm switch
2" tank top flanged fitting inlet/outlet
6" tank top flanged fitting with emergency venting
2" tank top flanged fitting with an inlet for nitrogen
6" tank top flanged fitting with a level indicator
2" tank top flanged fitting with a normal vent
4" tank top flanged fitting
Tank top fitting with pump
24" ID diameter manway

The following details were observed as part of the overall tank inspection. The tank inspection summary is provided following the STI periodic inspection criteria (monthly and annual), formal external inspection criteria, and additional inspection items. The periodic inspection items for this tank are described as follows:

Monthly Inspection Checklist

1. Tank Containment
   1.1. The tank was emptied and cleaned prior to our inspection. No liquid was present on the tank bottom.
   1.2. The containment area was inspected for debris and fire hazards. None were observed.
   1.3. The drain associated with the secondary containment area was clear of debris and appeared to be in working order.
   1.4. Containment egress pathways were inspected. No problems were identified.
2. Leak Detection
   2.1. The tank and containment area were inspected for signs of leakage. No leaks were observed.

3. Tank Attachments and Appurtances
   3.1. The tank stairs and topside access platform were inspected. These structures are secure with no signs of significant corrosion or damage.
   3.2. The tank liquid level gauge was inspected. The tank was empty during our inspection so the proper and accurate operation of the gauge was not verified.
   3.3. Tank openings were inspected to confirm proper sealing. Openings appeared to be properly sealed.
4. Other Conditions
   4.1. No conditions were identified which would be considered unsafe or that would significantly affect the site SPCC Plan.

Annual Inspection Checklist

1. Tank Containment
   1.1. The steel lined concrete secondary containment structure was inspected and found to be in satisfactory condition.
   1.2. The drainage pipe and/or valves associated with the secondary containment structures were inspected and found to be in satisfactory condition.
2. Tank Foundation and Supports
   2.1. No signs of tank settlement or foundation washout were identified.
   2.2. The concrete containment structure is not visible because there is a steel lining over it. The steel lining (i.e., overlay) was observed to be in good condition. Cracking and/or spalling were not identified. There is no ring wall associated with the subject tank.
   2.3. The tank rests on steel support saddles which rest on elevated concrete foundations which are covered with steel plate. Portions of the steel saddles have some limited paint failure. The foundations are in good condition.
   2.4. The area around the concrete containment structure is located under a roof. Drainage is not a concern.
   2.5. The tank stairs and platform are bonded to the steel building structure which is bonded to an earth ground rod. The grounding equipment was observed to be in good condition.
3. Cathodic Protection System
   3.1. There is no cathodic protection system associated with the subject tank. There is no buried steel associated with the tank or piping.
4. Tank External Coating
   4.1. The S.S. tank had no paint. The entire tank shell is covered with insulation. Some paint failure was observed on the steel support saddles.
5. Tank Shells/Heads
   5.1. Evidence of shell/head distortions, buckling, denting or bulging was not observed.
   5.2. Evidence of shell/head corrosion was not observed.
6. Tank Manways, Piping and Equipment within Secondary Containment
   6.1. The tank manhole and bolts were observed in good condition with no significant signs of wear or corrosion.
   6.2. The piping and equipment associated with the subject tank and located within the secondary containment was inspected and found to be in good condition.
7. Tank Roof
   7.1. Not applicable, the tank is a horizontal cylindrical design.
8. Venting
   8.1. The normal vents are in good condition and free from obstructions.
   8.2. The tank has emergency venting which appeared to be in good condition and working properly.
9. Insulated Tanks
   9.1. The tank shell is insulated. No missing insulation was identified.
   9.2. Areas of moisture associated with the insulation were not identified.
   9.3. No mold was observed.
   9.4. No damage to the insulation was observed.
   9.5. The tank is located under a roof; therefore, the insulating material is protected from precipitation.

10. Level and Overfill Prevention Instrumentation of Shop Fabricated Tanks
    10.1. The tank level sensing device was inspected, found to be in good condition but not tested for proper operation.
    10.2. The overfill prevention device includes an electronic high level warning alarm. This device is in good condition but was not tested for proper operation.
11. Electrical Equipment
    11.1. The tank grounding cable and/or connections were inspected and found to be in good condition. There were some electrical conduits that were not sealed and would not meet NFPA 30 flammable and combustible liquid codes.
    11.2. Heat trace tape is located on the exterior of the tank under the insulation layer. This was not visible and was not inspected. Other electrical wiring associated with the tank equipment is in good condition.

Formal External Inspection

1. General
    1.1. A formal external inspection was performed by an STI certified inspector.
    1.2. The subject aboveground storage tank (AST) is single wall stainless steel, horizontal, cylindrical design. The tank is 120 inches in diameter, 15 feet long with a nominal capacity of 10,000 gallons and is used to store waste solvent. The tank was reportedly installed in 1996.
    1.3. According to facility personnel, the subject tank has been evaluated for integrity in the past. Refer to the historical reports from Knight Consulting Engineers.
    1.4. There was no nameplate observed on the tank; however, according to available information the tank was built by Stainless Fabrication Inc. Springfield, MO, fabricated the tank in 1996.
    1.5. The fabrication of the AST was inspected using UL 142 as a baseline.
    1.6. The AST foundations were inspected for indications of settlement, cracking, exposed rebar, and general disrepair. No evidence of the above conditions was observed.
    1.7. The AST supports were inspected for indications of cracking, spalling, and general disrepair. The supports include three steel saddles which are not bolted to the concrete foundation. The supports have some isolated paint failure.
    1.8. The subject tank is located within a concrete secondary containment structure which is lined with plate steel. An electronic high level warning alarm is located in the tank. The containment area associated with the tank was inspected and found to be in good condition.
        1.8.1. No breaches or damage were identified with the containment structure.
        1.8.2. There were no foreign materials or liquid located within the containment structure.
        1.8.3. There is a drainage system associated with the containment structure. There were no penetrations observed which would lead to failure of the secondary containment.
    1.9. Ancillary equipment was inspected for condition and operability.
        1.9.1. Piping and piping connections were inspected for visible signs of stress or leakage such as severe corrosion, rusted bolted connections, or other severe degradation. Piping and piping connections were observed to be in good condition.
        1.9.2. The tank has a 2" diameter normal vent which terminates just above the building roof top and was observed to be in good condition. The tank has a 6" diameter

emergency vent and was observed to be in good condition.

1.9.3. The tank level systems were out-of-service during our inspection and were not tested for operation.

1.10. The tank system is grounded. The ground systems were observed to be in good condition.

1.11. The stairs and topside platform were inspected and found to be in good condition with no indications of significant corrosion or damage.

1.12. The tank has beige topcoat paint. The majority of the tank shells and heads are covered with insulation and are not visible for inspection. The steel supports have minor paint failure.

2. Original Shell Thickness of the AST
   - 2.1. Original tank documentation was provided for review.
   - 2.2. The tank manufacturer was Stainless Fabrication Inc.
   - 2.3. The tank was manufactured to the ASME Pressure Vessel Code.
   - 2.4. According to the manufacturer's data, the original shell thickness was ¼ inches (0.25 inches). The original head thickness was 1/4 inches (0.250 inches).
   - 2.5. The tank was rated for a maximum working pressure of 20 psi at a maximum temperature of 140 degrees F.
3. Horizontal ASTs
   - 3.1. Shell plates, welds and ancillary equipment were inspected for indications of exterior corrosion, bucking, distortion of stress, cracking, pinholes and mechanical damage.
     - 3.1.1. The insulating material and jacketing was not removed. With the exception of several four-inch diameter access ports, the exterior surfaces of the tank shell were not inspected.
   - 3.2. The tank shell was inspected for indications of changes that may have been made to the AST after it was fabricated. No evidence of changes to the original tanks was identified; however, the tank heads and shell surfaces could not be visually inspected due to the presence of insulation.

<u>Formal Internal Inspection</u>

1. General
   - 1.1. A formal internal inspection was performed by an STI certified inspector.
   - 1.1. The tank was cleaned by the owner prior to our inspection.
2. Horizontal AST Internal Inspection
   - 2.1. Internal appurtenances were documented and visually inspected. Stainless steel appurtenances were in good condition. No mechanical damage, cracking or other concerns were identified.
   - 2.2. Welds were visually inspected. No problems were identified.
   - 2.3. Ultrasonic Thickness Scanning (UTS) was performed on the interior surfaces of the tank heads. Data collected ranged from 0.214 to 0.224 inches.
     - 2.3.1. The entire interior shell had no scale. Data collected ranged from 0.232 to 0.266 inches.
     - 2.3.2. No pitting was identified.
   - 2.4. The fabrication of the AST was inspected using UL 142 as a baseline.

Suitability for Continued Service

Based on the STI criteria and result of the current inspection, the subject tank is suitable for continued service. The interval until the next certified inspection is 10 years. Federal, state and/or local regulations may require more frequent inspections of the subject AST.

Recordkeeping

1. AST records should be retained for the life of the AST system.
2. Monthly Inspection Checklists should be completed by the owner/operator and retained for a minimum of 36 months.
3. Annual Inspection Checklists should be completed by the owner/operator and retained for a minimum of 3 years.
4. Certified Inspection Reports should be retained for the life of the AST system.

IV. ULTRASONIC THICKNESS MEASUREMENTS SUMMARY

To obtain the residual metal thickness readings, a Panametrics 36DL Plus datalogging ultrasonic digital thickness gauge with a D790 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material.

Refer to the attachment of this report for a tank sketch and UT thickness measurements.

V. REQUIREMENTS FOR CONTINUED SERVICE

The following items are based on the requirements of SP-001 and UL 142. These documents are industry standards. Additional regulatory requirements may apply to the subject AST.

General Solvent #3 (1) 10,000-gallon tank

1. Based on the STI Standard (SP-001), the interval until the next certified inspection is not to exceed 10 years. If the facility uses an alternate Standard or chooses to provide "equivalent environmental protection" in lieu of routine integrity testing, the method and schedule for such should be included in the facility's SPCC Plan.

If the facility's SPCC Plan requires the use of routine "integrity testing" using the STI procedure SP-001, then the following routine inspections should be completed as described by the owner/operator. Specific inspection items may be modified for tank specific use as necessary; however, deviations from or alterations of the STI Standard should be discussed in the facility SPCC Plan.

Shop Fabricated Steel Tanks

The Steel Tank Institute (STI) Standard for Inspection requires the owner or operator of an aboveground tank to perform and document periodic inspections. Refer to the attached checklists. These documents should be completed by the owner or operator on a monthly and annual basis. All records should be maintained.

VI. RECOMMENDATIONS

The following recommendations are based on good engineering practices and industry standards; however, they are not specific regulatory requirements or requirements for continued service.

General Solvent #3 (1) 10,000-gallon tank

1. There was some isolated paint failure located on the tank saddles.
   a. The saddles should be prepped and repainted.
   b. The electrical conduits should be sealed.

PROFESSIONAL OPINION

The subject above ground storage tank(s) at the IBM Essex Junction facility, Essex Junction, VT have been inspected using procedures found in STI SP001 4th edition publication "Standard for the Inspection of Aboveground Storage Tanks".

It is the professional opinion of this firm that the structural integrity of the subject stailess steel tank is acceptable. Unless a different interval is indicated in this report, a certified inspection should be completed within 10 years of the date of this inspection, no later than July 2021.

This is not to be construed as an expressed or implied warranty of future performance.

Should you have any questions or comments concerning this inspection report, please do not hesitate to contact the undersigned at 860-276-1201.

Sincerely,

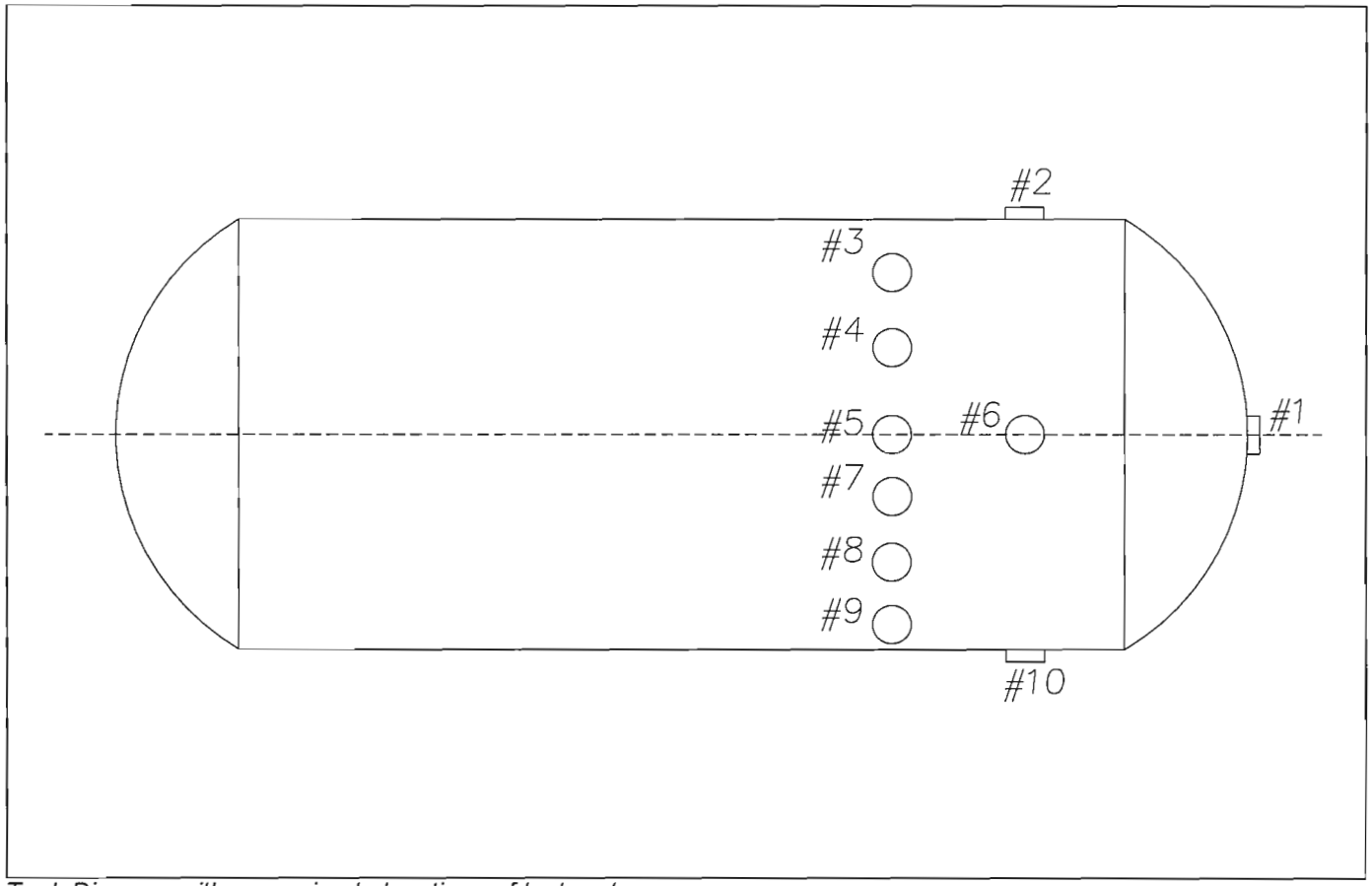
Joseph Paterak (ext. 109)
AST Inspector (STI #AST-RO9117)

Attachments

External Thickness Measurements

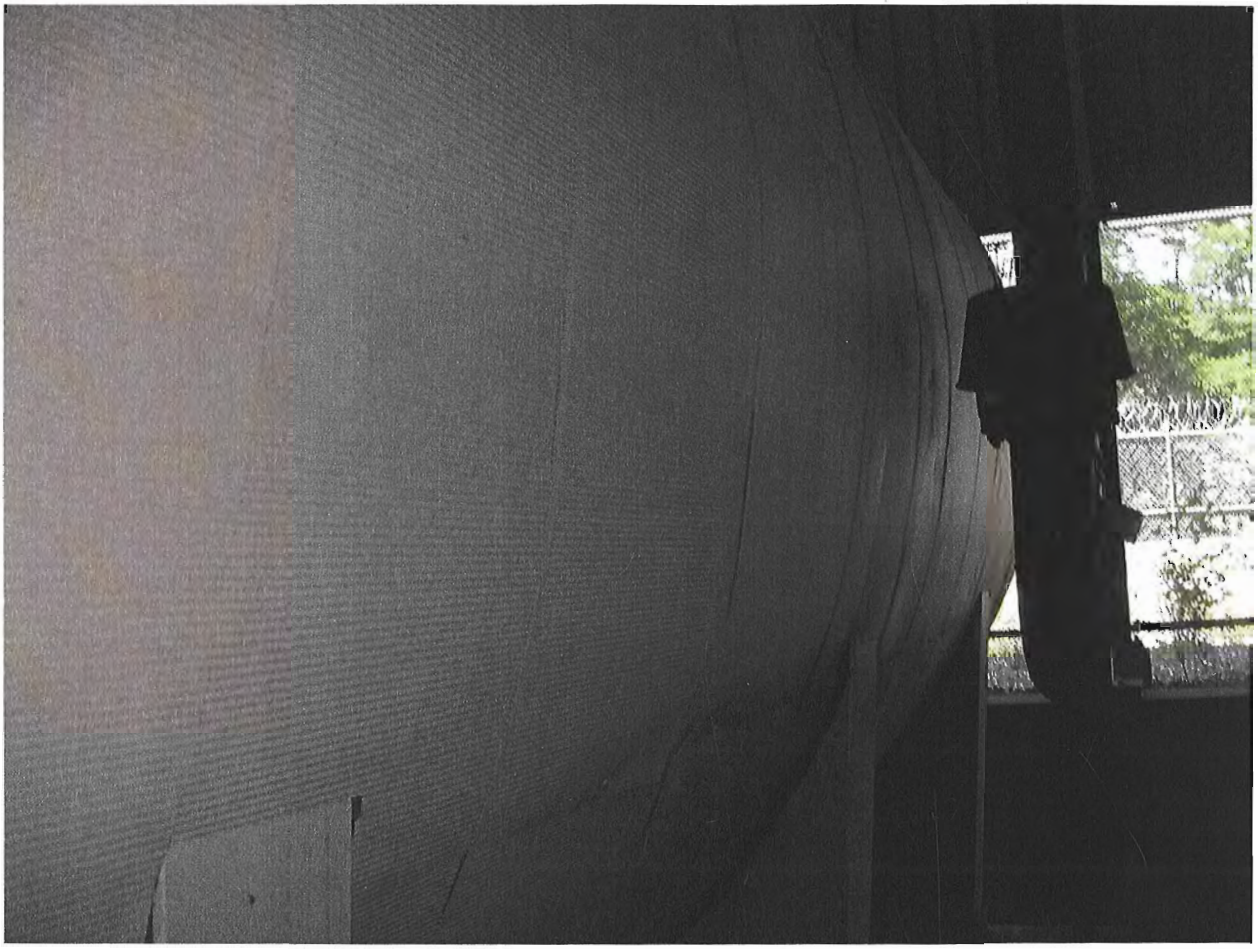
Tank Name: General Solvent #3 **Survey Date:** 7/12/2011
Inspector: Joe Paterak

External Inspection Readings	
Data Point ID	**Thickness (in.)**
#1	0.240
#2	no access
#3	0.253
#4	0.259
#5	0.257
#6	0.254
#7	0.253
#8	0.254
#9	0.254
#10	0.256



Tank Diagram with approximate locations of test ports.

TANK EXTERIOR

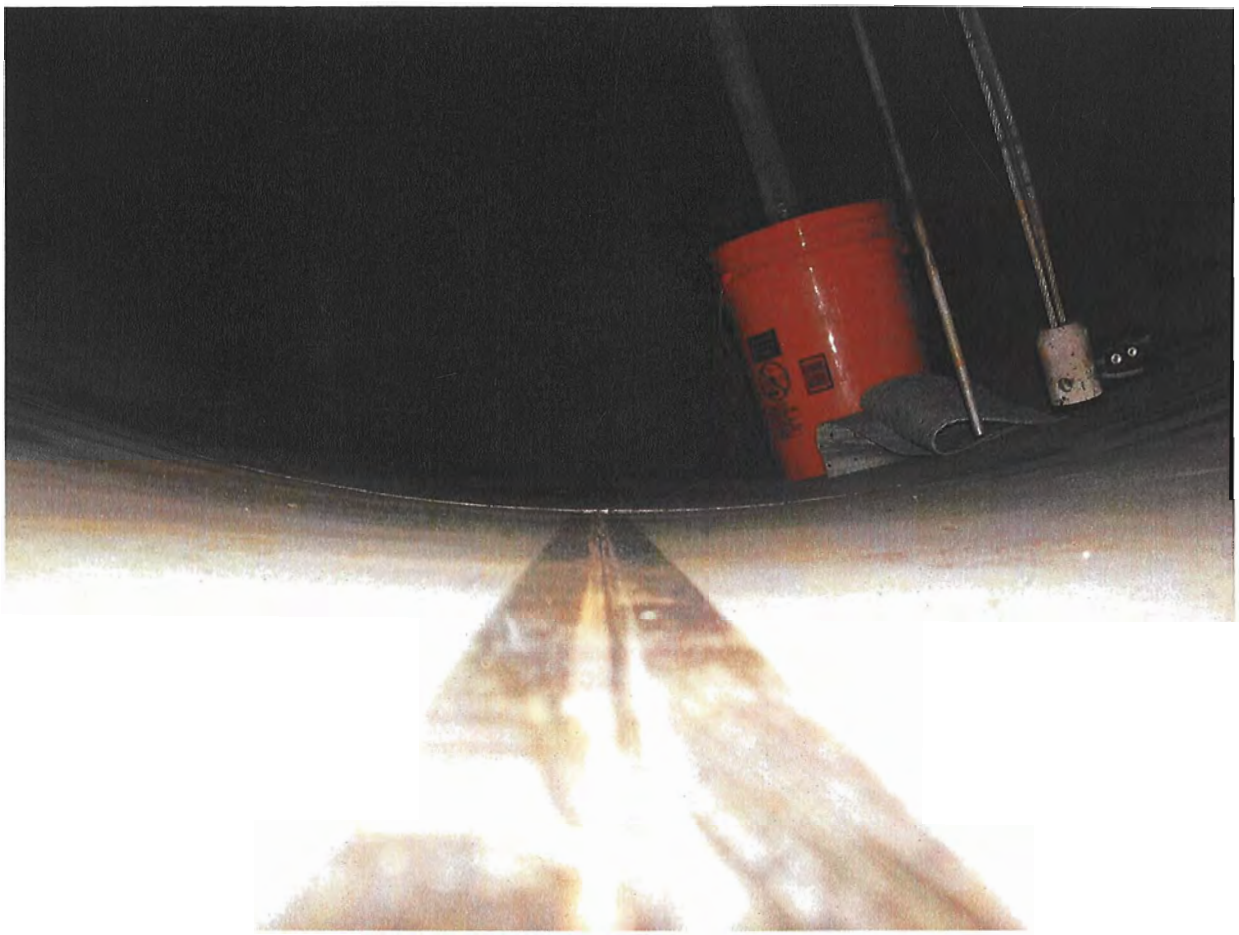


TANK SADDLE (WITH MINOR CORROSION)

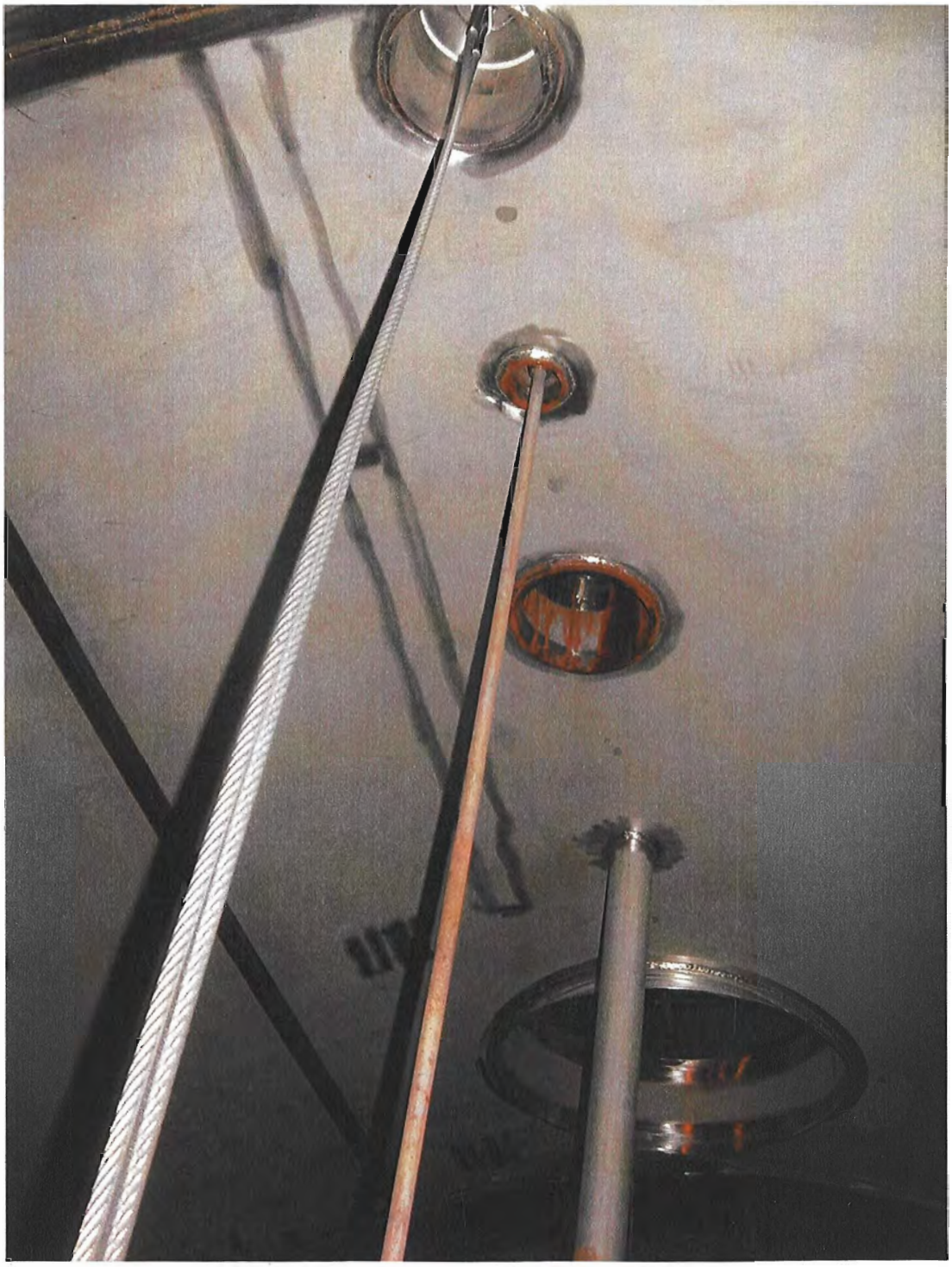
TANK HEAD (INTERIOR)

TANK HEAD (INTERIOR)

TANK BOTTOM (INTERIOR)



TANK TOP (INTERIOR)



Aboveground Storage Tank Inspection Report
Waste Deep DUV #1/Tank Farm
Inspection Date: July 13, 2010

OUT-OF-SERVICE ABOVEGROUND STORAGE TANK INSPECTION REPORT

KNIGHT CONSULTING ENGINEERS
IBM ESSEX JUNCTION
RIVER ROAD, ESSEX JUNCTION, VERMONT
Inspection Dates: July 13, 2010

Prepared for:

Lisa Martinez
Pizzagalli Construction
72 Remo Drive
South Burlington, VT 05403
Phone: 802-769-6108

Prepared by:

AARON ENVIRONMENTAL

189 Atwater Street
Plantsville, CT 06479
860-276-1201

July 21, 2010

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ATTACHMENTS

Tank Photographs

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LIMITATIONS

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    k. Release Prevention Barriers
    l. Spill Control Systems

3. Visually inspect the interior of the tank in detail. At a minimum, the following areas of concern were addressed (where applicable):
    a. Identify, inspect and record AST internal appurtenances
    b. Inspect for mechanical damage, corrosion, cracking, etc.
    c. Inspect for deteriorating or corroding internal attachments and piping
    d. Visually inspect welds
    e. Ultrasonic thickness measurements
    f. Vacuum box examination of questionable welds

4. Inspect the tank based on its construction, per the following:

    a. Single Wall Tank, Not in Contact with the Ground
        i. Either conduct ultrasonic testing (from the exterior) to determine the shell thickness as described in the STI Standard, or visually examine the interior of the tank as described in the STI Standard.

This report documents the findings of our inspections. It is intended to provide the tank owner/operator with an assessment of the tank's current condition, recommendations for improvements to maintain the long term integrity of the structure and an opinion of the tank's suitability for continued service.

II. GENERAL SITE AND TANK DESCRIPTION

AARON Environmental (AARON) was asked to conduct an out-of-service inspection of one aboveground waste solvent storage tank located at IBM Corporation, River Road, Essex Junction, VT. The tanks were inspected on July 13, 2010. The subject tank is described in the table below.

TANK ID / LOCATION	SIZE (GALLONS)	TANK CONSTRUCTION MATERIAL	MANWAY ACCESS	PRODUCT STORED
WASTE DEEP DUV #1 / TANK FARM	10,000	SINGLE WALL STEEL/FRP LINED WITH CONCRETE/ STEEL CONTAINMENT DIKE	YES	WASTE SOLVENT

The subject tank was identified as shop-fabricated, welded, carbon steel construction. The age, size, orientation, and appurtenances of the tank are described in further detail in Section III of this report.

III. INSPECTION SUMMARY

The following sections provide a summary of the inspection completed for the tank. The visual and ultrasonic thickness (if applicable) summaries are also provided for the tank.

Waste Deep DUV Resist #1

This 10,000-gallon tank is a horizontal, cylindrical design with a diameter of 120 inches and an overall length 180 inches (15 feet), and is used to store waste solvent. The tank consists of single wall carbon steel, welded construction with an FRP liner and rests within a covered concrete secondary containment structure. The containment dike is steel lined and has a calculated containment capacity of 23,170 gallons. There was no nameplate observed on the tank; however, the tank is insulated and a nameplate may not be visible. The age of the tank could not be verified based on field data but was reportedly installed in 1980 when the Chemical Distribution facility was built.

For the purposes of this inspection, the subject tank is considered to be single wall, not in

contact with the ground. The tank is equipped with a manway and was inspected both externally and internally.

The tank is equipped with the following fittings and equipment located along the centerline:

24" ID access manway, tight bolted with high-level warning alarm switch
2" tank top flanged fitting inlet/outlet
6" tank top flanged fitting with emergency venting
2" tank top flanged fitting with an inlet for nitrogen
6" tank top flanged fitting with a level indicator
2" tank top flanged fitting with a normal vent
4" tank top flanged fitting
Tank top fitting with pump
24" ID diameter manway

The following details were observed as part of the overall tank inspection. The tank inspection summary is provided following the STI periodic inspection criteria (monthly and annual), formal external inspection criteria, and additional inspection items. The periodic inspection items for this tank are described as follows:

Monthly Inspection Checklist

1. Tank Containment
   1.1. The tank was emptied and cleaned prior to our inspection. No liquid was present on the tank bottom.
   1.2. The containment area was inspected for debris and fire hazards. None were observed.
   1.3. The drain associated with the secondary containment area was clear of debris and appeared to be in working order.
   1.4. Containment egress pathways were inspected. No problems were identified.
2. Leak Detection
   2.1. The tank and containment area were inspected for signs of leakage. No leaks were observed.
3. Tank Attachments and Appurtances
   3.1. The tank stairs and topside access platform were inspected. These structures are secure with no signs of significant corrosion or damage.
   3.2. The tank liquid level gauge was inspected. The tank was empty during our inspection so the proper and accurate operation of the gauge was not verified.
   3.3. Tank openings were inspected to confirm proper sealing. Openings appeared to be properly sealed.
4. Other Conditions
   4.1. No conditions were identified which would be considered unsafe or that would significantly affect the site SPCC Plan.

Annual Inspection Checklist

1. Tank Containment
   1.1. The steel lined concrete secondary containment structure was inspected and found to be in satisfactory condition.

1.2. The drainage pipe and/or valves associated with the secondary containment structures were inspected and found to be in satisfactory condition.

2. Tank Foundation and Supports
   2.1. No signs of tank settlement or foundation washout were identified.
   2.2. The concrete containment structure is not visible because there is a steel lining over it. The steel lining (i.e., overlay) was observed to be in good condition. Cracking and/or spalling were not identified. There is no ring wall associated with the subject tank.
   2.3. The tank rests on steel support saddles, which rest on elevated concrete foundations, which are covered, with steel plate. Portions of the steel saddles have some limited paint failure. The foundations are in good condition.
   2.4. The area around the concrete containment structure is located under a roof. Drainage is not a concern.
   2.5. The tank stairs and platform are bonded to the steel building structure that is bonded to an earth ground rod. The grounding equipment was observed to be in good condition.
3. Cathodic Protection System
   3.1. There is no cathodic protection system associated with the subject tank. There is no buried steel associated with the tank or piping.
4. Tank External Coating
   4.1. The tank has beige topcoat paint. The entire tank shell is covered with insulation; therefore routine inspection of the painted surfaces is not possible.
5. Tank Shells/Heads
   5.1. Evidence of shell/head distortions, buckling, denting or bulging was not observed.
   5.2. Evidence of shell/head corrosion was not observed.
6. Tank Manways, Piping and Equipment within Secondary Containment
   6.1. The tank manhole and bolts were observed in good condition with no significant signs of wear or corrosion.
   6.2. The piping and equipment associated with the subject tank and located within the secondary containment was inspected and found to be in good condition.
7. Tank Roof
   7.1. Not applicable, the tank is a horizontal cylindrical design.
8. Venting
   8.1. The normal vents are in good condition and free from obstructions.
   8.2. The tank has emergency venting that appeared to be in good condition and working properly.
9. Insulated Tanks
   9.1. The tank shell is insulated. No missing insulation was identified.
   9.2. Areas of moisture associated with the insulation were not identified.
   9.3. No mold was observed.
   9.4. No damage to the insulation was observed.
   9.5. The tank is located under a roof; therefore, the insulating material is protected from precipitation.
10. Level and Overfill Prevention Instrumentation of Shop Fabricated Tanks
    10.1. The tank level sensing device was inspected, found to be in good condition but not tested for proper operation.
    10.2. The overfill prevention device includes an electronic high level warning alarm. This device is in good condition but was not tested for proper operation.
11. Electrical Equipment
    11.1. The tank grounding cable and/or connections were inspected and found to be in good

condition.

11.2. Heat trace tape is located on the exterior of the tank under the insulation layer. This was not visible and was not inspected. Other electrical wiring associated with the tank equipment is in good condition.

Formal External Inspection

1. General
   1.1. A formal external inspection was performed by an STI certified inspector.
   1.2. The subject aboveground storage tank (AST) is single wall carbon, horizontal, cylindrical design. The tank is 120 inches in diameter, 15 feet long with a nominal capacity of 10,000 gallons and is used to store waste solvent. The tank was reportedly installed in 1980.
   1.3. According to facility personnel, the subject tank has been evaluated for integrity in the past. Refer to the historical reports from Knight Consulting Engineers.
   1.4. There was no nameplate observed on the tank; however, according to available information Eastern Tank Fabricators of Wallington, New Jersey, fabricated the tank in 1981.
   1.5. The fabrication of the AST was inspected using UL 142 as a baseline.
   1.6. The AST foundations were inspected for indications of settlement, cracking, exposed rebar, and general disrepair. No evidence of the above conditions was observed.
   1.7. The AST supports were inspected for indications of cracking, spalling, and general disrepair. The supports include three steel saddles that are not bolted to the concrete foundation. The supports have some isolated paint failure.
   1.8. The subject tank is located within a concrete secondary containment structure that is lined with plate steel. An electronic high-level warning alarm is located in the tank. The containment area associated with the tank was inspected and found to be in good condition.
      1.8.1. No breaches or damage were identified with the containment structure.
      1.8.2. There were no foreign materials or liquid located within the containment structure. One other AST, of the same size is located within a common containment area.
      1.8.3. There is a drainage system associated with the containment structure. There were no penetrations observed which would lead to failure of the secondary containment.
   1.9. Ancillary equipment was inspected for condition and operability.
      1.9.1. Piping and piping connections were inspected for visible signs of stress or leakage such as severe corrosion, rusted bolted connections, or other severe degradation. Piping and piping connections were observed to be in good condition.
      1.9.2. The tank has a 2" diameter normal vent that terminates just above the building rooftop and was observed to be in good condition. The tank has a 6" diameter emergency vent. The roof top weighted vent cap was checked for free operation, and was free of obstruction.
      1.9.3. The tank level systems were out-of-service during our inspection and were not tested for operation.
   1.10. The tank system is grounded. The ground systems were observed to be in good

condition.

1.11. The stairs and topside platform were inspected and found to be in good condition with no indications of significant corrosion or damage.

1.12. The tank has beige topcoat paint. The majority of the tank shells and heads are covered with insulation and are not visible for inspection. The steel supports have minor paint failure.

2. Original Shell Thickness of the AST
   2.1. The tank manufacturer was Eastern Tank Fabricators of Wallington, NJ.
   2.2. The tank was manufactured to the ASME Pressure Vessel Code.
   2.3. According to the manufacturer's data, the original shell thickness was ¼ inches (0.25 inches). The original head thickness was ¼ inches (0.25 inches).
   2.4. The tank was rated for a maximum working pressure of 20 psi at a maximum temperature of 100 degrees F.
3. Horizontal ASTs
   3.1. Shell plates, welds and ancillary equipment were inspected for indications of exterior corrosion, bucking, distortion of stress, cracking, pinholes and mechanical damage.
      3.1.1. The insulating material and jacketing was not removed. With the exception of several four-inch diameter access ports, the exterior surfaces of the tank shell were not inspected.
   3.2. The tank shell was inspected for indications of changes that may have been made to the AST after it was fabricated. No evidence of changes to the original tanks was identified; however, the tank heads and shell surfaces could not be visually inspected due to the presence of insulation.

Formal Internal Inspection

1. General
   1.1. A formal internal inspection was performed by an STI certified inspector.
   1.2. The tank was cleaned by the owner prior to repairs and inspection.
   1.3. A preliminary inspection was performed after sand blasting was completed. The sand blasting was performed in preparation to the following repairs.
   1.4. Cobosil filler was used to fill pitting on the tank interior.
   1.5. Atprime2 was used was applied as a secondary bonding primer.
   1.6. Hetron 800 was applied and 2 layers of fiberglass mat with an overall thickness of 125>mills were applied.
   1.7. A top coat of Hetron corrosion barrier was applied.
2. Horizontal AST Internal Inspection
   2.1. Internal appurtenances were documented and visually inspected, No mechanical damage, cracking or other concerns were identified.
   2.2. Welds were visually inspected. Prior to lining. No problems were identified.
   2.3. The fabrication of the AST was inspected using UL 142 as a baseline.

Suitability for Continued Service

Based on the STI criteria and result of the current inspection, the subject tank is suitable for continued service.

Recordkeeping

1. AST records should be retained for the life of the AST system.
2. Monthly Inspection Checklists should be completed by the owner/operator and retained for a minimum of 36 months.
3. Annual Inspection Checklists should be completed by the owner/operator and retained for a minimum of 3 years.
4. Certified Inspection Reports should be retained for the life of the AST system.

IIII. REQUIREMENTS FOR CONTINUED SERVICE

The following items are based on the requirements of SP-001 and UL 142. These documents are industry standards. Additional regulatory requirements may apply to the subject AST.

Tank Waste Deep DUV #1– (1) 10,000-gallon tank

If the facility's SPCC Plan requires the use of routine "integrity testing" using the STI procedure SP-001, then the following routine inspections should be completed as described by the owner/operator. Specific inspection items may be modified for tank specific use as necessary; however, deviations from or alterations of the STI Standard should be discussed in the facility SPCC Plan.

Shop Fabricated Steel Tanks

The Steel Tank Institute (STI) Standard for Inspection requires the owner or operator of an aboveground tank to perform and document periodic inspections. Refer to the attached checklists. These documents should be completed by the owner or operator on a monthly and annual basis. All records should be maintained.

V. RECOMMENDATIONS

The following recommendations are based on good engineering practices and industry standards; however, they are not specific regulatory requirements or requirements for continued service.

All tanks should be clearly labeled with the product stored, capacity of the tank and an NFPA hazard label, as a minimum. Piping should be labeled with the product and flow direction.

PROFESSIONAL OPINION

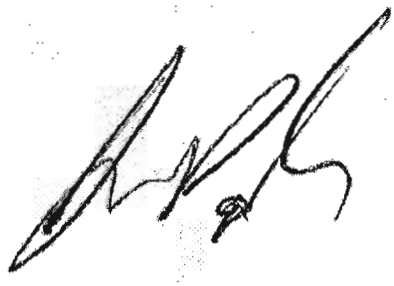
The subject above ground storage tank(s) at the IBM Essex Junction facility, Essex Junction, VT have been inspected using procedures found in STI SP001-05 publication "Standard for the Inspection of Aboveground Storage Tanks".

It is the professional opinion of this firm that the structural integrity of the subject steel tank(s) is acceptable. Unless a different interval is indicated in this report, a certified inspection should be completed within 10 years of the date of this inspection, no later than July 2020.

This is not to be construed as an expressed or implied warranty of future performance.

Should you have any questions or comments concerning this inspection report, please do not hesitate to contact the undersigned at 860-276-1201.

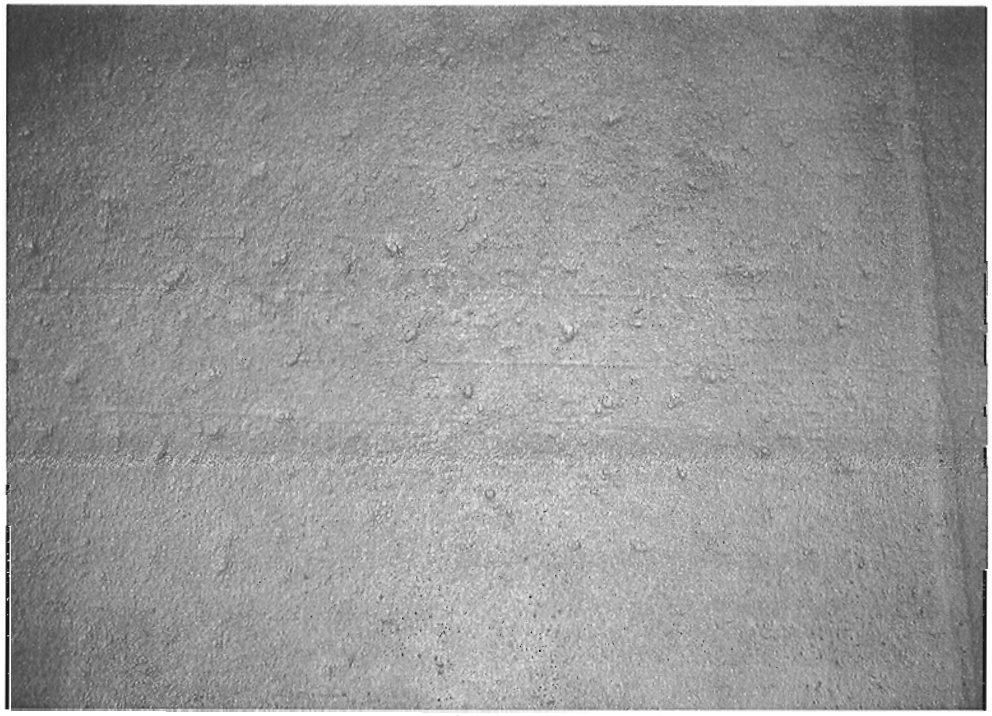
Sincerely,



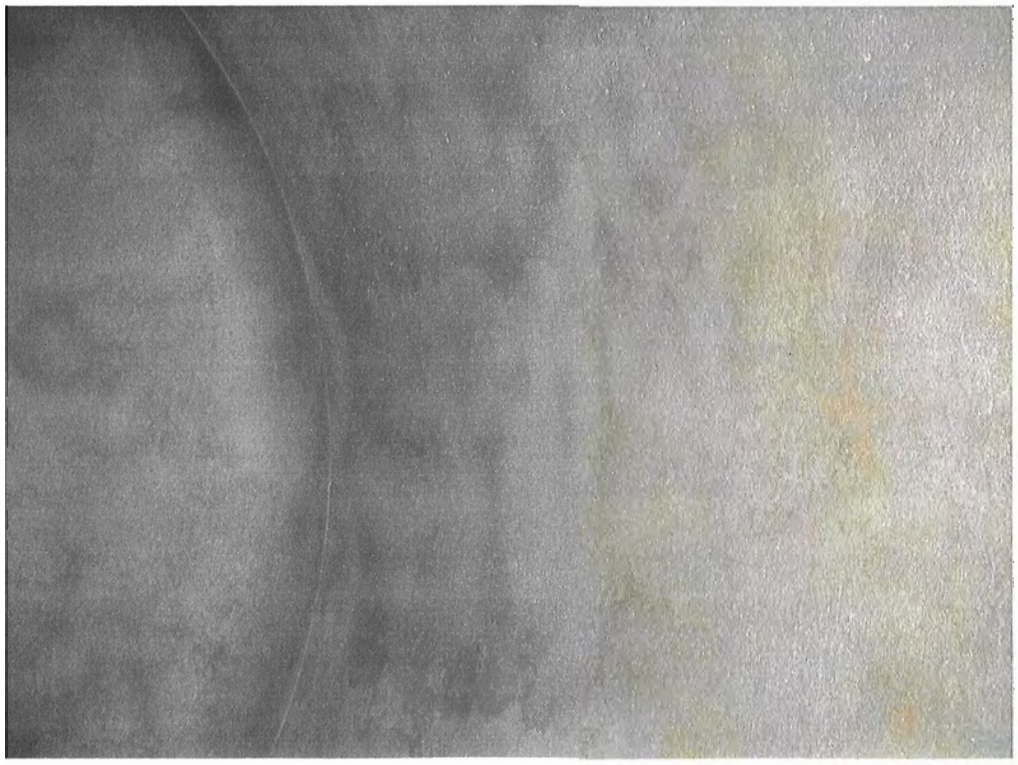
Joseph Paterak (ext. 109)
AST Inspector (STI #AST-RO9117)

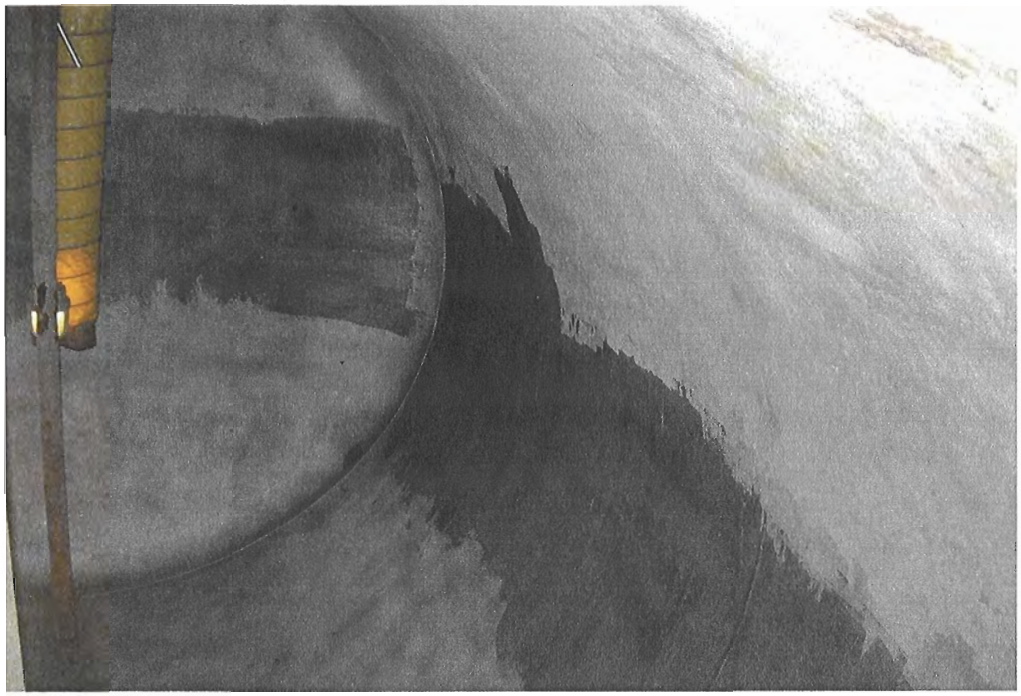
Attachments

DUV #1 after IBM cleaning

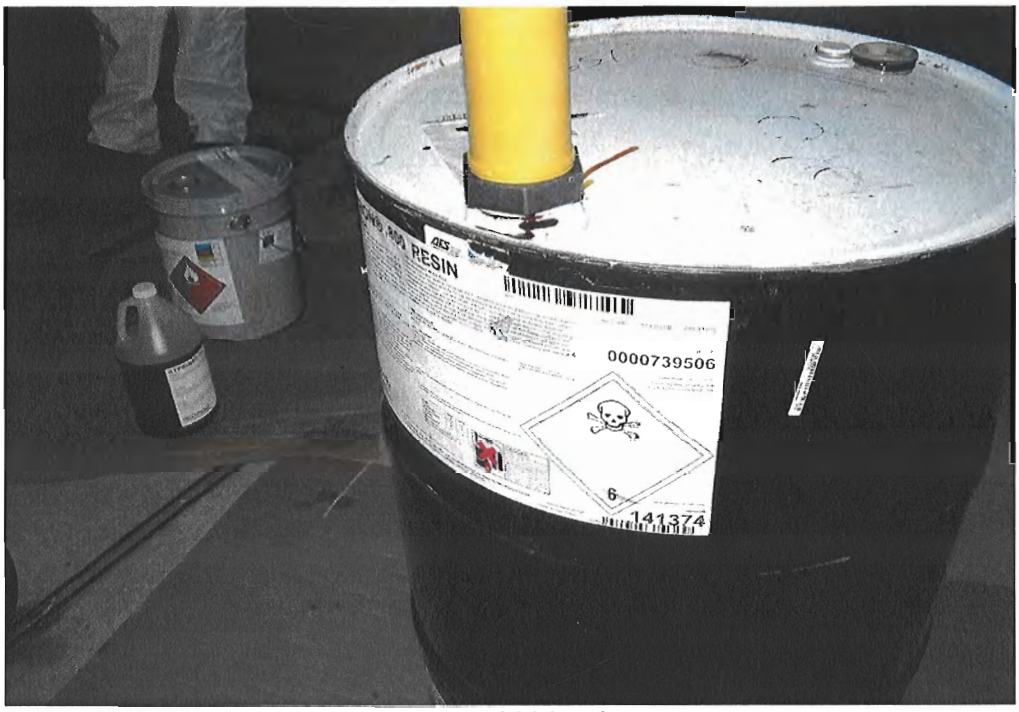


DUV #1 after glass-blasting

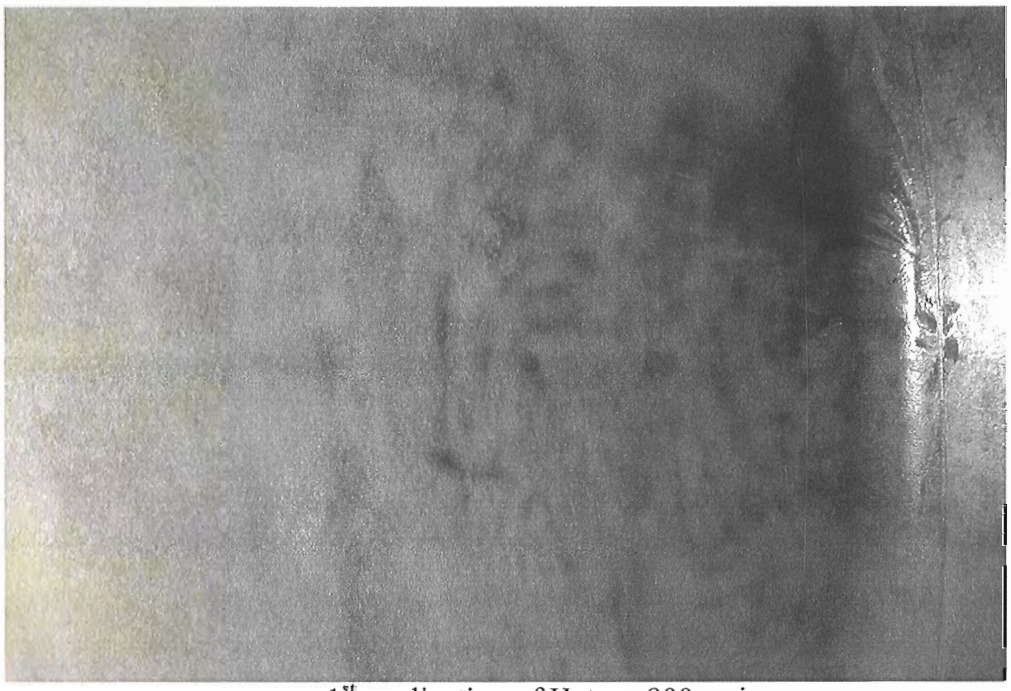




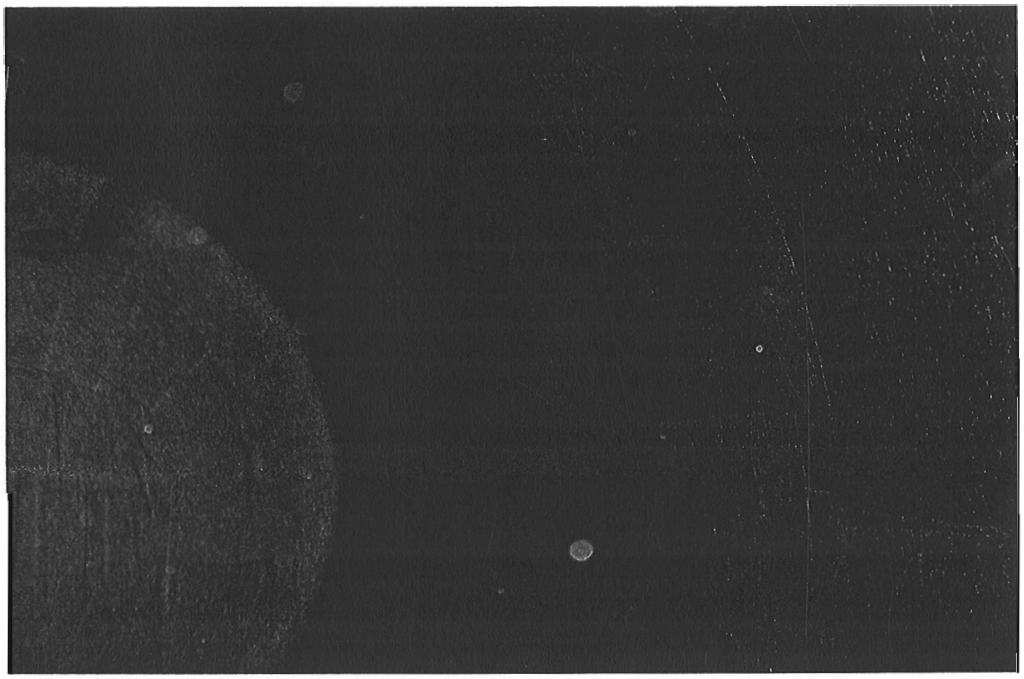
DUV #1 after Cobisol was applied



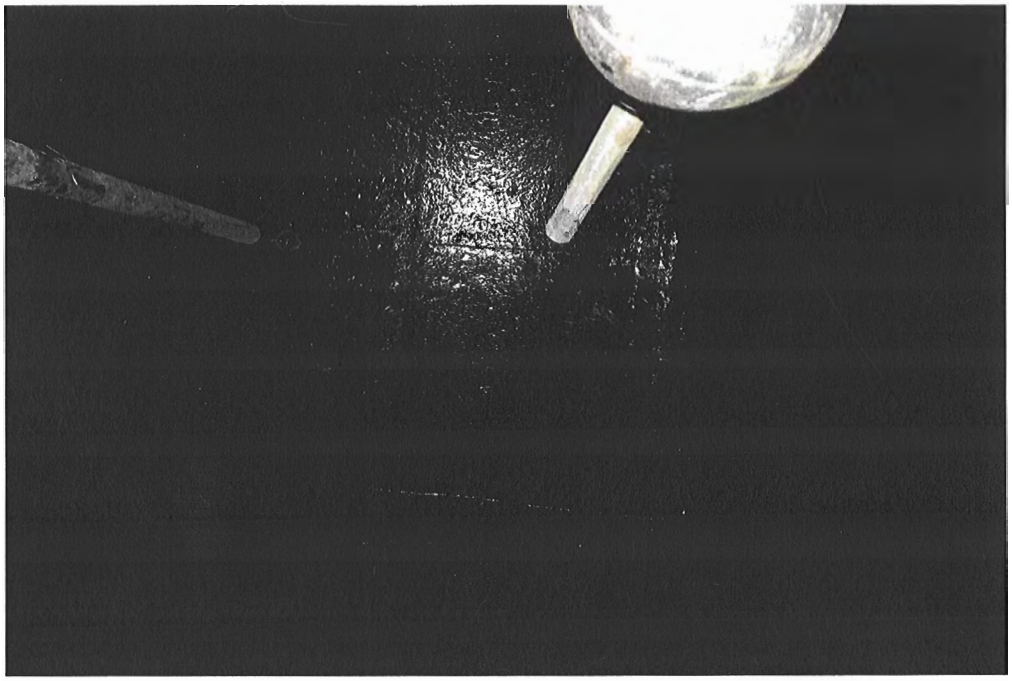
Hetron 800 Resin


1st application of Hetron 800 resin

Hetron 800 and glass application



Hetron 800 finish coat



Aboveground Storage Tank Inspection Report
Waste Mid UV Resist #3/Tank Farm
Inspection Date: June 25 and 26, 2014

OUT-OF-SERVICE ABOVEGROUND STORAGE TANK INSPECTION REPORT

KNIGHT CONSULTING ENGINEERS
IBM ESSEX JUNCTION
RIVER ROAD, ESSEX JUNCTION, VERMONT
Inspection Dates: June 25 & 26, 2014

Prepared for:

Martin Hain, P.E.
Knight Consulting Engineers
51 Knight Lane, Williston, Vermont 05495
Phone: 802-879-6343

Prepared by:

AARON ENVIRONMENTAL

189 Atwater Street
Plantsville, CT 06479
860-276-1201

July 16, 2014

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Preface

Throughout this document, `Customer' or `Client' refers to Knight Consulting Engineers (KCE) and/or IBM Corporation; and `Consultant', `Engineer' or `AARON' refers to AARON Environmental.

The field observations and research reported herein are considered sufficient in detail and scope to form a reasonable basis for an out-of-service evaluation of the referenced tank(s). The methods used to acquire the information as well as compile and analyze the data are considered current and widely accepted methods in the industry. These methods have been developed to provide the Client with information regarding apparent indications of existing or potential conditions relating to the tank(s) and are limited to the accessibility to the tank(s) and information available at the time of the site visit and inspection. Conclusions listed in this document may have been based in-part on information provided by the current facility owner, their agents and/or third parties (including, but not limited to, state and local authorities); pursuant to this, the accuracy of said information is not guaranteed by AARON.

LIMITATIONS

Notwithstanding anything contained in this report, nothing herein shall be construed as a representation, warranty or guarantee, either expressed or implied, regarding the future structural integrity, life expectancy, or performance of any of the items evaluated. This report and the analysis provided is in all respects subject to and shall be interpreted within the limitations and parameters of the test procedures performed. In the event testing is performed using a sampling procedure, this report and any analysis shall be limited to those areas actually tested and the type of test conducted, and the customer is cautioned not to extrapolate the results of the test samples.

I. INSPECTION PROCEDURES

The aboveground storage tank was inspected following portions of the applicable procedures contained in the Steel Tank Institute (STI) Standard SP001 5th Edition "Standard for Inspection of Aboveground Storage Tanks".

Where applicable, AARON provided the following inspection and testing services on the tank(s):

1. Perform the periodic inspections (monthly and annual) described in the STI Standard.

2. Visually inspect the outside of each tank in detail. At a minimum, the following tank components were inspected (where applicable):

    a. Primary Tank
    b. Secondary Tank
    c. Tank Supports
    d. Tank Anchors
    e. Tank Foundation and external supports
    f. Tank gauges and alarms
    g. Insulation covering
    h. Tank appurtenances
    i. Normal Vents
    j. Emergency Vents
    k. Release Prevention Barriers
    l. Spill Control Systems

3. Visually inspect the interior of each tank in detail. At a minimum, the following areas of concern were addressed (where applicable):
    a. Identify, inspect and record AST internal appurtenances
    b. Inspect for mechanical damage, corrosion, cracking, etc.
    c. Inspect for deteriorating or corroding internal attachments and piping
    d. Visually inspect welds
    e. Ultrasonic thickness measurements
    f. Vacuum box examination of questionable welds

4. Inspect the tank based on its construction, per the following:

    a. Single Wall Tank, Not in Contact with the Ground
        i. Either conduct ultrasonic testing (from the exterior) to determine the shell thickness as described in the STI Standard, or visually examine the interior of the tank as described in the STI Standard.

To obtain the residual metal thickness readings, a Panametrics 36DL Plus datalogging ultrasonic digital thickness gauge with a D790 or D791 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The meter is capable of collecting readings using a scan mode or single point mode. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material. Field data was stored in the unit and downloaded to a computer using Panametrics' WINplus interface software.

This report documents the findings of our inspections. It is intended to provide the tank owner/operator with an assessment of the tank's current condition, recommendations for improvements to maintain the long term integrity of the structure and an opinion of the tank's suitability for continued service.

II. GENERAL SITE AND TANK DESCRIPTION

AARON Environmental (AARON) was asked to conduct an out-of-service inspection of one aboveground waste solvent storage tanks located at IBM Corporation, River Road, Essex Junction, VT. The tank was inspected on June 25 and 26, 2014.

TANK ID / LOCATION	SIZE (GALLONS)	TANK CONSTRUCTION MATERIAL	MANWAY ACCESS	PRODUCT STORED
WASTE MID UV RESIST #3 / TANK FARM	10,000	SINGLE WALL STEEL WITH CONCRETE/STEEL CONTAINMENT DIKE	YES	WASTE SOLVENT

The subject tanks were identified as shop-fabricated, welded, carbon steel construction. The age, size, orientation, and appurtenances of the tank are described in further detail in Section III of this report.

III. INSPECTION SUMMARY

The following sections provide a summary of the inspection completed for the tank. The visual and ultrasonic thickness (if applicable) summaries are also provided.

Waste Mid UV Resist #3

This 10,000-gallon tank is a horizontal, cylindrical design with a diameter of 120 inches and an overall length 180 inches (15 feet), and is used to store waste solvent. The tank consists of single wall carbon steel, welded construction and rests within a covered concrete secondary containment structure. The containment dike is steel lined and has a calculated containment capacity of 23,170 gallons. There was no nameplate observed on the tank; however, the tank is insulated and a nameplate may not be visible. The age of the tank could not be verified based on field data but was reportedly installed in 1980 (Manufactured by Eastern Tank Fabricators) according to the Manufacturers Data Report for Pressure Vessels.

For the purposes of this inspection, the subject tank is considered to be single wall, not in contact with the ground. The tank is equipped with a man-way and was inspected both externally and internally.

The tank is equipped with the following fittings and equipment located along the centerline:

24" ID access manway, tight bolted with high-level warning alarm switch
2" tank top flanged fitting inlet/outlet
6" tank top flanged fitting with emergency venting
2" tank top flanged fitting with an inlet for nitrogen
6" tank top flanged fitting with a level indicator
2" tank top flanged fitting with a normal vent
4" tank top flanged fitting
Tank top fitting with pump

24" ID diameter manway

The following details were observed as part of the overall tank inspection. The tank inspection summary is provided following the STI periodic inspection criteria (monthly and annual), formal external inspection criteria, and additional inspection items. The periodic inspection items for this tank are described as follows:

Monthly Inspection Checklist

1. Tank Containment
   1.1. The tank was emptied and cleaned prior to our inspection. Some residual liquid was present on the tank bottom.
   1.2. The containment area was inspected for debris and fire hazards. None were observed.
   1.3. The drain associated with the secondary containment area was clear of debris and appeared to be in working order.
   1.4. Containment egress pathways were inspected. No problems were identified.
2. Leak Detection
   2.1. The tank and containment area were inspected for signs of leakage. No leaks were observed.
3. Tank Attachments and Appurtances
   3.1. The tank stairs and topside access platform were inspected. These structures are secure with no signs of significant corrosion or damage.
   3.2. The tank liquid level gauge was inspected. The tank was empty during our inspection so the proper and accurate operation of the gauge was not verified.
   3.3. Tank openings were inspected to confirm proper sealing. Openings appeared to be properly sealed.
4. Other Conditions
   4.1. No conditions were identified which would be considered unsafe or that would significantly affect the site SPCC Plan.

Annual Inspection Checklist

1. Tank Containment
   1.1. The steel lined concrete secondary containment structure was inspected and found to be in satisfactory condition.
   1.2. The drainage pipe and/or valves associated with the secondary containment structures were inspected and found to be in satisfactory condition.
2. Tank Foundation and Supports
   2.1. No signs of tank settlement or foundation washout were identified.
   2.2. The concrete containment structure is not visible because there is a steel lining over it. The steel lining (i.e., overlay) was observed to be in good condition. Cracking and/or spalling were not identified. There is no ring wall associated with the subject tank.
   2.3. The tank rests on steel support saddles which rest on elevated concrete foundations which are covered with steel plate. Portions of the steel saddles have some limited paint failure. The foundations are in good condition.
   2.4. The area around the concrete containment structure is located under a roof. Drainage is not a concern.
   2.5. The tank stairs and platform are bonded to the steel building structure which is bonded to an earth ground rod. The grounding equipment was observed to be in good condition.
3. Cathodic Protection System
   3.1. There is no cathodic protection system associated with the subject tank. There is no buried steel associated with the tank or piping.
4. Tank External Coating
   4.1. The tank has beige topcoat paint. The entire tank shell is covered with insulation; therefore routine inspection of the painted surfaces is not possible. Some paint failure was observed on the steel support saddles.
5. Tank Shells/Heads
   5.1. Evidence of shell/head distortions, buckling, denting or bulging was not observed.
   5.2. Evidence of shell/head corrosion was not observed.
6. Tank Manways, Piping and Equipment within Secondary Containment
   6.1. The tank manhole and bolts were observed in good condition with no significant signs of wear or corrosion.
   6.2. The piping and equipment associated with the subject tank and located within the secondary containment was inspected and found to be in good condition.
7. Tank Roof
   7.1. Not applicable, the tank is a horizontal cylindrical design.
8. Venting
   8.1. The normal vents are in good condition and free from obstructions.
   8.2. The tank has emergency venting which appeared to be in good condition and working properly.
9. Insulated Tanks
   9.1. The tank shell is insulated. No missing insulation was identified.
   9.2. Areas of moisture associated with the insulation were not identified.
   9.3. No mold was observed.
   9.4. No damage to the insulation was observed.
   9.5. The tank is located under a roof; therefore, the insulating material is protected from precipitation.

10. Level and Overfill Prevention Instrumentation of Shop Fabricated Tanks
    10.1. The tank level sensing device was inspected, found to be in good condition but not tested for proper operation.
    10.2. The overfill prevention device includes an electronic high level warning alarm. This device is in good condition but was not tested for proper operation.
11. Electrical Equipment
    11.1. The tank grounding cable and/or connections were inspected and found to be in good condition.
    11.2. Heat trace tape is located on the exterior of the tank under the insulation layer. This was not visible and was not inspected. Other electrical wiring associated with the tank equipment is in good condition.

Formal External Inspection

1. General
    1.1. A formal external inspection was performed by an STI certified inspector.
    1.2. The subject aboveground storage tank (AST) is single wall carbon, horizontal, cylindrical design. The tank is 120 inches in diameter, 15 feet long with a nominal capacity of 10,000 gallons and is used to store waste solvent. The tank was reportedly installed in 1980.
    1.3. According to facility personnel, the subject tank has been evaluated for integrity in the past. Refer to the historical reports from Knight Consulting Engineers and AARON Environmental.
    1.4. There was no nameplate observed on the tank; however, according to available information Eastern Tank Fabricators of Wallington, New Jersey, fabricated the tank in 1980.
    1.5. The fabrication of the AST was inspected using UL 142 as a baseline.
    1.6. The AST foundations were inspected for indications of settlement, cracking, exposed rebar, and general disrepair. No evidence of the above conditions was observed.
    1.7. The AST supports were inspected for indications of cracking, spalling, and general disrepair. The supports include three steel saddles which are not bolted to the concrete foundation. The supports have some isolated paint failure.
    1.8. The subject tank is located within a concrete secondary containment structure which is lined with plate steel. An electronic high level warning alarm is located in the tank. The containment area associated with the tank was inspected and found to be in good condition.
        1.8.1. No breaches or damage were identified with the containment structure.
        1.8.2. There were no foreign materials or liquid located within the containment structure. One other AST, of the same size is located within a common containment area.
        1.8.3. There is a drainage system associated with the containment structure. There were no penetrations observed which would lead to failure of the secondary containment.
    1.9. Ancillary equipment was inspected for condition and operability.
        1.9.1. Piping and piping connections were inspected for visible signs of stress or leakage such as severe corrosion, rusted bolted connections, or other severe degradation. Piping and piping connections were observed to be in good condition.
        1.9.2. The tank has a 2" diameter normal vent which terminates just above the building

roof top and was observed to be in good condition. The tank has a 6" diameter emergency vent.

1.9.3. The tank level systems were out-of-service during our inspection and were not tested for operation.

1.10. The tank system is grounded. The ground systems were observed to be in good condition.

1.11. The stairs and topside platform were inspected and found to be in good condition with no indications of significant corrosion or damage.

1.12. The tank has beige topcoat paint. The majority of the tank shells and heads are covered with insulation and are not visible for inspection. The steel supports have minor paint failure.

2. Original Shell Thickness of the AST
   - 2.1. Original tank documentation was provided for review and is attached to this report.
   - 2.2. The tank manufacturer was Eastern Tank Fabricators of Wallington, NJ.
   - 2.3. The tank was manufactured to the ASME Pressure Vessel Code.
   - 2.4. According to the manufacturer's data, the original shell thickness was ¼ inches (0.25 inches). The original head thickness was 1/4 inches (0.250 inches).
   - 2.5. The tank was rated for a maximum working pressure of 20 psi at a maximum temperature of 100 degrees F.
3. Horizontal ASTs
   - 3.1. Shell plates, welds and ancillary equipment were inspected for indications of exterior corrosion, bucking, distortion of stress, cracking, pinholes and mechanical damage.
     - 3.1.1. The insulating material and jacketing was not removed. With the exception of several four-inch diameter access ports, the exterior surfaces of the tank shell were not inspected.
   - 3.2. The tank shell was inspected for indications of changes that may have been made to the AST after it was fabricated. No evidence of changes to the original tanks was identified; however, the tank heads and shell surfaces could not be visually inspected due to the presence of insulation.

<u>Formal Internal Inspection</u>

1. General
   - 1.1. A formal internal inspection was performed by an STI certified inspector.
   - 1.1. The tank was cleaned by the owner prior to our inspection. Approximately 15% of the upper interior surfaces of the tank were covered with scale. The scale was removed in several locations to inspect the steel surface.
2. Horizontal AST Internal Inspection
   - 2.1. Internal appurtenances were documented and visually inspected. Carbon steel appurtenances were in fair condition. No mechanical damage, cracking or other concerns were identified.
   - 2.2. Welds were visually inspected. No problems were identified.
   - 2.3. Ultrasonic Thickness Scanning (UTS) was performed on the interior surfaces of the tank shell and heads. Data collected ranged from 0.241 to 0.261 inches.
     - 2.3.1. The entire interior shell has uniform corrosion and scale with pitting that ranged from 0.01 to 0.02 inches.
     - 2.3.2. No significant or isolated pitting beyond that was identified.
   - 2.4. The fabrication of the AST was inspected using UL 142 as a baseline.

Suitability for Continued Service

Based on the STI criteria and result of the current inspection, the subject tank is suitable for continued service. The STI regulated interval until the next certified inspection is 10 years. AARON suggests the next certified inspection be done within the next 5 years to ensure tank integrity. Federal, state and/or local regulations may require more frequent inspections of the subject AST.

Recordkeeping

1. AST records should be retained for the life of the AST system.
2. Monthly Inspection Checklists should be completed by the owner/operator and retained for a minimum of 36 months.
3. Annual Inspection Checklists should be completed by the owner/operator and retained for a minimum of 3 years.
4. Certified Inspection Reports should be retained for the life of the AST system.

IV. ULTRASONIC THICKNESS MEASUREMENTS SUMMARY

To obtain the residual metal thickness readings, a Panametrics 36DL Plus datalogging ultrasonic digital thickness gauge with a D790 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material.

Refer to the attachment of this report for a UT thickness measurements.

V. REQUIREMENTS FOR CONTINUED SERVICE

The following items are based on the requirements of SP-001 and UL 142. These documents are industry standards. Additional regulatory requirements may apply to the subject AST.

Tank Waste Mid UV Resist #3 – (1) 10,000-gallon tank

1. Based on the STI Standard (SP-001), the interval until the next certified inspection is not to exceed 10 years. If the facility uses an alternate Standard or chooses to provide "equivalent environmental protection" in lieu of routine integrity testing, the method and schedule for such should be included in the facility's SPCC Plan.

If the facility's SPCC Plan requires the use of routine "integrity testing" using the STI procedure SP-001, then the following routine inspections should be completed as described by the owner/operator. Specific inspection items may be modified for tank specific use as necessary; however, deviations from or alterations of the STI Standard should be discussed in the facility SPCC Plan.

Shop Fabricated Steel Tanks

The Steel Tank Institute (STI) Standard for Inspection requires the owner or operator of an aboveground tank to perform and document periodic inspections. Refer to the attached checklists. These documents should be completed by the owner or operator on a monthly and annual basis. All records should be maintained.

VI. RECOMMENDATIONS

The following recommendations are based on good engineering practices and industry standards; however, they are not specific regulatory requirements or requirements for continued service.

Waste Mid UV Resist #3 – (1) 10,000-gallon tank

1. There was some isolated paint failure located on the tank saddles.
    a. The saddles should be prepped and repainted.

All tanks should be clearly labeled with the product stored, capacity of the tank and an NFPA hazard label, as a minimum. Piping should be labeled with the product and flow direction.

PROFESSIONAL OPINION

The subject above ground storage tank(s) at the IBM Essex Junction facility, Essex Junction, VT have been inspected using procedures found in STI SP001-05 publication "Standard for the Inspection of Aboveground Storage Tanks".

It is the professional opinion of this firm that the structural integrity of the subject steel tank(s) is acceptable. The STI regulated interval until the next certified inspection is 10 years, a certified inspection is required to be completed no later than June 2024. AARON recommends the next certified inspection be done within the next 5 years to ensure tank integrity. Federal, state and/or local regulations may require more frequent inspections of the subject AST.

This is not to be construed as an expressed or implied warranty of future performance.

Should you have any questions or comments concerning this inspection report, please do not hesitate to contact the undersigned at 860-276-1201.

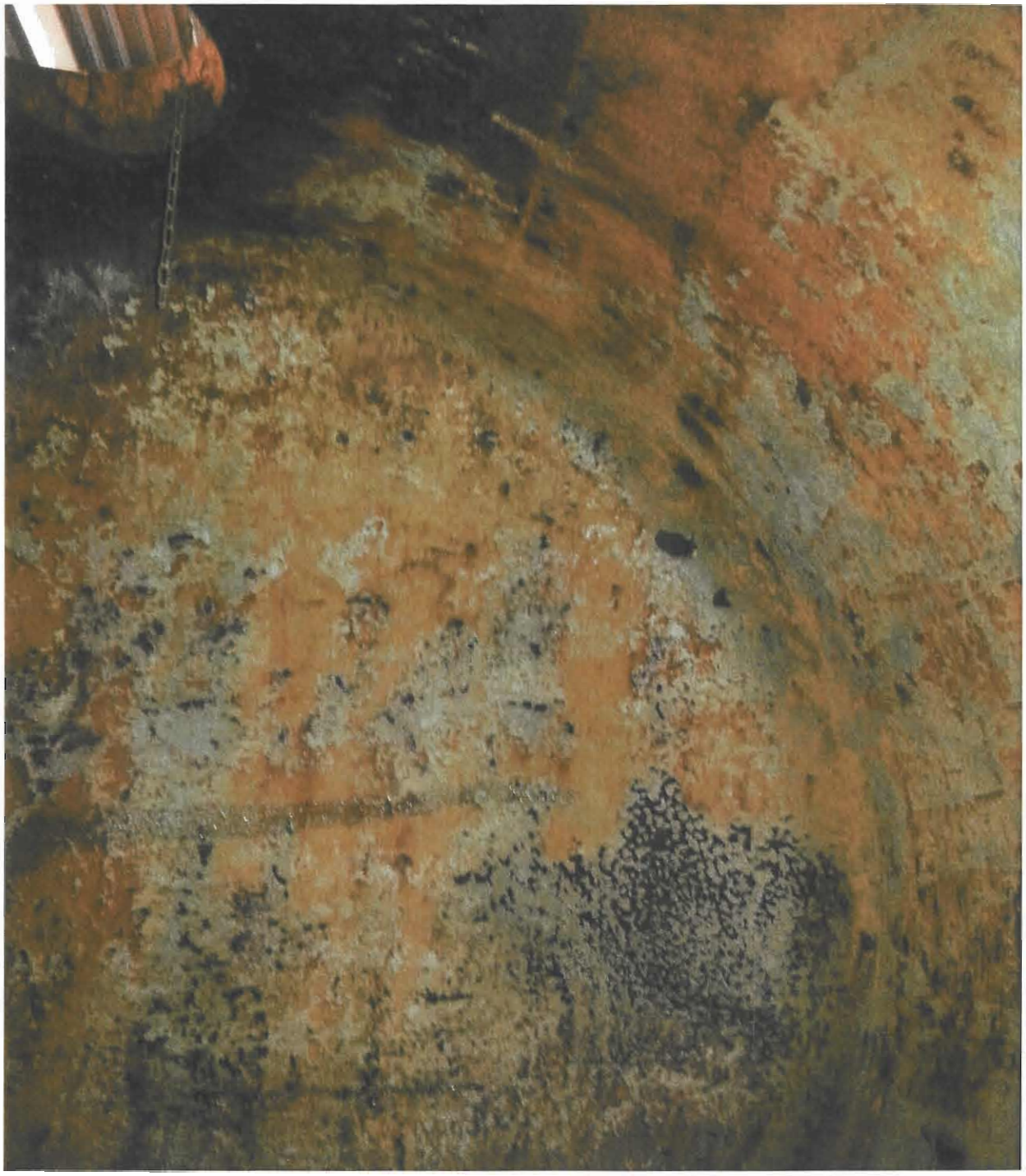
Sincerely,

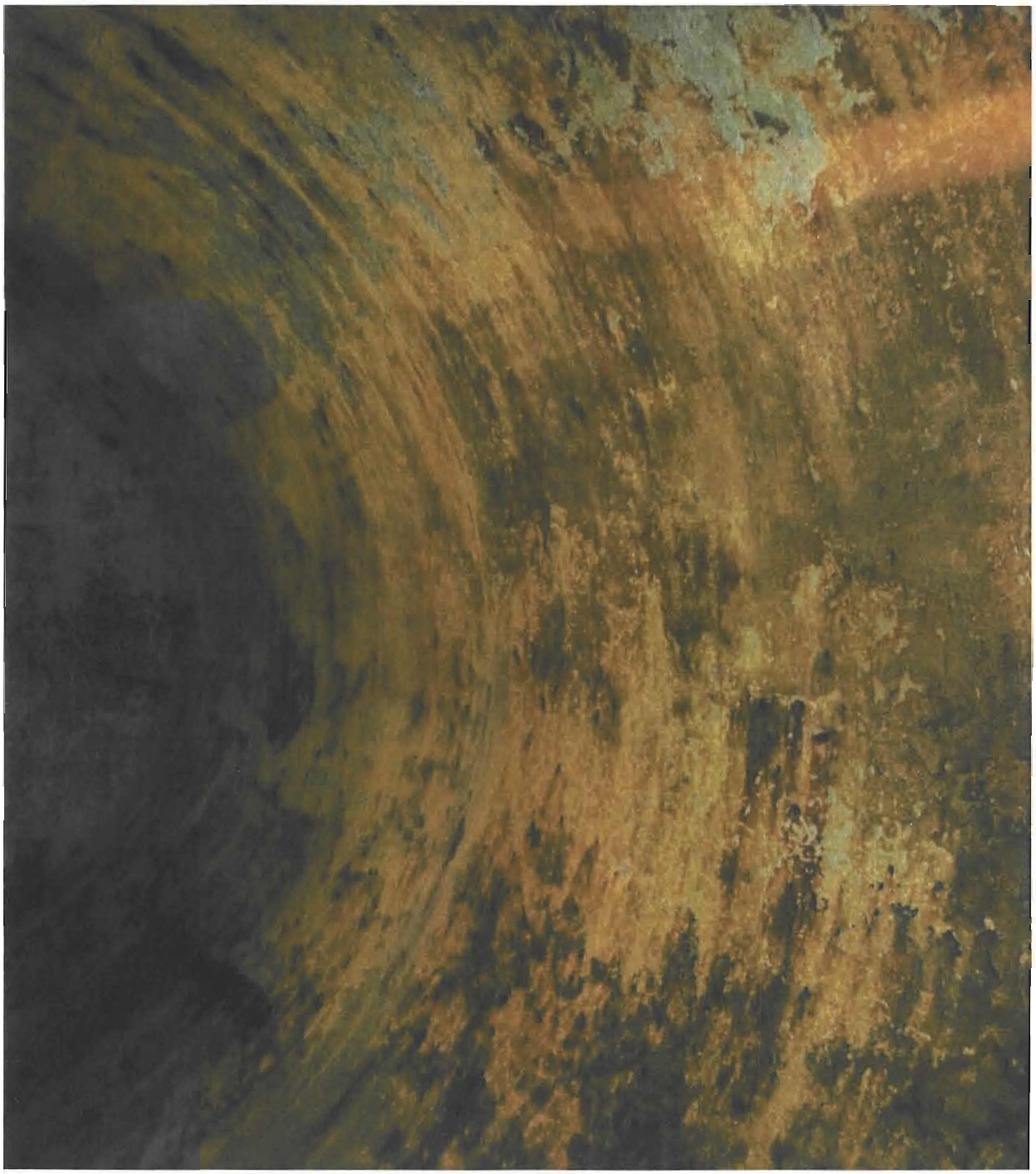
Joseph Paterak (ext. 109)
AST Inspector (STI #AST-RO9117)

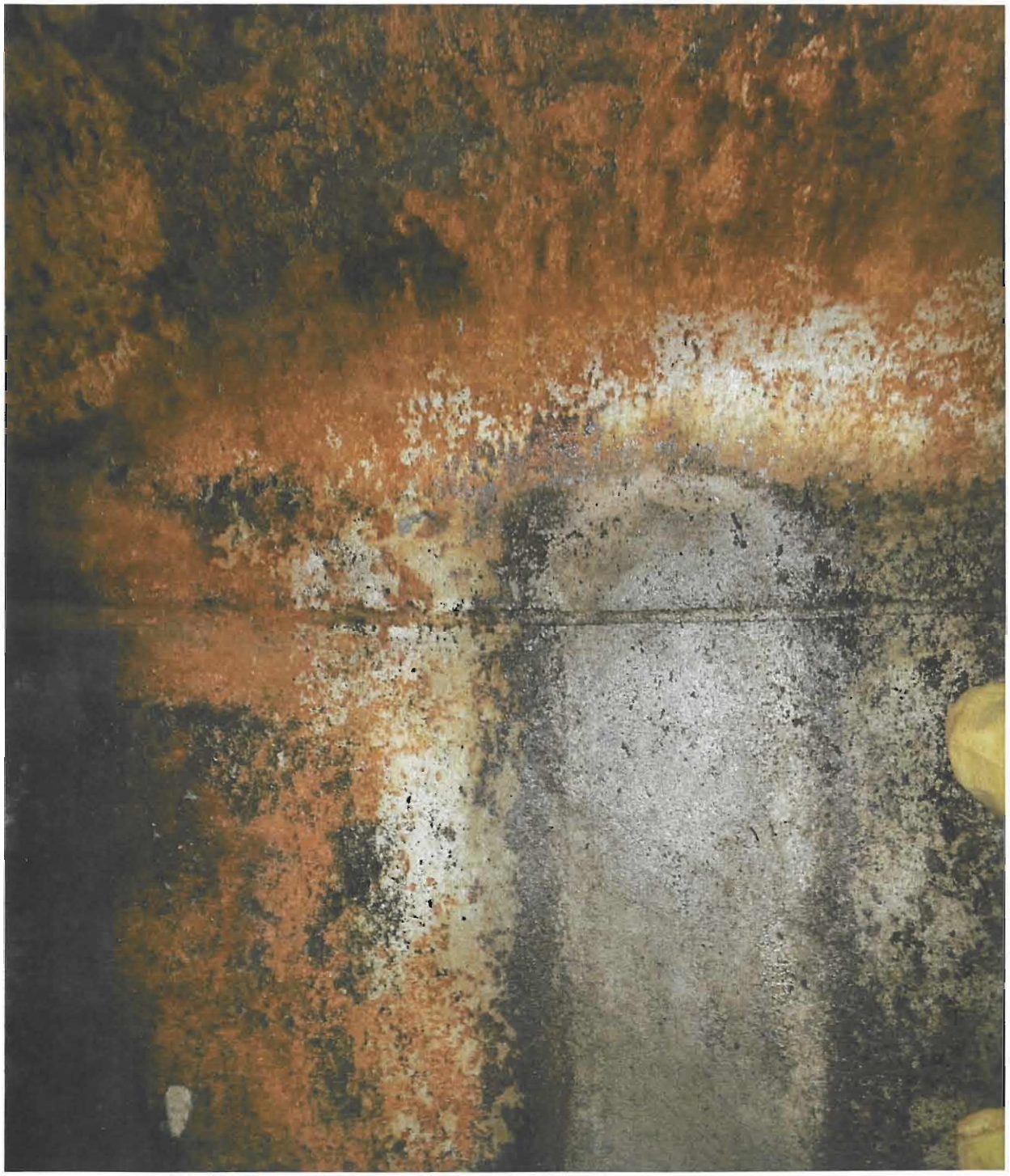
ATTACHMENTS

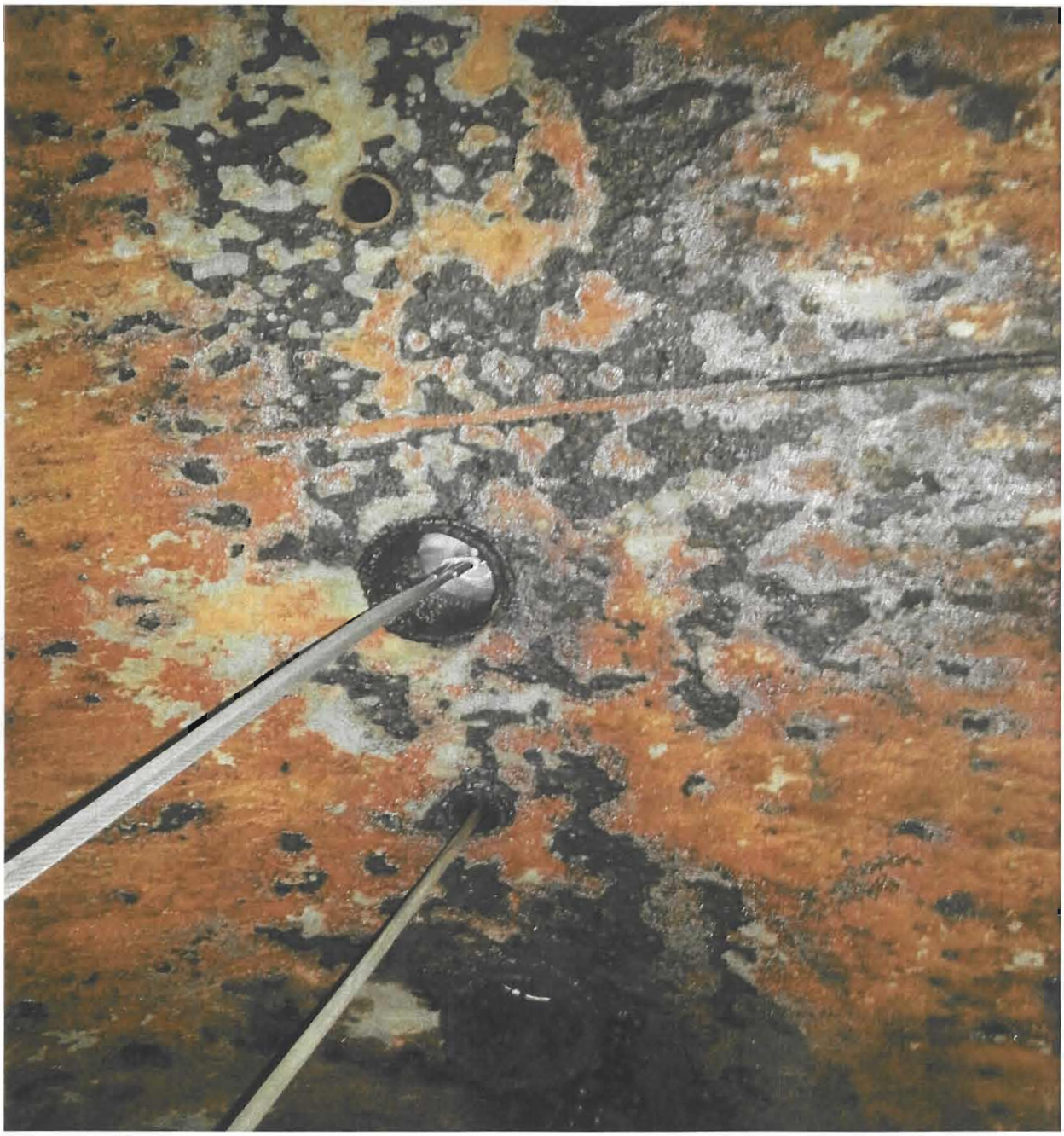
Tank Top Appurtances

Tank Interior Photo's









Tank Saddles

PANAMETRICS Ultrasonic Thickness Gage

File Name: IBM Mid UV
File Type: Incremental
File Description: General Solvent Waste
Location Note: Tank North End
Inspector ID: JP

Survey Date: 6/26/2014

Data Point ID	Thickness	Units	Flags	Setup	Comments
001	0.255	IN	M-m-WF	02	Tank North
002	0.257	IN	M-m-WF	02	Tank North
003	0.261	IN	M-m-WF	02	Tank North
004	0.241	IN	M-m-WF	02	Tank North
005	0.251	IN	M-m-WF	02	Tank North
006	0.244	IN	M-m-WF	02	Tank North
007	0.245	IN	M-m-WF	02	Tank North
008	0.257	IN	M-m-WF	02	Tank North
009	0.251	IN	M-m-WF	02	Tank North
010	0.255	IN	M-m-WF	02	Tank North
011	0.260	IN	M-m-WF	02	Tank North
012	0.259	IN	M-m-WF	02	Tank North
013	0.253	IN	M-m-WF	02	Tank North
014	0.249	IN	M-m-WF	02	Tank North
015	0.252	IN	M-m-WF	02	Tank North
016	0.243	IN	M-m-WF	02	Tank North
017	0.260	IN	M-m-WF	02	Tank North
018	0.256	IN	M-m-WF	02	Tank North
019	0.241	IN	M-m-WF	02	Tank North
020	0.244	IN	M-m-WF	02	Tank North
021	0.258	IN	M-m-WF	02	Tank North
022	0.251	IN	M-m-WF	02	Tank North
023	0.255	IN	M-m-WF	02	Tank North
024	0.261	IN	M-m-WF	02	Tank North
025	0.253	IN	M-m-WF	02	Tank North
026	0.253	IN	M-m-WF	02	Tank North
027	0.256	IN	M-m-WF	02	Tank North
028	0.249	IN	M-m-WF	02	Tank North
029	0.246	IN	M-m-WF	02	Tank North
030	0.253	IN	M-m-WF	02	Tank North

PANAMETRICS Ultrasonic Thickness Gage

File Name: IBM Mid UV
File Type: Incremental
File Description: General Solvent Waste
Location Note: Tank South End
Inspector ID: JP

Survey Date: 6/26/2014

Data Point ID	Thickness	Units	Flags	Setup	Comments
001	0.258	IN	M-m-WF	02	Tank South
002	0.256	IN	M-m-WF	02	Tank South
003	0.241	IN	M-m-WF	02	Tank South
004	0.244	IN	M-m-WF	02	Tank South
005	0.242	IN	M-m-WF	02	Tank South
006	0.256	IN	M-m-WF	02	Tank South
007	0.261	IN	M-m-WF	02	Tank South
008	0.257	IN	M-m-WF	02	Tank South
009	0.261	IN	M-m-WF	02	Tank South
010	0.246	IN	M-m-WF	02	Tank South
011	0.260	IN	M-m-WF	02	Tank South
012	0.259	IN	M-m-WF	02	Tank South
013	0.253	IN	M-m-WF	02	Tank South
014	0.249	IN	M-m-WF	02	Tank South
015	0.252	IN	M-m-WF	02	Tank South
016	0.253	IN	M-m-WF	02	Tank South
017	0.249	IN	M-m-WF	02	Tank South
018	0.252	IN	M-m-WF	02	Tank South
019	0.243	IN	M-m-WF	02	Tank South
020	0.260	IN	M-m-WF	02	Tank South
021	0.258	IN	M-m-WF	02	Tank South
022	0.253	IN	M-m-WF	02	Tank South
023	0.249	IN	M-m-WF	02	Tank South
024	0.252	IN	M-m-WF	02	Tank South
025	0.243	IN	M-m-WF	02	Tank South
026	0.260	IN	M-m-WF	02	Tank South
027	0.253	IN	M-m-WF	02	Tank South
028	0.249	IN	M-m-WF	02	Tank South
029	0.252	IN	M-m-WF	02	Tank South
030	0.243	IN	M-m-WF	02	Tank South

PANAMETRICS Ultrasonic Thickness Gage

File Name: IBM Mid UV
File Type: Incremental
File Description: General Solvent Waste
Location Note: East Side Wall
Inspector ID: JP

Survey Date: 6/26/2014

Data Point ID	Thickness	Units	Flags	Setup	Comments
001	0.259	IN	M-m-WF	02	East Side Wall
002	0.257	IN	M-m-WF	02	East Side Wall
003	0.243	IN	M-m-WF	02	East Side Wall
004	0.247	IN	M-m-WF	02	East Side Wall
005	0.247	IN	M-m-WF	02	East Side Wall
006	0.251	IN	M-m-WF	02	East Side Wall
007	0.252	IN	M-m-WF	02	East Side Wall
008	0.255	IN	M-m-WF	02	East Side Wall
009	0.261	IN	M-m-WF	02	East Side Wall
010	0.259	IN	M-m-WF	02	East Side Wall
011	0.251	IN	M-m-WF	02	East Side Wall
012	0.241	IN	M-m-WF	02	East Side Wall
013	0.242	IN	M-m-WF	02	East Side Wall
014	0.245	IN	M-m-WF	02	East Side Wall
015	0.261	IN	M-m-WF	02	East Side Wall
016	0.253	IN	M-m-WF	02	East Side Wall
017	0.253	IN	M-m-WF	02	East Side Wall
018	0.256	IN	M-m-WF	02	East Side Wall
019	0.254	IN	M-m-WF	02	East Side Wall
020	0.259	IN	M-m-WF	02	East Side Wall
021	0.242	IN	M-m-WF	02	East Side Wall
022	0.249	IN	M-m-WF	02	East Side Wall
023	0.258	IN	M-m-WF	02	East Side Wall
024	0.261	IN	M-m-WF	02	East Side Wall
025	0.257	IN	M-m-WF	02	East Side Wall
026	0.253	IN	M-m-WF	02	East Side Wall
027	0.247	IN	M-m-WF	02	East Side Wall
028	0.260	IN	M-m-WF	02	East Side Wall
029	0.255	IN	M-m-WF	02	East Side Wall
030	0.257	IN	M-m-WF	02	East Side Wall

PANAMETRICS Ultrasonic Thickness Gage

File Name: IBM Mid UV
File Type: Incremental
File Description: General Solvent Waste
Location Note: West Side Wall
Inspector ID: JP

Survey Date: 6/26/2014

Data Point ID	Thickness	Units	Flags	Setup	Comments
001	0.260	IN	M-m-WF	02	West Side Wall
002	0.258	IN	M-m-WF	02	West Side Wall
003	0.253	IN	M-m-WF	02	West Side Wall
004	0.249	IN	M-m-WF	02	West Side Wall
005	0.252	IN	M-m-WF	02	West Side Wall
006	0.244	IN	M-m-WF	02	West Side Wall
007	0.245	IN	M-m-WF	02	West Side Wall
008	0.257	IN	M-m-WF	02	West Side Wall
009	0.251	IN	M-m-WF	02	West Side Wall
010	0.255	IN	M-m-WF	02	West Side Wall
011	0.260	IN	M-m-WF	02	West Side Wall
012	0.259	IN	M-m-WF	02	West Side Wall
013	0.253	IN	M-m-WF	02	West Side Wall
014	0.249	IN	M-m-WF	02	West Side Wall
015	0.243	IN	M-m-WF	02	West Side Wall
016	0.247	IN	M-m-WF	02	West Side Wall
017	0.247	IN	M-m-WF	02	West Side Wall
018	0.251	IN	M-m-WF	02	West Side Wall
019	0.252	IN	M-m-WF	02	West Side Wall
020	0.255	IN	M-m-WF	02	West Side Wall
021	0.258	IN	M-m-WF	02	West Side Wall
022	0.251	IN	M-m-WF	02	West Side Wall
023	0.259	IN	M-m-WF	02	West Side Wall
024	0.253	IN	M-m-WF	02	West Side Wall
025	0.249	IN	M-m-WF	02	West Side Wall
026	0.253	IN	M-m-WF	02	West Side Wall
027	0.256	IN	M-m-WF	02	West Side Wall
028	0.249	IN	M-m-WF	02	West Side Wall
029	0.246	IN	M-m-WF	02	West Side Wall
030	0.253	IN	M-m-WF	02	West Side Wall

PANAMETRICS Ultrasonic Thickness Gage

File Name: IBM Mid UV
File Type: Incremental
File Description: General Solvent Waste
Location Note: Tank Bottom
Inspector ID: JP

Survey Date: 6/26/2014

Data Point ID	Thickness	Units	Flags	Setup	Comments
001	0.253	IN	M-m-WF	02	Tank Bottom
002	0.257	IN	M-m-WF	02	Tank Bottom
003	0.258	IN	M-m-WF	02	Tank Bottom
004	0.244	IN	M-m-WF	02	Tank Bottom
005	0.247	IN	M-m-WF	02	Tank Bottom
006	0.251	IN	M-m-WF	02	Tank Bottom
007	0.261	IN	M-m-WF	02	Tank Bottom
008	0.252	IN	M-m-WF	02	Tank Bottom
009	0.247	IN	M-m-WF	02	Tank Bottom
010	0.260	IN	M-m-WF	02	Tank Bottom
011	0.255	IN	M-m-WF	02	Tank Bottom
012	0.261	IN	M-m-WF	02	Tank Bottom
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015	0.256	IN	M-m-WF	02	Tank Bottom
016	0.248	IN	M-m-WF	02	Tank Bottom
017	0.251	IN	M-m-WF	02	Tank Bottom
018	0.242	IN	M-m-WF	02	Tank Bottom
019	0.260	IN	M-m-WF	02	Tank Bottom
020	0.253	IN	M-m-WF	02	Tank Bottom
021	0.258	IN	M-m-WF	02	Tank Bottom
022	0.251	IN	M-m-WF	02	Tank Bottom
023	0.260	IN	M-m-WF	02	Tank Bottom
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027	0.256	IN	M-m-WF	02	Tank Bottom
028	0.249	IN	M-m-WF	02	Tank Bottom
029	0.246	IN	M-m-WF	02	Tank Bottom
030	0.253	IN	M-m-WF	02	Tank Bottom

IBM RCRA Subpart J Certification for Building 963 General Solvent Waste Tank Replacement
January 15, 2009

IBM
RCRA SUBPART J CERTIFICATION
FOR
BUILDING 963 GENERAL SOLVENT WASTE TANK REPLACEMENT

Prepared for

IBM
Burlington, Vermont

Prepared by

CH2MHILL
IDC

January 15, 2009

Rev. 0
1/19/2009

B963 GENERAL SOLVENT WASTE TANK SYSTEM

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather or evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Michael Lamore

Michael Lamore, P.E.

1/19/09

Date

STATE OF VERMONT
MICHAEL G. LAMORE
NO. 8902
MECHANICAL
LICENSED
PROFESSIONAL ENGINEER

CONTENTS

Introduction 1

Description of the Solvent Waste Tank System 1

Hazardous Waste Characteristics 2

Design and Installation Assessment 5

ATTACHMENTS

Attachment 1 – Selected Design Drawings
Attachment 2 – Vendor Submittals for the new solvent waste tank
Attachment 3 – Burlington Facilities Specification 15410-9 – Solvent Mechanical Standard
Attachment 4 – Secondary Containment Capacity Calculations
Attachment 5 – Original Containment Construction Drawings
Attachment 6 – Inspection Reports
Attachment 7 – Pressure Test Reports

Introduction

This report provides certification of a portion of the Building 963 General Solvent Waste Tank system at the IBM semiconductor manufacturing facility located in Burlington, Vermont. IBM has determined that this system will collect, transfer and store waste solvents that meet the definition of a hazardous waste pursuant to rules codified in the Resource Conservation and Recovery Act (RCRA) at 40 CFR Part 261. The system is subject to the Tank System standards under RCRA Subpart J. This certification is provided in compliance with 40 CFR Part 264 Subpart J and supports that the tank system has sufficient structural integrity, is acceptable for the storing of the hazardous waste for which the system was designed, was properly designed and installed, and was repaired, if required pursuant to 40 CFR 264.192(b) and (d). This report certifies the tank system design and installation.

This certification is based on the documentation included in this report which includes the following information:

- Description of the solvent waste collection system.
- Hazardous characteristics of the wastes to be handled.
- Assessment of the collection systems, including,
  - Design standards according to which the tanks and ancillary equipment have been constructed including design of the secondary containment system.
  - Structural design considerations
  - Visual inspection of the tank system.
  - Tightness test results for the new tank and ancillary equipment.

Description of the Solvent Waste Tank System

The following narrative provides a description of the solvent waste tank system design which is provided in Attachment 1.

Spent solvents are conveyed from usage points around the site to the chemical distribution center (CDC) on the far side of East Loop Road. If there is an interruption to flow either in the trestle across the road or into the CDC, solvent waste may be routed instead from the B963 Solvent Room to the Building 963 General Solvent Waste Tank through a 2" carbon steel carrier pipe. All pipe that is part of this system consists of fully welded double walled carbon steel pipe. The

tank system is located outdoors off the Northeast corner of IBM's Building 963. The tank being installed is replacing an existing tank of the same size and configuration.

The Tank System consists of the following:

- (1) - 9000 gallon capacity tank
- Carbon steel construction
- (1) 3 HP, 40 GPM design point transfer pump
- Control valves
- Venting system
- The tank, control valve, and pump are secondarily contained by a concrete basin lined with 14 gauge stainless steel spill containment.
- The entire system is covered by an adhered membrane roof on a steel deck on steel columns supported off the containment walls.
- The tank and associated piping will have heat trace.

This certification applies to the tank and ancillary equipment being replaced within the tank containment area as showing in the attachment 1drawings.

Hazardous Waste Characteristics

Based on composition analysis of the CDC waste tanks, IBM anticipates that the highest possible flash point of any waste entering the B963 General Solvent Waste Tank would be in the 100-140F range. This would qualify them as Class II, considered combustible, not flammable. The following is a list of hazards, and their associated waste codes, that IBM currently expects may be found in the B963 General Solvent Waste Tank.

Waste Code	
D001	Ignitability
D004	Arsenic
D005	Barium
D008	Lead
D010	Selenium
D018	Benzene
D019	Carbon Tetrachloride
D021	Chlorobenzene
D022	Chloroform
D023	o-Cresol
D024	m-Cresol
D025	p-Cresol

D026	Cresol
D027	1,4 Dichlorobenzene
D028	1,2 Dichloroethane
D029	1,1- Dichloroethylene
D035	Methyl Ethyl Ketone
D039	Tetrachloroethylene
D040	Trichloroethylene
D043	Vinyl Chloride
F001	Dichlorofluoroethane, Tetrachloroethylene, Trichloroethylene
F002	Tetrachloroethylene, 1,1,2-Trichloro- 1,2,2-trifluoroethane, Ortho-dichlorobenzene, Chlorobenzene, Trichloroethylene Methylene Chloride
F003	Acetone, Xylene, Ethyl Benzene, Ethyl Acetate, Cyclohexanone, Methyl Isobutyl Ketone, Methanol
F005	Methyl Ethyl Ketone
F005	Toluene
U002	Acetone
U031	n-Butyl Alcohol
U057	Cyclohexanone
U079	trans-1,2-Dichloroethylene
U080	Methylene Chloride
U154	Methanol
U159	Methyl Ethyl Ketone
U161	Methyl Isobutyl Ketone
U210	Tetrachloroethylene
U211	Carbon Tetrachloride
U220	Toluene
U226	1,1,1-Trichloroethane
U228	Trichloroethylene
U239	Xylene
VT02	Oil

VT08	Ethylene Glycol

Additional chemicals expected to be found in the tank:

- .175 N Stripper
- 70% gamma-butyrolactone/30% n-butyl acetate
- Isopropanol
- N-Methyl-2-Pyrrolidone
- Propylene Glycol Monomethyl Ether Acetate (PGMEA)

The underlying hazardous components that are expected to be found in the tank are as follows:

Constituents
Antimony
Nickel
Zinc
Bis(2-ethyl)Hexylphthalate
m-Dichlorobenzene (1,3-Di)
1,1 Dichloroethane
trans-1,2-Dichloroethylene
Fluoride
Methyl Methacrylate
Naphthalene
Phenol
1,1,2,2, Tetrachloroethane
1,1,1 Tricholorethane
1,1,2 Tricholorethane
1,4-Dioxane
Iso-Butyl Alcohol
Phthalic Anhydride
Ethylene Oxide
2-Chloro-1,3-butadiene
1,2-Dichloropropane
Diphenylamine
2,4-Dichlorophenol
Cadmium
Chromium
Silver
Pyrene
Chrysene

Benzo(a)pyrene
Di-n-Butyl Phthalate
Phenanthrene
Dichlorodifluoromethane
Butyl benzyl phthalate
Carbon disulfide
Chloromethane
Cyanide, Total
Thallium
cis-1,3-Dichloropropene
trans,-1,3-Dichloropropene
Tribromomethane/Bromoform
Bromodichloromethane
Chlorodibromomethane
Bromomethane
Chloroethane
2-Chloroethyl vinyl ether
Trichloromonofluoromethane

Design and Installation Assessment

Regulations codified at 40 CFR Part 264.192 require that owners of a new tank system "obtain a written assessment reviewed by an independent, qualified, registered professional engineer attesting that the system has sufficient structural integrity and is acceptable for storing and treating of hazardous waste". The regulations also require that "prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified installation inspector or an independent, qualified registered professional engineer, either of whom is qualified and experienced in the proper installation of tank systems, must inspect the system" per the requirements of 40 CFR 264.192(b) through (f). 40 CFR 264.193(a)-(f) provide the containment and release detection requirements for hazardous waste tank systems. The following pages present the results of the B963 General Solvent Waste Tank System assessment.

Applicable portions of 40 CFR Part 264 Subpart J regulations are provided followed by an assessment of how the design of the system meets the requirements. Regulatory citations are provided in italics.

192(a)(1) Design Standards *- Design standard(s) according to which the tank(s) and ancillary equipment is or will be constructed.*

Tank or Ancillary Equipment Identification	Design Standard	Specifications/References	Attachments
Tank	Attached design drawings	UL-142	Drawing B963P-7000
Piping	ASME/ANSI B31.3	Section 15061 – Carbon Steel Piping Systems Pipe Class CS07	
Piping	IBM Burlington Facilities Standards	Section 15410-9 – Solvent Mechanical Standard	Included as an attachment

192(a)(3) Corrosion Protection *- For new tank systems or components in which the external shell of a metal tank or any external metal component of the tank system is or will be in contact with the soil or with water, a determination by a corrosion expert of:*

(i) Factors affecting the potential for corrosion, including but not limited to:

(A) Soil moisture content;
(B) Soil pH;
(C) Soil sulfides level;
(D) Soil resistivity;
(E) Structure to soil potential;
(F) Influence of nearby underground metal structures (e.g., piping);
(G) Stray electric current; and,
(H) Existing corrosion-protection measures (e.g., coating, cathodic protection), and

(ii) The type and degree of external corrosion protection that are needed to ensure the integrity of the tank system during the use of the tank system or component, consisting of one or more of the following:

(A) Corrosion-resistant materials of construction such as special alloys or fiberglass-reinforced plastic;
(B) Corrosion-resistant coating (such as epoxy or fiberglass) with cathodic protection (e.g., impressed current or sacrificial anodes); and
(C) Electrical isolation devices such as insulating joints and flanges.

This section is not applicable. No external portions of the tank systems are in contact with soil or water.

192(a)(4) Vehicular Traffic for Underground Tank Systems *- For underground tank system components that are likely to be affected by vehicular traffic, a determination of design or operational measures that will protect the tank system against potential damage;*

This section is not applicable. No portions of the tank systems are underground such that they are likely to be affected by vehicular traffic.

192(a)(5) Design Considerations *- Design considerations to ensure that*

> *(i) Tank foundations will maintain the load of a full tank;*
>
> *(ii) Tank systems will be anchored to prevent flotation or dislodgment where the tank system is placed in a saturated zone, or is located within a seismic fault zone; and*
>
> *(iii) Tank systems will withstand the effects of frost heave*

The new tank will be of identical size and configuration to the existing tank. Attachment 5 provides the original structural design drawings for the system dated 1986 and stamped by Stephen C. Knight of Knight Consulting Engineers, Inc. The design includes top saddles for stability and to prevent flotation in the event that the containment is flooded. There is no visible settling or cracking of the foundation/containment system.

192(b) Proper Installation of Tank Systems *– The owner or operator of a new tank system must ensure that proper handling procedures are adhered to in order to prevent damage to the system during installation. Prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified installation inspector or an independent, qualified, registered professional engineer, either of whom is trained and experienced in the proper installation of tank systems, must inspect the system or component for the presence of any of the following items:*

> *(1) Weld breaks;*
> *(2) Punctures;*
> *(3) Scrapes of protective coatings;*
> *(4) Cracks;*
> *(5) Corrosion;*
> *(6) Other structural damage or inadequate construction or installation.*
>
> *All discrepancies must be remedied before the tank system is covered, enclosed, or placed in use.*

A copy of the field inspection report is included as attachment 6.

192(c) Backfill for Underground Tanks and Piping *- New tank systems or components and piping that are placed underground and that are backfilled must be provided with a backfill material that is a non-corrosive, porous, homogeneous substance and that is carefully installed so that the backfill is placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported.*

This part of the regulations is not applicable since none of the tank systems or components including piping are placed underground.

192(d) Tightness Testing for New Tank Systems *- All new tanks and ancillary equipment must be tested for tightness prior to being covered, enclosed or placed in use. If a tank system is found not to be tight, all repairs necessary to remedy the leak(s) in the system must be performed prior to the tank system being covered, enclosed, or placed in use.*

Copies of the on-site and factory pressure test reports are included as attachment 7.

192(e) Ancillary Equipment Support and Protection *- Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion or contraction.*

Piping is mounted with pipe anchors, supports, or brackets either directly to concrete walls or indirectly to metal support structures. When appropriate, supports have incorporated provisions for protection of the ancillary equipment from vibration, expansion, or contraction.

192(f) Corrosion Protection *- The owner or operator must provide the type and degree of corrosion protection necessary, based on the information provided under paragraph (a)(3) of this section, to ensure the integrity of the tank system during use of the tank system. The installation of a corrosion protection system that is field fabricated must be supervised by an independent corrosion expert to ensure proper installation.*

The external shell of the tanks and external components of the tank systems are not in direct contact with the soil. CH2M HILL has determined that the solvents being placed in this tank are compatible with carbon steel.

192(g) Written Statements *- The owner or operator must obtain and keep on file at the facility written statements by those persons required to certify the design of the tank system and supervise the installation of the tank system in accordance with the requirements of paragraphs (b) through (f) of this section to attest that the tank system was properly designed and installed and that repairs, pursuant to paragraphs (b) and (d) of this section were performed. These written statements must also include the certification statement as required in §270.11(d) of this*

chapter.

This report provides documentation supporting the certification of the Building 963 General Solvent Waste Tank system design and installation.

193(b)(1) & (2) Secondary Containment System Design, Installation, and Operation - *Secondary containment systems must be:*

> *(1) Designed, installed, and operated to prevent any migration of wastes or accumulated liquid out of the system to the soil, ground water, or surface water at any time during the use of the tank system; and*
>
> *(2) Capable of detecting and collecting releases and accumulated liquids until the collected material is removed*

Secondary containment for the Building 963 General Solvent Waste Tank system comprises of a 6'-6" deep concrete basin with 12" walls and a 14ga stainless steel liner. Multiple leak detectors are used to notify operators of any primary containment breaches. Alarm stations are manned at all times. Calculations verifying the size of the containment system are provided as an attachment.

193(c)(1) Compatibility with Waste; Strength and Thickness - *Secondary containment systems must be at a minimum constructed of or lined with materials that are compatible with the waste(s) to be placed in the tank system and must have sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrological forces), physical contact with the waste to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation (including stresses from nearby vehicular traffic);*

The secondary containment systems for the Building 963 General Solvent Waste Tank system comprises of 12" thick concrete with a 14 ga stainless steel liner. The expected wastes present are generally non-corrosive to stainless steel. In addition, stainless steel is used to stand up to exposure to an outdoor environment. In the event of the release to the secondary containment, the static head of the solvents contained will be a maximum of 6.5 feet which will be largely offset by soil pressure on the outside of the containment. The containment is not close enough to any roadways to expect any stress from vehicular traffic.

193(c)(2) Foundation - *Placed on a foundation or base capable of providing support to the secondary containment system and resistance to pressure gradients above and below the system and capable of preventing failure due to settlement, compression, or uplift*

The foundation and concrete portion of the secondary containment are one and the same. The foundation was designed and stamped by Knight Consulting Engineers in 1986. The loads on the

foundation are not anticipated to change as part of this project. There are no visible cracks or signs of settling in the concrete. The original concrete design is provided as an attachment.

193(c)(3) Leak Detection *- Provided with a leak detection system that is designed and operated so that it will detect the failure of either the primary and secondary containment structure or any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours, or at the earliest practicable time if the existing detection technology or site conditions will not allow detection of a release within 24 hours*

193(c)(4) Leak Collection and Removal *- Sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spills, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within 24 hours, or in as timely a manner as is possible to prevent harm to human health or the environment, if removal of the released waste or accumulated precipitation cannot be accomplished within 24 hours.*

The B963 General Solvent Waste Tank secondary containment is equipped with a leak detection sensor that alarms to the facility monitoring system which is manned 24 hours per day 365 days per year. The containment slopes to a sump at the west end from which spillage is removed using a vacuum truck.

193(d) Secondary Containment Device *- Secondary containment for tanks must include one or more of the following devices*

(1) A liner (external to the tank);
(2) A vault;
(3) A double-walled tank; or
(4) An equivalent device as approved by the Regional Administrator

A combined stainless steel/concrete liner system is used for containment of the B963 General Solvent Waste Tank.

RCRA requires certain standards to be met depending on the type of secondary containment provided. The standards for double-walled tanks are provided in 265.193(e)(3). EPA indicated at 53FR34084 that when a concrete liner is used, the vault standards provided in 265.193(e)(2) should be evaluated. Both the 264.193(e)(1) and 264.193(e)(2) standards are evaluated for the tank below.

External liner systems must be:

193(e)(1)(i) *- Designed or operated to contain 100 percent of the capacity of the largest tank within its boundary;*

The stainless steel and concrete containment system has more than 100 percent capacity of the tank stored within its boundary. Containment size calculations are provided in Attachment 4.

193(e)(1)(ii) *- Designed or operated to prevent run-on or infiltration of precipitation into the secondary containment system unless the collection system has sufficient excess capacity to contain run-on or infiltration. Such additional capacity must be sufficient to contain precipitation from a 25-year, 24-hour rainfall event.*

The tanks are located under cover and are not subject to run-on or precipitation.

193(e)(1)(iii) *- Free of cracks or gaps; and*

The stainless steel liner is fully welded and free of cracks or gaps.

193(e)(1)(iv) *- Designed and installed to surround the tank completely and to cover all surrounding earth likely to come into contact with the waste if the waste is released from the tank(s) (i.e., capable of preventing lateral as well as vertical migration of the waste).*

A release from the tank will fill the containment area to a depth of approximately 6.5 feet. The containment area has a total depth of 7.5 feet.

193(e)(2)(i) Containment Capacity *- Designed or operated to contain 100 percent of the capacity of the largest tank within its boundary*

Secondary containment capacity calculations for the tank is provided as an attachment.

193(e)(2)(ii) Prevention of Run-on and Precipitation Infiltration *- Designed or operated to prevent run-on or infiltration of precipitation into the secondary containment system unless the collection system has sufficient excess capacity to contain run-on or infiltration. Such additional capacity must be sufficient to contain precipitation from a 25-year, 24-hour rainfall event*

The tanks are located under cover and are not subject to run-on or precipitation infiltration.

193(e)(2)(iii) Water Stop Construction *- Constructed with chemical-resistant water stops in place at all joints (if any);*

Original design shows PVC water stops at concrete joints. In addition the fully welded stainless steel liner provides a moisture barrier with a high degree of reliability.

193(e)(2)(iv) Interior Coating *- Provided with an impermeable interior coating or lining that is compatible with the stored waste and that will prevent migration of waste into the concrete;*

Original design shows PVC water stops at concrete joints. In addition the fully welded stainless steel liner provides a moisture barrier with a high degree of reliability.

193 (e)(2)(v) Formation of and Ignition of Flammable Vapors *- Provided with a means to protect against the formation of and ignition of vapors within the vault, if the waste being stored or treated*

> *(A) Meets the definition of ignitable waste under §262.21 of this chapter, or*
> *(B) Meets the definition of reactive waste under §262.21 of this chapter and may form an ignitable or explosive vapor;*

The area below the roof is open to the atmosphere on all sides above the containment. This is considered to allow enough air flow to protect against the formation of vapors within the containment.

193(e)(2)(vi) Exterior Moisture Barrier *- Provided with an exterior moisture barrier or be otherwise designed or operated to prevent migration of moisture into the vault if the vault is subject to hydraulic pressure*

The existing basin design is stamped by a PE and is assumed to be designed for local conditions.

Section 193(e)(3), below, does not apply, as containment is not a double-walled tank.

193(e)(3)(i) Integral Structure *– Designed as an integral structure (i.e., an inner tank within an outer shell so that any release from the inner tank is contained by the outer shell.*

193(e)(3)(ii) Corrosion Protection *– Protected, if constructed of metal, from both corrosion of the primary tank interior and the external surface of the outer shell.*

193(e)3)(iii) Leak Detection *– Provided with a built-in, continuous leak detection system capable of detecting a release with 24 hours or at the earliest practicable time, if the owner or operator can demonstrate to the Regional Administrator, and the Regional Administrator concurs, that the existing leak detection technology or site condition will not allow detection of a release within 24 hours;*

193(f) Secondary Containment for Ancillary Equipment *- Ancillary equipment must be provided with full secondary containment (e.g., trench, jacketing, double-walled piping) that meets the requirements of paragraphs (b) and (c) of this section except for:*

(1) Aboveground piping (exclusive of flanges, joints, valves, and connections) that are visually inspected for leaks on a daily basis;

(2) Welded flanges, welded joints, and welded connections that are visually inspected for leaks on a daily basis;

(3) Sealless or magnetic coupling pumps and sealless valves, that are visually inspected for leaks on a daily basis; and

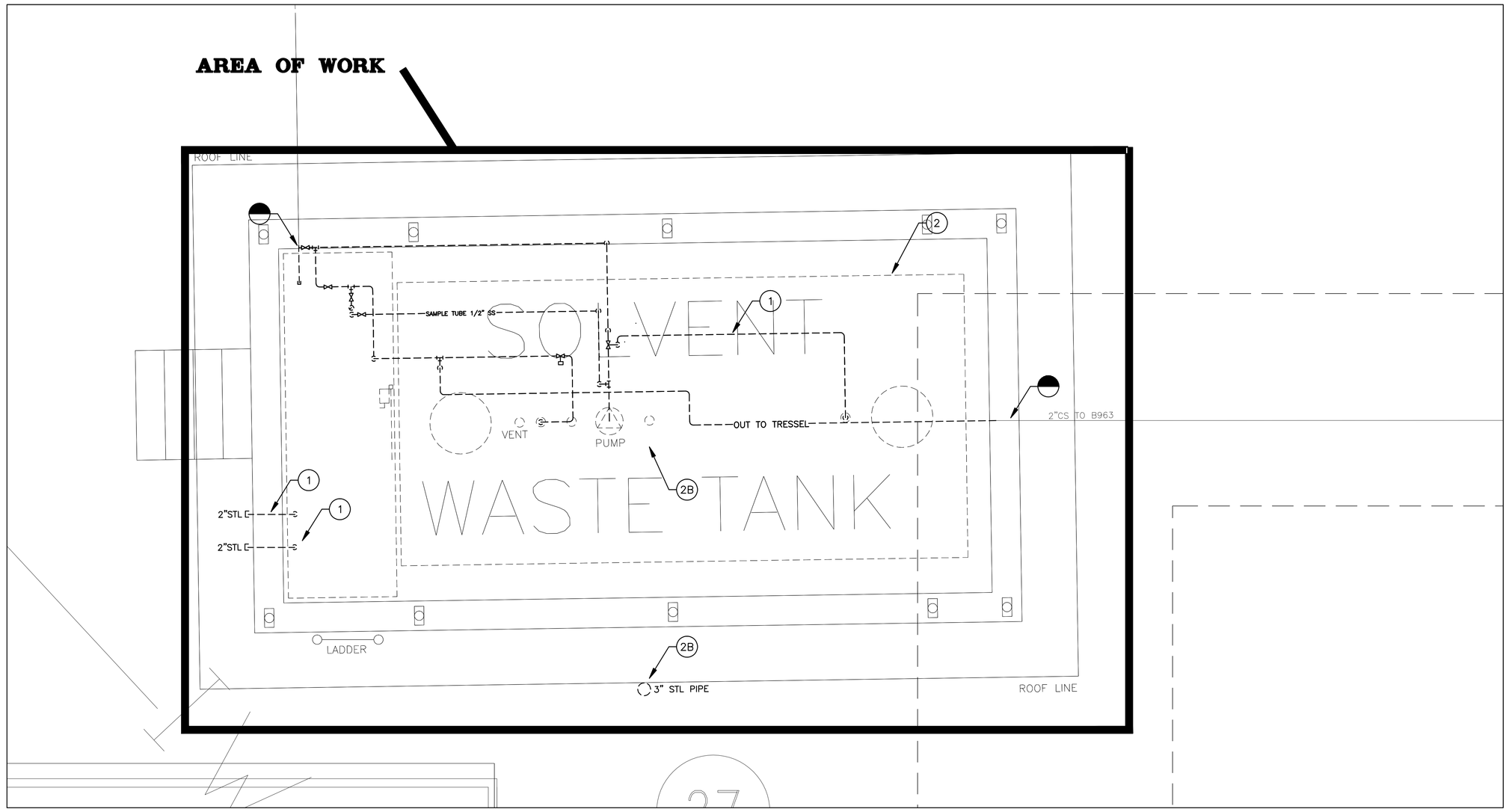
(4) Pressurized aboveground piping systems with automatic shut-off devices (e.g., excess flow check valves, flow metering shutdown devices, loss of pressure actuated shut-off devices) that are visually inspected for leaks on a daily basis.

All ancillary equipment is protected by the same containment basin as the tank. The primary conveyance piping is double walled and fully welded.

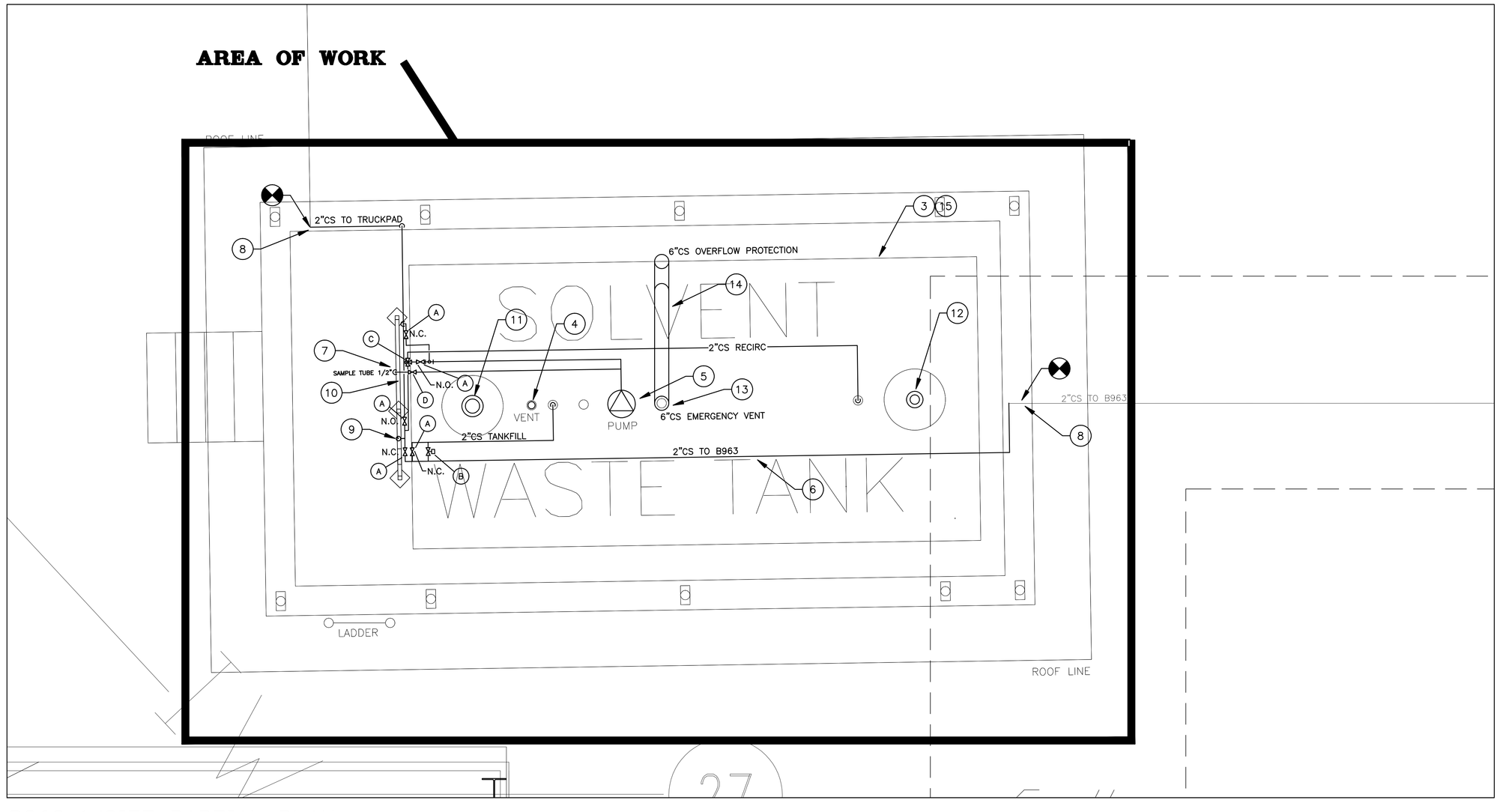
Attachment 1

Selected Design Drawings

Solvent Piping Demo/Installation	B963P-7000
Solvent Piping Demo/Installation	B963P-7001
Solvent Piping Detail Page	B963P-7600
Fire Protection	B963FP-7000



B963-1/SITE PARTIAL PLAN
PIPING DEMOLITION
SCALE: 1/2" = 1'-0"



B963-1/SITE PARTIAL PLAN
PIPING INSTALLATION
SCALE: 1/2" = 1'-0"

KEYED NOTES:

1 COORDINATE ALL WORK WITH IBM CHEM SERVICES. CONTACT PAUL CALLAHAN (2-2569). PROVIDE TEMPORARY TANK, MIN 4000 GALLON FOR DURATION OF WORK. SET UP IBM PROVIDED SECONDARY CONTAINMENT. FROM POINT OF DISCONNECTION ON SOLVENT LINE FROM B963, PROVIDE TEMPORARY 2" CS FILL LINE TO TEMPORARY TANK. FLUSH PIPING PRIOR TO DEMO. DISPOSE OF SOLVENT MATERIALS AS DIRECTED BY IBM. REMOVE PIPING INSULATION AND JACKET. HEAT TRACING TO BE REMOVED BY ELECTRICAL CONTRACTOR. REMOVE ALL PIPING CONNECTIONS TO TANK, REMOVE PIPING BACK AS INDICATED. TRANSPORT ALL REMOVED MATERIAL TO LOCATION AS DIRECTED BY IBM.

2 TANK ROOF STRUCTURE WILL BE REMOVED BY OTHERS. PUMP OUT SOLVENT TANK, REMOVE RESIDUAL MATERIAL, DECON IN PLACE ACCORDING TO IBM PROVIDED DECON PROCEDURE. REMOVE OUTER JACKET AND TANK INSULATION. ELECTRICAL CONTRACTOR TO REMOVE ALL HEAT TRACING. REMOVE TANK HOLD DOWN SUPPORTS FROM TANK. PROVIDE RIGGING TO REMOVE TANK, TRANSPORT BY TRUCK TO RECYCLING FACILITY AS DIRECTED BY IBM. CLEAN OUT VAULT AREA FROM WATER AND DEBRIS.

2B EXISTING UNDERGROUND 3" DRAIN TO BE FILLED WITH CONCRETE AND CAP WELDED TO 14 GA SS VAULT LINER (IF DRAIN UNDERNEATH IS OPEN TO LINER, THIS PIPE MAY GO ONLY TO KEYWAY UNDERNEATH SS LINER). , CUT 3" PIPE OUTSIDE CONTAINMENT AREA BELOW GROUND LEVEL, FILL WITH CONCRETE AND CAP.

3 PROVIDE 9' X 19', 9000 GALLON, STEEL, ABOVEGROUND SINGLE WALL TANK. REFER TO DETAIL 'C' SHEET B963P-7600, FOR CONNECTION LOCATIONS, AND DESIGNATIONS. PUMP OPENING MUST LINE UP WITH EXISTING ROOF HATCH FOR PUMP REMOVAL/INSTALLATION. PROVIDE WITH (2) 24" MANWAYS, (1) 10" FLANGE CONNECTIONS, (4) 4" FLANGE AND (1) 6" FLANGE CONNECTION. ALL CONNECTIONS TO BE FIELD MEASURED AND VERIFIED PRIOR TO ORDERING TO MATCH EXISTING TANK CONNECTION LOCATIONS. FLANGES TO BE ANSI CLASS 150. TANK TO BEAR UL-142 LABEL, HAVE (3) TANK SADDLES, SHIPPED LOOSE FOR FIELD INSTALLATION. TANK TO BE PRIMED WITH EPOXY PAINT. CONTACT MODERN WELDING COMPANY OF OHIO, INC (740) 344-9425. PROVIDE SUBMITTAL ON TANK PRIOR TO ORDERING. PROVIDE MANUFACTURERS PRESSURE TEST REPORT ON TANK TO IBM. WELD SADDLES ON TANK TO MATCH EXISTING SUPPORT BEAMS IN VAULT. TOUCH UP PRIMER ON WELD AREAS. COORDINATE WITH ELECTRICAL CONTRACTOR FOR HEAT TRACING. INSTALL 2" POLY-ISO INSULATION, AND ALUMINUM OUTER JACKET ON TANK. PROVIDE RIGGING TO PLACE TANK INTO VAULT. BOLT OR WELD SADDLES TO EXISTING W12 TANK SUPPORTS IN VAULT. INSTALL NEW HOLD DOWN PLATE STEEL ATTACHMENTS.

4 PROVIDE 2" CS VENT UP THROUGH STRUCTURE ROOF. PROVIDE PROTEGO COMBINATION FLAME ARRESTOR, PRESSURE AND VACUUM CONSERVATION VENT, REFER TO DETAIL 'A' SHEET B963P-7600 FOR MODEL NUMBER.

5 PROVIDE CRANE MODEL 4700 VERTICAL TURBINE PUMP. HEAD SIZE SDG 43-10. ALL IRON CONSTRUCTION WITH 316 SS LINE SHAFT, BABBIT GRAPHITE BEARINGS, MONEL SHAFT COLLARS, 316 SS BASKET STRAINER TO DUPLICATE EXISTING PUMP MATERIALS OF CONSTRUCTION. PUMP WILL BE 5 STAGE WITH 4.125" IMPELLERS AND WILL BE DRIVEN BY 3 HP, 1800 RPM, 230/460 VOLT, 3 PHASE, 60 HZ, EXPLOSION-PROOF, P-BASE MOTOR. PUMP DESIGN POINT (FOR PUMPING TO CDC VIA B963) IS 40 GPM @ 61 FT, HD. AT DESIGN POINT PUMP IS 71.5% EFFICIENT AND REQUIRES 1.5 FT. NPSH. PUMP LENGTH WILL BE 108" FROM BOTTOM OF DISCHARGE HEAD MOUNTING BASE TO BOTTOM OF SUCTION STRAINER. DISCHARGE HEAD WILL BE SUPPLIED TO MOUNT TO A 10" CLASS 150 ANSI FLANGE. PUMP DISCHARGE WILL BE 3" CLASS 125 ANSI FLANGE. CONTACT ROLFE INDUSTRIES (518) 383-2244. PROVIDE SUBMITTAL ON PUMP.

6 PROVIDE NEW CS PIPING (ASTM53 GRADE B) AS INDICATED WITH WELDED FITTINGS (PER ASTM A234). ANSI CLASS 150 FLANGE CONNECTIONS AT VALVES, AND AT CONNECTIONS TO TANK. PROVIDE VITON GASKETS AT FLANGE CONNECTIONS. PROVIDE PIPING SUPPORTS, UNISTRUT AND HARDWARE TO BE HOT DIPPED GALVANIZED. PROVIDE VALVES INDICATED ON PLAN REFER TO THE FOLLOWING:

A. SWAGELOK SERIES 60, 2" SS BODY, BUTT WELD CONNECTIONS, LOCKING HANDLE.
B. SWAGELOK SERIES 60, 2" SS BODY, BUTT WELD CONNECTIONS, PNEUMATIC ACTUATOR (90° ACTUATOR)
C. SWAGELOK SERIES 60, 3-WAY, 2" SS BODY, BUTT WELD CONNECTIONS, ~~THREADED CONNECTIONS,~~ PNEUMATIC ACTUATOR (180° ACTUATOR) THIS VALVE TO BE SET UP SUCH THAT THE NORMAL POSITION (NO AIR PRESSURE) IS PUMP RECIRC MODE.
D. SWAGELOK SERIES 60, 1/2" SS BODY, COMPRESSION CONNECTIONS, LOCKING HANDLE.

PROVIDE HANDLE EXTENSIONS FOR ALL VALVES FOR 2" INSULATION. INSULATE SOLVENT PIPING WITH 2" POLY-ISO INSULATION AND ALUMINUM OUTER JACKET. COORDINATE WITH ELECTRICAL CONTRACTOR FOR HEAT TRACING OF NEW SOLVENT PIPING PRIOR TO INSULATING. CS PIPING INSTALLED UNDER THIS PROJECT TO BE EPOXY PRIMED.

7 PROVIDE ¼"SS TUBING WITH VALVE AND THREADED CAP FOR SAMPLING.

8 MAKE CONNECTIONS TO EXISTING PIPING IN THESE LOCATIONS. THREAD EXISTING PIPE, INSTALL THREAD ON FLANGE FOR CONNECTION.

9 INSTALL 0-200 PRESSURE GAUGE WITH SWAGELOK 60 SERIES ¼"SS ISOLATION VALVE.

10 PROVIDE HOT DIPPED GALVANIZED UNISTRUT RACK FOR VALVE, CONTROL BOX, ELECTRICAL PANEL SUPPORT. COORDINATE WITH ELECTRICAL CONTRACTOR FOR MOUNTING REQUIREMENTS. USE ALL GALVANIZED HARDWARE ON RACK.

11 PROVIDE 6" FLANGED CONNECTION ON MANWAY COVER TO MOUNT HIGH LEVEL SENSOR. CUT HOLE IN COVER, WELD ON PIPE STUB AND FLANGE.

12 PROVIDE 4" FLANGED CONNECTION ON MANWAY COVER TO MOUNT TANK LEVEL SENSOR. CUT HOLE IN COVER, WELD ON PIPE STUB AND FLANGE.

13 PROVIDE 6" CS EMERGENCY VENT UP THROUGH ROOF. PROVIDE PROTECTOSEAL EMERGENCY RELIEF VENT. REFER TO DETAIL 'A' SHEET B963P-7600 FOR MODEL NUMBER.

14 PROVIDE 6"CS OVERFLOW PROTECTION PIPING WITH PROTECTOSEAL EMERGENCY RELIEF. REFER TO DETAIL 'A' SHEET B963P-7600 FOR MODEL NUMBER. OVERFLOW OUTLET TO BE 12" ABOVE TOP OF TANK. OVERFLOW TO BE OVER THE SECONDARY CONTAINMENT.

15 PERFORM PRESSURE TEST OF NEW PIPING AND TANK, PRIOR TO HEAT TRACE AND INSULATING, WITH PRESSURE RELIEF DEVICES REMOVED AND CAPPED. PRESSURE TEST WITH COMPRESSED AIR TO 4 PSI. UNDER NO CIRCUMSTANCES IS TANK TO BE PRESSURIZED OVER 4PSI. ENSURE SYSTEM HOLDS PRESSURE FOR 2 HRS. IF MORE THAN 0.5 PSI DROP DURING THAT TIME PERIOD, REPAIR AND RETEST UNTIL SYSTEM HOLDS.

GENERAL NOTES

A EACH CONTRACTOR SHALL BE RESPONSIBLE FOR SEALING AND FIRE STOPPING ALL PENETRATIONS PERFORMED WITHIN THE SCOPE OF THEIR WORK, INCLUDING, BUT NOT LIMITED TO SEALING/FIRE STOPPING FOR NEW PENETRATIONS AND SEALING/FIRE STOPPING AROUND NEW SERVICES THROUGH EXISTING PENETRATIONS.

B SURVEY OF EXISTING FIELD CONDITIONS SHALL BE PERFORMED PRIOR TO BID. ACCOMODATION OF EXISTING CONDITIONS IS REQUIRED TO PROVIDE COMPLETE, OPERATIONAL SYSTEMS AS DETAILED HEREIN.

C SPACE COORDINATION WITH OTHER TRADES SHALL BE PERFORMED DURING SHOP DRAWING DEVELOPMENT AND THROUGH CONSTRUCTION. SHOP DRAWINGS SHALL BE PREPARED AFTER REVIEW OF EXISTING SITE CONDITIONS. ANY INTERFERENCES WHICH CANNOT BE ACCOMODATED BY CONTRACTOR COORDINATION SHALL BE FLAGGED FOR EVALUATION BY ENGINEER / OWNER. ENGINEER'S REVIEW OF SHOP DRAWINGS IS REQUIRED PRIOR TO CONTRACTOR'S BEGINNING WORK.

D THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OF ANY AND ALL DAMAGE TO NEW OR EXISTING EQUIPMENT INSTALLED OR RELOCATED UNDER THIS CONTRACT. THIS SHALL INCLUDE ALL TOUCH UP PAINTING.

E THE CONTRACTOR SHALL REMOVE ALL DEBRIS RELATIVE TO THE RESPECTIVE TRADE AT THE END OF EACH WORK DAY AND PRACTICE GOOD HOUSEKEEPING.

F DO NOT SHUTDOWN ANY SERVICES WITHOUT APPROVAL FROM THE BUILDING COORDINATOR.

G ALL CEILING SPACE IN AND AROUND THE IMMEDIATE CONSTRUCTION AREA IS TO BE LEFT CLEAN OF ALL DIRT, DUST, & DEBRIS WHETHER GENERATED BY THIS CONTRACT OR LEFT BY OTHERS UNDER OTHER CIRCUMSTANCES.

H THE CONTRACTOR SHALL IMMEDIATELY STOP ALL WORK IF SUSPECT MATERIALS ARE IDENTIFIED WHICH MAY CONTAIN ASBESTOS FIBERS.

I THE CONTRACTOR SHALL REMOVE AND REPLACE ANY FLOOR TILES DAMAGED OR SPOILED UNDER THIS CONTRACT AS PER IBM SPEC. 02072-1 & 01800-5 TO MATCH EXISTING.

J CONTRACTOR SHALL REWORK EXISTING SUPPORTS AS REQUIRED TO FACILITATE THE INSTALLATION OF PIPING, DUCTWORK, AND EQUIPMENT IN THIS PACKAGE.

K. INSTALL SOLVENT WASTE PIPING PER BFS 15410-9.

L. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OF ANY AND ALL DAMAGE TO NEW OR EXISTING EQUIPMENT INSTALLED OR RELOCATED UNDER THIS CONTRACT. THIS SHALL INCLUDE ALL TOUCH UP PAINTING.

CH2MHILL
IDC
Pittsburgh Office
Cherrington Corporate Center
200 Corporate Center Dr, Suite 200
Moon Township, PA 15108

ANY CHANGES AFTER SIGN-OFF MAY IMPACT PROJECT SCHEDULE

SIGN-OFF	SIGNATURE	DATE
EQUIPMENT OWNER 1		
EQUIPMENT OWNER 2		
PLANNING		
PROJECT MANAGER		
SAFETY		
FACILITY OWNER		
FACILITY OWNER		
FACILITY OWNER		
OTHER		
OTHER		
OTHER		

IF CHEMICALS ARE TO BE USED ON IBM PREMISES, A COMPLETE LISTING OF SAID CHEMICALS MUST BE SUBMITTED TO THE ENGINEER PRIOR TO COMMENCEMENT OF WORK. SUBMISSION OF MSDS (MATERIAL SAFETY DATA SHEETS) WILL BE REQUIRED FOR CHEMICALS NOT IDENTIFIED ON THE MOST CURRENT IBM APPROVED LISTING.

THIS DOCUMENT IS THE PROPERTY OF IBM, CORP. ITS USE IS AUTHORIZED ONLY FOR A REQUEST FOR QUOTATION OR FOR THE PERFORMANCE OF WORK FOR IBM. REFER QUESTIONS TO THE IBM PURCHASING DEPARTMENT.

REVISIONS

REV#	DATE	DESCRIPTION
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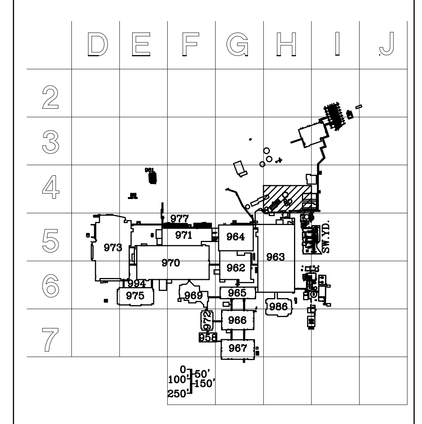
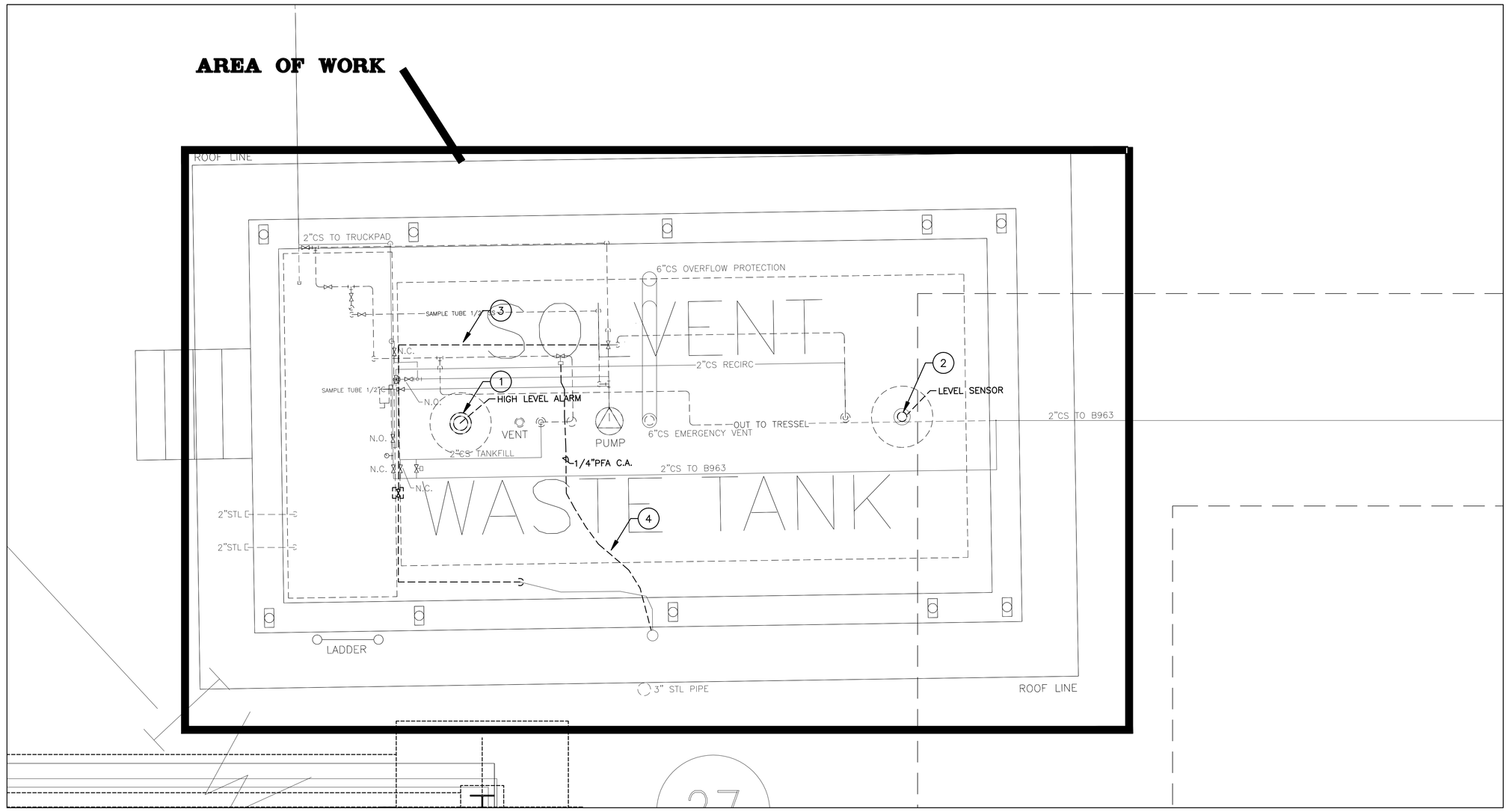
0	07/25/08	ISSUE FOR BID

KEY PLAN

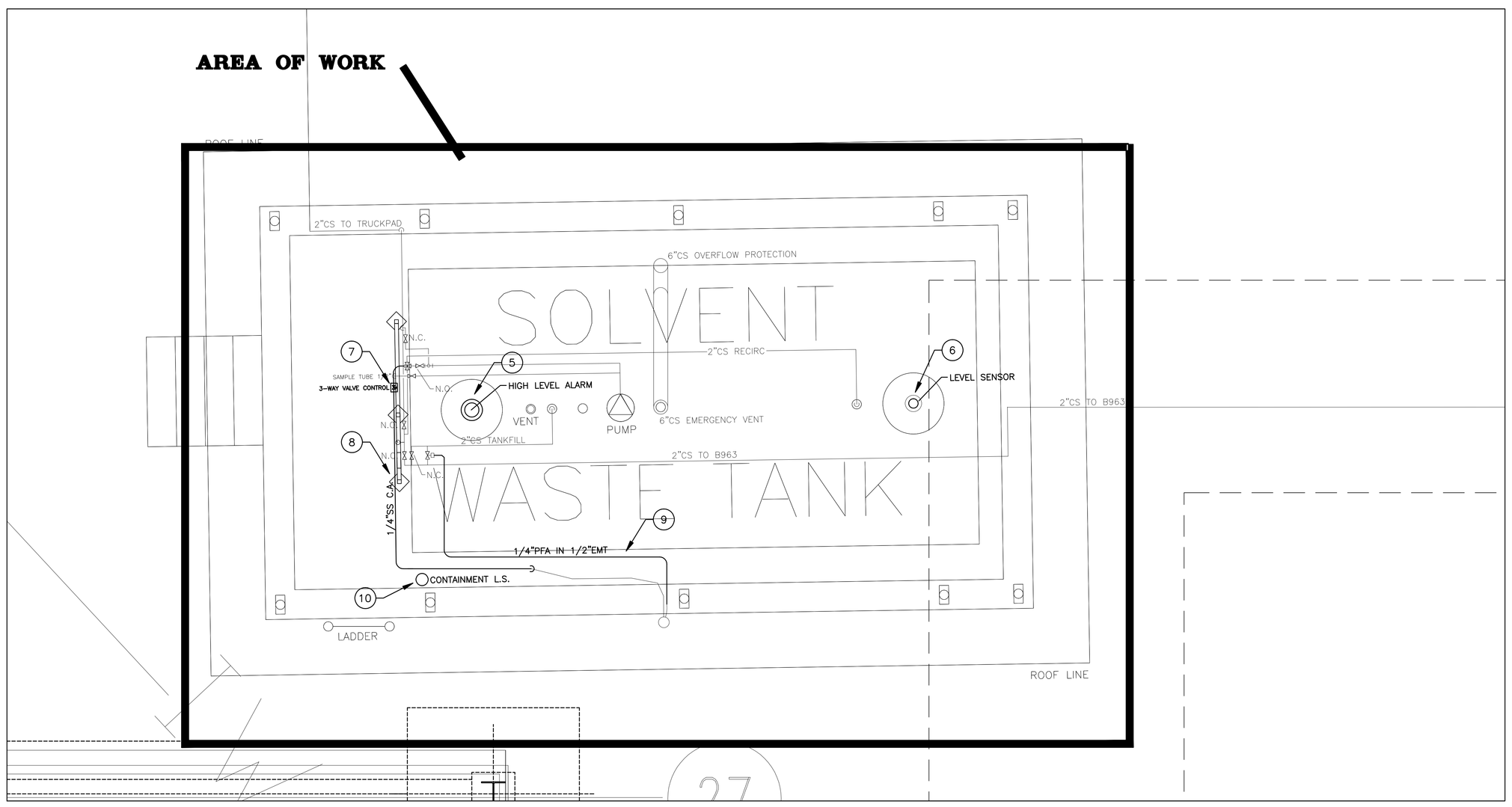


IBM MICROELECTRONICS DIVISION
BURLINGTON, VERMONT

PROJECT NAME:	REPLACE NORTH SOLVENT TANK SOLVENT PIPING DEMO/INSTALLATION
PROJECT#:	BTV080326091555-010198
COORDINATOR: ----	PAGE: ----
PROJECT LEADER: LARRY RIEGERT	PHONE: 6-2635
DESIGNER: CLINT CALDERWOOD	PHONE: 6-1152
DATE: 04/29/08	DRAWING NAME: B963P-7000
IDC #: 000000.01	TOOLS: N/A



B963-1/SITE PARTIAL PLAN
PIPING DEMOLITION
SCALE: 1/2" = 1'-0"



B963-1/SITE PARTIAL PLAN
PIPING INSTALLATION
SCALE: 1/2" = 1'-0"

KEYED NOTES:

1 COORDINATE ALL WORK WITH IBM CHEM SERVICES. CONTACT PAUL CALLAHAN (2-2569). REMOVE HIGH LEVEL SENSOR. REMOVE CABLE BACK TO GROUND PENETRATION CONDUIT. SENSOR TO BE REUSED PER INSTALL. COIL AND PROTECT CABLE DURING CONSTRUCTION WORK.

2 REMOVE TANK LEVEL SENSOR. REMOVE CABLE BACK TO GROUND PENETRATION CONDUIT. COIL AND PROTECT CABLE DURING CONSTRUCTION WORK.

3 REMOVE CONTROL AIR SS TUBING AS INDICATED. REMOVE CONTROL AIR VALVE. CAP CA SOURCE AND PROTECT TUBING DURING CONSTRUCTION WORK.

4 REMOVE 1/4"PFA TUBING FROM CONTROL AIR VALVE. CAP TUBING, COIL AND PROTECT DURING CONSTRUCTION.

5 INSTALL HIGH LEVEL SENSOR WITH VITON GASKET. PROVIDE CONDUIT, INSTALL CABLE TO SENSOR. PROVIDE FLEX CONDUIT TO FINAL SENSOR CONNECTION. EXPLOSION PROOF CONDUIT AND FITTINGS.

6 PROVIDE TANK LEVEL SENSOR: SETUP FOR 9'ø TANK

MAGNETROL PRODUCTS:

705-510A-110 ECLIPSE GUIDED WAVE RADAR LEVEL TRANSMITTER

X7E7-A630-011 GUIDED WAVE RADAR TWIN ELEMENT FLEXIBLE PROBE

INSTALL SENSOR INTO 4" FLANGE FITTING WITH VITON GASKET. PROVIDE CONDUIT, INSTALL CABLE TO NEW SENSOR. PROVIDE FLEX SECTION TO FINAL SENSOR LOCATION. EXPLOSION PROOF CONDUIT AND FITTINGS.

7 PROVIDE HOFFMAN BOX A865JFGQRR, FIBERGLASS ENCLOSURE WITH QUICK RELEASE LATCHES. MOUNT AIR CONTROL LEVER, MOUNT ENCLOSURE TO RACK 48" GRATE FLOOR. LABEL BOX '3-WAY VALVE CONTROL'

8 PROVIDE 1/4" SS SWAGELOK TUBING TO CONTROL BOX, AND FROM CONTROL BOX TO VALVE ACTUATOR. PROVIDE 3-WAY, MANUAL RETURN AIR VALVE, MCMASTER-CARR 6464K17 OR EQUIVALENT. 3-WAY VALVE SHOULD BE NORMALLY POSITIONED SUCH THAT NORMAL POSITION(NO APPLIED PRESSURE) IS RECIRC MODE.

9 INSTALL 1/4" PFA TUBING TO VALVE ACTUATOR.

10 RE-SUPPORT EXISTING LEAK SENSOR, RE-SUPPORT EXISTING CONDUIT AS REQUIRED.

GENERAL NOTES

A EACH CONTRACTOR SHALL BE RESPONSIBLE FOR SEALING AND FIRE STOPPING ALL PENETRATIONS PERFORMED WITHIN THE SCOPE OF THEIR WORK, INCLUDING, BUT NOT LIMITED TO SEALING/FIRE STOPPING FOR NEW PENETRATIONS AND SEALING/FIRE STOPPING AROUND NEW SERVICES THROUGH EXISTING PENETRATIONS.

B SURVEY OF EXISTING FIELD CONDITIONS SHALL BE PERFORMED PRIOR TO BID. ACCOMODATION OF EXISTING CONDITIONS IS REQUIRED TO PROVIDE COMPLETE, OPERATIONAL SYSTEMS AS DETAILED HEREIN.

C SPACE COORDINATION WITH OTHER TRADES SHALL BE PERFORMED DURING SHOP DRAWING DEVELOPMENT AND THROUGH CONSTRUCTION. SHOP DRAWINGS SHALL BE PREPARED AFTER REVIEW OF EXISTING SITE CONDITIONS. ANY INTERFERENCES WHICH CANNOT BE ACCOMODATED BY CONTRACTOR COORDINATION SHALL BE FLAGGED FOR EVALUATION BY ENGINEER / OWNER. ENGINEER'S REVIEW OF SHOP DRAWINGS IS REQUIRED PRIOR TO CONTRACTOR'S BEGINNING WORK.

D THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OF ANY AND ALL DAMAGE TO NEW OR EXISTING EQUIPMENT INSTALLED OR RELOCATED UNDER THIS CONTRACT. THIS SHALL INCLUDE ALL TOUCH UP PAINTING.

E THE CONTRACTOR SHALL REMOVE ALL DEBRIS RELATIVE TO THE RESPECTIVE TRADE AT THE END OF EACH WORK DAY AND PRACTICE GOOD HOUSEKEEPING.

F DO NOT SHUTDOWN ANY SERVICES WITHOUT APPROVAL FROM THE BUILDING COORDINATOR.

G ALL CEILING SPACE IN AND AROUND THE IMMEDIATE CONSTRUCTION AREA IS TO BE LEFT CLEAN OF ALL DIRT, DUST, & DEBRIS WHETHER GENERATED BY THIS CONTRACT OR LEFT BY OTHERS UNDER OTHER CIRCUMSTANCES.

H THE CONTRACTOR SHALL IMMEDIATELY STOP ALL WORK IF SUSPECT MATERIALS ARE IDENTIFIED WHICH MAY CONTAIN ASBESTOS FIBERS.

I THE CONTRACTOR SHALL REMOVE AND REPLACE ANY FLOOR TILES DAMAGED OR SPOILED UNDER THIS CONTRACT AS PER IBM SPEC. 02072-1 & 01800-5 TO MATCH EXISTING.

J CONTRACTOR SHALL REWORK EXISTING SUPPORTS AS REQUIRED TO FACILITATE THE INSTALLATION OF PIPING, DUCTWORK, AND EQUIPMENT IN THIS PACKAGE.

K. INSTALL SOLVENT WASTE PIPING PER BFS 15410-9.

L. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OF ANY AND ALL DAMAGE TO NEW OR EXISTING EQUIPMENT INSTALLED OR RELOCATED UNDER THIS CONTRACT. THIS SHALL INCLUDE ALL TOUCH UP PAINTING.

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IDC
Pittsburgh Office
Cherrington Corporate Center
200 Corporate Center Dr. Suite 200
Moon Township, PA 15108

ANY CHANGES AFTER SIGN-OFF MAY IMPACT PROJECT SCHEDULE

SIGN-OFF	SIGNATURE	DATE
EQUIPMENT OWNER 1		
EQUIPMENT OWNER 2		
PLANNING		
PROJECT MANAGER		
SAFETY		
FACILITY OWNER		
FACILITY OWNER		
FACILITY OWNER		
OTHER		
OTHER		
OTHER		

IF CHEMICALS ARE TO BE USED ON IBM PREMISES, A COMPLETE LISTING OF SAID CHEMICALS MUST BE SUBMITTED TO THE ENGINEER PRIOR TO COMMENCEMENT OF WORK. SUBMISSION OF MSDS (MATERIAL SAFETY DATA SHEETS) WILL BE REQUIRED FOR CHEMICALS NOT IDENTIFIED ON THE MOST CURRENT IBM APPROVED LISTING.

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REVISIONS

REV#	DATE	DESCRIPTION
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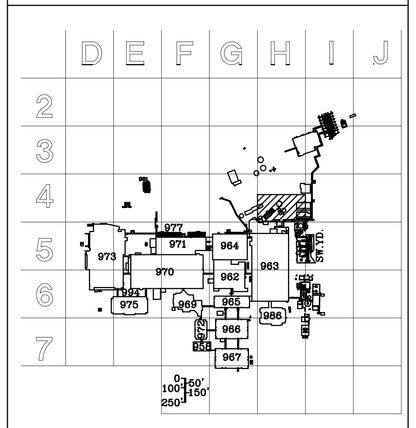
0	07/25/08	ISSUE FOR BID

KEY PLAN



IBM MICROELECTRONICS DIVISION
BURLINGTON, VERMONT

PROJECT NAME: REPLACE NORTH SOLVENT TANK SOLVENT PIPING DEMO/INSTALLATION

PROJECT#: BTV080326091555-010198

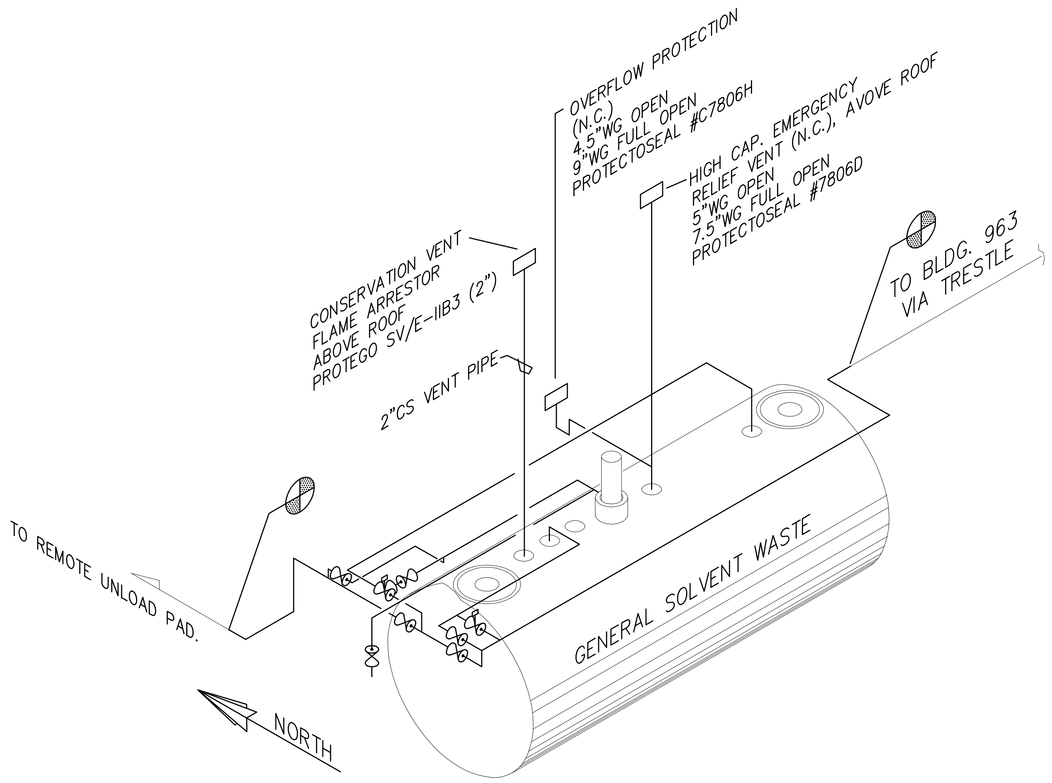
COORDINATOR: ----- PAGE: ----

PROJECT LEADER: LARRY RIEGERT PHONE: 6-2635

DESIGNER: CLINT CALDERWOOD PHONE: 6-1152

DATE: 04/29/08 DRAWING NAME: B963P-7001

IDC #: 000000.01 TOOLS: N/A



DETAIL "A"
NORTH TANK

NTS

FITTING SCHEDULE

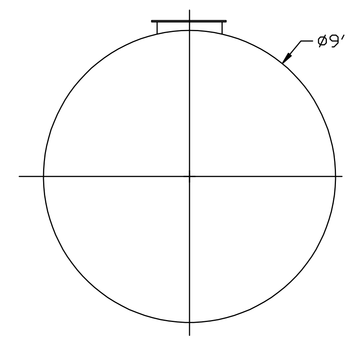
A= 4" ANSI CLASS 150 FLANGE
B= 24" MANHOLE
C= 10"ø CLASS 150 FLANGE
D= 6"ø CLASS 150 FLANGE

① TANK RESTRAINT LOCATIONS (FIELD INSTALLED)
② TANK SUPPORT LOCATIONS (FIELD INSTALLED)

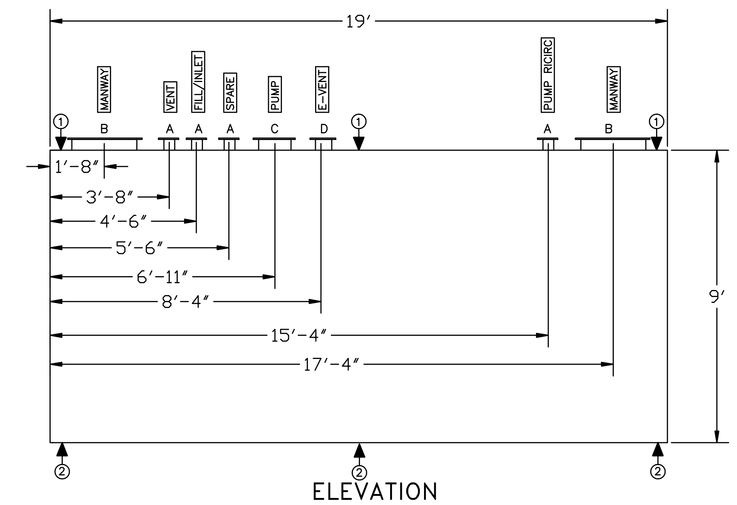
GENERAL NOTES

CAPACITY : 9000 GALLONS
TYPE : SINGLE WALL, ABOVEGROUND HORIZONTAL
NO. REQ. : 1
MATERIAL : MILD CARBON STEEL
TEST : 5 P.S.I.
MIN. GAUGE OR THICKNESS (PER U.L. 142):
HEADS : 5/16"
SHELL : 1/4"
PAINT :
INTERIOR : NONE
EXTERIOR : EPOXY PRIMER
CONSTRUCTION : FLAT FLANGED HEADS, LAP WELD ALL EXTERIOR SEAMS ONLY
APPROVED LABELS : U.L. 142
OPERATING PRESSURE: 0.5 PSI
FOR STORAGE OF SOLVENT WASTE, CLASS II

PROVIDE (3) SADDLES, SHIPPED LOOSE



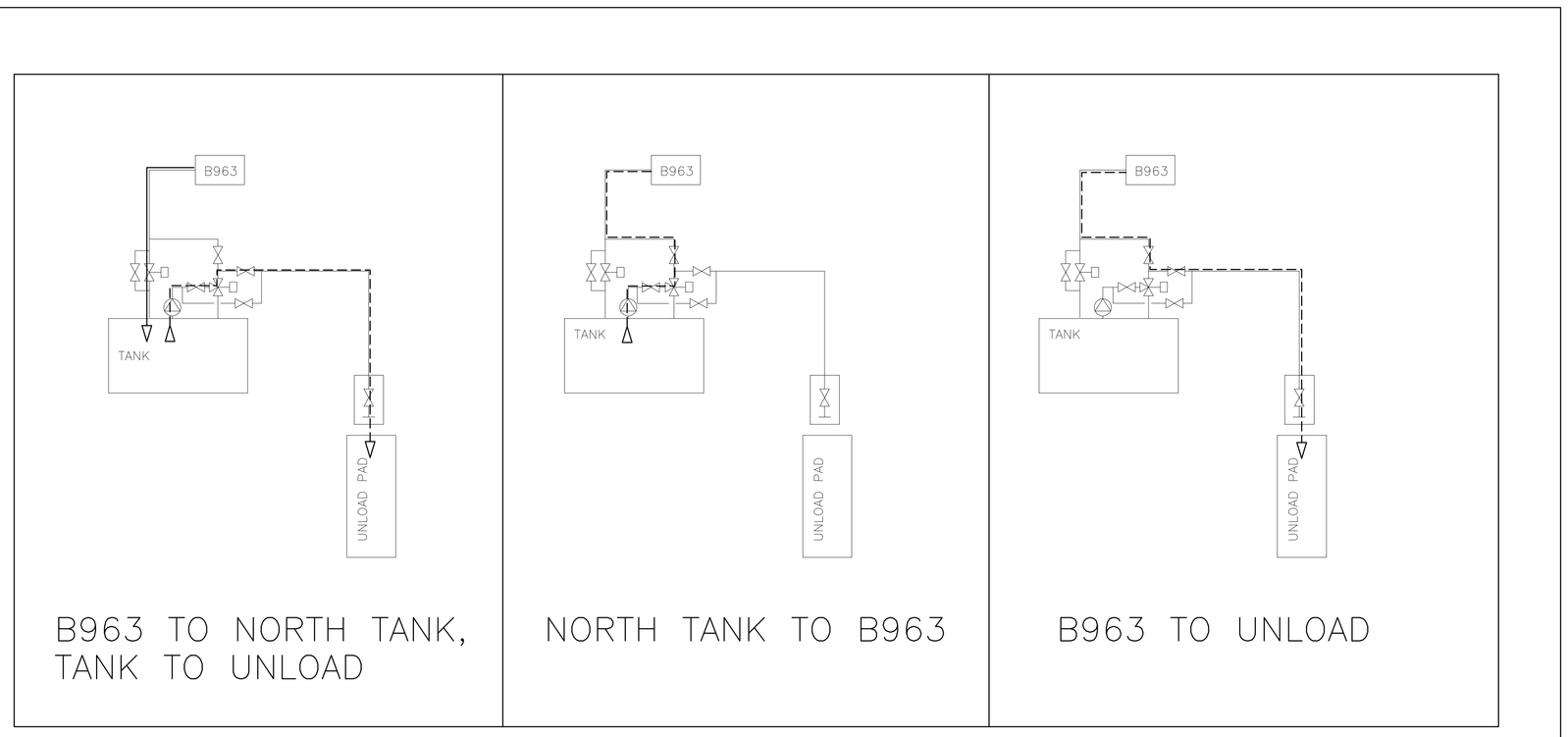
END VIEW



ELEVATION

(C) SOLVENT TANK

SCALE: NONE



B963 TO NORTH TANK, TANK TO UNLOAD

NORTH TANK TO B963

B963 TO UNLOAD

(B) SOLVENT FLOW SCHEMATIC

SCALE: NONE

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Cherrington Corporate Center
200 Corporate Center Dr., Suite 200
Moon Township, PA 15108

ANY CHANGES AFTER SIGN-OFF MAY IMPACT PROJECT SCHEDULE

SIGN-OFF	SIGNATURE	DATE
EQUIPMENT OWNER 1		
EQUIPMENT OWNER 2		
PLANNING		
PROJECT MANAGER		
SAFETY		
FACILITY OWNER		
FACILITY OWNER		
FACILITY OWNER		
OTHER		
OTHER		
OTHER		

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REVISIONS

REV#	DATE	DESCRIPTION
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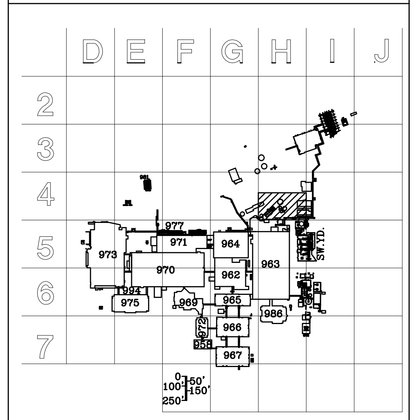
0	07/25/08	ISSUE FOR BID

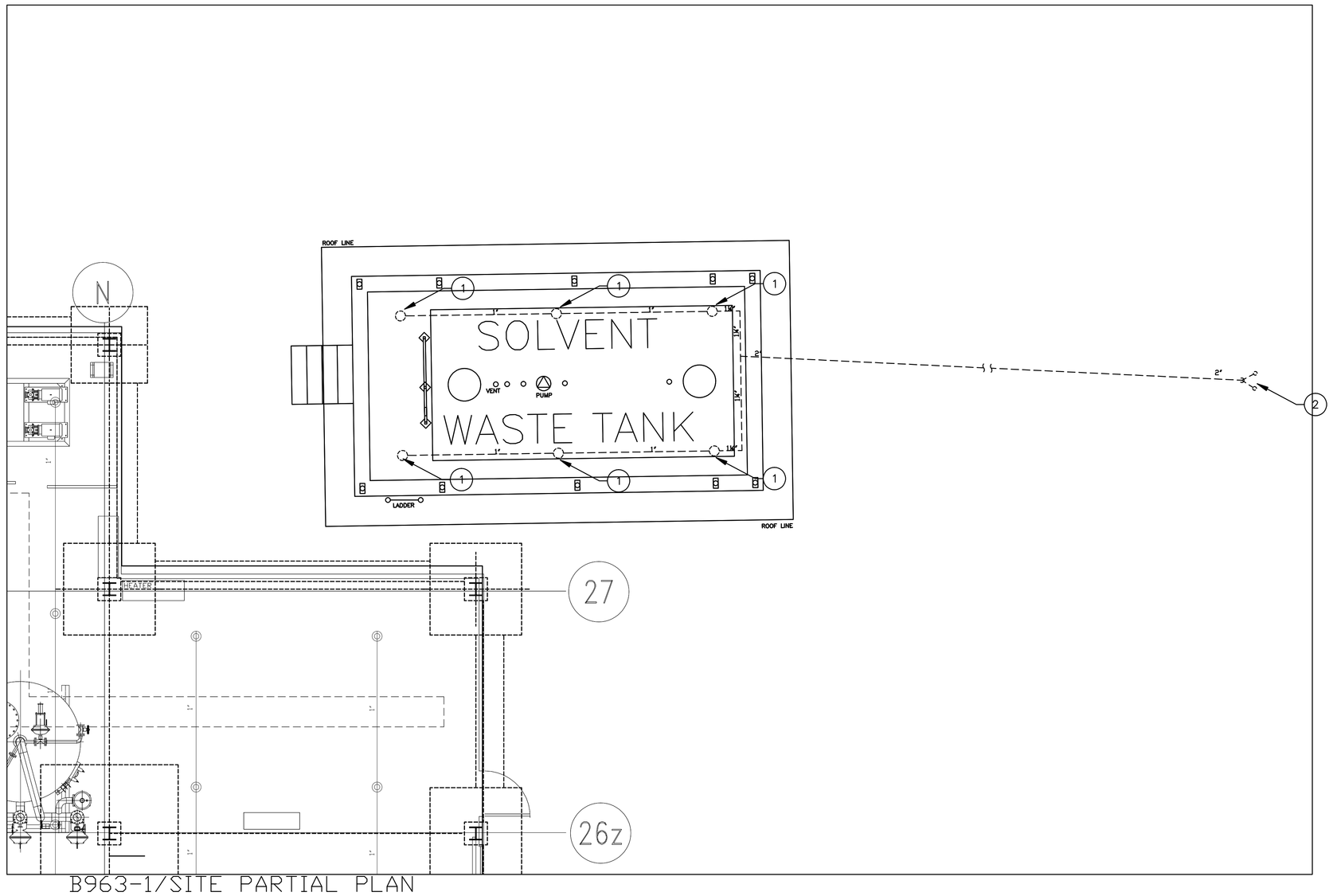
KEY PLAN



IBM MICROELECTRONICS DIVISION
BURLINGTON, VERMONT

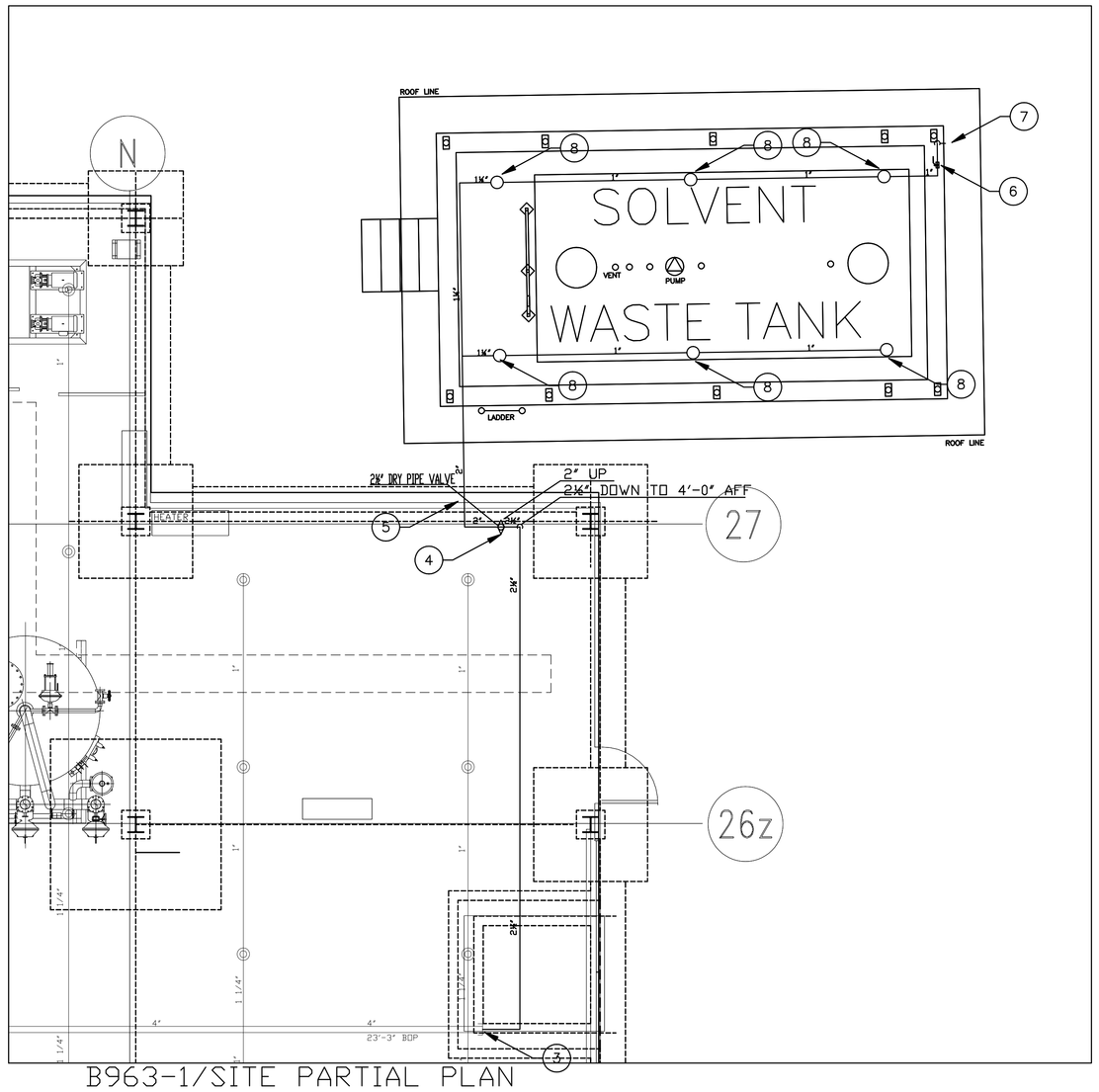
PROJECT NAME: REPLACE NORTH SOLVENT TANK
SOLVENT PIPING
DETAIL PAGE

PROJECT#: BTV080326091555-010198
COORDINATOR: ----
PAGE: ----
PROJECT LEADER: LARRY RIEGERT
PHONE: 6-2635
DESIGNER: CLINT CALDERWOOD
PHONE: 6-1152
DATE: 04/29/08
DRAWING NAME: B963P-7600
IDC #: 000000.01
TOOLS: N/A



B963-1/SITE PARTIAL PLAN
PROPOSED SPRINKLER DEMOLITION

SCALE: 1/4" = 1'-0"



B963-1/SITE PARTIAL PLAN
PROPOSED SPRINKLER INSTALLATION

SCALE: 1/4" = 1'-0"

KEYED NOTES:

1. DEMOLISH EXISTING SPRINKLER HEADS AS SHOWN.

2. DEMOLISH ALL EXISTING SPRINKLER PIPING INCLUDING EXISTING FIRE DEPARTMENT CONNECTION AS SHOWN.

3. MAKE NEW 2½" CONNECTION TO EXISTING 4" PIPE MAIN AT APPROXIMATELY 23'-6" AFF.

4. INSTALL NEW 2½" GATE VALVE AND DRY PIPE VALVE WITH ALL NECESSARY TRIM. DRY PIPE SYSTEM AIR IS TO BE SUPPLIED FROM BUILDING AIR SYSTEM. SYSTEM VOLUME IS APPROXIMATELY 6 GALLONS. WIRE TAMPER SWITCH FOR CONTROL VALVE AND PRESSURE SWITCH FOR DRY PIPE VALVE TO BUILDING ALARM SYSTEM. REDUCE TO 2" AT TOP OF DRY PIPE VALVE AND PIPE OUT TO TANK ROOF.

5. PROVIDE FLEXIBLE FITTING AT PENETRATION THROUGH BUILDING WALL TO ALLOW FOR INDEPENDENT MOVEMENT OF THE TWO BUILDINGS. SEAL PENETRATION THROUGH BUILDING EXTERIOR WALL.

6. INSTALL INSPECTORS TEST AND DRAIN VALVE AT APPROXIMATELY 6'-0" AFF.

7. DIRECT DISCHARGE FROM INSPECTORS TEST AND DRAIN THROUGH 45° ELBOW TURNED DOWN TOWARD A CONCRETE PAD OR PAVER (SUPPLIED BY OWNER) TO PREVENT EROSION OF SURROUNDING SOIL.

8. INSTALL NEW STANDARD RESPONSE, 212° F RATED, UPRIGHT SPRINKLER HEADS WITH BRASS FINISH WITHIN 12 INCHES OF ROOF DECK. (TYPICAL OF 6)

GENERAL NOTES:

1. SURVEY EXISTING FIELD CONDITIONS PRIOR TO BID.

2. ALL CONSTRUCTION ACTIVITIES SHALL BE IN CONFORMANCE WITH THE BFS AND ALL APPLICABLE LOCAL, STATE, AND NATIONAL CODES.

3. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO MAINTAIN A SAFE AND CLEAN WORK ENVIRONMENT. REMOVE ALL DEBRIS AT THE END OF EACH WORK DAY AND PRACTICE GOOD HOUSEKEEPING.

4. AUTOMATIC SPRINKLER SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH BFS SECTION 15325-1, NFPA 13 AND FM DATA SHEET 2-8N.

5. AUTOMATIC SPRINKLER PIPE SHALL BE SEISMICALLY BRACED IN ACCORDANCE WITH NFPA 13 AND SPECIFICATION SECTION 01500.

6. THE AREA OF WORK MAY BE SERVED BY SEVERAL DIFFERENT SPRINKLER SYSTEMS SO SPECIAL CARE SHALL BE TAKEN TO INSURE THAT THE CORRECT SPRINKLER SYSTEM HAS BE SHUT DOWN AND DRAINED BEFORE WORKING ON EXISTING SPRINKLER SYSTEMS. (CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE CAUSED BY IMPROPER SHUT DOWN OF SPRINKLER SYSTEMS.)

7. NEW AND EXISTING SPRINKLER PIPING IN AREA OF WORK SHALL BE ADEQUATELY LABELED TO INDICATE THE SPRINKLER SYSTEM IT IS SUPPLIED BY.

8. ONLY ONE SPRINKLER SYSTEM SHALL BE OUT OF SERVICE AT A TIME AND SYSTEMS SHALL NOT BE LEFT OUT OF SERVICE UNATTENDED.

9. CONTRACTOR SHALL PROVIDE AS-BUILT DRAWINGS AT THE COMPLETION OF THE JOB TO BE TURNED INTO THE IBM COORDINATOR FOR UPDATING THE MASTER FILES.

10. DRY SYSTEM SPRINKLER PIPE SHALL BE ADEQUATELY PITCHED TO ALLOW PROPER DRAINAGE. SPRINKLER MAINS SHALL BE PITCHED ¼" PER 10 FEET AND BRANCHLINES SHALL BE PITCHED ⅛" PER 10 FEET.

11. DRY SYSTEM SPRINKLER PIPE SHALL BE GALVANIZED BOTH INTERNALLY AND EXTERNALLY.

12. INSPECTORS TEST AND DRAIN DISCHARGE SHALL BE PIPED TO DISCHARGE ONTO A CONCRETE PAD OR SIMILAR OBJECT TO AVOID ANY EROSION OF THE FRAGILE GROUND SURFACE.

CHASE ENGINEERING
40 OVERLAKE DRIVE
MILTON, VT 05468
(802) 893-7900

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IDC
Pittsburgh Office
Cherrington Corporate Center
200 Corporate Center Dr, Suite 200
Moon Township, PA 15108

ANY CHANGES AFTER SIGN-OFF MAY IMPACT PROJECT SCHEDULE

SIGN-OFF	SIGNATURE	DATE
EQUIPMENT OWNER 1		
EQUIPMENT OWNER 2		
PLANNING		
PROJECT MANAGER		
SAFETY		
FACILITY OWNER		
FACILITY OWNER		
FACILITY OWNER		
OTHER		
OTHER		
OTHER		

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REVISIONS

REV#	DATE	DESCRIPTION
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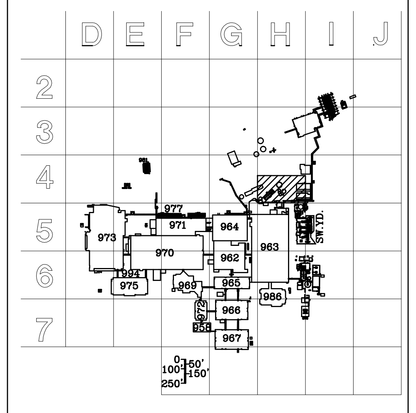
0	07/25/08	ISSUE FOR BID

KEY PLAN



IBM MICROELECTRONICS DIVISION
BURLINGTON, VERMONT

PROJECT NAME: REPLACE NORTH SOLVENT TANK FIRE PROTECTION

C:\CE Project\Autocad\VT Sign and Seal.tif

PROJECT#: BTV080326091555-010198	
COORDINATOR: ----	PAGE: ----
PROJECT LEADER: LARRY RIEGERT	PHONE: 6-2635
DESIGNER: MATT CHASE	PHONE: 893-7900
DATE: 04/29/08	DRAWING NAME: B963FP-7000
IDC #: 000000.01	TOOLS: N/A

Attachment 2

Vendor Submittal for Solvent Waste Tank

Rev. 0
11/14/2008

pizzagalli construction company
Mail Stop 966-A, Dept. NU4-A
1000 River Road
Essex Junction, VT 05452
T: (802) 769-9367
F: (802) 769-9400
E : gdiminick@pizzagalli.com

IBM Microelectronics
Essex Junction, Vermont
2008 Recurring Work
PCM Project 12709

Submittal Cover Sheet 7

Primary Submittal Information

Project	500005	Dated	9/19/2008	Type	Material Submittal
Submittal #	7	Due	9/22/2008		
Review Cycle	Original	Resub.	☐	Priority	High

Sent To For Review	Responsible Subcontractor or Vendor	Manufacturer
Mr. Larry Riegert IBM 1000 River Road Essex Jct., VT 05452	Mr. Carlton Cook Peck Mechanical Vendor #87298 4050 Williston Rd, Suite 511 South Burlington, VT 05403	Modern Welding Co. of Ohio

References

Site	Main Facility	System	Piping
Building	B963	Doc 1	
Area	Central Utilities Plant	Doc 1 Note	374689.01
Floor		Doc 2	
Room		Doc 2 Note	

Item Being Submitted

B963 North Solvent Tank Replacement -
New Solvent Waste Tank

Reviewed By:

Contractor's Review Stamp

I hereby certify that I have examined the enclosed submittal(s) and have determined and verified all field measurements, construction criteria, materials, calalog numbers and similar data, coordinated the submittal(s) with other submissions and the work of other trades and contractor's, and to the best of my knowledge and belief, the enclosed submittal(s) is/are in full compliance with the Contract requirements, except as follows or noted above:

Architect's Review Stamp

☒ **NO EXCEPTIONS NOTED**
☐ **MAKE CORRECTIONS NOTED**
☐ **REVISE AND RESUBMIT**
☐ **SUBMIT ITEMS AS NOTED**

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any Action shown is subject to the requirements of the plans and specifications. Contractor is responsible for: dimensions which shall be confirmed and correlated at the jobsite, fabrication processes and techniques of construction, coordination of the work with that of all other trades and the satisfactory performance of the work.

By: Chinlen Gilderwood
Dated: 9/19/08

CH2MHILL
IDC

Phone: 802-658-3378 x 230
Fax: 802-658-3527
carlton@peckelectric.com

Submittal Cover Sheet

Primary Submittal Information

Project:	B963 Solvent Waste Tank Replacement
Number:	BP#500005
Review Cycle:	Original
Dated:	9/18/2008
Due Back:	**ASAP**
Type:	Product Data
Priority:	High

Reference Data

Doc 1:	B963P-7600	Site:	IBM
Doc 2:		Building:	963
		Area:	CUP
Tag:	N/A	Floor:	1
System:	Solvent Waste Tank	Room:	

Subcontract or Vendor

Modern Welding Company

Manufacturer

Modern Welding Company

Item Being Submitted

Steel Tank

Peck Review Comments and Notes

Peck Review Clause

I hereby certify that I have examined the enclosed submittal(s) 1 and have determined and verified all field measurements, construction criteria, materials, catalog numbers and similar data, coordinated the submittal(s) with other submissions and the work of other trades and contractor's, and to the best of my knowledge and belief, the enclosed submittal(s) is/are in full compliance with the Contract requirements, except as follows or noted above:

Architect's Review

19'-0"(228"±)

8'-4"
6'-11"
5'-6"
4'-6"
3'-8""
1'-1"

3'-8""
1'-1"

B1 A1 A2 A3 C D A4 B2

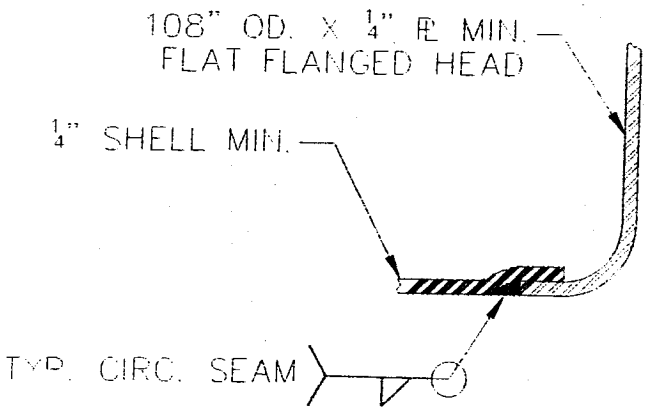
60" 60"

typ

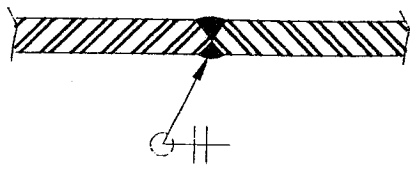
108" O.D.

87" 87"

—(3) STANDARD SADDLI
TRIAL FIT & SHIP LOO



DETAIL @ PRIMARY CIRC. SEAM



TYP. PRI. LONG'T WELD SEAM

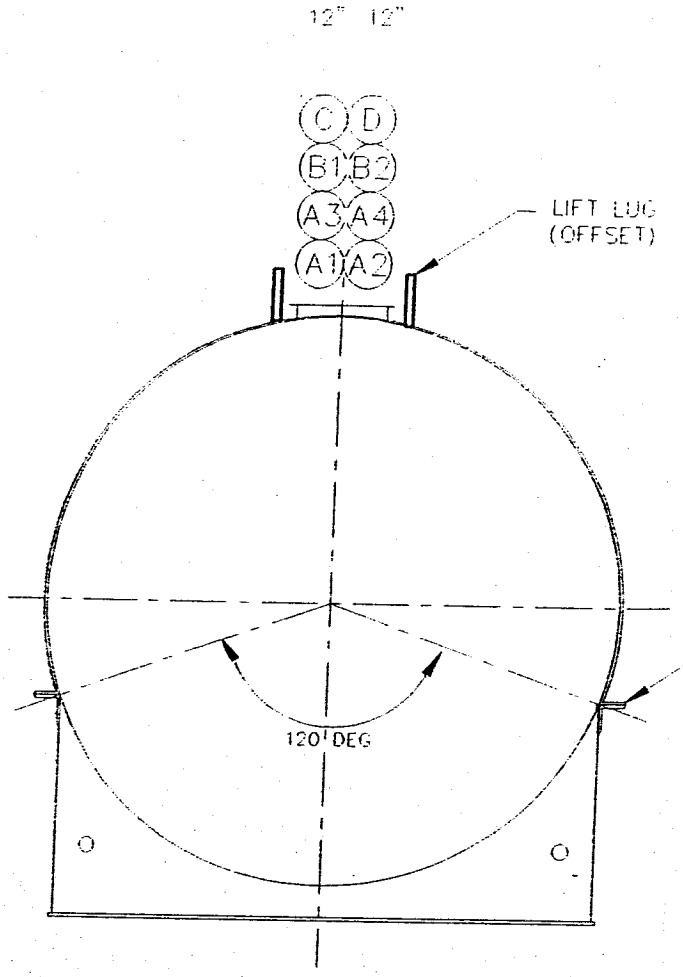
GENERAL NOTES

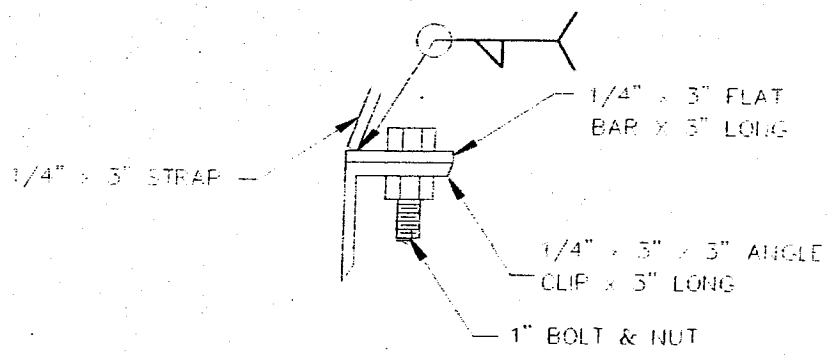
FABRICATION PER: UL-142
LABEL REQUIRED ☑YES ☐NO - UL-142
DESIGN PRESSURE: ATMOS
DESIGN TEMPERATURE: AMB
CORROSION ALLOWANCE: NONE
SHOP TEST: PER UL-142
3-5 PSI AIR WITH SOAP SUDS
INSPECTION BY: MODERN WELDING Q.C.
MATERIAL SHELL: C.S.
FLANGES: C.S.
SADDLES: A-36
INT. APPURTANCES: C.S.
EXT. APPURTANCES: C.S.
BOLTS: A-307 (ZINC PLATED) NUTS: A-307 (ZINC PLATED)
GASKETS: PER UL-142
SURFACE PREP EXT: NONE INT: NONE
PAINT:
EXT.: - SHERWIN WILLIAMS MACROPOXY RED PRIMER ONLY

INT.: - NONE

EST. WT. EMPTY: 10,150 LBS

OPENINGS SHALL BE PROTECTED PER UL-142





HOLD DOWN DETAIL

CUSTOMER TO APPROVE ALL NOZZLES, APPURTANCES LOCATIONS AND VERIFY ALL DIMENSIONS

MARK	REQ'D.	SIZE	NK. THNS.	RATING	TYPE	SERVICE
B2	1	24"	1/4"	-	-	MANWAY
A4	1	4"	SCH 40	150#	S.O. FLG	PUMP RECIRCULATION
D	1	8"	SCH 40	150#	S.O. FLG	EMERGENCY VENT
C	1	10"	SCH 40	150#	S.O. FLG	PUMP
A3	1	4"	SCH 40	150#	S.O. FLG	SPARE
A2	1	4"	SCH 40	150#	S.O. FLG	FILL/INLET
B1	1	24"	1/4"	-	-	MANWAY
A1	1	4"	SCH 40	150#	S.O. FLG	VENT

SCHEDULE OF OPENINGS

BY	REVISION	DATE	NO
RH/JC	Original Issue For Approval	-	0

NO. REQ'D ONE (1) ITEM NO. HS109

MODERN WELDING CO. of OHIO INC.

P.O. Box 2265
One Modern Way

Newark, Ohio 43055
(740)344-9425

PECK ELECTRIC
9,000 GALLON A.G.H. SINGLEWALL TANK

DWN. BY	RH	DATE 09/17/08	SCALE None
CHK. BY	JC	JOB NO. 0504247	DWG. NO. 0504247-1 0
APR. BY		S.O. NO. M0423	SHT. NO. 1 OF 1

Attachment 3

Burlington Facilities Specification 15410-9
Solvent Mechanical Standard

Rev. 0
11/14/2008

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BTV - S6Q - SECTION 15410-9 SOLVENT MECHANICAL STANDARD

No. RESO-SP-0274 Rev. 2 Production Date: 09/04/2007

Owner: Janice Edler

Online Version is the Master

SECTION 15410-9
SOLVENT MECHANICAL STANDARD

Burlington Facilities Standards

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PART 1 - GENERAL

1.01 WORK INCLUDED

A. This document defines the procedures to be followed for all aspects of work performed on the solvent supply, return, and waste system. Covered under this standard are all revisions to the existing system as well as all new installations.

B. Systems covered under this standard:

Virgin Supply	Waste Systems
1. 70/30 GBL/NBA)	MUV Waste
2. Isopropanol (IPA)	WGS)
3. n-Methyl Pyrrolidnoe (NMP)	WAS4
4. 0.175 Stripper (AZ400T)	WNMP
5. 100% PGMEA	DUV Waste

	Other systems specified by IBM System Engineer

C. The work covered by the scope of this BFS is not regulated by the Vermont Plumbing Code.

1.02 RELATED SECTIONS

A. 01011 - General Contract Requirements

B. 01100-1 IBM and Construction Manager Risk Assessment Procedures

C. 07270-1 - Fire stopping Penetrations through Rated Walls and Floors

D. 15100-1 - Flashing and Piping Sleeves

E. 15140-1 - Supports and Anchors: Pipe Hangers and Supports

F. 15190-2 - Mechanical Identification - Systems Labeling

G. 15411-7 - Stainless Steel Weld/Material Spec.

H. 18060-1 - Tool Installation: Bulk Solvent

1.03 REFERENCES

A. American Standard Code for Pressure Piping

B. ANSI A13.2 - Identification of Piping.

C. ANSI B31.9 - Building Service Piping.

D. ANSI Z49.1 - Safety in Welding and Cutting.

E. ASME Boiler and Pressure Vessel Code

F. ASME Sec. 9 - Welding and Brazing Qualifications.

G. ASTM A213

H. ASTM A269 - Stainless Steel Tubing

I. ASTM A270 - Seamless Steel Tubing

J. ASTM A380

K. AWS and AISC Welding Standards

1.04 QUALIFICATIONS

A. Any portion of installation deemed improper by IBM, shall be removed and replaced at contractor's expense.

B. All pipe fitters who fabricate and install pipe, and associated equipment shall be qualified (see 15411-7 Section 5.1)

1.05 REGULATORY REQUIREMENTS

A. The work covered by the scope of this BFS is not regulated by the Vermont Plumbing Code.

1.06 DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

A. All components and materials used during the installation of the solvent piping system shall be delivered, stored, and handled in such a way as to prevent damage and/or contamination at all times. Open ends of all stainless steel tubing must remain capped, and all fittings and valves must remain sealed and bagged until use. Wood, cloth, and tape on or in open ends are not acceptable and shall not be used.

B. All components and materials must be stored in the manufacturer's original containers and maintained in such a way as to prevent contamination. They must be stored in a clean, dry, indoor environment.

C. During unpackaging, cutting, fit-up, welding, and other installation activities, any contractor personnel handling components and materials must wear Playtex Nistride Stanslov gloves, or equivalent, with no hand powder.

D. All components and materials which become contaminated during handling shall not be reused, but shall be segregated from the new

material, under supervision of the IBM Representative.

1.07 SCHEDULING

A. All work which may impact or disrupt chemical delivery to the Manufacturing tools shall be performed during a scheduled tool shutdown. The time and duration of the shutdown shall be arranged with Manufacturing through IBM Coordinator.

B. The IBM Coordinator will schedule all projects with Contractors and Chemical Operations. Chemical Operations personnel shall be present at the initial cut-in to any solvent piping system. Chemical Systems personnel will isolate all systems to be worked on, and shall activate all systems upon completion of related tests and acceptance. Contractor shall not operate any values connected to the solvent system.

C. Certain work may have to be performed on overtime or during a plant shutdown. Such work shall be discussed and scheduled with IBM during the bidding process.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. Carbon steel (Containment Piping)

1. The containment piping surrounding the solvent supply and/or waste piping shall be 2" carbon steel pipe per ASTM A53 Grade B. The fittings shall be carbon steel per ASTM A234 Grade WPB 300 PSI Rating. Manual welding or threaded connections are both acceptable.

B. Stainless Steel Tubing (Solvent Piping)

1. Tubing used in the fabrication of the solvent supply and/or waste system shall be 1" seamless stainless steel Grade 316L, .065" wall thickness, bright annealed, fully passivated, with as inside surface finish not to exceed 15 Ra microinches (see 15411-7, section 12). Hardness is to be Rb 80 or less. Tubing is to be thermocouple clean per ASTM A632 with the ends prepared for automatic orbital head butt welding.

2. Tubing which is used to fabricate the IBM Manufacturing tool drop shall be same as above except ½" in diameter, .049" wall thickness.

3. Fittings used in the fabrication of the solvent supply and/or waste system shall be .065" wall thickness (.049" for ½" tubing) seamless stainless steel Grade 316L, Bright annealed, fully passivated, with an inside surface finish not to exceed 15 Ra micro-inches. Fittings are to be long-radius type, thermocouple clean per ASTM A632 with 3"-6" extension provided at each end for automatic orbital head butt welding.

C. Compression Fittings (Point-of-Use Only)

1. Compression fittings to be used for solvent tool drops are to be stainless steel Grade 316L. Acceptable product Manufacturers are:

a. Parker Fluid Connectors (A-lok fittings)

b. Swagelok

c. Lokring

2.02 VALVES

A. Manual Ball Valves (Bulk Distribution System)

1. Manual ball valves used in the solvent system shall be three-piece, three or four bolt stainless steel ball valves with lockout capability. Either reduced-port or full-port valves are acceptable unless otherwise specified on the contract documents. Valves are to be assembled dry (without lubricants) and use only Teflon seats and seals. Valves are to have 3" extensions at each end to facilitate automatic orbital butt head welding.

Manufacturer	P/N
Watts Regulator	(size)-S8455LL-M1-VT-AD-OL-Z98
Whitey	SS-65TW12TM3-3989 (¾" VALVE)
	SS-65TW16TM3-3989 (1" VALVE)

Worcester Valve Co.	(size)-WK4466TXBO

B. Manual Ball Valves (Mfg. Point-of-Use)

1. Manual ball valves used in the solvent supply system to provide IBM Manufacturing with point-of-use solvent drops are to be ½" one-piece or three-piece stainless steel ball valves with lockout capability. Valves are to be assembled dry (without lubricant) and use only Teflon seats and seals. Acceptable product Manufacturers are:

Manufacturer	**P/N**
One-piece:	
Parker Instruments	8A-B8LJ-SS
Whitey Co. "40" Series	SS-45S8
Three-piece:	
Watts Regulator	½"-S8455LL-M1-VT-AD-OL-Z98
Worcester Valve Co.	½"-WK4466TXBO

C. Automatic Valves (Bulk Distribution System)

1. Automatic valves used in the fabrication of the solvent supply system shall consist of a manual valve specified in Section 2.02a coupled with the Manufacturer's recommended actuator for that valve. Actuators are to be spring-return to provide fail-safe operation. The valve and actuator shall be from the same Manufacturer. Acceptable product Manufacturers are:

Manufacturer	**P/N**
Watts Regulator	PAS-400 Actuator
Whitey	"130" Series Actuator
Worcester Valve Co.	Series 39 Actuator

D. Automatic Valves (Mfg. Point-of-Use)

1. Automatic valves used in the solvent supply system to provide IBM Manufacturing with point-of-use solvent drops shall consist of a manual valve specified in Section 2.02b coupled with the Manufacturer's recommended actuator for that valve. Actuators are to be spring-return

to provide fail-safe operation. The valve and actuator shall be from the same Manufacturer. Acceptable produce Manufacturers are:

Manufacturer	P/N
Parker Instruments	
Watts Regulator	PAS-400 Actuator
Whitey Co.	"130" Series Actuator
Worcester Valve Co.	Series 39 Actuator

E. Check Valves

1. Check valves used in the solvent system shall be stainless steel with Teflon seats and seals. Acceptable product Manufacturers are:

Manufacturer	P/N
Circle Seal	220T-8PP

2.03 SOLVENT LIFT STATIONS

A. The mechanical contractor shall supply all solvent lift stations unless otherwise noted on the contract documents. See Section 18060-1 Tool Installation: Bulk Solvent for complete details of lift station. The electrical contractor shall supply and install the Gems level switch and lift station control panel unless otherwise noted on the contract documents. Acceptable lift station manufacturers are:

1. Innovative Design Solutions

B. Solvent lift station pumps shall be stainless steel with Teflon seats, seals, and diaphragms. Acceptable product Manufacturers are:

Manufacturer	P/N
ARO Corporation	666101-244

C. Solvent lift station level sensors are to be stainless steel. Acceptable product Manufacturers are:

Gems (LS800 Multi-station liquid level switch type 3. Wiring group I. SPSP 15W switch with amphenol connector. Float P/N 14569.

Actuation levels:

Actuation levels:

L4 = 2.5" NC switch

L3 = 6.5" NO

L2 = 10.5" NO

L1 = 14.5" NO

L0 = 16" (overall length)

D. Refer to Figure 1 for construction details.

2.04 FLAME ARRESTORS

A. Flame arrestors used in the solvent system shall be stainless with cast iron body. Acceptable product Manufacturers are:

Manufacturer	P/N
Protect-O-Seal	Model 2571

2.05 LABELS

A. Labels will be supplied by the contractor unless otherwise noted on the contract documents. Acceptable Manufacturers are:

Brady (1-piece labels)

Creative Labels, Inc.

B. Computer generated wraparound labels are acceptable alternatives. Contractor shall provide sample label prior to use.

C. All labels shall be ¾" high black letters on yellow stock.

2.06 POINT-OF-USE

A. The configuration of the solvent system at the point-of-use shall consist of ½" stainless steel tubing, a manual valve, and an automatic valve as described above. The automatic valve shall have a compression fitting on the downstream (non-pressurized) side of the valve for Manufacturing tool connections.

B. The electrical contractor shall be responsible to supply and install all solvent control panels unless otherwise noted on the contract documents. Refer to chemical control specifications and details.

2.07 MISCELLANEOUS

A. Miscellaneous Piping and Fittings

1. All pressure gauges, pressure regulators, flow meters, control valves, safety relief valves, storage tanks, and any other component which will comprise the solvent delivery system shall be 304L or 316L stainless steel, use only Teflon or Kalrez seats, seals, and O-rings, and must comply with the material, welding, and cleanliness requirements contained within this specification. Any deviations require the approval of the responsible IBM System Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Tools

1. The contractor shall provide all necessary labor, tools, and materials in order to furnish, fabricate, install, and make operational the items shown on the appropriate drawings unless otherwise noted.

2. All tools used for all phases of installation shall be in proper working condition. They shall be cleaned at least weekly as required.

3. Tubing cutters shall have sharp cutting wheels and employ a dry cutting method. Hacksaws or similar type cutting tools may not be used on stainless steel tubing. Tubing ends shall be properly prepared for automatic orbital welding. Tube ends shall not be deburred after cutting.

B. Gloves

1. Where required throughout this specification, the protective gloves to be worn during the handling,

cutting, and installation of the stainless steel piping shall be Playtex Nitride Stanslov gloves or equivalent, with no hand powder.

C. Materials

1. All piping, fittings, and other components used in the solvent system shall be free of any loose grit, filings, chips, dirt, or other foreign substance.

2. Written approval from the IBM Coordinator or responsible IBM Engineer is required prior to the use of substitute materials.

3. All stamping or marking shall be done prior to assembly.

4. No lubricants are permitted in the work area.

D. Support System

1. The piping support system shall be installed prior to the fabrication of any piping system.

2. The piping support system shall be labeled per section 3.02c5 of this document.

E. Cleanliness

1. All materials shall be handled and stored throughout the progress of the job so as to prevent contamination of any type.

2. The contractor shall ensure that the cleanliness standard is maintained throughout all phases of installation.

3. Piping, fittings, valves, and other components used in the solvent system shall be capped and bagged by the manufacturer prior to shipment. Except for cutting, no components shall be removed from their protective packaging until time of assembly into the system.

3.02 INSTALLATION

A. Piping Installation

1. All solvent piping installation shall be performed with the joint approval of Chemical Systems Engineering, and Chemical Services.

2. Do not use existing cable trays, PCV racks, or PCV hangers for solvent piping.

3. During the construction period, the contractor shall assume full responsibility for furnishing and installing necessary temporary tubing and equipment supports. The contractor shall remove the temporary supports as permanent supports are installed.

4. All valves shall be installed so that the handle is readily accessible and operable. When installed above the ceiling, the valve handles shall be oriented to allow operation from below. All new piping shall be installed so as not to interfere with access to existing valve handles.

5. If necessary, valve locations are to be staggered (not to exceed the length of the valve body) to allow space to operate valve handles.

6. All solvent waste piping shall be installed within steel containment piping.

7. All solvent supply piping shall be installed within steel containment piping unless otherwise noted on the contract drawings.

8. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

9. All solvent lines shall terminate with a valved, capped future. Welded tubing shall terminate with a welded valve, a weld-to-thread nipple (2"), and a threaded cap. Piping constructed using compression fittings shall terminate with a valve with a compression cap or plug such that the line can be extended using compression

fittings and tubing.

10. Access ports and valved, capped futures shall be installed in the vertical position above the level of the line to prevent pooling of solvents when draining.

11. Solvent piping shall be installed with a minimum number of joints. All welding fittings used with tubing shall be suitable for use with automatic orbital head welding equipment and meet the requirements of Section 2.01 of this Specification.

12. Threaded joints shall be kept to an absolute minimum. Only factory-threaded fittings are acceptable. Threaded joints are to be assembled using TFE joint tape only. Pipe dope shall not be used on the solvent piping under any circumstances.

13. All connections must be leak-free. Where necessary, suitable adapters shall be used for the installation of other components.

14. Tube bends are not permitted on the solvent piping system.

15. The piping between compressed air drops, solenoids, and air valves is to be ¼ inch copper tubing.

16. Work that is incomplete at the end of the working day shall be secured by maintaining a continuous nitrogen purge through the system or by maintaining a 2-5 psi positive pressure throughout the system after capping all open pipe ends and fittings.

17. All completed work must be left with a positive pressure 5-10 psi throughout the system.

B. Chemical Labels

1. The contractor is responsible for supplying all labels required.

2. The chemical label shall identify the chemical species

2. The chemical label shall identify the chemical species and direction of transport within the piping system. Provide labels per the following specifications:

a. Chemical labels shall employ the full chemical name. Abbreviations are not acceptable.

b. Chemical label colors shall be "safety black" lettering & directional arrows on "safety yellow" background in accordance with ANSI Z53.1.

C. Chemical Label Installation

1. All piping installed and connected to the solvent supply and/or waste systems shall be labeled at the termination points as well as every twenty (20) feet along the pipe.

2. Labels shall be installed one (1) foot from every valve.

3. Labels shall be applied on both sides of any wall or barrier penetration, within three (3) feet of the wall or barrier.

4. Label both ends of elbows or significant directional change in the piping, within two (2) feet of the elbow or directional change.

5. Horizontal support members of the solvent piping support system shall be labeled per figure 3.

6. Install labels so as to ensure visibility from normal vantage points. In general, where pipes are located above normal line of vision, labels shall be installed below the horizontal centerline of the pipe. Where pipes are located below the normal line of vision, labels shall be installed above the horizontal centerline of the pipe.

7. When the piping layout does not allow labeling per the above (e.g. due to complexity or inaccessibility of the piping), substitute labeling techniques shall be reviewed and approved by the IBM Coordinator prior to their implementation.

D. Pipe Hangers and Support Elements

1. Support all piping with hangers designed for vertical adjustment using leveling and locking nuts capable of carrying minimum normal load at standard hanger spacing.

2. Do not "piggyback" on existing hangers without the specific approval of the IBM Structural Systems Engineer.

3. Furnish supporting elements per ANSI B31.1 with Addenda MSS SP-58, MSS SP-69 except as otherwise modified and supplemented herein.

4. Supporting elements to comply with BOCA National Building Code/1987 Section 1113.0 for earthquake load.

5. The use of "C" clamps and bean clamps of "C" pattern and any modification thereof is prohibited from use on solvent piping systems.

6. Support uninsulated single pipes by Type 1 or Type 3 attachments per MSS SP-58 and MSS SP-69.

7. Steel hanger rods are to be ½ inch, threaded both ends, threaded one end, or continuous thread unless otherwise noted on the contract drawings.

8. Place a hanger within 12 inches of each horizontal elbow.

9. Use hangers with 1 ½ inch minimum vertical adjustment.

10. Support riser piping independently of connected horizontal piping.

11. Scrape, brush clean, and apply one coat of zinc-rich primer to wilding where pipe support members are welded to structural building framing.

E. Sleeves

1. All tubing passing through masonry partitions shall be fitted with pipe sleeves. Sleeves shall be of sufficient length to pass through the entire thickness of the partition and shall be cut flush with each surface. The contractor shall furnish and set all sleeves and be responsible for their proper installation.

2. Size sleeves large enough to allow for movement due to expansion and contraction.

3. Sleeves for pipes through non-fire rated floors, beams, walls, and footings shall be formed from 18 gauge galvanized steel.

4. Sleeves for pipes through fire-rated and fire-resistive floors and walls shall be constructed from UL Listed prefabricated fire-rated sleeves including seals.

F. Building 973 Piping

1. The piping contractor shall be responsible to core drill all holes through the deck of building 973 as necessary to install solvent piping.

2. The contractor shall install a flame arrestor on the upstairs side of all solvent waste lines in building 973. All new tie-ins to existing waste lines shall include the removal of the basement-level flame arrestors.

G. Electrical Installation

1. All solvent piping installation shall be performed with the joint approval of Chemical Systems Engineering, and Chemical Operations.

2. Absolutely no work shall be performed on any Solvent Control System until that system has been tagged by Chemical Operations as safe for contractor work.

3. All wiring for solvent, waste, and CSO (EPO) shall be run below the ceiling and shall be run parallel or

perpendicular to the face of the process tools.

4. All boxes and panels shall be placed to allow easy access.

5. The electrical contractor shall supply and install the Gems level switch and lift station control panel on any project requiring solvent lift station installation unless otherwise noted on the contract documents.

6. The electrical contractor shall be responsible to supply and install all solvent control panels unless otherwise noted on the contract documents.

7. Installation shall include the appropriate labeling of all wiring, and boxes. Appropriate labels for all services shall be applied every twenty (20) feet and at all boxes and panels.

a. All control wiring including chemical control boxes, and lift station panels shall be labeled "Chemical Control".

b. All Chemical Shut Off (CSO/EPO) wiring shall be labeled "Solvent/Acid System Emergency Off".

c. All supply panels shall be labeled "Dual Power Supply".

d. All lift station panels and solvent supply control panels shall be labeled with the appropriate chemical labels.

e. The contractor shall supply all labels.

3.03 RIPOUT

A. Risk Assessments:

1. IBM Chemical Operations, Construction Management, the IBM Coordinator, and the Contractor will perform a field review with the IFC drawings and specifications. At a minimum the field review will include a visual inspection of the chemical skid and distribution boxes, and the pipeline routings

and the pipeline routings.

2. A Risk Assessment must be followed per Section 01100-1.

B. Chemical Pipe Ripout Procedures:

1. Prior to starting the ripout work, confirm completion of the Risk Assessment and the associated field review and signoffs including: confirmation that pipelines have been purged, and disconnected, and all necessary lockout/tagouts are in place.

2. Notify Chemical Operations of intended work activity at the start of the work and daily thereafter.

3. Start removal of the pipeline at either the valve box or the chemical skid, use a fluorescent ring during demolition; the ring is to be slid along the piepline jacket from the starting point, and always present at the point if jacket/pipeline cut.

4. Develop a checklist, check off activities during demolition.

C. Absolutely no ripout work shall begin on any solvent system until Chemical Operations has tagged the line at all extreme points as safe for contractor work.

D. All items removed from the solvent system are the property of IBM and shall be returned to the IBM Coordinator or to IBM Reclaim per the IBM Coordinator's direction.

E. The contractor shall take special care when removing any items which may be reused. Any equipment or material that is damaged by the contractor during ripout due to carelessness shall be replaced by the contractor at no additional cost to IBM. The IBM Coordinator shall be responsible to determine damage.

F. Certain items are of particular interest to IBM and shall be transported by the contractor to the decontamination area and then to the storage area as directed by the IBM Coordinator. All existing labels shall be left intact, and items shall not leave IBM premises. The following is a list of those items:

1. MECHANICAL

   a. All air-actuated valves

   b. All manual valves

   c. All compression fittings. Compression fittings are to be removed from the pipe but fully assembled and sorted by type.

   d. All solvent lift stations. The IBM Coordinator shall direct the contractor as to the storage location for the solvent pumps after removal.

2. ELECTRICAL

   a. Lift Station Control Panel

   b. Level Sensor / Switch Assembly

   c. Solvent Supply Control Boxes

   d. CSO (EPO) Panels

   e. CSO (EPO) Break-glass Stations

   f. All Controller Hardware

   g. Relay Panels

   h. Terminal Boxes

3.04 TESTING

A. Contractor shall test all new or reworked sections of pipe tubing, and containment jacket.

B. Before testing commences, the contractor shall inspect all systems to ensure compliance with the design drawings. Contractor shall check all safety relief valves, flow meters, pressure regulators, pressure gauges, and all other components for pressure settings and temperature ratings. If adjustments and/or corrections are required to assure conformance with construction drawings, they shall be

made before proceeding with the testing activities. Pressure and temperature ratings of installed components shall not be exceeded.

C. All testing shall be done in the presence of an IBM representative. Approval of the IBM representative is required for the installation to be considered complete. Costs of all inspection, testing, and rework shall be borne by the contractor.

D. Notify the IBM representative no less than 48 hours prior to any testing. IBM personnel will shutdown systems as required.

E. Isolate the new system to be tested from the existing system during test procedures.

F. All stainless steel solvent supply, return, and waste network systems shall be pressure tested using filtered Ultra-High Purity (UHP) nitrogen or compressed air at 150 psig. for two hours. A pressure drop to zero (0) psi during the test is considered acceptable. A pressure drop greater than zero constitutes failure of the test. Bottled nitrogen or compressed air used for testing shall be supplied by contractor.

G. The containment piping shall be pressure tested using nitrogen or compressed sir at 10 psig for two hours. A pressure drop of zero (0) psi during the test is considered acceptable. A pressure drop greater than zero constitutes failure of the test. IBM house air may be used to test the containment piping. Any section of the containment piping which would be subject to the system pressure in the event of a leak in the carrier piping must be pressure tested at 150 psig for two hours. The same measurement criteria applies. Bottled gas to be provided by the contractor.

H. Promptly repair any defects or leaks and retest system as necessary. Caulking of leaking joints or any other makeshift measure is not permitted. Completely remake any joint which has failed the pressure test.

I. The contractor shall furnish all test equipment and any temporary system items. Test gauges used for the pressure testing must meet the following specifications:

1. Minimum of 200 psi sith 1.0 psi divisions

2. Accuracy +/- 0.25% of full scale

2. Accuracy +/- 0.25 % of full scale

3. Minimum of 6" diameter dial

4. Knife-edged pointer consistent with U.S.A. Standard B40.1 Grade 3A.

3.05 SAFETY

A. All tools used on flammable solvent systems shall be non-sparking tools (Ampco or equivalent) whenever solvent residuals are present.

B. The contractor shall be responsible for being familiar with the following safety references:

1. OSHA (Contractor)
   a. 1926.350-354 Welding Safety
   b. 1926.404 Hazardous Locations
2. OSHA (IBM)
   a. 1910.101-104 Compressed Gases
   b. 1910.251-254 Brazing
3. NFPA #51BStandard for Fire Prevention in the use of Cutting and Welding Processes

End of Section

- General Information
- Summary of Changes
- Approval Information

Date Approved	Approved By
09/04/2007	TRAVIS CAMPBELL/BURLINGTON/CONTR/IBM; BARRY POLLANDER/BURLINGTON/IBM; JANICE EDLER/BURLINGTON/IBM

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End of Document

Attachment 4

Secondary Containment Capacity Calculations

Rev. 0
11/14/2008

SUBJECT _____ BY _____

SHEET NO. _____ OF _____ DATE _____

PROJECT NO. _____

CONTAINMENT MUST HOLD 110% OF TANK.

TANK:

DIAMETER: 9' LENGTH: 18.5'

$$\text{VOLUME} = \left(\tfrac{1}{2}D\right)^2 \pi L$$

$$= \left[\tfrac{1}{2}(9')\right]^2 \pi (18.5') = 1{,}177\ ft^3$$

$$= (1{,}177\ ft^3)\left(\frac{7.48\ gal}{ft^3}\right) = \underline{8{,}803\ \text{GALLONS}}$$

CONTAINMENT:

$$\text{VOLUME} = WLH$$

$$= (12.5')(25')(6.5') = 2031\ ft^3$$

$$= (2031\ ft^3)\left(\frac{7.48\ gal}{1\ ft^3}\right) = \underline{15{,}194\ \text{Gallons}}$$

$$\frac{15{,}194\ gal}{8{,}803\ gal} = \boxed{1.7 \gg 1.1 \quad \text{CONTAINMENT IS OKAY}}$$

Attachment 5

Original Containment Design Drawings

Rev. 0
11/14/2008

Attachment 6

Inspection Report

Rev. 0
11/14/2008

CH2MHILL IDC

Field Inspection Report

PROJECT: North Solvent Waste Tank

DATE: November 19, 2008

LOCATION: North Solvent Waste Tank

Inspection by: Josh Harris

1) Existing Stainless Steel Liner

   a) The stainless steel liner appeared to be installed as described in the original design documents dated August, 1984.

   b) The liner was cleaned by the contractor in order to permit close detailed inspection.

   c) Careful inspection of liner showed no evidence of scrapes, dents, cracks, abrasion, or other damage.

   d) The liner showed no evidence of corrosion or other degradation.

   e) All welds were inspected revealing no evidence of weld breaks or cracks.

2) Existing Concrete Containment

   a) Inspection of the concrete containment revealed no damage, degradation, cracks, or erosion except as follows.

      i) On the East exterior side of the containment some spalling has occurred. Spalling appears to have taken place where rebar was too close to the face of the concrete. The area is approximately 12" square and less than an inch deep. The exposed concrete does not appear or feel to be punky or otherwise degraded. Staining and coloration suggests that the spalling happened long ago and is no longer continuing. It is my opinion that the spalling poses no threat to the integrity of the containment now or in the future.

3) New Carbon Steel Tank

   a) Initial inspection of the tank took place on the paved drive adjacent to the containment. There were no dents, punctures, cracks, corrosion, or other damage observed. The paint at one end of the tank had been removed due to abrasion during shipping. The contractor was directed to have paint touched up in this area. This will be followed up during the next field inspection.

CH2MHILL IDC

Field Inspection Report

PROJECT: North Solvent Waste Tank

DATE: December 10, 2008

LOCATION: North Solvent Waste Tank

Inspection by: Josh Harris

1) Inspection of tank for repair of pain per Field Inspection Report dated 11/19/08

   a) All damaged paint has been patched.

2) Hoisting of Tank onto saddles in containment pit.

   a) I observed the rigging of the tank into the containment pit by crane. The tank was picked and placed cleanly without any impact or other negligent acts. No apparent damage was done to the tank during the rigging process.

Attachment 7

Pressure Test Report

Rev. 0
11/14/2008

MODERN WELDING CO. OF OHIO, INC.
ONE MODERN WAY NEWARK, OHIO 43055
PO BOX 4430 NEWARK, OHIO 43055-4430
740-344-9425

CERTIFICATION OF TEST

VESSEL IDENTIFICATION

Customer	Peck Electric	
Customer PO #	MO423	
Item #	HS109	9,000 Gallon Aboveground Singlewall
MWC Job #	424701	

TEST SPECIFICATIONS

	PRIMARY TANK	INTER. SPACE / JACKET
Test Pressure	3 PSI	NA
Test Media	Air & Soap Suds	NA
Test Duration	1 Hour	NA

REMARKS OK

CERTIFICATION

I certify that the above information is correct and that the vessel was tested in my presence with the specifications indicated above.

Modern Welding Rep. Jeff Turner

Date 11-19-08

Customer Rep.

Date

SYSTEM TEST REPORT

PECK MECH.

TEST DATE 1/8/09

PECK JOB # MO 342 SYSTEM TITLE SOLVENT TANK

JOB DESCRIPTON AIR TEST

SYSTEM TESTED SOLVENT TANK & PIPING

TEST DESCRIPTION 3 PSI TYPE AIR

LOCATION 963 BLD 1ST FLOOR COL (SOLVENT TANK)

PLEASE CHECK !

____ ALL LABELING COMPLETE

✓ PIPING HANGERS AND FASTENING COMPLETE

____ INSULATION COMPLETE [IF APPLYS]

____ CONFIRMED ALL PENETRATIONS ARE PATCHED AND SEALED

____ CONFIRMED ALL COMPONENTS ARE RATED FOR TEST PRESSURE

____ DRAIN SYSTEMS WHEN TESTING COMPLETE

TEST START		TEST COMPLETE	
pressure	3	pressure	3 PSI
time	1:20 PM	time	3:20 PM
date	1/8/09	date	1/8/09

PECK		IBM		other	
NAME	Jim Dowell	NAME	[illegible]	NAME	[illegible]
DATE	1/8/09	DATE	1/8/09	DATE	1/8/09

RCRA Assessment of Waste Deep UV Resist/PGMEA Waste Storage Tank
August 20, 2010

Knowledge | Commitment | Experience

August 20, 2010

Lisa Martinez, Pizzagalli Construction Management
For IBM Microelectronics, Essex Junction, VT
Via: Email

Re: RCRA Assessment of Waste Deep UV Resist / PGMEA Waste Storage Tank (formerly called Xylene)
IBM Chemical Distribution Center Tank Farm

Dear Ms. Martinez:

This letter reports our assessment of the Waste Deep UV Resist / PGMEA Waste Storage Tank (formerly called Xylene) with respect to the requirements of 40 CFR 264.192 and 40 CFR 264.193. The report will paraphrase each requirement of the CFR and then provide an assessment of the actual conditions with respect to each requirement.

40 CFR 264.192

Requirement (a) - Owner must have a written assessment by a registered professional engineer indicating that the foundation, structural support, and the tank are properly designed, the tank material is compatible with the waste to be stored, and that corrosion protection is provided if necessary. At a minimum the assessment must include the design standard(s) to which the tank was constructed; a list of the hazardous characteristics of the waste to be stored; and an assessment of the foundation's ability to support the load of the tanks, prevent flotation or dislodgement of the tanks, and to prevent movement due to frost action.

Assessment:

1. The tank is 15'-0" long with a diameter of 10'-0". It is built of welded SA285C carbon steel plate. The cylindrical shell has a nominal thickness of 1/4". The heads have a nominal thickness of 3/16". The tank was manufactured in 1981 by Eastern Tank Fabricator. It is designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code. A copy of the Manufacturer's Data Report for Pressure Vessels is included in Appendix 1. In July 2010 the tank was lined using the Hetron® 800 system consisting of two layers of fiberglass covered with a corrosion barrier. Prior to installing the liner system the pits in the tank wall were filled with Cobosil filler.

2. The chemicals stored in the tank (as reported by IBM) and their compatibility with the Hetron® 800 liner (as reported by Ashland Performance Materials) are listed in Appendix 2.

3. The tank is not in contact with soil. It is protected from rain and snow by a roof and a partial height wall. Since the tank is not in contact with soil or water, additional corrosion protection is not required.

4. The tank is above ground therefore the requirements for below grade tanks are not applicable.

5. The tank is supported on a 12" concrete slab which was designed by Gustav Getter Associates, New Rochelle, NY, in 1980 to support the 10,000 gallon storage tank. There is no evidence indicating significant settlement of the slab or movement due to frost action. Based on the performance of the slab over the past 30 years it is our opinion that the slab was designed properly. The tank is not subject to flotation since the elevation of the top of the vault walls in which the tank sits is low enough that the water would overflow the walls before flotation would occur.

Requirement (b) – The owner must insure that the tank is not damage during installation. A qualified independent inspector or PE shall inspect the tank systems for the presence of weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, or other structural damage.

Assessment - No reports of inspections conducted after the tank was installed have been located. The thickness of the tank has been periodically measured by Knight Consulting Engineers, Inc., starting in 1983. The latest such inspection was conducted in November 2004, and the report from that inspection is included in Appendix 3 (the tank is identified as Waste DUV #1). The last interior and exterior inspection of the tank was completed by Aaron Environmental in July 2010 after the installation of the Hetron® 800 liner system. IBM visually inspects the exterior of the tanks on a daily basis. IBM reports that no leaks have occurred in this tank since it has been in service.

Requirement (c) – Applies to undergound tanks and is therefore not applicable to this tank.

Requirement (d) – All new tanks and ancillary equipment must be tested for tightness prior to being placed in use.

Assessment – The tank was pressure tested to 20 psi by the manufacturer (see Appendix 1). We cannot state whether or not all ancillary piping and equipment was tested, however, IBM reports that no leaks have occurred since the tank was placed in service.

Requirement (e) – Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.

Assessment – We have completed a visual assessment of support of the ancillary equipment and it is our opinion that the equipment is so supported.

Requirement (f) – Corrosion protection must be provided as required in section (a). Not applicable.

<u>40 CFR 264.193</u>

Requirement (c)(1) – Secondary containment must be constructed of or lined with materials that are compatible with the waste to be stored and must have sufficient strength and thickness to prevent failure due to pressure gradients, physical contact with the waste, climatic conditions, and the stress of daily operation.

Assessment – The secondary containment system consists of a ¼" thick ASTM A588-85 Grade B weathering steel plate liner designed by Knight Consulting Engineers in 1987 supported by concrete foundation and walls designed by Gustav Getter Associates in 1980. The liner is protected from wind and snow by the roof and wall structure designed by Knight Consulting Engineers in 1987. It has sufficient strength to prevent failure due to pressure gradients, physical contact with the waste and the stress of daily operation. Knight Consulting Engineers, Inc., has reviewed chemical compatibility charts provided by Cole-Palmer and Cat Pumps to check for compatibility with the liner. The information gathered is summarized in Appendix 2. Knight Consulting Engineers, Inc., does not specialize in chemical engineering, so this data is provided as general information only.

Requirement (c)(2) – The secondary containment system must be placed on a foundation capable of providing support to the secondary containment system, resistance to pressure gradients above and below the system, and capable of preventing failure due to settlement.

Assessment – The liner is supported by concrete slabs and walls designed by Gustav Getter Associates in 1980. The concrete slab and walls have sufficient strength to resist pressure gradients above and below the system. They are also capable of preventing failure due to settlement.

Requirement (c)(3) – The secondary containment system must be provided with a leak detection system that is designed and operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours.

Assessment – A leak detection system is provided to detect leaks of the tanks into the secondary containment system. In addition, the secondary containment is visually inspected on a daily basis. No leak detection system is provided to detect leaks of the secondary containment system. There

are standpipes above the lowest areas of the concrete slab supporting the liner that could be used to visually inspect for leaks of the secondary containment system, however, IBM does not currently conduct such inspections.

Requirement (c)(4) – The secondary containment system must be sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spill, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within 24 hours, or in as timely a manner as is possible to prevent harm to human health and the environment.

Assessment – The secondary containment system has sufficient volume to contain the volume of all tanks protected by the containment system. In addition there is a piping and vault system designed to collect overflow of the secondary containment in the very unlikely event that such overflow would occur.

Requirement (d) – The secondary containment system must include one or more of the following devices: (1) a liner (external to the tank); (2) a vault; (3) A double-walled tank; or (4) an equivalent device as approved by the Regional Administrator.

Assessment – The secondary containment system includes a liner as described earlier in this report.

Requirement (e)(1)(i) – The liner must be designed or operated to contain 100 percent of the capacity of the largest tank within its boundary.

Assessment – Each lined area contains two 10,000 gallon tanks. Each lined area has a secondary containment capacity of approximately 21,000 gallons, so this requirement is satisfied.

Requirement (e)(1)(ii) – The liner must be designed or operated to prevent run-on or infiltration of the precipitation into the secondary containment system.

Assessment – The liner is protected by an overhanging roof and wall structure that prevents precipitation from falling on the containment area. Groundwater cannot flow into the containment area.

Requirement (e)(1)(iii) – The liner must be free from cracks and gaps.

Assessment – The liner was hydrostatically tested and the liner welds were vacuum tested after construction.

Requirement (e)(1)(iv) – The liner must be designed and installed to surround the tank completely and to cover all earth likely to come into contact with the waste if the waste is released from the tank(s) (i.e., capable of preventing lateral as well as vertical migration of the waste).

Assessment – The liner extends at least 10' beyond the tanks in all directions in order to satisfy this requirement.

Requirement (f) – Ancillary equipment must be provided with secondary containment that meets the requirements if paragraphs (b) and (c) of this section except for aboveground piping, welded flanges, welded joints, welded connections, seal less or magnetic coupling pumps, and seal less valves that are inspected on a daily basis.

Assessment – Ancillary equipment is located above the area that is lined as described above and thus meets this requirement. To our knowledge all piping that leaves the lined area is double contained piping. According to IBM, all ancillary equipment is inspected daily.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

Martin W. Hain, P.E.
President
Knight Consulting Engineers, Inc.

File: S:\10\10260\RCRA Assessment - Waste Deep UV Resist - 2010.doc

FORM U-1A MANUFACTURERS' DATA REPORT FOR PRESSURE VESSELS
(Alternate Form for Single Chamber, Completely Shop-Fabricated Vessels Only)
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

Formerly Perc. Now XYLENE #1

1. Manufactured by Eastern Tank Fabricators, 460 Main Ave, Wallington, NJ 07055
2. Manufactured for William L. Crow Constr. Co. 1 Penn Plaza, NYC 10001
3. Location of Installation IBM Corp, Burlington, Vermont
4. Type Horiz. (Horiz. or vert. tank) 5018-1 (Mfgr's Serial No.) - (CRN) D9616-2 (Drawing No.) 1655 (Nat'l Brd No.) (Year Built) 1981
5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1980 (Year) and Addenda to 6/30/80 (Date) and Code Case Nos. None
Special Service per UG-120(d) None
Manufacturers' Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: --
6. Shell: Matl. SA285-C (Spec. No., Grade) Nom. Thk. 1/4 in. Corr. Allow. 0 in. Diam. 120" in. Lgth. 15 ft 0 in. SL
7. Seams: Long. WeldDblButt (Welded, Dbl, Sngl, Lap, Butt) R.T. None (Spot or Full) Efficiency 70 % H.T. Temp. -- F Time -- hr
Girth Weld Dbl Butt (Welded, Dbl, Sngl, Lap, Butt) R.T. None (Spot, Partial, or Full) No. of Courses 2
8. Heads: (a) Material SA285-C (Spec. No., Grade) (b) Material (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Min. Thk.	Corr. Allow.	Crown Radius	Knuckle Radius	Ellipse Ratio	Conical Apex Angle	Hemisph. Radius	Flat Diam.	Side to Pressure (Convex or Concave)
(a)	Ends	3/16	0	114	8	-	-	-	-	Concave
(b)										

If removable, bolts used (describe other fastenings) --
9. Constructed for max. allowable working pressure 20 psi at max. temp. 100 F. Min. temp. (when less than -20 F) - F. Hydrostatic, pneumatic, or combination test pressure 30 psi.
10. Safety Valve Outlets: Number - Size - Location Elsewhere In System
11. Nozzles and Inspection Openings:

Purpose (Inlet, Outlet, Drain)	No.	Diam. or Size	Type	Matl.	Nom. Thk.	Reinforcement Matl.	How Attached	Location
Misc.	1	10"	150#SlipOn	SA53B	.365	-	Welded	Shell
Misc.	1	5	150#SlipOn	SA53B	.258	-	Welded	Shell
Misc.	1	6	150#SlipOn	SA53B	.28-	-	Welded	Shell
Misc.	2	2	150#SlipOn	SA53B	.154	-	Welded	Shell
Misc.	2	2	150#SlipOn	SA53B*	.154	-	Welded	Shell
Insp.	2	24	Manhole	SA285C	1"(Neck)	-	Welded	Shell

12. Supports: Skirt No (Yes or no) Lugs - (No.) Legs - (No.) Other 3 - 120° Saddles (Describe) Attached Welded to Shell (Where and how)
13. Remarks: *W/Pipe Extended to Tank Bottom
14 Clips and structural for rail and platform support - Solvent Storage Tank

Designed according to the Rules of UW12C

CERTIFICATE OF COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1.
Date 1/25/81 Signed Eastern Tank Fabricators (Manufacturer) By [signature] (Representative)
"U" Certificate of Authorization No. 8453 expires August 4, 1981

CERTIFICATE OF SHOP INSPECTION

Vessel made by EASTERN TANK FABRICATORS, INC 460 Main Ave, Wallington, NJ
I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of New Jersey and employed by CommUnionInsCo have inspected the pressure vessel described in this Manufacturers' Data Report on 1/28 19 81, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in the Manufacturers' Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.
Signed [signature] (Inspector) Date 1/28/81 Commissions NB 7169 (Nat'l Board, State, Province and No.)

(1/76) This form (E00117) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 10017

APPENDIX 2

Chemicals Stored and Compatibility with Liner

Chemical	Compatibility with HETRON 800 Liner (per Ashland Performance Materials)	Compatibility with Carbon Steel (per Cat Pumps)	Compatibility with Carbon Steel (per Cole Palmer)
2-Heptanone	Acceptable for continuous exposure to 150°F.	No information available	No information available
2-methyl-1-butanol	Acceptable for continuous exposure to 120°F.	No information available	No information available
Cyclohexanone	Acceptable for continuous exposure to 100°F.	Not rated	A-Excellent
Ethyl 3-ethoxypropionate	Acceptable for continuous exposure to 120°F.	Not rated	No information available
Ethyl lactate	Acceptable for continuous exposure to 100°F.	No information available	No information available
Ethylene Glycol	Acceptable for continuous exposure to 250°F.	C-Questionable	B-Good
gamma-Butyrolactone	Acceptable for continuous exposure to 100°F	No information available	No information available
n-Butyle Acetate	Acceptable for continuous exposure to 100°F.	A-Good	A-Excellent
PGME	Acceptable for continuous exposure to 100°F.	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good
PGMEA	Acceptable for continuous exposure to 100°F.	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good
Xylene	Acceptable for continuous exposure to 225°F.	B-Fair	A-Excellent
Ethylbenzene	Acceptable for continuous exposure to 150°F.	Not rated	No information available
Methanol	Acceptable for continuous exposure to 150°F.	B-Fair	A-Excellent

RCRA Assessment of General Solvent #1 Waste Storage Tank
June 27, 2006

KNIGHT CONSULTING ENGINEERS, INC.
P.O. BOX 29, 51 KNIGHT LANE
WILLISTON, VERMONT 05495
Tel: 802-879-6343 Fax: 802-879-6376

STEPHEN C. KNIGHT, JR. P.E.
MARTIN W. HAIN, P.E.
ERIC H. GODDARD, P.E.
ROBERT A. LOVGREN, P.E.

CIVIL ENGINEERING
STRUCTURAL ENGINEERING
GEOTECHNICAL ENGINEERING
HYDRAULIC ENGINEERING
CONSTRUCTION INSPECTION
CONSTRUCTION TESTING

June 27, 2006

David Crawford
IBM Microelectronics
Essex Junction, VT

Re: RCRA Assessment of General Solvent #1 Waste Storage Tank
IBM Chemical Distribution Center Tank Farm

Dear Mr. Crawford:

This letter reports our assessment of the General Solvent #1 waste storage tank with respect to the requirements of 40 CFR 264.192 and 40 CFR 264.193. The report will paraphrase each requirement of the CFR and then provide an assessment of the actual conditions with respect to each requirement.

40 CFR 264.192

Requirement (a) - Owner must have a written assessment by a registered professional engineer indicating that the foundation, structural support, and the tank are properly designed, the tank material is compatible with the waste to be stored, and that corrosion protection is provided if necessary. At a minimum the assessment must include the design standard(s) to which the tank was constructed; a list of the hazardous characteristics of the waste to be stored; and an assessment of the foundation's ability to support the load of the tanks, prevent flotation or dislodgement of the tanks, and to prevent movement due to frost action.

Assessment:

1. The tank is 15'-0" long with a diameter of 10'-0". It is built of welded SA285C carbon steel plate. The cylindrical shell has a nominal thickness of 1/4". The heads have a nominal thickness of 3/16". The tank was manufactured in 1980 by Eastern Tank Fabricator. It is designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code. A copy of the Manufacturer's Data Report for Pressure Vessels is included in Appendix 1.

2. The chemicals stored in the tank as reported by IBM are listed in Appendix 2. Knight Consulting Engineers, Inc., has reviewed chemical compatibility charts provided by Cole-Palmer and Cat Pumps to check for compatibility with the SA285C carbon steel tank. The information gathered is summarized in Appendix 2. Knight Consulting Engineers, Inc., does not specialize in chemical engineering, so this data is provided as general information only.

3. The tank is not in contact with soil. It is protected from rain and snow by a roof and a partial height wall. Since the tank is not in contact with soil or water, additional corrosion protection is not required.

4. The tank is above ground therefore the requirements for below grade tanks are not applicable.

5. The tank is supported on a 12" concrete slab which was designed by Gustav Getter Associates, New Rochelle, NY, in 1980 to support the 10,000 gallon storage tank. There is no evidence indicating significant settlement of the slab or movement due to frost action. Based on the performance of the slab over the past 25 years it is our opinion that the slab was designed properly. The tank is not subject to flotation since the elevation of the top of the vault walls in which the tank sits is low enough that the water would overflow the walls before flotation would occur.

Requirement (b) – The owner must insure that the tank is not damage during installation. A qualified independent inspector or PE shall inspect the tank systems for the presence of weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, or other structural damage.

Assessment - No reports of inspections conducted after the tank was installed have been located. The thickness of the tank has been periodically measured by Knight Consulting Engineers, Inc., starting in 1983. The latest such inspection was conducted in November 2004, and the report from that inspection is included in Appendix 3. The last interior inspection of the tank was completed in 1990. The report of this inspection is attached in Appendix 4. IBM visually inspects the exterior of the tanks on a daily basis. IBM reports that no leaks have occurred in this tank since it has been in service.

Requirement (c) – Applies to undergound tanks and is therefore not applicable to this tank.

Requirement (d) – All new tanks and ancillary equipment must be tested for tightness prior to being placed in use.

Assessment – The tank was pressure tested to 20 psi by the manufacturer (see Appendix 1). We cannot state whether or not all ancillary piping and equipment was tested, however, IBM reports that no leaks have occurred since the tank was placed in service.

Requirement (e) – Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.

Assessment – We have completed a visual assessment of support of the ancillary equipment and it is our opinion that the equipment is so supported.

Requirement (f) – Corrosion protection must be provided as required in section (a). Not applicable.

<u>40 CFR 264.193</u>

Requirement (c)(1) – Secondary containment must be constructed of or lined with materials that are compatible with the waste to be stored and must have sufficient strength and thickness to prevent failure due to pressure gradients, physical contact with the waste, climatic conditions, and the stress of daily operation.

Assessment – The secondary containment system consists of a ¼" thick ASTM A588-85 Grade B weathering steel plate liner designed by Knight Consulting Engineers in 1987 supported by concrete foundation and walls designed by Gustav Getter Associates in 1980. The liner is protected from wind and snow by the roof and wall structure designed by Knight Consulting Engineers in 1987. It has sufficient strength to prevent failure due to pressure gradients, physical contact with the waste and the stress of daily operation. Knight Consulting Engineers, Inc., has reviewed chemical compatibility charts provided by Cole-Palmer and Cat Pumps to check for compatibility with the liner. The information gathered is summarized in Appendix 2. Knight Consulting Engineers, Inc., does not specialize in chemical engineering, so this data is provided as general information only.

Requirement (c)(2) – The secondary containment system must be placed on a foundation capable of providing support to the secondary containment system, resistance to pressure gradients above and below the system, and capable of preventing failure due to settlement.

Assessment – The liner is supported by concrete slabs and walls designed by Gustav Getter Associates in 1980. The concrete slab and walls have sufficient strength to resist pressure gradients above and below the system. They are also capable of preventing failure due to settlement.

Requirement (c)(3) – The secondary containment system must be provided with a leak detection system that is designed and operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours.

Assessment – A leak detection system is provided to detect leaks of the tanks into the secondary containment system. In addition, the secondary containment is visually inspected on a daily basis. No leak detection system is provided to detect leaks of the secondary containment system. There are standpipes above the lowest areas of the concrete slab supporting the liner that could be used to visually inspect for leaks of the secondary containment system, however, IBM does not currently conduct such inspections.

Requirement (c)(4) – The secondary containment system must be sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spill, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within 24 hours, or in as timely a manner as is possible to prevent harm to human health and the environment.

Assessment – The secondary containment system has sufficient volume to contain the volume of all tanks protected by the containment system. In addition there is a piping and vault system designed to collect overflow of the secondary containment in the very unlikely event that such overflow would occur.

Requirement (d) – The secondary containment system must include one or more of the following devices: (1) a liner (external to the tank); (2) a vault; (3) A double-walled tank; or (4) an equivalent device as approved by the Regional Administrator.

Assessment – The secondary containment system includes a liner as described earlier in this report.

Requirement (e)(1)(i) – The liner must be designed or operated to contain 100 percent of the capacity of the largest tank within its boundary.

Assessment – Each lined area contains two 10,000 gallon tanks. Each lined area has a secondary containment capacity of approximately 21,000 gallons, so this requirement is satisfied.

Requirement (e)(1)(ii) – The liner must be designed or operated to prevent run-on or infiltration of the precipitation into the secondary containment system.

Assessment – The liner is protected by an overhanging roof and wall structure that prevents precipitation from falling on the containment area. Groundwater cannot flow into the containment area.

Requirement (e)(1)(iii) – The liner must be free from cracks and gaps.

Assessment – The liner was hydrostatically tested and the liner welds were vacuum tested after construction.

Requirement (e)(1)(iv) – The liner must be designed and installed to surround the tank completely and to cover all earth likely to come into contact with the waste if the waste is released from the tank(s) (i.e., capable of preventing lateral as well as vertical migration of the waste).

Assessment – The liner extends at least 10' beyond the tanks in all directions in order to satisfy this requirement.

Requirement (f) – Ancillary equipment must be provided with secondary containment that meets the requirements if paragaphs (b) and (c) of this section except for aboveground piping, welded flanges, welded joints, welded connections, sealless or magnetic coupling pumps, and sealless valves that are inspected on a daily basis.

Assessment – Ancillary equipment is located above the area that is lined as described above and thus meets this requirement. To our knowledge all piping that leaves the lined area is double contained piping. According to IBM, all ancillary equipment is inspected daily.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

STATE OF VERMONT
MARTIN W. HAIN
No. 5490
REGISTERED
PROFESSIONAL ENGINEER

Martin W. Hain, P.E.
President
KNIGHT CONSULTING ENGINEERS, INC.

File: S:\06264\General Solvent #1\Report - General Solvent #1.doc

FORM U-1A MANUFACTURERS' DATA REPORT FOR PRESSURE VESSELS
(Alternate Form for Single Chamber, Completely Shop-Fabricated Vessels Only)
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

G.S. #1

1. Manufactured by Eastern Tank Fabricators, 460 Main Ave, Wallington, NJ 07055
2. Manufactured for Wm. L. Crow Construction, One Penn Plaza, NYC 10001
3. Location of Installation IBM Corp., Burlington, Vermont
4. Type Horiz. (Horiz. or vert. tank) 5010-5 (Mfgr's Serial No.) – (CRN) D9616-2 (Drawing No.) 1629 (Nat'l Brd No.) (Year Built) 1980
5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1980 (Year) and Addenda to 6/30/80 (Date) and Code Case Nos. None
Special Service per UG-120(d) None
Manufacturers' Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: –
6. Shell: Matl. SA285C (Spec. No., Grade) Nom. Thk. ½ in. Corr. Allow. 0 in. Diam. 120 in. Lgth. 15 ft 0 in. SL
7. Seams: Long. Weld Dbl Butt (Welded, Dbl, Sngl, Lap, Butt) R.T. None (Spot or Full) Efficiency 70 % H.T. Temp. – F Time – hr
Girth Weld Dbl Butt (Welded, Dbl, Sngl, Lap, Butt) R.T. None (Spot, Partial, or Full) No. of Courses 2
8. Heads: (a) Material SA285-C (Spec. No., Grade) (b) Material (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Min. Thk.	Corr. Allow.	Crown Radius	Knuckle Radius	Ellipse Ratio	Conical Apex Angle	Hemisph. Radius	Flat Diam.	Side to Pressure (Convex or Concave)
(a)	Ends	3/16	0	114	8	–	–	–	–	Concave
(b)										

If removable, bolts used (describe other fastenings) –
9. Constructed for max. allowable working pressure 20 psi at max. temp. 100 F. Min. temp. (when less than −20 F) – F. Hydrostatic, pneumatic, or combination test pressure 30 psi.
10. Safety Valve Outlets: Number – Size – Location Elsewhere In System
11. Nozzles and Inspection Openings:

Purpose (Inlet, Outlet, Drain)	No.	Diam. or Size	Type	Matl.	Nom. Thk.	Reinforcement Matl.	How Attached	Location
Misc.	1	10"	150#SlipOn	SA53B	.365	–	Welded	Shell
Misc.	1	5	150#SlipOn	SA53B	.258	–	Welded	Shell
Misc.	1	6	150#SlipOn	SA53B	.280	–	Welded	Shell
Misc.	2	2	150#SlipOn	SA53B	.154	–	Welded	Shell
Misc.	2	2	150#SlipOn	SA53B*	.154	–	Welded	Shell
Insp.	2	24	Manhole	SA285C	1" (Neck)	–	Welded	Shell

12. Supports: Skirt No (Yes or no) Lugs – (No.) Legs – (No.) Other 3 – 120° Saddles (Describe) Attached Welded to Shell (Where and how)
13. Remarks: *W/Pipe Extended to tank bottom –
14 clips and structurals for rail and platform support–
Chemical Waste Storage Tank
Designed according to the Rules of UW12C

CERTIFICATE OF COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1.
Date 12/31/80 Signed Eastern Tank Fabricator (Manufacturer) by [signature] (Representative)
"U" Certificate of Authorization No. 8453 expires August 4th, 19 81

CERTIFICATE OF SHOP INSPECTION

Vessel made by EASTERN TANK FABRICATORS at 460 Main Ave, Wallington, NJ
I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of New Jersey and employed by CommUnionInsCo have inspected the pressure vessel described in this Manufacturers' Data Report on 12-10 19 80, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in the Manufacturers' Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.
Signed [signature] (Inspector) Date 12-15-80 Commissions NB 8941 (Nat'l Board, State, Province and No.)

(1/76) This form (E00117) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 10017

APPENDIX 2
Chemicals Stored and Compatibility Guidelines

General Solvent 1			Carbon Steel		304 Stainless Steel		314 Stainless Steel	
COMPOUND	CAS #	Comments	CAT Pumps	Cole Palmer	CAT Pumps	Cole Palmer	CAT Pumps	Cole Palmer
1,2,4-Trimethylbenzene	95-63-6	Found to be 2420 ppb in Oct 2004 sample	No information available	No information available	No information available	No information available	No information available	No information available
1,3,5-Trimethylbenzene	108-67-8	Found to be 654 ppb in Oct 2004 sample	No information available	No information available	No information available	No information available	No information available	No information available
Acetic Acid	64-19-7	Found to be 14,300 ppm in Oct 2004 sample	A-Good	D-Severe Effect	C-Questionable	C-Fair	B-Fair	A-Excellent
Acetone	67-64-1	Found to be 185 ppm in Oct 2004 sample	A-Good	B-Good	A-Good	A-Excellent	A-Good	A-Excellent
Cresol (mixture of m-, o- , & p-)	1319-77-3		Not rated	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
Cyclohexanone	108-94-1		Not rated	A-Excellent	Not rated	A-Excellent	A-Good	A-Excellent
Di-isobutyl ketone	108-83-8		Not rated	No information available	Not rated	No information available	Not rated	No information available
Ethyl 3-ethoxypropionate (Propionic Acid)	763-69-9	Found to be 3,170 ppm in Oct 2004 sample	Not rated	No information available	Not rated	No information available	Not rated	No information available
Ethyl lactate	97-64-3	Found to be 1,550 ppm in Oct 2004 sample	No information available	No information available	No information available	No information available	No information available	No information available
Ethylene Glycol	107-21-1		C-Questionable	B-Good	A-Good	B-Good	A-Good	B-Good
gamma-Butyrolactone	96-48-0		No information available	No information available	No information available	No information available	No information available	No information available
Isopropanol (Isopropyl Alchohol)	67-63-0	Main constituent, Found to be 114,000 ppm in Oct 2004 sample	A-Good	A-Excellent	A-Good	B-Good	A-Good	B-Good
Methanol	67-56-1		A-Good	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
Methyl Ethyl Ketone	78-93-3		Not rated	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
Methyl Isoamyl Ketone	110-12-3		No information available	No information available	No information available	No information available	No information available	No information available
Methyl isobutyl ketone	108-10-1	Found to be 864 ppm in Oct 2004 sample	Not rated	A-Excellent	A-Good	B-Good	A-Good	B-Good
n-Butyl Acetate	123-86-4	Found to be 7,500 ppm in Oct 2004 sample	A-Good	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
n-Butyl Alcohol	71-36-3		C-Questionable	B-Good	A-Good	A-Excellent	A-Good	A-Excellent
n-Methyl pyrrolidone	872-50-4	Found to be 13,900 ppm in Oct 2004 sample	No information available	No information available	No information available	No information available	No information available	No information available
PGME	107-98-2	Found to be 1,360 ppm in Oct 2004 sample	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated A-Good	Propylene Glycol is rated B-Good
PGMEA	108-65-6	Found to be 49,400 ppm in Oct 2004 sample	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated A-Good	Propylene Glycol is rated B-Good
n-Propylbenzene	103-65-1	Found to be 320 ppb in Oct 2004 sample	No information available	No information available	No information available	No information available	No information available	No information available
Propylene Glycol	57-55-6		B-Fair	B-Good	B-Fair	B-Good	A-Good	B-Good
Tetrachloroethylene	127-18-4		Not rated	A-Excellent	Not rated	A-Excellent	Not rated	Not rated
Toluene	108-88-3	Found to be 320 ppb in Oct 2004 sample	A-Good	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
Xylene, m-	108-38-3		B-Fair	A-Excellent	A-Good	B-Good	A-Good	B-Good
Xylene, o-	95-47-6		B-Fair	A-Excellent	A-Good	B-Good	A-Good	B-Good
Xylene, p-	106-42-3		B-Fair	A-Excellent	A-Good	B-Good	A-Good	B-Good

RCRA Assessment of General Solvent Waste Storage Tanks #2 and #3

December 20, 2005

KNIGHT CONSULTING ENGINEERS, INC.
P.O. BOX 29, 51 KNIGHT LANE
WILLISTON, VERMONT 05495
Tel: 802-879-6343 Fax: 802-879-6376

STEPHEN C. KNIGHT, JR. P.E.
MARTIN W. HAIN, P.E.
ERIC H. GODDARD, P.E.
ROBERT A. LOVGREN, P.E.

CIVIL ENGINEERING
STRUCTURAL ENGINEERING
GEOTECHNICAL ENGINEERING
HYDRAULIC ENGINEERING
CONSTRUCTION INSPECTION
CONSTRUCTION TESTING

December 20, 2005

Andrew Snow
IBM Microelectronics
Essex Junction, VT

Re: RCRA Assessment of General Solvent Waste Storage Tanks #2 and #3
IBM Chemical Distribution Center Tank Farm

Dear Mr. Snow:

This letter reports our assessment of General Solvent Waste Storage Tanks #2 and #3 with respect to the requirements of 40 CFR 264.192 and 40 CFR 264.193. The report will paraphrase each requirement of the CFR and then provide an assessment of the actual conditions with respect to each requirement.

40 CFR 264.192

Requirement (a) - Owner must have a written assessment by a registered professional engineer indicating that the foundation, structural support, and the tank are properly designed, the tank material is compatible with the waste to be stored, and that corrosion protection is provided if necessary. At a minimum the assessment must include the design standard(s) to which the tank was constructed; a list of the hazardous characteristics of the waste to be stored; and an assessment of the foundation's ability to support the load of the tanks, prevent flotation or dislodgement of the tanks, and to prevent movement due to frost action.

Assessment:

1. Both steel tanks are 15'-0" long with a diameter of 9'-11½". They are built of welded ¼" SA240 304 stainless steel plate. Tanks were manufactured in 1996 by Stainless Fabrications, Inc. They were designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code. Copies of the Manufacturer's Data Report for Pressure Vessels are included in Appendix 1.

2. The MSDS sheets for the waste material stored in the tanks can be found in Appendix 2. Knight Consulting Engineers, Inc., has reviewed chemical compatibility charts provided by Cole-Palmer and Cat Pumps to check for compatibility with the 304 Stainless Steel Tanks. The information gathered is summarized in Appendix 7. Knight Consulting Engineers, Inc., does not specialize in chemical engineering, so this data is provided as general information only.

3. The tanks are not in contact with soil. They are protected from rain and snow by a roof a partial height wall. Since that tanks are not in contact with soil or water, additional corrosion protection is not required.

4. The tanks are above ground therefore the requirements for below grade tanks are not applicable.

5. The tanks are supported on 12" concrete slabs which were designed by Gustav Getter Associates, New Rochelle, NY, in 1980 to support 10,000 gallon storage tanks. There is no evidence indicating significant settlement of the slabs or movement due to frost action. Based on the performance of the slabs over the past 25 years it is our opinion that the slabs were designed properly. The tanks are not subject to flotation since the elevation of the top of the vault walls in which the tanks sit is low enough that the water would overflow the walls before flotation would occur.

Requirement (b) – The owner must insure that the tank is not damage during installation. A qualified independent inspector or PE shall inspect the tank systems for the presence of weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, or other structural damage.

Assessment - No reports of inspections conducted after the tanks were installed have been located. The inside of the tanks were cleaned and visually inspected in 2002. A copy of the report of this inspection is included in Appendix 3. IBM visually inspects the exterior of the tanks on a daily basis. A copy of the inspection form is included in Appendix 8. IBM reports that no leaks have occurred in these tanks since they have been in service.

Requirement (c) – Applies to undergound tanks and is therefore not applicable to these tanks.

Requirement (d) – All new tanks and ancillary equipment must be tested for tightness prior to being placed in use.

Assessment – The tanks were pressure tested to 31 psi by the manufacturer (see Appendix 1). Piping to the tanks was pressure tested prior to being placed into service in 1988 (see Appendix 4). We cannot state whether or not all ancillary piping and equipment was tested, however, IBM reports that no leaks have occurred since the tanks were placed in service.

Requirement (e) – Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.

Assessment – We have completed a visual assessment of support of the ancillary equipment and it is our opinion that the equipment is so supported.

Requirement (f) – Corrosion protection must be provided as required in section (a). Not applicable.

<u>40 CFR 264.193</u>

Requirement (c)(1) – Secondary containment must be constructed of or lined with materials that are compatible with the waste to be stored and must have sufficient strength and thickness to prevent failure due to pressure gradients, physical contact with the waste, climatic conditions, and the stress of daily operation.

Assessment – The secondary containment system consists of a ¼" thick ASTM A588-85 Grade B weathering steel plate liner designed by Knight Consulting Engineers in 1987 supported by concrete foundation and walls designed by Gustav Getter Associates in 1980. The mill test reports for the steel plate are in Appendix 5. The liner is protected from wind and snow by the roof and wall structure designed by Knight Consulting Engineers in 1987. It has sufficient strength to prevent failure due to pressure gradients, physical contact with the waste and the stress of daily operation. Knight Consulting Engineers, Inc., has reviewed chemical compatibility charts provided by Cole-Palmer and Cat Pumps to check for compatibility with the liner. The information gathered is summarized in Appendix 7. Knight Consulting Engineers, Inc., does not specialize in chemical engineering, so this data is provided as general information only.

Requirement (c)(2) – The secondary containment system must be placed on a foundation capable of providing support to the secondary containment system, resistance to pressure gradients above and below the system, and capable of preventing failure due to settlement.

Assessment – The liner is supported by concrete slabs and walls designed by Gustav Getter Associates in 1980. The concrete slab and walls have sufficient strength to resist pressure gradients above and below the system. They are also capable of preventing failure due to settlement.

Requirement (c)(3) – The secondary containment system must be provided with a leak detection system that is designed and operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours.

Assessment – A leak detection system is provided to detect leaks of the tanks into the secondary containment system. In addition, the secondary containment is visually inspected on a daily basis. No leak detection system is provided to detect leaks of the secondary containment system. There are standpipes above the lowest areas of the concrete slab supporting the liner that could be used to visually inspect for leaks of the secondary containment system, however, IBM does not currently conduct such inspections.

Requirement (c)(4) – The secondary containment system must be sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spill, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within 24 hours, or in as timely a manner as is possible to prevent harm to human health and the environment.

Assessment – The secondary containment system has sufficient volume to contain the volume of all tanks protected by the containment system. In addition there is a piping and vault system designed to collect overflow of the secondary containment in the very unlikely event that such overflow would occur.

Requirement (d) – The secondary containment system must include one or more of the following devices: (1) a liner (external to the tank); (2) a vault; (3) A double-walled tank; or (4) an equivalent device as approved by the Regional Administrator.

Assessment – The secondary containment system includes a liner as described earlier in this letter.

Requirement (e)(1)(i) – The liner must be designed or operated to contain 100 percent of the capacity of the largest tank within its boundary.

Assessment – Each lined area contains two 10,000 gallon tanks. Each lined area has a secondary containment capacity of approximately 21,000 gallons, so this requirement is satisfied.

Requirement (e)(1)(ii) – The liner must be designed or operated to prevent run-on or infiltration of the precipitation into the secondary containment system.

Assessment – The liner is protected by an overhanging roof and wall structure that prevents precipitation from falling on the containment area. Groundwater cannot flow into the containment area.

Requirement (e)(1)(iii) – The liner must be free from cracks and gaps.

Assessment – The liner was hydrostatically tested and the liner welds were vacuum tested after construction. Test reports can be found in Appendix 6.

Requirement (e)(1)(iv) – The liner must be designed and installed to surround the tank completely and to cover all earth likely to come into contact with the waste if the waste is released from the tank(s) (i.e., capable of preventing lateral as well as vertical migration of the waste).

Assessment – The liner extends at least 10' beyond the tanks in all directions in order to satisfy this requirement.

Requirement (f) – Ancillary equipment must be provided with secondary containment that meets the requirements if paragaphs (b) and (c) of this section except for aboveground piping, welded flanges, welded joints, welded connections, sealless or magnetic coupling pumps, and sealless valves that are inspected on a daily basis.

Assessment – Ancillary equipment is located above the area that is lined as described above and thus meets this requirement. To our knowledge all piping that leaves the lined area is double contained piping. According to IBM, all ancillary equipment is inspected daily.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

Martin W. Hain, P.E.
President
KNIGHT CONSULTING ENGINEERS, INC.

STATE OF VERMONT
MARTIN W. HAIN
No. 5490
REGISTERED
PROFESSIONAL ENGINEER

File: S:\05355\Letter 01.doc

G.S. #2

FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
(Alternative Form for Single Chamber, Completely Shop-Fabricated Vessels Only)
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1. Manufactured and certified by Stainless Fabrication Inc., 4455 West Kearney St., Springfield MO 65803 (Name and address of Manufacturer)

2. Manufactured for Whitning Turner Contracting Company PO Box 49 Essex Junction, VT 05453 (Name and address of Purchaser)

3. Location of installation IBM Essex Junction, VT (Name and address)

4. Type Horizontal (Horiz. or vert., tank) | 3792 - 1 (Mfgr's. serial No.) | None (CRN) | DHM0056 Rev B (Drawing No.) | 675 (Nat'l. Bd. No.) | 1996 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1995 (Year)

to 1995 (Addenda (Date)) | none (Code Case Nos.) | none (Special Service per UG-120(d))

6. Shell: SA240 304 (Mat'l. (Spec. No., Grade)) | .250" (Nom. Thk. (in.)) | 0 (Cor. Allow. (in.)) | 9' 11-1/2" (Diam. I.D. (ft. & in.)) | 15' 0" (Length (overall) (ft. & in.))

7. Seams: WDB (Long. (Welded, Dbl., Sngl., Lap, Butt)) | None (R.T. (Spot or Full)) | .70 (Eff. (%)) | None (H.T. Temp (°F)) | - (Time (hr)) | WDB (Girth (Welded, Dbl., Sngl., Lap, Butt)) | None (R.T. (Spot, Partial, or Full)) | 2 (No. of Courses)

8. Heads: (a) SA240 304 (Spec. No., Grade) (b) SA240 304 (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	Left	.215"	0	120"	8"	-	-	-	-	Concave
(b)	Right	.214"	0	120"	8"	-	-	-	-	Concave

If removable, bolts used (describe other fastening) _____ (Mat'l., Spec. No. Gr., Size, No.)

9. MAWP 20 psi at max. temp. 140 °F.

Min. design metal temp. -20 °F at 20 psi. Hydro., pneu., or comb. test pressure 31 psi.

10. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Type	Material	Nom. Thk.	Reinforcement Material	How Attached	Location
Inspection	2 --	24"	Loose	SA240 304	.250"	None	UW16.1(i)	Shell
Level - Pump	1 - 1	8" - 10"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(i)/Fig2-4(3)	-
In-Vent-Spare	2-1-1	2"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(i)/Fig2-4(3)	-
Lvl-Vent-Gauge	-1-1-1	5"-6"-4"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(i)/Fig2-4(3)	-

11. Supports: Skirt No (Yes or no) Lugs - (No.) Legs - (No.) Others (3) Saddles (Describe) Attached Welded to Pad Over Shell (Where and how)

12. Remarks: Manufacaturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: None (Name of part, item number, Mfgr's. name and identifying stamp)

Item is a 10,000 gallon horizontal storage tank, contents unknown. Impact testing exempted per UHA51(d). Completed vessel was hydrostatically tested in horizontal position.

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1. "U" Certificate of Authorization No. 23598 expires November 24, 19 96

Date November 1, 1996 Co. Name Stainless Fabrication, Inc. (Manufacturer) Signed [signature] (Representative)

CERTIFICATE OF SHOP INSPECTION

Vessel constructed by Stainless Fabrication, Inc. at 4455 W. Kearney St., Springfield MO 65803

The undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of MO. employed by Commercial Union Insurance Co. of Boston, MA have inspected the pressure vessel described in this Manufacturer's Data Report on 11-1 19 96, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel descibed in the Manufacturer's Data Report. Furthermore, neither the inspector nor his Employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 11-1-96 Signed [signature] (Authorized Inspector) Commissions N.B. #11763 'A' (Nat'l Board Incl. endorsement, State, Province and No.)

FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
(Alternative Form for Single Chamber, Completely Shop-Fabricated Vessels Only)
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

G.S. #3

1. Manufactured and certified by Stainless Fabrication Inc., 4455 West Kearney St., Springfield MO 65803
(Name and address of Manufacturer)

anufactured for Whitning Turner Contracting Company PO Box 49 Essex Junction, VT 05453
(Name and address of Purchaser)

3. Location of installation IBM Essex Junction, VT
(Name and address)

4. Type Horizontal (Horiz. or vert., tank) | 3792 - 2 (Mfg'r's. serial No.) | None (CRN) | DHM0058 Rev A (Drawing No.) | 676 (Nat'l. Bd. No.) | 1998 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1995 (Year)

to 1995 (Addenda (Date)) | none (Code Case Nos.) | none (Special Service per UG-120(d))

6. Shell: SA240 304 (Matl. (Spec. No., Grade)) | .250" (Nom. Thk. (in.)) | 0 (Corr. Allow. (in.)) | 9' 11-1/2" (Diam. I.D. (ft. & in.)) | 15' 0" (Length (overall) (ft. & in.))

7. Seams: WDB (Long. (Welded, Dbl., Sngl., Lap, Butt)) | None (R.T. (Spot or Full)) | 70 (Eff. (%)) | None (H.T. Temp (°F)) | - (Time (hr)) | WDB (Girth (Welded, Dbl., Sngl., Lap, Butt)) | None (R.T. (Spot, Partial, or Full)) | 2 (No. of Courses)

8. Heads: (a) SA240 304 (Spec. No., Grade) (b) SA240 304 (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	Left	.216"	0	120"	8"	-	-	-	-	Concave
(b)	Right	.219"	0	120"	8"	-	-	-	-	Concave

If removable, bolts used (describe other fastening) _____ (Matl., Spec. No. Gr., Size, No.)

9. MAWP 20 psi at max. temp. 140 °F.

Min. design metal temp. -20 °F at 20 psi. Hydro., pneu., or comb. test pressure 31 psi.

10. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Type	Material	Nom. Thk.	Reinforcement Material	How Attached	Location
Inspection	2	24"	Loose	SA240 304	.250"	None	UW16.1(i)	Shell
Level - Pump	1 - 1	8" - 10"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(i)/Fig2-4(3)	-
In-Vent-Spare	2-1-1	2"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(i)/Fig2-4(3)	-
Lvl-Vent-Gauge	1-1-1	5"-6"-4"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(i)/Fig2-4(3)	-

11. Supports: Skirt No (Yes or no) Lugs - (No.) Legs - (No.) Others (3) Saddles (Describe) Attached Welded to Pad Over Shell (Where and how)

12. Remarks: Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: None
(Name of part, item number, Mfg'r's. name and identifying stamp)

Item is a 10,000 gallon horizontal storage tank, contents unknown. Impact testing exempted per UHA51(d). Completed vessel was hydrostatically tested in horizontal position.

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1. "U" Certificate of Authorization No. 23598 expires November 24, 19 96

Date November 1, 1996 Co. Name Stainless Fabrication, Inc. (Manufacturer) Signed [signature] (Representative)

CERTIFICATE OF SHOP INSPECTION

Vessel constructed by Stainless Fabrication, Inc. at 4455 W. Kearney St., Springfield MO 65803

undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of MO. employed by Commercial Union Insurance Co. of Boston, MA have inspected e pressure vessel described in this Manufacturer's Data Report on 11-1, 19 96, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel descibed in the Manufacturer's Data Report. Furthermore, neither the Inspector nor his Employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 11-1-96 Signed [signature] (Authorized Inspector) Commissions N.B. #11763 'A' (Nat'l Board Incl. endorsement, State, Province and No.)

Air Products and Chemicals, Inc.

Date Prepared: 08/18/04
Date Printed: 09/10/04
MSDS No: 308.0000012-006.006

CLEANROOM LP ACETIC ACID 100%

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Material Identity
Product Name: CLEANROOM LP ACETIC ACID 100%
Product Code: 3013100
General or Generic ID: ORGANIC ACID

Company
Air Products and Chemicals, Inc.
7201 Hamilton Blvd.
Allentown, PA 18195-1501

Emergency Telephone Number:
(800) 523-9374 in Continental U.S., Canada and Puerto Rico
(610) 481-7711 other locations
Technical Information:
800-752-1597

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient(s)	CAS Number	% (by weight)
ACETIC ACID	64-19-7	98.0-100.0

3. HAZARDS IDENTIFICATION

Potential Health Effects

Eye
Can cause permanent eye injury. Symptoms include stinging, tearing, redness, and swelling of eyes. Can injure the cornea and cause blindness.

Skin
Can cause permanent skin damage. Symptoms may include redness, burning, and swelling of skin, burns, and other skin damage. Additional symptoms of skin contact may include: abnormal coloring of the skin, Passage of this material into the body through the skin is possible, and may add to toxic effects from breathing or swallowing.

Swallowing
Swallowing this material may be harmful or fatal. Symptoms may include severe stomach and intestinal irritation (nausea, vomiting, diarrhea), abdominal pain, and vomiting of blood. Swallowing this material may cause burns and destroy tissue in the mouth, throat, and digestive tract. Low blood pressure and shock may occur as a result of severe tissue injury.

Inhalation
Breathing of vapor or mist is possible. Breathing this material may be harmful or fatal. Symptoms may include severe irritation and burns to the nose, throat, and respiratory tract.

Symptoms of Exposure
Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: stomach or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways), lung irritation, difficult breathing, lung edema (fluid buildup in the lung tissue).

Continued on next page

Target Organ Effects
Overexposure to this material (or its components) has been suggested as a cause of the following effects in humans: damage to tooth enamel, chronic bronchitis effects on lung function.

Developmental Information
Based on the available information, risk to the fetus from maternal exposure to this material cannot be assessed.

Cancer Information
There is no information available. The chance of this material causing cancer is unknown. This material is not listed as a carcinogen by the International Agency for Research on Cancer, the National Toxicology Program, or the Occupational Safety and Health Administration.

Other Health Effects
No data

Primary Route(s) of Entry
Inhalation, Skin absorption, Skin contact, Eye contact, Ingestion.

4. FIRST AID MEASURES

Eyes
If material gets into the eyes, immediately flush eyes gently with water for at least 15 minutes while holding eyelids apart. If symptoms develop as a result of vapor exposure, immediately move individual away from exposure and into fresh air before flushing as recommended above. Seek immediate medical attention.

Skin
Immediately flush skin with water for at least 15 minutes while removing contaminated clothing and shoes. Seek immediate medical attention. Wash clothing before reuse and discard contaminated shoes.

Swallowing
Seek immediate medical attention. Do not induce vomiting. Vomiting will cause further damage to the mouth and throat. If individual is conscious and alert, immediately rinse mouth with water and give milk or water to drink. If possible, do not leave individual unattended.

Inhalation
If symptoms develop, immediately move individual away from exposure and into fresh air. Seek immediate medical attention; keep person warm and quiet. If person is not breathing, begin artificial respiration. If breathing is difficult, administer oxygen.

Note to Physicians
Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin, lung (for example, asthma-like conditions).

5. FIRE FIGHTING MEASURES

Flash Point
100.0 F (37.7 C) TCC

Continued on next page

Explosive Limit
(for product) Lower 4.0 Upper 19.9 %

Autoignition Temperature
No data

Hazardous Products of Combustion
May form: acid vapors, carbon dioxide and carbon monoxide, various hydrocarbons.

Fire and Explosion Hazards
Vapors are heavier than air and may travel along the ground or be moved by ventilation and ignited by heat, pilot lights, other flames and ignition sources at locations distant from material handling point. Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively.

Extinguishing Media
alcohol foam, water fog, carbon dioxide, dry chemical.

Fire Fighting Instructions
Wear a self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode with appropriate turn-out gear and chemical resistant personal protective equipment. Refer to the personal protective equipment section of this MSDS.

NFPA Rating
Health - 2, Flammability - 2, Reactivity - 0

6. ACCIDENTAL RELEASE MEASURES

Small Spill
Cover with soda ash. Mix and scoop into a beaker of water.

Large Spill
Eliminate all ignition sources (flares, flames including pilot lights, electrical sparks). Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed. Stop spill at source. Prevent from entering drains, sewers, streams or other bodies of water. Prevent from spreading. If runoff occurs, notify authorities as required. Pump or vacuum transfer spilled product to clean containers for recovery. Absorb unrecoverable product. Transfer contaminated absorbent, soil and other materials to containers for disposal.

7. HANDLING AND STORAGE

Handling
Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed. All five-gallon pails and larger metal containers, including tank cars and tank trucks, should be grounded and/or bonded when material is transferred. Never add water to acids. Always add acids to water.

Continued on next page

Storage
Do not allow moisture or water contamination of product.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection
Chemical splash goggles and face shield (8" min.) in compliance with OSHA regulations are advised; however, OSHA regulations also permit other type safety glasses. (Consult your industrial hygienist.)

Skin Protection
Wear resistant gloves such as: neoprene, nitrile rubber, To prevent skin contact, wear impervious clothing and boots.

Respiratory Protections
If workplace exposure limit(s) of product or any component is exceeded (see exposure guidelines), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your industrial hygienist). Engineering or administrative controls should be implemented to reduce exposure.

Engineering Controls
Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below TLV(s).

: sure Guidelines
Co. onent

ACETIC ACID (64-19-7)
OSHA PEL 10.000 ppm - TWA
OSHA VPEL 10.000 ppm - TWA
ACGIH TLV 10.000 ppm - TWA
ACGIH TLV 15.000 ppm - STEL

9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point
(for product) 244.0 F (117.7 C) @ 760 mmHg

Vapor Pressure
(for product) 11.000 mmHg @ 68.00 F

Specific Vapor Density
2.100 @ AIR=1

Specific Gravity
1.054 @ 68.00 F

Liquid Density
8.780 lbs/gal @ 68.00 F
1.054 kg/l @ 20.00 C

Continued on next page

Percent Volatiles
100.0 %

Volatile Organic Compounds (VOC)
.000 %

Evaporation Rate
.97 (N-BUTYL ACETATE)

Appearance
No data

State
LIQUID

Physical Form
NEAT

Color
CLEAR & COLORLESS

Odor
No data

pH
2.0

10. STABILITY AND REACTIVITY

Hazardous Polymerization
Product will not undergo hazardous polymerization.

Hazardous Decomposition
May form: acid vapors, carbon dioxide and carbon monoxide, various hydrocarbons.

Chemical Stability
Stable.

Incompatibility
Avoid contact with: amines, halogens, heat, peroxides, strong alkalis, strong mineral acids, strong oxidizing agents, Acid reacts with most metals to release hydrogen gas which can form explosive mixtures with air.

11. TOXICOLOGICAL INFORMATION

No data

Continued on next page

12. ECOLOGICAL INFORMATION

No data

13. DISPOSAL CONSIDERATION

Waste Management Information

Dispose of in accordance with all applicable local, state and federal regulations.

14. TRANSPORT INFORMATION

DOT Information - 49 CFR 172.101

DOT Description:

ACETIC ACID, GLACIAL,8(3),UN2789,II

Container/Mode:

55 GAL DRUM/TRUCK PACKAGE

NOS Component:

None

RQ (Reportable Quantity) - 49 CFR 172.101

Product Quantity (lbs)	Component
5000	ACETIC ACID

Other Transportation Information

The Transport Information may vary with the container and mode of shipment.

15. REGULATORY INFORMATION

US Federal Regulations

TSCA (Toxic Substances Control Act) Status

TSCA (UNITED STATES) The intentional ingredients of this product are listed.

CERCLA RQ - 40 CFR 302.4(a)

Component	RQ (lbs)
ACETIC ACID	5000

CERCLA RQ - 40 CFR 302.4(b)

Materials without a "listed" RQ may be reportable as an "unlisted hazardous substance". See 40 CFR 302.5 (b).

SARA 302 Components - 40 CFR 355 Appendix A

None

Section 311/312 Hazard Class - 40 CFR 370.2

Immediate(X) Delayed(X) Fire(X) Reactive( ) Sudden Release of Pressure( )

Continued on next page

SARA 313 Components - 40 CFR 372.65
None

OSHA Process Safety Management 29 CFR 1910
None listed

EPA Accidental Release Prevention 40 CFR 68
None listed

International Regulations
Inventory Status
AICS (AUSTRALIA) The intentional ingredients of this product are listed.
DSL (CANADA) The intentional ingredients of this product are listed.
ECL (SOUTH KOREA) The intentional ingredients of this product are listed.
EINECS (EUROPE) The intentional ingredients of this product are listed.
ENCS (JAPAN) The intentional ingredients of this product are listed.
IECSC (CHINA) The intentional ingredients of this product are listed.
PICCS (PHILIPPINES) The intentional ingredients of this product are listed.

State and Local Regulations
California Proposition 65
None

New Jersey RTK Label Information
ACETIC ACID 64-19-7

Pennsylvania RTK Label Information
ACETIC ACID 64-19-7

16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.

MSDS Number: **A0446** * * * * * *Effective Date:* ***05/20/04*** * * * * * *Supercedes:* ***02/12/04***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ACETONE

1. Product Identification

Synonyms: Dimethylketone; 2-propanone; dimethylketal
CAS No.: 67-64-1
Molecular Weight: 58.08
Chemical Formula: (CH3)2CO
Product Codes:
J.T. Baker: 5008, 5018, 5356, 5580, 9001, 9002, 9003, 9004, 9005, 9006, 9007, 9008, 9009, 9010, 9015, 9024, 9036, 9125, 9254, 9271, A134, V655
Mallinckrodt: 0018, 2432, 2435, 2437, 2438, 2440, 2443, 2445, 2850, H451, H580, H981

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Acetone	67-64-1	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 0 - None
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache. Higher concentrations can produce central nervous system depression, narcosis, and unconsciousness.
Ingestion:
Swallowing small amounts is not likely to produce harmful effects. Ingestion of larger amounts may produce abdominal pain, nausea and vomiting. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms are expected to parallel inhalation.
Skin Contact:
Irritating due to defatting action on skin. Causes redness, pain, drying and cracking of the skin.
Eye Contact:
Vapors are irritating to the eyes. Splashes may cause severe irritation, with stinging, tearing, redness and pain.
Chronic Exposure:
Prolonged or repeated skin contact may produce severe irritation or dermatitis.
Aggravation of Pre-existing Conditions:
Use of alcoholic beverages enhances toxic effects. Exposure may increase the toxic potential of chlorinated hydrocarbons, such as chloroform, trichloroethane.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT

INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

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5. Fire Fighting Measures

Fire:
Flash point: -20C (-4F) CC
Autoignition temperature: 465C (869F)
Flammable limits in air % by volume:
lel: 2.5; uel: 12.8
Extremely Flammable Liquid and Vapor! Vapor may cause flash fire.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. This material may produce a floating fire hazard. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, alcohol foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

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7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Acetone:
-OSHA Permissible Exposure Limit (PEL):
1000 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):
500 ppm (TWA), 750 ppm (STEL) A4 - not classifiable as a human carcinogen
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear, colorless, volatile liquid.
Odor:
Fragrant, mint-like
Solubility:
Miscible in all proportions in water.
Specific Gravity:
0.79 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
56.5C (133F) @ 760 mm Hg
Melting Point:
-95C (-139F)
Vapor Density (Air=1):
2.0
Vapor Pressure (mm Hg):
400 @ 39.5C (104F)
Evaporation Rate (BuAc=1):
ca. 7.7

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Concentrated nitric and sulfuric acid mixtures, oxidizing materials, chloroform, alkalis, chlorine compounds, acids, potassium t-butoxide.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Oral rat LD50: 5800 mg/kg; Inhalation rat LC50: 50,100mg/m3; Irritation eye rabbit, Standard Draize, 20 mg severe; investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Acetone (67-64-1)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material is expected to readily biodegrade. When released to water, this material is expected to quickly evaporate. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ACETONE
Hazard Class: 3
UN/NA: UN1090
Packing Group: II
Information reported for product/size: 188L

International (Water, I.M.O.)

Proper Shipping Name: ACETONE
Hazard Class: 3
UN/NA: UN1090
Packing Group: II
Information reported for product/size: 188L

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Acetone (67-64-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Acetone (67-64-1)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Acetone (67-64-1)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Acetone (67-64-1)	5000	U002	No

Chemical Weapons Convention: No TSCA 12(b): Yes CDTA: Yes
SARA 311/312: Acute: Yes Chronic: No Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 2[Y]E
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **1** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES

IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

Label Precautions:

Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.

Label First Aid:

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

BREWER SCIENCE INC.
MATERIAL SAFETY DATA SHEET

This Material Safety Data Sheet has been prepared to comply with the EC Directive, Canadian WHMIS and the OSHA Hazard Communication Standard.

SECTION 1: IDENTIFICATION

Product Name: Cyclohexanone

Manufacturer: Brewer Science, Inc.
2401 Brewer Drive
Rolla, MO 65401

Information Phone Number: (573) 364-0300 Fax: (573) 368-3318
Emergency Phone Number: (800) 255-3924 (Chem Tel)
MSDS Date of Preparation: 6/06/96

SECTION 2: HAZARDOUS COMPONENTS

Component	CAS#	%	Exposure Limits
Cyclohexanone	108-94-1	100	50 ppm PEL-TWA 25 ppm TLV-TWA skin

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Clear liquid with a sweet, sharp odor. Flammable Liquid and Vapor. May cause eye and skin irritation. Inhalation of vapors may cause mucous membrane and respiratory irritation, headache, dizziness, nausea and other symptoms of central nervous system depression. May be absorbed through the skin to cause symptoms similar to inhalation. Prolonged overexposure may cause liver and kidney damage.

Potential Health Effects:

Eye: May cause moderate irritation with pain and redness.

Skin: May cause redness, irritation and dryness. Prolonged or repeated exposure may cause defatting and dermatitis. Cyclohexanone is absorbed through the skin causing effects similar to those described under inhalation.

Inhalation: Inhalation of vapors, mists or aerosols may cause mucous membrane and respiratory irritation. Central nervous system depression with symptoms of headache, dizziness, nausea, drowsiness and unconsciousness may also occur.

Ingestion: Swallowing may cause central nervous system depression with headache, nausea, dizziness and unconsciousness; gastrointestinal irritation and injury to the lungs, liver and brain.

Chronic Hazards: Chronic absorption of cyclohexanone may cause damage to the liver and kidneys based on data from animal studies. Cyclohexanone has been reported to cause adverse reproductive effects in laboratory animals.

Carcinogen Status: Cyclohexanone is not listed as a carcinogen by OSHA, IARC or NTP.

Medical Conditions Aggravated by Exposure: Pre-existing skin, liver and kidney diseases.

SECTION 4: FIRST AID MEASURES

Eye: Rinse thoroughly with water for at least 15 minutes, holding the eye lids open to be sure the material is washed out. Get prompt medical attention.

Skin: Remove contaminated clothing. Wash contact area thoroughly with soap and water. Get medical attention if irritation or symptoms of exposure develop. Launder clothing before re-use.

Inhalation: Remove victim to fresh air. Give artificial respiration if needed. Get immediate medical attention.

Ingestion: If the victim is conscious and not convulsing, induce vomiting, keeping the head lower than the hips to prevent aspiration. Get immediate medical attention.

SECTION 5: FIRE AND EXPLOSION DATA

Flash Point: 111 °F (44°C) Flammable Limits: LEL: 1.1% UEL: 9.5%

Extinguishing Media: Use water fog or spray, alcohol-resistant foam, carbon dioxide or dry chemical.

Special Fire Fighting Procedures: Wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing. Cool fire exposed containers with water.

Unusual Fire Hazards: Vapors are heavier than air and may travel along surfaces to remote ignition sources and flask back.

Hazardous Decomposition Products: Oxides of carbon.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Spill: Remove all ignition sources such as open flames, spark producing equipment, pilot lights, etc. Wear appropriate protective clothing including impervious gloves, safety goggles and respirator if needed. Ventilate area. Cover with and inert absorbent material and collect into an appropriate container for disposal. Report spills and releases as required to appropriate authorities.

SECTION 7: HANDLING AND STORAGE

Handling: Avoid breathing vapors. Use with adequate ventilation. Avoid contact with the eyes, skin and clothing. Wash thoroughly after handling. Do not eat, drink or smoke in the work area. Keep product away from heat, sparks, flames and all other sources of ignition. No smoking in storage or use areas. Keep containers closed when not in use.

Storage: Store in a cool, dry, well-ventilated location away from incompatible materials. Keep containers closed when not in use.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation: Use with adequate general or local exhaust ventilation to maintain exposure levels below the occupational exposure limit.

Respiratory Protection: If needed, a NIOSH/MSHA approved respirator with organic vapor cartridges may be used. For higher exposures (greater than 10 times the TLV), a supplied air respirator may be required. Respirator selection and use should be based on contaminant type, form and concentration. Follow OSHA 1910.134, ANSI Z88.2 and good Industrial Hygiene practice.

Skin Protection: Impervious gloves such as butyl rubber.

Eye Protection: Chemical safety goggles or face shield recommended.

Other Protective Equipment: Impervious clothing as needed to avoid skin contact and contamination of personal clothing. An eye wash facility should be available in the work area.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: Clear, colorless liquid with a sweet, sharp odor. The odor threshold for cyclohexanone is reported to be 0.12 ppm (mean value).

pH: Not applicable
Boiling Point: 156°C
Vapor Pressure: 5 mmHg @ 26°C
Vapor Density: 3.4

Specific Gravity: 0.97
Melting Point: -45°C
Water Solubility: Insoluble
Evaporation Rate: 0.23 (butyl acetate = 1)

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable

Incompatibility/Conditions to Avoid: Strong oxidizing agents, strong acids, reducing agents. Keep away from heat, sparks, flames and other sources of ignition.

Hazardous Decomposition Products: Oxides of carbon.

Hazardous Polymerization: Will not occur

SECTION 11: TOXICOLOGICAL INFORMATION

Cyclohexanone: Oral rat LD50 - 1535 mg/kg
Inhalation rat LC50 - 8000 ppm/4 hr

SECTION 12: ECOLOGICAL INFORMATION

Cyclohexanone: LC50 pimephales promelas (fathead minnow) 527 mg/l/96 hr flow-through bioassay.

SECTION 13: DISPOSAL INFORMATION

Dispose in accordance with all local, state and federal regulations.

SECTION 14: TRANSPORT INFORMATION

DOT Shipping Name: Cyclohexanone
DOT Hazard Class: 3, PG III
UN Number: UN1915
DOT Labels Required (49CFR172.101): Flammable Liquid (See 173.120 for domestic shipment exemption)
Hazardous Substance (49CFR172.101): Cyclohexanone (RQ 5000 lbs)
Reportable Quantity: Product - 5882 lbs

IATA Shipping Name: Cyclohexanone
IATA Hazard Class: 3, PG III
IATA Hazard Labels Required: Flammable Liquid

UN Number: UN1915

SECTION 15: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

CERCLA 103 Reportable Quantity: 5000 lbs.

SARA TITLE III:

Hazard Category for Section 311/312: Acute Health, Chronic Health, Fire Hazard
Section 313 Toxic Chemicals: This product contains the following chemicals subject to SARA Title III Section 313 Reporting requirements: None
Section 302 Extremely Hazardous Substances (TPQ): None.

EPA Toxic Substances Control Act (TSCA) Status: All of the components of this product are listed on the TSCA inventory.

INTERNATIONAL REGULATIONS:

Canadian WHMIS Classification: Class B-3 (Combustible Liquid); Class D, Division 2, Subdivision B (Toxic Material causing other chronic effects)

Canadian Environmental Protection Act: All of the components of this product are listed on the Canadian Domestic Substances List (DSL).

European Inventory of Commercial Chemical Substances: All of the components of this product are listed on the EINECS inventory.

European Community Labeling Classification: Harmful (Xn)

European Community Risk and Safety Phrases: R10, R20, S25

Australia: All of the components of this product are listed on the Australian Inventory of Chemical Substances.

Japan: All of the components of this product are listed on the Japanese Existing and New Chemical Substances (MITI) list.

STATE REGULATIONS:

California Proposition 65: These products contain the following substances known to the State of California to cause cancer and/or reproductive harm: None

SECTION 16: OTHER INFORMATION

HMIS Ratings: Health - 2* Flammability - 2 Reactivity - 0

NFPA Ratings: Health - 2 Flammability - 2 Reactivity - 0

This above information is believed to be correct but does not propose to be all inclusive and shall be used only as a guide. Brewer Science shall not be held liable for any damage resulting from handling or from contact with the above product.

Material Safety Data Sheet

I. Product and Supplier Information

Product Name: Ethyl Lactate
Product Number: 10741
Product Synonyms: Ethyl-(S)-Lactate, Ethyl(S)-2-Hydroxy Propionate
Above nomenclature is for optically active (L+) form.
Chemical Family or Formula: Ester C5 H10 O3

MSDS Number: UPSEL16A
Publication Date: Nov. 13 2002
Replaces: Mar. 25, 2002

Supplier: Ultra Pure Solutions, Inc.
11485 Commercial Parkway (Bldg 10)
Castroville, CA 95012

Phone: 831-632-2120
Fax: 831-632-2521
Web page: ultrapuresln@earthlink.net

Product Information: 831-632-2120
Transportation Emergency: 800-424-9300

II. Composition and Information on Ingredients

CAS #	SARA 313	Material or Component	%	RQ#	Exposure Limits TWA*	STEL*	WEEL*
687-47-8	No	Ethyl(S) Lactate(optically active)	<100	None	Not established		
97-64-3	No	Ethyl Lactate (Racemic)					

No component is listed in "Threshold and Biological Exposure Indices for 2001" from ACGIH except as noted above.
Components listed in Title III Sec. 313 (EPCRA) are indicated by "Yes" above.
*TWA= Time Weighted Average; STEL= Short Term Exposure Limit; WEEL= Workplace Employee Exposure Level
NE= Not Established

III. Hazards Identification

OSHA Hazard Classification:

Vapors and mists will irritate the nose and throat, and irritate the eyes. Combustible liquid.
Risk of serious damage to eyes. Effects of skin contact may include erythema.

Routes of Entry: Skin, inhalation or eye

Chemical Interactions: Avoid contact with all acids, alkalis and oxidizing agents.

Medical Conditions Aggravated:
None found

Human Threshold Response Data
Odor Threshold: 0.18 ppm
Irritation Threshold: Not established

Hazard Category Classifications and Ratings

Hazard Categories:	Health	Fire	Pressure	Reactivity	Reference 49 CFR 171.8 & 173, OSHA 29 CFR 1910.1200 and SARA 302/311/312/313.
Immediate	Yes	Yes	No	No	
Delayed	No	Yes	No	No	
HMIS Hazard Ratings: Health 1 Fire 2 Instability 0 Other B (Tight fitting goggles, gloves)					
NFPA 704 Hazard Ratings: Health 2 Flammability 2 Reactivity 0 Special NA					
Hazard Ratings: Least: 0 Slight: 1 Moderate: 2 High: 3 Extreme: 4					

Immediate (Acute) Health Effects

Inhalation Toxicity:
Not known

Inhalation Irritation:
Moderate

Skin Contact:
No irritation likely with brief contact.

Skin Absorption:
Not considered a problem.

Eye Contact
Causes eye irritation upon contact with vapor or mist. Wear tight fitting goggles.

Ingestion Irritation:
No data

Ingestion Toxicity:
No data.

AcuteTarget Organ Toxicity:
No data.

Prolonged (Chronic) Health Effects

Carcinogenicity:
This product is not known or reported to be carcinogenic by any reference source including IARC, OSHA or NTP, or ACGIH.

Reproductive and Developmental Toxicity:
No data.

Sensitization:
No data.

Inhalation:
Prolonged or repeated exposure may cause more severe irritation.

Skin Contact:
Prolonged or repeated skin exposure will aggravate symptoms described above.

Skin Absorption:
No data

Ingestion:
Chronic ingestion unlikely.

General :
Not considered a toxic hazard.

Chronic Target Organ Toxicity:
Skin, respiratory tract, kidney, liver.

Supplemental Health Hazard Information:
No additional health information available.

IV. First Aid

Inhalation:
Remove individual to fresh air. If not breathing, give artificial respiration or oxygen as appropriate. Seek medical attention if breathing becomes difficult.

Skin Contact:
Flush skin with water for 15 minutes and remove contaminated clothing. Wash clothing before reuse.

Eyes:
Immediately flush eyes with plenty of water for at least 15 minutes while holding eyelids apart.

Ingestion:
Induce vomiting if person is conscious. Consult a physician.
Never give anything by mouth to an unconscious person.

V. Fire Fighting Measures

Flammability Summary (OSHA):

Flammable. Combustible Liquid for DOT shipment

Flammable Properties:

Flash Point: 141.8 (61C) TCC (ISO2719)

Autoignition Temperature: 752F(400C)

Upper Flammable/Explosive Limit, % in air: 11.4 @ 100C

Lower Flammable/Explosive Limit, % in air: 1.5 @100C

Fire/Explosion Hazards: Flammable liquid. Vapor can travel distances to ignition sources and flash back. OSHA Class II Combustible Liquid. Follow appropriate National Fire Protection Association (NFPA) codes. Hot organic chemical vapors or mists are susceptible to sudden spontaneous combustion when mixed with air. Ignition may occur at temperatures below published autoignition or ignition temperatures. Ignition temperatures decrease with increasing vapor volume and vapor/air contact time and are influenced by pressure changes. Ignition may occur at typical elevated temperature process conditions, especially in processes operating under vacuum if subjected to the sudden ingress of air, or with sudden escape of hot vapors into outside air.

Extinguishing Media:

Water spray, foam, dry chemical or CO2

Do not allow contaminated water to enter sewers or waterways.

Fire Fighting Instructions:

In case of fire, use normal fire fighting equipment including a NIOSH approved self-contained breathing breathing apparatus (SCBA). Use water to cool containers.

Hazardous Combustion Products:

Oxides of carbon.

VI. Accidental Release Measures

Personal Protection for Emergency Situations:

Evacuate the area of all unnecessary personnel. Eliminate any ignition sources until the area is determined to be free from explosion and fire hazards. Contain the release and eliminate its source if this can be done safely.

Spill Mitigation Procedures

Air Release:

Low vapor pressure makes air release unlikely.

Water Release:

This material is soluble in water. Contain all liquid for treatment and/or disposal as a (potential) hazardous waste. Notify all downstream users of possible contamination.

Land Release:

Create a dike or trench to contain materials. Absorb spill with inert material (e.g., dry sand, clay, earth or commercial absorbent), then place in a chemical waste container. Decontaminate all clothing and the spill area using a detergent and flush with large amounts of water. Contain all contaminated water for disposal and/or treatment.

Additional Spill Information:

Stop source of spill as soon as possible and notify appropriate personnel. Utilize emergency response personal protection equipment prior to the start of any response. Evacuate all non-essential personnel. Dispose of spill residues per guidelines under Section XIII, Disposal Considerations.

VII. Handling and Storage

Handling:

Do not take internally. Avoid contact with skin, eyes and clothing. Upon contact with skin or eyes, wash with water. Avoid breathing vapor, mist or gas. Electrically ground all equipment when handling this product. Rinse empty container with water to flush out residue.

Storage

Keep container closed. Store in a cool area away from ignition sources and oxidizers.

Shelf Life Limitations:

See label or certificate of analysis for shelf life if applicable.

Incompatible Materials for Storage:

Compatible with common metals. May soften some plastics.

VIII. Exposure Controls and Personal Protection

Ventilation:

Use general exhaust ventilation if that is sufficient to meet TLV, and for general worker safety and comfort. Explosion proof motors and fans are required. A NIOSH/MSHA approved air supplied respirator is advised in the absence of adequate environmental control.

Protective Equipment for Routine Use of Product Where Appropriate:

Respiratory Protection:

See previous paragraph. Material should be handled or transferred in an approved fume hood or with adequate ventilation.

Respirator Type(s):

NIOSH approved with organic vapor cartridges with appropriate particulate filter may be permissible. Vendor study found breakthrough at 9 hours at 100 ppm DMF and 80% relative humidity.

Skin: Wear tough, impervious butyl gloves to avoid skin contact. Discard gloves with tears, pinholes or wear.

Eyes: Use chemical safety glasses with side shields, safety goggles and/or a full face shield where splashing is possible.

Protective Clothing Type: Impervious butyl rubber apron, boots or suit, as appropriate.

Wear flame resistant clothing if handling above flash point.

Exposure Limit Data : See Section II

Chemical Name	NIOSH Level Immediately Dangerous to Life or Health:
	Not found

IX. Physical Data

Physical State:	Liquid
Color:	Colorless
Odor:	Characteristic
Molecular Weight:	118.15
pH (@ 25 Deg. C):	Neutral in water
Octanol/Water Coeff:	log Pow=0.08
Solubility in Water:	100%
Bulk Density:	Not applicable
Specific Gravity:	1.03
Vapor Density (Air = 1):	4.07
Vapor Pressure: (@ 25 Deg. C):	No data
Evaporation Rate(Butyl acetate =1):	0.29
Volatiles % by vol.:	100
Boiling Point:	307C
Freezing Point:	-3C

X. Stability and Reactivity

Stability and Reactivity Summary:

Stable under normal conditions.

Reactive Properties:

Sensitivity to mechanical shock:	None
Hazardous Polymerization:	Will not occur
Conditions to Avoid:	Temperatures above 141.8F (61C) (its Flash Point)
Chemical Incompatibility:	Alkalis and oxidizing agents.
Incompatible materials:	Compatible with standard metals of construction. May soften some plastics.
Hazardous Decomposition Products:	Oxides of carbon and nitrogen formed if burned, plus unidentified compounds in black smoke.
Decomposition Temperature:	No data

Product May Be Unstable At Temperatures Above: No data

XI. Toxicological Information

Component Animal Toxicology

Oral LD50 value: Mouse: 2500 mg/kg
Dermal LD50 value: No data
Inhalation LC50 value: Rat 8 hr= 5400 mg/m3
Product Animal Toxicity: Listed above, as product is pure Ethyl lactate.

Skin Irritation:
This material is expected to be moderately irritating, but not a sensitizer.
Eye Irritation:
This material is expected to be slight to severely irritating.
Reproductive and Developmental Toxicity:
Not found in animal testing.
Inhalation: 28 day inhalation: NOAEL (systemic toxicity) 600mg/m3
NOAEL (local toxicity) 200mg/m3

Component Data:
All data refer to Ethyl lactate.
Mutagenicity:
Not known or reported to be mutagenic.
Carcinogenicity:
This chemical is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP, or EPA.

XII. Ecological Information

Ecological Toxicity Values:

Environmental fate: Readily biodegradable. BOD=1.43mg O2/mg; COD=1.66 mg/O2/mg
Environmental Toxicity: EC50/48hr/Daphia=683mg/l Fish = 320 mg/l EC50/Algae = 2200 mg/l

XIII. Disposal Considerations

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THIS MATERIAL THE USER OF THIS MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS
Waste Disposal Summary:
Product as supplied qualifies as "Unlisted Hazardous Waste D001" with the characteristic of ignitability.

Potential US EPA Waste Codes:
U002; D001
Disposal Methods:
Disposed of in accordance with local, state and federal regulations for hazardous waste.
Components subject to land ban restrictions:
No data

XIV. Transportation Information

Proper Shipping Name, Hazard Class, UN/NA Number Packing Group, Emergency Response Guide Number	
Esters, n.o.s., 3, UN3272, PG III ERG 127	
Labels required per 49 CFR 172.101:	Combustible liquid
Size for "Limited quantity" per 49 CFR 173.150-.155:	1 gallon max. in 66# max. container
Reportable Quantity ("RQ") per 49 CFR172.101:	None
Passenger and Cargo Air & Rail (172.101):	60 L
Eff. Jan 1, 2001 Cargo only:	220 L
Vessel Stowage:	A

XV. Regulatory Information

UNITED STATES:

Toxic Substances Control Act (TSCA):

The components of this product are listed on the TSCA Inventory of Existing Chemical Substances.

Pesticide acceptance indication: US EPA Registration Number:

Not applicable

Superfund Amendments and Reauthorization Act (SARA) Title III:

See Section III of this MSDS.

Hazard Categories Sections 311/312 (40 CFR 370.2):

Health:

Acute	Yes	Fire:	Yes	Pressure:	No
Chronic	No	Reactivity:	No		

Physical: None

Emergency Planning & Community Right to Know (40 CFR 355, App. A):

Extremely Hazardous Substance Section 302 - Threshold Planning Quantity:

Not applicable

Reportable Quantity (40 CFR 302.4):

None

Supplier Notification Requirements (40 CFR 372.45), 313 Reportable Components

None

State Right-to-Know Regulations Status of Ingredients

Pennsylvania:	Yes
New Jersey:	No information
Massachusetts:	Yes

XVI. Additional Information

MSDS REVISION STATUS: Revised to meet the ANSI standard of 16 sections.

THIS MATERIAL SAFETY DATA SHEET (MSDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. THE INFORMATION IN THIS MSDS SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. WE BELIEVE THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF ITS PUBLICATION DATE, BUT MAKE NO WARRANTY THAT IT IS. IF THIS MSDS IS MORE THAN THREE YEARS OLD YOU SHOULD CONTACT THE SUPPLIER TO MAKE CERTAIN THAT THE INFORMATION IS CURRENT.

MSDS data source: VOPAK USA, Inc.8/27/89.

For label warning see Section III.

KANTO CORPORATION *MATERIAL SAFETY DATA SHEET*

2-Propanol

Date of Preparation: September 2003

Revision: 2

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: 2-Propanol
Chemical Formula: $(CH_3)_2CHOH$
Synonyms: Isopropanol, Isopropyl alcohol, Dimethyl carbinol, 2-hydroxypropane, sec-propyl alcohol, rubbing alcohol.
General Use: Solvent, chemical intermediate, dehydrating agent, for denaturing ethyl alcohol, and in the semi-conductor industry.

Manufacturer: Kanto Corporation, 13424 N. Woodrush Way, Portland, OR 97203
Non-Emergency Contact: Customer Service, Phone (503) 283-0405, FAX (503) 240-0409

For All Transportation Emergencies Call CHEMTREC at 1-800-424-9300

Section 2 - Composition, Information on Ingredients

Ingredient Name	CAS Number	% vol
2-propanol	67-63-0	9.0 -99.9
De-Ionized Water	7732-18-5	Balance

Occupational Exposure Limits

	OSHA PEL		ACGIH TLV		NIOSH REL		NIOSH
Ingredient	TWA	STEL	TWA	STEL	TWA	STEL	IDLH
2-propanol	400 ppm 980 mg/m^3	None established	400 ppm 980 mg/m^3	500 ppm 1225 mg/m^3	400 ppm 500 mg/m^3	500 ppm 1225 mg/m^3	2000 ppm (10% LEL)

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Highly flammable, volatile liquid. Inhalation can cause irritation of the eyes and respiratory tract, and central nervous system depression at high concentrations.

HMIS	
H	1
F	3
R	0
PPE†	
†Sec. 8	

Potential Health Effects

Primary Entry Routes: Inhalation, ingestion, skin and eye contact.
Target Organs: Eyes, skin, respiratory system, kidneys, and central nervous system.
Acute Effects
Inhalation: Vapor inhalation is irritating to the respiratory tract and can cause central nervous system depression at high concentrations.
Eye: Exposure to the vapor or direct contact with the liquid causes irritation and possible corneal burns.
Skin: Some irritation may occur after prolonged exposure.
Ingestion: Nausea and vomiting, headache, facial flushing, dizziness, lowered blood pressure, mental depression, hallucinations and distorted perceptions, difficulty breathing, respiratory depression, stupor, unconsciousness, and coma. Kidney insufficiency including decrease or ceasing of urine output, nitrogen retention, and edema may occur. Extensive hemorrhagic tracheobronchitis, bronchopneumonia, and hemorrhagic pulmonary edema may occur.
Carcinogenicity: IARC Class 3 carcinogen
Medical Conditions Aggravated by Long-Term Exposure: Dermatitis or respiratory or kidney disorders.
Chronic Effects: Drying of skin due to defattening and delayed hypersensitivity reactions.

Section 4 - First Aid Measures

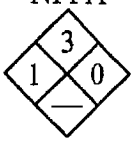
Eye Contact: Gently lift eyelids and flush immediately and continuously with copious amounts of water for at least 15 minutes. Do not allow the victim to rub or keep eyes tightly shut. Consult an ophthalmologist immediately.
Skin Contact: Rinse with flooding amounts of water, while removing contaminated clothing, for at least 15 minutes. Wash with soap and water. Seek medical attention immediately. Wash clothing before reuse.
Ingestion: If the victim is conscious, give large amounts of water. Seek medical attention immediately. Never give anything by mouth to an unconscious or convulsing person.
Inhalation: Remove exposed person to an uncontaminated atmosphere and support breathing. If not breathing, give artificial respiration. Seek medical attention immediately.

After first aid, seek appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Diagnostic test: acetone in urine (from oxidation of 2-propanol in the body). Vomiting may be inadvisable because of the rapid onset of central nervous system depression. Gastric lavage is preferred.

Section 5 - Fire-Fighting Measures

NFPA



Flash Point: 53°F (11.7°C)
Flash Point Method: CC
Auto ignition Temperature: 750 °F (399°C)
LEL: 2.0% v/v
UEL: 12.7% v/v at 200 °F
Flammability Classification: Class 1B Flammable Liquid
Extinguishing Media: Carbon dioxide, dry chemical, water fog, or alcohol-resistant foam.
Unusual Fire or Explosion Hazards: Containers may explode in heat of fire. Vapors may travel to an ignition source and flash back. Liquid will float on water while vapors will sink to low areas creating a potential flash back hazard.
Hazardous Combustion Products: Carbon oxides and acrid smoke.
Fire-Fighting Instructions: If possible without risk, move container from fire area. Apply cooling water to container side until well after fire is out. Stay away from ends of tanks. Use monitor nozzles or unmanned hose holders; if impossible, withdraw and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. Do not release runoff from fire control methods to sewers or waterways.
Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

Small Spills: Shut off all ignition sources. Wear proper protective equipment. Use non-sparking tools and equipment. Take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers.
Large Spills: Notify safety personnel and deny entry. Isolate and ventilate area and stay upwind. Shut off all ignition sources and remove any heat sources. Use non-sparking tools and equipment. Cleanup personnel should wear proper protective equipment and respiratory protection. Water spray may reduce vapor, but may not prevent ignition in closed spaces. Dike far ahead of liquid spill for later disposal.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Always electrically ground all equipment before handling. Use non-sparking tools to open containers. Avoid contact with eyes and skin. Avoid prolonged inhalation of vapors or mists. Use only in areas with adequate ventilation.
Storage Requirements: Store in a cool, well-ventilated area with other flammables away from heat, ignition sources, and incompatibles such as strong oxidizers. Use only undamaged, DOT-approved containers. Avoid ignition sources.

Section 8 - Exposure Controls/Personal Protection

Engineering Controls
Ventilation: Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.
Administrative Controls
Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or non-routine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.
Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.
Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance and Odor: Colorless with a slight odor and bitter taste.
Odor Threshold: 22 ppm
Vapor Pressure: 33 mm Hg
Formula Weight: 60.09 g/mol
Vapor Density (H2O = 1, at 4°C): 2.1
Specific Gravity (H_2O=1, at 4 °C): 0.79
pH: ~ 5.5

Water Solubility: Miscible
Other Solubilities: Soluble in ethyl alcohol, ethyl ether, chloroform, and benzene.
Boiling Point: 180.5°F (82.5°C)
Freezing Point: -127°F (-88.3°C)
Viscosity: 2.1 cP at 77°F (25°C)
Evaporation Rate (ether = 1): 1.5
Critical Pressure: 47 atm

Section 10 - Stability and Reactivity

Stability: 2-Propanol is stable at room temperature in closed containers under normal storage and handling conditions.
Polymerization: Hazardous polymerization will not occur.
Chemical Incompatibilities: Include acetaldehyde, chlorine, ethylene oxide, acids and isocyanates, hydrogen, palladium, nitroform, oleum, phosgene, potassium *t*-butoxide, oxygen (forms unstable persoxides), trinitromethane, barium perchlorate, tetraflouroborate, chromium trioxide, sodium dichromate, sulfuric acid, aluminum, aluminum triisopropoxide, and strong oxidizers. Will attack some forms of plastic, rubber, and coatings.
Conditions to Avoid: Exposure to heat, ignition sources, sunlight, and incompatibilities.
Hazardous Decomposition Products: Thermal oxidative decomposition of 2-propanol can produce carbon dioxide, carbon monoxide and acrid smoke.

Section 11 - Toxicological Information

Acute Effects:	Irritation Effects:
Human, oral, TC_{Lo}: 223 mg/kg Human, oral, LD_{Lo}: 3570 mg/kg Rat, oral, LD_{50}: 2735 mg/kg Rat, inhalation, LC_{50}: 1600 ppm/8 hours	Rabbit, eye: 100 mg - severe irritation. Rabbit, skin: 500 mg - mild irritation **Reproductive:** Fetotoxicity, developmental abnormalities, fertility decrease, and menstrual cycle changes. **Chronic Effects:** Drying of skin and delayed hypersensitivity reactions. **Carcinogenic:** IARC Group 3 carcinogen

* See NIOSH, *RTECS (NT8050000)*, for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: Guppies, LC_{50}: 7,0606 ppm/7 days. Fathead minnow LC_{50}: 11,830 mg/L/1 hr. BOD = 133%/5 days.
Environmental Degradation: In soil, 2-propanol will volatilize or leach into groundwater. Biodegradation is possible by volatilizing (estimated half-life of 5.4 days) or biodegrading in water. It is not expected to bioconcentrate in fish. In the air, it reacts with photochemically produced hydroxyl radicals with a half-life of one to several days.

Section 13 - Disposal Considerations

Disposal: Microbial degradation is possible by oxidizing 2-propanol to acetone. 2-Propanol can be settled out of water spills by salting with sodium chloride. 2-Propanol may be approved for land disposal after treatment if the concentration is under federal concentration limits. Contact your supplier or a licensed contractor for detailed recommendations.
Regulations: Follow all applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Isopropyl alcohol
Hazard Class: 3
ID No.: UN1219
Packing Group: II
Label: 3
Special Provisions (172.102):
IB2, T4, TP1

Packaging Authorizations
Exceptions: 173.150
Non-bulk Packaging: 173.202
Bulk Packaging: 173.242

Quantity Limitations
Passenger, Aircraft, or Railcar: 5L
Cargo Aircraft Only: 60L

Vessel Stowage Requirements
Vessel Stowage: B

Emergency Response Guidebook # 129

Section 15 - Regulatory Information

EPA Regulations:

RCRA Hazardous Waste Number (40 CFR 261.21): D001
RCRA Hazardous Waste Classification (40 CFR 261.21): Characteristics of Ignitibility
EPA Hazardous Waste Number: U140
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
CERCLA Reportable Quantity (RQ): Not listed
SARA 311/312 Codes: Acute, Fire
SARA 313: Listed (only by the manufactures of the strong acid process)
SARA Toxic Chemical (40 CFR 372.65): Not listed
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed
TSCA: Listed

OSHA Regulations:

Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A): Listed

Section 16 - Other Information

Revision Notes: Revised Sections 2, 9, 11, 14, and 15.

Disclaimer: This Material Safety Data Sheet is offered solely for the customer's information, consideration and investigation. Kanto Corporation provides no express or implied warranties with respect to the information contained herein. Although all data included in this MSDS is believed to be accurate, Kanto Corporation makes no representations as to its accuracy, sufficiency or completeness. Conditions of use are beyond Kanto Corporation's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes, and they assume all risks of their use, handling, and disposal of the product, or from the use of, or reliance upon, information contained herein.

MATERIAL SAFETY DATA SHEET

Date Printed: 01/28/2004
Date Updated: 02/10/2003
Version 1.4

Section 1 - Product and Company Information

Product Name	M-CRESOL, 99%
Product Number	C85727
Brand	ALDRICH
Company	Sigma-Aldrich
Street Address	3050 Spruce Street
City, State, Zip, Country	SAINT LOUIS MO 63103 US
Technical Phone:	314 771 5765
Emergency Phone:	414 273 3850 Ext. 5996
Fax:	800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
M-CRESOL	108-39-4	Yes

Formula C7H8O
Synonyms 3-Cresol * m-Cresol (ACGIH:OSHA) * m-Cresole * m-Cresylic acid * 1-Hydroxy-3-methylbenzene * m-Hydroxytoluene * 3-Hydroxytoluene * m-Kresol * m-Methylphenol * 3-Methylphenol * m-Oxytoluene * Phenol, 3-methyl- (9CI) * RCRA waste number U052 * m-Toluol
RTECS Number: GO6125000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW
Toxic.
Toxic in contact with skin and if swallowed. Causes burns. Readily absorbed through skin. Combustible. Target organ(s): Central nervous system. Lungs.

HMIS RATING
HEALTH: 3*
FLAMMABILITY: 2
REACTIVITY: 1

NFPA RATING
HEALTH: 3
FLAMMABILITY: 2
REACTIVITY: 1

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is

conscious. Call a physician immediately. Do not induce vomiting.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
186.8 °F 86 °C Method: closed cup

EXPLOSION LIMITS
Lower: 1.06 % Upper: 1.35 %

AUTOIGNITION TEMP
558 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Combustible liquid. Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Cover with dry lime or soda ash, pick up, keep in a closed container, and hold for waste disposal. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Keep away from heat and open

flame. Store in a cool dry place.

SPECIAL REQUIREMENTS
Moisture sensitive.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.
Other: Faceshield (8-inch minimum).

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Discard contaminated shoes. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	TWA	5 PPM
Remarks: Skin			
USA	MSHA Standard-air	TWA	5 PPM (22 MG/M3)
USA	OSHA.	PEL	8H TWA 5 PPM (22 MG/M3) (SKIN)
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	2.3 PPM

Section 9 - Physical/Chemical Properties

Appearance Physical State: Liquid

Property	Value	At Temperature or Pressure
Molecular Weight	108.14 AMU	
pH	N/A	
BP/BP Range	200 - 203 °C	
MP/MP Range	8 - 10 °C	
Freezing Point	N/A	
Vapor Pressure	< 1 mmHg	20 °C
Vapor Density	3.72 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	1.034 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	12.9 Pas	25 °C
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	186.8 °F 86 °C	Method: closed cup
Explosion Limits	Lower: 1.06 %	
	Upper: 1.35 %	
Flammability	N/A	
Autoignition Temp	558 °C	
Refractive Index	1.542	

Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	Other Solvents: MISCIBLE IN ALCOHOL, ETHER SOLUBLE IN ACETONE, ETHANOL,

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Conditions to Avoid: Sensitive to moisture.
Materials to Avoid: Oxidizing agents, Bases.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes burns.
Skin Absorption: Toxic if absorbed through skin. Readily absorbed through skin.
Eye Contact: Causes burns.
Inhalation: Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Central nervous system. Lungs. Liver. Kidneys. Eyes.

SIGNS AND SYMPTOMS OF EXPOSURE
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may result in spasm, inflammation and edema of the larynxand bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Exposure can cause: Damage to the eyes. Damage to the kidneys. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Oral
Rat
242 mg/kg
LD50
Remarks: Behavioral:Somnolence (general depressed activity).
Behavioral:Convulsions or effect on seizure threshold.
Gastrointestinal:Peritonitis.

Inhalation
Rat
> 710 mg/m3
LC50

Skin
Rat
1100 mg/kg
LD50

Oral
Mouse
828 mg/kg
LD50

Intraperitoneal
Mouse
168 MG/KG
LD50

Skin
Rabbit
2050 mg/kg
LD50
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Behavioral:Convulsions or effect on seizure threshold. Gastrointestinal:Changes in structure or function of salivary glands.

IRRITATION DATA

Skin
Rabbit
517 mg
24H
Remarks: Severe irritation effect

Eyes
Rabbit
103 mg
Remarks: Severe irritation effect

CHRONIC EXPOSURE - CARCINOGEN

Species: Mouse
Route of Application: Skin
Dose: 2280 MG/KG
Exposure Time: 20W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and Appendages: Other: Tumors.

CHRONIC EXPOSURE - TERATOGEN

Species: Rabbit
Dose: 134 GM/KG
Route of Application: Subcutaneous
Exposure Time: (6-18D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

CHRONIC EXPOSURE - MUTAGEN

Species: Human
Dose: 10 UMOL/L
Exposure Time: 4H
Cell Type: HeLa cell

Mutation test: DNA inhibition

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: EC50 Algae
Time: 24 h
Value: 110 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 24 h
Value: 25 mg/l

Test Type: LC50 Fish
Species: Leuciscus idus
Time: 48 h
Value: 17 - 19 mg/l

Test Type: LC50 Fish
Species: Onchorhynchus mykiss (Rainbow trout)
Time: 96 h
Value: 8.9 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Cresols
UN#: 2076
Class: 6.1
Packing Group: Packing Group II
Hazard Label: Toxic substances.
Hazard Label: Corrosive
PIH: Not PIH

IATA
Proper Shipping Name: Cresols, liquid (o-, m-, p-)
IATA UN Number: 2076
Hazard Class: 6.1
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T
Indication of Danger: Toxic.
R: 24/25 34
Risk Statements: Toxic in contact with skin and if swallowed. Causes burns.
S: 36/37/39 45
Safety Statements: Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US CLASSIFICATION AND LABEL TEXT

Indication of Danger: Toxic.
Risk Statements: Toxic in contact with skin and if swallowed. Causes burns.
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
US Statements: Readily absorbed through skin. Combustible.
Target organ(s): Central nervous system. Lungs.

UNITED STATES REGULATORY INFORMATION

SARA LISTED: Yes
DEMINIMIS: 1 %
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2004 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.

MSDS Material Safety Data Sheet

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response In Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

METHYL ALCOHOL

1. Product Identification

Synonyms: Wood alcohol; methanol; carbinol
CAS No: 67-56-1
Molecular Weight: 32.04
Chemical Formula: CH_3OH
Product Codes: **J.T. Baker:**
5217, 5370, 5794, 5811, 5842, 5869, 9049, 9063, 9065, 9066, 9067, 9069, 9070, 9071, 9073, 9075, 9076, 9077, 9091, 9093, 9096, 9097, 9098, 9263, 9822, 9830, V654
Mallinckrodt:
3004, 3006, 3016, 3017, 3018, 3024, 3041, 3701, 4295, 5160, 8814, H080, H488, H603, H985, V079, V571

2. Composition/Information on Ingredients

Ingredient	CAS No.	Percent	Hazardous
Methyl Alcohol	67-56-1	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! AVOID PROLONGED OR REPEATED EXPOSURE. HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CAUSES DAMAGE TO EYES. POISONOUS. FLAMMABLE LIQUID. VAPOR CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM AND OTHER ORGANS.

SAF-T-DATA ™ Ratings

(Provided here for your convenience)

Health:	Flammability:	Reactivity:	Contact:
3 - Severe (Poison)	3 - Severe (Flammable)	1 - Slight	3 - Severe (Life)

Lab Protection Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:

A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Once absorbed into the body, it is very slowly eliminated. Symptoms of overexposure may include headache, drowsiness, nausea, vomiting, blurred vision, blindness, coma, and death. A person may get better but then worse again up to 30 hours later.

Ingestion:

Toxic. Symptoms parallel inhalation. Can intoxicate and cause blindness. Usual fatal dose: 100-125 milliliters.

Skin Contact:

Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure.

Eye Contact:

Irritant. Continued exposure may cause eye lesions.

Chronic Exposure:

Marked impairment of vision has been reported. Repeated or prolonged exposure may cause skin irritation.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Flash point: 12°C (54°F) CC
Autoignition temperature: 464°C (867°F)
Flammable limits in air % by volume:
lel: 6.0; uel: 36
Flammable Liquid and Vapor!

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Moderate explosion hazard and dangerous fire hazard when exposed to heat, sparks or flames. Sensitive to static discharge.

Fire Extinguishing Media:

Use alcohol foam, dry chemical or carbon dioxide. (Water may be ineffective.)

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Use water spray to blanket fire, cool fire exposed containers, and to flush non-ignited spills or vapors away from fire. Vapors can flow along surfaces to distant ignition source and flash back.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.
J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

For Methyl Alcohol:
- OSHA Permissible Exposure Limit (PEL):
  200 ppm (TWA)
- ACGIH Threshold Limit Value (TLV):
  200 ppm (TWA), 250 ppm (STEL) skin

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details. Use explosion-proof equipment.

Personal Respirator (NIOSH Approved)

If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). This substance has poor warning properties.

Skin Protection:

Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Characteristic odor.

Boiling Point:
64.5°C (147°F)

Melting Point:
-98°C (-144°F)

Solubility:
Miscible in water.

Specific Gravity:
0.8

pH:
No information found.

% Volatiles by volume @ 21°C (70°F):
100

Vapor Density (Air=1):
1.1

Vapor Pressure (mm Hg):
97 @ 20°C (68°F)

Evaporation Rate (BuAc=1):
5.9

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
May form carbon dioxide, carbon monoxide, and formaldehyde when heated to decomposition.

Hazardous Polymerization:
Will not occur.

Incompatabilities:
Strong oxidizing agents such as nitrates, perchlorates or sulfuric acid. Will attack some forms of plastics, rubber, and coatings. May react with metallic aluminum and generate hydrogen gas.

Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Methyl Alcohol (Methanol) Oral rat LD50: 5628 mg/kg; inhalation rat LC50: 64000 ppm/4H; skin rabbit LD50: 15800 mg/kg; Irritation data-standard Draize test: skin, rabbit: 20mg/24 hr. Moderate; eye, rabbit: 100 mg/24 hr. Moderate. Investigated as a mutagen; reproductive effector.

Cancer Lists

Ingredient	NTP Carcinogen Known	NTP Carcinogen Anticipated	IARC Category
Methyl Alcohol (67-56-1)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into water, this material is expected to readily biodegrade. When released into the air, this material is expected to exist in the aerosol phase with a short half-life. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into air, this material is expected to have a half-life between 10 and 30 days. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition.

Environmental Toxicity:
This material is expected to be slightly toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: METHANOL
Hazard Class: 3
UN/NA: UN1230 **Packing Group:** II
Information reported for product/size: 358LB

International (Water, I.M.O.)

Proper Shipping Name: METHANOL
Hazard Class: 3, 6.1
UN/NA: UN1230 **Packing Group:** II
Information reported for product/size: 358LB

15. Regulatory Information

Chemical Inventory Status

Ingredient	TSCA	EC	Japan	Australia	Korea	Canada DSL	Canada NDSL	Phil.
Methyl Alcohol (67-56-1)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Federal, State & International Regulations

Ingredient	SARA 302 RQ	SARA 302 TPQ	SARA 313 List	SARA 313 Chemical Catg.	CERCLA	RCRA 261.33	TSCA 8(d)
Methyl Alcohol (67-56-1)	No	No	Yes	No	5000	U154	No

Chemical Weapons Convention: No **TSCA 12(b):** No **CDTA:** No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No Reactivity: No (Pure / Liquid)
Australian Hazchem Code: 2PE **Australian Poison Schedule:** S6
WHMIS: This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings:
Health: 1 Flammability: 3 Reactivity: 0

Label Hazard Warning:
POISON! DANGER! VAPOR HARMFUL. MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CANNOT BE MADE NONPOISONOUS. FLAMMABLE LIQUID AND VAPOR. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM AND LIVER.

Label Precautions:
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Keep container closed.
Use only with adequate ventilation.
Keep away from heat, sparks and flame.

Label First Aid:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If

swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

No changes.

Disclaimer:

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Prepared By: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

CYANTEK CORPORATION

MATERIAL SAFETY DATA SHEET

MIBK

SECTION I MATERIAL INFORMATION

MANUFACTURER:
CYANTEK CORPORATION
3055 OSGOOD COURT
FREMONT, CA 94539 (510) 651-3341

24 HOUR EMERGENCY RESPONSE
CHEMTREC: 800-424-9300 OR 202-483-7676

NFPA RATING

HEALTH: 2
FIRE: 3
REACTIVITY: 0

0=LEAST, 1=SLIGHT, 2=MODERATE, 3=SERIOUS, 4=SEVERE

TRADE NAME AND SYNONYMS: Methyl Isobutyl Ketone
4-Methyl-2Pentanone

CAS NUMBER: N/A

CHEMICAL FAMILY: Ketonic

FORMULA: C6H120

SECTION II HAZARDOUS INGREDIENTS

INGREDIENTS	% wt)	EXPOSURE LIMITS	CAS NUMBER
Methyl Isobutyl Ketone	100%	50 ppm	108-10-1

SECTION III PHYSICAL AND CHEMICAL CHARACTERISTICS

MOLECULAR WEIGHT:	100.16	SOLUBILITY IN WATER:	Slight
BOILING POINT (F):	241	SPECIFIC GRAVITY (g/ml):	0. 80
FREEZING POINT (F):	-119	APPEARANCE & COLOR:	Colorless Liquid
VAPOR PRESSURE (mm Hg):	16	ODOR:	Strong solvent odor
VAPOR DENSITY (Air =1):	3.5		
PERCENT VOLATILES (by vol):	100%		

CYANTEK CORPORATION

MIBK

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (F): 74° (TAG CLOSED CUP)

EXPLOSION LIMIT (% by vol.): LOWER: 1.4 UPPER: 7.5

EXTINGUISHING MEDIA:
Use alcohol foam, carbon dioxide, dry chemical, or water fog. All types of extinguish media could be used.

SPECIAL FIREFIGHTING PROCEDURES:
Prevent boiling of this formulation. Use water spray to cool exposed containers. Do not use direct attack with high pressure hose. Remove containers to cool area.

FIREFIGHTERS SHOULD WEAR:
Wear face shield. Wear full protective clothing.
Wear self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Explosive air/vapor mixtures may occur.
Dangerous when exposed to heat or flames. Vapors can travel and ignite.
Combustion products are toxic. Substance can react with oxidizing agents.

SECTION V HEALTH HAZARD INFORMATION

LISTED AS CARCINOGEN:
Not listed as a carcinogen.

EFFECTS OF OVEREXPOSURE:
Inhalation of vapors from hot material can cause narcosis. At high concentrations, it may cause drowsiness and unconsciousness. Excessive contact may cause irritation to the skin, eyes, nose, and throat.

FIRST AID PROCEDURES:

EYE CONTACT:
Flush with water at least 15 minutes. Get medical care.

SKIN CONTACT:
Flush affected areas with plenty of water. Get medical attention if skin shows irritation.

INHALATION:
Move to fresh air. Consult a physician if prolonged exposure occurs.

INGESTION:
Give large amounts of water. Get medical attention.

CYANTEK CORPORATION

MIBK

SECTION VI REACTIVITY DATA

STABILITY:
Stable.

INCOMPATIBILITY:
Incompatible with strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS:
Toxic gases and vapors such as carbon monoxide as a result of combustion. No hazardous decomposition products if it does not burn.

HAZARDOUS POLYMERIZATION:
No hazardous polymerization expected.

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN:
Remove all ignition sources. Do not smoke. Ventilate area of spill/leak. Possibility of explosive air/vapor mixture. Avoid skin contact with substance. Contain the spill by diking or absorbing the liquid. Persons with no protective equipment should be restricted from spill area.

WASTE DISPOSAL:
Dispose in approved disposal site following federal, state, local regulations. It does not contain heavy metals. Containers with residue may contain explosive air-vapor mixtures.

SECTION VIII SPECIAL PROTECTION

Use organic vapor respirator.
Use self-contained breathing apparatus for large spills.
Use gloves and face shield.

VENTILATION:
Provide general ventilation and local exhaust to meet TLV requirements in work place.
Ventilation should keep vapor/air mixture below explosive limits.
Use explosion -proof ventilation.

SECTION IX SPECIAL PRECAUTIONS

Separate from oxidizing materials.
Store in a cool area. Use only in an area equipped to handle flammable liquids.

CYANTEK CORPORATION

MIBK

SECTION X REGULATORY INFORMATION

SARA/TITLE III DATA For Ingredients)CERCLA HAZARDOUS SUBSTANCES: Methyl Isobutyl Ketone (5000#) (WITH REPORTABLE QUANTITIES)

EXTREMELY HAZARDOUS SUBSTANCES: None

TOXIC CHEMICALS (SECTION 313): Methyl Isobutyl Ketone

DOT INFORMATION

HAZARD CLASS: Flammable Liquid

PROPER SHIPPING NAME: Methyl Isobutyl Ketone

UN NUMBER: UN 1245

TSCA INVENTORY
(For Ingredients)

TSCA INVENTORY: All ingredients on TSCA inventory.

PROPOSITION 65 STATUS
(For Ingredients)

PROP. 65 LIST: No ingredients on Prop. 65 list.

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Dow (hereinafter, and for purposes of this MSDS only, refers to The Dow Chemical Company and to Dow Chemical Canada Inc.) encourages and expects you to read and understand the entire MSDS, as there is important information throughout the document. Dow expects you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1.1 IDENTIFICATION

Product Name Butyl Acetate, Urethane Grade

1.2 COMPANY IDENTIFICATION

The Dow Chemical Company
Midland, MI 48674

1.3 EMERGENCY TELEPHONE NUMBER

24-HOUR EMERGENCY TELEPHONE NUMBER: (989)636-4400.
Customer Information Number: 1-800-258-2436.

* or ® Indicates a Trademark of The Dow Chemical Company.

2. COMPOSITION INFORMATION

Component	CAS #	Amount (%W/W)
n-Butyl acetate	123-86-4	100 %

3. HAZARDS IDENTIFICATION

3.1 EMERGENCY OVERVIEW

Appearance Colorless

Physical State Liquid

Odor Sweet

Hazards of product
FLAMMABLE LIQUID AND VAPOR.
HARMFUL IF INHALED.
MAY CAUSE EYE IRRITATION.
MAY CAUSE SKIN IRRITATION.
MAY CAUSE ANESTHETIC EFFECTS.
MAY CAUSE RESPIRATORY TRACT IRRITATION.

3.2 POTENTIAL HEALTH EFFECTS

Effects of Single Acute Overexposure

Inhalation Prolonged excessive exposure may cause serious adverse effects, even death. Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs. Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed.

Eye Contact May cause moderate eye irritation. Vapor may cause eye irritation experienced as mild discomfort and redness.

Skin Contact Brief contact is essentially nonirritating to skin. Prolonged or repeated contact may cause skin irritation. May cause drying and flaking of the skin.

Skin Absorption Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Swallowing Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

Chronic, Prolonged or Repeated Overexposure

Effects of Repeated Overexposure In animals, effects have been reported on the following organs: Upper respiratory tract. Has been toxic to the fetus in lab animals at doses nontoxic to the mother.
Other Effects of Overexposure No information available.

Medical Conditions Aggravated by Exposure

Excessive exposure may aggravate preexisting lung disease.

See Section 11 for toxicological information and additional information about potential health effects.

3.3 POTENTIAL ENVIRONMENTAL EFFECTS

See Section 12 for Ecological Information.

4. FIRST AID PROCEDURES

4.1 INHALATION

Move person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

4.2 EYE CONTACT

Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

4.3 SKIN CONTACT

Wash skin with plenty of water.

4.4 SWALLOWING

No emergency medical treatment necessary.

4.5 NOTES TO PHYSICIAN

No specific antidote.
Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. FIRE FIGHTING MEASURES

5.1 FLAMMABLE PROPERTIES - REFER TO SECTION 9, PHYSICAL AND CHEMICAL PROPERTIES

5.2 EXTINGUISHING MEDIA

Extinguish fires with water spray or apply alcohol-type or all-purpose-type foam by manufacturer's recommended techniques for large fires. Use carbon dioxide or dry chemical media for small fires.

5.3 FIRE FIGHTING PROCEDURES

Use water spray to cool fire-exposed containers and structures.

5.4 SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS

Use self-contained breathing apparatus and protective clothing.

5.5 UNUSUAL FIRE AND EXPLOSION HAZARDS

Vapors form from this product and may travel or be moved by air currents and ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges or other ignition sources at locations distant from product handling point.
Static ignition hazard can result from handling and use. Electrically bond and ground all containers, personnel and equipment before transfer or use of material. Special precautions may be necessary to dissipate static electricity for non-conductive containers. Use proper bonding and grounding during product transfer as described in National Fire Protection Association Document NFPA 77.
Avoid splash filling of containers when handling this flammable liquid because static electricity may be generated. Use proper bonding and grounding during product transfer as described in National Fire Protection Association Document NFPA 77.
See Section 8.3 - Engineering Controls
Vapors from this material may settle in low or confined areas or travel a long distance to an ignition source and flash back explosively.

Avoid accumulation of water. Product may be carried across water surface spreading fire or contacting an ignition source.

5.6 HAZARDOUS COMBUSTION PRODUCTS

Burning can produce the following products: Carbon monoxide and/or carbon dioxide. Carbon monoxide is highly toxic if inhaled; carbon dioxide in sufficient concentrations can act as an asphyxiant.

6. ACCIDENTAL RELEASE MEASURES

Steps to be Taken If Material is Released or Spilled:
Ground and bond all containers and handling equipment. Contain spilled material if possible. Collect in suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

Personal Precautions: Isolate area. Eliminate all sources of ignition in vicinity of spill or released vapor to avoid fire or explosion. Ground and bond all containers and handling equipment. Keep unnecessary and unprotected personnel from entering the area. Keep upwind of spill. Ventilate area of leak or spill. For large spills, warn public of downwind explosion hazard. Vapor explosion hazard. Keep out of sewers. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to Section 7, Handling for additional precautionary measures.

Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

7. HANDLING AND STORAGE

7.1 HANDLING

General Handling
Keep away from heat, sparks and flame.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Use with adequate ventilation.
Keep container closed.
Wash thoroughly after handling.

No smoking, open flames or sources of ignition in handling and storage area.
See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Ventilation
Exhaust systems should be designed to move the air away from the source of vapor/aerosol generation and people working at this point

Other Precautions

This product is a poor conductor of electricity and can become electrostatically charged during handling and use (for example: during mixing, filtering or pumping). If this charge reaches a sufficiently high level, static discharges or sparks capable of causing ignition might occur.

7.2 STORAGE

Store at normal ambient temperatures. Additional storage and handling information is available from Dow's Customer Information Group at 1-800-258-2436 (U.S.) or 1-800-331-6451 (Canada).

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

8.1 EXPOSURE LIMITS

Component	Exposure Limits	Skin. Form
n-Butyl acetate	150 ppm TWA8 ACGIH 200 ppm STEL ACGIH 150 ppm TWA8 OSHA 710 mg/m3 TWA8 OSHA	

In the Exposure Limits Chart above, if there is no specific qualifier (i.e., Aerosol) listed in the Form Column for a particular limit, the listed limit includes all airborne forms of the substance that can be inhaled.

A "Yes" in the Skin Column indicates a potential significant contribution to overall exposure by the cutaneous (skin) route, including mucous membranes and the eyes, either by contact with vapors or by direct skin contact with the substance. A "Blank" in the Skin Column indicates that exposure by the cutaneous (skin) route is not a potential significant contributor to overall exposure.

8.2 PERSONAL PROTECTION

Respiratory Protection: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required, use an approved air-purifying or positive-pressure supplied-air respirator depending on the potential airborne concentration.
For emergency and other conditions where the exposure guideline may be exceeded, use an approved positive-pressure self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply.

Ventilation: Exhaust systems should be designed to move the air away from the source of vapor/aerosol generation and people working at this point

Eye Protection: Use chemical goggles.
If exposure causes eye discomfort, use a full-face respirator.

Other Protective Equipment: When prolonged or frequently repeated contact could occur, use chemically protective clothing resistant to this material. Selection of specific items such as faceshield, gloves, boots, apron, or full-body suit will depend on operation.

II

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid

Appearance: Colorless

Odor: Sweet

Flash Point - Closed Cup: **29 °C 84 °F** *, Pensky-Martens Closed Cup ASTM D 93*

Flammable Limits In Air:
Lower **1.7 %(V)**
Upper **7.6 %(V)**

Autoignition Temperature: *No test data available.*

Vapor Pressure: **8 mmHg** *20 °C*

Boiling Point (760 mmHg): **126 °C 259 °F**

Vapor Density (air = 1): **4.0**

Specific Gravity (H2O = 1): **0.8826** *20 °C / 20 °C*

Freezing Point: **-73.5 °C -100.3 °F**

Melting Point: *Not applicable.*

Solubility in Water (by weight): **0.68 %** *20 °C*

pH: *No test data available.*

Molecular Weight: 116.16 g/mol

Octanol/Water Partition Coefficient - Measured: 1.82

Evaporation Rate (Butyl Acetate = 1): 1

Percent Volatiles: 100 Wt%

10. STABILITY AND REACTIVITY

10.1 STABILITY/INSTABILITY Stable.

Incompatible Materials: Strong oxidizing agents. Nitric acid. Sodium hydroxide. Alkali metal hydroxides.

10.2 HAZARDOUS POLYMERIZATION Will not occur.

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Peroral

Rat; LD50 = > 14500 mg/kg

Percutaneous

The LD50 for skin absorption in rabbits is >5000 mg/kg.

Inhalation

LC50 Rat; 4 hours = 2000 ppm

SENSITIZATION (ANIMAL AND HUMAN STUDIES)

Did not cause allergic skin reactions when tested in guinea pigs., Did not cause allergic skin reactions when tested in humans.

DEVELOPMENTAL TOXICITY

Birth defects are unlikely. Exposures having no effect on the mother should have no effect on the fetus. Did not cause birth defects in animals; other effects were seen in the fetus only at doses which caused toxic effects to the mother.

REPRODUCTIVE TOXICITY

In animal studies, did not interfere with reproduction.

GENETIC TOXICOLOGY

In Vitro

In vitro genetic toxicity studies were negative.

SIGNIFICANT DATA WITH POSSIBLE RELEVANCE TO HUMANS

In animals, effects have been reported on the following organs:
Upper respiratory tract.

12. ECOLOGICAL INFORMATION

12.1 ENVIRONMENTAL FATE

Biodegradation under aerobic static laboratory conditions is high (BOD20 or BOD28/ThOD > 40%). Degradation is expected in the atmospheric environment within minutes to hours.

BOD (% Oxygen consumption)

	Day 5	Day 10	Day 15	Day 20	Day 28/30
	57 %	67 %		82 %	

12.2 ECOTOXICITY

Material is slightly toxic to aquatic organisms on an acute basis (LC50/EC50 between 10 and 100 mg/L in the most sensitive species tested).

Toxicity to Aquatic Invertebrates
water flea (Daphnia magna); Acute LC50
Result value: 44 mg/L

Toxicity to Fish
fathead minnow (Pimephales promelas); Acute LC50
Result value: 18 mg/L

Toxicity to Fish
bluegill (Lepomis macrochirus); Acute LC50
Result value: 100 mg/L

Toxicity to Fish
tidewater silverside (Menidia beryllina); Acute LC50
Result value: 185 mg/L

12.3 FURTHER INFORMATION

Bioconcentration potential is low (BCF < 100 or Log Pow < 3). Potential for mobility in soil is very high (Koc between 0 and 50). Log soil organic carbon/water partition coefficient (log Koc) is estimated to be: 1.53 - 2.37 Henry's Law Constant (H) is estimated to be: 3.2E-04 atm-m3/mole. Log air/water partition coefficient (log Kaw) is -1.87.
Theoretical Oxygen Demand (THOD) - calculated: 2.21 mg/mg

Octanol/Water Partition Coefficient - Measured: 1.82

13. DISPOSAL CONSIDERATIONS

13.1 DISPOSAL

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. DOW HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION 2 (Composition/ Information on Ingredients). FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device. As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Group at 1-800-258-2436 or 1-989-832-1556 (U.S.), or 1-800-331-6451 (Canada) for further details .

14. TRANSPORT INFORMATION

14.1 U.S. D.O.T.

NON-BULK
Proper Shipping Name : BUTYL ACETATE
Hazard Class : 3
ID Number : UN1123
Packing Group : PG III

BULK
Proper Shipping Name : BUTYL ACETATE
Hazard Class : 3
ID Number : UN1123
Packing Group : PG III

Reportable Quantity : 5,000 LB

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

15.1 FEDERAL/NATIONAL

OSHA HAZARD COMMUNICATION STANDARD

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 TITLE III (EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986) SECTION 313

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA) SECTION 103

This product contains the following substances which are subject to CERCLA Section 103 reporting requirements and which are listed in 40 CFR 302.4.

Component	CAS #	Amount
n-Butyl acetate	123-86-4	<= 100.0000%
Isobutyl acetate	110-19-0	<= 0.1000%
Butanol	71-36-3	<= 0.0400%
Isoamyl acetate	123-92-2	<= 0.0200%

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 TITLE III (EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986) SECTION 302

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 TITLE III (EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986) SECTIONS 311 AND 312

Delayed (Chronic) Health Hazard : Yes
Fire Hazard : Yes
Immediate (Acute) Health Hazard : Yes
Reactive Hazard : No
Sudden Release of Pressure Hazard : No

TOXIC SUBSTANCES CONTROL ACT (TSCA)

All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30.

EUROPEAN INVENTORY OF EXISTING COMMERCIAL CHEMICAL SUBSTANCES (EINECS)

The components of this product are on the EINECS inventory or are exempt from EINECS inventory requirements.

CEPA - DOMESTIC SUBSTANCES LIST (DSL)

All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

15.2 STATE/LOCAL

PENNSYLVANIA (WORKER AND COMMUNITY RIGHT-TO-KNOW ACT): PENNSYLVANIA HAZARDOUS SUBSTANCES LIST AND/OR PENNSYLVANIA ENVIRONMENTAL HAZARDOUS SUBSTANCE LIST:

The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Component	CAS #	Amount
n-Butyl acetate	123-86-4	<= 100.0000%

PENNSYLVANIA (WORKER AND COMMUNITY RIGHT-TO-KNOW ACT): PENNSYLVANIA SPECIAL HAZARDOUS SUBSTANCES LIST:

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

CALIFORNIA PROPOSITION 65 (SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986)

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

CALIFORNIA SCAQMD RULE 443.1 (SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT RULE 443.1, LABELING OF MATERIALS CONTAINING ORGANIC SOLVENTS)

VOC: 881 g/l Vapor Pressure 8 mmHg @ 20° C

This section provides selected regulatory information on this product including its components. This is not intended to include all regulations. It is the responsibility of the user to know and comply with all applicable rules, regulations and laws relating to the product being used.

16. OTHER INFORMATION

16.1 ADDITIONAL INFORMATION

Additional information on this product may be obtained by calling Dow's Customer Information Group at 1-800-258-2436 (U.S.) or 1-800-331-6451 (Canada).

16.2 HAZARD RATING SYSTEM

NFPA ratings for this product are: H - 3 **F** - 3 **R** - 0

These ratings are part of a specific hazard communication program and should be disregarded where individuals are not trained in the use of this hazard rating system. You should be familiar with the hazard communication programs applicable to your workplace.

16.3 RECOMMENDED USES AND RESTRICTIONS

For industrial use.

16.4 REVISION

Version: 8.0
Revision: 09/14/2004
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

16.5 LEGEND

Bacterial/NA	Non Acclimated Bacteria
F	Fire
H	Health
IHG	Industrial Hygiene Guideline
N/A	Not available
NFPA	National Fire Protection Association
O	Oxidizer
R	Reactivity
TS	Trade secret
VOL/VOL	Volume/Volume
W	Water Reactive
W/W	Weight/Weight

NOTICE: Dow urges each customer or recipient of this MSDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this MSDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given., Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that its activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of Dow, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product., Due to the proliferation of sources for information such as manufacturer-specific MSDSs, Dow is not and cannot be responsible for MSDSs obtained from any source other than Dow. If you have obtained a Dow MSDS from a non-Dow source or if you are not sure that a Dow MSDS is current, please contact Dow for the most current version.

Safety data sheet
N-Methylpyrrolidone EG

1. Substance/preparation and company identification

Company
BASF CORPORATION
100 Campus Drive
Florham Park, NJ 07932

24 Hour Emergency Response Information
CHEMTREC: (800) 424-9300
BASF HOTLINE: (800) 832-HELP

Molecular formula:	C(5)H(9)NO
Molecular weight:	99.00 g/mol
Chemical family:	heterocyclic, amines
Synonyms:	NMP TECHNICAL

2. Composition/information on ingredients

CAS Number	Content (W/W)	Chemical name
872-50-4	>= 99.8 %	N-Methylpyrrolidone
60544-40-3	<= 0.4 %	Pyrrolidinone, dimethyl-

3. Hazard identification

Emergency overview

DANGER: COMBUSTIBLE LIQUID. MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION.
PROLONGED OR REPEATED CONTACT MAY RESULT IN DERMATITIS.
INGESTION MAY CAUSE GASTRIC DISTURBANCES.
CONTAINS MATERIAL THAT MAY ADVERSELY AFFECT THE DEVELOPING FETUS BASED ON ANIMAL DATA.
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.
Use with local exhaust ventilation.
Wear chemical resistant protective gloves.
Avoid contact with the skin, eyes and clothing.

Potential health effects

Primary routes of exposure
Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquified gases.

Acute toxicity:
Information on: n-Methylpyrrolidone
NMP is moderately toxic by all routes of exposure; however, due to its low vapor pressure, dermal exposure represents the primary hazard in most settings. Contact with the liquid results in moderate eye irritation and may cause temporary corneal clouding. Skin contact results in mild irritation; prolonged skin contact may cause redness and dermatitis. Inhalation of the vapors of NMP may result in respiratory irritation. Accidental ingestion of the liquid causes gastric disturbances and may result in nausea and vomiting.

Irritation:
Information on: n-Methylpyrrolidone
Contact with the liquid can result in irritation. Skin contact should be avoided. Prolonged skin contact may result in redness and dermatitis.

Repeated dose toxicity:
Information on: n-Methylpyrrolidone

In animal studies NMP was embryotoxic by the oral, dermal and intraperitoneal routes, but only after repeated high doses that approached the LD50 or were maternally toxic. Embryotoxicity without maternal toxicity was observed at a high concentration in one rat inhalation study, but not in others. Testicular effects in rats were noted after repeated, high-dose oral and inhalation exposures. NMP was not carcinogenic in rats receiving lifetime exposures via inhalation (100 ppm) or the diet. This product contains a chemical known to the state of California to cause birth defects or other reproductive harm. In a mouse cancer study, high doses of NMP produced liver carcinomas & adenomas in males (1089 mg/kg) and liver adenomas in females (1399 mg/kg). Middle doses caused liver hypertrophy in males (173 mg/kg) but not females (221 mg/kg). No effects were noted at low doses in either males (89 mg/kg) or females (115 mg/kg).

Medical conditions aggravated by overexposure:
Data available do not indicate that there are medical conditions that are generally recognized as being aggravated by exposure to this substance/product.
See MSDS section 11 - Toxicological information.

4. First-aid measures

General advice:
Remove contaminated clothing.

If inhaled:
Remove the affected individual into fresh air and keep the person calm. Assist in breathing if necessary. Immediate medical attention required.

If on skin:
Wash affected areas thoroughly with soap and water. If irritation develops, seek medical attention.

If in eyes:
In case of contact with the eyes, rinse immediately for at least 15 minutes with plenty of water. If irritation develops, seek medical attention.

If swallowed:
Rinse mouth and then drink plenty of water. Induce vomiting. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions. Immediate medical attention required.

5. Fire-fighting measures

Flash point:	196 °F	(ASTM D93)
Autoignition:	245 °C	(DIN 51794)
Lower explosion limit:	1.3 %(V)	
Upper explosion limit:	9.5 %(V)	

Suitable extinguishing media:
water spray, dry extinguishing media, foam, carbon dioxide

Hazards during fire-fighting:
nitrous gases

Protective equipment for fire-fighting:
Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.

Further information:
Collect contaminated extinguishing water separately, do not allow to reach sewage or effluent systems.

NFPA Hazard codes:
Health : 2 Fire: 2 Reactivity: 0 Special:

6. Accidental release measures

Personal precautions:
Wear appropriate respiratory protection. Use personal protective clothing. Ensure adequate ventilation.

Environmental precautions:
This product is not regulated by RCRA. This product is not regulated by CERCLA ('Superfund').

Cleanup:
Spills should be contained, solidified, and placed in suitable containers for disposal.

For small amounts: Pick up with absorbent material (e.g. sand, sawdust, general-purpose binder). Dispose of absorbed material in accordance with regulations.
For large amounts: Pump off product.

7. Handling and storage

Handling

General advice:
Ensure thorough ventilation of stores and work areas.

Avoid contact with skin and eyes. Wear suitable gloves and eye/face protection.

Protection against fire and explosion:
The product is combustible.

Storage

General advice:
Containers should be stored tightly sealed in a dry place.

Storage stability:
Storage duration: 24 Months

8. Exposure controls and personal protection

Advice on system design:
Provide local exhaust ventilation to maintain recommended P.E.L.

Personal protective equipment

Respiratory protection:
Wear a NIOSH-certified (or equivalent) organic vapour respirator.

Hand protection:
Chemical resistant protective gloves (EN 374), Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):, butyl rubber (butyl) - 0.7 mm coating thickness, Manufacturer's directions for use should be observed because of great diversity of types., Supplementary note: The specifications are based on own tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined in accordance with EN 374.

Eye protection:
Wear face shield or tightly fitting safety goggles (chemical goggles) if splashing hazard exists. Safety glasses with side-shields.

Body protection:
Hardhat, Suitable materials, Body protection must be chosen based on level of activity and exposure.

General safety and hygiene measures:
Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is required additionally to the stated personal protection equipment. Eye wash fountains and safety showers must be easily accessible. Wear protective clothing as necessary to minimize contact. Wash soiled clothing immediately. When using do not eat or drink. When using do not smoke. Gloves must be inspected regularly and prior to each use. Replace if necessary (e.g. pinhole leaks). Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Form:	liquid	
Odour:	mild, amine-like	
Colour:	clear colourless	
pH value:	8.5 - 10	(100 g/l, 20 °C)
Melting point:	-23.6 °C	(760 mmHg)
Boiling point:	204.3 °C	(760 mmHg)
Vapour pressure:	0.32 mbar	(20 °C)
Density:	1.028 g/cm3	(25 °C) (DIN 51757)
Partitioning coefficient n-octanol/water (log Pow):	-0.46	
Viscosity, dynamic:	1.796 mPa.s	(20 °C)
Solubility in water:		miscible
Solubility (qualitative):	miscible solvent(s): organic solvents,	

10. Stability and reactivity

Substances to avoid:
strong acids, oxidizing agent

Hazardous reactions:
Exothermic reaction.
Reacts with oxidizing agents.

Decomposition products:
Hazardous decomposition products: carbon monoxide, Carbon dioxide, nitrogen oxides

Thermal decomposition:
approx. > 300 °C

Corrosion to metals:
No corrosive effect on metal.

11. Toxicological information

Acute toxicity

Oral:
LD50/rat: 3,600 mg/kg

Inhalation:
LC50/rat: > 5.1 mg/l / 4 h

Inhalation-risk test (IRT): No mortality within 8 hours as shown in animal studies. The inhalation of a highly saturated vapor-air mixture represents no acute hazard.

Dermal:
LD50/rabbit: 8,000 mg/kg

Eye irritation :
rabbit: Irritant. (BASF-Test)

Sensitization:
Skin sensitizing effects were not observed in animal studies.

Chronic toxicity

Genetic toxicity:
In the majority of studies performed with microorganisms and in mammalian cell culture, a mutagenic effect was not found. A mutagenic effect was also not observed in in vivo tests.

Carcinogenicity:
Results from a number of long-term carcinogenity studies and short-term tests are available. Taking into account all of the information, there is no indication that the substance itself is carcinogenic.

Developmental toxicity/teratogenicity:
No maternal toxicity.
Teratogenic.
Embryotoxic.
Effects observed at maternally toxic doses.
No embryotoxic effects.
No developmental effects.
Effects were observed only at the high dose.
No teratogenic effects.

12. Ecological information

Environmental fate and transport

Biodegradation:

Test method:	OECD 301E/92/69/EEC, C.4-B
Method of analysis:	DOC reduction
Degree of elimination:	> 90 %
Evaluation:	Readily biodegradable.

Chemical oxygen demand (COD):
1,600 mg/l

Biochemical oxygen demand (BOD):
Incubation period 5 d: < 2 mg/g

Adsorbable organically-bound halogen (AOX):

This product contains no organically-bound halogen.

Environmental toxicity

Acute and prolonged toxicity to fish:
golden orfe/LC50 (96 h): > 500 mg/l

Acute toxicity to aquatic invertebrates:
Daphnia magna/EC50 (24 h): > 1,000 mg/l

Toxicity to aquatic plants:
green algae/EC50 (72 h): > 500 mg/l

Toxicity to microorganisms:
OECD Guideline 209 bacterium/EC20 (30 min): > 600 mg/l
Inhibition of degradation activity in activated sludge is not to be anticipated during correct introduction of low concentrations.

13. Disposal considerations

Waste disposal of substance:
Incinerate in a licensed facility.
Do not discharge substance/product into sewer system.

Contaminated packaging:
Dispose of in a licensed facility. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

14. Transport information

Reference Bill of Lading

15. Regulatory information

Federal Regulations

Registration status:

TSCA, US	released / listed

OSHA hazard category: Skin and/or eye irritant, Combustible Liquid, Chronic target organ effects reported

State regulations

State RTK

CAS Number	Chemical name	State RTK
872-50-4	N-Methylpyrrolidone	MA, PA

CA Prop. 65:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

16. Other information

HMIS III rating
Health: 2¤ Flammability: 2 Physical hazard: 0

HMIS uses a numbering scale ranging from 0 to 4 to indicate the degree of hazard. A value of zero means that the substance possesses essentially no hazard; a rating of four indicates high hazard.

Local contact information
PROD_STEW_CA_CP_CZ@BASF.COM

IMPORTANT: WHILE THE DESCRIPTIONS, DESIGNS, DATA AND INFORMATION CONTAINED HEREIN ARE PRESENTED IN GOOD FAITH AND BELIEVED TO BE ACCURATE , IT IS PROVIDED FOR YOUR GUIDANCE ONLY. BECAUSE MANY FACTORS MAY AFFECT PROCESSING OR APPLICATION/USE, WE RECOMMEND THAT YOU MAKE TESTS TO DETERMINE THE SUITABILITY OF A PRODUCT FOR YOUR PARTICULAR PURPOSE PRIOR TO USE. NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE REGARDING PRODUCTS DESCRIBED OR DESIGNS, DATA OR INFORMATION SET FORTH, OR THAT THE PRODUCTS, DESIGNS, DATA OR INFORMATION MAY BE USED WITHOUT INFRINGING THE INTELLECTUAL PROPERTY RIGHTS OF OTHERS. IN NO CASE SHALL THE DESCRIPTIONS, INFORMATION, DATA OR DESIGNS PROVIDED BE CONSIDERED A PART OF OUR TERMS AND CONDITIONS OF SALE. FURTHER, YOU EXPRESSLY UNDERSTAND AND AGREE THAT THE DESCRIPTIONS, DESIGNS, DATA, AND INFORMATION FURNISHED BY BASF HEREUNDER ARE GIVEN GRATIS AND BASF ASSUMES NO OBLIGATION OR LIABILITY FOR THE DESCRIPTION, DESIGNS, DATA AND INFORMATION GIVEN OR RESULTS OBTAINED, ALL SUCH BEING GIVEN AND ACCEPTED AT YOUR RISK.
END OF DATA SHEET

Material Safety Data Sheet

Original Date: 10/17/2002
Revision Date: 10/17/2002

BASF CORPORATION
3000 CONTINENTAL DRIVE NORTH

MOUNT OLIVE, NJ 07828
(973) 426-4671

EMERGENCY TELEPHONE: (800) 424-9300 CHEMTREC
(800) 832-HELP (BASF Hotline)
BOTH NUMBERS ARE AVAILABLE DAYS, NIGHTS, WEEKENDS, & HOLIDAYS.

SECTION 1 - PRODUCT INFORMATION

METHOXYPROPYLACETATE EG
Product ID: NCI 687312
Common Chemical Name:
Propylene glycol monomethyl ether acetate
Synonyms:
1-Methoxy propyl acetate-2
Molecular Formula:
NONE
Chemical Family: Glycol
Molecular Wt.: NOT APPLICABLE

SECTION 2 - INGREDIENTS

Chemical Name:	CAS	Amount
2-PROPANOL, 1-METHOXY-, A	108-65-6	99.5 %
PEL/TLV NOT ESTABLISHED		
PHENOL, 2,6-BIS(1,1-DIMET	128-37-0	< 0.1 %
ACGIH TLV TWA	10 MG/CU. M	
1-PROPANOL, 2-METHOXY-, A	70657-70-4	0.5 %
PEL/TLV NOT ESTABLISHED		

SECTION 3 - PHYSICAL PROPERTIES

Color: Clear
Form/Appearance: Liquid
Odor: MILD

	Typical	Low/High	U.O.M.			
Specific Gravity:		0.965- 0.97		@	20	DEG C
Viscosity:	1.2		MPAS	@	20	DEG.

pH: NOT AVAILABLE

	Typical	Low/High	Deg.	@	Pressure
Boiling Pt:		145 - 147	C	1	ATMOSPHERES

Freezing Pt: NOT AVAILABLE
Decomp. Tmp: NOT AVAILABLE

	Typical	Low/High	U.O.M.	@	Temperature	
Solubility:	209.3		G/L		20	C

SECTION 3 - PHYSICAL PROPERTIES (cont)

	Typical	Low/High	U.O.M.	@	Temperature	
Vapor Pressure:		3.37	MILLIBARS	X	20	DEG. C XX

Other Solvents:

SOLUBLE IN MANY ORGANIC SOLVENTS.

SECTION 4 - FIRE AND EXPLOSION DATA

	Typical	Low/High	Deg.	Method
Flash Point:	45		C	DIN 51755
Autoignition:	315		C	DIN 51794
Flam. Limits:		1.5 - 10.8	%	

Extinguishing Media:

Use water, dry extinguishing media, carbon dioxide (CO2) or foam.

Fire Fighting Procedures:

Firefighters should be equipped with self-contained breathing apparatus and turn out gear.

Unusual Hazards:

There are no known unusual fire or explosion hazards.

SECTION 5 - HEALTH EFFECTS

Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquified gases.

Toxicology Test Data:

Rat, Oral LD50 - 8,532 MG/KG
Slightly Toxic/Practically Nontoxic
Rat, Inhalation LC50 - >23.8 MG/L
Moderately Toxic
Rat, Dermal LD50 - >5,000 MG/KG
Slightly Toxic/Practically Nontoxic
Rabbit, Primary Skin Irritation -
Nonirritating
Rabbit, Eye Irritation -
Irritating
Sensitizing potential -
Not a sensitizer

Acute Overexposure Effects:

Prolonged contact with eyes and skin may result in irritation. Overexposure by ingestion, inhalation or skin absorption may result in central nervous system effects, including headache, nausea, dizziness and narcosis.

Chronic Overexposure Effects:

There are no other known chronic effects associated with this material.

First Aid Procedures - Skin:

Wash affected areas with soap and water. Remove and launder contaminated clothing before reuse. If irritation develops, get medical attention.

SECTION 5 - HEALTH EFFECTS (cont)

First Aid Procedures - Eyes:
Immediately rinse eyes with running water for 15 minutes. If irritation develops, get medical attention.

First Aid Procedures - Ingestion:
If swallowed, dilute with water. DO NOT INDUCE VOMITING. Never give fluids or induce vomiting if the victim is unconscious or having convulsions. Get immediate medical attention.

First Aid Procedures - Inhalation:
Move to fresh air. Aid in breathing, if necessary, and get immediate medical attention.

First Aid Procedures - Notes to Physicians:
None known.

First Aid Procedures - Aggravated Medical Conditions:
No data is available which addresses medical conditions that are generally recognized as being aggravated by exposure to this product. Please refer to the effects of overexposure section for effects (if any) observed in animals.

First Aid Procedures - Special Precautions:
None

SECTION 6 - REACTIVITY DATA

Stability Data:
Stable

Incompatability:
Oxidizing agents.

Conditions/Hazards to Avoid:
Strong oxidizers.

Hazardous Decomposition/Polymerization:
Hazardous decomposition products: None known.

Corrosive Properties:
Not corrosive.

Oxidizer Properties:
Not an oxidizer

SECTION 7 - PERSONAL PROTECTION

Clothing:
Gloves, coveralls, apron, and boots as necessary to prevent contact.

Eyes:
Safety glasses or goggles.

Respiration:
Approved organic vapor mist respirator as necessary.

Ventilation:
Use local exhaust to control vapors/mists.

Explosion Proofing:
None required.

Other Personal Protection Data:
None under normal conditions.

SECTION 8 - SPILL-LEAK/ENVIRONMENTAL

General:

SECTION 8 - SPILL-LEAK/ENVIRONMENTAL (cont)

containers for disposal in a licensed facility. This material is not regulated by RCRA or CERCLA ("Superfund"). Wear appropriate respiratory protection and protective clothing and provide adequate ventilation during clean-up.

Waste Disposal:

Incinerate in a licensed facility. Do not discharge into waterways or sewer systems.

Container Disposal:

Dispose of in a licensed facility. Recommend crushing or other means to prevent unauthorized reuse.

Environmental Toxicity Test Data:

Rainbow Trout, static 96 hr LC50 - 100-180 MG/L
Slightly Toxic
Daphnia magna, 48 hr static EC50 - >500 MG/L
Insignificant Hazard
Inhibition of Activated Sludge - >1000 MG/L
No adverse effect on activated sludge.
Elimination (OECD Test 302 B) - >90 PERCENT
Readily Biodegradable

SECTION 9 - STORAGE AND HANDLING

General:

Keep away from sources of ignition.
Keep in tightly closed container in a cool place.

Other Storage and Handling Data:

Prevent contact with air/oxygen (formation of peroxide).

SECTION 10 - REGULATORY INFORMATION

TSCA Inventory Status
Listed on Inventory: YES

RCRA Haz. Waste No .: NA
CERCLA: NO Reportable Qty.: (If YES)

State Regulatory Information: (By Component)	NJ/PA/MA RTK
CAS: 108-65-6	YES
NAME: 2-PROPANOL, 1-METHOXY-, A	
CAS: 128-37-0	YES
NAME: PHENOL, 2,6-BIS(1,1-DIMET	
CAS: 70657-70-4	NO
NAME: 1-PROPANOL, 2-METHOXY-, A	

Hazard Ratings:

	Health:	Fire:	Reactivity:	Special:
HMIS	2	2	0	NA

SECTION 11 - TRANSPORTATION INFORMATION

DOT Proper Shipping Name:
SEE BELOW
DOT Technical Name:
SEE BELOW

SECTION 11 - TRANSPORTATION INFORMATION (cont)

DOT Primary Hazard Class:
SEE BELOW
DOT Secondary Hazard Class:
SEE BELOW
DOT Label Required:
SEE BELOW
DOT Placard Required:
SEE BELOW
DOT Poison Constituent:
SEE BELOW
BASF Commodity Codes: UN/NA Code: E/R Guide:
Bill of Lading Description:
ESTERS, NOS, (METHOXYPROPYLACETATE), 3, UN3272, PGIII

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END OF DATA SHEET

MATERIAL SAFETY DATA SHEET

Date Printed: 02/06/2004
Date Updated: 09/06/2002
Version 1.2

Section 1 - Product and Company Information

Product Name	O-CRESOL, 99+%
Product Number	C85700
Brand	ALDRICH
Company	Sigma-Aldrich
Street Address	3050 Spruce Street
City, State, Zip, Country	SAINT LOUIS MO 63103 US
Technical Phone:	314 771 5765
Emergency Phone:	414 273 3850 Ext. 5996
Fax:	800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
O-CRESOL	95-48-7	Yes

Formula C7H8O

Synonyms 2-Cresol * o-Cresol (ACGIH:OSHA) * o-Cresylic acid * 1-Hydroxy-2-methylbenzene * o-Hydroxytoluene * 2-Hydroxytoluene * o-Kresol (German) * o-Methylphenol * 2-Methylphenol * o-Methylphenylol * Orthocresol * o-Oxytoluene * Phenol, 2-methyl- (9CI) * RCRA waste number U052 * o-Toluol

RTECS Number: GO6300000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Highly Toxic (USA) Very Toxic (EU).
Toxic in contact with skin and if swallowed. Very toxic by inhalation. Causes burns.
Readily absorbed through skin. Target organ(s): Liver. Kidneys.

HMIS RATING
HEALTH: 3*
FLAMMABILITY: 2
REACTIVITY: 1

NFPA RATING
HEALTH: 4
FLAMMABILITY: 2
REACTIVITY: 1

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately. Do not induce vomiting.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
177.8 °F 81 °C Method: closed cup

EXPLOSION LIMITS
Lower: 1.3 % Upper: 58 %

AUTOIGNITION TEMP
599 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.

SPECIAL REQUIREMENTS
Air and light sensitive.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Use only in a chemical fume hood.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.
Other: Faceshield (8-inch minimum).

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Discard contaminated shoes. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	TWA	5 PPM
Remarks: Skin			
USA	MSHA Standard-air	TWA	5 PPM (22 MG/M3)
USA	OSHA.	PEL	8H TWA 5 PPM (22 MG/M3) (SKIN)
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	2.3 PPM

Section 9 - Physical/Chemical Properties

Appearance
Physical State: Solid
Color: White
Form: Powder

Property	Value	At Temperature or Pressure
Molecular Weight	108.14 AMU	
pH	4.5	Concentration: 25 g/l
BP/BP Range	191 °C	760 mmHg
MP/MP Range	29 °C	
Freezing Point	N/A	
Vapor Pressure	0.3 mmHg	20 °C
Vapor Density	3.72 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	1.048 g/cm3	20 °C
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	177.8 °F 81 °C	Method: closed cup
Explosion Limits	Lower: 1.3 %	
	Upper: 58 %	
Flammability	N/A	
Autoignition Temp	599 °C	

Refractive Index	N/A
Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	Solubility in Water:25 mg/ml H2O, 20°C

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Conditions to Avoid: Sensitive to air. Sensitive to light.
Materials to Avoid: Oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes burns.
Skin Absorption: Toxic if absorbed through skin. Readily absorbed through skin.
Eye Contact: Causes burns.
Inhalation: May be fatal if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.
Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Liver. Kidneys. Pancreas. Spleen. Cardiovascular system. Central nervous system. Lungs.

SIGNS AND SYMPTOMS OF EXPOSURE
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin.
Inhalation may result in spasm, inflammation and edema of the larynxand bronchi, chemical pneumonitis, and pulmonary edema.
Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Can cause CNS depression. Exposure can cause:
Vomiting. Diarrhea. Headache. Gastrointestinal disturbances.

TOXICITY DATA

Oral
Rat
121 mg/kg
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold.
Lungs, Thorax, or Respiration:Dyspnea.
Gastrointestinal:Ulceration or bleeding from stomach.

Inhalation
Rat
> 1,220 mg/m3
LC50
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Behavioral:Somnolence (general depressed

activity).

Skin
Rat
620 mg/kg
LD50

Oral
Mouse
344 mg/kg
LD50

Inhalation
Mouse
179 mg/m3
LC50

Skin
Rabbit
890 mg/kg
LD50

IRRITATION DATA

Skin
Rabbit
524 mg
24H
Remarks: Severe irritation effect

Eyes
Rabbit
105 mg
Remarks: Severe irritation effect

CHRONIC EXPOSURE - CARCINOGEN

Species: Mouse
Route of Application: Skin
Dose: 4800 MG/KG
Exposure Time: 12W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and Appendages: Other: Tumors.

CHRONIC EXPOSURE - MUTAGEN

Species: Human
Dose: 8 MMOL/L
Cell Type: fibroblast
Mutation test: Sister chromatid exchange

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: EC50 Algae
Species: SELENASTRUM
Time: 72 h
Value: 100 mg/l

Test Type: EC50 Daphnia

Species: Daphnia magna
Time: 24 h
Value: 20 mg/l

Test Type: LC50 Fish
Species: Leuciscus idus
Time: 96 h
Value: 10 mg/l

Test Type: LC50 Fish
Species: Lepomis macrochirus (Bluegill)
Time: 96 h
Value: 18.4 - 24.20 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Cresols
UN#: 2076
Class: 6.1
Packing Group: Packing Group II
Hazard Label: Toxic substances.
Hazard Label: Corrosive
PIH: Not PIH

IATA
Proper Shipping Name: Cresols, solid (o-, m-, p-)
IATA UN Number: 2076
Hazard Class: 6.1
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T
Indication of Danger: Toxic.
R: 24/25 34
Risk Statements: Toxic in contact with skin and if swallowed. Causes burns.
S: 36/37/39 45
Safety Statements: Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Highly Toxic (USA) Very Toxic (EU).
Risk Statements: Toxic in contact with skin and if swallowed. Very toxic by inhalation. Causes burns.
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap-suds. Wear suitable protective clothing, gloves, and eye/face

protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
US Statements: Readily absorbed through skin. Target organ(s): Liver. Kidneys.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2004 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.

MATERIAL SAFETY DATA SHEET

Date Printed: 03/15/2004
Date Updated: 03/11/2004
Version 1.3

Section 1 - Product and Company Information

Product Name	1-METHOXY-2-PROPANOL, 98%
Product Number	268895
Brand	ALDRICH
Company	Sigma-Aldrich
Street Address	3050 Spruce Street
City, State, Zip, Country	SAINT LOUIS MO 63103 US
Technical Phone:	314 771 5765
Emergency Phone:	414 273 3850 Ext. 5996
Fax:	800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1-METHOXY-2-PROPANOL	107-98-2	No

Formula C4H10O2

Synonyms Dowanol 33B * Dowanol PM * Dowanol PM glycol ether * Dowtherm 209 * Glycol ether PM * Methoxy ether of propylene glycol * 1-Methoxy-2-propanol * Methyl proxitol * Poly-Solve MPM * Propasol solvent M * Propylene glycol methyl ether * Propylene glycol monomethyl ether * alpha-Propylene glycol monomethyl ether * Propylene glycol monomethyl ether (ACGIH) * Propylenglykol-monomethylaether (German) * Ucar Solvent LM (Obs.)

RTECS Number: UB7700000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Flammable. Irritant.
Irritating to eyes, respiratory system and skin. May form explosive peroxides.
Target organ(s): Liver. Kidneys.

HMIS RATING

HEALTH: 1*
FLAMMABILITY: 3
REACTIVITY: 0

NFPA RATING

HEALTH: 1
FLAMMABILITY: 3
REACTIVITY: 0

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

FLAMMABLE HAZARDS
Flammable Hazards: Yes
Organic Peroxide: Yes

EXPLOSION HAZARDS
Vapor may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions. Forms explosive mixtures in air. May form peroxides of unknown stability.

FLASH POINT
93 °F 34 °C Method: closed cup

EXPLOSION LIMITS
Lower: 1.8 % Upper: 16 %

AUTOIGNITION TEMP
278 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Flammable liquid. Emits toxic fumes under fire conditions.
Specific Method(s) of Fire Fighting: Use water spray to cool fire-exposed containers.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area. Shut off all sources of ignition.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP

Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING

User Exposure: Avoid breathing vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep container closed. Keep away from heat, sparks, and open flame. Store in a cool dry place.
Unsuitable: Minimize exposure to air. If peroxide formation is suspected, do not open or move container.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

Safety shower and eye bath. Use nonsparking tools. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash thoroughly after handling. Wash contaminated clothing before reuse.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	STEL	150 PPM
USA	ACGIH	TWA	100 PPM
USA	MSHA Standard-air	TWA	100 PPM (360 MG/M3)
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	100 PPM
		STEL	150 PPM

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	180 mg/m3
Poland		NDSCh	360 mg/m3
Poland		NDSP	

Section 9 - Physical/Chemical Properties

Appearance — Physical State: Clear liquid
Color: Colorless

Property	Value	At Temperature or Pressure
Molecular Weight	90.12 AMU	
pH	N/A	
BP/BP Range	118 - 119 °C	760 mmHg
MP/MP Range	N/A	
Freezing Point	N/A	
Vapor Pressure	10.9 mmHg	25 °C
Vapor Density	3.12 g/l	

Saturated Vapor Conc.	N/A
SG/Density	0.921 g/cm3
Bulk Density	N/A
Odor Threshold	N/A
Volatile%	N/A
VOC Content	N/A
Water Content	N/A
Solvent Content	N/A
Evaporation Rate	N/A
Viscosity	N/A
Surface Tension	N/A
Partition Coefficient	N/A
Decomposition Temp.	N/A
Flash Point	93 °F 34 °C Method: closed cup
Explosion Limits	Lower: 1.8 % Upper: 16 %
Flammability	N/A
Autoignition Temp	278 °C
Refractive Index	1.403
Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	Solubility in Water:Miscible.

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: May be harmful if inhaled. Material is irritating to mucous membranes and upper respiratory tract.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Liver. Kidneys.

TOXICITY DATA

Inhalation
Rat
10,000 ppm
LC50

Intraperitoneal
Rat
3720 MG/KG
LD50

Subcutaneous
Rat
7800 MG/KG
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Dyspnea.

Intravenous
Rat
4200 MG/KG
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Dyspnea.

Oral
Mouse
11700 mg/kg
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Dyspnea.

Intravenous
Mouse
5300 MG/KG
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Dyspnea.

Oral
Dog
5000 mg/kg
LD50

Intravenous
Dog
2 GM/KG
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Dyspnea.

Oral
Rabbit
5700 mg/kg
LD50

Skin
Rabbit
13000 mg/kg
LD50

Subcutaneous
Rabbit
5 GM/KG
LD50

Intravenous
Rabbit
1200 MG/KG
LD50

IRRITATION DATA

Skin
Rabbit
500 mg
Remarks: Open irritation test

Eyes
Rabbit
500 mg
24H
Remarks: Mild irritation effect

CHRONIC EXPOSURE - TERATOGEN

Species: Rat
Dose: 3000 PPM/6H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system.

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 3000 PPM/6H
Route of Application: Inhalation
Exposure Time: (MULTIGENERATION)
Result: Maternal Effects: Other effects. Effects on Newborn: Live birth index (# fetuses per litter; measured after birth). Effects on Newborn: Physical.

Section 12 - Ecological Information

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: 1-Methoxy-2-propanol
UN#: 3092
Class: 3
Packing Group: Packing Group III
Hazard Label: Flammable liquid
PIH: Not PIH

IATA
Proper Shipping Name: 1-Methoxy-2-propanol
IATA UN Number: 3092
Hazard Class: 3
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
R: 10

Risk Statements: Flammable.
S: 24
Safety Statements: Avoid contact with skin.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Flammable. Irritant.
Risk Statements: Irritating to eyes, respiratory system and skin. May form explosive peroxides.
Safety Statements: Keep away from sources of ignition - no smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing.
US Statements: Target organ(s): Liver. Kidneys.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
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MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

TOLUENE

1. Product Identification

Synonyms: Methylbenzene; Toluol; Phenylmethane
CAS No.: 108-88-3
Molecular Weight: 92.14
Chemical Formula: C6H5-CH3
Product Codes:
J.T. Baker: 5375, 5812, 9336, 9351, 9364, 9456, 9457, 9459, 9460, 9462, 9466, 9472, 9476
Mallinckrodt: 4483, 8092, 8604, 8608, 8610, 8611, V560

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Toluene	108-88-3	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Very high concentrations may cause unconsciousness and death.
Ingestion:
Swallowing may cause abdominal spasms and other symptoms that parallel over-exposure from inhalation. Aspiration of material into the lungs can cause chemical pneumonitis, which may be fatal.
Skin Contact:
Causes irritation. May be absorbed through skin.
Eye Contact:
Causes severe eye irritation with redness and pain.
Chronic Exposure:
Reports of chronic poisoning describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated or prolonged contact has a defatting action, causing drying, redness, dermatitis. Exposure to toluene may affect the developing fetus.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver or kidney function may be more susceptible to the effects of this substance. Alcoholic beverage consumption can enhance the toxic effects of this substance.

---

4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.
Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give

anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.

Skin Contact:

In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:

Flash point: 7C (45F) CC

Autoignition temperature: 422C (792F)

Flammable limits in air % by volume:

lel: 3.3; uel: 19

Flammable liquid and vapor!

Dangerous fire hazard when exposed to heat or flame. Vapors can flow along surfaces to distant ignition source and flash back.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

---

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Toluene:
- OSHA Permissible Exposure Limit (PEL):
200 ppm (TWA); 300 ppm (acceptable ceiling conc.); 500 ppm (maximum conc.).
- ACGIH Threshold Limit Value (TLV):
50 ppm (TWA) skin, A4 - Not Classifiable as a Human Carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Aromatic benzene-like.

Solubility:
0.05 gm/100gm water @ 20C (68F).

Specific Gravity:

0.86 @ 20C / 4 C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
00
Boiling Point:
111C (232F)
Melting Point:
-95C (-139F)
Vapor Density (Air=1):
3.14
Vapor Pressure (mm Hg):
22 @ 20C (68F)
Evaporation Rate (BuAc=1):
2.24

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetraoxide; will attack some forms of plastics, rubber, coatings.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 636 mg/kg; skin rabbit LD50: 14100 uL/kg; inhalation rat LC50: 49 gm/m3/4H; Irritation data: skin rabbit, 500 mg, Moderate; eye rabbit, 2 mg/24H, Severe. Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Has shown some evidence of reproductive effects in laboratory animals.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
luene (108-88-3)	No	No	3

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. This material has a log octanol-water partition coefficient of less than 3.0. Bioconcentration factor = 13.2 (eels).
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

International (Water, I.M.O.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Toluene (108-88-3)	Yes	Yes	Yes	

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Toluene (108-88-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Toluene (108-88-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Toluene (108-88-3)	1000	U220	

cal Weapons Convention: No TSCA 12(b): No CDTA: Yes
311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 3[Y]E
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:

Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.

Label First Aid:

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head below hips to prevent aspiration into lungs. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:

****

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****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **P6928** * * * * * *Effective Date: 11/02/01* * * * * *Supercedes: 02/25/99*

MSDS **Material Safety Data Sheet**

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

PROPYLENE GLYCOL

1. Product Identification

Synonyms: 1,2-propanediol; 1,2-dihdroxypropane; methyl glycol; methylethylene glycol
CAS No.: 57-55-6
Molecular Weight: 76.09
Chemical Formula: CH3CHOHCH2OH
Product Codes:
J.T. Baker: 9402, 9403, U510
Mallinckrodt: 1925, 6263

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Propylene Glycol	57-55-6	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY CAUSE IRRITATION TO SKIN AND EYES.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 0 - None
Flammability Rating: 1 - Slight
Reactivity Rating: 1 - Slight
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
No adverse health effects via inhalation.
Ingestion:
Relatively non-toxic. Ingestion of sizable amount (over 100ml) may cause some gastrointestinal upset and temporary central nervous system depression. Effects appear more severe in individuals with kidney problems.
Skin Contact:
Mild irritant and defatting agent, especially on prolonged contact.
Eye Contact:
May cause transitory stinging and tearing.
Chronic Exposure:
Lactic acidosis, stupor and seizures have been reported following chronic ingestion.
Aggravation of Pre-existing Conditions:
Kidney disorders.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. Not expected to require first aid measures.
Ingestion:
Not expected to require first aid measures. Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.
Skin Contact:
Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.
Eye Contact:
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Call a physician if irritation persists.

Note to Physician:
In case of ingestion, monitor for acidosis and central nervous system changes. Exposed persons with previous kidney dysfunction may require special treatment.

Fire Fighting Measures

Fire:
Flash point: 99C (210F) CC
Autoignition temperature: 371C (700F)
Flammable limits in air % by volume:
lel: 2.6; uel: 12.5
Material can support combustion.
Explosion:
Containers may explode in heat or fire.
Fire Extinguishing Media:
Dry chemical, foam, water or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Move exposed containers from fire area, if it can be done without risk. Use water to keep fire-exposed containers cool.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

---

7. Handling and Storage

Protect container from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture, and incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
AIHA Workplace Environmental Exposure Level (WEEL): Vapor and Aerosol = 50ppm; Aerosol, only = 10mg/m3.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of

the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face respirator with an organic vapor cartridge and particulate filter (NIOSH type P95 or R95 filter) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with an organic vapor cartridge and particulate filter (NIOSH P100 or R100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. Please note that N series filters are not recommended for this material. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear protective gloves and clean body-covering clothing.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear oily liquid.

Odor:
Odorless.

Solubility:
Miscible in water.

Specific Gravity:
1.0361 @ 20C/4C

pH:
No information found.

% Volatiles by volume @ 21C (70F):
No information found.

Boiling Point:
188.2C (370F)

Melting Point:
-59C (-74F)

Vapor Density (Air=1):
2.6

Vapor Pressure (mm Hg):
0.129 @ 25C (77F)

Evaporation Rate (BuAc=1):
0.01

Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition. Aldehydes or lactic, pyruvic or acetic acids may also be formed.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Oral rat LD50: 20g/kg. Skin rabbit LD50: 20.8g/kg.
Irritation: Eye rabbit/Draize, 500 mg/24H mild.
Investigated as a mutagen and reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Propylene Glycol (57-55-6)	No	No	None

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into water, this material is expected to readily biodegrade. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.
Environmental Toxicity:
No information found.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Not regulated.

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15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\----------------------------------
Ingredient                                      TSCA  EC   Japan  Australia
----------------------------------------------  ----  ---  -----  ---------
Propylene Glycol (57-55-6)                       Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\----------------------------------
                                                        --Canada--
Ingredient                                      Korea  DSL   NDSL  Phil.
----------------------------------------------  -----  ---   ----  -----
Propylene Glycol (57-55-6)                       Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Propylene Glycol (57-55-6)                No    No      No         No

--------\Federal, State & International Regulations - Part 2\----------------
                                                        -RCRA-    -TSCA-
  gredient                                CERCLA        261.33     8(d)
  ----------------------------------------  ------      ------    ------
Propylene Glycol (57-55-6)                No            No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: No   Fire: No  Pressure: No
Reactivity: No          (Pure / Liquid)
```

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **0** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY CAUSE IRRITATION TO SKIN AND EYES.
Label Precautions:
Avoid contact with eyes, skin and clothing.

Wash thoroughly after handling.

Label First Aid:

In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. Call a physician if irritation develops or persists.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 8.

Disclaimer:

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Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet

ersion 1.0
Revision Date 04/28/2005

MSDS Number 300000007748
Print Date 07/10/2005

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Ethylene Glycol
Chemical formula	:	C2H6O2
Synonyms	:	1,2-Ethane diol
Product Use Description	:	General Industrial
Company	:	Air Products and Chemicals,Inc 7201 Hamilton Blvd. Allentown, PA 18195-1501
Telephone	:	1-800-345-3148 Chemicals 1-800-752-1597 Gases and Electronic Chemicals
Emergency telephone number	:	800-523-9374 USA 01-610-481-7711 International

2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Weight)
Ethylene glycol	107-21-1	90% - 100 %

3. HAZARDS IDENTIFICATION

Emergency Overview

Reproductive toxin.
Mild skin irritant.
Mild eye irritant.
Components of the product may affect the nervous system.

Potential Health Effects

Eye contact	:	Contact with eyes may cause irritation.
Skin contact	:	Mild skin irritation.
Ingestion	:	May cause central nervous system effects, such as headache, nausea, vomiting, abdominal pain, dizziness, confusion, breathing difficulties. Severe cases of overexposure can result in respiratory failure. Exposure to large amounts of ethylene glycol can damage the kidneys, heart, and nervous system. Contains Ethylene Glycol which may cause birth defects.
Chronic Health Hazard	:	This product contains no listed carcinogens according to IARC, ACGIH, NTP and/or OSHA in concentrations of 0.1 percent or greater. Reproductive toxin.

Exposure Guidelines

Target Organs : Reproductive hazard.

Aggravated Medical Condition

None known.

4. FIRST AID MEASURES

General advice	: Seek medical advice. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately.
Eye contact	: Rinse immediately with plenty of water also under the eyelids for at least 20 minutes. Remove contact lenses.
Skin contact	: Wash off immediately with plenty of water for at least 20 minutes. Wash off with soap and water. Immediately remove contaminated clothing, and any extraneous chemical, if possible to do so without delay.
Ingestion	: Never give anything by mouth to an unconscious person. Do not induce vomiting without medical advice. Prevent aspiration of vomit. Turn victim's head to the side.
Inhalation	: Move to fresh air.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	: Alcohol-resistant foam. The product itself does not burn. Carbon dioxide (CO2). Dry chemical. Dry sand. Limestone powder.
Specific hazards	: Incomplete combustion may form carbon monoxide. No special precautions required.
Special protective equipment for fire-fighters	: Use personal protective equipment. Wear self contained breathing apparatus for fire fighting if necessary.
Further information	: The product, as distributed, is noncombustible.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	: Wear suitable protective clothing, gloves and eye/face protection. Use self-contained breathing apparatus and chemically protective clothing. Evacuate personnel to safe areas.
Methods for cleaning up	: Contact Air Products' Emergency Response Center for advice. Place in appropriate chemical waste container.

Additional advice : If possible, stop flow of product.

7. HANDLING AND STORAGE

Handling

Emergency showers and eye wash stations should be readily accessible. Adhere to work practice rules established by government regulations. Avoid contact with eyes. Use personal protective equipment. When using, do not eat, drink or smoke.

Storage

Keep containers tightly closed in a cool, well-ventilated place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Provide readily accessible eye wash stations and safety showers.
Provide natural or explosion-proof ventilation adequate to ensure concentrations are kept below exposure limits.

Personal protective equipment

Respiratory protection	: Not required for properly ventilated areas.
Hand protection	: Neoprene gloves. Nitrile rubber. The breakthrough time of the selected glove(s) must be greater than the intended use period.
Eye protection	: Chemical safety glasses.
Skin and body protection	: Long sleeve shirts and trousers without cuffs.
Special instructions for protection and hygiene	: Provide readily accessible eye wash stations and safety showers. Wash at the end of each workshift and before eating, smoking or using the toilet.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form	: Liquid.
Color	: Colorless.
Odor	: Slight. Sweet.
Molecular Weight	: 62.08 g/mol
Relative vapor density	: 2.14 (air = 1)
Relative density	: 1.1135 (water = 1)

Vapor pressure	:	< 1.00 mmHg
Density	:	69.482 lb/ft3 (1.113 g/cm3) at
Boiling point/range	:	387 °F (197 °C)
Melting point/range	:	9 °F (-13 °C)
Upper flammability limit	:	15.3 %(V)
Lower flammability limit	:	3.2 %(V)
Water solubility	:	Completely soluble.

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions.
Materials to avoid	:	Dehydrating Agents. Reactive metals (e.g. sodium, calcium, zinc etc.). Materials reactive with hydroxyl compounds. Oxidizing agents. Acids. Aluminium. Halogens.
Hazardous decomposition products	:	Carbon monoxide. Carbon dioxide (CO2). Aldehydes. Flammable hydrocarbon fragments (e.g., acetylene).

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

Ingestion	:	LD50 : 4,700 mg/kg Species : Rat.
Inhalation	:	No data is available on the product itself.
Skin.	:	LD50 : 9,530 mg/kg Species : Rabbit.
Eye irritation/corrosion	:	Mild eye irritation.
Acute dermal irritation/corrosion	:	Mild skin irritation.

Chronic Health Hazard

This product contains ETHYLENE GLYCOL, which has been shown to cause dose-related teratogenic effects in rats and mice when given by gavage or in drinking water at high concentrations or doses. Ethylene glycol has also caused teratogenic effects in mice when administered as an aerosol at a concentration of 2500 mg/m3 for 6 hours a day throughout the period of organogenesis. Repeated ingestion of ethylene glycol has caused bladder and kidney stone formation, and kidney damage in laboratory animals. Two chronic feeding studies, using rats and mice, have not produced any evidence that ethylene glycol caused dose-related increases in tumor incidence.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity	:	LC50 (96 h) : 27,540 mg/l Species : Bluegill sunfish (Lepomis macrochirus). LC50 (96 h) : > 10,000 mg/l Species : Fathead minnow (Pimephales promelas). LC50 (96 h) : 8,050 mg/l Species : Fathead minnow (Pimephales promelas).
Toxicity to other organisms	:	No data available.

Persistence and degradability

Mobility	:	No data available.
Bioaccumulation	:	Negligible bioaccumulation potential.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products	:	Contact supplier if guidance is required.
Contaminated packaging	:	Dispose of container and unused contents in accordance with federal, state, and local requirements.

14. TRANSPORT INFORMATION

CFR

not regulated

IATA

not regulated

IMDG

not regulated

CTC

not regulated

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard (29 CFR 1910.1200) Hazard Class(es)
No OSHA Hazards.

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on EINECS inventory or polymer substance, monomers included on EINECS inventory or no longer polymer.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

EPA SARA Title III Section 312 (40 CFR 370) Hazard Classification:
No SARA Hazards

EPA SARA Title III Section 313 (40 CFR 372) Component(s) above 'de minimus' level:
Ethylene glycol

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other harm.

16. OTHER INFORMATION

HMIS Rating

Health : 1
Flammability : 0
Physical hazard : 0

Prepared by : Air Products and Chemicals, Inc. Global EH&S Product Safety Department

For additional information, please visit our Product Stewardship web site at
http//www.airproducts.com/productstewardship/

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

XYLENES

1. Product Identification

Synonyms: Dimethyl benzene, xylol, methyltoluene
CAS No.: 1330-20-7
Molecular Weight: 106.17
Chemical Formula: C6H4(CH3)2
Product Codes:
J.T. Baker: 5377, 5810, 5813, 9483, 9489, 9490, 9493, 9494, 9499, 9516, X516
Mallinckrodt: 8664, 8668, 8671, 8672, 8685, 8802, V052

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
m-Xylene	108-38-3	40 - 65%	Yes
o-Xylene	95-47-6	15 - 20%	Yes
p-Xylene	106-42-3	< 20%	Yes
Ethyl Benzene	100-41-4	15 - 25%	Yes

3. Hazards Identification

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 2 - Moderate
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors may be irritating to the nose and throat. Inhalation of high concentrations may result in nausea, vomiting, headache, ringing in the ears, and severe breathing difficulties which may be delayed in onset. Substernal pain, cough, and hoarseness are also reported. High vapor concentrations are anesthetic and central nervous system depressants.
Ingestion:
Ingestion causes burning sensation in mouth and stomach, nausea, vomiting and salivation. Minute amounts aspirated into the lungs can produce a severe hemorrhagic pneumonitis with severe pulmonary injury or death.
Skin Contact:
Skin contact results in loss of natural oils and often results in a characteristic dermatitis. May be absorbed through the skin.
Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Chronic Exposure:
Chronic inhalation can cause headache, loss of appetite, nervousness and pale skin. Repeated or prolonged skin contact may cause a skin rash. Repeated exposure of the eyes to high concentrations of vapor may cause reversible eye damage. Repeated exposure can damage bone marrow, causing low blood cell count. May damage the liver and kidneys.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, blood, or respiratory function may be more susceptible to the effects of the substance.

---

4 First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.

Ingestion:

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:

Flash point: 29C (84F) CC
Autoignition temperature: 464C (867F)
Flammable limits in air % by volume:
lel: 1.0; uel: 7.0

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
100 ppm (TWA) xylene
100 ppm (TWA) ethylbenzene
-ACGIH Threshold Limit Value (TLV):
xylene: 100 ppm (TWA) 150 ppm (STEL), A4 - Not classifiable as a human carcinogen.
ethyl benzene: 100 ppm (TWA) 125 ppm (STEL), A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Physical and Chemical Properties

The following physical data is for xylene.
Appearance:
Clear, colorless liquid.
Odor:
Characteristic odor.
Solubility:
Insoluble in water.
Specific Gravity:
0.86 @ 20C/4C
pH:
Not applicable.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
137 - 140C (279 - 284F)
Melting Point:
-25C (-13F)
Vapor Density (Air=1):
3.7
Vapor Pressure (mm Hg):
8 @ 20C (68F)
Evaporation Rate (BuAc=1):
0.7

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Involvement in a fire causes formation of carbon monoxide and unidentified organic components.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents and strong acids.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Toxicological Data:
Xylene: oral rat LD50: 4300 mg/kg; inhalation rat LC50: 5000 ppm/4H; skin rabbit LD50: > 1700 mg/kg;

Irritation eye rabbit: 87 mg mild (Std. Draize); irritation skin rabbit 500 mg/24 moderate (Std. Draize); investigated as a tumorigen, mutagen, reproductive effector.
Ethyl benzene: oral rat LD50: 3500 mg/kg; skin rabbit LD50: 17800 uL/kg; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
m-Xylene (108-38-3)	No	No	3
o-Xylene (95-47-6)	No	No	3
p-Xylene (106-42-3)	No	No	3
Ethyl Benzene (100-41-4)	No	No	2B

12. Ecological Information

Environmental Fate:
Following data for xylene: When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. (mixed xylenes: octanol / water partition coefficient 3.1 - 3.2; bioconcentration factor = 1.3, eels)
Environmental Toxicity:
For xylene: This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, XYLENES

Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
m-Xylene (108-38-3)	Yes	Yes	Yes	Yes
o-Xylene (95-47-6)	Yes	Yes	Yes	Yes
p-Xylene (106-42-3)	Yes	Yes	Yes	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
m-Xylene (108-38-3)	Yes	Yes	No	Yes
o-Xylene (95-47-6)	Yes	Yes	No	Yes
p-Xylene (106-42-3)	Yes	Yes	No	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
m-Xylene (108-38-3)	No	No	Yes	No
o-Xylene (95-47-6)	No	No	Yes	No
p-Xylene (106-42-3)	No	No	Yes	No
Ethyl Benzene (100-41-4)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
m-Xylene (108-38-3)	1000	No	No
o-Xylene (95-47-6)	1000	No	No
p-Xylene (106-42-3)	100	No	Yes
Ethyl Benzene (100-41-4)	1000	No	No

cal Weapons Convention: No TSCA 12(b): No CDTA: No
311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 3[Y]
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.
Label Precautions:
Keep away from heat, sparks and flame.
Avoid contact with eyes, skin and clothing.
Keep container closed.
Use only with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly after handling.
Label First Aid:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
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Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR

Pipe Test Acceptance Records

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

TEL: 802-879-6343

STEPHEN C. KNIGHT, JR., P.E.

ROGER W. DORWART, P.E.
ELROY L. LANGDELL, P.E.
GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Two 2" future lines through South Ric-wiL pipe (3 and 5 o'clock positions looking east from CDC Building) terminations at ends of Ric-wil in organic storage room and tank farm.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 26, 1988/12:30 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

STEPHEN C. KNIGHT, JR., P.E.

TEL: 802-879-6343

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GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

N-Methyl Pyrrolidone Reclaim - 1½" stainless steel pipe from tie-in to NMP Bulk Tank No. 3 to tie-in to existing system in CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 24, 1988/5:00 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. 215
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

TEL: 802-879-6343

STEPHEN C. KNIGHT, JR., P.E.

ROGER W. DORWART, P.E.
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DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin N-Methyl Pyrrolidone Supply - 1½" stainless steel pipe from tie-ins at VNMP Bulk Tanks 1 and 2 through tank farm pump house to tie-in to existing system at CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 21, 1988/5:30 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

STEPHEN C. KNIGHT, JR., P.E.

TEL: 802-879-6343

ROGER W. DORWART, P.E.
ELROY L. LANODELL, P.E.
GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin N-Methyl-Pyrrolidone - 2½" stainless steel pipe from tie-in to truck unloading pump at truck dock to VNMP Bulk Tank Nos. 1, 2, 3 tie-ins. Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 21, 1988/4:00 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD
PARKER
No.
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

TEL: 802-879-6343

STEPHEN C. KNIGHT, JR., P.E.

ROGER W. DORWART, P.E.
ELROY L. LANGDELL, P.E.
GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Butyl Acetate - 1½" stainless steel pipe from tie-ins to VBA Bulk Tanks 1, 2, 3, through tank farm pump shack (pump removed from system during test) to tie-in to existing Butyl Acetate Supply System in CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 21, 1988/4:35 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD
PARKER
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

TEL: 802-879-6343

STEPHEN C. KNIGHT, JR., P.E.

ROGER W. DORWART, P.E.
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GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Butyl Acetate - 1½" stainless steel pipe from tie-in to VBA Bulk Tank No. 4 to tie-in to existing system at CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 21, 1988/3:10 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

TEL: 802-879-6343

STEPHEN C. KNIGHT, JR., P.E.

ROGER W. DORWART, P.E.
ELROY L. LANGDELL, P.E.
GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Butyl Acetate - 2½" stainless steel pipe from truck off-loading pump to tie-in at bulk tanks 1, 2, 3, 4.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 21, 1988/10:25 A.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No.
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Perchloroethylene line (Stainless Steel) from pump tie-in at truck unloading station to bulk tank tie-in.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 18, 1988/9:50 A.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Isopropyl Alcohol Supply - 1¼" stainless steel pipe from VIPA Tanks 1,2 through pump house (pump removed from system during test) to connection to existing system at CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 18, 1988/1:10 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. 7
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

STEPHEN C. KNIGHT, JR., P.E.

TEL: 802-879-6343

ROGER W. DORWART, P.E.
ELROY L. LANODELL, P.E.
GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Butyl Acetate (Pos Resist) Waste - 2" black iron pipe from tie-in to existing system at CDC Building Penthouse through tank farm pump shack, tee to valve above WBA tank No. 1 (valve closed), to tie-in to WBA Tank No.2

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 24, 1988/11:40 A.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD
PARKER
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Methyl Pyrrolidone Cross Tie Line - 2 Inch black iron pipe from valve between iron and stainless steel pipes above virgin NMP Tank No. 3 to tie-in to 2½" black iron pipe above waste NMP Tank No. 1. Splits at tie-in to two pipes:

1. 2½" black iron to valve in horizontal run above General Solvent Waste Tank No. 4.
2. 2½" black iron trhough pump shack to tie-in to existing system at CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 18, 1988/1:45 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. [illegible]
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Perchloroethylene line (Stainless Steel) from pump tie-in at truck unloading station to bulk tank tie-in.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 14, 1988/2:30 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

(Two) 2 inch future lines in center Ricwil pipe. (Terminations at ends of Ricwil in tank farm and organic storage room.)

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 13, 1988/1:20 P.M. (Line A 8 o'clock position - looking East from CDC Building.)

October 13, 1988/3:20 P.M. (Line at 6 o'clock position - looking East from CDC Building.)

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

(Three) 2 inch future lines in northern Ricwil pipe. (Terminations at ends of Ricwil in tank farm and organic storage room.)

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 13, 1988/2:00 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Perchloroethylene line (stainless steel) from bulk tank tie-in in tank farm, through pump room, (pump removed from system during test) to tie-in to existing system at CDC Building penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 14, 1988/3:25 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD
PARKER
No. 347
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Butyl Acetate Cross Tie Line (still bottoms). 1" black iron pipe from Waste Butyl Acetate Tank No. 2 (against upstream side of double check valves above virgin Butyl Acetate Tank No. 4) to tie-in to existing system at CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 18, 1988/3:50 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD
PARKER
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Waste N-Methyl Pyrrolidone (still bottoms) from tie-in to existing system at CDC building penthouse to bulk tank #2 in the farm.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 12, 1988 11:55 A.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. 317
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Waste N-Methyl Pyrrolidone (still bottoms) from tie-in to existing system at CDC building penthouse to bulk tank #2 in the farm.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 12, 1988 11:55 A.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. 917
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Waste perchloroethylene piping from tie-in to existing system at chemical distribution center penthouse to bulk tank in tank farm.

TEST PARAMETERS:

100 psi air pressure, 2 hour duration, with no pressure loss.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 6, 1988 1:00 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD
PARKER
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Waste truck loading system from individual tank tie-ins to down stream side of pneumatic actuators at truck loading station.

TEST PARAMETERS:

100 psi compressed air, 2 hour duration, no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

September 26, 1988 3:05 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

General solvent waste piping from tie-in to existing system in chemical distribution center penthouse to general solvent tanks 1,2, and 3 in tank farm.

TEST PARAMETERS:

100 psi compressed air, 2 hour duration, with no pressure loss.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 6, 1988 1:50 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

53004 (7-86)

BETHLEHEM STEEL CORPORATION
QUALITY ASSURANCE DEPARTMENT

REPORT OF TESTS AND ANALYSES

VENDOR	SOLD TO	SHIP TO
BETHLEHEM STEEL CORPORATION BURNS HARBOR PLANT BOX 248 CHESTERTON, INDIANA 46304	RELIANCE STEEL INC 62 OAK CIRCLE DRIVE COLCHESTER VT 05446	RELIANCE STEEL INC C/O TRIANGLE SHEET METAL CATAMOUNT INDUSTRIAL PARK MILTON VT 05468

SHIPMENT NO.	DATE SHIPPED	MILL ORDER NO.	CAR OR VEHICLE NO.	PURCHASE ORDER NO.
805-22839	06/03/88	BSC-GH 001-07412	TRLR HT1010	R0710

MATERIAL DESCRIPTION

GAUGE	WIDTH	LENGTH	CUSTOMER APPLICATION	SPECIFICATION
1/4 A IN	48 IN	144 IN	LINING UNDER CHEMICAL TANKS-SUITABLE FOR BENDING	STRIP PLATE SHEARED EDGE---ASTM A588-88 GR B

ITEM — TEST RESULTS

COIL/LIFT NUMBER	NO. PCS.	WEIGHT	HEAT NUMBER	TEST LOC.	YLD PT TRANS	TENSILE KSI-T	ELONG. IN. L/T	ELONG. PCNT.-T	BEND TRAN.
245863E	12	5880	803864830	F	62.6	79.9	2	27	OK
				M	63.8	77.7	2	29	OK
248500C	17	8330	803865270	F	67.9	85.4	2	30	OK
				M	61.6	75.2	2	29	OK
248500E	17	8330	803865270	F	67.9	85.4	2	30	OK
				M	61.6	75.2	2	29	OK
245501A	17	8330	803865270	F	67.8	84.2	2	24	OK
				M	63.1	77.0	2	32	OK

MELTED AND MANUFACTURED IN THE U.S.A.

CHEMICAL ANALYSIS

HEAT NUMBER	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Ti	Al	Cb	N
803864830	.12	.99	.009	.014	.364	.282		.56		.032				
803865270	.12	.93	.016	.016	.369	.267		.56		.030				

I certify that the above results are a true and correct copy of records prepared and maintained by Bethlehem in compliance with the requirements of the specification cited above.

SUPERINTENDENT QUALITY ASSURANCE A.J. BARSOPHY

53004 (7-86)

BETHLEHEM S L CORPORATION
QUALITY ASSU. NCE DEPARTMENT

REPORT OF TESTS AND ANALYSES

VENDOR	SOLD TO	SHIP TO
BETHLEHEM STEEL CORPORATION BURNS HARBOR PLANT BOX 248 CHESTERTON, INDIANA 46304	RELIANCE STEEL INC 62 OAK CIRCLE DRIVE COLCHESTER VT 05446	RELIANCE STEEL INC C/U TRIANGLE SHEET METAL CATAMOUNT INDUSTRIAL PARK MILTON VT 05468

SHIPMENT NO.	DATE SHIPPED	MILL ORDER NO.	CAR OR VEHICLE NO.	PURCHASE ORDER NO.
805-22839	06/03/88	BSC-GH 001-07412	TRLR HT1010	R0710

MATERIAL DESCRIPTION

GAUGE	WIDTH	LENGTH	CUSTOMER APPLICATION	SPECIFICATION
1/4 A IN	48 IN	144 IN	LINING UNDER CHEMICAL TANKS-SUITABLE FOR BENDING	STRIP PLATE SHEARED EDGE---ASTM A588-85 GR B

ITEM — TEST RESULTS

COIL/LIFT NUMBER	NO. PCS.	WEIGHT	HEAT NUMBER	TEST LOC.	YLD PT TRANS	TENSILE KSI-T	ELONG. IN. L/T	ELONG. PCNT.-T	BEND TRAN.
248801C	17	8330	803865270	F	67.8	84.2	2	24	OK
				M	63.1	77.0	2	32	OK

MELTED AND MANUFACTURED IN THE U.S.A.

CHEMICAL ANALYSIS

HEAT NUMBER	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Ti	Al	Cb	N
803865270	.12	.93	.016	.016	.369	.267		.56		.030				

certify that the above results are a true and correct copy of records prepared and maintained by Bethlehem in compliance with the requirements of the specification cited above.

SUPERINTENDENT QUALITY ASSURANCE A.J. BARSUPHY

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
STEER PLATE LINER STATUS AS OF JANUARY 2, 1989

- South Unloading Station
  - Welds vacuum tested - No leaks detected.
  - Basin filled with water - 12 hour duration with no less of water. Accepted 8-19-88

- Truck Scale Pit
  - Welds vacuum tested - No leaks detected.
  - Basin filled with water - 12 hour duration with no loss of water. Accepted 11-19-88

- Pump Shack Pan
  - Welds vacuum tested - No leaks detected.

- Pump Pan at Truck Loading/Unloading area
  - Welds vacuum tested - No leaks detected.

- Tank Farm Basin Liners (10 Basins)
  - Welds vacuum tested - No leaks detected.

Note: Completion of watertightness testing and final acceptance of containment basins will occur as weather permits (Spring 89).

Robert A. Lovgren/kld

FIELD

Tank Farm Leak Testing
July 10, 1989

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

STEPHEN C. KNIGHT, JR., P.E.

TEL: 802-879-6343

ROGER W. DORWART, P.E.
ELROY L. LANGDELL, P.E.
GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

July 10, 1989

Mr. M. Weinstein
International Business Machines Corporation
Department 741, Building 615-2
Essex Junction, Vermont 05452

Re: Tank Farm Leak Testing

Dear Mike:

Steel plate lines at tank basins and associated overflow piping at CDC tank farm have been tested for watertightness. Results of testing indicate that at this time all basins and overflow piping are free of leaks and found to be acceptable in accordance with the procedures agreed upon by the Owner.

The following is a summary of test procedures and acceptance parameters:

Welded Steel Plate Containment Basins: Tank containment basins were tested by filling with water to just below top of weir plates. Prior to filling, leak sump in concrete basin was inspected by sighting down standpipe to insure an initial dry condition. Basins were left filled for 24 hours. Leak sump was again inspected visually and in each case found to be dry. Water was then pumped to an adjacent basin and the procedure repeated until all basins were accepted. The attached sketch plan indicates dates of acceptance of each basin.

Overflow Piping: Overflow piping in the central trench from each basin to the 18 inch main line in the vault on the north side of the scale pit was tested in the following manner. A section of overflow pipe adjacent to the main line was removed and an inflatable test ball was inserted. (Main pipe from the vault to the final retention basin was tested previously and accepted by the project coordinator, Mr. Gerlack.) Overflow piping was filled with water until pipe and weir boxes at each tank basin were completely full. Test was held for 24 hours.

At the end of this time each welded connection throughout the weir and overflow system was examined visually for signs of leakage. No leakage was noted. Test ball was removed and section of pipe was replaced. Welds at this location were inspected visually and noted to be of acceptable quality.

If further information is required please contact the undersigned.

Testing Witnessed By:

Robert A. Lovgren

Reviewed by:

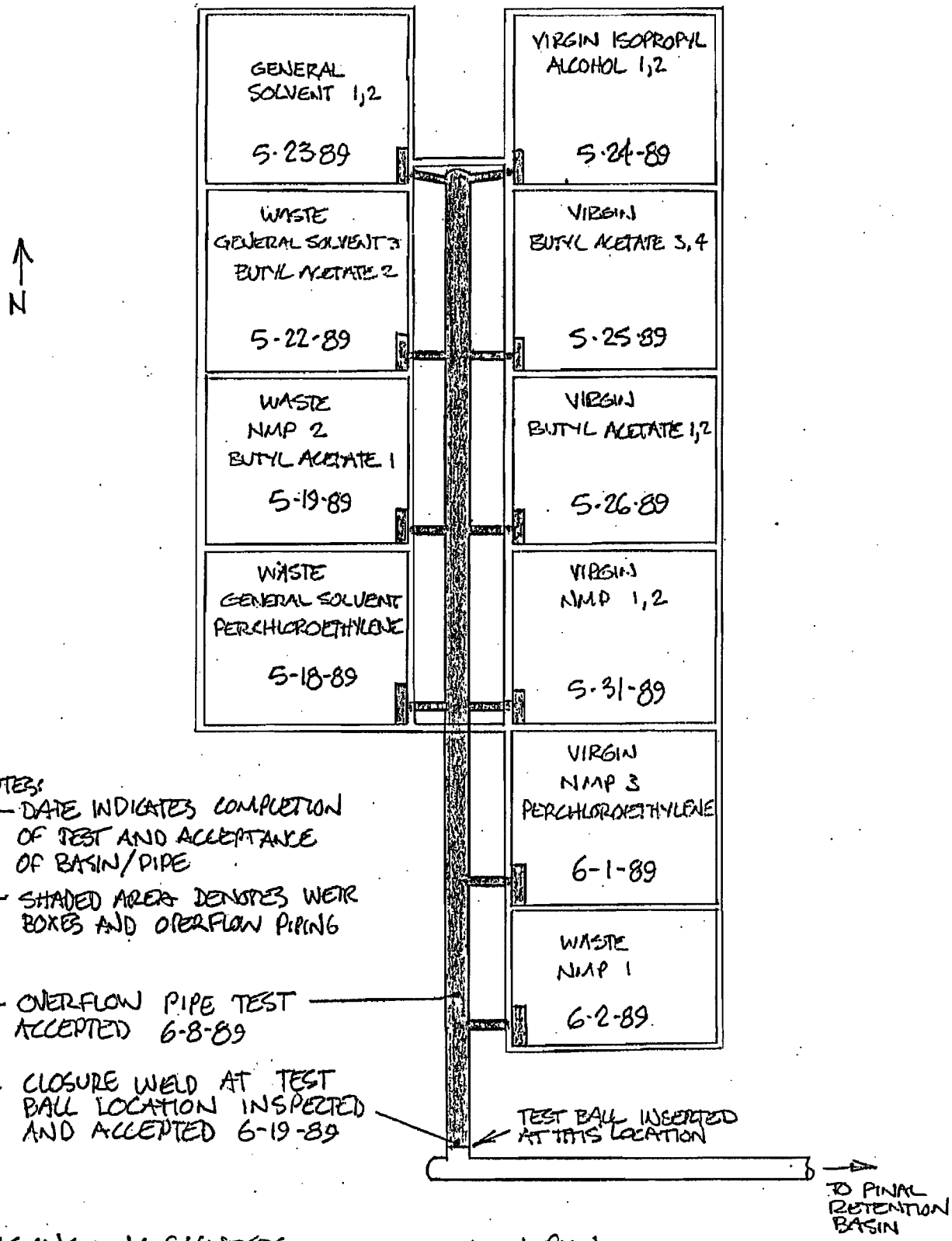
Donald J. Parker, P.E.

RAL/kld

File: 87522-C33-1

STATE OF VERMONT
DONALD J. PARKER
No. 947
REGISTERED PROFESSIONAL ENGINEER

IBM CHEMICAL DISTRIBUTION CENTER
TANK FARM UPGRADE
WELDED STEEL CONTAINMENT BASIN LEAK TEST SUMMARY



NOTES:
- DATE INDICATES COMPLETION OF TEST AND ACCEPTANCE OF BASIN/PIPE
- SHADED AREA DENOTES WEIR BOXES AND OVERFLOW PIPING
- OVERFLOW PIPE TEST ACCEPTED 6-8-89
- CLOSURE WELD AT TEST BALL LOCATION INSPECTED AND ACCEPTED 6-19-89

KNIGHT CONSULTING ENGINEERS
PROJECT NO 87522

SKETCH PLAN
NOT TO SCALE

Appendix 7
Chemical Compatibility

	Tanks - 304 Stainless Steel		Secondary Containment Liner - Carbon Steel	
	Cat Pumps Chemical Compatibility Guide	**Cole-Palmer Compatibility Guide**	**Cat Pumps Chemical Compatibility Guide**	**Cole-Palmer Compatibility Guide**
Acetic Acid	C-Questionable	Ranges from B-Good to D-Severe Effect depending on the concetration.	A-Acceptable	D-Severe Effect
Acetone	A-Acceptable	A-Excellent	A-Acceptable	B-Good
Cyclohexanone	No information.	A-Excellent	No Information	A-Excellent
Ethyl Lactate	No Information.	No Information.	No Information	No Information
2-Propanal	A-Acceptable	B-Good	A-Acceptable	A-Excellent
M-Cresol	A-Acceptable	A-Excellent	No Information	A-Excellent
Methyl Alcohol	A-Acceptable	A-Excellent	A-Acceptable	A-Excellent
MIK Methyl Isobutyl Ketone	A-Acceptable	B-Good	No Information	A-Excellent
Butyl Acetate, Urethane Grade	C-Questionable	B-Good	A-Acceptable	A-Excellent
N-Methylpyrrolidone EG	No information.	No Information.	No Information	No Information
Methoxypropylacetate EG	Propylene glycol is rated B-Fair	Propylene glycol is rated B-Good	Propylene glycol is rated B-Fair	Propylene glycol is rated B-Good
O-Cresol	A-Acceptable	A-Excellent	No Information	A-Excellent
1-Methoxy-2-Propanol	A-Acceptable	Propylene glycol is rated B-Good	Propylene glycol is rated B-Fair	Propylene glycol is rated B-Good
Toluene	A-Acceptable	A-Excellent	A-Acceptable	A-Excellent
Propylene Glycol	B-Fair	B-Good	B-Fair	B-Good
Ethylene Glycol	A-Acceptable	B-Good	C-Questionable	B-Good
Xylenes	A-Acceptable	B-Good	B-Fair	A-Excellent

CDC TANK FARM INSPECTION LOG

Inspector's Name	Title	Date of Inspection (Month/Day/Year)	Time of Inspection (Military Time)
	CHEMICAL SERVICES		

ITEM	TYPE OF PROBLEM	STATUS (X)		OBSERVATIONS	DATE/ NATURE OF REPAIRS REMEDIAL ACTIONS
		Acceptable	Unacceptable		
SECURITY DEVICES					
1) Fence	Corrosion Damage to Chain Link Fence				
2) Gate and Lock 2 gates at load / unload sta. 12 gates around tank farm	Corrosion Damage to Gate, Sticking or Corroding Lock, Unlocked Locks, Doors Open				
SAFETY AND EMERGENCY EQUIPMENT					
3) Warning Signs	Missing, Damaged or Illegible (signs should be posted at all approaches to the facility)				
4) Eye Wash	Frozen, Damaged, Schedule Checked				
OPERATING AND STRUCTURAL EQUIPMENT					
5) Pipes, Fittings, and Valves	Leaks, Corrosion, Deterioration				
6) Control Panel, Opened	Keys in Panel, Opened				
TANK STORAGE AREA AND ANCILLARY EQUIPMENT					
7) Concrete Pads and Ramps	Concrete Deterioration, Cracking or Spalling, Visible signs of Leaks				
8) Secondary Containment System	Debris, Erosion, Leaks				
9) Hoses and Fittings	Cracks, Corrosion, Distortion, Leaks				

CDC TANK F M INSPECTION LOG

Inspector's Name	Title	Date of Inspection (Month/Day/Year)	Time of Inspection (Military Time)
	CHEMICAL SERVICES		

ITEM	TYPE OF PROBLEM	STATUS (X)		OBSERVATIONS	DATE/NATURE OF REPAIRS/ REMEDIAL ACTIONS
		Acceptable	Unacceptable		
EXTERNAL TANK INSPECTION					
10) Ladders / Stairs	Damaged / Structural Stability				
11) Foundation / Structural Supports	Cracks, Spalling, Uneven Settlement Erosion, Wet Spots, Leaks				
12) Pipe Connections	External Corrosion, Cracks, Distortions, Leaks				
13) Anchor Bolts	Distortion, Erosion				
14) Tank Cover	Malfunction of Seals, Corrosion				
15) Cat Walk	Grates out of position, Corrosion, Distortion, Structural Stability				
16) Pump Pad	Leaks, Wet Spots, Corrosion				
MONITORING EQUIPMENT					
17) Alarms	High Level Alarm Conditions				

RCRA Assessment of General Solvent #4 Waste Storage Tank
June 27, 2006

KNIGHT CONSULTING ENGINEERS, INC.
P.O. BOX 29, 51 KNIGHT LANE
WILLISTON, VERMONT 05495
Tel: 802-879-6343 Fax: 802-879-6376

STEPHEN C. KNIGHT, JR. P.E.
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CIVIL ENGINEERING
STRUCTURAL ENGINEERING
GEOTECHNICAL ENGINEERING
HYDRAULIC ENGINEERING
CONSTRUCTION INSPECTION
CONSTRUCTION TESTING

June 27, 2006

David Crawford
IBM Microelectronics
Essex Junction, VT

Re: RCRA Assessment of General Solvent #4 Waste Storage Tank
IBM Chemical Distribution Center Tank Farm

Dear Mr. Crawford:

This letter reports our assessment of the General Solvent #4 waste storage tank with respect to the requirements of 40 CFR 264.192 and 40 CFR 264.193. The report will paraphrase each requirement of the CFR and then provide an assessment of the actual conditions with respect to each requirement.

40 CFR 264.192

Requirement (a) - Owner must have a written assessment by a registered professional engineer indicating that the foundation, structural support, and the tank are properly designed, the tank material is compatible with the waste to be stored, and that corrosion protection is provided if necessary. At a minimum the assessment must include the design standard(s) to which the tank was constructed; a list of the hazardous characteristics of the waste to be stored; and an assessment of the foundation's ability to support the load of the tanks, prevent flotation or dislodgement of the tanks, and to prevent movement due to frost action.

Assessment:

1. The tank is 15'-0" long with a diameter of 10'-0". It is built of welded SA285C carbon steel plate. The cylindrical shell has a nominal thickness of 1/4". The heads have a nominal thickness of 3/16". The tank was manufactured in 1980 by Eastern Tank Fabricator. It is designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code. A copy of the Manufacturer's Data Report for Pressure Vessels is included in Appendix 1.

2. The chemicals stored in the tank as reported by IBM are listed in Appendix 2. Knight Consulting Engineers, Inc., has reviewed chemical compatibility charts provided by Cole-Palmer and Cat Pumps to check for compatibility with the SA285C carbon steel tank. The information gathered is summarized in Appendix 2. Knight Consulting Engineers, Inc., does not specialize in chemical engineering, so this data is provided as general information only.

3. The tank is not in contact with soil. It is protected from rain and snow by a roof and a partial height wall. Since the tank is not in contact with soil or water, additional corrosion protection is not required.

4. The tank is above ground therefore the requirements for below grade tanks are not applicable.

5. The tank is supported on a 12" concrete slab which was designed by Gustav Getter Associates, New Rochelle, NY, in 1980 to support the 10,000 gallon storage tank. There is no evidence indicating significant settlement of the slab or movement due to frost action. Based on the performance of the slab over the past 25 years it is our opinion that the slab was designed properly. The tank is not subject to flotation since the elevation of the top of the vault walls in which the tank sits is low enough that the water would overflow the walls before flotation would occur.

Requirement (b) – The owner must insure that the tank is not damage during installation. A qualified independent inspector or PE shall inspect the tank systems for the presence of weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, or other structural damage.

Assessment - No reports of inspections conducted after the tank was installed have been located. The thickness of the tank has been periodically measured by Knight Consulting Engineers, Inc., starting in 1983. The latest such inspection was conducted in November 2004, and the report from that inspection is included in Appendix 3. The last interior inspection of the tank was completed in 1990. The report of this inspection is attached in Appendix 4. IBM visually inspects the exterior of the tanks on a daily basis. IBM reports that no leaks have occurred in this tank since it has been in service.

Requirement (c) – Applies to undergound tanks and is therefore not applicable to this tank.

Requirement (d) – All new tanks and ancillary equipment must be tested for tightness prior to being placed in use.

Assessment – The tank was pressure tested to 20 psi by the manufacturer (see Appendix 1). We cannot state whether or not all ancillary piping and equipment was tested, however, IBM reports that no leaks have occurred since the tank was placed in service.

Requirement (e) – Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.

Assessment – We have completed a visual assessment of support of the ancillary equipment and it is our opinion that the equipment is so supported.

Requirement (f) – Corrosion protection must be provided as required in section (a). Not applicable.

40 CFR 264.193

Requirement (c)(1) – Secondary containment must be constructed of or lined with materials that are compatible with the waste to be stored and must have sufficient strength and thickness to prevent failure due to pressure gradients, physical contact with the waste, climatic conditions, and the stress of daily operation.

Assessment – The secondary containment system consists of a ¼" thick ASTM A588-85 Grade B weathering steel plate liner designed by Knight Consulting Engineers in 1987 supported by concrete foundation and walls designed by Gustav Getter Associates in 1980. The liner is protected from wind and snow by the roof and wall structure designed by Knight Consulting Engineers in 1987. It has sufficient strength to prevent failure due to pressure gradients, physical contact with the waste and the stress of daily operation. Knight Consulting Engineers, Inc., has reviewed chemical compatibility charts provided by Cole-Palmer and Cat Pumps to check for compatibility with the liner. The information gathered is summarized in Appendix 2. Knight Consulting Engineers, Inc., does not specialize in chemical engineering, so this data is provided as general information only.

Requirement (c)(2) – The secondary containment system must be placed on a foundation capable of providing support to the secondary containment system, resistance to pressure gradients above and below the system, and capable of preventing failure due to settlement.

Assessment – The liner is supported by concrete slabs and walls designed by Gustav Getter Associates in 1980. The concrete slab and walls have sufficient strength to resist pressure gradients above and below the system. They are also capable of preventing failure due to settlement.

Requirement (c)(3) – The secondary containment system must be provided with a leak detection system that is designed and operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours.

Assessment – A leak detection system is provided to detect leaks of the tanks into the secondary containment system. In addition, the secondary containment is visually inspected on a daily basis. No leak detection system is provided to detect leaks of the secondary containment system. There are standpipes above the lowest areas of the concrete slab supporting the liner that could be used to visually inspect for leaks of the secondary containment system, however, IBM does not currently conduct such inspections.

Requirement (c)(4) – The secondary containment system must be sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spill, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within 24 hours, or in as timely a manner as is possible to prevent harm to human health and the environment.

Assessment – The secondary containment system has sufficient volume to contain the volume of all tanks protected by the containment system. In addition there is a piping and vault system designed to collect overflow of the secondary containment in the very unlikely event that such overflow would occur.

Requirement (d) – The secondary containment system must include one or more of the following devices: (1) a liner (external to the tank); (2) a vault; (3) A double-walled tank; or (4) an equivalent device as approved by the Regional Administrator.

Assessment – The secondary containment system includes a liner as described earlier in this report.

Requirement (e)(1)(i) – The liner must be designed or operated to contain 100 percent of the capacity of the largest tank within its boundary.

Assessment – Each lined area contains two 10,000 gallon tanks. Each lined area has a secondary containment capacity of approximately 21,000 gallons, so this requirement is satisfied.

Requirement (e)(1)(ii) – The liner must be designed or operated to prevent run-on or infiltration of the precipitation into the secondary containment system.

Assessment – The liner is protected by an overhanging roof and wall structure that prevents precipitation from falling on the containment area. Groundwater cannot flow into the containment area.

Requirement (e)(1)(iii) – The liner must be free from cracks and gaps.

Assessment – The liner was hydrostatically tested and the liner welds were vacuum tested after construction.

Requirement (e)(1)(iv) – The liner must be designed and installed to surround the tank completely and to cover all earth likely to come into contact with the waste if the waste is released from the tank(s) (i.e., capable of preventing lateral as well as vertical migration of the waste).

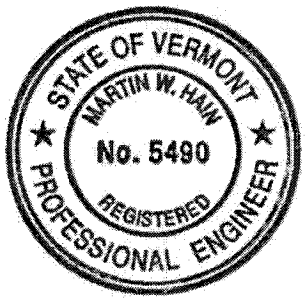
Assessment – The liner extends at least 10' beyond the tanks in all directions in order to satisfy this requirement.

Requirement (f) – Ancillary equipment must be provided with secondary containment that meets the requirements if paragaphs (b) and (c) of this section except for aboveground piping, welded flanges, welded joints, welded connections, sealless or magnetic coupling pumps, and sealless valves that are inspected on a daily basis.

Assessment – Ancillary equipment is located above the area that is lined as described above and thus meets this requirement. To our knowledge all piping that leaves the lined area is double contained piping. According to IBM, all ancillary equipment is inspected daily.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,



Martin W. Hain, P.E.
President
KNIGHT CONSULTING ENGINEERS, INC.

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FORM U-1A MANUFACTURERS' DATA REPORT FOR PRESSURE VESSELS
(Alternate Form for Single Chamber, Completely Shop-Fabricated Vessels Only)
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

G.S. #4

1. Manufactured by Eastern Tank Fabricators, 460 Main Ave, Wallington, NJ 07055
2. Manufactured for William L. Crow Constr. Co. 1 Penn Plaza, NYC 10001
3. Location of Installation IBM Corp, Burlington, Vermont
4. Type Horiz. (Horiz. or vert. tank) 5018-2 (Mfgr's Serial No.) - (CRN) D9616-2 (Drawing No.) 1656 (Nat'l Bd No.) (Year Built) 1981
5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1980 (Year) and Addenda to 6/30/80 (Date) and Code Case Nos. None
Special Service per UG-120(d) None
Manufacturers' Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: --
6. Shell: Matl. SA285-C (Spec. No., Grade) Nom. Thk. ½ in. Corr. Allow. 0 in. Diam. 120" in. Lgth. 15 ft 0 in. SL
7. Seams: Long. WeldDblButt (Welded, Dbl, Sngl, Lap, Butt) R.T. None (Spot or Full) Efficiency 70 % H.T. Temp. -- F Time -- hr
Girth Weld Dbl Butt (Welded, Dbl, Sngl, Lap, Butt) R.T. None (Spot, Partial, or Full) No. of Courses 2
8. Heads: (a) Material SA285-C (Spec. No., Grade) (b) Material (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Min. Thk.	Corr. Allow.	Crown Radius	Knuckle Radius	Ellipse Ratio	Conical Apex Angle	Hemisph. Radius	Flat Diam.	Side to Pressure (Convex or Concave)
(a)	Ends	3/16	0	114	8	-	-	-	-	Concave
(b)										

If removable, bolts used (describe other fastenings) --
9. Constructed for max. allowable working pressure 20 psi at max. temp: 100 F. Min. temp. (when less than -20 F) - F. Hydrostatic, pneumatic, or combination test pressure 30 psi.
10. Safety Valve Outlets: Number - Size - Location Elsewhere In System
11. Nozzles and Inspection Openings:

Purpose (Inlet, Outlet, Drain)	No.	Diam. or Size	Type	Matl.	Nom. Thk.	Reinforcement Matl.	How Attached	Location
Misc.	1	10"	150#SlipOn	SA53B	.365	-	Welded	Shell
Misc.	1	5	150#SlipOn	SA53B	.258	-	Welded	Shell
Misc.	1	6	150#SlipOn	SA53B	.28	-	Welded	Shell
Misc.	2	2	150#SlipOn	SA53B	.154	-	Welded	Shell
Misc.	2	2	150#SlipOn	SA53B*	.154	-	Welded	Shell
Insp.	2	24	Manhole	SA285C	1" (Neck)	-	Welded	Shell

12. Supports: Skirt No (Yes or no) Lugs - (No.) Legs - (No.) Other 3 - 120° Saddles (Describe) Attached Welded to Shell (Where and how)
13. Remarks: *W/Pipe Extended to Tank Bottom
14 Clips and structural for rail and platform support -
Solvent Storage Tank

Designed according to the Rules of UW12C

CERTIFICATE OF COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1.
Date 1/28/81 Signed Eastern Tank Fabricators (Manufacturer) [signature] (Representative)
"U" Certificate of Authorization No. 8453 expires August 4 19 81

CERTIFICATE OF SHOP INSPECTION

Vessel made by EASTERN TANK FABRICATORS, INC 460 Main Ave, Wallington, NJ
I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of New Jersey and employed by CommUnionInsCo have inspected the pressure vessel described in this Manufacturers' Data Report on 1/28 19 81 and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in the Manufacturers' Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.
Signed [signature] (Inspector) Date 1/28/81 Commissions NB 7169 (Nat'l Board, State, Province and No.)

(1/76) This form (S00117) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 10017

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APPENDIX 2

Chemicals Stored and Compatibility Guidelines

General Solvent #4			Carbon Steel		304 Stainless Steel		314 Stainless Steel	
COMPOUND	CAS #	Comments	CAT Pumps	Cole Palmer	CAT Pumps	Cole Palmer	CAT Pumps	Cole Palmer
1,1,1-Trichloroethane	71-55-6		Not rated	B-Good	C-Questionable	B-Good	A-Good	B-Good
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1		Not rated	Not rated	Not rated	Not rated	A-Good	Not rated
1,1,2-Trichloroethane	79-00-5		Not rated	B-Good	C-Questionable	B-Good	A-Good	B-Good
1,1,2,2-Tetrachloroethane	79-34-5		Not rated	B-Good	A-Good	A-Excellent	A-Good	B-Good
1,2-Dichloropropane (Propylene Dichloride)	78-87-5		Not rated	No information available	Not rated	No information available	Not rated	No information available
1,4-Dioxane	123-91-1		Not rated	No information available	Not rated	No information available	Not rated	No information available
2-Chloro-1,3-butadiene	126-99-8		No information available	No information available	No information available	No information available	No information available	No information available
2-Chloroethyl vinyl ether	110-75-8		No information available	No information available	No information available	No information available	No information available	No information available
2,4-Dichlorophenol	120-83-2		Phenol is not rated	Phenol is not rated	Phenol is rated B-Fair	Phenol is rated A-Excellent	Phenol is rated A-Good	Phenol is rated A-Excellent
Acetone	67-64-1		A-Good	B-Good	A-Good	A-Excellent	A-Good	A-Excellent
Antimony	7440-36-0		No information available	No information available	No information available	No information available	No information available	No information available
Arsenic	7440-38-2		Arsenic Acid is rated U-Unsatisfactory	Arsenic Acid is rated D-Sever Effects	Arsenic Acid is rated A-Good	Arsenic Acid is rated A-Excellent	Arsenic Acid is rated A-Good	Arsenic Acid is rated A-Excellent
Barium	7440-39-3		No information available	No information available	No information available	No information available	No information available	No information available
Benzene	71-43-2		C-Questionable	A-Excellent	A-Good	B-Good	A-Good	B-Good
Benzo[a]pyrene	50-32-8		No information available	No information available	No information available	No information available	No information available	No information available
Benzyl alcohol	100-51-6		Not rated	B-Good	A-Good	B-Good	A-Good	B-Good
Bis(2-ethylhexyl)phthalate	117-81-7		No information available	No information available	No information available	No information available	No information available	No information available
Bromodichloromethane	75-27-4		No information available	No information available	No information available	No information available	No information available	No information available
Bromomethane (Methyl Bromide)	74-83-9		Not rated	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
Butyl benzyl phthalate	85-68-7		No information available	No information available	No information available	No information available	No information available	No information available
Cadmium	7440-43-9		No information available	No information available	No information available	No information available	No information available	No information available
Carbon disulfide	75-15-0		Not rated	Not rated	A-Good	A-Excellent	B-Fair	B-Good
Carbon Tetrachloride	56-23-5		U-Unsatisfactory	B-Good	A-Good	A-Excellent	A-Good	A-Excellent
Chlorobenzene	108-90-7		C-Questionable	B-Good	A-Good	A-Excellent	A-Good	B-Good
Chlorodibromomethane	124-48-1		Not rated	Not rated	Not rated	Not rated	A-Good	Not rated
Chloroethane	75-00-3		No information available	No information available	No information available	No information available	No information available	No information available
Chloroform	67-66-3		C-Questionable	B-Good	A-Good	A-Excellent	A-Good	A-Excellent
Chloromethane	74-87-3		No information available	No information available	No information available	No information available	No information available	No information available
Chromium	7440-47-3		No information available	No information available	No information available	No information available	No information available	No information available

APPENDIX 2

Chemicals Stored and Compatibility Guidelines

General Solvent #4			Carbon Steel		304 Stainless Steel		314 Stainless Steel	
COMPOUND	CAS #	Comments	CAT Pumps	Cole Palmer	CAT Pumps	Cole Palmer	CAT Pumps	Cole Palmer
Chrysene	218-01-9		No information available	No information available	No information available	No information available	No information available	No information available
Cresol (mixture of m-, o- , & p-)	1319-77-3		Not rated	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
Cyanide	57-12-5		No information available	No information available	No information available	No information available	No information available	No information available
Cyclohexanone	108-94-1		Not rated	A-Excellent	Not rated	A-Excellent	A-Good	A-Excellent
Di-n-butyl phthalate	84-74-2		Not rated	No information available	Not rated	No information available	Not rated	No information available
Dichlorobenzene, m- [1,3-]	541-73-1		Not rated	B-Good	Not rated	Not rated	Not rated	B-Good
Dichlorobenzene, o- [1,2-]	95-50-1		Not rated	B-Good	Not rated	Not rated	Not rated	B-Good
Dichlorobenzene, p- [1,4-]	106-46-7		Not rated	B-Good	Not rated	Not rated	Not rated	B-Good
Dichlorodifluoromethane (Freon 12)	75-71-8		Not rated	D-Severe Effect	U-Unsatisfactory	B-Good	U-Unsatisfactory	B-Good
Dichloroethane, 1,1-	75-34-3		Not rated	D-Severe Effect	A-Good	B-Good	A-Good	B-Good
Dichloroethane, 1,2-	107-06-2		Not rated	D-Severe Effect	A-Good	B-Good	A-Good	B-Good
Dichloroethylene, 1,1-	75-35-4		No information available	No information available	No information available	No information available	No information available	No information available
Dichloroethylene, 1,2-cis-	156-59-2		No information available	No information available	No information available	No information available	No information available	No information available
Dichloroethylene, 1,2-trans-	156-60-5		No information available	No information available	No information available	No information available	No information available	No information available
Dichlorofluoroethane (Freon 141)	1717-00-6		No information available	No information available	No information available	No information available	No information available	No information available
Dichloropropene, cis-1,3-	10061-01-5		No information available	No information available	No information available	No information available	No information available	No information available
Dichloropropene, trans-1,3-	10061-02-6		No information available	No information available	No information available	No information available	No information available	No information available
Dimethylphenol, 2,4-	105-67-9		No information available	No information available	No information available	No information available	No information available	No information available
Diphenylamine	122-39-4		No information available	No information available	No information available	No information available	No information available	No information available
Ethyl 3-ethoxypropionate (Propionic Acid)	763-69-9		Not rated	No information available	Not rated	No information available	Not rated	No information available
Ethyl acetate	141-78-6		C-Questionable	B-Good	A-Good	B-Good	A-Good	B-Good
Ethyl alcohol	64-17-5		A-Good	B-Good	A-Good	A-Excellent	A-Good	A-Excellent
Ethyl benzene	100-41-4		Not rated	No information available	Not rated	No information available	Not rated	No information available
Ethyl lactate	97-64-3		No information available	No information available	No information available	No information available	No information available	No information available
Ethylene Glycol	107-21-1		C-Questionable	B-Good	A-Good	B-Good	A-Good	B-Good
Ethylene oxide	75-21-8		Not rated	C-Fair	C-Questionable	B-Good	A-Good	B-Good
Fluoride	16984-48-8		No information available	No information available	No information available	No information available	No information available	No information available
gamma-Butyrolactone	96-48-0		No information available	No information available	No information available	No information available	No information available	No information available
Isobutyl alcohol	78-83-1		Not rated	B-Good	Not rated	A-Excellent	Not rated	A-Excellent
Isopropanol	67-63-0		A-Good	A-Excellent	A-Good	B-Good	A-Good	B-Good

APPENDIX 2

Chemicals Stored and Compatibility Guidelines

General Solvent #4			Carbon Steel		304 Stainless Steel		314 Stainless Steel	
COMPOUND	CAS #	Comments	CAT Pumps	Cole Palmer	CAT Pumps	Cole Palmer	CAT Pumps	Cole Palmer
Lead	7439-92-1		No information available	No information available	No information available	No information available	No information available	No information available
Methanol	67-56-1		A-Good	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
Methyl Ethyl Ketone	78-93-3		Not rated	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
Methyl isobutyl ketone	108-10-1		Not rated	A-Excellent	A-Good	B-Good	A-Good	B-Good
Methyl methacrylate	80-62-6		Not rated	Not rated	Not rated	B-Good	Not rated	B-Good
Methylene chloride	75-09-2		Not rated	B-Good	C-Questionable	B-Good	C-Questionable	B-Good
Mixed Hydrocarbon Oils	Various		No information available	No information available	No information available	No information available	No information available	No information available
n-Butyl Alcohol	71-36-3		C-Questionable	B-Good	A-Good	A-Excellent	A-Good	A-Excellent
n-Methyl pyrrolidone	872-50-4		No information available	No information available	No information available	No information available	No information available	No information available
Napthalene	91-20-3		A-Good	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
Nickel	7440-02-0		No information available	No information available	No information available	No information available	No information available	No information available
PGME	107-98-2		Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated A-Good	Propylene Glycol is rated B-Good
PGMEA	108-65-6		Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated A-Good	Propylene Glycol is rated B-Good
Phenanthrene	85-01-8		No information available	No information available	No information available	No information available	No information available	No information available
Phenol	108-95-2		Not rated	Not rated	B-Fair	B-Good	A-Good	B-Good
Phthalic anhydride	85-44-9		No information available	A-Excellent	No information available	A-Excellent	No information available	A-Excellent
Propylene Glycol	57-55-6		B-Fair	B-Good	B-Fair	B-Good	A-Good	B-Good
Pyrene	129-00-0		No information available	No information available	No information available	No information available	No information available	No information available
Selenium	7782-49-2		No information available	No information available	No information available	No information available	No information available	No information available
Silver	7440-22-4		No information available	No information available	No information available	No information available	No information available	No information available
Tetrachloroethylene	127-18-4		Not rated	A-Excellent	Not rated	A-Excellent	Not rated	Not rated
Thallium	7440-28-0		No information available	No information available	No information available	No information available	No information available	No information available
Toluene	108-88-3		A-Good	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
Tribromomethane	75-25-2		No information available	No information available	No information available	No information available	No information available	No information available
Trichloroethane, 1,1,1-	71-55-6		Not rated	B-Good	C-Questionable	B-Good	A-Good	B-Good
Trichloroethylene	79-01-6		B-Fair	B-Good	A-Good	B-Good	A-Good	B-Good
Trichloromonofluoromethane	75-69-4		No information available	No information available	No information available	No information available	No information available	No information available
Vinyl chloride	75-01-4		Not rated	A-Excellent	Not rated	B-Good	Not rated	A-Excellent
Xylene, m-	108-38-3		B-Fair	A-Excellent	A-Good	B-Good	A-Good	B-Good
Xylene, o-	95-47-6		B-Fair	A-Excellent	A-Good	B-Good	A-Good	B-Good
Xylene, p-	106-42-3		B-Fair	A-Excellent	A-Good	B-Good	A-Good	B-Good

RCRA Assessment of Waste Mid UV Resist/PGMEA Storage Tank
June 27, 2006

KNIGHT CONSULTING ENGINEERS, INC.
P.O. BOX 29, 51 KNIGHT LANE
WILLISTON, VERMONT 05495
Tel: 802-879-6343 Fax: 802-879-6376

STEPHEN C. KNIGHT, JR. P.E.
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CIVIL ENGINEERING
STRUCTURAL ENGINEERING
GEOTECHNICAL ENGINEERING
HYDRAULIC ENGINEERING
CONSTRUCTION INSPECTION
CONSTRUCTION TESTING

June 27, 2006

David Crawford
IBM Microelectronics
Essex Junction, VT

Re: RCRA Assessment of Waste Mid UV Resist / PGMEA Storage Tank (formerly N Butyl Acetate #1)
IBM Chemical Distribution Center Tank Farm

Dear Mr. Crawford:

This letter reports our assessment of the Waste Mid UV Resist / PGMEA storage tank (formerly N Butyl Acetate #1) with respect to the requirements of 40 CFR 264.192 and 40 CFR 264.193. The report will paraphrase each requirement of the CFR and then provide an assessment of the actual conditions with respect to each requirement.

40 CFR 264.192

Requirement (a) - Owner must have a written assessment by a registered professional engineer indicating that the foundation, structural support, and the tank are properly designed, the tank material is compatible with the waste to be stored, and that corrosion protection is provided if necessary. At a minimum the assessment must include the design standard(s) to which the tank was constructed; a list of the hazardous characteristics of the waste to be stored; and an assessment of the foundation's ability to support the load of the tanks, prevent flotation or dislodgement of the tanks, and to prevent movement due to frost action.

Assessment:

1. The tank is 15'-0" long with a diameter of 10'-0". It is built of welded SA285C carbon steel plate. The cylindrical shell has a nominal thickness of 1/4". The heads have a nominal thickness of 3/16". The tank was manufactured in 1980 by Eastern Tank Fabricator. It is designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code. A copy of the Manufacturer's Data Report for Pressure Vessels is included in Appendix 1.

2. The chemicals stored in the tank as reported by IBM are listed in Appendix 2. Knight Consulting Engineers, Inc., has reviewed chemical compatibility charts provided by Cole-Palmer and Cat Pumps to check for compatibility with the SA285C carbon steel tank. The information gathered is summarized in Appendix 2. Knight Consulting Engineers, Inc., does not specialize in chemical engineering, so this data is provided as general information only.

3. The tank is not in contact with soil. It is protected from rain and snow by a roof and a partial height wall. Since the tank is not in contact with soil or water, additional corrosion protection is not required.

4. The tank is above ground therefore the requirements for below grade tanks are not applicable.

5. The tank is supported on a 12" concrete slab which was designed by Gustav Getter Associates, New Rochelle, NY, in 1980 to support the 10,000 gallon storage tank. There is no evidence indicating significant settlement of the slab or movement due to frost action. Based on the performance of the slab over the past 25 years it is our opinion that the slab was designed properly. The tank is not subject to flotation since the elevation of the top of the vault walls in which the tank sits is low enough that the water would overflow the walls before flotation would occur.

Requirement (b) – The owner must insure that the tank is not damage during installation. A qualified independent inspector or PE shall inspect the tank systems for the presence of weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, or other structural damage.

Assessment - No reports of inspections conducted after the tank was installed have been located. The thickness of the tank has been periodically measured by Knight Consulting Engineers, Inc., starting in 1983. The latest such inspection was conducted in November 2004, and the report from that inspection is included in Appendix 3. Note that this tank was previously identified as Butyl Acetate #1 and is so indicated in the report in Appendix 3. The last interior inspection of the tank was completed in 1990. The report of this inspection is attached in Appendix 4. Again the tank is identified in the 1990 report as Butyl Acetate #1. IBM visually inspects the exterior of the tanks on a daily basis. IBM reports that no leaks have occurred in this tank since it has been in service.

Requirement (c) – Applies to undergound tanks and is therefore not applicable to this tank.

Requirement (d) – All new tanks and ancillary equipment must be tested for tightness prior to being placed in use.

Assessment – The tank was pressure tested to 20 psi by the manufacturer (see Appendix 1). We cannot state whether or not all ancillary piping and equipment was tested, however, IBM reports that no leaks have occurred since the tank was placed in service.

Requirement (e) – Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.

Assessment – We have completed a visual assessment of support of the ancillary equipment and it is our opinion that the equipment is so supported.

Requirement (f) – Corrosion protection must be provided as required in section (a). Not applicable.

<u>40 CFR 264.193</u>

Requirement (c)(1) – Secondary containment must be constructed of or lined with materials that are compatible with the waste to be stored and must have sufficient strength and thickness to prevent failure due to pressure gradients, physical contact with the waste, climatic conditions, and the stress of daily operation.

Assessment – The secondary containment system consists of a ¼" thick ASTM A588-85 Grade B weathering steel plate liner designed by Knight Consulting Engineers in 1987 supported by concrete foundation and walls designed by Gustav Getter Associates in 1980. The liner is protected from wind and snow by the roof and wall structure designed by Knight Consulting Engineers in 1987. It has sufficient strength to prevent failure due to pressure gradients, physical contact with the waste and the stress of daily operation. Knight Consulting Engineers, Inc., has reviewed chemical compatibility charts provided by Cole-Palmer and Cat Pumps to check for compatibility with the liner. The information gathered is

summarized in Appendix 2. Knight Consulting Engineers, Inc., does not specialize in chemical engineering, so this data is provided as general information only.

Requirement (c)(2) – The secondary containment system must be placed on a foundation capable of providing support to the secondary containment system, resistance to pressure gradients above and below the system, and capable of preventing failure due to settlement.

Assessment – The liner is supported by concrete slabs and walls designed by Gustav Getter Associates in 1980. The concrete slab and walls have sufficient strength to resist pressure gradients above and below the system. They are also capable of preventing failure due to settlement.

Requirement (c)(3) – The secondary containment system must be provided with a leak detection system that is designed and operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours.

Assessment – A leak detection system is provided to detect leaks of the tanks into the secondary containment system. In addition, the secondary containment is visually inspected on a daily basis. No leak detection system is provided to detect leaks of the secondary containment system. There are standpipes above the lowest areas of the concrete slab supporting the liner that could be used to visually inspect for leaks of the secondary containment system, however, IBM does not currently conduct such inspections.

Requirement (c)(4) – The secondary containment system must be sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spill, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within 24 hours, or in as timely a manner as is possible to prevent harm to human health and the environment.

Assessment – The secondary containment system has sufficient volume to contain the volume of all tanks protected by the containment system. In addition there is a piping and vault system designed to collect overflow of the secondary containment in the very unlikely event that such overflow would occur.

Requirement (d) – The secondary containment system must include one or more of the following devices: (1) a liner (external to the tank); (2) a vault; (3) A double-walled tank; or (4) an equivalent device as approved by the Regional Administrator.

Assessment – The secondary containment system includes a liner as described earlier in this report.

Requirement (e)(1)(i) – The liner must be designed or operated to contain 100 percent of the capacity of the largest tank within its boundary.

Assessment – Each lined area contains two 10,000 gallon tanks. Each lined area has a secondary containment capacity of approximately 21,000 gallons, so this requirement is satisfied.

Requirement (e)(1)(ii) – The liner must be designed or operated to prevent run-on or infiltration of the precipitation into the secondary containment system.

Assessment – The liner is protected by an overhanging roof and wall structure that prevents precipitation from falling on the containment area. Groundwater cannot flow into the containment area.

Requirement (e)(1)(iii) – The liner must be free from cracks and gaps.

Assessment – The liner was hydrostatically tested and the liner welds were vacuum tested after construction.

Requirement (e)(1)(iv) – The liner must be designed and installed to surround the tank completely and to cover all earth likely to come into contact with the waste if the waste is released from the tank(s) (i.e., capable of preventing lateral as well as vertical migration of the waste).

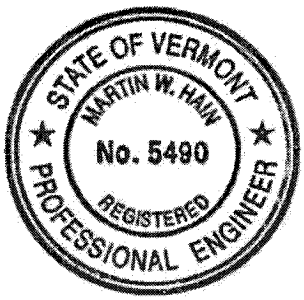
Assessment – The liner extends at least 10' beyond the tanks in all directions in order to satisfy this requirement.

Requirement (f) – Ancillary equipment must be provided with secondary containment that meets the requirements if paragaphs (b) and (c) of this section except for aboveground piping, welded flanges, welded joints, welded connections, sealless or magnetic coupling pumps, and sealless valves that are inspected on a daily basis.

Assessment – Ancillary equipment is located above the area that is lined as described above and thus meets this requirement. To our knowledge all piping that leaves the lined area is double contained piping. According to IBM, all ancillary equipment is inspected daily.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,



Martin W. Hain, P.E.
President
KNIGHT CONSULTING ENGINEERS, INC.

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FORM U-1A MANUFACTURERS' DATA REPORT FOR PRESSURE VESSELS
(Alternate Form for Single Chamber, Completely Shop-Fabricated Vessels Only)
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

B.A. # 1

1. Manufactured by Eastern Tank Fabricators, 460 Main Ave, Wallington, NJ 07055
2. Manufactured for Wm. L. Crow Construction, One Penn Plaza, NYC 10001
3. Location of Installation IBM Corp., Burlington, Vermont
4. Type Horiz. (Horiz. or vert. tank) 5019-3 (Mfgr's Serial No.) – (CRN) D9616-2 (Drawing No.) 1627 (Nat'l Bd. No.) (Year Built) 1980

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1980 (Year) and Addenda to 6/30/80 (Date) and Code Case Nos. None

Special Service per UG-120(d) None

Manufacturers' Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: –

6. Shell: Matl. SA285C (Spec. No., Grade) Nom. Thk. 1/2 Corr. Allow. 0 in. Diam. 120 in. Lgth. 15 ft 0 in. SL

7. Seams: Long Weld Dbl Butt (Welded, Dbl. Sngl. Lap, Butt) R.T. None (Spot or Full) Efficiency 70 % H.T. Temp. – F Time – hr

Girth Weld Dbl Butt (Welded, Dbl. Sngl. Lap, Butt) R.T. None (Spot, Partial, or Full) No. of Courses 2

8. Heads: (a) Material SA285-C (Spec. No., Grade) (b) Material (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Min. Thk.	Corr. Allow.	Crown Radius	Knuckle Radius	Ellipse Ratio	Conical Apex Angle	Hemisph. Radius	Flat Diam.	Side to Pressure (Convex or Concave)
(a)	Ends	3/16	0	114	8	–	–	–	–	Concave
(b)										

If removable, bolts used (describe other fastenings) – (Material, Spec. No., Gr., Size, No.)

9. Constructed for max. allowable working pressure 20 psi at max. temp. 100 F. Min. temp. (when less than –20 F) – F. Hydrostatic, pneumatic, or combination test pressure 30 psi.
10. Safety Valve Outlets: Number – Size – Location Elsewhere In System
11. Nozzles and Inspection Openings:

Purpose (Inlet, Outlet, Drain)	No.	Diam. or Size	Type	Matl.	Nom. Thk.	Reinforcement Matl.	How Attached	Location
Misc.	1	10"	150#SlipOn	SA53B	.365	–	Welded	Shell
Misc.	1	5	150#SlipOn	SA53B	.258	–	Welded	Shell
Misc.	1	6	150#SlipOn	SA53B	.280	–	Welded	Shell
Misc.	2	2	150#SlipOn	SA53B	.154	–	Welded	Shell
Misc.	2	2	150#SlipOn	SA53B*	.154	–	Welded	Shell
Insp.	2	24	Manhole	SA285C	1" (Neck)	–	Welded	Shell

12. Supports: Skirt No (Yes or no) Lugs – (No.) Legs – (No.) Other 3 – 120° Saddles (Describe) Attached Welded to Shell (Where and how)
13. Remarks: *W/Pipe Extended to tank bottom –
14 clips and structurals for rail and platform support–
Chemical Waste Storage Tank
Designed according to the Rules of UW12C

CERTIFICATE OF COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1.

Date 12/10/80 Signed Eastern Tank Fabricator (Manufacturer) by [signature] (Representative)

"U" Certificate of Authorization No. 8453 expires August 4th, 1981

CERTIFICATE OF SHOP INSPECTION

Vessel made by EASTERN TANK FABRICATORS at 460 Main Ave, Wallington, NJ

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of New Jersey and employed by CommUnionInsCo have inspected the pressure vessel described in this Manufacturers' Data Report on 12/10 1980, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in the Manufacturers' Data Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Signed [signature] (Inspector) Date 12/10/80 Commissions NB 769 (Nat'l Board, State, Province and No.)

(1/76) This form (E00117) may be obtained from the Order Dept., ASME, 345 E. 47th St., New York, N.Y. 10017

APPENDIX 2
Chemicals Stored and Compatibility Guidelines

Mid-UV			Carbon Steel		304 Stainless Steel		314 Stainless Steel	
COMPOUND	**CAS #**	**Comments**	**CAT Pumps**	**Cole Palmer**	**CAT Pumps**	**Cole Palmer**	**CAT Pumps**	**Cole Palmer**
Acetic Acid	64-19-7	Found at 596 ppm in Sept 2005 sample	A-Good	D-Severe Effect	C-Questionable	C-Fair	B-Fair	A-Excellent
Cresol (mixture of m-, o- , & p-)	1319-77-3		Not rated	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
Cyclohexanone	108-94-1		Not rated	A-Excellent	Not rated	A-Excellent	A-Good	A-Excellent
Cyclopentanone	120-92-3		No information available	No information available	No information available	No information available	No information available	No information available
Dichloroethane, 1,2-	107-06-2		Not rated	D-Severe Effect	A-Good	B-Good	A-Good	B-Good
Ethyl 3-ethoxypropionate	763-69-9		Not rated	No information available	Not rated	No information available	Not rated	No information available
Ethyl benzene	100-41-4		Not rated	No information available	Not rated	No information available	Not rated	No information available
Ethyl lactate	97-64-3	Found at 10,100 ppm in Sept 2005 sample	No information available	No information available	No information available	No information available	No information available	No information available
Ethylene Glycol	107-21-1	Found at 428 ppm in Sept 2005 sample	C-Questionable	B-Good	A-Good	B-Good	A-Good	B-Good
gamma-Butyrolactone	96-48-0	Found at 199,000 ppm in Sept 2005 sample	No information available	No information available	No information available	No information available	No information available	No information available
HMDS (Hexamethyldisilazane)	999-97-3		No information available	No information available	No information available	No information available	No information available	No information available
Isopropanol	67-63-0	Found at 881 ppm in Sept 2005 sample	A-Good	A-Excellent	A-Good	B-Good	A-Good	B-Good
n-Butyl Acetate	123-86-4	Found at 240,000 ppm in Sept 2005 sample	A-Good	A-Excellent	A-Good	A-Excellent	A-Good	A-Excellent
n-Butyl Alcohol	71-36-3		C-Questionable	B-Good	A-Good	A-Excellent	A-Good	A-Excellent
n-Methyl pyrrolidone	872-50-4	Found at 123 ppm in Sept 2005 sample	No information available	No information available	No information available	No information available	No information available	No information available
PGME	107-98-2	Found at 112 ppm in Sept 2005 sample	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated A-Good	Propylene Glycol is rated B-Good
PGMEA	108-65-6	Main constituent >50%, Found at 634,000 ppm in Sept 2005 sample	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated B-Fair	Propylene Glycol is rated B-Good	Propylene Glycol is rated A-Good	Propylene Glycol is rated B-Good
Styrene	100-42-5		Not rated	C-Fair	A-Good	A-Excellent	A-Good	A-Excellent
Tetramethyl ammonium hydroxide (TMAH)	75-59-2	Found at 6850 ppm in Sept 2005 sample	No information available	No information available	No information available	No information available	No information available	No information available
Xylene, m-	108-38-3	B-Fair	A-Excellent	A-Good	B-Good	A-Good	B-Good	
Xylene, o-	95-47-6	B-Fair	A-Excellent	A-Good	B-Good	A-Good	B-Good	
Xylene, p-	106-42-3	B-Fair	A-Excellent	A-Good	B-Good	A-Good	B-Good	

Knowledge | Commitment | Experience

July 25, 2017

Gary Diminick
PC Construction
Via Email: gdiminick@pcconstruction.com

Re: General Solvent #1 and DUV Waste Tank Inspections

Dear Gary:

On July 18 and 19, 2017, the tanks referenced above were inspected internally and externally by Joe Paterak and Richard Vocke of Aaron Environmental working as a subcontractor for Knight Consulting Engineers, Inc. The tanks were taken out of service, emptied and cleaned prior to the inspection.

The report of Aaron Environmental's findings and recommendations is attached. I have reviewed the attached report and I concur with the recommendations of Aaron Environmental.

Please feel free to contact the undersigned if you have any comments or questions regarding this matter.

Sincerely,

STATE OF VERMONT
MARTIN W. HAIN
No. 5490
REGISTERED
PROFESSIONAL ENGINEER

Martin W. Hain, P.E.
President
Knight Consulting Engineers, Inc.

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Out-of-Service Aboveground Storage Tank Inspection Report

Knight Consulting Engineers

Global Foundries

River Road, Essex Junction, Vermont

Inspection Dates: July 18 & 19, 2017

Prepared for:

Martin Hain, P.E.
Knight Consulting Engineers
51 Knight Lane, Williston, Vermont 05495
Phone: 802-879-6343

Prepared by:

AARON ENVIRONMENTAL

189 Atwater Street

Plantsville, CT 06479

860-276-1201

July 21, 2017

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Ultrasonic Thickness Data

Tank Photographs

Preface

Throughout this document, 'Customer' or 'Client' refers to Knight Consulting Engineers (KCE) and/or Global Foundries; and 'Consultant', 'Engineer' or 'AARON' refers to AARON Environmental.

The field observations and research reported herein are considered sufficient in detail and scope to form a reasonable basis for an out-of-service evaluation of the referenced tank(s). The methods used to acquire the information as well as compile and analyze the data are considered current and widely accepted methods in the industry. These methods have been developed to provide the Client with information regarding apparent indications of existing or potential conditions relating to the tank(s) and are limited to the accessibility to the tank(s) and information available at the time of the site visit and inspection. Conclusions listed in this document may have been based in-part on information provided by the current facility owner, their agents and/or third parties (including, but not limited to, state and local authorities); pursuant to this, the accuracy of said information is not guaranteed by AARON.

LIMITATIONS

Notwithstanding anything contained in this report, nothing herein shall be construed as a representation, warranty or guarantee, either expressed or implied, regarding the future structural integrity, life expectancy, or performance of any of the items evaluated. This report and the analysis provided is in all respects subject to and shall be interpreted within the limitations and parameters of the test procedures performed. In the event testing is performed using a sampling procedure, this report and any analysis shall be limited to those areas actually tested and the type of test conducted, and the customer is cautioned not to extrapolate the results of the test samples.

I. INSPECTION PROCEDURES

The aboveground storage tank(s) were inspected following portions of the applicable procedures contained in the Steel Tank Institute (STI) Standard SP001 5th Edition "Standard for Inspection of Aboveground Storage Tanks".

Where applicable, AARON provided the following inspection and testing services on the tank(s):

1. Perform the periodic inspections (monthly and annual) described in the STI Standard.

2. Visually inspect the outside of each tank in detail. At a minimum, the following tank components were inspected (where applicable):

    a. Primary Tank
    b. Secondary Tank
    c. Tank Supports
    d. Tank Anchors
    e. Tank Foundation and external supports
    f. Tank gauges and alarms
    g. Insulation covering
    h. Tank appurtenances
    i. Normal Vents
    j. Emergency Vents
    k. Release Prevention Barriers
    l. Spill Control Systems

3. Visually inspect the interior of each tank in detail. At a minimum, the following areas of concern were addressed (where applicable):
    a. Identify, inspect and record AST internal appurtenances

b. Inspect for mechanical damage, corrosion, cracking, etc.
c. Inspect for deteriorating or corroding internal attachments and piping
d. Visually inspect welds
e. Ultrasonic thickness measurements
f. Vacuum box examination of questionable welds

4. Inspect the tank based on its construction, per the following:

   a. Single Wall Tank, Not in Contact with the Ground
      i. Either conduct ultrasonic testing (from the exterior) to determine the shell thickness as described in the STI Standard, or visually examine the interior of the tank as described in the STI Standard.

To obtain the residual metal thickness readings, a Panametrics 38DL Plus datalogging ultrasonic digital thickness gauge with a D790 or D791 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The meter is capable of collecting readings using a scan mode or single point mode. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material. Field data was stored in the unit and downloaded to a computer using Panametrics' WINplus interface software.

This report documents the findings of our inspections. It is intended to provide the tank owner/operator with an assessment of the tank's current condition, recommendations for improvements to maintain the long term integrity of the structure and an opinion of the tank's suitability for continued service.

II. GENERAL SITE AND TANK DESCRIPTION

AARON Environmental (AARON) was asked to conduct an out-of-service inspection of two aboveground waste solvent storage tanks located at Global Foundries, River Road, Essex Junction, VT. The tanks were inspected on July 18 and 19, 2017. The subject tanks are described in the table below.

Tank ID / Location	Size (gallons)	Tank Construction Material	Manway Access	Product Stored
General Solvent #1 / Tank Farm	10,000	Single Wall Steel with concrete/steel containment dike	Yes	Waste Solvent
Waste Deep DUV Resist #1 / Tank Farm	10,000	Single Wall Steel with concrete/ Steel containment dike	Yes	Waste Solvent

The subject tanks were identified as shop-fabricated, welded, carbon steel construction. The age, size, orientation, and appurtenances of the tank are described in further detail in Section III of this report.

Two historical reports by Knight Consulting Engineers addressing prior inspections of the subject tanks were provided to AARON for review. Both reports, dated September 21, 2007 and July 21, 2009 included both interior and exterior ultrasonic thickness data for the subject tanks, referred to as designated above.

III. INSPECTION SUMMARY

The following sections provide a summary of the inspection completed for each tank. The visual and ultrasonic thickness (if applicable) summaries are also provided for each tank.

General Solvent #1

This 10,000-gallon tank is a horizontal, cylindrical design with a diameter of 120 inches and an overall length 180 inches (15 feet), and is used to store waste solvent. The tank consists of single wall carbon steel, welded construction and rests within a covered concrete secondary containment structure. The containment dike is steel lined and has a calculated containment capacity of 23,170 gallons. There was no nameplate observed on the tank; however, the tank is insulated and a nameplate may not be visible. The age of the tank could not be verified based on field data but was reportedly installed in 1980 according to the Manufacturers Data Report for Pressure Vessels.

For the purposes of this inspection, the subject tank is considered to be single wall, not in contact with the ground. The tank is equipped with a manway and was inspected both externally and internally.

The tank is equipped with the following fittings and equipment located along the centerline:

24" ID access manway, tight bolted with high-level warning alarm switch
2" tank top flanged fitting inlet/outlet
6" tank top flanged fitting with emergency venting
2" tank top flanged fitting with an inlet for nitrogen
6" tank top flanged fitting with a level indicator
2" tank top flanged fitting with a normal vent
4" tank top flanged fitting
Tank top fitting with pump
24" ID diameter manway

The following details were observed as part of the overall tank inspection. The tank inspection summary is provided following the STI periodic inspection criteria (monthly and annual), formal external inspection criteria, and additional inspection items. The periodic inspection items for this tank are described as follows:

Monthly Inspection Checklist

1. Tank Containment
   1.1. The tank was emptied and cleaned prior to our inspection. No liquid was present on the tank bottom.
   1.2. The containment area was inspected for debris and fire hazards. None were observed.
   1.3. The drain associated with the secondary containment area was clear of debris and appeared to be in working order.
   1.4. Containment egress pathways were inspected. No problems were identified.
2. Leak Detection
   2.1. The tank and containment area were inspected for signs of leakage. No leaks were observed.
3. Tank Attachments and Appurtances
   3.1. The tank stairs and topside access platform were inspected. These structures are secure with no signs of significant corrosion or damage.
   3.2. The tank liquid level gauge was inspected. The tank was empty during our inspection so the proper and accurate operation of the gauge was not verified.
   3.3. Tank openings were inspected to confirm proper sealing. Openings appeared to be properly sealed. Each of the two manway covers had been removed by others.
4. Other Conditions
   4.1. No conditions were identified which would be considered unsafe or that would significantly affect the site SPCC Plan.

Annual Inspection Checklist

1. Tank Containment
   1.1. The steel lined concrete secondary containment structure was inspected and found to be in satisfactory condition.
   1.2. The drainage pipe and/or valves associated with the secondary containment structures were inspected and found to be in satisfactory condition.
2. Tank Foundation and Supports
   2.1. No signs of tank settlement or foundation washout were identified.
   2.2. The concrete containment structure is not visible because there is a steel lining over it. The steel lining (i.e., overlay) was observed to be in good condition. Cracking and/or spalling were not identified. There is no ring wall associated with the subject tank.
   2.3. The tank rests on steel support saddles which rest on elevated concrete foundations which are covered with steel plate. Portions of the steel saddles have some limited paint failure. The foundations are in good condition.
   2.4. The area around the concrete containment structure is located under a roof. Drainage is not a concern.
   2.5. The tank stairs and platform are bonded to the steel building structure which is bonded to several earth ground rods. The grounding equipment was observed to be in good condition.
3. Cathodic Protection System
   3.1. There is no cathodic protection system associated with the subject tank. There is no buried steel associated with the tank or piping.
4. Tank External Coating
   4.1. The tank has beige topcoat paint. The entire tank shell is covered with insulation; therefore routine inspection of the painted surfaces is not possible. Some paint failure was observed on the steel support saddles.
5. Tank Shells/Heads
   5.1. Evidence of shell/head distortions, buckling, denting or bulging was not observed.

5.2. Evidence of shell/head corrosion was not observed.

6. Tank Manways, Piping and Equipment within Secondary Containment

6.1. The tank manhole and bolts were observed in good condition with no significant signs of wear or corrosion.

6.2. The piping and equipment associated with the subject tank and located within the secondary containment was inspected and found to be in good condition.

7. Tank Roof

7.1. Not applicable, the tank is a horizontal cylindrical design.

8. Venting

8.1. The normal vents are in good condition and free from obstructions.

8.2. The tank has emergency venting with a flame arrestor that appear to be in good condition and working properly.

9. Insulated Tanks

9.1. The tank shell is insulated. No missing insulation was identified.

9.2. Areas of moisture associated with the insulation were not identified.

9.3. No mold was observed.

9.4. No damage to the insulation was observed.

9.5. The tank is located under a roof; therefore, the insulating material is protected from precipitation.

10. Level and Overfill Prevention Instrumentation of Shop Fabricated Tanks

10.1. The tank level sensing device was inspected, found to be in good condition but not tested for proper operation.

10.2. The overfill prevention device includes an electronic high level warning alarm. This device is in good condition but was not tested for proper operation.

11. Electrical Equipment

11.1. A specific grounding cable was not identified; however, the tank is grounded by design.

11.2. Heat trace tape is located on the exterior of the tank under the insulation layer. This was not visible and was not inspected. Other electrical wiring associated with the tank equipment is in good condition.

Formal External Inspection

1. General
   1.1. A formal external inspection was performed by an STI certified inspector.
   1.2. The subject aboveground storage tank (AST) is single wall carbon, horizontal, cylindrical design. The tank is 120 inches in diameter, 15 feet long with a nominal capacity of 10,000 gallons and is used to store waste solvent. The tank was reportedly installed in 1980.
   1.3. According to facility personnel, the subject tank has been evaluated for integrity in the past. Refer to the historical reports from Knight Consulting Engineers attached to this report.
   1.4. There was no nameplate observed on the tank; however, according to available information Eastern Tank Fabricators of Wallington, New Jersey, fabricated the tank in 1980.
   1.5. The fabrication of the AST was inspected using UL 142 as a baseline.
   1.6. The AST foundations were inspected for indications of settlement, cracking, exposed rebar, and general disrepair. No evidence of the above conditions was observed.
   1.7. The AST supports were inspected for indications of cracking, spalling, and general disrepair. The supports include three steel saddles which are not bolted to the concrete foundation. The supports have some isolated paint failure.
   1.8. The subject tank is located within a concrete secondary containment structure which is lined with plate steel. An electronic high level warning alarm is located in the tank. The containment area associated with the tank was inspected and found to be in good condition.
      1.8.1. No breaches or damage were identified with the containment structure.
      1.8.2. There were no foreign materials or liquid located within the containment structure. One other AST, of the same size is located within a common containment area.
      1.8.3. There is a drainage system associated with the containment structure. There were no penetrations observed which would lead to failure of the secondary containment.
   1.9. Ancillary equipment was inspected for condition and operability.

1.9.1. Piping and piping connections were inspected for visible signs of stress or leakage such as severe corrosion, rusted bolted connections, or other severe degradation. Piping and piping connections were observed to be in good condition.

1.9.2. The tank has a 2" diameter normal vent (vacuum relief with integrated flame arrestor) which terminates just above the building roof top and was observed to be in good condition. The tank has a 6" diameter emergency vent/flame arrestor. The tank does normally not vent.

1.9.3. The tank level systems were out-of-service during our inspection and were not tested for operation.

1.10. The tank system is grounded by design. The ground systems were observed to be in good condition.

1.11. The stairs and topside platform were inspected and found to be in good condition with no indications of significant corrosion or damage.

1.12. The tank has beige topcoat paint. The majority of the tank shells and heads are covered with insulation and are not visible for inspection. The steel supports have minor paint failure.

2. Original Shell Thickness of the AST

2.1. Original tank documentation was provided for review and is attached to this report.

2.2. The tank manufacturer was Eastern Tank Fabricators of Wallington, NJ.

2.3. The tank was manufactured to the ASME Pressure Vessel Code.

2.4. According to the manufacturer's data, the original shell thickness was ¼ inches (0.25 inches). The original head thickness was 1/4 inches (0.250 inches).

2.5. The tank was rated for a maximum working pressure of 20 psi at a maximum temperature of 100 degrees F.

3. Horizontal ASTs

3.1. Shell plates, welds and ancillary equipment were inspected for indications of exterior corrosion, bucking, distortion of stress, cracking, pinholes and mechanical damage.

3.1.1. The insulating material and jacketing was not removed. With the exception of several four-inch diameter access ports, the exterior surfaces of the tank shell were

not inspected.

3.2. The tank shell was inspected for indications of changes that may have been made to the AST after it was fabricated. No evidence of changes to the original tank was identified; however, the tank heads and shell surfaces could not be visually inspected due to the presence of insulation.

Formal Internal Inspection

1. General
   1.1. A formal internal inspection was performed by an STI certified inspector.
2. The tank was cleaned by the owner prior to our inspection.
3. Horizontal AST Internal Inspection
   3.1. Internal appurtenances were documented and visually inspected. Carbon steel appurtenances were in fair condition. No mechanical damage, cracking or other concerns were identified.
   3.2. Welds were visually inspected. No problems were identified.
   3.3. Ultrasonic Thickness Scanning (UTS) was performed on the interior surfaces of the tank shell and heads. Data collected ranged from 0.224 to 0.290 inches.
      3.3.1. The entire interior shell has uniform corrosion, with minimal pitting.
      3.3.2. No significant or isolated pitting beyond that was identified.
   3.4. The fabrication of the AST was inspected using UL 142 as a baseline.

Suitability for Continued Service

Based on the STI criteria and result of the current inspection, the subject tank is suitable for continued service. The interval until the next certified inspection is 10 years. Federal, state and/or local regulations may require more frequent inspections of the subject AST.

Recordkeeping

1. AST records should be retained for the life of the AST system.
2. Monthly Inspection Checklists should be completed by the owner/operator and retained for a minimum of 36 months.
3. Annual Inspection Checklists should be completed by the owner/operator and retained for a minimum of 3 years.
4. Certified Inspection Reports should be retained for the life of the AST system.

Waste Deep DUV Resist #1

This 10,000-gallon tank is a horizontal, cylindrical design with a diameter of 120 inches and an overall length 180 inches (15 feet), and is used to store waste solvent. The tank consists of single wall carbon steel, welded construction and rests within a covered concrete secondary containment structure. The containment dike is steel lined and has a calculated containment capacity of 23,170 gallons. There was no nameplate observed on the tank; however, the tank is insulated and a nameplate may not be visible. The age of the tank could not be verified based on field data but was reportedly installed in 1980 when the Chemical Distribution facility was built.

For the purposes of this inspection, the subject tank is considered to be single wall, not in contact with the ground. The tank is equipped with a manway and was inspected both externally and internally.

The tank is equipped with the following fittings and equipment located along the centerline:

24" ID access manway, tight bolted with high-level warning alarm switch
2" tank top flanged fitting inlet/outlet
6" tank top flanged fitting with emergency venting
2" tank top flanged fitting with an inlet for nitrogen
6" tank top flanged fitting with a level indicator
2" tank top flanged fitting with a normal vent

4" tank top flanged fitting
Tank top fitting with pump
24" ID diameter manway

The following details were observed as part of the overall tank inspection. The tank inspection summary is provided following the STI periodic inspection criteria (monthly and annual), formal external inspection criteria, and additional inspection items. The periodic inspection items for this tank are described as follows:

Monthly Inspection Checklist

1. Tank Containment
   1.1. The tank was emptied and cleaned prior to our inspection. No liquid was present on the tank bottom.
   1.2. The containment area was inspected for debris and fire hazards. None were observed.
   1.3. The drain associated with the secondary containment area was clear of debris and appeared to be in working order.
   1.4. Containment egress pathways were inspected. No problems were identified.
2. Leak Detection
   2.1. The tank and containment area were inspected for signs of leakage. No leaks were observed.
3. Tank Attachments and Appurtances
   3.1. The tank stairs and topside access platform were inspected. These structures are secure with no signs of significant corrosion or damage.
   3.2. The tank liquid level gauge was inspected. The tank was empty during our inspection so the proper and accurate operation of the gauge was not verified.
   3.3. Tank openings were inspected to confirm proper sealing. Openings appeared to be properly sealed.

4. Other Conditions
   4.1. No conditions were identified which would be considered unsafe or that would significantly affect the site SPCC Plan.

Annual Inspection Checklist

1. Tank Containment
   1.1. The steel lined concrete secondary containment structure was inspected and found to be in satisfactory condition.
   1.2. The drainage pipe and/or valves associated with the secondary containment structures were inspected and found to be in satisfactory condition.
2. Tank Foundation and Supports
   2.1. No signs of tank settlement or foundation washout were identified.
   2.2. The concrete containment structure is not visible because there is a steel lining over it. The steel lining (i.e., overlay) was observed to be in good condition. Cracking and/or spalling were not identified. There is no ring wall associated with the subject tank.
   2.3. The tank rests on steel support saddles, which rest on elevated concrete foundations, which are covered, with steel plate. Portions of the steel saddles have some limited paint failure. The foundations are in good condition.
   2.4. The area around the concrete containment structure is located under a roof. Drainage is not a concern.
   2.5. The tank stairs and platform are bonded to the steel building structure that is bonded to an earth ground rod. The grounding equipment was observed to be in good condition.
3. Cathodic Protection System
   3.1. There is no cathodic protection system associated with the subject tank. There is no buried steel associated with the tank or piping.
4. Tank External Coating
   4.1. The tank has beige topcoat paint. The entire tank shell is covered with insulation; therefore routine inspection of the painted surfaces is not possible. Some paint failure was observed

on the steel support saddles.

5. Tank Shells/Heads
   5.1. Evidence of shell/head distortions, buckling, denting or bulging was not observed.
   5.2. Evidence of shell/head corrosion was not observed.
6. Tank Manways, Piping and Equipment within Secondary Containment
   6.1. The tank manhole and bolts were observed in good condition with no significant signs of wear or corrosion.
   6.2. The piping and equipment associated with the subject tank and located within the secondary containment was inspected and found to be in good condition.
7. Tank Roof
   7.1. Not applicable, the tank is a horizontal cylindrical design.
8. Venting
   8.1. The normal vents are in good condition and free from obstructions.
   8.2. The tank has emergency venting that appeared to be in good condition and working properly.
9. Insulated Tanks
   9.1. The tank shell is insulated. No missing insulation was identified.
   9.2. Areas of moisture associated with the insulation were not identified.
   9.3. No mold was observed.
   9.4. No damage to the insulation was observed.
   9.5. The tank is located under a roof; therefore, the insulating material is protected from precipitation.
10. Level and Overfill Prevention Instrumentation of Shop Fabricated Tanks
    10.1. The tank level sensing device was inspected, found to be in good condition but not tested for proper operation.
    10.2. The overfill prevention device includes an electronic high level warning alarm. This device is in good condition but was not tested for proper operation.
11. Electrical Equipment
    11.1. The tank grounding cable and/or connections were inspected and found to be in good

condition.

11.2. Heat trace tape is located on the exterior of the tank under the insulation layer. This was not visible and was not inspected. Other electrical wiring associated with the tank equipment is in good condition.

Formal External Inspection

1. General

1.1. A formal external inspection was performed by an STI certified inspector.

1.2. The subject aboveground storage tank (AST) is single wall carbon, horizontal, cylindrical design. The tank is 120 inches in diameter, 15 feet long with a nominal capacity of 10,000 gallons and is used to store waste solvent. The tank was reportedly installed in 1980.

1.3. According to facility personnel, the subject tank has been evaluated for integrity in the past. Refer to the historical reports from Knight Consulting Engineers attached to this report.

1.4. There was no nameplate observed on the tank; however, according to available information Eastern Tank Fabricators of Wallington, New Jersey, fabricated the tank in 1981.

1.5. The fabrication of the AST was inspected using UL 142 as a baseline.

1.6. The AST foundations were inspected for indications of settlement, cracking, exposed rebar, and general disrepair. No evidence of the above conditions was observed.

1.7. The AST supports were inspected for indications of cracking, spalling, and general disrepair. The supports include three steel saddles that are not bolted to the concrete foundation. The supports have some isolated paint failure.

1.8. The subject tank is located within a concrete secondary containment structure that is lined with plate steel. An electronic high-level warning alarm is located in the tank. The containment area associated with the tank was inspected and found to be in good condition.

1.8.1. No breaches or damage were identified with the containment structure.

1.8.2. There were no foreign materials or liquid located within the containment structure.

One other AST, of the same size is located within a common containment area.

1.8.3. There is a drainage system associated with the containment structure. There were no penetrations observed which would lead to failure of the secondary containment.

1.9. Ancillary equipment was inspected for condition and operability.

1.9.1. Piping and piping connections were inspected for visible signs of stress or leakage such as severe corrosion, rusted bolted connections, or other severe degradation. Piping and piping connections were observed to be in good condition.

1.9.2. The tank has a 2" diameter normal vent that terminates just above the building rooftop and was observed to be in good condition. The tank has a 6" diameter emergency vent. The roof top weighted vent cap was checked for free operation, and was free of obstruction.

1.9.3. The tank level systems were out-of-service during our inspection and were not tested for operation.

1.10. The tank system is grounded by design. The ground systems were observed to be in good condition.

1.11. The stairs and topside platform were inspected and found to be in good condition with no indications of significant corrosion or damage.

1.12. The tank has beige topcoat paint. The majority of the tank shells and heads are covered with insulation and are not visible for inspection. The steel supports have minor paint failure.

2. Original Shell Thickness of the AST

2.1. Original tank documentation was provided for review and is attached to this report.

2.2. The tank manufacturer was Eastern Tank Fabricators of Wallington, NJ.

2.3. The tank was manufactured to the ASME Pressure Vessel Code.

2.4. According to the manufacturer's data, the original shell thickness was ¼ inches (0.25 inches). The original head thickness was ¼ inches (0.25 inches).

2.5. The tank was rated for a maximum working pressure of 20 psi at a maximum temperature of 100 degrees F.

3. Horizontal ASTs

3.1. Shell plates, welds and ancillary equipment were inspected for indications of exterior corrosion, bucking, distortion of stress, cracking, pinholes and mechanical damage.

3.1.1. The insulating material and jacketing was not removed. With the exception of several four-inch diameter access ports, the exterior surfaces of the tank shell were not inspected.

3.2. The tank shell was inspected for indications of changes that may have been made to the AST after it was fabricated. No evidence of changes to the original tanks was identified; however, the tank heads and shell surfaces could not be visually inspected due to the presence of insulation.

Formal Internal Inspection

1. General

1.1. A formal internal inspection was performed by an STI certified inspector.

1.2. The tank was cleaned by the owner prior to our inspection.

2. Horizontal AST Internal Inspection

2.1. Internal appurtenances were documented and visually inspected. Carbon steel appurtenances had moderate corrosion. No mechanical damage, cracking or other concerns were identified.

2.2. Welds were visually inspected. No problems were identified.

2.3. Ultrasonic Thickness Scanning (UTS) was performed on the interior surfaces of the tank shell and heads. Data collected ranged from 0.197 to 0.279 inches. UT readings were taken for a baseline due to the severity of the pitting. Additional surfaces were measured with a pit gauge.

2.3.1. The interior shell has some significant corrosion with pitting that ranged from 0.140 to 0.075 inches.

2.3.2. Significant pitting along the mid level of the tank shell, at the 7 and 9 o'clock positions was observed. Pits were measured up to a maximum of 0.140 inches in this area. The pitting extended over an area roughly 36 inches in height. Some

erosion on the shell ranged from 0.00 to 0.053 inches.

2.4. The fabrication of the AST was inspected using UL 142 as a baseline.

Suitability for Continued Service

Based on the STI criteria and result of the current inspection, the subject tank is not suitable for continued service.

The mid portion of the tank shell has significant pitting. Numerous pits were measured as deep as 0.130 inches or 52% of the tank's original thickness.

An interior liner was installed in this tank in 2009, following the previous STI Inspection. The tank was internally cleaned last week and the interior liner detached at that time. The liner was removed by the cleaning contractor and staged in disposal boxes on-site. The failed liner had exceeded its warranty period of five years.

The interval until the next certified inspection is one year. Repairs are required before this tank can be returned to service. Federal, state and/or local regulations may require more frequent inspections of the subject AST.

Recordkeeping

1. AST records should be retained for the life of the AST system.
2. Monthly Inspection Checklists should be completed by the owner/operator and retained for a minimum of 36 months.
3. Annual Inspection Checklists should be completed by the owner/operator and retained for a minimum of 3 years.
4. Certified Inspection Reports should be retained for the life of the AST system.

IV. ULTRASONIC THICKNESS MEASUREMENTS SUMMARY

To obtain the residual metal thickness readings, a Panametrics 38DL Plus datalogging ultrasonic digital thickness gauge with a D790 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material.

Refer to the attachment of this report for a tank sketch and UT thickness measurements.

V. REQUIREMENTS FOR CONTINUED SERVICE

The following items are based on the requirements of SP-001 and UL 142. These documents are industry standards. Additional regulatory requirements may apply to the subject AST.

General Solvent #1 – (1) 10,000-gallon tank

1. Based on the STI Standard (SP-001), the interval until the next certified inspection is not to exceed 10 years. If the facility uses an alternate Standard or chooses to provide "equivalent environmental protection" in lieu of routine integrity testing, the method and schedule for such should be included in the facility's SPCC Plan.

Tank Waste Deep DUV #1– (1) 10,000-gallon tank

1. The mid portion of the tank shell has moderate to significant pitting. Pits were measured as deep as 0.130 inches or 56% of the tank's original thickness. For continued use, the tank needs to be inspected annually.

If the facility's SPCC Plan requires the use of routine "integrity testing" using the STI procedure SP-001, then the following routine inspections should be completed as described by the owner/operator. Specific inspection items may be modified for tank specific use as necessary; however, deviations from or alterations of the STI Standard should be discussed in the facility SPCC Plan.

Shop Fabricated Steel Tanks

The Steel Tank Institute (STI) Standard for Inspection requires the owner or operator of an aboveground tank to perform and document periodic inspections. Refer to the attached checklists. These documents should be completed by the owner or operator on a monthly and annual basis. All records should be maintained.

VI. RECOMMENDATIONS

The following recommendations are based on good engineering practices and industry standards; however, they are not specific regulatory requirements or requirements for continued service.

General Solvent #1 – (1) 10,000-gallon tank

1. There was some isolated paint failure located on the tank saddles.
    a. The saddles should be prepped and repainted.

Waste Deep DUV Resist #1 – (1) 10,000-gallon tank

1. The lower portion of the tank shell has significant pitting. Numerous pits were measured as deep as 0.140 inches or 56% of the tank's original thickness.
    a. Repairs to the interior shell surfaces or replacing the tank is recommended.
2. There was some isolated paint failure located on the tank saddles.
    a. The saddles should be prepped and repainted.

All tanks should be clearly labeled with the product stored, capacity of the tank and an NFPA hazard label, as a minimum. Piping should be labeled with the product and flow direction.

PROFESSIONAL OPINION

The subject above ground storage tank(s) at the Global Foundries, Essex Junction facility, Essex Junction, VT have been inspected using procedures found in STI SP001-05 publication "Standard for the Inspection of Aboveground Storage Tanks".

It is the professional opinion of this firm that the structural integrity of the subject steel tank(s) is acceptable. Unless a different interval is indicated in this report, a certified inspection should be completed within 10 years of the date of this inspection, no later than July 2022.

This is not to be construed as an expressed or implied warranty of future performance.

Should you have any questions or comments concerning this inspection report, please do not hesitate to contact the undersigned at 860-276-1201.

Sincerely,

Joseph Paterak (ext. 109)
AST Inspector (STI #AST-RO9117)

Richard Vocke
Sr. Project Manager

Attachments

Measurements

		Survey Date:	07/18 & 19/2017 03:13PM
Survey Name:	Global Foundries	**Survey Mode:**	THK
Survey Description:		**Erase Protection:**	False
Survey Type:	INCREMENTAL	**Survey Inspector:**	RV/JP
Survey Location:	Tank Farm		

DataPoint ID	Thickness	Units	Flags	Calc Mode	Setup	Modified
External Data Points (5 per AST)						
Waste DEEP DUV #1						
AABR	0.242	IN	M----F	THK	0004	False
AABS	0.233	IN	M----F	THK	0004	False
AABT	0.228	IN	M----F	THK	0004	False
AABU	0.232	IN	M----F	THK	0004	False
AABV	0.254	IN	M----F	THK	0004	False
General Solvent Tank #1						
AABW	0.278	IN	M----F	THK	0004	False
AABX	0.274	IN	M----F	THK	0004	False
AABY	0.271	IN	M----F	THK	0004	False
AABZ	0.279	IN	M----F	THK	0004	False
AACA	0.255	IN	M----F	THK	0004	False
AST General Solvent Tank #1						
AACC	0.500	IN	M----F	THK	0004	False
AACD	0.402	IN	M----F	THK	0004	False
AACE	0.305	IN	M----F	THK	0004	False
AACF	0.209	IN	M----F	THK	0004	False
AACG	0.112	IN	M----F	THK	0004	False
AACH	0.280	IN	M----F	THK	0004	False
AACI	0.256	IN	M----F	THK	0004	False
AACJ	0.259	IN	M----F	THK	0004	False
AACK	0.258	IN	M----F	THK	0004	False
AACL	0.262	IN	M----F	THK	0004	False
AACM	0.262	IN	M----F	THK	0004	False
AACN	0.266	IN	M----F	THK	0004	False
AACO	0.265	IN	M----F	THK	0004	False
AACP	0.290	IN	M----F	THK	0004	False
AACQ	0.289	IN	M----F	THK	0004	False
AACR	0.281	IN	M----F	THK	0004	False
AACS	0.285	IN	M----F	THK	0004	False
AACT	0.259	IN	M----F	THK	0004	False
AACU	0.240	IN	M----F	THK	0004	False
AACV	0.238	IN	M----F	THK	0004	False
AACW	0.270	IN	M----F	THK	0004	False

AACX	0.271 IN	M----F	THK	0004	False
AACY	0.281 IN	M----F	THK	0004	False
AACZ	0.276 IN	M----F	THK	0004	False
AADA	0.278 IN	M----F	THK	0004	False
AADB	0.226 IN	M----F	THK	0004	False
AADC	0.261 IN	M----F	THK	0004	False
AADD	0.271 IN	M----F	THK	0004	False
AADE	0.270 IN	M----F	THK	0004	False
AADF	0.266 IN	M----F	THK	0004	False
AADG	0.241 IN	M----F	THK	0004	False
AADH	0.247 IN	M----F	THK	0004	False
AADI	0.255 IN	M----F	THK	0004	False
AADJ	0.261 IN	M----F	THK	0004	False
AADK	0.269 IN	M----F	THK	0004	False
AADL	0.265 IN	M----F	THK	0004	False
AADM	0.287 IN	M----F	THK	0004	False
AADN	0.284 IN	M----F	THK	0004	False
AADO	0.285 IN	M----F	THK	0004	False
AADP	0.264 IN	M----F	THK	0004	False
AADQ	0.260 IN	M----F	THK	0004	False
AADR	0.288 IN	M----F	THK	0004	False
AADS	0.290 IN	M----F	THK	0004	False
AADT	0.237 IN	M----F	THK	0004	False
AADU	0.262 IN	M----F	THK	0004	False
AADV	0.283 IN	M----F	THK	0004	False
AADW	0.285 IN	M----F	THK	0004	False
AADX	0.273 IN	M----F	THK	0004	False
AADY	0.256 IN	M----F	THK	0004	False
AADZ	0.284 IN	M----F	THK	0004	False
AAEA	0.280 IN	M----F	THK	0004	False
AAEB	0.272 IN	M----F	THK	0004	False
AAEC	0.274 IN	M----F	THK	0004	False
AAED	0.252 IN	M----F	THK	0004	False
AAEE	0.225 IN	M----F	THK	0004	False
AAEF	0.257 IN	M----F	THK	0004	False
AAEG	0.272 IN	M----F	THK	0004	False
AAEH	0.226 IN	M----F	THK	0004	False
AAEI	0.231 IN	M----F	THK	0004	False
AAEJ	0.260 IN	M----F	THK	0004	False
AAEK	0.267 IN	M----F	THK	0004	False
AAEL	0.240 IN	M----F	THK	0004	False
AAEM	0.245 IN	M----F	THK	0004	False
AAEN	0.269 IN	M----F	THK	0004	False
AAEO	0.275 IN	M----F	THK	0004	False
AAEP	0.278 IN	M----F	THK	0004	False
AAEQ	0.279 IN	M----F	THK	0004	False
AAER	0.286 IN	M----F	THK	0004	False

AAES	0.261 IN	M----F	THK	0004	False
AAET	0.236 IN	M----F	THK	0004	False
AAEU	0.252 IN	M----F	THK	0004	False
AAEV	0.269 IN	M----F	THK	0004	False
AAEW	0.257 IN	M----F	THK	0004	False
AAEX	0.228 IN	M----F	THK	0004	False
AAEY	0.262 IN	M----F	THK	0004	False
AAEZ	0.259 IN	M----F	THK	0004	False
AAFA	0.260 IN	M----F	THK	0004	False
AAFB	0.268 IN	M----F	THK	0004	False
AAFC	0.269 IN	M----F	THK	0004	False
AAFD	0.257 IN	M----F	THK	0004	False
AAFE	0.267 IN	M----F	THK	0004	False
AAFF	0.278 IN	M----F	THK	0004	False
AAFG	0.256 IN	M----F	THK	0004	False
AAFH	0.247 IN	M----F	THK	0004	False
AAFI	0.251 IN	M----F	THK	0004	False
AAFJ	0.245 IN	M----F	THK	0004	False

AST Waste DEEP DUV #1

AAFL	0.269 IN	M----F	THK	0004	False
AAFM	0.250 IN	M----F	THK	0004	False
AAFN	0.245 IN	M----F	THK	0004	False
AAFO	0.239 IN	M----F	THK	0004	False
AAFP	0.253 IN	M----F	THK	0004	False
AAFQ	0.249 IN	M----F	THK	0004	False
AAFR	0.228 IN	M----F	THK	0004	False
AAFS	0.237 IN	M----F	THK	0004	False
AAFT	0.237 IN	M----F	THK	0004	False
AAFU	0.258 IN	M----F	THK	0004	False
AAFV	0.256 IN	M----F	THK	0004	False
AAFW	0.272 IN	M----F	THK	0004	False
AAFX	0.266 IN	M----F	THK	0004	False
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AAFZ	0.243 IN	M----F	THK	0004	False
AAGA	0.244 IN	M----F	THK	0004	False
AAGB	0.237 IN	M----F	THK	0004	False
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AAGV	0.268 IN	M----F	THK	0004	False
AAGW	0.259 IN	M----F	THK	0004	False
AAGX	0.234 IN	M----F	THK	0004	False
AAGY	0.224 IN	M----F	THK	0004	False
AAGZ	0.247 IN	M----F	THK	0004	False
AAHA	0.265 IN	M----F	THK	0004	False
AAHB	0.251 IN	M----F	THK	0004	False
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AAHD	0.228 IN	M----F	THK	0004	False
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AAHI	0.251 IN	M----F	THK	0004	False
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AAHK	0.265 IN	M----F	THK	0004	False
AAHL	0.268 IN	M----F	THK	0004	False
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AAHU	0.248 IN	M----F	THK	0004	False
AAHV	0.246 IN	M----F	THK	0004	False
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AAIJ	0.214 IN	M----F	THK	0004	False
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AAJD	0.263 IN	M----F	THK	0004	False
AAJE	0.236 IN	M----F	THK	0004	False
AAJF	0.254 IN	M----F	THK	0004	False
AAJG	0.247 IN	M----F	THK	0004	False
AAJH	0.260 IN	M----F	THK	0004	False
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AAJM	0.254 IN	M----F	THK	0004	False
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AAJO	0.244 IN	M----F	THK	0004	False
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AAJR	0.257 IN	M----F	THK	0004	False
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AAJU	0.260 IN	M----F	THK	0004	False
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AAJW	0.261 IN	M----F	THK	0004	False
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AAJZ	0.247 IN	M----F	THK	0004	False
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AAKC	0.252 IN	M----F	THK	0004	False
AAKD	0.251 IN	M----F	THK	0004	False

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AAKV	0.214 IN	M----F	THK	0004	False
AAKW	0.233 IN	M----F	THK	0004	False
AAKX	0.232 IN	M----F	THK	0004	False
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AALO	0.239 IN	M----F	THK	0004	False
AALP	0.235 IN	M----F	THK	0004	False
AALQ	0.230 IN	M----F	THK	0004	False
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AALT	0.229 IN	M----F	THK	0004	False
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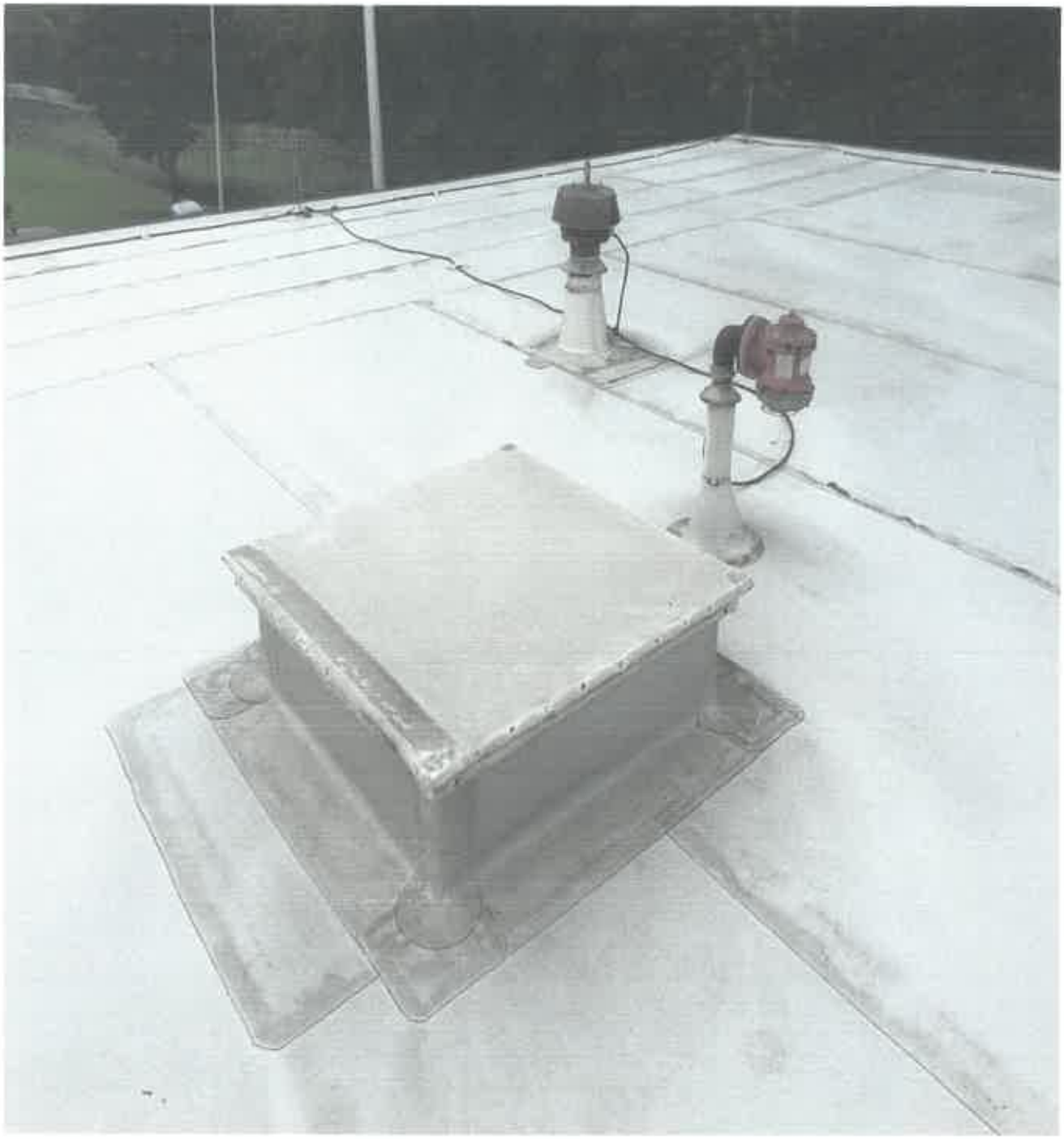
AALW	0.276 IN	M----F	THK	0004	False
AALX	0.279 IN	M----F	THK	0004	False
AALY	0.252 IN	M----F	THK	0004	False

AALZ	0.251 IN	M----F	THK	0004	False
AAMA	0.258 IN	M----F	THK	0004	False
AAMB	0.254 IN	M----F	THK	0004	False
AAMC	0.260 IN	M----F	THK	0004	False
AAMD	0.248 IN	M----F	THK	0004	False
AAME	0.259 IN	M----F	THK	0004	False
AAMF	0.278 IN	M----F	THK	0004	False
AAMG	0.245 IN	M----F	THK	0004	False
AAMH	0.259 IN	M----F	THK	0004	False
AAMI	0.254 IN	M----F	THK	0004	False
AAMJ	0.259 IN	M----F	THK	0004	False
AAMK	0.257 IN	M----F	THK	0004	False
AAML	0.257 IN	M----F	THK	0004	False

Photographs

Tank Exterior



Tank Roof Fittings

Tank Top Fittings

Tank Sidewall Weld

Interior Shell

Tank Side Wall

Tank Bottom

Tank Exterior

Tank Top Fittings

Roof Top Fittings

Tank Interior Pits

Interior Sidewall & Head

Interior Sidewall & Head

Tank Bottom

Tank Bottom With Remainder of Liner

GLOBALFOUNDRIES
RCRA SUBPART J CERTIFICATION
FOR
BUILDING 963 GENERAL SOLVENT WASTE TANK REPLACEMENT

Prepared for

GLOBALFOUNDRIES
Burlington, Vermont

Prepared by

JACOBS®

July 13, 2019

Rev. 0
7/13/2019

B963 GENERAL SOLVENT WASTE TANK SYSTEM

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather or evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Elizabeth B. Luecker, P.E.

July 13, 2019
Date

STATE OF VERMONT
ELIZABETH B. LUECKER
NO. 0074052
ENVIRONMENTAL
LICENSED
PROFESSIONAL ENGINEER

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Attachment 2 – General Solvent Waste Stream Laboratory Analysis
Attachment 3 – Vendor Submittals for the Replacement B963 General Solvent Waste Tank
Attachment 4 – Burlington Facilities Specification 15410-9 – Solvent Mechanical Standard
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Introduction

This report provides certification of a portion of the Building 963 General Solvent Waste Tank system at the GLOBALFOUNDRIES semiconductor manufacturing facility located in Burlington, Vermont. GLOBALFOUNDRIES has determined that this system will collect, transfer and store waste solvents that meet the definition of a hazardous waste pursuant to rules codified in the Resource Conservation and Recovery Act (RCRA) at 40 CFR Part 261. The system is subject to the Tank System standards under RCRA Subpart J. This certification is provided in compliance with 40 CFR Part 264 Subpart J and 40 CFR 265 Subpart J and supports that the tank system has sufficient structural integrity, is conditionally acceptable for the storing of the hazardous waste for which the system was designed, was properly designed and installed, and was repaired, if required pursuant to 40 CFR 264.192(b) and (d) and 40 CFR 264.192(b) and (d). This report certifies the tank system design and installation.

This certification is based on the documentation included in this report which includes the following information:

- Description of the solvent waste collection system.
- Hazardous characteristics of the wastes to be handled.
- Assessment of the collection systems, including,
    - Design standards according to which the tanks and ancillary equipment have been constructed including design of the secondary containment system.
    - Structural design considerations
    - Visual inspection of the tank system.
    - Tightness test results for the new tank and ancillary equipment.
- Tank Material Compatibility with Hazardous Waste and Recommendations

Description of the General Solvent Waste Tank System

The following narrative provides a description of the General Solvent Waste Tank system design; selected design drawing for the General Solvent Waste Tank system are provided in Attachment 1.

Spent solvents are conveyed from usage points around the site to the chemical distribution center (CDC) on the far side of East Loop Road. If there is an interruption to flow either in the trestle across the road or into the CDC, solvent waste may be routed instead from the B963 Solvent

Room to the Building 963 General Solvent Waste Tank through a 2-inch carbon steel carrier pipe. All pipe that is part of this system consists of fully welded double walled carbon steel pipe. The tank system is located outdoors off the Northeast corner of GLOBALFOUNDRIES Building 963. The tank being installed is replacing an existing tank of the same size and configuration.

The Tank System consists of the following:

- One 9000-gallon capacity tank
- Stainless steel construction
- One 3-HP, 40 GPM design point transfer pump
- Control valves
- Venting system
- The tank, control valve, and pump are secondarily contained by a concrete basin lined with 14-gauge stainless steel spill containment.
- The entire system is covered by an adhered membrane roof on a steel deck on steel columns supported off the containment walls.
- The tank and associated piping will have heat trace.

This certification applies to the tank and ancillary equipment being replaced within the tank containment area as shown in the Attachment 1 drawings.

Hazardous Waste Characteristics

Based on composition analysis of the wastes in the CDC waste tanks, GLOBALFOUNDRIES anticipates that the highest possible flash point of any waste entering the B963 General Solvent Waste Tank would be in the 100-140°F range. This would qualify the waste as Class II, considered combustible, not flammable, under the *International Fire Code* (2018).

General solvent waste streams 1 and 3 are the waste streams that may be directed to the B963 General Solvent Waste Tank. Endyne Inc. analyzed these two general solvent waste streams in August 2018; the Endyne Inc. laboratory report can be found as Attachment 2 to this certification report. These samples are expected to be representative of each waste stream.

Design and Installation Assessment

40 CFR 264.192 and 40 CFR 265.192 require that owners of a new tank system "obtain a written assessment reviewed by an independent, qualified, registered professional engineer attesting that

the system has sufficient structural integrity and is acceptable for storing and treating of hazardous waste". The regulations also require that "prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified installation inspector or an independent, qualified registered professional engineer, either of whom is qualified and experienced in the proper installation of tank systems, must inspect the system" per the requirements of 40 CFR 264.192(b) through (f) and 40 CFR 265.192(b) through (f). 40 CFR 264.193(a) through (f) and 40 CFR 265.193(a) through (f) provide the containment and release detection requirements for hazardous waste tank systems. The following pages present the results of the B963 General Solvent Waste Tank system assessment.

Applicable portions of 40 CFR 264 Subpart J and 40 CFR 265 Subpart J regulations are provided followed by an assessment of how the design of the system meets the requirements. (The requirements are essentially the same in 40 CFR 264.192 and 264.193[a] through [f], and 40 CFR 265.192 and 265.193[a] through [f]). Regulatory citations are provided in italics.

192(a)(1) Design Standards *- Design standard(s) according to which the tank(s) and ancillary equipment is or will be constructed.*

Tank or Ancillary Equipment Identification	Design Standard	Specifications/References	Attachments
Tank	Attachment 1 design drawings and Attachment 3 vendor submittals	UL-142	Drawings BSITEA-7000 and BSITEP-7600
Piping	ASME/ANSI B31.3	-	
Piping	GLOBALFOUNDRIES Burlington Facilities Standards	Section 15410-9 – Solvent Mechanical Standard	Attachment 4

192(a)(3) Corrosion Protection *- For new tank systems or components in which the external shell of a metal tank or any external metal component of the tank system is or will be in contact with the soil or with water, a determination by a corrosion expert of:*

(i) Factors affecting the potential for corrosion, including but not limited to:
(A) Soil moisture content;
(B) Soil pH;
(C) Soil sulfides level;

(D) Soil resistivity;
(E) Structure to soil potential;
(F) Influence of nearby underground metal structures (e.g., piping);
(G) Stray electric current; and,
(H) Existing corrosion-protection measures (e.g., coating, cathodic protection), and

(ii) The type and degree of external corrosion protection that are needed to ensure the integrity of the tank system during the use of the tank system or component, consisting of one or more of the following:

(A) Corrosion-resistant materials of construction such as special alloys or fiberglass-reinforced plastic;

(B) Corrosion-resistant coating (such as epoxy or fiberglass) with cathodic protection (e.g., impressed current or sacrificial anodes); and

(C) Electrical isolation devices such as insulating joints and flanges.

This section is not applicable. No external portions of the tank systems are in contact with soil or water.

192(a)(4) Vehicular Traffic for Underground Tank Systems *- For underground tank system components that are likely to be affected by vehicular traffic, a determination of design or operational measures that will protect the tank system against potential damage;*

This section is not applicable. No portions of the tank systems are underground such that they are likely to be affected by vehicular traffic.

192(a)(5) Design Considerations - *Design considerations to ensure that:*

(i) Tank foundations will maintain the load of a full tank;

(ii) Tank systems will be anchored to prevent flotation or dislodgment where the tank system is placed in a saturated zone, or is located within a seismic fault zone; and

(iii) Tank systems will withstand the effects of frost heave

The new tank will be of identical size and configuration to the existing tank. The original structural design drawings for the system are dated 1986 and stamped by Stephen C. Knight of Knight Consulting Engineers, Inc. The design includes top saddles for stability and to prevent flotation in the event that the containment is flooded. There is no visible settling or cracking of the foundation/containment system.

192(b) Proper Installation of Tank Systems – *The owner or operator of a new tank system must ensure that proper handling procedures are adhered to in order to prevent damage to the system during installation. Prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified installation inspector or an independent, qualified, registered professional engineer, either of whom is trained and experienced in the proper installation of tank systems, must inspect the system or component for the presence of any of the following items:*

(1) Weld breaks;
(2) Punctures;
(3) Scrapes of protective coatings;
(4) Cracks;
(5) Corrosion;
(6) Other structural damage or inadequate construction or installation.

All discrepancies must be remedied before the tank system is covered, enclosed, or placed in use.

A copy of the site observation report is included as Attachment 5.

192(c) Backfill for Underground Tanks and Piping - *New tank systems or components and piping that are placed underground and that are backfilled must be provided with a backfill material that is a non-corrosive, porous, homogeneous substance and that is carefully installed so that the backfill is placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported.*

This part of the regulations is not applicable since none of the tank systems or components, including piping, are placed underground.

192(d) Tightness Testing for New Tank Systems - *All new tanks and ancillary equipment must be tested for tightness prior to being covered, enclosed or placed in use. If a tank system is found not to be tight, all repairs necessary to remedy the leak(s) in the system must be performed prior to the tank system being covered, enclosed, or placed in use.*

Copies of the on-site and factory pressure test reports are included as Attachment 6.

192(e) Ancillary Equipment Support and Protection - *Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion or contraction.*

Piping is mounted with pipe anchors, supports, or brackets either directly to concrete walls or indirectly to metal support structures. When appropriate, supports have incorporated provisions for protection of the ancillary equipment from vibration, expansion, or contraction.

192(f) Corrosion Protection *- The owner or operator must provide the type and degree of corrosion protection necessary, based on the information provided under paragraph (a)(3) of this section, to ensure the integrity of the tank system during use of the tank system. The installation of a corrosion protection system that is field fabricated must be supervised by an independent corrosion expert to ensure proper installation.*

The external shell of the tanks and external components of the tank systems are not in direct contact with the soil.

192(g) Written Statements *- The owner or operator must obtain and keep on file at the facility written statements by those persons required to certify the design of the tank system and supervise the installation of the tank system in accordance with the requirements of paragraphs (b) through (f) of this section to attest that the tank system was properly designed and installed and that repairs, pursuant to paragraphs (b) and (d) of this section were performed. These written statements must also include the certification statement as required in §270.11(d) of this chapter.*

This report provides documentation supporting the certification of the Building 963 General Solvent Waste Tank system design and installation.

193(b)(1) & (2) Secondary Containment System Design, Installation, and Operation *- Secondary containment systems must be:*

> *(1) Designed, installed, and operated to prevent any migration of wastes or accumulated liquid out of the system to the soil, ground water, or surface water at any time during the use of the tank system; and*
>
> *(2) Capable of detecting and collecting releases and accumulated liquids until the collected material is removed*

Secondary containment for the Building 963 General Solvent Waste Tank system is comprised of a 6.5-feet deep by 21-feet long by 12.5-feet wide concrete basin with 12-inch thick walls and a 14-gauge stainless steel liner that fully lines the containment basin. Multiple leak detectors are used to notify operators of any primary containment breaches. Alarm stations are manned at all times. Calculations verifying the size of the containment system are provided as an Attachment 7.

193(c)(1) Compatibility with Waste; Strength and Thickness *- Secondary containment systems must be at a minimum constructed of or lined with materials that are compatible with the waste(s) to be placed in the tank system and must have sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrological forces), physical contact with the waste to which they are exposed, climatic conditions, the stress*

of installation, and the stress of daily operation (including stresses from nearby vehicular traffic);

The secondary containment systems for the Building 963 General Solvent Waste Tank system comprises of 12-inch thick concrete with a 14-gauge stainless steel liner. The expected wastes present are generally non-corrosive to stainless steel. In addition, stainless steel is used to stand up to exposure to an outdoor environment. In the event of the release to the secondary containment, the static head of the solvents contained will be a maximum of 6.5 feet which will be largely offset by soil pressure on the outside of the containment. The containment is not close enough to any roadways to expect any stress from vehicular traffic.

193(c)(2) Foundation *- Placed on a foundation or base capable of providing support to the secondary containment system and resistance to pressure gradients above and below the system and capable of preventing failure due to settlement, compression, or uplift*

The foundation and concrete portion of the secondary containment are one and the same. The foundation was designed and stamped by Knight Consulting Engineers in 1986. The loads on the foundation are not anticipated to change as part of this project. There are no visible cracks or signs of settling in the concrete.

193(c)(3) Leak Detection *- Provided with a leak detection system that is designed and operated so that it will detect the failure of either the primary and secondary containment structure or any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours, or at the earliest practicable time if the existing detection technology or site conditions will not allow detection of a release within 24 hours*

193(c)(4) Leak Collection and Removal *- Sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spills, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within 24 hours, or in as timely a manner as is possible to prevent harm to human health or the environment, if removal of the released waste or accumulated precipitation cannot be accomplished within 24 hours.*

The B963 General Solvent Waste Tank secondary containment is equipped with a leak detection sensor that alarms to the facility monitoring system which is manned 24 hours per day 365 days per year. The containment slopes to a sump at the west end from which spillage is removed using a vacuum truck.

193(d) Secondary Containment Device *- Secondary containment for tanks must include one or more of the following devices:*

(1) A liner (external to the tank);

(2) A vault;
(3) A double-walled tank; or
(4) An equivalent device as approved by the Regional Administrator

A combined stainless steel/concrete liner system is used for containment of the B963 General Solvent Waste Tank.

RCRA requires certain standards to be met depending on the type of secondary containment provided. 40 CFR 264.193(e)(1) and 265.193(e)(1) describe the requirements for external liner systems; 40 CFR 264.193(e)(2) and 265.193(e)(2) describe the requirements for vault systems. Both the 40 CFR 264.193(e)(1) and 264.193(e)(2) standards and the 40 CFR 265.193(e)(1) and 265.193(e)(2) standards are evaluated below for the tank.

193(e)(1) *External liner systems must be:*

193(e)(1)(i) *- Designed or operated to contain 100 percent of the capacity of the largest tank within its boundary;*

The stainless steel and concrete containment system has greater than 100 percent capacity of the tank stored within its boundary. Containment size calculations are provided in Attachment 7.

193(e)(1)(ii) *- Designed or operated to prevent run-on or infiltration of precipitation into the secondary containment system unless the collection system has sufficient excess capacity to contain run-on or infiltration. Such additional capacity must be sufficient to contain precipitation from a 25-year, 24-hour rainfall event.*

The tanks are located under cover and are not subject to run-on or precipitation.

193(e)(1)(iii) - Free of cracks or gaps; and

The stainless steel liner is fully welded and free of cracks or gaps.

193(e)(1)(iv) *- Designed and installed to surround the tank completely and to cover all surrounding earth likely to come into contact with the waste if the waste is released from the tank(s) (i.e., capable of preventing lateral as well as vertical migration of the waste).*

A release from the tank will fill the containment area to a depth of approximately 3.9 feet. The containment area has a total depth of 6.5 feet.

193(e)(2)(i) Containment Capacity *- Designed or operated to contain 100 percent of the capacity of the largest tank within its boundary*

Secondary containment capacity calculations for the tank are provided as Attachment 7.

193(e)(2)(ii) Prevention of Run-on and Precipitation Infiltration *- Designed or operated to prevent run-on or infiltration of precipitation into the secondary containment system unless the collection system has sufficient excess capacity to contain run-on or infiltration. Such additional capacity must be sufficient to contain precipitation from a 25-year, 24-hour rainfall event*

The tanks are located under cover and are not subject to run-on or precipitation infiltration.

193(e)(2)(iii) Water Stop Construction *- Constructed with chemical-resistant water stops in place at all joints (if any);*

Original design shows PVC water stops at concrete joints. In addition, the fully welded stainless steel liner provides a moisture barrier with a high degree of reliability.

193(e)(2)(iv) Interior Coating *- Provided with an impermeable interior coating or lining that is compatible with the stored waste and that will prevent migration of waste into the concrete;*

Original design shows PVC water stops at concrete joints. In addition, the fully welded stainless steel liner provides a moisture barrier with a high degree of reliability.

193 (e)(2)(v) Formation of and Ignition of Flammable Vapors *- Provided with a means to protect against the formation of and ignition of vapors within the vault, if the waste being stored or treated*

(A) Meets the definition of ignitable waste under §262.21 of this chapter, or

(B) Meets the definition of reactive waste under §262.21 of this chapter and may form an ignitable or explosive vapor;

The area below the roof is open to the atmosphere on all sides above the containment. This is considered to allow enough air flow to protect against the formation of vapors within the containment.

193(e)(2)(vi) Exterior Moisture Barrier *- Provided with an exterior moisture barrier or be otherwise designed or operated to prevent migration of moisture into the vault if the vault is subject to hydraulic pressure*

The existing basin design is stamped by a PE and is assumed to be designed for local conditions.

Section 193(e)(3), below, does not apply, as containment is not a double-walled tank.

193(e)(3)(i) Integral Structure *– Designed as an integral structure (i.e., an inner tank within an outer shell so that any release from the inner tank is contained by the outer shell.*

193(e)(3)(ii) Corrosion Protection *– Protected, if constructed of metal, from both corrosion of the primary tank interior and the external surface of the outer shell.*

193(e)3)(iii) Leak Detection – *Provided with a built-in, continuous leak detection system capable of detecting a release with 24 hours or at the earliest practicable time, if the owner or operator can demonstrate to the Regional Administrator, and the Regional Administrator concurs, that the existing leak detection technology or site condition will not allow detection of a release within 24 hours;*

193(f) Secondary Containment for Ancillary Equipment - *Ancillary equipment must be provided with full secondary containment (e.g., trench, jacketing, double-walled piping) that meets the requirements of paragraphs (b) and (c) of this section except for:*

(1) Aboveground piping (exclusive of flanges, joints, valves, and connections) that are visually inspected for leaks on a daily basis;

(2) Welded flanges, welded joints, and welded connections that are visually inspected for leaks on a daily basis;

(3) Sealless or magnetic coupling pumps and sealless valves, that are visually inspected for leaks on a daily basis; and

(4) Pressurized aboveground piping systems with automatic shut-off devices (e.g., excess flow check valves, flow metering shutdown devices, loss of pressure actuated shut-off devices) that are visually inspected for leaks on a daily basis.

All ancillary equipment is protected by the same containment basin as the tank. The primary conveyance piping is double walled and fully welded.

Tank Material Compatibility with Hazardous Waste and Recommendations

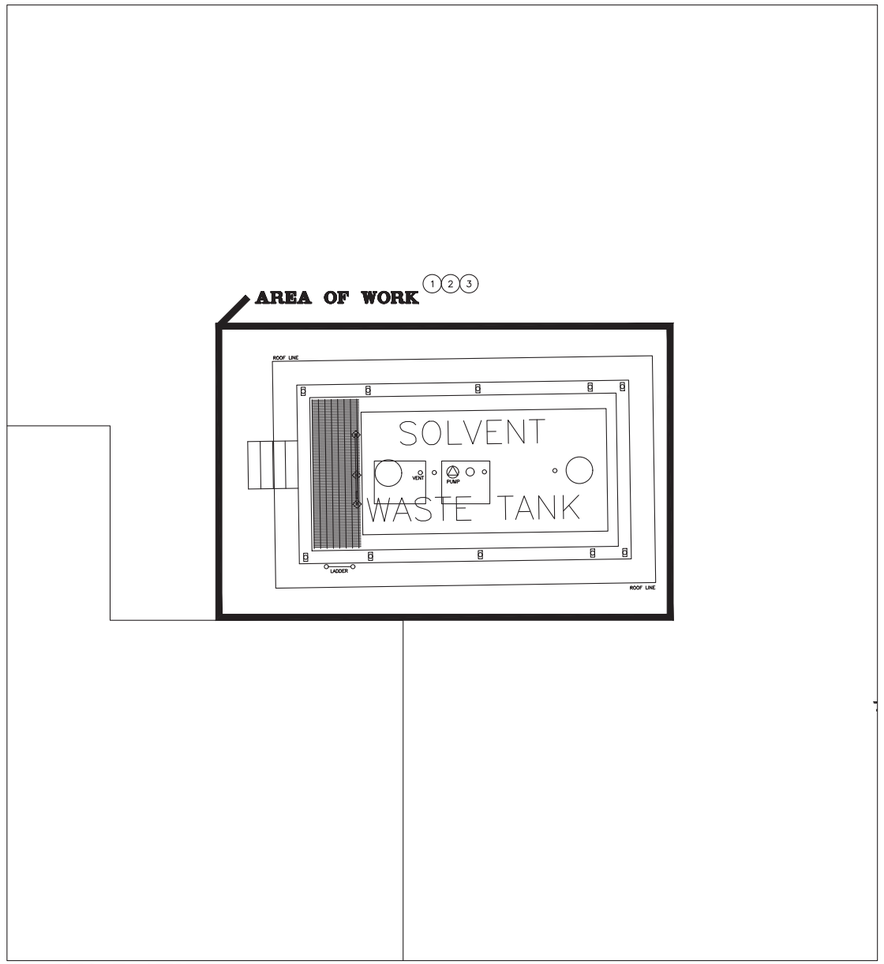
The replacement tank is specified as 316L stainless steel construction. The selection is based on GLOBALFOUNDRIES' experience with existing piping installations. However, due to the corrosive properties of the hazardous waste, the type and rate of corrosion of the tank is not quantifiable based on available literature. The following actions are recommended for GLOBALFOUNDRIES to implement to remove the "conditional":

- Maintain annual characterization of the waste stream to continue catalog of the historical waste characteristics. Ensure that this characterization includes the identification of any corrosive components.
- Establish coupon testing to evaluate material compatibility and corrosion rates with the waste profile established.
- Perform inspections (internal if possible and thickness measurements at a minimum) of tank at regular intervals to monitor material compatibility and effect, if any, of the hazardous waste on the system materials of construction.

Attachment 1

Selected Design Drawings

ARCHITECTURAL PLAN – PROPOSED	BSITEA-7000
PIPING DEMO/INSTALLATION	BSITEP -7000
PIPING DEMO/INSTALLATION	BSITEP -7001
PIPING DETAILS	BSITEP -7600



BSITE PARTIAL PLAN
LAYOUT DEMOLITION & INSTALLATION
SCALE: 1/4" = 1'-0"

KEYED NOTES

1 REMOVE AND RETAIN ROOF OVER EXISTING TANK FOR TANK REPLACEMENT. REINSTALL ROOF ONCE TANK IS REPLACED.

2 REPLACE ALL HARDWARE TO MATCH EXISTING.

3 REMOVE AND RETAIN PLATFORM GRATING. REINSTALL ONCE TANK IS REPLACED. REPLACE ALL HARDWARE TO MATCH.

GENERAL NOTES

A SURVEY EXISTING FIELD CONDITIONS PRIOR TO BID.

B ALL CONSTRUCTION ACTIVITIES SHALL CONFORM TO THE BFS AND ALL APPLICABLE LOCAL, STATE, AND NATIONAL CODES. APPLICABLE BFS INCLUDE BUT NOT LIMITED TO; 02072–1, 07270–1, 08000–1, 08100–1, 08710–1, 08800–1, 09260–1, 09500–1, 09650–1, 09900–1, 09900–2, 12900–1 AND 13900–2.

C IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO MAINTAIN A SAFE AND CLEAN WORK ENVIRONMENT. REMOVE ALL DEBRIS AT THE END OF EACH WORK DAY AND PRACTICE GOOD HOUSEKEEPING.

D FURNISH, ASSEMBLE, AND DISASSEMBLE BARRIERS OF METAL PARTITIONING AROUND EACH CONSTRUCTION SPACE AS APPROPRIATE. BARRIERS TO BE CONSTRUCTED OF LIGHT GAUGE STEEL STUDS AND FINISHED ON THE EXTERIOR WITH POLISHED ALUMINUM SHEETS FREE FROM ANY LOOSE/SHARP EDGES. MAINTAIN WORKING CLEARANCES AROUND NEIGHBORING AREAS. EACH WORK AREA MUST HAVE AN APPROPRIATE ENTRYWAY.

E RETURN ALL DEMOLISHED AND/OR UNUSED ITEMS TO OWNER AND TRANSPORT TO STORAGE OR DISPOSE OF AT OWNER'S DIRECTION.

F COORDINATE WITH TRADES FOR REROUTING AND RE–SUPPORTING OF FACILITIES AS REQUIRED.

G CONTRACTOR RESPONSIBLE FOR EQUIPMENT MOVE IN. FIELD VERIFY MOVE IN PATH PRIOR TO BID. SPECIFY IN THE BID OBSTRUCTIONS AND THE LABOR ASSOCIATED WITH THE TEMPORARY REMOVAL TO ALLOW FOR EQUIPMENT MOVE IN. INCLUDE, BUT NOT LIMITED TO, DOORS, FRAMES, AND TRANSOMS ALONG PATH. COORDINATE STORAGE, MOVE, AND SCHEDULE WITH PROJECT COORDINATOR AND EQUIPMENT OWNER(S).

H RETRIEVE GLOBALFOUNDRIES PROVIDED SHEETS OF ALUMINUM AND PLACE ON ALL RAISED FLOOR ALONG EQUIPMENT MOVE PATH. RETURN TO STORAGE WHEN EQUIPMENT MOVE IS COMPLETE.

J TEMPORARY CEILING AND/OR FLOOR REMOVAL ALLOWED WITH PRIOR APPROVAL OF GLOBALFOUNDRIES ONLY. ALL CEILING AND FLOOR TILES MUST BE RETURNED TO ORIGINAL STATE OR BETTER UPON COMPLETION. REPLACE FLOOR AND CEILING TILES THAT ARE BROKEN, CUT, CORED AND/OR DAMAGED WITHIN AREA OF WORK WITH NEW TO MATCH EXISTING. COORDINATE WITH TRADES.

K COMPLETE AND ISSUE ASBESTOS AND LEAD FORMS; REFERENCE BFS 02065–1 & 2. SUBMIT NAMES OF ASBESTOS AND LEAD ABATEMENT FIRMS (WITH MIN. 7 YEARS EXPERIENCE IN ASBESTOS AND LEAD ABATEMENT) TO CHRIS CICCONE (6–3327) FOR APPROVAL PRIOR TO CONTRACT. CONFIRM WITH CHRIS CICCONE PRIOR TO START OF WORK. FURNISH ALL MATERIALS AND EQUIPMENT RELATED TO ASBESTOS AND LEAD IDENTIFICATION AND REMEDIATION.

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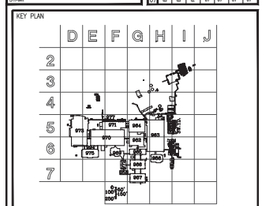
Project Title:
B963 EMERGENCY SOLVENT
WASTE TANK REPLACEMENT
ARCHITECTURAL PLAN - PROPOSED

SIGN–OFF:	SIGNATURE:	PRINT:	DATE:
CONT. OWNER			
CONT. OWNER 2			
PLANNING			
SAFETY			
SYSTEM OWNER			
SYSTEM OWNER			
SYSTEM OWNER			

STAMP
STATE OF VERMONT
LARRY REEGERT
No. 018.0134281
CHEMICAL
LICENSED
PROFESSIONAL ENGINEER
Digital Signature

KEY PLAN



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Pjct. Mgr: LARRY REEGERT — Drawn By: M Di PAUL
Phone No:709-2633 — Phone No:1154

Project Title: B963 EMERGENCY SOLVENT WASTE TANK REPLACEMENT
Sheet Title: ARCHITECTURAL PLAN PROPOSED

GF Project Number: 2018060009152
CH2M Project Number: 700489112
Sheet Number: BSITEA-7000.dwg
Scale: NA
Start Date: 8/14/18

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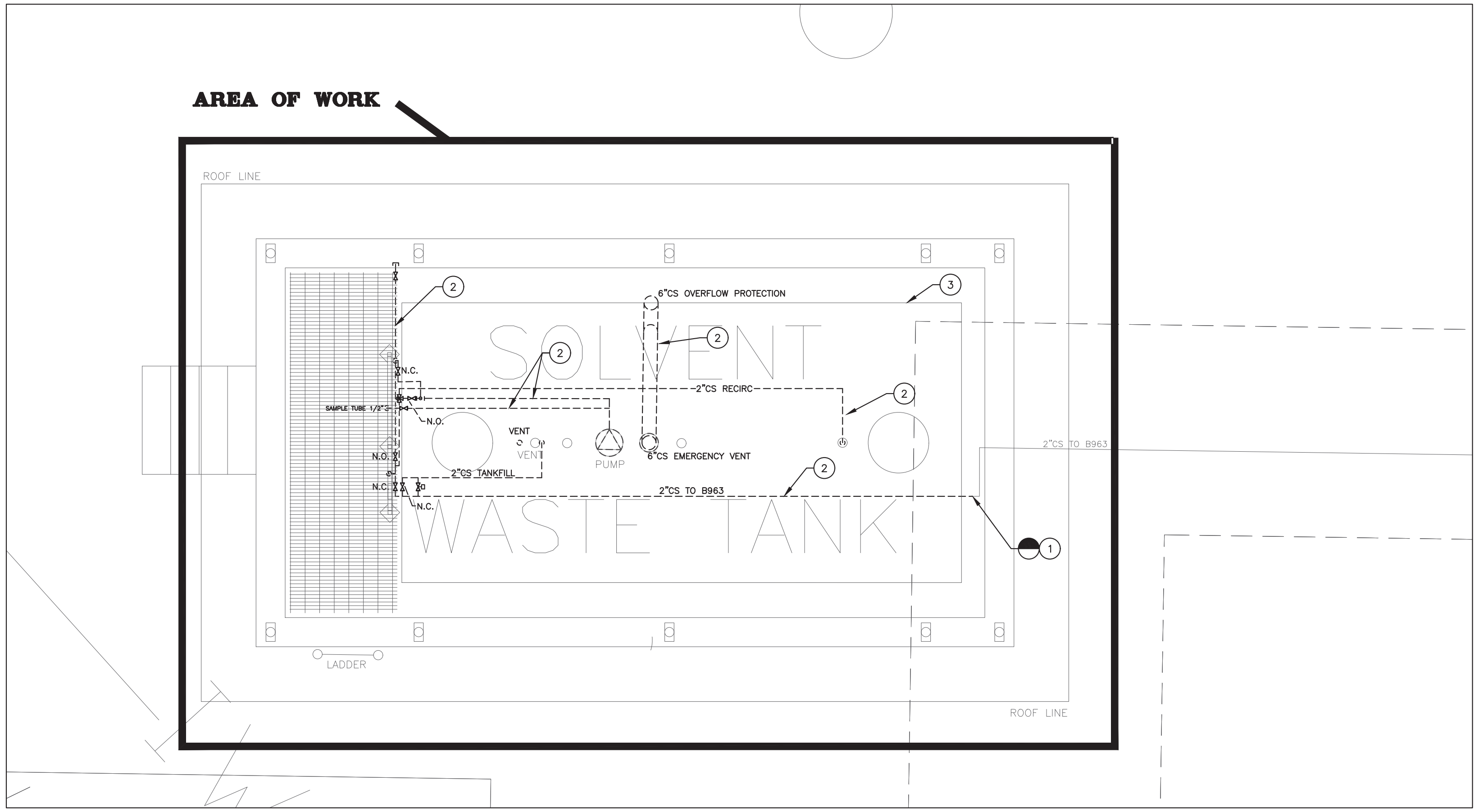
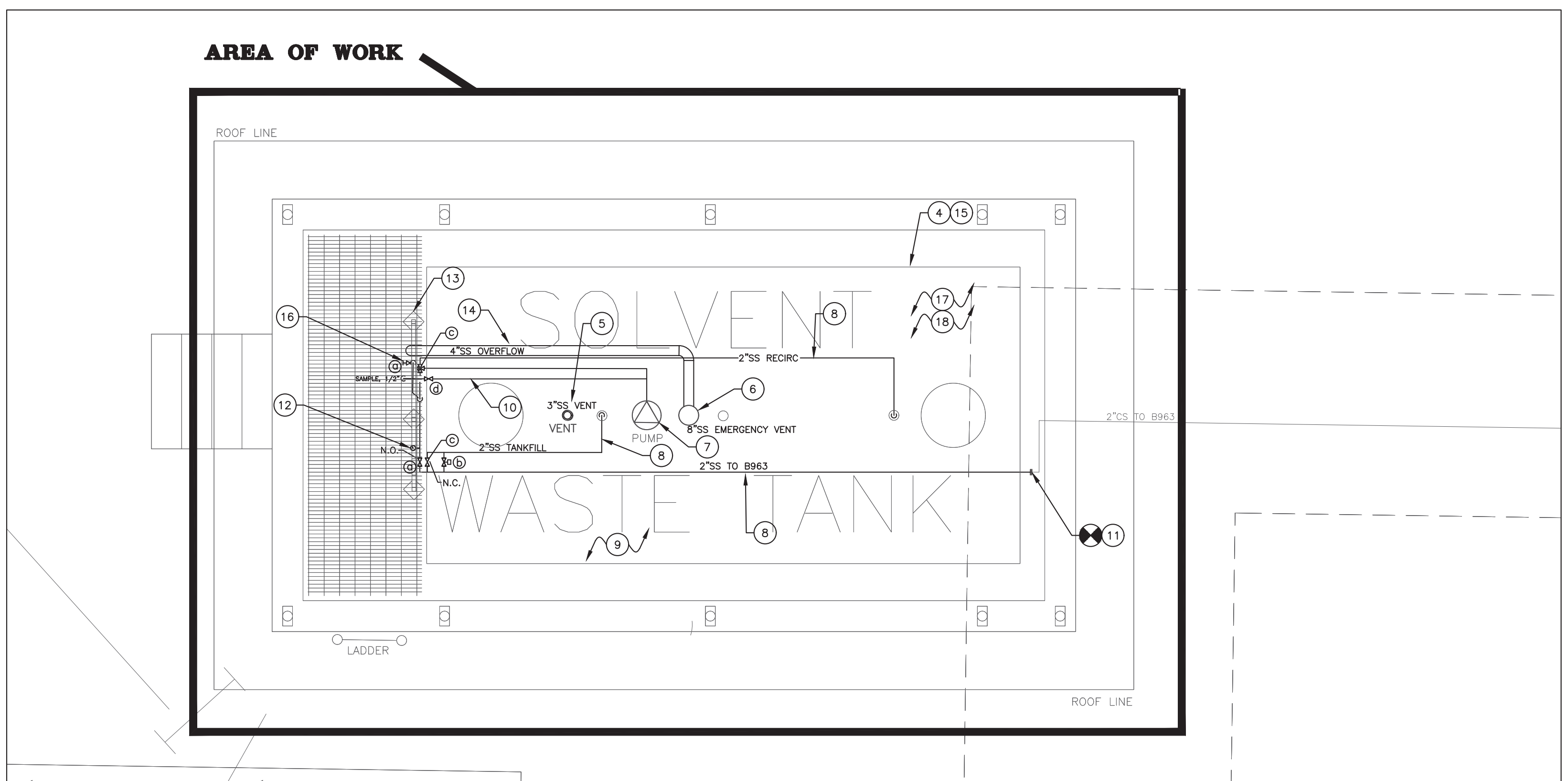


B-SITE PARTIAL PLAN
PIPING DEMOLITION
SCALE: 1/2" = 1'-0"



B-SITE PARTIAL PLAN
PIPING INSTALLATION
SCALE: 1/2" = 1'-0"

KEYED NOTES:

1. COORDINATE ALL WORK WITH GLOBALFOUNDRIES CHEM SERVICES. CONTACT PAUL CALLAHAN (769-2569).

2. FLUSH PIPING PRIOR TO DEMO. DISPOSE OF SOLVENT MATERIALS AS DIRECTED BY GLOBALFOUNDRIES. REMOVE PIPING INSULATION AND JACKET. HEAT TRACING TO BE REMOVED BY ELECTRICAL CONTRACTOR. REMOVE ALL PIPING CONNECTIONS TO TANK, REMOVE PIPING BACK AS INDICATED. TRANSPORT ALL REMOVED MATERIAL TO LOCATION AS DIRECTED BY GLOBALFOUNDRIES. BRING VALVES TO DECON AND GET VALVES BACK AFTER CLEANING. RETAIN SS VALVES FOR INSTALLATION WORK.

3. TANK ROOF STRUCTURE WILL BE REMOVED BY OTHERS. PUMP OUT SOLVENT TANK, REMOVE RESIDUAL MATERIAL, DECON IN PLACE ACCORDING TO GLOBALFOUNDRIES PROVIDED DECON PROCEDURE. REMOVE OUTER JACKET AND TANK INSULATION. ELECTRICAL CONTRACTOR TO REMOVE ALL HEAT TRACING. REMOVE TANK HOLD DOWN SUPPORTS FROM TANK. PROVIDE RIGGING TO REMOVE TANK, TRANSPORT BY TRUCK TO RECYCLING FACILITY AS DIRECTED BY GLOBALFOUNDRIES. CLEAN OUT VAULT AREA FROM WATER AND DEBRIS. DISCONNECT SPRINKLER SYSTEM.

4. PROVIDE 9' X 19', 9000 GALLON, 316LSS, ABOVEGROUND SINGLE WALL TANK. REFER TO DETAIL 'B' SHEET BSITEP-7600, FOR CONNECTION LOCATIONS AND TYPES. PUMP OPENING MUST LINE UP WITH EXISTING ROOF HATCH FOR PUMP REMOVAL/INSTALLATION. FLANGES TO BE ANSI CLASS 150. TANK TO BEAR UL-142 LABEL. PROVIDE SUBMITTAL ON TANK PRIOR TO ORDERING. PROVIDE MANUFACTURERS PRESSURE TEST REPORT ON TANK TO GLOBALFOUNDRIES. COORDINATE WITH ELECTRICAL CONTRACTOR FOR HEAT TRACING. PROVIDE 2" POLY-ISO INSULATION, AND ALUMINUM OUTER JACKET ON TANK AND TANK SUPPORT STANDS. PROVIDE RIGGING TO PLACE TANK INTO VAULT. BOLT SADDLES SUPPORTS TO EXISTING W12 TANK SUPPORTS IN VAULT. PROVIDE PTFE ENCAPSULATED SS (OR VITON) GASKETS ON MANWAY CONNECTIONS.

5. PROVIDE 3" 316L SS TANK VENT WITH FLAME ARRESTOR. INSTALL 3" VENT FROM TANK UP THROUGH STRUCTURE ROOF. PROVIDE COMBINATION FLAME ARRESTOR, PRESSURE AND VACUUM CONSERVATION VENT, REFER TO DETAIL 'A' SHEET BSITEP-7600 FOR MODEL NUMBER.

6. PROVIDE 8" 316L SS EMERGENCY VENT UP THROUGH ROOF. PROVIDE EMERGENCY RELIEF VENT. REFER TO DETAIL 'A' SHEET BSITEP-7600 FOR MODEL NUMBER.

7. PROVIDE CRANE MODEL 4770 VERTICAL TURBINE PUMP. ALL 316L SS CONSTRUCTION INCLUDING DISCHARGE HEAD SDG 43-10 FOR MOUNTING TO A 10" CLASS 150 ANSI FLANGE WITH 3" CLASS 125 ANSI DISCHARGE FLANGE. LINE SHAFT, COLUMN SECTIONS, BOWL ASSEMBLY, IMPELLERS, SUCTION BELL AND BASKET STRAINER. pUMP SHALL INCLUDE BABBIT GRAPHITE BEARINGS AND MONEL SHAFT COLLARS. PUMP WILL BE 5 STAGE WITH 4.125" IMPELLERS AND WILL BE DRIVEN BY 3 HP, 1800 RPM, 230/460 VOLT, 3 PHASE, 60 HZ, EXPLOSION-PROOF MOTOR WITH NON-REVERSE RATCHET AND 182 VP FRAME. PUMP DESIGN POINT (FOR PUMPING TO CDC VIA B963) IS 40 GPM @ 61 FT, HD. AT DESIGN POINT PUMP IS 71.5% EFFICIENT AND REQUIRES 1.5 FT. NPSH. PUMP LENGTH WILL BE 108" FROM BOTTOM OF DISCHARG. PUMP DISTIBUTER TO PROVIDE OPTIONS FOR USE OF EXISTING MOTOR AND NEW MOTOR SUPPLIED WITH PUMP. IN EITHER INSTANCE THE ELECTRICAL CONTRACTOR SHALL INSTALL AND WIRE THE MOTOR ON THE PUMP DISCHARGE HEAD (MOTOR BRACKET). THE PUMP DISTRIBUTOR WILL PROVIDE A FACTORY TRAINED SERVICE TECHNICIAN TO INSTALL THE MECHANICAL SEAL, MOTOR COUPLING (SHIPPED SEPARATELY) AND ADJUST THE IMPELLER CLEARANCE PRIOR TO START-UP. CONTACT ROLFE INDUSTRIES (518) 383-2244. PROVIDE SUBMITTAL ON PUMP.

8. PROVIDE NEW 316L SS PIPING AS INDICATED WITH WELDED FITTINGS. ANSI CLASS 150 FLANGE CONNECTIONS AT VALVES, AND AT CONNECTIONS TO TANK. PROVIDE PTFE ENCAPSULATED SS GASKETS AT FLANGE CONNECTIONS. PROVIDE PIPING SUPPORTS, UNISTRUT AND HARDWARE TO BE HOT DIPPED GALVANIZED. RE-USE VALVES INDICATED ON PLAN UNLESS OTHERWISE NOTED. REFER TO THE PLAN FOR VALVE LOCATIONS:

   a. SWAGELOK SERIES 60, 2" SS BODY, BUTT WELD CONNECTIONS, LOCKING HANDLE.
   b. SWAGELOK SERIES 60, 2" SS BODY, BUTT WELD CONNECTIONS, PNEUMATIC ACTUATOR (90° ACTUATOR).
   c. SWAGELOK SERIES 60, 3-WAY, 2" SS BODY, BUTT WELD CONNECTIONS, PNEUMATIC ACTUATOR (180° ACTUATOR). THIS VALVE TO BE SET UP SUCH THAT THE NORMAL POSITION (NO AIR PRESSURE) IS PUMP RECIRC MODE.
   d. (PROVIDE THIS VALVE) SWAGELOK SERIES 60, 1/2" SS BODY, BUTT WELD CONNECTIONS, LOCKING HANDLE, PROVIDE ½" FLANGE CONNECTIONS, LOCKING HANDLE.

9. INSULATE SOLVENT PIPING WITH 2" POLY-ISO INSULATION AND ALUMINUM OUTER JACKET. COORDINATE WITH ELECTRICAL CONTRACTOR FOR HEAT TRACING OF NEW SOLVENT PIPING PRIOR TO INSULATING.

10. PROVIDE ½"SS PIPE (INSTEAD OF ORIGINAL TUBING) WITH VALVE AND THREADED CAP FOR SAMPLING.

11. MAKE CONNECTIONS TO EXISTING PIPING IN THESE LOCATIONS. THREAD EXISTING PIPE, INSTALL THREAD ON FLANGE FOR CONNECTION.

12. INSTALL 0-200 PRESSURE GAUGE WITH SWAGELOK 60 SERIES ¼"SS ISOLATION VALVE.

13. RE-USE UNISTRUT RACK FOR VALVE, CONTROL BOX, ELECTRICAL PANEL SUPPORT.

14. FROM 8" EMERGENCY VENT RISER, PROVIDE 4" 316L SS PIPE FOR TANK OVERFLOW. PIPE TO DROP DOWN MINIMUM OF 30", WITH OVERFLOW VALVE ABOVE GRATING. REFER TO DETAIL 'A' SHEET BSITEP-7600 FOR MODEL NUMBER. OVERFLOW TO BE LOCATED OVER THE SECONDARY CONTAINMENT.

15. PERFORM PRESSURE TEST ON TANK, PRIOR TO HEAT TRACE AND INSULATING, WITH PRESSURE RELIEF DEVICES REMOVED AND CAPPED. PRESSURE TEST TANK WITH COMPRESSED AIR TO 4 PSI. UNDER NO CIRCUMSTANCES IS TANK TO BE PRESSURIZED OVER 4 PSI. ENSURE SYSTEM HOLDS PRESSURE FOR 2 HRS. IF MORE THAN 0.5 PSI DROP DURING THAT TIME PERIOD, REPAIR AND RETEST UNTIL SYSTEM HOLDS.

16. CAPPED VALVE IN THIS LOCATION. THIS VALVED CONNECTION WILL SERVE AS A FUTURE CONNECTION POINT/TANKER CONNECTION LOCATION IF NEEDED.

17. RECONNECT SPRINKLER SYSTEM AFTER ROOF STRUCTURE IS REPLACED.

18. INSTALL LDAR VALVE AND FLANGE ID TAGS (GLOBALFOUNDRIES SUPPLIED) ON EMERGENCY TANK PIPING AS DIRECTED BY GLOBALFOUNDRIES.

GENERAL NOTES

A EACH CONTRACTOR SHALL BE RESPONSIBLE FOR SEALING AND FIRE STOPPING ALL PENETRATIONS PERFORMED WITHIN THE SCOPE OF THEIR WORK, INCLUDING, BUT NOT LIMITED TO SEALING/FIRE STOPPING FOR NEW PENETRATIONS AND SEALING/FIRE STOPPING AROUND NEW SERVICES THROUGH EXISTING PENETRATIONS.

B SURVEY OF EXISTING FIELD CONDITIONS SHALL BE PERFORMED PRIOR TO BID. ACCOMODATION OF EXISTING CONDITIONS IS REQUIRED TO PROVIDE COMPLETE, OPERATIONAL SYSTEMS AS DETAILED HEREIN.

C SPACE COORDINATION WITH OTHER TRADES SHALL BE PERFORMED DURING SHOP DRAWING DEVELOPMENT AND THROUGH CONSTRUCTION. SHOP DRAWINGS SHALL BE PREPARED AFTER REVIEW OF EXISTING SITE CONDITIONS. ANY INTERFERENCES WHICH CANNOT BE ACCOMODATED BY CONTRACTOR COORDINATION SHALL BE FLAGGED FOR EVALUATION BY ENGINEER / OWNER. ENGINEER'S REVIEW OF SHOP DRAWINGS IS REQUIRED PRIOR TO CONTRACTOR'S BEGINNING WORK.

D THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OF ANY AND ALL DAMAGE TO NEW OR EXISTING EQUIPMENT INSTALLED OR RELOCATED UNDER THIS CONTRACT. THIS SHALL INCLUDE ALL TOUCH UP PAINTING.

E THE CONTRACTOR SHALL REMOVE ALL DEBRIS RELATIVE TO THE RESPECTIVE TRADE AT THE END OF EACH WORK DAY AND PRACTICE GOOD HOUSEKEEPING.

F DO NOT SHUTDOWN ANY SERVICES WITHOUT APPROVAL FROM THE BUILDING COORDINATOR.

G ALL CEILING SPACE IN AND AROUND THE IMMEDIATE CONSTRUCTION AREA IS TO BE LEFT CLEAN OF ALL DIRT, DUST, & DEBRIS WHETHER GENERATED BY THIS CONTRACT OR LEFT BY OTHERS UNDER OTHER CIRCUMSTANCES.

H THE CONTRACTOR SHALL IMMEDIATELY STOP ALL WORK IF SUSPECT MATERIALS ARE IDENTIFIED WHICH MAY CONTAIN ASBESTOS FIBERS.

I THE CONTRACTOR SHALL REMOVE AND REPLACE ANY FLOOR TILES DAMAGED OR SPOILED UNDER THIS CONTRACT AS PER GLOBALFOUNDRIES SPEC. 02072-1 & 01800-5 TO MATCH EXISTING.

J CONTRACTOR SHALL REWORK EXISTING SUPPORTS AS REQUIRED TO FACILITATE THE INSTALLATION OF PIPING, DUCTWORK, AND EQUIPMENT IN THIS PACKAGE.

K. INSTALL SOLVENT WASTE PIPING PER BFS 15410-9.

L. SOLVENT WASTE PIPING TO BE 316L SS, SCHEDULE 40.

M. VENT AND OVERFLOW PIPING TO BE 316L SS, SCHEDULE 10.

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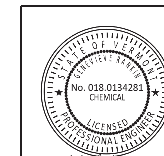
B963 EMERGENCY SOLVENT WASTE TANK REPLACEMENT

PIPING DEMO/INSTALLATION

Project Title:

DATE:	PRINT:	SIGNATURE:	SIGN-OFF:
			EQPN OWNER 1
			EQPN OWNER 2
			PLANNING
			SAFETY
			SYSTEM OWNER Other
			SYSTEM OWNER Other
			SYSTEM OWNER Other



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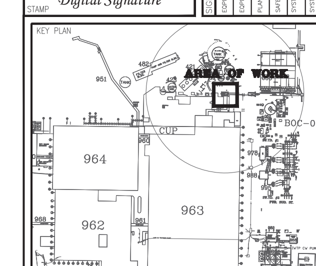
KEY PLAN



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Pjct Mgr: LARRY RIEGERT	Drawn By: C. CALDERWOOD
Phone No: 769-2635	Phone No: 6-1152

Project Title: B963 EMERGENCY SOLVENT WASTE TANK REPLACEMENT

Sheet Title: PIPING DEMO/INSTALLATION

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GF Project Number: 20180608090452	Sheet Number: BSITEP-7000.dwg
CH2M Project Number: 700480.12	
Tools: N.A	Start Date: 8/14/18

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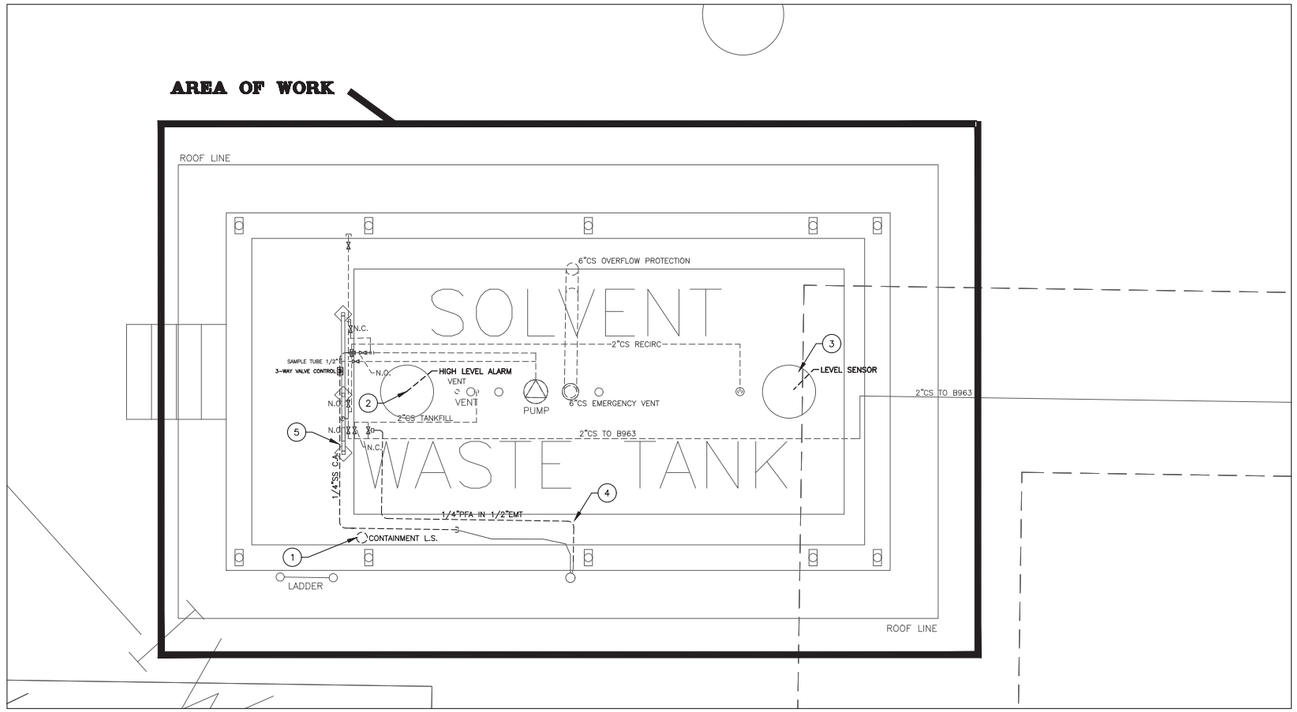
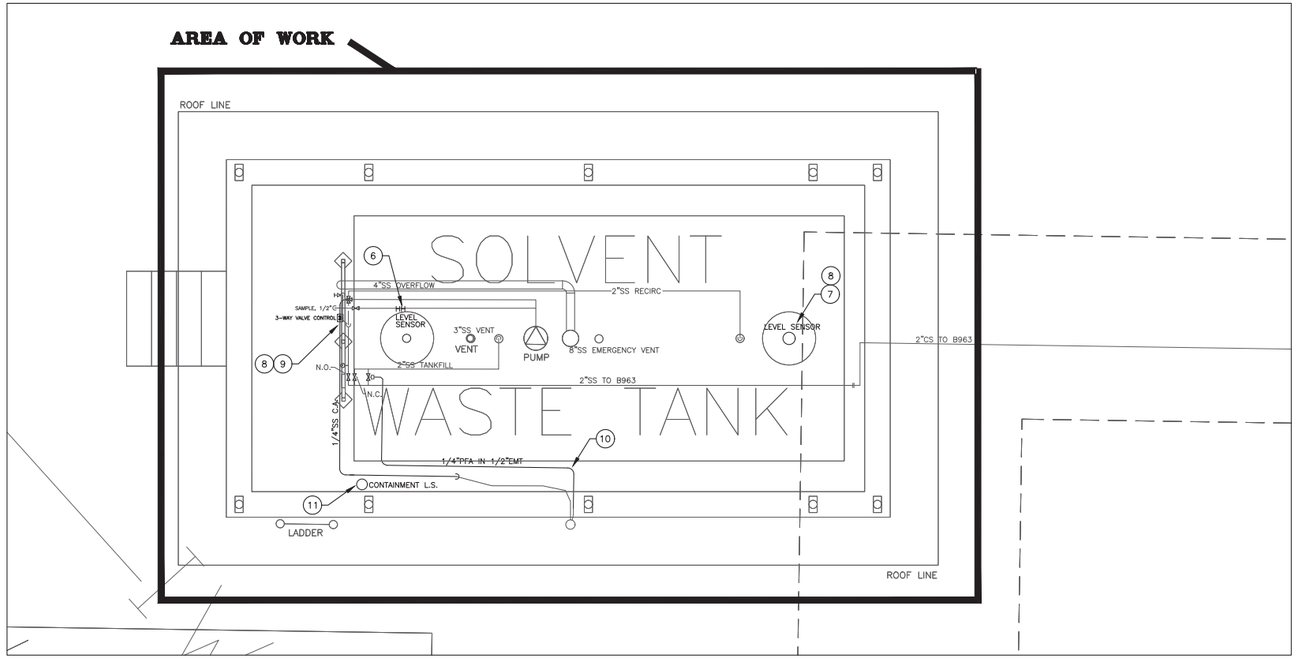


B-SITE PARTIAL PLAN
PIPING AND CONTROLS DEMOLITION
SCALE: 1/2" = 1'-0"



B-SITE PARTIAL PLAN
PIPING AND CONTROLS INSTALLATION
SCALE: 1/2" = 1'-0"

KEYED NOTES:

1. REMOVE SECONDARY CONTAINMENT SENSOR, RETAIN FOR RE-INSTALLATION
2. REMOVE HIGH LEVEL SENSOR. REMOVE CABLE BACK TO GROUND PENETRATION CONDUIT. SENSOR TO BE REUSED PER INSTALL.
3. REMOVE TANK LEVEL SENSOR. REMOVE CABLE BACK TO GROUND PENETRATION CONDUIT. COIL AND PROTECT CABLE DURING CONSTRUCTION WORK. SENSOR TO BE REUSED PER INSTALL.
4. REMOVE CONTROL AIR TUBING AS INDICATED. REMOVE CONTROL AIR VALVE. CAP CA SOURCE AND PROTECT TUBING DURING CONSTRUCTION WORK.
5. REMOVE CONTROL AIR VALVE ENCLOSURE, RETAIN FOR RE-INSTALL. REMOVE TUBING FROM CONTROL AIR VALVE BACK TO LOCATION INDICATED.
6. INSTALL HIGH LEVEL SENSOR WITH PTFE ENCAPSULATED SS GASKET. PROVIDE CONDUIT, INSTALL CABLE TO SENSOR. PROVIDE FLEX CONDUIT TO FINAL SENSOR CONNECTION. EXPLOSION PROOF CONDUIT AND FITTINGS.
7. INSTALL LEVEL SENSOR WITH PTFE ENCAPSULATED SS GASKET. PROVIDE CONDUIT, INSTALL CABLE TO NEW SENSOR. PROVIDE FLEX SECTION TO FINAL SENSOR LOCATION. EXPLOSION PROOF CONDUIT AND FITTINGS.
8. INSTALL CONTROL AIR VALVE ENCLOSURE. MOUNT AIR CONTROL LEVER, MOUNT ENCLOSURE TO RACK 48" ABOVE GRATED FLOOR. LABEL BOX '3-WAY VALVE CONTROL'.
9. PROVIDE 1/4" SS SWAGELOK TUBING TO CONTROL BOX, AND FROM CONTROL BOX TO VALVE ACTUATOR. PROVIDE REPLACEMENT 3-WAY, MANUAL RETURN AIR VALVE, MCMASTER-CARR 6464K17 OR EQUIVALENT. 3-WAY VALVE SHOULD BE NORMALLY POSITIONED SUCH THAT NORMAL POSITION (NO APPLIED PRESSURE) IS RECIRC MODE.
10. INSTALL 1/4" PFA TUBING TO VALVE ACTUATOR.
11. INSTALL LEAK SENSOR, RE-SUPPORT EXISTING CONDUIT AS REQUIRED. EXPLOSION PROOF CONDUIT AND FITTINGS.

GENERAL NOTES

A EACH CONTRACTOR SHALL BE RESPONSIBLE FOR SEALING AND FIRE STOPPING ALL PENETRATIONS PERFORMED WITHIN THE SCOPE OF THEIR WORK, INCLUDING, BUT NOT LIMITED TO SEALING/FIRE STOPPING FOR NEW PENETRATIONS AND SEALING/FIRE STOPPING AROUND NEW SERVICES THROUGH EXISTING PENETRATIONS.

B SURVEY OF EXISTING FIELD CONDITIONS SHALL BE PERFORMED PRIOR TO BID. ACCOMODATION OF EXISTING CONDITIONS IS REQUIRED TO PROVIDE COMPLETE, OPERATIONAL SYSTEMS AS DETAILED HEREIN.

C SPACE COORDINATION WITH OTHER TRADES SHALL BE PERFORMED DURING SHOP DRAWING DEVELOPMENT AND THROUGH CONSTRUCTION. SHOP DRAWINGS SHALL BE PREPARED AFTER REVIEW OF EXISTING SITE CONDITIONS. ANY INTERFERENCES WHICH CANNOT BE ACCOMODATED BY CONTRACTOR COORDINATION SHALL BE FLAGGED FOR EVALUATION BY ENGINEER / OWNER. ENGINEER'S REVIEW OF SHOP DRAWINGS IS REQUIRED PRIOR TO CONTRACTOR'S BEGINNING WORK.

D THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OF ANY AND ALL DAMAGE TO NEW OR EXISTING EQUIPMENT INSTALLED OR RELOCATED UNDER THIS CONTRACT. THIS SHALL INCLUDE ALL TOUCH UP PAINTING.

E THE CONTRACTOR SHALL REMOVE ALL DEBRIS RELATIVE TO THE RESPECTIVE TRADE AT THE END OF EACH WORK DAY AND PRACTICE GOOD HOUSEKEEPING.

F DO NOT SHUTDOWN ANY SERVICES WITHOUT APPROVAL FROM THE BUILDING COORDINATOR.

G ALL CEILING SPACE IN AND AROUND THE IMMEDIATE CONSTRUCTION AREA IS TO BE LEFT CLEAN OF ALL DIRT, DUST, & DEBRIS WHETHER GENERATED BY THIS CONTRACT OR LEFT BY OTHERS UNDER OTHER CIRCUMSTANCES.

H THE CONTRACTOR SHALL IMMEDIATELY STOP ALL WORK IF SUSPECT MATERIALS ARE IDENTIFIED WHICH MAY CONTAIN ASBESTOS FIBERS.

I THE CONTRACTOR SHALL REMOVE AND REPLACE ANY FLOOR TILES DAMAGED OR SPOILED UNDER THIS CONTRACT AS PER GLOBALFOUNDRIES SPEC. 02072-1 & 01800-5 TO MATCH EXISTING.

J CONTRACTOR SHALL REWORK EXISTING SUPPORTS AS REQUIRED TO FACILITATE THE INSTALLATION OF PIPING, DUCTWORK, AND EQUIPMENT IN THIS PACKAGE.

K. INSTALL SOLVENT WASTE PIPING PER BFS 15410-9.

GLOBALFOUNDRIES
1000 River Street
Essex Junction, VT 05452

ch2m
VT GLOBALFOUNDRIES Office
1000 River Street
Mail Stop 1000
Essex Junction, VT 05452

Project Title:

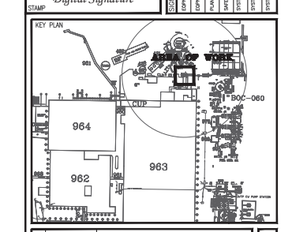
B963 EMERGENCY SOLVENT WASTE TANK REPLACEMENT

PIPING DEMO/INSTALLATION

SIGN-OFF	SIGNATURE	PRINT	DATE
GDFM OWNER 1			
GDFM OWNER 2			
PLANNING			
SAFETY			
SYSTEM OWNER 1			
SYSTEM OWNER 2			
SYSTEM OWNER 3			

STAMP: CALIFORNIA No. 018.0134281 CHEMICAL PROFESSIONAL ENGINEER — Digital Signature

KEY PLAN



No:	Date:	Issued For:
1	11/09/18	ISSUED FOR CONSTRUCTION

Pjct Mgr: LARRY RIEGERT — Drawn By: C. CALDERWOOD
Phone No: 769-2635 — Phone No: 6-1152

Project Title: B963 EMERGENCY SOLVENT WASTE TANK REPLACEMENT
Sheet Title: PIPING DEMO/INSTALLATION

GF Project Number: 2018068000152
CH2M Project Number: 700189
Sheet Number: BSITEP-7001.dwg
Scale: NOTE
Date: 8/14/18

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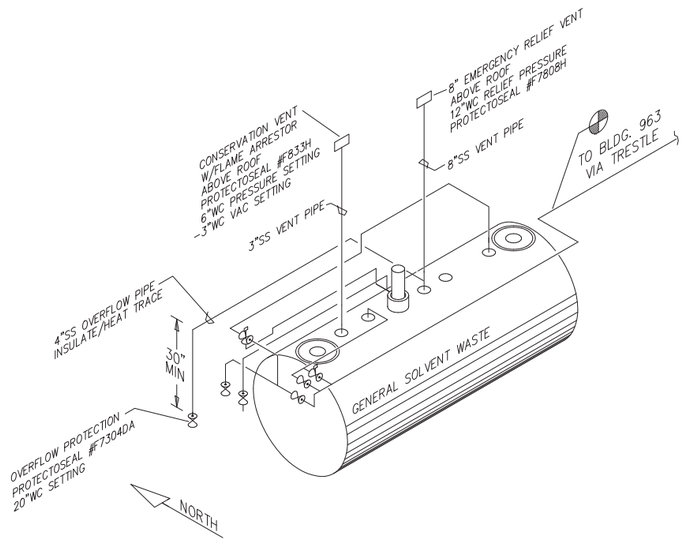
IFC



A SOLVENT TANK PIPING ISOMETRIC
SCALE: NONE

FITTING SCHEDULE

A= 4" ANSI CLASS 150 FLANGE
B= 24" MANHOLE
C= 10"ø ANSI CLASS 150 FLANGE
D= 6"ø ANSI CLASS 150 FLANGE
E= 5" ANSI CLASS 150 FLANGE
F= 8" ANSI CLASS 150 FLANGE

① TANK RESTRAINT/HOLD DOWN LOCATIONS
(PROVIDE WELDEDE 36"X 8" SS ROLLED PLATES)

② TANK SUPPORT LOCATIONS
(PROVIDE WELDED SADDLE SUPPORTS,
OR SS STRAP MECHANICALLY SECURED)

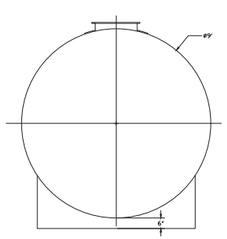
TANK REQUIREMENTS

UL-142 ABOVEGROUND, SINGLE WALL, HORIZONTAL
CAPACITY : 9000 GALLONS
NO. REQ. : 1
MATERIAL : 316L SS
FACTORY TEST : 5 P.S.I.
MIN. GAUGE OR THICKNESS:
HEADS : TBD
SHELL : TBD

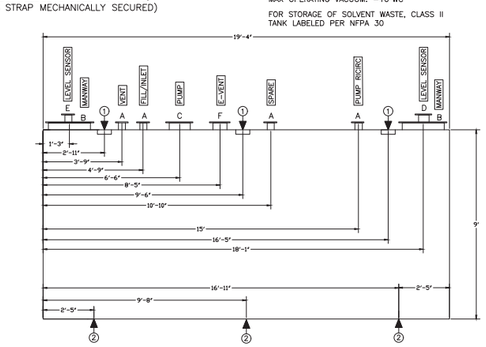
PAINT : INTERIOR : NONE
EXTERIOR : NONE
CONSTRUCTION : FLAT FLANGED HEADS
SADDLE SUPPORTS

MAX OPERATING PRESSURE: 2.5 PSI
MAX OPERATING VACUUM: -10"WC

FOR STORAGE OF SOLVENT WASTE, CLASS II
TANK LABELED PER NFPA 30



END VIEW



ELEVATION

B SOLVENT TANK
SCALE: NONE

GLOBALFOUNDRIES
1000 River Street
Essex Junction, VT 05452

ch2m
VT GLOBALFOUNDRIES Office
1000 River Street
Mail Stop 1-Bldg
Essex Junction, VT 05452

B963 EMERGENCY SOLVENT WASTE TANK REPLACEMENT

PIPING DETAILS

Project Title:

SIGN-OFF:	SIGNATURE:	PRINT:	DATE:
CONT. OWNER 1			
CONT. OWNER 2			
PLANNING			
SAFETY			
SYSTEM OWNER MECH.			
SYSTEM OWNER ELEC.			

STAMP
No. 018.0134281
CHEMICAL
Digital Signature

KEY PLAN

No:	Date:	Issued For:
-		
-		
-		
-		
0	11/09/18	ISSUED FOR CONSTRUCTION

Pjct Mgr: LARRY RIEGERT — Drawn By: C. CALDERWOOD
Phone No: 769-2635 — Phone No: 1152

Project Title: B963 EMERGENCY SOLVENT WASTE TANK REPLACEMENT
Sheet Title: PIPING DETAILS

GF Project Number: 201805080904512
CH2M Project Number: 700480.12
Sheet Number: BSITEP-7600.dwg
Scale: N.A. Start Date: 8/14/18

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0 OF

Attachment 2

General Solvent Waste Stream Laboratory Analysis

ENDYNE Inc.
Environmental Laboratories

GLOBALFOUNDRIES U.S. 2 LLC	
1000 River Road - B966	100519
Essex Jct, VT 05452	
Atten: Andrea Pomroy-McCullen	

PROJECT: HW-General Solvent 1,3
WORK ORDER: **1808-20426**
DATE RECEIVED: August 14, 2018
DATE REPORTED: September 07, 2018
SAMPLER: Scott

Laboratory Report

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. All required method quality control elements including instrument calibration were performed in accordance with method requirements and determined to be acceptable unless otherwise noted.

The column labeled Lab/Tech in the accompanying report denotes the laboratory facility where the testing was performed and the technician who conducted the assay. A "W" designates the Williston, VT lab under NELAC certification ELAP 11263; "R" designates the Lebanon, NH facility under certification NH 2037 and “N” the Plattsburgh, NY lab under certification ELAP 11892. “Sub” indicates the testing was performed by a subcontracted laboratory. The accreditation status of the subcontracted lab is referenced in the corresponding NELAC and Qual fields.

The NELAC column also denotes the accreditation status of each laboratory for each reported parameter. “A” indicates the referenced laboratory is NELAC accredited for the parameter reported. “N” indicates the laboratory is not accredited. “U” indicates that NELAC does not offer accreditation for that parameter in that specific matrix. Test results denoted with an “A” meet all National Environmental Laboratory Accreditation Program requirements except where denoted by pertinent data qualifiers. Test results are representative of the samples as they were received at the laboratory

Endyne, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose.

Reviewed by:

Harry B. Locker, Ph.D.
Laboratory Director

Laboratory Report DATE REPORTED: 09/07/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC WORK ORDER: **1808-20426**
PROJECT: HW-General Solvent 1,3 DATE RECEIVED: 08/14/2018

001 Site: Site 1 GS1 Date Sampled: 8/13/18 Time: 8:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Water Content, Karl Fisher	3.65	%	Titration	8/29/18	SWSUB	U	STA
Mercury Digestion	Digested		EPA 7471B	8/20/18	W CM	A	
Metals Solids Digestion	Digested		EPA 3051A	8/24/18	W FAA	A	
Arsenic, Total	< 1.8	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Barium, Total	< 3.7	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Cadmium, Total	< 0.18	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Chromium, Total	< 0.92	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Lead, Total	< 3.7	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Mercury, Total	< 0.059	mg/Kg	EPA 7471B	8/20/18	W CM	A	
Selenium, Total	< 3.7	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Silver, Total	< 1.8	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Volatile Organic Compounds							
Prep EPA 5035A	Completed		EPA 5035A-H	8/27/18	W TEL	A	
Dichlorodifluoromethane	< 101	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Chloromethane	< 60.5	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Vinyl chloride	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Bromomethane	< 101	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Chloroethane	< 101	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Trichlorofluoromethane	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Diethyl ether	< 101	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
1,1-Dichloroethene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Acetone	< 202	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Carbon disulfide	< 101	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Methylene chloride	< 101	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
t-Butanol	< 504	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Methyl-t-butyl ether (MTBE)	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
trans-1,2-Dichloroethene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Di-isopropyl ether (DIPE)	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	U	
1,1-Dichloroethane	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Ethyl-t-butyl ether (ETBE)	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	U	
2-Butanone	< 202	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
2,2-Dichloropropane	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
cis-1,2-Dichloroethene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Bromochloromethane	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Chloroform	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Tetrahydrofuran	< 202	mg/Kg	EPA 8260C	8/27/18	W TEL	U	
1,1,1-Trichloroethane	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Carbon tetrachloride	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1-Dichloropropene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Benzene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
t-Amylmethyl ether (TAME)	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	U	
1,2-Dichloroethane	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Trichloroethene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dichloropropane	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Dibromomethane	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Bromodichloromethane	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	

Laboratory Report DATE REPORTED: 09/07/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC WORK ORDER: **1808-20426**
PROJECT: HW-General Solvent 1,3 DATE RECEIVED: 08/14/2018

001 Site: Site 1 GS1 Date Sampled: 8/13/18 Time: 8:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
cis-1,3-Dichloropropene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
4-Methyl-2-pentanone (MIBK)	74,300	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Toluene	30.6	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
trans-1,3-Dichloropropene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1,2-Trichloroethane	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Tetrachloroethene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,3-Dichloropropane	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
2-Hexanone	< 605	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Dibromochloromethane	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dibromoethane	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Chlorobenzene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Ethylbenzene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1,1,2-Tetrachloroethane	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Xylenes, Total	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Styrene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Bromoform	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Isopropylbenzene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1,2,2-Tetrachloroethane	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
Bromobenzene	< 20.2	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
n-Propylbenzene	80.8	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,3-Trichloropropane	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
2-Chlorotoluene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
1,3,5-Trimethylbenzene	107	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
4-Chlorotoluene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
t-Butylbenzene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,4-Trimethylbenzene	338	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
s-Butylbenzene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
4-Isopropyltoluene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,3-Dichlorobenzene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,4-Dichlorobenzene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,3-Trimethylbenzene	44.0	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
n-Butylbenzene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dichlorobenzene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dibromo-3-Chloropropane	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
1,2,4-Trichlorobenzene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
1,3,5-Trichlorobenzene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Hexachlorobutadiene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Naphthalene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,3-Trichlorobenzene	< 40.3	mg/Kg	EPA 8260C	8/27/18	W TEL	N	
Surr. 1 (Dibromofluoromethane)	109	%	EPA 8260C	8/27/18	W TEL	U	
Surr. 2 (Toluene d8)	100	%	EPA 8260C	8/27/18	W TEL	U	
Surr. 3 (4-Bromofluorobenzene)	98	%	EPA 8260C	8/27/18	W TEL	U	
Unidentified Peaks	1		EPA 8260C	8/27/18	W TEL	U	
TPH DRO Package							
Ultrasonic Extraction	Completed		EPA 3550B	9/6/18	W DPD	A	
C7-C10 TPH	467000	mg/Kg	EPA 8015D	9/6/18	W DPD	U	

Laboratory Report DATE REPORTED: 09/07/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC
PROJECT: HW-General Solvent 1,3

WORK ORDER: **1808-20426**
DATE RECEIVED: 08/14/2018

001 Site: Site 1 GS1 Date Sampled: 8/13/18 Time: 8:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
C10-C28 TPH-DRO	< 700	mg/Kg	EPA 8015D	9/6/18	W DPD	A	
C28-C40 TPH	< 700	mg/Kg	EPA 8015D	9/6/18	W DPD	U	
Tot. Petroleum Hydrocarbons	470000	mg/Kg	EPA 8015D	9/6/18	W DPD	U	
Hydrocarbon Window	C8-C12		EPA 8015D	9/6/18	W DPD	U	
Solvent Scan Package							
Acetone	< 2000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
2-Propanol	86500	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Surrogate-MIBK	44	%	EPA 8015D	9/4/18	W DPD	U	
n-Butyl Acetate	45000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	DS-
n-Butanol	< 2000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
PGME	< 2000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Ethyl Lactate	< 2000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
PGMEA	94100	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Acetic Acid	< 10000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Propylene Glycol	< 2000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Ethylene Glycol	< 2000	ppm, v/v	EPA 8015D	9/4/18	W DPD	N	
g-Butyrolactone	< 2000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
n-Methyl-2-Pyrrolidone (NMP)	< 2000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Unidentified Peaks	1		EPA 8015D	9/4/18	W DPD	U	
EPA 8270C Semi-VOA							
Ultrasonic Extraction	Completed		EPA 3580A	9/5/18	W EEP	A	
N-Nitrosodimethylamine	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Pyridine	< 198	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Aniline	< 198	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Bis(2-chloroethyl)ether	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1,2-Dichlorobenzene	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1,3-Dichlorobenzene	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1,4-Dichlorobenzene	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzyl alcohol	< 395	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2,2'-Oxybis(1-chloropropane)	< 198	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
N-Nitrosodi-n-propylamine	< 198	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Hexachloroethane	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Nitrobenzene	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
N-Nitrosopiperidine	< 198	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Isophorone	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Bis(2-chloroethoxy)methane	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1,2,4-Trichlorobenzene	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Naphthalene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Chloroaniline	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Hexachlorobutadiene	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
N-Nitrosodi-n-butylamine	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2-Methylnaphthalene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1-Methylnaphthalene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
Hexachlorocyclopentadiene	< 395	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2-Chloronaphthalene	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1-Chloronaphthalene	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	N	

Laboratory Report DATE REPORTED: 09/07/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC WORK ORDER: **1808-20426**
PROJECT: HW-General Solvent 1,3 DATE RECEIVED: 08/14/2018

001 Site: Site 1 GS1 Date Sampled: 8/13/18 Time: 8:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
2-Nitroaniline	< 395	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Dimethyl phthalate	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,6-Dinitrotoluene	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Acenaphthylene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
3-Nitroaniline	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Acenaphthene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Dibenzofuran	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2,4-Dinitrotoluene	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1-Naphthylamine	< 198	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2-Naphthylamine	< 198	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Fluorene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Diethyl phthalate	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Chlorophenyl phenyl ether	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Nitroaniline	< 395	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
N-Nitrosodiphenylamine	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Azobenzene/1,2-Diphenylhydrazine	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
4-Bromophenyl phenyl ether	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Hexachlorobenzene	< 19.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Phenanthrene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Anthracene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Carbazole	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Di-n-butylphthalate	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Fluoranthene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzidine	< 395	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Pyrene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Butyl benzyl phthalate	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(a)anthracene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Chrysene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
3,3'-Dichlorobenzidine	< 198	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Bis(2-ethylhexyl)phthalate	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Di-n-octylphthalate	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(b)fluoranthene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(k)fluoranthene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(a)pyrene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Indeno(1,2,3-cd)pyrene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Dibenzo(a,h)anthracene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(g,h,i)perylene	< 9.9	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Phenol	< 39.5	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2-Chlorophenol	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2-Methylphenol (o-cresol)	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
3&4-Methylphenol (m&p-cresol)	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Cresols, Total	< 198	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
2-Nitrophenol	< 198	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4-Dimethylphenol	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4-Dichlorophenol	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,6-Dichlorophenol	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	N	

Laboratory Report DATE REPORTED: 09/07/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC
PROJECT: HW-General Solvent 1,3

WORK ORDER: **1808-20426**
DATE RECEIVED: 08/14/2018

001 Site: Site 1 GS1 Date Sampled: 8/13/18 Time: 8:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
4-Chloro-3-methylphenol	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4,5-Trichlorophenol	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4,6-Trichlorophenol	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4-Dinitrophenol	< 395	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Nitrophenol	< 98.8	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4,6-Dinitro-2-methylphenol	< 395	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Pentachlorophenol	< 198	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
BaP Toxic Equiv. Quotient	< 22.9	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
B/N Surr.1 Nitrobenzene-d5	81	%	EPA 8270D	9/5/18	W EEP	U	
B/N Surr.2 2-Fluorobiphenyl	82	%	EPA 8270D	9/5/18	W EEP	U	
B/N Surr.3 Terphenyl-d14	89	%	EPA 8270D	9/5/18	W EEP	U	
Acid Surr.1 2-Fluorophenol	83	%	EPA 8270D	9/5/18	W EEP	U	
Acid Surr.2 Phenol-d5	97	%	EPA 8270D	9/5/18	W EEP	U	
Acid Surr.3 Tribromophenol	78	%	EPA 8270D	9/5/18	W EEP	U	
Unidentified Peaks	> 10		EPA 8270D	9/5/18	W EEP	U	

002 Site: Site 2 GS-3 Date Sampled: 8/13/18 Time: 8:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Water Content, Karl Fisher	61.50	%	Titration	8/29/18	SWSUB	U	STA
Mercury Digestion	Digested		EPA 7471B	8/20/18	W CM	A	
Metals Solids Digestion	Digested		EPA 3051A	8/24/18	W FAA	A	
Arsenic, Total	< 1.5	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Barium, Total	< 3.0	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Cadmium, Total	< 0.15	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Chromium, Total	< 0.74	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Lead, Total	< 3.0	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Mercury, Total	< 0.048	mg/Kg	EPA 7471B	8/20/18	W CM	A	
Selenium, Total	< 3.0	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Silver, Total	< 1.5	mg/Kg	EPA 6010C	8/24/18	W FAA	A	
Volatile Organic Compounds							
Prep EPA 5035A	Completed		EPA 5035A-H	8/27/18	W TEL	A	
Dichlorodifluoromethane	< 25,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Chloromethane	< 15,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Vinyl chloride	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Bromomethane	< 25,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Chloroethane	< 25,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Trichlorofluoromethane	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Diethyl ether	< 25,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
1,1-Dichloroethene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Acetone	< 50,300	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Carbon disulfide	< 25,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Methylene chloride	< 25,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
t-Butanol	< 126,000	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Methyl-t-butyl ether (MTBE)	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
trans-1,2-Dichloroethene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	

Laboratory Report DATE REPORTED: 09/07/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC WORK ORDER: **1808-20426**
PROJECT: HW-General Solvent 1,3 DATE RECEIVED: 08/14/2018

002 Site: Site 2 GS-3 Date Sampled: 8/13/18 Time: 8:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Di-isopropyl ether (DIPE)	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	U	
1,1-Dichloroethane	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Ethyl-t-butyl ether (ETBE)	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	U	
2-Butanone	< 50,300	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
2,2-Dichloropropane	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
cis-1,2-Dichloroethene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Bromochloromethane	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Chloroform	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Tetrahydrofuran	< 50,300	ug/Kg	EPA 8260C	8/27/18	W TEL	U	
1,1,1-Trichloroethane	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Carbon tetrachloride	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1-Dichloropropene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Benzene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
t-Amylmethyl ether (TAME)	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	U	
1,2-Dichloroethane	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Trichloroethene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dichloropropane	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Dibromomethane	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Bromodichloromethane	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
cis-1,3-Dichloropropene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
4-Methyl-2-pentanone (MIBK)	< 50,300	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Toluene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
trans-1,3-Dichloropropene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1,2-Trichloroethane	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Tetrachloroethene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,3-Dichloropropane	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
2-Hexanone	< 50,300	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Dibromochloromethane	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dibromoethane	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Chlorobenzene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Ethylbenzene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1,1,2-Tetrachloroethane	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Xylenes, Total	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Styrene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Bromoform	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Isopropylbenzene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1,2,2-Tetrachloroethane	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Bromobenzene	< 5,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
n-Propylbenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,3-Trichloropropane	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
2-Chlorotoluene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
1,3,5-Trimethylbenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
4-Chlorotoluene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
t-Butylbenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,4-Trimethylbenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
s-Butylbenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	

Laboratory Report DATE REPORTED: 09/07/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC WORK ORDER: **1808-20426**
PROJECT: HW-General Solvent 1,3 DATE RECEIVED: 08/14/2018

002 Site: Site 2 GS-3 Date Sampled: 8/13/18 Time: 8:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
4-Isopropyltoluene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,3-Dichlorobenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,4-Dichlorobenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,3-Trimethylbenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
n-Butylbenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dichlorobenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dibromo-3-Chloropropane	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
1,2,4-Trichlorobenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
1,3,5-Trichlorobenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Hexachlorobutadiene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Naphthalene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,3-Trichlorobenzene	< 10,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Surr. 1 (Dibromofluoromethane)	96	%	EPA 8260C	8/27/18	W TEL	U	
Surr. 2 (Toluene d8)	100	%	EPA 8260C	8/27/18	W TEL	U	
Surr. 3 (4-Bromofluorobenzene)	100	%	EPA 8260C	8/27/18	W TEL	U	
Unidentified Peaks	0		EPA 8260C	8/27/18	W TEL	U	
TPH DRO Package							
Ultrasonic Extraction	Completed		EPA 3550B	9/6/18	W DPD	A	AN1
C7-C10 TPH	< 200	mg/Kg	EPA 8015D	9/6/18	W DPD	U	
C10-C28 TPH-DRO	< 200	mg/Kg	EPA 8015D	9/6/18	W DPD	A	
C28-C40 TPH	< 200	mg/Kg	EPA 8015D	9/6/18	W DPD	U	
Tot. Petroleum Hydrocarbons	< 200	mg/Kg	EPA 8015D	9/6/18	W DPD	U	
Hydrocarbon Window	NA		EPA 8015D	9/6/18	W DPD	U	
Solvent Scan Package							
Acetone	< 5000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
2-Propanol	< 5000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Surrogate-MIBK	37	%	EPA 8015D	9/4/18	W DPD	U	
n-Butyl Acetate	< 5000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
n-Butanol	< 5000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
PGME	< 5000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Ethyl Lactate	< 5000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
PGMEA	< 5000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Acetic Acid	< 25000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Propylene Glycol	61900	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Ethylene Glycol	167000	ppm, v/v	EPA 8015D	9/4/18	W DPD	N	
g-Butyrolactone	< 5000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
n-Methyl-2-Pyrrolidone (NMP)	< 5000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Unidentified Peaks	0		EPA 8015D	9/4/18	W DPD	U	
EPA 8270C Semi-VOA							
Ultrasonic Extraction	Completed		EPA 3580A	9/5/18	W EEP	A	
N-Nitrosodimethylamine	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Pyridine	< 161	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Aniline	< 161	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Bis(2-chloroethyl)ether	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1,2-Dichlorobenzene	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1,3-Dichlorobenzene	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	

Laboratory Report DATE REPORTED: 09/07/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC WORK ORDER: **1808-20426**
PROJECT: HW-General Solvent 1,3 DATE RECEIVED: 08/14/2018

002 Site: Site 2 GS-3 Date Sampled: 8/13/18 Time: 8:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
1,4-Dichlorobenzene	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzyl alcohol	< 323	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2,2'-Oxybis(1-chloropropane)	< 161	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
N-Nitrosodi-n-propylamine	< 161	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Hexachloroethane	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Nitrobenzene	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
N-Nitrosopiperidine	< 161	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Isophorone	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Bis(2-chloroethoxy)methane	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1,2,4-Trichlorobenzene	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Naphthalene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Chloroaniline	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Hexachlorobutadiene	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
N-Nitrosodi-n-butylamine	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2-Methylnaphthalene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1-Methylnaphthalene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
Hexachlorocyclopentadiene	< 323	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2-Chloronaphthalene	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1-Chloronaphthalene	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2-Nitroaniline	< 323	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Dimethyl phthalate	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,6-Dinitrotoluene	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Acenaphthylene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
3-Nitroaniline	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Acenaphthene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Dibenzofuran	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2,4-Dinitrotoluene	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1-Naphthylamine	< 161	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2-Naphthylamine	< 161	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Fluorene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Diethyl phthalate	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Chlorophenyl phenyl ether	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Nitroaniline	< 323	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
N-Nitrosodiphenylamine	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Azobenzene/1,2-Diphenylhydrazine	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
4-Bromophenyl phenyl ether	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Hexachlorobenzene	< 16.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Phenanthrene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Anthracene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Carbazole	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Di-n-butylphthalate	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Fluoranthene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzidine	< 323	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Pyrene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Butyl benzyl phthalate	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(a)anthracene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	

Laboratory Report DATE REPORTED: 09/07/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC
PROJECT: HW-General Solvent 1,3

WORK ORDER: **1808-20426**
DATE RECEIVED: 08/14/2018

002 Site: Site 2 GS-3 Date Sampled: 8/13/18 Time: 8:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Chrysene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
3,3'-Dichlorobenzidine	< 161	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Bis(2-ethylhexyl)phthalate	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Di-n-octylphthalate	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(b)fluoranthene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(k)fluoranthene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(a)pyrene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Indeno(1,2,3-cd)pyrene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Dibenzo(a,h)anthracene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(g,h,i)perylene	< 8.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Phenol	< 32.3	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2-Chlorophenol	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2-Methylphenol (o-cresol)	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
3&4-Methylphenol (m&p-cresol)	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Cresols, Total	< 161	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
2-Nitrophenol	< 161	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4-Dimethylphenol	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4-Dichlorophenol	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,6-Dichlorophenol	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
4-Chloro-3-methylphenol	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4,5-Trichlorophenol	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4,6-Trichlorophenol	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4-Dinitrophenol	< 323	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Nitrophenol	< 80.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4,6-Dinitro-2-methylphenol	< 323	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Pentachlorophenol	< 161	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
BaP Toxic Equiv. Quotient	< 18.7	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
B/N Surr.1 Nitrobenzene-d5	79	%	EPA 8270D	9/5/18	W EEP	U	
B/N Surr.2 2-Fluorobiphenyl	85	%	EPA 8270D	9/5/18	W EEP	U	
B/N Surr.3 Terphenyl-d14	89	%	EPA 8270D	9/5/18	W EEP	U	
Acid Surr.1 2-Fluorophenol	86	%	EPA 8270D	9/5/18	W EEP	U	
Acid Surr.2 Phenol-d5	70	%	EPA 8270D	9/5/18	W EEP	U	
Acid Surr.3 Tribromophenol	84	%	EPA 8270D	9/5/18	W EEP	U	
Unidentified Peaks	1		EPA 8270D	9/5/18	W EEP	U	

Laboratory Report DATE REPORTED: 09/07/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC WORK ORDER: **1808-20426**
PROJECT: HW-General Solvent 1,3 DATE RECEIVED: 08/14/2018

Report Summary of Qualifiers and Notes

VOC samples were collected without chemical preservation in the field. Samples were extracted and preserved at the laboratory. Reported concentrations less than 200 ug/Kg may be biased low due to the sample not being collected according to 5035/5035A low-level specifications.

STA: Analysis performed by subcontracted laboratory, Sterling Analytical Services, Inc. Results are presented here for your convenience. Refer to the complete subcontracted report, which has been appended to this report, for detailed information regarding this result.

DS-: The Laboratory Duplicate analysis of this sample was not within method acceptance limits. The value of the Laboratory Duplicate was significantly lower than reported value.

AN1: DRO solvent dilution was not completely miscible in laboratory solvent. Results may be biased low.

DRO values are based on the response and calibration of Diesel/#2 Fuel Oil.

Sterling Analytical, Inc.
15 Agawam Avenue
West Springfield, MA 01089
Phone (413) 214-6541 Fax (413) 214-6842
email-madhu@sterlinganalytical.com

Visit our website: www.sterlinganalytical.com

Mass Certification - MA-00071
Conn Certification - PH-0520

Report Date August 30, 2018

Customer	Contact	Laboratory Supervisor	eMail
Endyne, Inc.	E. Toomey	Madhu Shah	customerservice@sterlinganalytical.com

Sample Description
Analysis of Samples for Karl Fischer moisture

Samples Analyzed

Enclosed are Report No(s): 64352, 64353

Thank you for your business

madhu shah

Madhu Shah, Laboratory Supervisor

8/30/2018

Date

ALL the information contained in this report has been reviewed for accuracy and checked against all quality control requirements outlined in each applicable method.

This report may not be reproduced, except in full, without written approval from Sterling Analytical, Inc.

Sample	Description	Source	Taken/Time	Received
64352	1808-20426-001	Endyne, Inc.	8/14/18	8/22/18

Parameter	Results		RDL	Method	Analyzed/Time	Tech
Water, Karl Fischer, Vol	3.65	%	0.01	ASTM E203	08/29/18	dfp

Sample	Description	Source	Taken/Time	Received
64353	1808-20426-002	Endyne, Inc.	8/14/18	8/22/18

Parameter	Results		RDL	Method	Analyzed/Time	Tech
Water, Karl Fischer, Vol	61.50	%	0.10	ASTM E203	08/29/18	dfp

HW-General Solvent 1,3

Endyne Inc. COC

Prepared: 7/27/18

1808-20426

1808-20426

GLOBALFOUNDRIES U.S. 2 LLC
HW-General Solvent 1,3

Cust #

W-10029UHS

Bill to:

GLOBALFOUNDRIES U.S. 2 LLC
1000 River Road - B966
Essex Jct VT 05452
Ph: 1-518-681-6332

Report to:

Andrea Pomroy-McCullen
GLOBALFOUNDRIES U.S. 2 LLC
1000 River Road - B966
Essex Jct VT 05452
etoomey@endynelabs.com

ID: Site 1 GS 1 Sampled Date/Time: 08/13/18 @ 820 Sampler: SWJ

RCRA 8 Metals Package	Bag/Bottle Soil	<6C
Karl Fisher TPH-DRO Package Semi-VOA Compounds	250ml Amber Glass Soil	<6C
GF Scan Package	2 - 40 ml vials	<6C
VOC w/ Oxygenates, Soil	40ml VOA-Soil	<6C, Methanol

ID: Site 2 - GS-3 Sampled Date/Time: 08/13/18 @ 820 Sampler: SWJ

RCRA 8 Metals Package	Bag/Bottle Soil	<6C
Karl Fisher TPH-DRO Package Semi-VOA Compounds	250ml Amber Glass Soil	<6C
GF Scan Package	2 - 40 ml vials	<6C
VOC w/ Oxygenates, Soil	40ml VOA-Soil	<6C, Methanol

Minimum Total Mass Required = 200 grams
5 - 40ml VOA vials (No Air Bubbles)
1 - 250 ml Amber Glass

* This is the bottle requirement for one sample

Relinquished by: [signature] 8/14/18 13:50 Date Time

Accepted by: [signature] 8/14/18 13:50 Date Time

Relinquished by: Date Time

Received by: Date Time

Sites/Parameters correct as listed. Client Initials _____

Client Authorization to use Subcontract lab Client Initials _____

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#) _____

Requested Turnaround Time: Routine: Rush Due Date _____

Lab use Only

Delv: Client
Temp C: 8.3
Comment:

Tmpl Ck
Log by

ENDYNE Inc.
www.endynelabs.com

160 James Brown Dr.
Williston, VT 05495
Ph 802-879-4333
Fax 802-879-7103

56 Etna Road
Lebanon, NH 03766
Ph 603-678-4891
Fax 603-678-4893

315 New York Rd.
Plattsburgh, NY 12903
Ph 518-563-1720
Fax 518-563-0052

Attachment 3

Vendor Submittal for
Replacement B963 General Solvent Waste Tank

Rev. 0
7/13/2019

Gary Diminick
c/o GF 1000 River Road MS 966-A, Dept NU4A
Essex Junction, VT 05452
T: 802-769-9393
F: 802-769-9400
E: gdiminick@pcconstruction.com

Project No. RE1800039
2018 B963 Emergency Solvent Waste Tank Replace
c/o GF 1000 River Road MS 966-A, Dept NU4A
Essex Junction, VT 05452

Submittal 00002-A

Title	**Storage Tank**		
Type	**Shop Drawings**		
Sent Date	**04-FEB-19**	Spec Section	
Due Date	**08-FEB-19**	Spec Sub-Section	

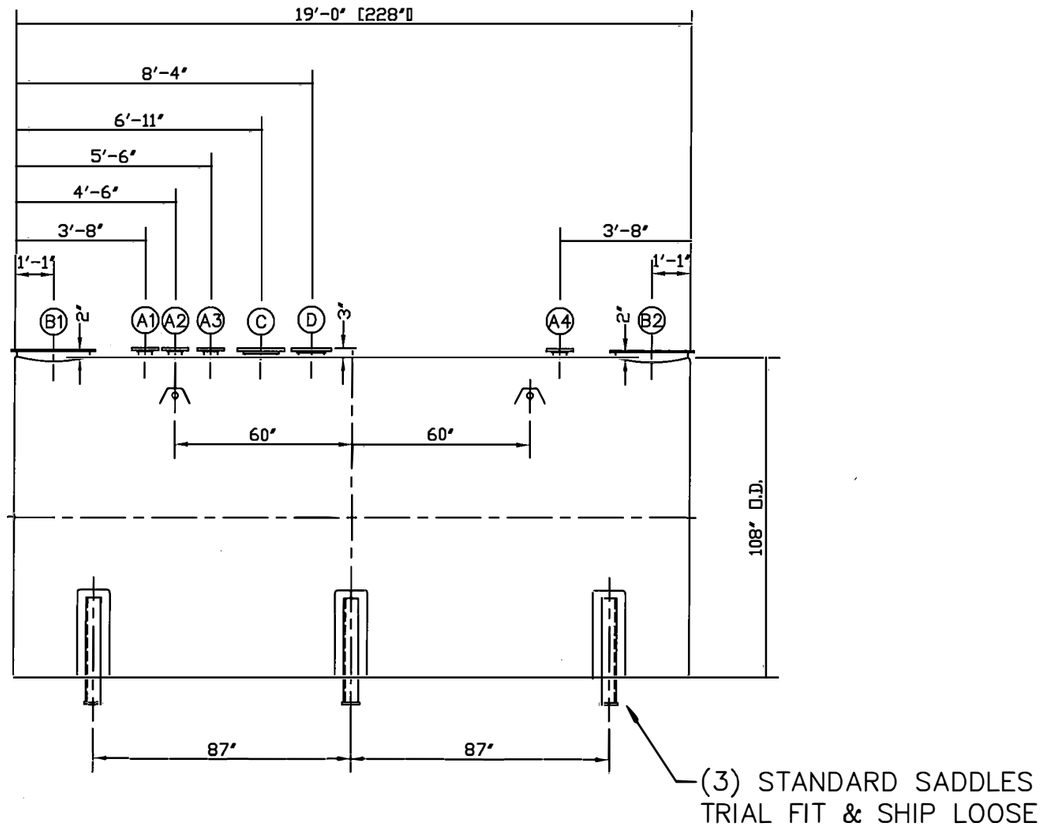
Sent To For Review
Josh Harris
CH2M

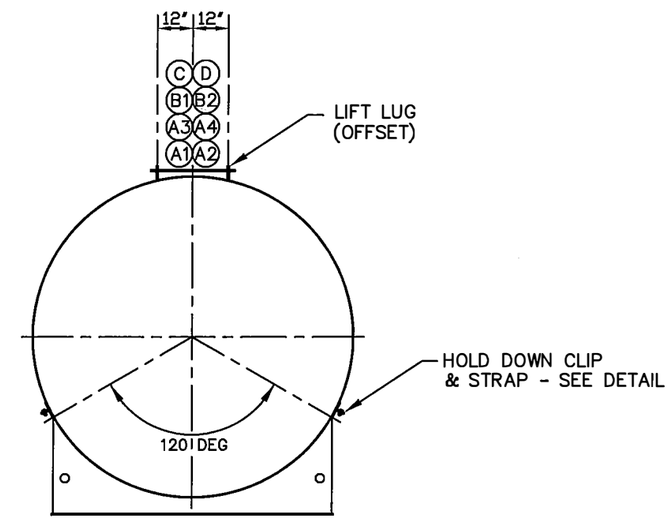
Responsible Subcontractor / Vendor

Item Being Submitted
Storage Tank

Contractor's Review Stamp	**Architect's Review Stamp**
I hereby certify that I have examined the enclosed submittal(s) and have determined and verified all field measurements, construction criteria, materials, catalog numbers, and similar data, coordinated the submittal(s) with other submissions and the work of other trades and contractors and, to the best of my knowledge and belief, the enclosed submittal(s) is/are in full compliance with the Contract requirements, except as noted above.	CH2MHILL Project Submittal Review ● **A - Approved.** Submit Certified Documents ☐ **B - Approved as Noted.** Submit Certified Documents ☐ **C - Not Approved.** Revise and Resubmit ☐ **D - Received for Information.** Not Subject to Review
Signature Date	By: Clinton Calderwood
Name Gary Diminick PC Construction Company	Date: 2/8/19
	Review is only for general conformance with the design concept of the project and general compliance with the information provided in the contract documents. Contractor/Supplier remains responsible for compliance with contract documents, confirming and correlating all quantities and dimensions, selecting fabrication process and techniques of all trades and performance of this work in a safe and satisfactory manner.

This approval does not release subcontractor / vendor from the contractual responsibilities.





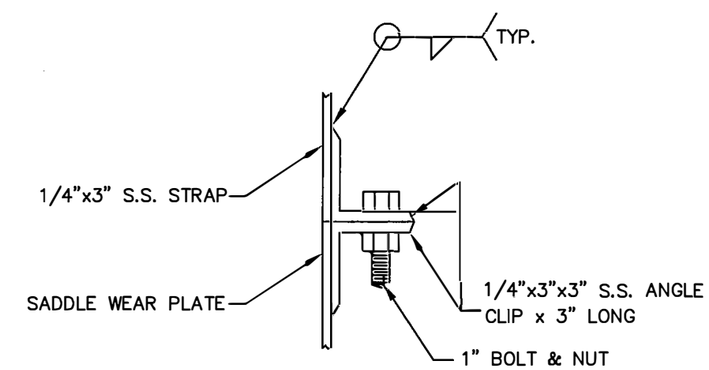
GENERAL NOTES

FABRICATION PER: UL-142
LABEL REQUIRED ☒YES ☐NO UL-142
DESIGN PRESSURE: ATMOS
DESIGN TEMPERATURE: AMB
CORROSION ALLOWANCE: NONE
SHOP TEST: PER UL-142
3-5 PSI AIR WITH SOAP SUDS
INSPECTION BY: MODERN WELDING Q.C.
MATERIAL SHELL: 316SS
FLANGES: 316SS
SADDLES: A-36 (SHOP PRIMER & SHIP LOOSE)
INT. APPURTANCES: S.S.
EXT. APPURTANCES: S.S.
BOLTS: S.S. NUTS: S.S.
GASKETS: PER UL-142
SURFACE PREP. EXT: NONE INT: NONE
PAINT:
EXT.: - OKITE CLEAN
INT.: - NONE
EST. WT. EMPTY: 10,150 LBS.
VENTING CAPACITY (CFH): 353,200
OPENINGS SHALL BE PROTECTED PER UL-142

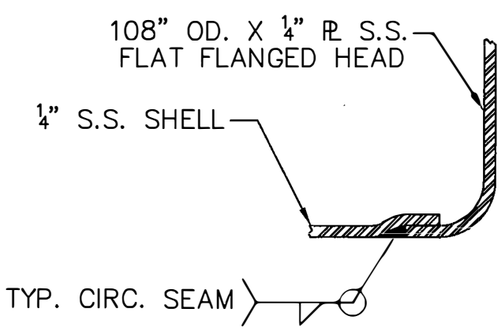
NOTES

ALL NOZZLES AND MANWAY BOLT HOLES TO STRADDLE NORTH, SOUTH CENTERLINES.

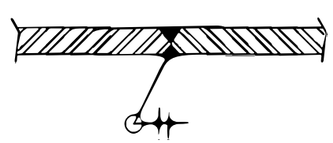
SADDLES TO BE PAINTED WITH SHOP PRIMER AND SHIPPED LOOSE.



HOLD DOWN DETAIL



DETAIL @ CIRC. SEAM



DETAIL @ LONG'T WELD SEAM

MARK	REQ'D.	SIZE	NK. TKNS.	RATING	TYPE	SERVICE
B2	1	24"	1/4"	-	-	MANWAY
A4	1	4"	SCH 40	150#	S.O. FLG	PUMP RECIRCULATION
D	1	8"	SCH 40	150#	S.O. FLG	EMERGENCY VENT
C	1	10"	SCH 40	150#	S.O. FLG	PUMP
A3	1	4"	SCH 40	150#	S.O. FLG	SPARE
A2	1	4"	SCH 40	150#	S.O. FLG	FILL/INLET
B1	1	24"	1/4"	-	-	MANWAY
A1	1	4"	SCH 40	150#	S.O. FLG	VENT

SCHEDULE OF OPENINGS

BY	REVISION	DATE	NO
JS/DR	ORIGINAL ISSUE FOR APPROVAL	2/4 2019	0
AP			

NO. REQ'D ONE (1) ITEM NO. -

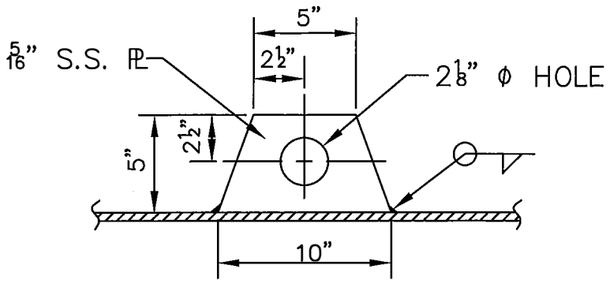
MODERN WELDING CO. of OHIO INC.

P.O. Box 2265
One Modern Way

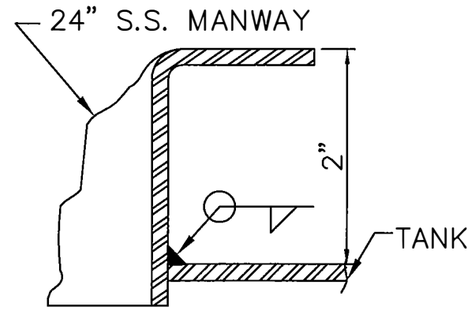
Newark, Ohio 43055
(740)344-9425

PC CONSTRUCTION
9,000 GALLON S.S. HORIZONTAL SINGLEWALL TANK

DWN. BY	JS	DATE 2/4/2019	SCALE: None
CHK. BY	DR	JOB NO. 30915-1	DWG. NO. 30915-1 (0)
APR. BY		P.O. NO. RE1800039002	SHT. NO. 1 OF 2

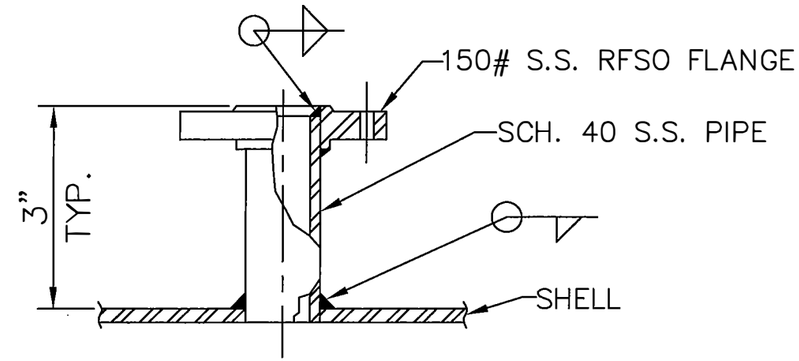


DETAIL @ LIFTING LUG
(2) REQUIRED

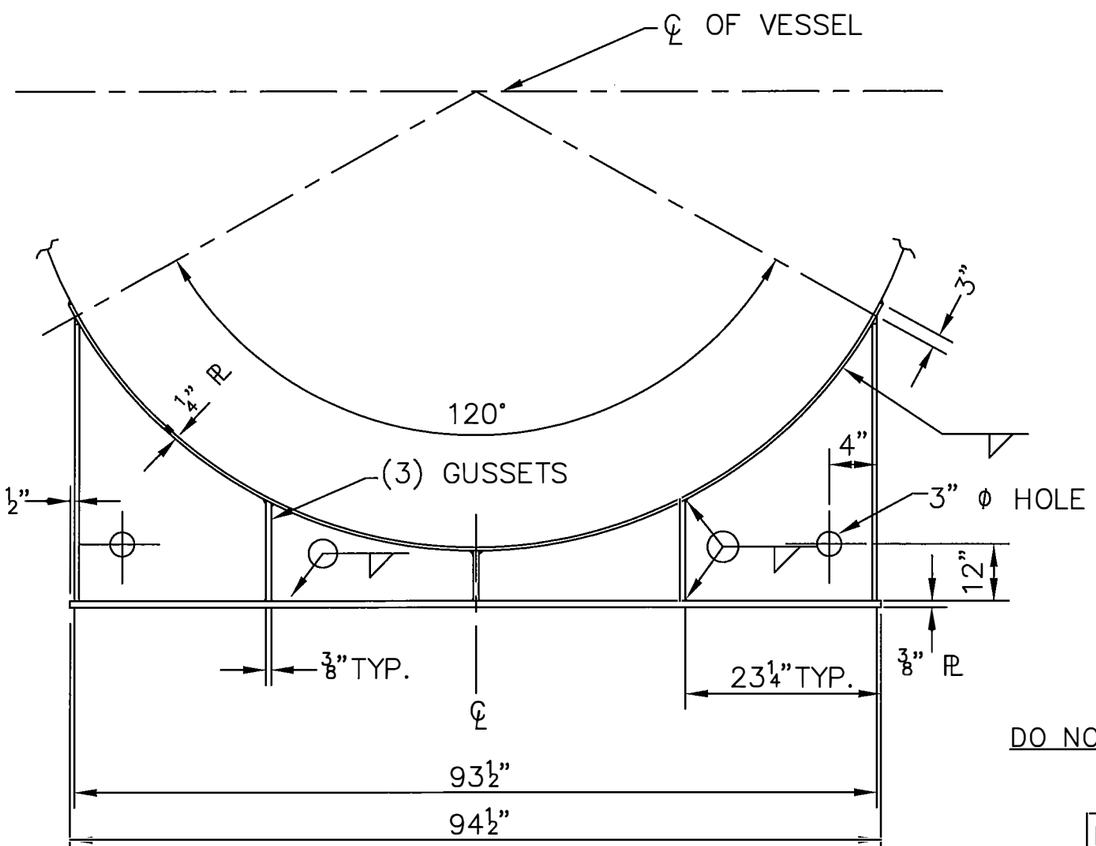


MANWAY DETAIL (B1)(B2)

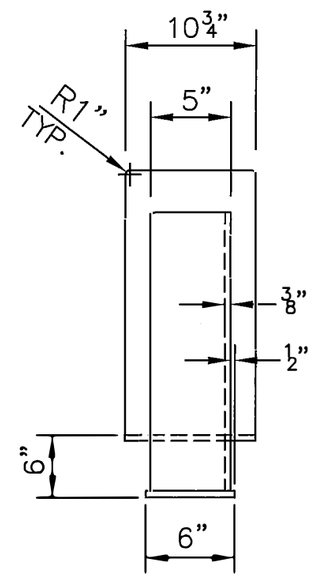
NOTE: CUT VENT TO CONTOUR OF TANK



DETAIL @ E-VENT & NORMAL VENT (A1)(D)

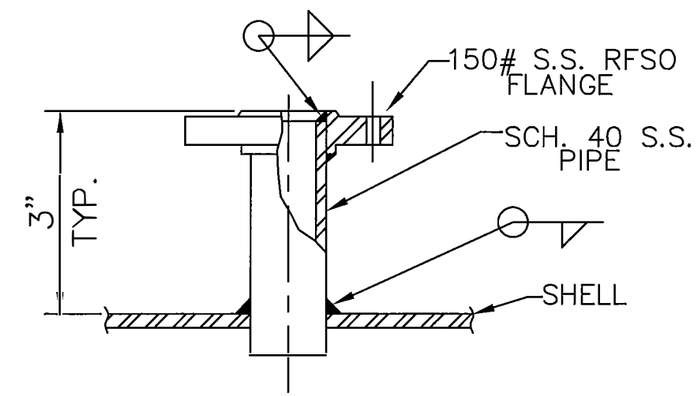


DETAIL @ SADDLE
(3) REQUIRED



DO NOT WELD SADDLES TO TANK

NOTE: ALL FILLET WELDS ARE TO BE 3/16"



DETAIL @ NOZZLE (A2)(A3)(C)(A4)

JS / DR	ORIGINAL ISSUE FOR APPROVAL	2/4 2019	0
BY / AP	REVISION	DATE	NO
NO. REQ'D ONE (1)	ITEM NO. -		

MODERN WELDING CO. of OHIO INC.

P.O. Box 2265
One Modern Way

modern

Newark, Ohio 43055
(740)344-9425

PC CONSTRUCTION
9,000 GALLON S.S. HORIZONTAL SINGLEWALL TANK

DWN. BY	JS	DATE 2/4/2019	SCALE: None
CHK. BY	DR	JOB NO. 30915-1	DWG. NO. 30915-1 0
APR. BY		P.O. NO. RE1800039002	SHT. NO. 2 OF 2

Attachment 4

Burlington Facilities Specification 15410-9
Solvent Mechanical Standard

Rev. 0
7/13/2019

SECTION 15410-9
SOLVENT MECHANICAL STANDARD

Burlington Facilities Standard

Version date 03/04/14, due for review 03/04/16
Owning/Approving Department: S6Q
Burlington, VT

Distribution of this document is not controlled. The current master is online and can be accessed on IBM SiteServ under the Burlington, Vermont web page. Hardcopy versions of this document may be obsolete. The user is responsible to verify that the printed hardcopy version date is the same as the online master document. When obsolete, hardcopy documents must be promptly removed from use and destroyed.

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This document defines the procedures to be followed for all aspects of work performed on the solvent supply, return, and waste system. Covered under this standard are all revisions to the existing system as well as all new installations.

B. Systems covered under this standard:

Virgin Supply	Waste Systems
1. 70/30 (GBL/NBA)	MUV Waste
2. Isopropanol (IPA)	General Solvent Waste
3. n-Methyl Pyrrolidnoe (NMP)	WNMP
4. 0.175 Stripper (AZ400T)	DUV Waste
5. 100% PGMEA	Other systems specified by IBM System Engineer

C. The work covered by the scope of this BFS is not regulated by the Vermont Plumbing Code.

1.02 RELATED SECTIONS

A. 01011 - General Contract Requirements

B. 01100-1 IBM and Construction Manager Risk Assessment Procedures

C. 07270-1 - Fire stopping Penetrations through Rated Walls and Floors

D. 15100-1 - Flashing and Piping Sleeves

E. 15140-1 - Supports and Anchors: Pipe Hangers and Supports

F. 15190-2 - Mechanical Identification - Systems Labeling

G. 15411-7 - Stainless Steel Weld/Material Spec.

H. 18060-1 - Tool Installation: Bulk Solvent

1.03 REFERENCES

A. American Standard Code for Pressure Piping

B. ANSI A13.2 - Identification of Piping.

C. ANSI B31.9 - Building Service Piping.

D. ANSI Z49.1 - Safety in Welding and Cutting.

E. ASME Boiler and Pressure Vessel Code

F. ASME Sec. 9 - Welding and Brazing Qualifications.

G. ASTM A213

H. ASTM A269 - Stainless Steel Tubing

I. ASTM A270 - Seamless Steel Tubing

J. ASTM A380

K. AWS and AISC Welding Standards

1.04 QUALIFICATIONS

A. Any portion of installation deemed improper by IBM, shall be removed and replaced at contractor's expense.

B. All pipe fitters who fabricate and install pipe, and associated equipment shall be qualified (see 15411-7 Section 5.1)

1.05 REGULATORY REQUIREMENTS

A. The work covered by the scope of this BFS is not regulated by the Vermont Plumbing Code.

1.06 DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

A. All components and materials used during the installation of the solvent piping system shall be delivered, stored, and handled in such a way as to prevent damage and/or contamination at all times. Open ends of all stainless steel tubing must remain capped, and all fittings and valves must remain sealed and bagged until use. Wood, cloth, and tape on or in open ends are not acceptable and shall not be used.

B. All components and materials must be stored in the manufacturer's original containers and maintained in such a way as to prevent contamination. They must be stored in a clean, dry, indoor environment.

C. During unpackaging, cutting, fit-up, welding, and other installation activities, any contractor personnel handling components and materials must wear Playtex Nistride Stanslov gloves, or equivalent, with no hand powder.

D. All components and materials which become contaminated during handling shall not be reused, but shall be segregated from the new material, under supervision of the IBM Representative.

1.07 SCHEDULING

A. All work which may impact or disrupt chemical delivery to the Manufacturing tools shall be performed during a scheduled tool shutdown. The time and duration of the shutdown shall be arranged with Manufacturing through IBM Coordinator.

B. The IBM Coordinator will schedule all projects with Contractors and Chemical Operations. Chemical Operations personnel shall be present at the initial cut-in to any solvent piping system. Chemical Systems personnel will isolate all systems to be worked on, and shall activate all systems upon completion of related tests and acceptance. Contractor shall not operate any values connected to the solvent system.

C. Certain work may have to be performed on overtime or during a plant shutdown. Such work shall be discussed and scheduled with IBM during the bidding process.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. Carbon steel (Containment Piping)

1. The containment piping surrounding the solvent supply and/or waste piping shall be 2" carbon steel pipe per ASTM A53 Grade B. The fittings shall be carbon steel per ASTM A234 Grade WPB 300 PSI Rating. Manual welding or threaded connections are both acceptable.

B. Stainless Steel Tubing (Solvent Piping)

1. Tubing used in the fabrication of the solvent supply and/or waste system shall be 1" seamless stainless steel Grade 316L, .065" wall thickness, bright annealed, fully passivated, with as inside surface finish not to exceed 15 Ra microinches (see 15411-7, section 12). Hardness is to be Rb 80 or less. Tubing is to be thermocouple clean per ASTM A632 with the ends prepared for automatic orbital head butt welding.

2. Tubing which is used to fabricate the IBM Manufacturing tool drop shall be same as above except ½" in diameter, .049" wall thickness.

3. Fittings used in the fabrication of the solvent supply and/or waste system shall be .065" wall thickness (.049" for ½" tubing) seamless stainless steel Grade 316L, Bright annealed, fully passivated, with an inside surface finish not to exceed 15 Ra micro-inches. Fittings are to be long-radius type, thermocouple clean per ASTM A632 with 3"-6" extension provided at each end for automatic orbital head butt welding.

C. Compression Fittings (Point-of-Use Only)

1. Compression fittings to be used for solvent tool drops are to be stainless steel Grade 316L. Acceptable product Manufacturers are:

a. Parker Fluid Connectors (A-lok fittings)

b. Swagelok

c. Lokring

2.02 VALVES

A. Manual Ball Valves (Bulk Distribution System)

1. Manual ball valves used in the solvent system shall be three-piece, three or four bolt stainless steel ball valves with lockout capability. Either reduced-port or full-port valves are acceptable unless otherwise specified on the contract documents. Valves are to be assembled dry (without lubricants) and use only Teflon seats and seals. Valves are to have 3" extensions at each end to facilitate automatic orbital butt head welding.

Manufacturer	P/N
Watts Regulator	(size)-S8455LL-M1-VT-AD-OL-Z98
Whitey	SS-65TW12TM3-3989 (¾" VALVE)
	SS-65TW16TM3-3989 (1" VALVE)
Worcester Valve Co.	(size)-WK4466TXBO

B. Manual Ball Valves (Mfg. Point-of-Use)

1. Manual ball valves used in the solvent supply system to provide IBM Manufacturing with point-of-use solvent drops are to be ½" one-piece or three-piece stainless steel ball valves with lockout capability. Valves are to be assembled dry (without lubricant) and use only Teflon seats and seals. Acceptable product Manufacturers are:

Manufacturer	P/N
One-piece:	
Parker Instruments	8A-B8LJ-SS
Whitey Co. "40" Series	SS-45S8
Three-piece:	
Watts Regulator	½"-S8455LL-M1-VT-AD-OL-Z98
Worcester Valve Co.	½"-WK4466TXBO

C. Automatic Valves (Bulk Distribution System)

1. Automatic valves used in the fabrication of the solvent supply system shall consist of a manual valve specified in Section 2.02a coupled with the Manufacturer's recommended

actuator for that valve. Actuators are to be spring-return to provide fail-safe operation. The valve and actuator shall be from the same Manufacturer. Acceptable product Manufacturers are:

Manufacturer	P/N
Watts Regulator	PAS-400 Actuator
Whitey	"130" Series Actuator
Worcester Valve Co.	Series 39 Actuator

D. Automatic Valves (Mfg. Point-of-Use)

1. Automatic valves used in the solvent supply system to provide IBM Manufacturing with point-of-use solvent drops shall consist of a manual valve specified in Section 2.02b coupled with the Manufacturer's recommended actuator for that valve. Actuators are to be spring-return to provide fail-safe operation. The valve and actuator shall be from the same Manufacturer. Acceptable produce Manufacturers are:

Manufacturer	P/N
Parker Instruments	
Watts Regulator	PAS-400 Actuator
Whitey Co.	"130" Series Actuator
Worcester Valve Co.	Series 39 Actuator

E. Check Valves

1. Check valves used in the solvent system shall be stainless steel with Teflon seats and seals. Acceptable product Manufacturers are:

Manufacturer	P/N
Circle Seal	220T-8PP

2.03 SOLVENT LIFT STATIONS

A. The mechanical contractor shall supply all solvent lift stations unless otherwise noted on the contract documents. See Section 18060-1 Tool Installation: Bulk Solvent for complete details of lift station. The electrical contractor shall supply and install the Gems level switch and lift station control panel unless otherwise noted on the contract documents. Acceptable lift station manufacturers are:

1. Innovative Design Solutions

B. Solvent lift station pumps shall be stainless steel with Teflon seats, seals, and diaphragms. Acceptable product Manufacturers are:

Manufacturer	P/N
ARO Corporation	666101-244

C. Solvent lift station level sensors are to be stainless steel. Acceptable product Manufacturers are:

Gems (LS800 Multi-station liquid level switch type 3. Wiring group I. SPSP 15W switch with amphenol connector. Float P/N 14569.

Actuation levels:

L4 = 2.5" NC switch

L3 = 6.5" NO

L2 = 10.5" NO

L1 = 14.5" NO

L0 = 16" (overall length)

D. Refer to Figure 1 for construction details.

2.04 FLAME ARRESTORS

A. Flame arrestors used in the solvent system shall be stainless with cast iron body. Acceptable product Manufacturers are:

Manufacturer	P/N
Protect-O-Seal	Model 2571

2.05 LABELS

A. Labels will be supplied by the contractor unless otherwise noted on the contract documents. Acceptable Manufacturers are:

Brady (1-piece labels)

Creative Labels, Inc.

B. Computer generated wraparound labels are acceptable alternatives. Contractor shall provide sample label prior to use.

C. All labels shall be ¾" high black letters on yellow stock.

2.06 POINT-OF-USE

A. The configuration of the solvent system at the point-of-use shall consist of ½" stainless steel tubing, a manual valve, and an automatic valve as described above. The automatic valve shall have a compression fitting on the downstream (non-pressurized) side of the valve for Manufacturing tool connections.

B. The electrical contractor shall be responsible to supply and install all solvent control panels unless otherwise noted on the contract documents. Refer to chemical control specifications and

details.

2.07 MISCELLANEOUS

A. Miscellaneous Piping and Fittings

1. All pressure gauges, pressure regulators, flow meters, control valves, safety relief valves, storage tanks, and any other component which will comprise the solvent delivery system shall be 304L or 316L stainless steel, use only Teflon or Kalrez seats, seals, and O-rings, and must comply with the material, welding, and cleanliness requirements contained within this specification. Any deviations require the approval of the responsible IBM System Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Tools

1. The contractor shall provide all necessary labor, tools, and materials in order to furnish, fabricate, install, and make operational the items shown on the appropriate drawings unless otherwise noted.

2. All tools used for all phases of installation shall be in proper working condition. They shall be cleaned at least weekly as required.

3. Tubing cutters shall have sharp cutting wheels and employ a dry cutting method. Hacksaws or similar type cutting tools may not be used on stainless steel tubing. Tubing ends shall be properly prepared for automatic orbital welding. Tube ends shall not be deburred after cutting.

B. Gloves

1. Where required throughout this specification, the protective gloves to be worn during the handling, cutting, and installation of the stainless steel piping shall be Playtex Nitride Stanslov gloves or equivalent, with no hand powder.

C. Materials

1. All piping, fittings, and other components used in the solvent system shall be free of any loose grit, filings, chips, dirt, or other foreign substance.

2. Written approval from the IBM Coordinator or responsible IBM Engineer is required prior to the use of substitute materials.

3. All stamping or marking shall be done prior to assembly.

4. No lubricants are permitted in the work area.

D. Support System

1. The piping support system shall be installed prior to the fabrication of any piping system.

2. The piping support system shall be labeled per section 3.02c5 of this document.

E. Cleanliness

1. All materials shall be handled and stored throughout the progress of the job so as to prevent contamination of any type.

2. The contractor shall ensure that the cleanliness standard is maintained throughout all phases of installation.

3. Piping, fittings, valves, and other components used in the solvent system shall be capped and bagged by the manufacturer prior to shipment. Except for cutting, no components shall be removed from their protective packaging until time of assembly into the system.

3.02 INSTALLATION

A. Piping Installation

1. All solvent piping installation shall be performed with the joint approval of Chemical Systems Engineering, and Chemical Services.

2. Do not use existing cable trays, PCV racks, or PCV hangers for solvent piping.

3. During the construction period, the contractor shall assume full responsibility for furnishing and installing necessary temporary tubing and equipment supports. The contractor shall remove the temporary supports as permanent supports are installed.

4. All valves shall be installed so that the handle is readily accessible and operable. When installed above the ceiling, the valve handles shall be oriented to allow operation from below. All new piping shall be installed so as not to interfere with access to existing valve handles.

5. If necessary, valve locations are to be staggered (not to exceed the length of the valve body) to allow space to operate valve handles.

6. All solvent waste piping shall be installed within steel containment piping.

7. All solvent supply piping shall be installed within steel containment piping unless otherwise noted on the contract drawings.

8. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

9. All solvent lines shall terminate with a valved, capped future. Welded tubing shall terminate with a welded valve, a weld-to-thread nipple (2"), and a threaded cap. Piping constructed using compression fittings shall terminate with a valve with a compression cap or plug such that the line can be extended using compression fittings and tubing.

10. Access ports and valved, capped futures shall be installed in the vertical position above the level of the line to prevent pooling of solvents when draining.

11. Solvent piping shall be installed with a minimum number of joints. All welding fittings used with tubing shall be suitable for use with automatic orbital head welding equipment and meet the requirements of Section 2.01 of this Specification.

12. Threaded joints shall be kept to an absolute minimum. Only factory-threaded fittings are acceptable. Threaded joints are to be assembled using TFE joint tape only. Pipe dope shall not be used on the solvent piping under any circumstances.

13. All connections must be leak-free. Where necessary, suitable adapters shall be used for the installation of other components.

14. Tube bends are not permitted on the solvent piping system.

15. The piping between compressed air drops, solenoids, and air valves is to be ¼ inch copper tubing.

16. Work that is incomplete at the end of the working day shall be secured by maintaining a continuous nitrogen purge through the system or by maintaining a 2-5 psi positive pressure throughout the system after capping all open pipe ends and fittings.

17. All completed work must be left with a positive pressure 5-10 psi throughout the system.

B. Chemical Labels

1. The contractor is responsible for supplying all labels required.

2. The chemical label shall identify the chemical species and direction of transport within the piping system. Provide labels per the following specifications:

   a. Chemical labels shall employ the full chemical name. Abbreviations are not acceptable.

   b. Chemical label colors shall be "safety black" lettering & directional arrows on "safety yellow" background in accordance with ANSI Z53.1.

C. Chemical Label Installation

1. All piping installed and connected to the solvent supply and/or waste systems shall be labeled at the termination points as well as every twenty (20) feet along the pipe.

2. Labels shall be installed one (1) foot from every valve.

3. Labels shall be applied on both sides of any wall or barrier penetration, within three (3) feet of the wall or barrier.

4. Label both ends of elbows or significant directional change in the piping, within two (2) feet of the elbow or directional change.

5. Horizontal support members of the solvent piping support system shall be labeled per figure 3.

6. Install labels so as to ensure visibility from normal vantage points. In general, where pipes are located above normal line of vision, labels shall be installed below the horizontal centerline of the pipe. Where pipes are located below the normal line of vision, labels shall be installed above the horizontal centerline of the pipe.

7. When the piping layout does not allow labeling per the above (e.g. due to complexity or inaccessibility of the piping), substitute labeling techniques shall be reviewed and approved by the IBM Coordinator prior to their implementation.

D. Pipe Hangers and Support Elements

1. Support all piping with hangers designed for vertical adjustment using leveling and locking nuts capable of carrying minimum normal load at standard hanger spacing.

2. Do not "piggyback" on existing hangers without the specific approval of the IBM Structural Systems Engineer.

3. Furnish supporting elements per ANSI B31.1 with Addenda MSS SP-58, MSS SP-69 except as otherwise modified and supplemented herein.

4. Supporting elements to comply with BOCA National Building Code/1987 Section 1113.0 for earthquake load.

5. The use of "C" clamps and bean clamps of "C" pattern and any modification thereof is prohibited from use on solvent piping systems.

6. Support uninsulated single pipes by Type 1 or Type 3 attachments per MSS SP-58 and MSS SP-69.

7. Steel hanger rods are to be ½ inch, threaded both ends, threaded one end, or continuous thread unless otherwise noted on the contract drawings.

8. Place a hanger within 12 inches of each horizontal elbow.

9. Use hangers with 1 ½ inch minimum vertical adjustment.

10. Support riser piping independently of connected horizontal piping.

11. Scrape, brush clean, and apply one coat of zinc-rich primer to wilding where pipe support members are welded to structural building framing.

E. Sleeves

1. All tubing passing through masonry partitions shall be fitted with pipe sleeves. Sleeves shall be of sufficient length to pass through the entire thickness of the partition and shall be cut flush with each surface. The contractor shall furnish and set all sleeves and be responsible for their proper installation.

2. Size sleeves large enough to allow for movement due to expansion and contraction.

3. Sleeves for pipes through non-fire rated floors, beams, walls, and footings shall be formed from 18 gauge galvanized steel.

4. Sleeves for pipes through fire-rated and fire-resistive floors and walls shall be constructed from UL Listed prefabricated fire-rated sleeves including seals.

F. Building 973 Piping

1. The piping contractor shall be responsible to core drill all holes through the deck of building 973 as necessary to install solvent piping.

2. The contractor shall install a flame arrestor on the upstairs side of all solvent waste lines in building 973. All new tie-ins to existing waste lines shall include the removal of the basement-level flame arrestors.

G. Electrical Installation

1. All solvent piping installation shall be performed with the joint approval of Chemical Systems Engineering and Chemical Operations.

2. Absolutely no work shall be performed on any Solvent Control System until that system has been tagged by Chemical Operations as safe for contractor work.

3. All wiring for solvent, waste, and CSO (EPO) shall be run below the ceiling and shall be run parallel or perpendicular to the face of the process tools.

4. All boxes and panels shall be placed to allow easy access.

5. The electrical contractor shall supply and install the Gems level switch and lift station control panel on any project requiring solvent lift station installation unless otherwise noted on the contract documents.

6. The electrical contractor shall be responsible to supply and install all solvent control panels unless otherwise noted on the contract documents.

7. Installation shall include the appropriate labeling of all wiring, and boxes. Appropriate labels for all services shall be applied every twenty (20) feet and at all boxes and panels.

   a. All control wiring including chemical control boxes, and lift station panels shall be labeled "Chemical Control".

   b. All Chemical Shut Off (CSO/EPO) wiring shall be labeled "Solvent/Acid System Emergency Off".

   c. All supply panels shall be labeled "Dual Power Supply".

   d. All lift station panels and solvent supply control panels shall be labeled with the appropriate chemical labels.

   e. The contractor shall supply all labels.

3.03 RIPOUT

A. Risk Assessments:

1. IBM Chemical Operations, Construction Management, the IBM Coordinator, and the Contractor will perform a field review with the IFC drawings and specifications. At a minimum the field review will include a visual inspection of the chemical skid and distribution boxes, and the pipeline routings.

2. A Risk Assessment must be followed per Section 01100-1.

B. Chemical Pipe Ripout Procedures:

1. Prior to starting the ripout work, confirm completion of the Risk Assessment and the associated field review and signoffs including: confirmation that pipelines have been purged, and disconnected, and all necessary lockout/tagouts are in place.

2. Notify Chemical Operations of intended work activity at the start of the work and daily thereafter.

3. Start removal of the pipeline at either the valve box or the chemical skid, use a fluorescent ring during demolition; the ring is to be slid along the piepline jacket from the starting point, and always present at the point if jacket/pipeline cut.

4. Develop a checklist, check off activities during demolition.

C. Absolutely no ripout work shall begin on any solvent system until Chemical Operations has tagged the line at all extreme points as safe for contractor work.

D. All items removed from the solvent system are the property of IBM and shall be returned to the IBM Coordinator or to IBM Reclaim per the IBM Coordinator's direction.

E. The contractor shall take special care when removing any items which may be reused. Any equipment or material that is damaged by the contractor during ripout due to carelessness shall be replaced by the contractor at no additional cost to IBM. The IBM Coordinator shall be responsible to determine damage.

F. Certain items are of particular interest to IBM and shall be transported by the contractor to the decontamination area and then to the storage area as directed by the IBM Coordinator. All existing labels shall be left intact, and items shall not leave IBM premises. The following is a list of those items:

1. MECHANICAL

   a. All air-actuated valves

   b. All manual valves

   c. All compression fittings. Compression fittings are to be removed from the pipe but fully assembled and sorted by type.

   d. All solvent lift stations. The IBM Coordinator shall direct the contractor as to the storage location for the solvent pumps after removal.

2. ELECTRICAL

   a. Lift Station Control Panel

   b. Level Sensor / Switch Assembly

   c. Solvent Supply Control Boxes

   d. CSO (EPO) Panels

   e. CSO (EPO) Break-glass Stations

   f. All Controller Hardware

   g. Relay Panels

   h. Terminal Boxes

3.04 TESTING

A. Contractor shall test all new or reworked sections of pipe tubing, and containment jacket.

B. Before testing commences, the contractor shall inspect all systems to ensure compliance with the design drawings. Contractor shall check all safety relief valves, flow meters, pressure regulators, pressure gauges, and all other components for pressure settings and temperature ratings. If adjustments and/or corrections are required to assure conformance with construction drawings, they shall be made before proceeding with the testing activities. Pressure and temperature ratings of installed components shall not be exceeded.

C. All testing shall be done in the presence of an IBM representative. Approval of the IBM representative is required for the installation to be considered complete. Costs of all inspection, testing, and rework shall be borne by the contractor.

D. Notify the IBM representative no less than 48 hours prior to any testing. IBM personnel will shutdown systems as required.

E. Isolate the new system to be tested from the existing system during test procedures.

F. All stainless steel solvent supply, return, and waste network systems shall be pressure tested using filtered Ultra-High Purity (UHP) nitrogen or compressed air at 150 psig. for two hours. A pressure drop of zero (0) psi during the test is considered acceptable. A pressure drop greater than zero constitutes failure of the test. Bottled nitrogen or compressed air used for testing shall be supplied by contractor.

G. The containment piping shall be pressure tested using nitrogen or compressed sir at 10 psig for two hours. A pressure drop of zero (0) psi during the test is considered acceptable. A pressure drop greater than zero constitutes failure of the test. IBM house air may be used to test the containment piping. Any section of the containment piping which would be subject to the system pressure in the event of a leak in the carrier piping must be pressure tested at 150 psig for two hours. The same measurement criteria applies. Bottled gas to be provided by the contractor.

H. Promptly repair any defects or leaks and retest system as necessary. Caulking of leaking joints or any other makeshift measure is not permitted. Completely remake any joint which has failed the pressure test.

I. The contractor shall furnish all test equipment and any temporary system items. Test gauges used for the pressure testing must meet the following specifications:

1. Minimum of 200 psi sith 1.0 psi divisions

2. Accuracy +/- 0.25% of full scale

3. Minimum of 6" diameter dial

4. Knife-edged pointer consistent with U.S.A. Standard B40.1 Grade 3A.

3.05 SAFETY

A. All tools used on flammable solvent systems shall be non-sparking tools (Ampco or equivalent) whenever solvent residuals are present.

B. The contractor shall be responsible for being familiar with the following safety references:

1. OSHA (Contractor)
    a. 1926.350-354 Welding Safety
    b. 1926.404 Hazardous Locations
2. OSHA (IBM)
    a. 1910.101-104 Compressed Gases
    b. 1910.251-254 Brazing
3. NFPA #51BStandard for Fire Prevention in the use of Cutting and Welding Processes

END OF SECTION

Attachment 5

Site Observation Report
And Weld Photos

Rev. 0
7/13/2019

JACOBS

SITE OBSERVATION REPORT

Client Name:	GLOBALFOUNDRIES		
Project Name:	B963 Emerg Solvent Waste Tank Certification	**Time Onsite:**	8:00 am
Project Number:	D32127.06	**Time Offsite:**	11:00 am
Project Location:	Essex Junction, VT	**Observation Date:**	5/30/19
Prepared by:	Josh Harris (for Roger Marcus)	**Issue Date:**	5/30/19
Distribution:			

Item	Description
S1	The existing stainless steel containment liner was observed after the old tank was removed and the liner was cleaned. No defects, corrosion, or failed welds were observed in the liner. No evidence of scrapes, dents, cracks, or abrasion were observed. The one exception is grinder marks where the old tank feet welds were ground off. At these locations there was a second layer of stainless steel protecting the primary containment liner. The scrapes were in the protective layer.
S2	Observation of the concrete containment revealed no damage, degradation, cracks, or erosion. The spalling observed when the tank was last replaced (10 years ago) has since been repaired and the entire basin is in good condition.
S3	Observation of the tank took place on the paved drive adjacent to the containment. A ladder was used to view the top of the tank as well. There were no dents, punctures, cracks, corrosion, or other visible damage. Approximately 80% of the welds were observed, but the remainder could not be observed safely at close distance. All welds were cleaned of slag and appeared consistant. Minimal amounts of spatter was observed on the horizontal welds at the ends of the tank.
S4	Installation of the tank was observed. The tank was successfully lifted via crane into the containment basin without incident. The placement was gentle.

End of Report

6
7
P.R. APP'D
NO. 339 TC
8
9
THE STANLEY
WORKS © 1988
10

Attachment 6

Shop and Field Pressure Test Reports
And Field Test Photo

MODERN WELDING CO. OF OHIO, INC.
ONE MODERN WAY NEWARK, OHIO 43055
PO BOX 4430 NEWARK, OHIO 43055-4430
740-344-9425

CERTIFICATION OF TEST

VESSEL IDENTIFICATION

Customer	PC Constructuion
Customer PO #	RE1800039002
Item #	072-108-09000
MWC Job #	30915-1

TEST SPECIFICATIONS

	PRIMARY TANK	INTER. SPACE / JACKET
Test Pressure	3-5 psi with air (5/6/19)	
Test Media	Soapy water soution	
Test Duration	1 hour	

REMARKS Tank passed the required test

CERTIFICATION

I certify that the above information is correct and that the vessel was tested in my presence with the specifications indicated above.

Modern Welding Rep.

Date 5/21/19

Customer Rep.

Date

OUELLETTE PLUMBING & HEATING CORP.

36 Dorset Lane Williston, Vermont 05495
802-878-6004 FAX 802-878-0658

TEST REPORT

JOB NAME: SOLVENT WASTE TANK REPLACEMENT

SYSTEM: SOLVENT WASTE

LOCATION: B963 N.E. OUTSIDE

TYPE OF TEST: AIR

DURATION: 2 HRS.

WITNESSED BY: LARRY BIEGENT 6/3/19

DATE: 5.31.19

0
1
2
3
4
5
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8
9
10
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12
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psi
ASHCROFT
MADE IN U.S.A.

Attachment 7

Secondary Containment Capacity Calculations

Tank

	Diameter: 9'	Length: 19'	(Design showed 19'-4", but final submittal drawings showed 19'-0")
Volume:	9,000	gallons	

Containment

	Width: 12.5'	Length: 25'	Height: 6.5'
Volume:	W*L*H	2,031	cf
	7.48gal/cf	15,194	gal

Ratio

Containment Vol/Tank Vol	1.69

Containment must at least 100% of tank volume.
Containment is greater than 100% of the tank volume.

GLOBALFOUNDRIES
RCRA SUBPART J CERTIFICATION
FOR
BUILDING 491 DUV SOLVENT WASTE TANK (REPURPOSED)

Prepared for

GLOBALFOUNDRIES
Burlington, Vermont

Prepared by

JACOBS®

July 13, 2019

Rev. 0
7/13/2019

B491 DUV SOLVENT WASTE TANK SYSTEM

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather or evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Elizabeth B. Luecker, P.E.

July 13, 2019
Date

STATE OF VERMONT
ELIZABETH B. LUECKER
NO. 0074052
ENVIRONMENTAL
LICENSED
PROFESSIONAL ENGINEER

CONTENTS

Introduction 1

Description of the Solvent Waste Tank System 1

Hazardous Waste Characteristics 2

Design and Installation Assessment 2

Tank Material Compatibility with Hazardous Waste and Recommendations 10

ATTACHMENTS

Attachment 1 –RCRA Assessment of General Solvent Waste Storage Tanks #2 and #3 by Knight Consulting Engineers, Inc., December 20, 2005

Attachment 2 – Endyne Inc. Laboratory Report dated September 05, 2018 for DUV solvent waste stream

Attachment 3 – Out-of-Service Aboveground Inspection Report for General Solvent #2 Tank, by Aaron Environmental for Knight Consulting Engineers, August 18, 2011

Introduction

This report provides certification of a portion of the Building 491 deep ultraviolet (DUV) Solvent Waste Tank system at the GLOBALFOUNDRIES semiconductor manufacturing facility located in Burlington, Vermont. GLOBALFOUNDRIES has determined that this system will collect, transfer and store waste solvents that meet the definition of a hazardous waste pursuant to rules codified in the Resource Conservation and Recovery Act (RCRA) at 40 CFR 261. The system is subject to the Tank System standards under RCRA Subpart J. This certification is provided in compliance with 40 CFR 265 Subpart J and 40 CFR 264 Subpart J and supports that the tank system has sufficient structural integrity, is conditionally acceptable for the storing of the hazardous waste for which the system was designed, was properly designed and installed, and was repaired, if required pursuant to 40 CFR 265.192(b) and (d) and 40 CFR 264.192(b) and (d). This report certifies the tank system design and installation.

This certification is based on the documentation included in this report which includes the following information:

- Description of the solvent waste collection system.
- Hazardous characteristics of the wastes to be handled.
- Assessment of the collection systems, including,
    - Design standards according to which the tanks and ancillary equipment have been constructed including design of the secondary containment system.
    - Structural design considerations
    - Visual inspection of the tank system.
- Tank Material Compatibility with Hazardous Waste and Recommendations

Description of the Solvent Waste Tank System

The following narrative provides a description of the solvent waste tank system.

Spent solvents are conveyed from usage points around the site to the chemical distribution center (CDC) on the far side of East Loop Road. DUV is used as a photoresist for printing on wafers. When spent, DUV solvents are conveyed via a discrete piping system to the Building 491 DUV Solvent Waste Tank. Previously this tank was used to store general solvent waste and was known as General Solvent Waste Tank #2. Attachment 1 is the Knight Consulting Engineers, Inc. 2005 tank assessment and certification report for General Solvent Waste Tanks #2 and #3. In

November 2017, the General Solvent Waste Tank #2 was re-piped to receive DUV solvent waste instead. This certification is intended to address that change of use.

The Tank System consists of the following:

- One 10,000-gallon capacity tank
- 304 stainless steel construction
- Manufactured in 1996 by Stainless Fabrications, Inc.
- Design and constructed in accordance with the ASME Boiler and Pressure Vessel Code.
- Venting system
- The system is within a concrete containment area containing multiple similar tanks.
- The entire system is covered by an adhered membrane roof on a steel deck on steel columns supported off the containment walls.
- The tank and associated piping are insulated and heat-traced.

This certification applies to the tank and its changed use from managing general solvent waste to managing DUV solvent waste.

Hazardous Waste Characteristics

Based on composition analysis of the CDC waste tanks, GLOBALFOUNDRIES anticipates that the highest possible flash point of any waste entering the Building 491 DUV Solvent Waste Tank would be in the 100-140°F range. This would qualify the waste as Class II liquid, considered combustible, not flammable under the *International Fire Code* (2018).

A laboratory report based on an analysis of DUV solvent waste performed by Endyne Inc. in August 2018 and can be found as Attachment 2 to this tank certification report. This sample is expected to be representative of the DUV solvent waste stream.

Design and Installation Assessment

40 CFR 264.192 and 40 CFR 265.192 require that owners of a new tank system "obtain a written assessment reviewed by an independent, qualified, registered professional engineer attesting that the system has sufficient structural integrity and is acceptable for storing and treating of hazardous waste". The regulations also require that "prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified installation inspector or an independent, qualified registered professional engineer, either of whom is qualified and experienced in the proper installation of tank systems, must inspect the system" per the requirements of 40 CFR 264.192(b) through (f) and 40 CFR 265.192(b) through (f). 40 CFR

264.193(a) through (f) and 40 CFR 265.193(a) through (f) provide the containment and release detection requirements for hazardous waste tank systems. The following pages present the results of the B491 DUV Solvent Waste Tank System assessment.

Applicable portions of 40 CFR 264 Subpart J and 40 CFR 265 Subpart J regulations are provided followed by an assessment of how the design of the system meets the requirements. (The requirements are essentially the same in 40 CFR 264.192 and 264.193(a) through (f), and 40 CFR 265.192 and 265.193(a) through (f). Regulatory citations are provided in italics.

192(a)(1) Design Standards *- Design standard(s) according to which the tank(s) and ancillary equipment is or will be constructed.*

As indicated in Attachment 1, the DUV Solvent Waste Tank (formerly General Solvent Waste Tank #2) was manufactured in 1996 by Stainless Fabrications, Inc., and was designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code.

192(a)(3) Corrosion Protection *- For new tank systems or components in which the external shell of a metal tank or any external metal component of the tank system is or will be in contact with the soil or with water, a determination by a corrosion expert of:*

(i) Factors affecting the potential for corrosion, including but not limited to:

(A) Soil moisture content;
(B) Soil pH;
(C) Soil sulfides level;
(D) Soil resistivity;
(E) Structure to soil potential;
(F) Influence of nearby underground metal structures (e.g., piping);
(G) Stray electric current; and,
(H) Existing corrosion-protection measures (e.g., coating, cathodic protection), and

(ii) The type and degree of external corrosion protection that are needed to ensure the integrity of the tank system during the use of the tank system or component, consisting of one or more of the following:

(A) Corrosion-resistant materials of construction such as special alloys or fiberglass-reinforced plastic;

(B) Corrosion-resistant coating (such as epoxy or fiberglass) with cathodic protection (e.g., impressed current or sacrificial anodes); and

(C) Electrical isolation devices such as insulating joints and flanges.

This section is not applicable. No external portions of the tank systems are in contact with soil or water.

192(a)(4) Vehicular Traffic for Underground Tank Systems *- For underground tank system components that are likely to be affected by vehicular traffic, a determination of design or operational measures that will protect the tank system against potential damage;*

This section is not applicable. No portions of the tank systems are underground such that they are likely to be affected by vehicular traffic.

192(a)(5) Design Considerations - *Design considerations to ensure that:*

(i) Tank foundations will maintain the load of a full tank;

(ii) Tank systems will be anchored to prevent flotation or dislodgment where the tank system is placed in a saturated zone, or is located within a seismic fault zone; and

(iii) Tank systems will withstand the effects of frost heave

The tanks are supported on 12" concrete slabs which were designed by Gustav Getter Associates, New Rochelle, NY, in 1980 to support 10,000-gallon storage tanks. There is no evidence indicating significant settlement of the slabs or movement due to frost action. Based on the performance of the slabs over the past 39 years, it is evident that the slabs were designed properly. The tanks not subject to flotation since the elevation of the top of the vault walls in which the tank sits is low enough that the water would overflow the walls before flotation would occur.

192(b) Proper Installation of Tank Systems – *The owner or operator of a new tank system must ensure that proper handling procedures are adhered to in order to prevent damage to the system during installation. Prior to covering, enclosing, or placing a new tank system or component in use, an independent, qualified installation inspector or an independent, qualified, registered professional engineer, either of whom is trained and experienced in the proper installation of tank systems, must inspect the system or component for the presence of any of the following items:*

(1) Weld breaks;
(2) Punctures;
(3) Scrapes of protective coatings;
(4) Cracks;
(5) Corrosion;
(6) Other structural damage or inadequate construction or installation.

All discrepancies must be remedied before the tank system is covered, enclosed, or placed in use.

No reports of inspections conducted after the tanks were installed have been located. However, an out-of-service inspection was conducted in 2011 by Aaron Environmental under contract to Knight Consulting Engineers; this inspection is included as Attachment 3.

192(c) Backfill for Underground Tanks and Piping *- New tank systems or components and piping that are placed underground and that are backfilled must be provided with a backfill material that is a non-corrosive, porous, homogeneous substance and that is carefully installed so that the backfill is placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported.*

This part of the regulations is not applicable since none of the tank systems or components including piping are placed underground.

192(d) Tightness Testing for New Tank Systems *- All new tanks and ancillary equipment must be tested for tightness prior to being covered, enclosed or placed in use. If a tank system is found not to be tight, all repairs necessary to remedy the leak(s) in the system must be performed prior to the tank system being covered, enclosed, or placed in use.*

The tanks were pressure tested to 31 psi by the manufacturer (see Attachment 1, Appendix 1). Piping to the tanks was pressure tested prior to being placed into service in 1988 (see Attachment 1, Appendix 4). We cannot state whether or not all ancillary piping and equipment was tested.

192(e) Ancillary Equipment Support and Protection *- Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion or contraction.*

Piping is mounted with pipe anchors, supports, or brackets either directly to the building structure or to the slab on grade. When appropriate, supports have incorporated provisions for protection of the ancillary equipment from vibration, expansion, or contraction.

192(f) Corrosion Protection *- The owner or operator must provide the type and degree of corrosion protection necessary, based on the information provided under paragraph (a)(3) of this section, to ensure the integrity of the tank system during use of the tank system. The installation of a corrosion protection system that is field fabricated must be supervised by an independent corrosion expert to ensure proper installation.*

The external shell of the tanks and external components of the tank systems are not in direct contact with the soil.

192(g) Written Statements *- The owner or operator must obtain and keep on file at the facility written statements by those persons required to certify the design of the tank system and supervise the installation of the tank system in accordance with the requirements of paragraphs (b) through (f) of this section to attest that the tank system was properly designed and installed and that repairs, pursuant to paragraphs (b) and (d) of this section were performed. These written statements must also include the certification statement as required in §270.11(d) of this chapter.*

This report provides documentation supporting the certification of the Building 491 DUV Solvent Waste Tank system design and installation.

193(b)(1) & (2) Secondary Containment System Design, Installation, and Operation - *Secondary containment systems must be:*

> *(1) Designed, installed, and operated to prevent any migration of wastes or accumulated liquid out of the system to the soil, ground water, or surface water at any time during the use of the tank system; and*
>
> *(2) Capable of detecting and collecting releases and accumulated liquids until the collected material is removed*

Secondary containment for the Building 491 DUV Solvent Waste Tank system comprises of a ¼" thick ASTM A588-85 Grade B weathering steel plate liner designed by Knight Consulting Engineers in 1987 supported by concrete foundation and walls designed by Gustav Getter Associates in 1980. The mill test reports for the steel plate are in Attachment 1, Appendix 5.

193(c)(1) Compatibility with Waste; Strength and Thickness *- Secondary containment systems must be at a minimum constructed of or lined with materials that are compatible with the waste(s) to be placed in the tank system and must have sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrological forces), physical contact with the waste to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation (including stresses from nearby vehicular traffic);*

The expected wastes present are not significantly corrosive to the steel plate liner in the short term. Leak detection would immediately notify a 24 hour per day control center of any leak, which would call for an immediate cleanup by the onsite spill response team. The liner is protected from wind and snow by the roof and wall structure designed by Knight Consulting Engineers in 1987. It has sufficient strength to prevent failure due to pressure gradients, physical contact with the waste, and the stress of daily operation.

193(c)(2) Foundation *- Placed on a foundation or base capable of providing support to the secondary containment system and resistance to pressure gradients above and below the system and capable of preventing failure due to settlement, compression, or uplift*

The liner is supported by concrete slabs and walls designed by Gustav Getter Associates in 1980. The concrete slab and walls show no signs of cracking or settlement over the last 39 years.

193(c)(3) Leak Detection *- Provided with a leak detection system that is designed and operated so that it will detect the failure of either the primary and secondary containment structure or any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours, or at the earliest practicable time if the existing detection technology or site conditions will not allow detection of a release within 24 hours*

193(c)(4) Leak Collection and Removal *- Sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spills, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within 24 hours, or in as timely a manner as is possible to prevent harm to human health or the environment, if removal of the released waste or accumulated precipitation cannot be accomplished within 24 hours.*

A leak detection system is provided to detect leaks of the tanks into the secondary containment system. It reports back to a command center that is manned at all times. The secondary containment system has sufficient volume to contain the volume of all tanks protected by the containment system. In addition, there is a piping and vault system designed to collect overflow of the secondary containment in the event that such overflow would occur.

193(d) Secondary Containment Device *- Secondary containment for tanks must include one or more of the following devices*

(1) A liner (external to the tank);
(2) A vault;
(3) A double-walled tank; or
(4) An equivalent device as approved by the Regional Administrator

The secondary containment system includes a liner as described earlier in this document.

RCRA requires certain standards to be met depending on the type of secondary containment provided. 40 CFR 264.193(e)(1) and 265.193(e)(1) describe the requirements for external liner systems; 40 CFR 264.193(e)(2) and 265.193(e)(2) describe the requirements for vault systems. Both the 40 CFR 264.193(e)(1) and 264.193(e)(2) standards and the 40 CFR 265.193(e)(1) and 265.193(e)(2) standards are evaluated below for the tank.

193(e)(1) *External liner systems must be:*

193(e)(1)(i) *- Designed or operated to contain 100 percent of the capacity of the largest tank within its boundary*;

The containment area has a capacity of 21,000 gallons. It has two tanks each with a capacity of 10,000 gallons or less.

193(e)(1)(ii) *- Designed or operated to prevent run-on or infiltration of precipitation into the secondary containment system unless the collection system has sufficient excess capacity to contain run-on or infiltration. Such additional capacity must be sufficient to contain precipitation from a 25-year, 24-hour rainfall event*.

The tank and secondary containment are located under cover and are not subject to run-on or precipitation.

193(e)(1)(iii) *- Free of cracks or gaps; and*

The liner was hydrostatically tested and the liner welds were vacuum tested after construction. Test reports can be found in Attachment 1, Appendix 6.

193(e)(1)(iv) *- Designed and installed to surround the tank completely and to cover all surrounding earth likely to come into contact with the waste if the waste is released from the tank(s) (i.e., capable of preventing lateral as well as vertical migration of the waste).*

The liner extends at least 10' beyond the tank in all directions.

193(e)(2)(i) Containment Capacity *- Designed or operated to contain 100 percent of the capacity of the largest tank within its boundary*

The containment area has a capacity of 21,000 gallons. It has two tanks each with a capacity of 10,000 gallons or less.

193(e)(2)(ii) Prevention of Run-on and Precipitation Infiltration *- Designed or operated to prevent run-on or infiltration of precipitation into the secondary containment system unless the collection system has sufficient excess capacity to contain run-on or infiltration. Such additional capacity must be sufficient to contain precipitation from a 25-year, 24-hour rainfall event*

The tank and secondary containment are located under cover and are not subject to run-on or precipitation.

193(e)(2)(iii) Water Stop Construction *- Constructed with chemical-resistant water stops in place at all joints (if any);*

The fully welded steel liner provides a moisture barrier with a high degree of reliability.

193(e)(2)(iv) Interior Coating - *Provided with an impermeable interior coating or lining that is compatible with the stored waste and that will prevent migration of waste into the concrete;*

The fully welded ASTM A588-85 Grade B steel liner provides a moisture barrier with a high degree of reliability.

193(e)(2)(v) Formation of and Ignition of Flammable Vapors - *Provided with a means to protect against the formation of and ignition of vapors within the vault, if the waste being stored or treated*

> *(A) Meets the definition of ignitable waste under §261.21 of this chapter, or*
> *(B) Meets the definition of reactive waste under §261.23 of this chapter and may form an ignitable or explosive vapor;*

The area below the roof is open to the atmosphere on all sides above the containment. This is considered to allow enough air flow to protect against the formation of vapors within the containment.

193(e)(2)(vi) Exterior Moisture Barrier - *Provided with an exterior moisture barrier or be otherwise designed or operated to prevent migration of moisture into the vault if the vault is subject to hydraulic pressure*

The existing basin design is stamped by a PE and is assumed to be designed for local conditions.

Section 193(e)(3), below, does not apply, as containment is not a double-walled tank.

193(e)(3)(i) Integral Structure *– Designed as an integral structure (i.e., an inner tank within an outer shell so that any release from the inner tank is contained by the outer shell.*

193(e)(3)(ii) Corrosion Protection *– Protected, if constructed of metal, from both corrosion of the primary tank interior and the external surface of the outer shell.*

193(e)(3)(iii) Leak Detection *– Provided with a built-in, continuous leak detection system capable of detecting a release with 24 hours or at the earliest practicable time, if the owner or operator can demonstrate to the Regional Administrator, and the Regional Administrator concurs, that the existing leak detection technology or site condition will not allow detection of a release within 24 hours;*

193(f) Secondary Containment for Ancillary Equipment - *Ancillary equipment must be provided with full secondary containment (e.g., trench, jacketing, double-walled piping) that meets the requirements of paragraphs (b) and (c) of this section except for:*

(1) Aboveground piping (exclusive of flanges, joints, valves, and connections) that are visually inspected for leaks on a daily basis;

(2) Welded flanges, welded joints, and welded connections that are visually inspected for leaks on a daily basis;

(3) Sealless or magnetic coupling pumps and sealless valves, that are visually inspected for leaks on a daily basis; and

(4) Pressurized aboveground piping systems with automatic shut-off devices (e.g., excess flow check valves, flow metering shutdown devices, loss of pressure actuated shut-off devices) that are visually inspected for leaks on a daily basis.

All ancillary equipment is protected by the same containment basin as the tank. The primary conveyance piping is double-walled and fully welded.

Tank Material Compatibility with Hazardous Waste and Recommendations

The DUV Solvent Waste Tank (repurposed) is 304 stainless steel construction. The selection is based on GLOBALFOUNDRIES' experience with existing piping installations. However, due to the corrosive properties of the hazardous waste, the type and rate of corrosion of the tank is not quantifiable based on available literature. The following actions are recommended for GLOBALFOUNDRIES to implement to remove the "conditional":

- Maintain annual characterization of the waste stream to continue catalog of the historical waste characteristics. Ensure that this characterization includes the identification of any corrosive components.
- Establish coupon testing to evaluate material compatibility and corrosion rates with the waste profile established.
- Perform inspections (internal if possible and thickness measurements at a minimum) of tank at regular intervals to monitor material compatibility and effect, if any, of the hazardous waste on the system materials of construction.

Attachment 1

2005 RCRA Assessment
of same tank with different contents

Rev. 0
7/13/2019

KNIGHT CONSULTING ENGINEERS, INC.
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CIVIL ENGINEERING
STRUCTURAL ENGINEERING
GEOTECHNICAL ENGINEERING
HYDRAULIC ENGINEERING
CONSTRUCTION INSPECTION
CONSTRUCTION TESTING

December 20, 2005

Andrew Snow
IBM Microelectronics
Essex Junction, VT

Re: RCRA Assessment of General Solvent Waste Storage Tanks #2 and #3
IBM Chemical Distribution Center Tank Farm

Dear Mr. Snow:

This letter reports our assessment of General Solvent Waste Storage Tanks #2 and #3 with respect to the requirements of 40 CFR 264.192 and 40 CFR 264.193. The report will paraphrase each requirement of the CFR and then provide an assessment of the actual conditions with respect to each requirement.

40 CFR 264.192

Requirement (a) - Owner must have a written assessment by a registered professional engineer indicating that the foundation, structural support, and the tank are properly designed, the tank material is compatible with the waste to be stored, and that corrosion protection is provided if necessary. At a minimum the assessment must include the design standard(s) to which the tank was constructed; a list of the hazardous characteristics of the waste to be stored; and an assessment of the foundation's ability to support the load of the tanks, prevent flotation or dislodgement of the tanks, and to prevent movement due to frost action.

Assessment:

1. Both steel tanks are 15'-0" long with a diameter of 9'-11½". They are built of welded ¼" SA240 304 stainless steel plate. Tanks were manufactured in 1996 by Stainless Fabrications, Inc. They were designed and constructed in accordance with the ASME Boiler and Pressure Vessel Code. Copies of the Manufacturer's Data Report for Pressure Vessels are included in Appendix 1.

2. The MSDS sheets for the waste material stored in the tanks can be found in Appendix 2. Knight Consulting Engineers, Inc., has reviewed chemical compatibility charts provided by Cole-Palmer and Cat Pumps to check for compatibility with the 304 Stainless Steel Tanks. The information gathered is summarized in Appendix 7. Knight Consulting Engineers, Inc., does not specialize in chemical engineering, so this data is provided as general information only.

3. The tanks are not in contact with soil. They are protected from rain and snow by a roof a partial height wall. Since that tanks are not in contact with soil or water, additional corrosion protection is not required.

4. The tanks are above ground therefore the requirements for below grade tanks are not applicable.

5. The tanks are supported on 12" concrete slabs which were designed by Gustav Getter Associates, New Rochelle, NY, in 1980 to support 10,000 gallon storage tanks. There is no evidence indicating significant settlement of the slabs or movement due to frost action. Based on the performance of the slabs over the past 25 years it is our opinion that the slabs were designed properly. The tanks are not subject to flotation since the elevation of the top of the vault walls in which the tanks sit is low enough that the water would overflow the walls before flotation would occur.

Requirement (b) – The owner must insure that the tank is not damage during installation. A qualified independent inspector or PE shall inspect the tank systems for the presence of weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, or other structural damage.

Assessment - No reports of inspections conducted after the tanks were installed have been located. The inside of the tanks were cleaned and visually inspected in 2002. A copy of the report of this inspection is included in Appendix 3. IBM visually inspects the exterior of the tanks on a daily basis. A copy of the inspection form is included in Appendix 8. IBM reports that no leaks have occurred in these tanks since they have been in service.

Requirement (c) – Applies to undergound tanks and is therefore not applicable to these tanks.

Requirement (d) – All new tanks and ancillary equipment must be tested for tightness prior to being placed in use.

Assessment – The tanks were pressure tested to 31 psi by the manufacturer (see Appendix 1). Piping to the tanks was pressure tested prior to being placed into service in 1988 (see Appendix 4). We cannot state whether or not all ancillary piping and equipment was tested, however, IBM reports that no leaks have occurred since the tanks were placed in service.

Requirement (e) – Ancillary equipment must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.

Assessment – We have completed a visual assessment of support of the ancillary equipment and it is our opinion that the equipment is so supported.

Requirement (f) – Corrosion protection must be provided as required in section (a). Not applicable.

<u>40 CFR 264.193</u>

Requirement (c)(1) – Secondary containment must be constructed of or lined with materials that are compatible with the waste to be stored and must have sufficient strength and thickness to prevent failure due to pressure gradients, physical contact with the waste, climatic conditions, and the stress of daily operation.

Assessment – The secondary containment system consists of a ¼" thick ASTM A588-85 Grade B weathering steel plate liner designed by Knight Consulting Engineers in 1987 supported by concrete foundation and walls designed by Gustav Getter Associates in 1980. The mill test reports for the steel plate are in Appendix 5. The liner is protected from wind and snow by the roof and wall structure designed by Knight Consulting Engineers in 1987. It has sufficient strength to prevent failure due to pressure gradients, physical contact with the waste and the stress of daily operation. Knight Consulting Engineers, Inc., has reviewed chemical compatibility charts provided by Cole-Palmer and Cat Pumps to check for compatibility with the liner. The information gathered is summarized in Appendix 7. Knight Consulting Engineers, Inc., does not specialize in chemical engineering, so this data is provided as general information only.

Requirement (c)(2) – The secondary containment system must be placed on a foundation capable of providing support to the secondary containment system, resistance to pressure gradients above and below the system, and capable of preventing failure due to settlement.

Assessment – The liner is supported by concrete slabs and walls designed by Gustav Getter Associates in 1980. The concrete slab and walls have sufficient strength to resist pressure gradients above and below the system. They are also capable of preventing failure due to settlement.

Requirement (c)(3) – The secondary containment system must be provided with a leak detection system that is designed and operated so that it will detect the failure of either the primary or secondary containment structure or the presence of any release of hazardous waste or accumulated liquid in the secondary containment system within 24 hours.

Assessment – A leak detection system is provided to detect leaks of the tanks into the secondary containment system. In addition, the secondary containment is visually inspected on a daily basis. No leak detection system is provided to detect leaks of the secondary containment system. There are standpipes above the lowest areas of the concrete slab supporting the liner that could be used to visually inspect for leaks of the secondary containment system, however, IBM does not currently conduct such inspections.

Requirement (c)(4) – The secondary containment system must be sloped or otherwise designed or operated to drain and remove liquids resulting from leaks, spill, or precipitation. Spilled or leaked waste and accumulated precipitation must be removed from the secondary containment system within 24 hours, or in as timely a manner as is possible to prevent harm to human health and the environment.

Assessment – The secondary containment system has sufficient volume to contain the volume of all tanks protected by the containment system. In addition there is a piping and vault system designed to collect overflow of the secondary containment in the very unlikely event that such overflow would occur.

Requirement (d) – The secondary containment system must include one or more of the following devices: (1) a liner (external to the tank); (2) a vault; (3) A double-walled tank; or (4) an equivalent device as approved by the Regional Administrator.

Assessment – The secondary containment system includes a liner as described earlier in this letter.

Requirement (e)(1)(i) – The liner must be designed or operated to contain 100 percent of the capacity of the largest tank within its boundary.

Assessment – Each lined area contains two 10,000 gallon tanks. Each lined area has a secondary containment capacity of approximately 21,000 gallons, so this requirement is satisfied.

Requirement (e)(1)(ii) – The liner must be designed or operated to prevent run-on or infiltration of the precipitation into the secondary containment system.

Assessment – The liner is protected by an overhanging roof and wall structure that prevents precipitation from falling on the containment area. Groundwater cannot flow into the containment area.

Requirement (e)(1)(iii) – The liner must be free from cracks and gaps.

Assessment – The liner was hydrostatically tested and the liner welds were vacuum tested after construction. Test reports can be found in Appendix 6.

Requirement (e)(1)(iv) – The liner must be designed and installed to surround the tank completely and to cover all earth likely to come into contact with the waste if the waste is released from the tank(s) (i.e., capable of preventing lateral as well as vertical migration of the waste).

Assessment – The liner extends at least 10' beyond the tanks in all directions in order to satisfy this requirement.

Requirement (f) – Ancillary equipment must be provided with secondary containment that meets the requirements if paragaphs (b) and (c) of this section except for aboveground piping, welded flanges, welded joints, welded connections, sealless or magnetic coupling pumps, and sealless valves that are inspected on a daily basis.

Assessment – Ancillary equipment is located above the area that is lined as described above and thus meets this requirement. To our knowledge all piping that leaves the lined area is double contained piping. According to IBM, all ancillary equipment is inspected daily.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

Martin W. Hain, P.E.
President
KNIGHT CONSULTING ENGINEERS, INC.

STATE OF VERMONT
MARTIN W. HAIN
No. 5490
REGISTERED
PROFESSIONAL ENGINEER

File: S:\05355\Letter 01.doc

G.S. #2

FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
(Alternative Form for Single Chamber, Completely Shop-Fabricated Vessels Only)
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1 Manufactured and certified by Stainless Fabrication Inc., 4455 West Kearney St., Springfield MO 65803
(Name and address of Manufacturer)

Manufactured for Whitning Turner Contracting Company PO Box 49 Essex Junction, VT 05453
(Name and address of Purchaser)

3. Location of installation IBM Essex Junction, VT
(Name and address)

4. Type Horizontal (Horiz. or vert., tank) | 3792 - 1 (Mfgr's. serial No.) | None (CRN) | DHM0056 Rev B (Drawing No.) | 675 (Nat'l. Bd. No.) | 1996 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1995 (Year)

to 1995 (Addenda (Date)) | none (Code Case Nos.) | none (Special Service per UG-120(d))

6. Shell: SA240 304 (Matl. (Spec. No., Grade)) | .250" (Nom. Thk. (in.)) | 0 (Corr. Allow. (in.)) | 9' 11-1/2" (Diam. I.D. (ft. & in.)) | 15' 0" (Length (overall) (ft. & in.))

7. Seams: WDB (Long. (Welded, Dbl., Sngl., Lap, Butt)) | None (R.T. (Spot or Full)) | .70 (Eff. (%)) | None (H.T. Temp (°F)) | - (Time (hr)) | WDB (Girth (Welded, Dbl., Sngl., Lap, Butt)) | None (R.T. (Spot, Partial, or Full)) | 2 (No. of Courses)

8. Heads: (a) SA240 304 (Spec. No., Grade) (b) SA240 304 (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	Left	.215"	0	120"	8"	-	-	-	-	Concave
(b)	Right	.214"	0	120"	8"	-	-	-	-	Concave

If removable, bolts used (describe other fastening) _____ (Matl., Spec. No. Gr., Size, No.)

9. MAWP 20 psi at max. temp. 140 °F.

Min. design metal temp. - 20 °F at 20 psi. Hydro., pneu., or comb. test pressure 31 psi.

10. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Type	Material	Nom. Thk.	Reinforcement Material	How Attached	Location
Inspection	2	24"	Loose	SA240 304	.250"	None	UW16.1(i)	Shell
Level - Pump	1 - 1	8" - 10"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(i)/Fig2-4(3)	-
In-Vent-Spare	2-1-1	2"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(i)/Fig2-4(3)	-
Lvl-Vent-Gauge	-1-1-1	5"-6"-4"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(i)/Fig2-4(3)	-

11. Supports: Skirt No (Yes or no) Lugs - (No.) Legs - (No.) Others (3) Saddles (Describe) Attached Welded to Pad Over Shell (Where and how)

12. Remarks: Manufacaturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: None
(Name of part, Item number, Mfgr's. name and identifying stamp)

Item is a 10,000 gallon horizontal storage tank, contents unknown. Impact testing exempted per UHA51(d). Completed vessel was hydrostatically tested in horizontal position.

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1. "U" Certificate of Authorization No. 23598 expires November 24, 19 96

Date November 1, 1996 Co. Name Stainless Fabrication, Inc. (Manufacturer) Signed [signature] (Representative)

CERTIFICATE OF SHOP INSPECTION

Vessel constructed by Stainless Fabrication, Inc. at 4455 W. Kearney St., Springfield MO 65803

The undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of MO. employed by Commercial Union Insurance Co. of Boston, MA have inspected the pressure vessel described in this Manufacturer's Data Report on 11-1 19 96, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel descibed in the Manufacturer's Data Report. Furthermore, neither the Inspector nor his Employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 11-1-96 Signed [signature] (Authorized Inspector) Commissions N.B. #11763 'A' (Nat'l Board Incl. endorsement, State, Province and No.)

FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
(Alternative Form for Single Chamber, Completely Shop-Fabricated Vessels Only)
As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

G.S. #3

1. Manufactured and certified by Stainless Fabrication Inc., 4455 West Kearney St., Springfield MO 65803 (Name and address of Manufacturer)

anufactured for Whitning Turner Contracting Company PO Box 49 Essex Junction, VT 05453 (Name and address of Purchaser)

3. Location of installation IBM Essex Junction, VT (Name and address)

4. Type Horizontal (Horiz. or vert., tank) | 3792 - 2 (Mfgr's. serial No.) | None (CRN) | DHM0058 Rev A (Drawing No.) | 676 (Nat'l. Bd. No.) | 1996 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 1995 (Year)

to 1995 (Addenda (Date)) | none (Code Case Nos.) | none (Special Service per UG-120(d))

6. Shell: SA240 304 (Matl. (Spec. No., Grade)) | .250" (Nom. Thk. (in.)) | 0 (Corr. Allow. (in.)) | 9' 11-1/2" (Diam. I.D. (ft. & in.)) | 15' 0" (Length (overall) (ft. & in.))

7. Seams: WDB (Long. (Welded, Dbl., Sngl., Lap, Butt)) | None (R.T. (Spot or Full)) | .70 (Eff. (%)) | None (H.T. Temp (°F)) | - (Time (hr)) | WDB (Girth (Welded, Dbl., Sngl., Lap, Butt)) | None (R.T. (Spot, Partial, or Full)) | 2 (No. of Courses)

8. Heads: (a) SA240 304 (Spec. No., Grade) (b) SA240 304 (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	Left	.216"	0	120"	8"	-	-	-	-	Concave
(b)	Right	.219"	0	120"	8"	-	-	-	-	Concave

If removable, bolts used (describe other fastening) _____ (Matl., Spec. No. Gr., Size, No.)

9. MAWP 20 psi at max. temp. 140 °F.

Min. design metal temp. -20 °F at 20 psi. Hydro., pneu., or comb. test pressure 31 psi.

10. Nozzles, Inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Type	Material	Nom. Thk.	Reinforcement Material	How Attached	Location
Inspection	2	24"	Loose	SA240 304	.250"	None	UW16.1(f)	Shell
Level - Pump	1 - 1	8" - 10"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(f)/Fig2-4(3)	-
In-Vent-Spare	2-1-1	2"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(f)/Fig2-4(3)	-
Lvl-Vent-Gauge	1-1-1	5"-6"-4"	Cl150 flg	SA312 / SA182 304	Sch 40	None	UW16.1(f)/Fig2-4(3)	-

11. Supports: Skirt No (Yes or no) Lugs - (No.) Legs - (No.) Others (3) Saddles (Describe) Attached Welded to Pad Over Shell (Where and how)

12. Remarks: Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: None (Name of part, item number, Mfgr's. name and identifying stamp)

Item is a 10,000 gallon horizontal storage tank, contents unknown. Impact testing exempted per UHA51(d). Completed vessel was hydrostatically tested in horizontal position.

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1. "U" Certificate of Authorization No. 23598 expires November 24, 19 96

Date November 1, 1996 Co. Name Stainless Fabrication, Inc. (Manufacturer) Signed [signature] (Representative)

CERTIFICATE OF SHOP INSPECTION

Vessel constructed by Stainless Fabrication, Inc. at 4455 W. Kearney St., Springfield MO 65803

undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of MO. employed by Commercial Union Insurance Co. of Boston, MA have inspected e pressure vessel described in this Manufacturer's Data Report on 11-1 19 96, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel descibed in the Manufacturer's Data Report. Furthermore, neither the Inspector nor his Employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 11-1-96 Signed [signature] (Authorized Inspector) Commissions N.B. #11763 'A' (Nat'l Board Incl. endorsement, State, Province and No.)

Air Products and Chemicals, Inc.

Date Prepared: 08/18/04
Date Printed: 09/10/04
MSDS No: 308.0000012-006.006

CLEANROOM LP ACETIC ACID 100%

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Material Identity
Product Name: CLEANROOM LP ACETIC ACID 100%
Product Code: 3013100
General or Generic ID: ORGANIC ACID

Company
Air Products and Chemicals, Inc.
7201 Hamilton Blvd.
Allentown, PA 18195-1501

Emergency Telephone Number:
(800) 523-9374 in Continental U.S., Canada and Puerto Rico
(610) 481-7711 other locations
Technical Information:
800-752-1597

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient(s)	CAS Number	% (by weight)
ACETIC ACID	64-19-7	98.0-100.0

3. HAZARDS IDENTIFICATION

Potential Health Effects

Eye
Can cause permanent eye injury. Symptoms include stinging, tearing, redness, and swelling of eyes. Can injure the cornea and cause blindness.

Skin
Can cause permanent skin damage. Symptoms may include redness, burning, and swelling of skin, burns, and other skin damage. Additional symptoms of skin contact may include: abnormal coloring of the skin, Passage of this material into the body through the skin is possible, and may add to toxic effects from breathing or swallowing.

Swallowing
Swallowing this material may be harmful or fatal. Symptoms may include severe stomach and intestinal irritation (nausea, vomiting, diarrhea), abdominal pain, and vomiting of blood. Swallowing this material may cause burns and destroy tissue in the mouth, throat, and digestive tract. Low blood pressure and shock may occur as a result of severe tissue injury.

Inhalation
Breathing of vapor or mist is possible. Breathing this material may be harmful or fatal. Symptoms may include severe irritation and burns to the nose, throat, and respiratory tract.

Symptoms of Exposure
Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: stomach or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways), lung irritation, difficult breathing, lung edema (fluid buildup in the lung tissue).

Continued on next page

Target Organ Effects
Overexposure to this material (or its components) has been suggested as a cause of the following effects in humans: damage to tooth enamel, chronic bronchitis effects on lung function.

Developmental Information
Based on the available information, risk to the fetus from maternal exposure to this material cannot be assessed.

Cancer Information
There is no information available. The chance of this material causing cancer is unknown. This material is not listed as a carcinogen by the International Agency for Research on Cancer, the National Toxicology Program, or the Occupational Safety and Health Administration.

Other Health Effects
No data

Primary Route(s) of Entry
Inhalation, Skin absorption, Skin contact, Eye contact, Ingestion.

4. FIRST AID MEASURES

Eyes
If material gets into the eyes, immediately flush eyes gently with water for at least 15 minutes while holding eyelids apart. If symptoms develop as a result of vapor exposure, immediately move individual away from exposure and into fresh air before flushing as recommended above. Seek immediate medical attention.

Skin
Immediately flush skin with water for at least 15 minutes while removing contaminated clothing and shoes. Seek immediate medical attention. Wash clothing before reuse and discard contaminated shoes.

Swallowing
Seek immediate medical attention. Do not induce vomiting. Vomiting will cause further damage to the mouth and throat. If individual is conscious and alert, immediately rinse mouth with water and give milk or water to drink. If possible, do not leave individual unattended.

Inhalation
If symptoms develop, immediately move individual away from exposure and into fresh air. Seek immediate medical attention; keep person warm and quiet. If person is not breathing, begin artificial respiration. If breathing is difficult, administer oxygen.

Note to Physicians
Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin, lung (for example, asthma-like conditions).

5. FIRE FIGHTING MEASURES

Flash Point
100.0 F (37.7 C) TCC

Continued on next page

Explosive Limit
(for product) Lower 4.0 Upper 19.9 %

Autoignition Temperature
No data

Hazardous Products of Combustion
May form: acid vapors, carbon dioxide and carbon monoxide, various hydrocarbons.

Fire and Explosion Hazards
Vapors are heavier than air and may travel along the ground or be moved by ventilation and ignited by heat, pilot lights, other flames and ignition sources at locations distant from material handling point. Never use welding or cutting torch on or near drum (even empty) because product (even just residue) can ignite explosively.

Extinguishing Media
alcohol foam, water fog, carbon dioxide, dry chemical.

Fire Fighting Instructions
Wear a self-contained breathing apparatus with a full facepiece operated in the positive pressure demand mode with appropriate turn-out gear and chemical resistant personal protective equipment. Refer to the personal protective equipment section of this MSDS.

NFPA Rating
Health - 2, Flammability - 2, Reactivity - 0

6. ACCIDENTAL RELEASE MEASURES

Small Spill
Cover with soda ash. Mix and scoop into a beaker of water.

Large Spill
Eliminate all ignition sources (flares, flames including pilot lights, electrical sparks). Persons not wearing protective equipment should be excluded from area of spill until clean-up has been completed. Stop spill at source. Prevent from entering drains, sewers, streams or other bodies of water. Prevent from spreading. If runoff occurs, notify authorities as required. Pump or vacuum transfer spilled product to clean containers for recovery. Absorb unrecoverable product. Transfer contaminated absorbent, soil and other materials to containers for disposal.

7. HANDLING AND STORAGE

Handling
Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed. All five-gallon pails and larger metal containers, including tank cars and tank trucks, should be grounded and/or bonded when material is transferred. Never add water to acids. Always add acids to water.

Continued on next page

Storage
Do not allow moisture or water contamination of product.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection
Chemical splash goggles and face shield (8" min.) in compliance with OSHA regulations are advised; however, OSHA regulations also permit other type safety glasses. (Consult your industrial hygienist.)

Skin Protection
Wear resistant gloves such as: neoprene, nitrile rubber, To prevent skin contact, wear impervious clothing and boots.

Respiratory Protections
If workplace exposure limit(s) of product or any component is exceeded (see exposure guidelines), a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your industrial hygienist). Engineering or administrative controls should be implemented to reduce exposure.

Engineering Controls
Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below TLV(s).

[illegible]sure Guidelines
Co[illegible]onent

ACETIC ACID (64-19-7)
OSHA PEL 10.000 ppm - TWA
OSHA VPEL 10.000 ppm - TWA
ACGIH TLV 10.000 ppm - TWA
ACGIH TLV 15.000 ppm - STEL

9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point
(for product) 244.0 F (117.7 C) @ 760 mmHg

Vapor Pressure
(for product) 11.000 mmHg @ 68.00 F

Specific Vapor Density
2.100 @ AIR=1

Specific Gravity
1.054 @ 68.00 F

Liquid Density
8.780 lbs/gal @ 68.00 F
1.054 kg/l @ 20.00 C

Continued on next page

Percent Volatiles
100.0 %

Volatile Organic Compounds (VOC)
.000 %

Evaporation Rate
.97 (N-BUTYL ACETATE)

Appearance
No data

State
LIQUID

Physical Form
NEAT

Color
CLEAR & COLORLESS

Odor
No data

pH
2.0

10. STABILITY AND REACTIVITY

Hazardous Polymerization
Product will not undergo hazardous polymerization.

Hazardous Decomposition
May form: acid vapors, carbon dioxide and carbon monoxide, various hydrocarbons.

Chemical Stability
Stable.

Incompatibility
Avoid contact with: amines, halogens, heat, peroxides, strong alkalis, strong mineral acids, strong oxidizing agents, Acid reacts with most metals to release hydrogen gas which can form explosive mixtures with air.

11. TOXICOLOGICAL INFORMATION

No data

Continued on next page

12. ECOLOGICAL INFORMATION

No data

13. DISPOSAL CONSIDERATION

Waste Management Information

Dispose of in accordance with all applicable local, state and federal regulations.

14. TRANSPORT INFORMATION

DOT Information - 49 CFR 172.101

DOT Description:

ACETIC ACID, GLACIAL,8(3),UN2789,II

Container/Mode:

55 GAL DRUM/TRUCK PACKAGE

NOS Component:

None

RQ (Reportable Quantity) - 49 CFR 172.101

Product Quantity (lbs)	Component
5000	ACETIC ACID

Other Transportation Information

The Transport Information may vary with the container and mode of shipment.

15. REGULATORY INFORMATION

US Federal Regulations

TSCA (Toxic Substances Control Act) Status

TSCA (UNITED STATES) The intentional ingredients of this product are listed.

CERCLA RQ - 40 CFR 302.4(a)

Component	RQ (lbs)
ACETIC ACID	5000

CERCLA RQ - 40 CFR 302.4(b)

Materials without a "listed" RQ may be reportable as an "unlisted hazardous substance". See 40 CFR 302.5 (b).

SARA 302 Components - 40 CFR 355 Appendix A

None

Section 311/312 Hazard Class - 40 CFR 370.2

Immediate(X) Delayed(X) Fire(X) Reactive( ) Sudden Release of Pressure( )

Continued on next page

SARA 313 Components - 40 CFR 372.65
None

OSHA Process Safety Management 29 CFR 1910
None listed

EPA Accidental Release Prevention 40 CFR 68
None listed

International Regulations
Inventory Status
AICS (AUSTRALIA) The intentional ingredients of this product are listed.
DSL (CANADA) The intentional ingredients of this product are listed.
ECL (SOUTH KOREA) The intentional ingredients of this product are listed.
EINECS (EUROPE) The intentional ingredients of this product are listed.
ENCS (JAPAN) The intentional ingredients of this product are listed.
IECSC (CHINA) The intentional ingredients of this product are listed.
PICCS (PHILIPPINES) The intentional ingredients of this product are listed.

State and Local Regulations
California Proposition 65
None

New Jersey RTK Label Information

ACETIC ACID	64-19-7

Pennsylvania RTK Label Information

ACETIC ACID	64-19-7

16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.

MSDS Number: **A0446** * * * * * *Effective Date:* ***05/20/04*** * * * * * *Supercedes:* ***02/12/04***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ACETONE

1. Product Identification

Synonyms: Dimethylketone; 2-propanone; dimethylketal
CAS No.: 67-64-1
Molecular Weight: 58.08
Chemical Formula: (CH3)2CO
Product Codes:
J.T. Baker: 5008, 5018, 5356, 5580, 9001, 9002, 9003, 9004, 9005, 9006, 9007, 9008, 9009, 9010, 9015, 9024, 9036, 9125, 9254, 9271, A134, V655
Mallinckrodt: 0018, 2432, 2435, 2437, 2438, 2440, 2443, 2445, 2850, H451, H580, H981

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Acetone	67-64-1	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 0 - None
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache. Higher concentrations can produce central nervous system depression, narcosis, and unconsciousness.
Ingestion:
Swallowing small amounts is not likely to produce harmful effects. Ingestion of larger amounts may produce abdominal pain, nausea and vomiting. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms are expected to parallel inhalation.
Skin Contact:
Irritating due to defatting action on skin. Causes redness, pain, drying and cracking of the skin.
Eye Contact:
Vapors are irritating to the eyes. Splashes may cause severe irritation, with stinging, tearing, redness and pain.
Chronic Exposure:
Prolonged or repeated skin contact may produce severe irritation or dermatitis.
Aggravation of Pre-existing Conditions:
Use of alcoholic beverages enhances toxic effects. Exposure may increase the toxic potential of chlorinated hydrocarbons, such as chloroform, trichloroethane.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT

INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

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5. Fire Fighting Measures

Fire:
Flash point: -20C (-4F) CC
Autoignition temperature: 465C (869F)
Flammable limits in air % by volume:
lel: 2.5; uel: 12.8
Extremely Flammable Liquid and Vapor! Vapor may cause flash fire.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Vapors can flow along surfaces to distant ignition source and flash back. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. This material may produce a floating fire hazard. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, alcohol foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

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7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Acetone:
-OSHA Permissible Exposure Limit (PEL):
1000 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):
500 ppm (TWA), 750 ppm (STEL) A4 - not classifiable as a human carcinogen
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless, volatile liquid.
Odor:
Fragrant, mint-like
Solubility:
Miscible in all proportions in water.
Specific Gravity:
0.79 @ 20C/4C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
56.5C (133F) @ 760 mm Hg
Melting Point:
-95C (-139F)
Vapor Density (Air=1):
2.0
Vapor Pressure (mm Hg):
400 @ 39.5C (104F)
Evaporation Rate (BuAc=1):
ca. 7.7

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Concentrated nitric and sulfuric acid mixtures, oxidizing materials, chloroform, alkalis, chlorine compounds, acids, potassium t-butoxide.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

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11. Toxicological Information

Oral rat LD50: 5800 mg/kg; Inhalation rat LC50: 50,100mg/m3; Irritation eye rabbit, Standard Draize, 20 mg severe; investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Acetone (67-64-1)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material is expected to readily biodegrade. When released to water, this material is expected to quickly evaporate. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition.
Environmental Toxicity:
This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ACETONE
Hazard Class: 3
UN/NA: UN1090
Packing Group: II
Information reported for product/size: 188L

International (Water, I.M.O.)

Proper Shipping Name: ACETONE
Hazard Class: 3
UN/NA: UN1090
Packing Group: II
Information reported for product/size: 188L

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Acetone (67-64-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Acetone (67-64-1)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Acetone (67-64-1)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Acetone (67-64-1)	5000	U002	No

Chemical Weapons Convention: No TSCA 12(b): Yes CDTA: Yes
SARA 311/312: Acute: Yes Chronic: No Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 2[Y]E
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **1** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. HARMFUL IF SWALLOWED OR INHALED. CAUSES

IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

Label Precautions:

Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.

Label First Aid:

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

BREWER SCIENCE INC.
MATERIAL SAFETY DATA SHEET

This Material Safety Data Sheet has been prepared to comply with the EC Directive, Canadian WHMIS and the OSHA Hazard Communication Standard.

SECTION 1: IDENTIFICATION

Product Name: Cyclohexanone

Manufacturer: Brewer Science, Inc.
2401 Brewer Drive
Rolla, MO 65401

Information Phone Number: (573) 364-0300 Fax: (573) 368-3318
Emergency Phone Number: (800) 255-3924 (Chem Tel)
MSDS Date of Preparation: 6/06/96

SECTION 2: HAZARDOUS COMPONENTS

Component	CAS#	%	Exposure Limits
Cyclohexanone	108-94-1	100	50 ppm PEL-TWA 25 ppm TLV-TWA skin

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Clear liquid with a sweet, sharp odor. Flammable Liquid and Vapor. May cause eye and skin irritation. Inhalation of vapors may cause mucous membrane and respiratory irritation, headache, dizziness, nausea and other symptoms of central nervous system depression. May be absorbed through the skin to cause symptoms similar to inhalation. Prolonged overexposure may cause liver and kidney damage.

Potential Health Effects:

Eye: May cause moderate irritation with pain and redness.

Skin: May cause redness, irritation and dryness. Prolonged or repeated exposure may cause defatting and dermatitis. Cyclohexanone is absorbed through the skin causing effects similar to those described under inhalation.

Inhalation: Inhalation of vapors, mists or aerosols may cause mucous membrane and respiratory irritation. Central nervous system depression with symptoms of headache, dizziness, nausea, drowsiness and unconsciousness may also occur.

Ingestion: Swallowing may cause central nervous system depression with headache, nausea, dizziness and unconsciousness; gastrointestinal irritation and injury to the lungs, liver and brain.

Chronic Hazards: Chronic absorption of cyclohexanone may cause damage to the liver and kidneys based on data from animal studies. Cyclohexanone has been reported to cause adverse reproductive effects in laboratory animals.

Carcinogen Status: Cyclohexanone is not listed as a carcinogen by OSHA, IARC or NTP.

Medical Conditions Aggravated by Exposure: Pre-existing skin, liver and kidney diseases.

SECTION 4: FIRST AID MEASURES

Eye: Rinse thoroughly with water for at least 15 minutes, holding the eye lids open to be sure the material is washed out. Get prompt medical attention.

Skin: Remove contaminated clothing. Wash contact area thoroughly with soap and water. Get medical attention if irritation or symptoms of exposure develop. Launder clothing before re-use.

Inhalation: Remove victim to fresh air. Give artificial respiration if needed. Get immediate medical attention.

Ingestion: If the victim is conscious and not convulsing, induce vomiting, keeping the head lower than the hips to prevent aspiration. Get immediate medical attention.

SECTION 5: FIRE AND EXPLOSION DATA

Flash Point: 111 ^{o}F (44°C) Flammable Limits: LEL: 1.1% UEL: 9.5%

Extinguishing Media: Use water fog or spray, alcohol-resistant foam, carbon dioxide or dry chemical.

Special Fire Fighting Procedures: Wear NIOSH approved, positive pressure, self-contained breathing apparatus and full protective clothing. Cool fire exposed containers with water.

Unusual Fire Hazards: Vapors are heavier than air and may travel along surfaces to remote ignition sources and flask back.

Hazardous Decomposition Products: Oxides of carbon.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Spill: Remove all ignition sources such as open flames, spark producing equipment, pilot lights, etc. Wear appropriate protective clothing including impervious gloves, safety goggles and respirator if needed. Ventilate area. Cover with and inert absorbent material and collect into an appropriate container for disposal. Report spills and releases as required to appropriate authorities.

SECTION 7: HANDLING AND STORAGE

Handling: Avoid breathing vapors. Use with adequate ventilation. Avoid contact with the eyes, skin and clothing. Wash thoroughly after handling. Do not eat, drink or smoke in the work area. Keep product away from heat, sparks, flames and all other sources of ignition. No smoking in storage or use areas. Keep containers closed when not in use.

Storage: Store in a cool, dry, well-ventilated location away from incompatible materials. Keep containers closed when not in use.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation: Use with adequate general or local exhaust ventilation to maintain exposure levels below the occupational exposure limit.

Respiratory Protection: If needed, a NIOSH/MSHA approved respirator with organic vapor cartridges may be used. For higher exposures (greater than 10 times the TLV), a supplied air respirator may be required. Respirator selection and use should be based on contaminant type, form and concentration. Follow OSHA 1910.134, ANSI Z88.2 and good Industrial Hygiene practice.

Skin Protection: Impervious gloves such as butyl rubber.

Eye Protection: Chemical safety goggles or face shield recommended.

Other Protective Equipment: Impervious clothing as needed to avoid skin contact and contamination of personal clothing. An eye wash facility should be available in the work area.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: Clear, colorless liquid with a sweet, sharp odor. The odor threshold for cyclohexanone is reported to be 0.12 ppm (mean value).

pH: Not applicable
Boiling Point: 156°C
Vapor Pressure: 5 mmHg @ 26°C
Vapor Density: 3.4

Specific Gravity: 0.97
Melting Point: -45°C
Water Solubility: Insoluble
Evaporation Rate: 0.23 (butyl acetate = 1)

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable

Incompatibility/Conditions to Avoid: Strong oxidizing agents, strong acids, reducing agents. Keep away from heat, sparks, flames and other sources of ignition.

Hazardous Decomposition Products: Oxides of carbon.

Hazardous Polymerization: Will not occur

SECTION 11: TOXICOLOGICAL INFORMATION

Cyclohexanone: Oral rat LD50 - 1535 mg/kg
Inhalation rat LC50 - 8000 ppm/4 hr

SECTION 12: ECOLOGICAL INFORMATION

Cyclohexanone: LC50 pimephales promelas (fathead minnow) 527 mg/l/96 hr flow-through bioassay.

SECTION 13: DISPOSAL INFORMATION

Dispose in accordance with all local, state and federal regulations.

SECTION 14: TRANSPORT INFORMATION

DOT Shipping Name: Cyclohexanone
DOT Hazard Class: 3, PG III
UN Number: UN1915
DOT Labels Required (49CFR172.101): Flammable Liquid (See 173.120 for domestic shipment exemption)
Hazardous Substance (49CFR172.101): Cyclohexanone (RQ 5000 lbs)
Reportable Quantity: Product - 5882 lbs

IATA Shipping Name: Cyclohexanone
IATA Hazard Class: 3, PG III
IATA Hazard Labels Required: Flammable Liquid

UN Number: UN1915

SECTION 15: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

CERCLA 103 Reportable Quantity: 5000 lbs.

SARA TITLE III:

Hazard Category for Section 311/312: Acute Health, Chronic Health, Fire Hazard
Section 313 Toxic Chemicals: This product contains the following chemicals subject to SARA Title III Section 313 Reporting requirements: None
Section 302 Extremely Hazardous Substances (TPQ): None.

EPA Toxic Substances Control Act (TSCA) Status: All of the components of this product are listed on the TSCA inventory.

INTERNATIONAL REGULATIONS:

Canadian WHMIS Classification: Class B-3 (Combustible Liquid); Class D, Division 2, Subdivision B (Toxic Material causing other chronic effects)

Canadian Environmental Protection Act: All of the components of this product are listed on the Canadian Domestic Substances List (DSL).

European Inventory of Commercial Chemical Substances: All of the components of this product are listed on the EINECS inventory.

European Community Labeling Classification: Harmful (Xn)

European Community Risk and Safety Phrases: R10, R20, S25

Australia: All of the components of this product are listed on the Australian Inventory of Chemical Substances.

Japan: All of the components of this product are listed on the Japanese Existing and New Chemical Substances (MITI) list.

STATE REGULATIONS:

California Proposition 65: These products contain the following substances known to the State of California to cause cancer and/or reproductive harm: None

SECTION 16: OTHER INFORMATION

HMIS Ratings: Health - 2* Flammability - 2 Reactivity - 0

NFPA Ratings: Health - 2 Flammability - 2 Reactivity - 0

This above information is believed to be correct but does not propose to be all inclusive and shall be used only as a guide. Brewer Science shall not be held liable for any damage resulting from handling or from contact with the above product.

Material Safety Data Sheet

I. Product and Supplier Information

Product Name: Ethyl Lactate
Product Number: 10741
Product Synonyms: Ethyl-(S)-Lactate, Ethyl(S)-2-Hydroxy Propionate
Above nomenclature is for optically active (L+) form.
Chemical Family or Formula: Ester C5 H10 O3

MSDS Number: UPSEL16A
Publication Date: Nov. 13 2002
Replaces: Mar. 25, 2002

Supplier: Ultra Pure Solutions, Inc.
11485 Commercial Parkway (Bldg 10)
Castroville, CA 95012

Phone: 831-632-2120
Fax: 831-632-2521
Web page: ultrapuresln@earthlink.net

Product Information: 831-632-2120
Transportation Emergency: 800-424-9300

II. Composition and Information on Ingredients

CAS #	SARA 313	Material or Component	%	RQ#	Exposure Limits TWA*	STEL*	WEEL*
687-47-8	No	Ethyl(S) Lactate(optically active)	<100	None	Not established		
97-64-3	No	Ethyl Lactate (Racemic)					

No component is listed in "Threshold and Biological Exposure Indices for 2001" from ACGIH except as noted above.
Components listed in Title III Sec. 313 (EPCRA) are indicated by "Yes" above.
*TWA= Time Weighted Average; STEL= Short Term Exposure Limit; WEEL= Workplace Employee Exposure Level
NE= Not Established

III. Hazards Identification

OSHA Hazard Classification:

Vapors and mists will irritate the nose and throat, and irritate the eyes. Combustible liquid.
Risk of serious damage to eyes. Effects of skin contact may include erythema.

Routes of Entry: Skin, inhalation or eye

Chemical Interactions: Avoid contact with all acids, alkalis and oxidizing agents.

Medical Conditions Aggravated:
None found

Human Threshold Response Data
Odor Threshold: 0.18 ppm
Irritation Threshold: Not established

Hazard Category Classifications and Ratings

Hazard Categories:	Health	Fire	Pressure	Reactivity	Reference 49 CFR 171.8 & 173, OSHA 29 CFR 1910.1200 and SARA 302/311/312/313.
Immediate	Yes	Yes	No	No	
Delayed	No	Yes	No	No	
HMIS Hazard Ratings: Health 1 Fire 2 Instability 0 Other B (Tight fitting goggles, gloves)					
NFPA 704 Hazard Ratings: Health 2 Flammability 2 Reactivity 0 Special NA					
Hazard Ratings: Least: 0 Slight: 1 Moderate: 2 High: 3 Extreme: 4					

Immediate (Acute) Health Effects

Inhalation Toxicity:
Not known

Inhalation Irritation:
Moderate

Skin Contact:
No irritation likely with brief contact.

Skin Absorption:
Not considered a problem.

Eye Contact
Causes eye irritation upon contact with vapor or mist. Wear tight fitting goggles.

Ingestion Irritation:
No data

Ingestion Toxicity:
No data.

AcuteTarget Organ Toxicity:
No data.

Prolonged (Chronic) Health Effects

Carcinogenicity:
This product is not known or reported to be carcinogenic by any reference source including IARC, OSHA or NTP, or ACGIH.

Reproductive and Developmental Toxicity:
No data.

Sensitization:
No data.

Inhalation:
Prolonged or repeated exposure may cause more severe irritation.

Skin Contact:
Prolonged or repeated skin exposure will aggravate symptoms described above.

Skin Absorption:
No data

Ingestion:
Chronic ingestion unlikely.

General :
Not considered a toxic hazard.

Chronic Target Organ Toxicity:
Skin, respiratory tract, kidney, liver.

Supplemental Health Hazard Information:
No additional health information available.

IV. First Aid

Inhalation:
Remove individual to fresh air. If not breathing, give artificial respiration or oxygen as appropriate. Seek medical attention if breathing becomes difficult.

Skin Contact:
Flush skin with water for 15 minutes and remove contaminated clothing. Wash clothing before reuse.

Eyes:
Immediately flush eyes with plenty of water for at least 15 minutes while holding eyelids apart.

Ingestion:
Induce vomiting if person is conscious. Consult a physician.
Never give anything by mouth to an unconscious person.

V. Fire Fighting Measures

Flammability Summary (OSHA):

Flammable. Combustible Liquid for DOT shipment

Flammable Properties:

Flash Point: 141.8 (61C) TCC (ISO2719)

Autoignition Temperature: 752F(400C)

Upper Flammable/Explosive Limit, % in air: 11.4 @ 100C

Lower Flammable/Explosive Limit, % in air: 1.5 @100C

Fire/Explosion Hazards: Flammable liquid. Vapor can travel distances to ignition sources and flash back. OSHA Class II Combustible Liquid. Follow appropriate National Fire Protection Association (NFPA) codes. Hot organic chemical vapors or mists are susceptible to sudden spontaneous combustion when mixed with air. Ignition may occur at temperatures below published autoignition or ignition temperatures. Ignition temperatures decrease with increasing vapor volume and vapor/air contact time and are influenced by pressure changes. Ignition may occur at typical elevated temperature process conditions, especially in processes operating under vacuum if subjected to the sudden ingress of air, or with sudden escape of hot vapors into outside air.

Extinguishing Media:

Water spray, foam, dry chemical or CO2

Do not allow contaminated water to enter sewers or waterways.

Fire Fighting Instructions:

In case of fire, use normal fire fighting equipment including a NIOSH approved self-contained breathing breathing apparatus (SCBA). Use water to cool containers.

Hazardous Combustion Products:

Oxides of carbon.

VI. Accidental Release Measures

Personal Protection for Emergency Situations:

Evacuate the area of all unnecessary personnel. Eliminate any ignition sources until the area is determined to be free from explosion and fire hazards. Contain the release and eliminate its source if this can be done safely.

Spill Mitigation Procedures

Air Release:

Low vapor pressure makes air release unlikely.

Water Release:

This material is soluble in water. Contain all liquid for treatment and/or disposal as a (potential) hazardous waste. Notify all downstream users of possible contamination.

Land Release:

Create a dike or trench to contain materials. Absorb spill with inert material (e.g., dry sand, clay, earth or commercial absorbent), then place in a chemical waste container. Decontaminate all clothing and the spill area using a detergent and flush with large amounts of water. Contain all contaminated water for disposal and/or treatment.

Additional Spill Information:

Stop source of spill as soon as possible and notify appropriate personnel. Utilize emergency response personal protection equipment prior to the start of any response. Evacuate all non-essential personnel. Dispose of spill residues per guidelines under Section XIII, Disposal Considerations.

VII. Handling and Storage

Handling:

Do not take internally. Avoid contact with skin, eyes and clothing. Upon contact with skin or eyes, wash with water. Avoid breathing vapor, mist or gas. Electrically ground all equipment when handling this product. Rinse empty container with water to flush out residue.

Storage

Keep container closed. Store in a cool area away from ignition sources and oxidizers.

Shelf Life Limitations:

See label or certificate of analysis for shelf life if applicable.

Incompatible Materials for Storage:

Compatible with common metals. May soften some plastics.

VIII. Exposure Controls and Personal Protection

Ventilation:

Use general exhaust ventilation if that is sufficient to meet TLV, and for general worker safety and comfort. Explosion proof motors and fans are required. A NIOSH/MSHA approved air supplied respirator is advised in the absence of adequate environmental control.

Protective Equipment for Routine Use of Product Where Appropriate:

Respiratory Protection:

See previous paragraph. Material should be handled or transferred in an approved fume hood or with adequate ventilation.

Respirator Type(s):

NIOSH approved with organic vapor cartridges with appropriate particulate filter may be permissible. Vendor study found breakthrough at 9 hours at 100 ppm DMF and 80% relative humidity.

Skin: Wear tough, impervious butyl gloves to avoid skin contact. Discard gloves with tears, pinholes or wear.

Eyes: Use chemical safety glasses with side shields, safety goggles and/or a full face shield where splashing is possible.

Protective Clothing Type: Impervious butyl rubber apron, boots or suit, as appropriate.

Wear flame resistant clothing if handling above flash point.

Exposure Limit Data : See Section II

Chemical Name NIOSH Level Immediately Dangerous to Life or Health:
Not found

IX. Physical Data

Physical State:	Liquid
Color:	Colorless
Odor:	Characteristic
Molecular Weight:	118.15
pH (@ 25 Deg. C):	Neutral in water
Octanol/Water Coeff:	log Pow=0.08
Solubility in Water:	100%
Bulk Density:	Not applicable
Specific Gravity:	1.03
Vapor Density (Air = 1):	4.07
Vapor Pressure: (@ 25 Deg. C):	No data
Evaporation Rate(Butyl acetate =1):	0.29
Volatiles % by vol.:	100
Boiling Point:	307C
Freezing Point:	-3C

X. Stability and Reactivity

Stability and Reactivity Summary:

Stable under normal conditions.

Reactive Properties:

Sensitivity to mechanical shock:	None
Hazardous Polymerization:	Will not occur
Conditions to Avoid:	Temperatures above 141.8F (61C) (its Flash Point)
Chemical Incompatibility:	Alkalis and oxidizing agents.
Incompatible materials:	Compatible with standard metals of construction. May soften some plastics.
Hazardous Decomposition Products:	Oxides of carbon and nitrogen formed if burned, plus unidentified compounds in black smoke.
Decomposition Temperature:	No data

Product May Be Unstable At Temperatures Above: No data

XI. Toxicological Information

Component Animal Toxicology

Oral LD50 value: Mouse: 2500 mg/kg
Dermal LD50 value: No data
Inhalation LC50 value: Rat 8 hr= 5400 mg/m3
Product Animal Toxicity: Listed above, as product is pure Ethyl lactate.

Skin Irritation:
This material is expected to be moderately irritating, but not a sensitizer.
Eye Irritation:
This material is expected to be slight to severely irritating.
Reproductive and Developmental Toxicity:
Not found in animal testing.
Inhalation: 28 day inhalation: NOAEL (systemic toxicity) 600mg/m3
NOAEL (local toxicity) 200mg/m3

Component Data:
All data refer to Ethyl lactate.
Mutagenicity:
Not known or reported to be mutagenic.
Carcinogenicity:
This chemical is not known or reported to be carcinogenic by any reference source including IARC, OSHA, NTP, or EPA.

XII. Ecological Information

Ecological Toxicity Values:

Environmental fate: Readily biodegradable. BOD=1.43mg O2/mg; COD=1.66 mg/O2/mg
Environmental Toxicity: EC50/48hr/Daphia=683mg/l Fish = 320 mg/l EC50/Algae = 2200 mg/l

XIII. Disposal Considerations

CARE MUST BE TAKEN TO PREVENT ENVIRONMENTAL CONTAMINATION FROM THE USE OF THIS MATERIAL THE USER OF THIS MATERIAL HAS THE RESPONSIBILITY TO DISPOSE OF UNUSED MATERIAL, RESIDUES AND CONTAINERS IN COMPLIANCE WITH ALL RELEVANT LOCAL, STATE AND FEDERAL LAWS
Waste Disposal Summary:
Product as supplied qualifies as "Unlisted Hazardous Waste D001" with the characteristic of ignitability.

Potential US EPA Waste Codes:
U002; D001
Disposal Methods:
Disposed of in accordance with local, state and federal regulations for hazardous waste.
Components subject to land ban restrictions:
No data

XIV. Transportation Information

Proper Shipping Name, Hazard Class, UN/NA Number Packing Group, Emergency Response Guide Number	
Esters, n.o.s., 3, UN3272, PG III ERG 127	
Labels required per 49 CFR 172.101:	Combustible liquid
Size for "Limited quantity" per 49 CFR 173.150-.155:	1 gallon max. in 66# max. container
Reportable Quantity ("RQ") per 49 CFR172.101:	None
Passenger and Cargo Air & Rail (172.101):	60 L
Eff. Jan 1, 2001 Cargo only:	220 L
Vessel Stowage:	A

XV. Regulatory Information

UNITED STATES:
Toxic Substances Control Act (TSCA):
The components of this product are listed on the TSCA Inventory of Existing Chemical Substances.
Pesticide acceptance indication: US EPA Registration Number:
Not applicable

Superfund Amendments and Reauthorization Act (SARA) Title III:
See Section III of this MSDS.
Hazard Categories Sections 311/312 (40 CFR 370.2):
Health:

Acute	Yes	Fire:	Yes	Pressure:	No
Chronic	No	Reactivity:	No		

Physical: None
Emergency Planning & Community Right to Know (40 CFR 355, App. A):
Extremely Hazardous Substance Section 302 - Threshold Planning Quantity:
Not applicable
Reportable Quantity (40 CFR 302.4):
None
Supplier Notification Requirements (40 CFR 372.45), 313 Reportable Components
None

State Right-to-Know Regulations Status of Ingredients

Pennsylvania:	Yes
New Jersey:	No information
Massachusetts:	Yes

XVI. Additional Information

MSDS REVISION STATUS: Revised to meet the ANSI standard of 16 sections.
THIS MATERIAL SAFETY DATA SHEET (MSDS) HAS BEEN PREPARED IN COMPLIANCE WITH THE FEDERAL OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200. THE INFORMATION IN THIS MSDS SHOULD BE PROVIDED TO ALL WHO WILL USE, HANDLE, STORE, TRANSPORT, OR OTHERWISE BE EXPOSED TO THIS PRODUCT. WE BELIEVE THIS INFORMATION TO BE RELIABLE AND UP TO DATE AS OF ITS PUBLICATION DATE, BUT MAKE NO WARRANTY THAT IT IS. IF THIS MSDS IS MORE THAN THREE YEARS OLD YOU SHOULD CONTACT THE SUPPLIER TO MAKE CERTAIN THAT THE INFORMATION IS CURRENT.
MSDS data source: VOPAK USA, Inc.8/27/89.
For label warning see Section III.

2-Propanol

Date of Preparation: September 2003 Revision: 2

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: 2-Propanol
Chemical Formula: $(CH_3)_2CHOH$
Synonyms: Isopropanol, Isopropyl alcohol, Dimethyl carbinol, 2-hydroxypropane, sec-propyl alcohol, rubbing alcohol.
General Use: Solvent, chemical intermediate, dehydrating agent, for denaturing ethyl alcohol, and in the semi-conductor industry.

Manufacturer: Kanto Corporation, 13424 N. Woodrush Way, Portland, OR 97203
Non-Emergency Contact: Customer Service, Phone (503) 283-0405, FAX (503) 240-0409

For All Transportation Emergencies Call CHEMTREC at 1-800-424-9300

Section 2 - Composition / Information on Ingredients

Ingredient Name	CAS Number	% vol
2-propanol	67-63-0	9.0 -99.9
De-Ionized Water	7732-18-5	Balance

Occupational Exposure Limits

	OSHA PEL		ACGIH TLV		NIOSH REL		NIOSH
Ingredient	TWA	STEL	TWA	STEL	TWA	STEL	IDLH
2-propanol	400 ppm 980 mg/m^3	None established	400 ppm 980 mg/m^3	500 ppm 1225 mg/m^3	400 ppm 500 mg/m^3	500 ppm 1225 mg/m^3	2000 ppm (10% LEL)

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Highly flammable, volatile liquid. Inhalation can cause irritation of the eyes and respiratory tract, and central nervous system depression at high concentrations.

HMIS
H 1
F 3
R 0
PPE†
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation, ingestion, skin and eye contact.
Target Organs: Eyes, skin, respiratory system, kidneys, and central nervous system.
Acute Effects
Inhalation: Vapor inhalation is irritating to the respiratory tract and can cause central nervous system depression at high concentrations.
Eye: Exposure to the vapor or direct contact with the liquid causes irritation and possible corneal burns.
Skin: Some irritation may occur after prolonged exposure.
Ingestion: Nausea and vomiting, headache, facial flushing, dizziness, lowered blood pressure, mental depression, hallucinations and distorted perceptions, difficulty breathing, respiratory depression, stupor, unconsciousness, and coma. Kidney insufficiency including decrease or ceasing of urine output, nitrogen retention, and edema may occur. Extensive hemorrhagic tracheobronchitis, bronchopneumonia, and hemorrhagic pulmonary edema may occur.
Carcinogenicity: IARC Class 3 carcinogen
Medical Conditions Aggravated by Long-Term Exposure: Dermatitis or respiratory or kidney disorders.
Chronic Effects: Drying of skin due to defattening and delayed hypersensitivity reactions.

Section 4 - First Aid Measures

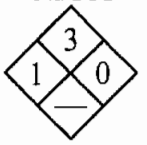
Eye Contact: Gently lift eyelids and flush immediately and continuously with copious amounts of water for at least 15 minutes. Do not allow the victim to rub or keep eyes tightly shut. Consult an ophthalmologist immediately.
Skin Contact: Rinse with flooding amounts of water, while removing contaminated clothing, for at least 15 minutes. Wash with soap and water. Seek medical attention immediately. Wash clothing before reuse.
Ingestion: If the victim is conscious, give large amounts of water. Seek medical attention immediately. Never give anything by mouth to an unconscious or convulsing person.
Inhalation: Remove exposed person to an uncontaminated atmosphere and support breathing. If not breathing, give artificial respiration. Seek medical attention immediately.

After first aid, seek appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Diagnostic test: acetone in urine (from oxidation of 2-propanol in the body). Vomiting may be inadvisable because of the rapid onset of central nervous system depression. Gastric lavage is preferred.

Section 5 - Fire-Fighting Measures

NFPA



Flash Point: 53°F (11.7°C)
Flash Point Method: CC
Auto ignition Temperature: 750 °F (399°C)
LEL: 2.0% v/v
UEL: 12.7% v/v at 200 °F
Flammability Classification: Class 1B Flammable Liquid
Extinguishing Media: Carbon dioxide, dry chemical, water fog, or alcohol-resistant foam.
Unusual Fire or Explosion Hazards: Containers may explode in heat of fire. Vapors may travel to an ignition source and flash back. Liquid will float on water while vapors will sink to low areas creating a potential flash back hazard.
Hazardous Combustion Products: Carbon oxides and acrid smoke.
Fire-Fighting Instructions: If possible without risk, move container from fire area. Apply cooling water to container side until well after fire is out. Stay away from ends of tanks. Use monitor nozzles or unmanned hose holders; if impossible, withdraw and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. Do not release runoff from fire control methods to sewers or waterways.
Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

Small Spills: Shut off all ignition sources. Wear proper protective equipment. Use non-sparking tools and equipment. Take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers.
Large Spills: Notify safety personnel and deny entry. Isolate and ventilate area and stay upwind. Shut off all ignition sources and remove any heat sources. Use non-sparking tools and equipment. Cleanup personnel should wear proper protective equipment and respiratory protection. Water spray may reduce vapor, but may not prevent ignition in closed spaces. Dike far ahead of liquid spill for later disposal.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Always electrically ground all equipment before handling. Use non-sparking tools to open containers. Avoid contact with eyes and skin. Avoid prolonged inhalation of vapors or mists. Use only in areas with adequate ventilation.
Storage Requirements: Store in a cool, well-ventilated area with other flammables away from heat, ignition sources, and incompatibles such as strong oxidizers. Use only undamaged, DOT-approved containers. Avoid ignition sources.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls
Ventilation: Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.
Administrative Controls
Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or non-routine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.
Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.
Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance and Odor: Colorless with a slight odor and bitter taste.
Odor Threshold: 22 ppm
Vapor Pressure: 33 mm Hg
Formula Weight: 60.09 g/mol
Vapor Density (H2O = 1, at 4°C): 2.1
Specific Gravity (H_2O=1, at 4 °C): 0.79
pH: ~ 5.5

Water Solubility: Miscible
Other Solubilities: Soluble in ethyl alcohol, ethyl ether, chloroform, and benzene.
Boiling Point: 180.5°F (82.5°C)
Freezing Point: -127°F (-88.3°C)
Viscosity: 2.1 cP at 77°F (25°C)
Evaporation Rate (ether = 1): 1.5
Critical Pressure: 47 atm

Section 10 - Stability and Reactivity

Stability: 2-Propanol is stable at room temperature in closed containers under normal storage and handling conditions.
Polymerization: Hazardous polymerization will not occur.
Chemical Incompatibilities: Include acetaldehyde, chlorine, ethylene oxide, acids and isocyanates, hydrogen, palladium, nitroform, oleum, phosgene, potassium *t*-butoxide, oxygen (forms unstable persoxides), trinitromethane, barium perchlorate, tetraflouroborate, chromium trioxide, sodium dichromate, sulfuric acid, aluminum, aluminum triisopropoxide, and strong oxidizers. Will attack some forms of plastic, rubber, and coatings.
Conditions to Avoid: Exposure to heat, ignition sources, sunlight, and incompatibilities.
Hazardous Decomposition Products: Thermal oxidative decomposition of 2-propanol can produce carbon dioxide, carbon monoxide and acrid smoke.

Section 11- Toxicological Information

Acute Effects:	Irritation Effects:
Human, oral, TC_{Lo}: 223 mg/kg Human, oral, LD_{Lo}: 3570 mg/kg Rat, oral, LD_{50}: 2735 mg/kg Rat, inhalation, LC_{50}: 1600 ppm/8 hours	Rabbit, eye: 100 mg - severe irritation. Rabbit, skin: 500 mg - mild irritation **Reproductive:** Fetotoxicity, developmental abnormalities, fertility decrease, and menstrual cycle changes. **Chronic Effects:** Drying of skin and delayed hypersensitivity reactions. **Carcinogenic:** IARC Group 3 carcinogen

* See NIOSH, *RTECS (NT8050000),* for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: Guppies, LC_{50}: 7,0606 ppm/7 days. Fathead minnow LC_{50}: 11,830 mg/L/1 hr. BOD = 133%/5 days.
Environmental Degradation: In soil, 2-propanol will volatilize or leach into groundwater. Biodegradation is possible by volatilizing (estimated half-life of 5.4 days) or biodegrading in water. It is not expected to bioconcentrate in fish. In the air, it reacts with photochemically produced hydroxyl radicals with a half-life of one to several days.

Section 13 - Disposal Considerations

Disposal: Microbial degradation is possible by oxidizing 2-propanol to acetone. 2-Propanol can be settled out of water spills by salting with sodium chloride. 2-Propanol may be approved for land disposal after treatment if the concentration is under federal concentration limits. Contact your supplier or a licensed contractor for detailed recommendations.
Regulations: Follow all applicable Federal, state, and local regulations.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Isopropyl alcohol
Hazard Class: 3
ID No.: UN1219
Packing Group: II
Label: 3
Special Provisions (172.102):
IB2, T4, TP1

Packaging Authorizations
Exceptions: 173.150
Non-bulk Packaging: 173.202
Bulk Packaging: 173.242

Quantity Limitations
Passenger, Aircraft, or Railcar: 5L
Cargo Aircraft Only: 60L

Vessel Stowage Requirements
Vessel Stowage: B

Emergency Response Guidebook # 129

Section 15 - Regulatory Information

EPA Regulations:

RCRA Hazardous Waste Number (40 CFR 261.21): D001
RCRA Hazardous Waste Classification (40 CFR 261.21): Characteristics of Ignitibility
EPA Hazardous Waste Number: U140
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
CERCLA Reportable Quantity (RQ): Not listed
SARA 311/312 Codes: Acute, Fire
SARA 313: Listed (only by the manufactures of the strong acid process)
SARA Toxic Chemical (40 CFR 372.65): Not listed
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed
TSCA: Listed

OSHA Regulations:

Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A): Listed

Section 16 - Other Information

Revision Notes: Revised Sections 2, 9, 11, 14, and 15.

Disclaimer: This Material Safety Data Sheet is offered solely for the customer's information, consideration and investigation. Kanto Corporation provides no express or implied warranties with respect to the information contained herein. Although all data included in this MSDS is believed to be accurate, Kanto Corporation makes no representations as to its accuracy, sufficiency or completeness. Conditions of use are beyond Kanto Corporation's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes, and they assume all risks of their use, handling, and disposal of the product, or from the use of, or reliance upon, information contained herein.

MATERIAL SAFETY DATA SHEET

Date Printed: 01/28/2004
Date Updated: 02/10/2003
Version 1.4

Section 1 - Product and Company Information

Product Name	M-CRESOL, 99%
Product Number	C85727
Brand	ALDRICH
Company	Sigma-Aldrich
Street Address	3050 Spruce Street
City, State, Zip, Country	SAINT LOUIS MO 63103 US
Technical Phone:	314 771 5765
Emergency Phone:	414 273 3850 Ext. 5996
Fax:	800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
M-CRESOL	108-39-4	Yes

Formula C7H8O

Synonyms 3-Cresol * m-Cresol (ACGIH:OSHA) * m-Cresole * m-Cresylic acid * 1-Hydroxy-3-methylbenzene * m-Hydroxytoluene * 3-Hydroxytoluene * m-Kresol * m-Methylphenol * 3-Methylphenol * m-Oxytoluene * Phenol, 3-methyl- (9CI) * RCRA waste number U052 * m-Toluol

RTECS Number: GO6125000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic.
Toxic in contact with skin and if swallowed. Causes burns. Readily absorbed through skin. Combustible. Target organ(s): Central nervous system. Lungs.

HMIS RATING

HEALTH: 3*
FLAMMABILITY: 2
REACTIVITY: 1

NFPA RATING

HEALTH: 3
FLAMMABILITY: 2
REACTIVITY: 1

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is

conscious. Call a physician immediately. Do not induce vomiting.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
186.8 °F 86 °C Method: closed cup

EXPLOSION LIMITS
Lower: 1.06 % Upper: 1.35 %

AUTOIGNITION TEMP
558 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Specific Hazard(s): Combustible liquid. Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Cover with dry lime or soda ash, pick up, keep in a closed container, and hold for waste disposal. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Keep away from heat and open

flame. Store in a cool dry place.

SPECIAL REQUIREMENTS
Moisture sensitive.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.
Other: Faceshield (8-inch minimum).

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Discard contaminated shoes. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	TWA	5 PPM
Remarks: Skin			
USA	MSHA Standard-air	TWA	5 PPM (22 MG/M3)
USA	OSHA.	PEL	8H TWA 5 PPM (22 MG/M3) (SKIN)
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	2.3 PPM

Section 9 - Physical/Chemical Properties

Appearance Physical State: Liquid

Property	Value	At Temperature or Pressure
Molecular Weight	108.14 AMU	
pH	N/A	
BP/BP Range	200 - 203 °C	
MP/MP Range	8 - 10 °C	
Freezing Point	N/A	
Vapor Pressure	< 1 mmHg	20 °C
Vapor Density	3.72 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	1.034 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	12.9 Pas	25 °C
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	186.8 °F 86 °C	Method: closed cup
Explosion Limits	Lower: 1.06 %	
	Upper: 1.35 %	
Flammability	N/A	
Autoignition Temp	558 °C	
Refractive Index	1.542	

Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	Other Solvents: MISCIBLE IN ALCOHOL, ETHER SOLUBLE IN ACETONE, ETHANOL,

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Conditions to Avoid: Sensitive to moisture.
Materials to Avoid: Oxidizing agents, Bases.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes burns.
Skin Absorption: Toxic if absorbed through skin. Readily absorbed through skin.
Eye Contact: Causes burns.
Inhalation: Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Central nervous system. Lungs. Liver. Kidneys. Eyes.

SIGNS AND SYMPTOMS OF EXPOSURE
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may result in spasm, inflammation and edema of the larynxand bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Exposure can cause: Damage to the eyes. Damage to the kidneys. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Oral
Rat
242 mg/kg
LD50
Remarks: Behavioral:Somnolence (general depressed activity).
Behavioral:Convulsions or effect on seizure threshold.
Gastrointestinal:Peritonitis.

Inhalation
Rat
> 710 mg/m3
LC50

Skin
Rat
1100 mg/kg
LD50

Oral
Mouse
828 mg/kg
LD50

Intraperitoneal
Mouse
168 MG/KG
LD50

Skin
Rabbit
2050 mg/kg
LD50
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Behavioral:Convulsions or effect on seizure threshold. Gastrointestinal:Changes in structure or function of salivary glands.

IRRITATION DATA

Skin
Rabbit
517 mg
24H
Remarks: Severe irritation effect

Eyes
Rabbit
103 mg
Remarks: Severe irritation effect

CHRONIC EXPOSURE - CARCINOGEN

Species: Mouse
Route of Application: Skin
Dose: 2280 MG/KG
Exposure Time: 20W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and Appendages: Other: Tumors.

CHRONIC EXPOSURE - TERATOGEN

Species: Rabbit
Dose: 134 GM/KG
Route of Application: Subcutaneous
Exposure Time: (6-18D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

CHRONIC EXPOSURE - MUTAGEN

Species: Human
Dose: 10 UMOL/L
Exposure Time: 4H
Cell Type: HeLa cell

Mutation test: DNA inhibition

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: EC50 Algae
Time: 24 h
Value: 110 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 24 h
Value: 25 mg/l

Test Type: LC50 Fish
Species: Leuciscus idus
Time: 48 h
Value: 17 - 19 mg/l

Test Type: LC50 Fish
Species: Onchorhynchus mykiss (Rainbow trout)
Time: 96 h
Value: 8.9 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Cresols
UN#: 2076
Class: 6.1
Packing Group: Packing Group II
Hazard Label: Toxic substances.
Hazard Label: Corrosive
PIH: Not PIH

IATA
Proper Shipping Name: Cresols, liquid (o-, m-, p-)
IATA UN Number: 2076
Hazard Class: 6.1
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T
Indication of Danger: Toxic.
R: 24/25 34
Risk Statements: Toxic in contact with skin and if swallowed. Causes burns.
S: 36/37/39 45
Safety Statements: Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US CLASSIFICATION AND LABEL TEXT

Indication of Danger: Toxic.
Risk Statements: Toxic in contact with skin and if swallowed. Causes burns.
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
US Statements: Readily absorbed through skin. Combustible.
Target organ(s): Central nervous system. Lungs.

UNITED STATES REGULATORY INFORMATION

SARA LISTED: Yes
DEMINIMIS: 1 %
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2004 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

METHYL ALCOHOL

1. Product Identification

Synonyms: Wood alcohol; methanol; carbinol
CAS No: 67-56-1
Molecular Weight: 32.04
Chemical Formula: CH...OH
Product Codes: **J.T. Baker:**
5217, 5370, 5794, 5811, 5842, 5869, 9049, 9063, 9065, 9066, 9067, 9069, 9070, 9071, 9073, 9075, 9076, 9077, 9091, 9093, 9096, 9097, 9098, 9263, 9822, 9830, V654
Mallinckrodt:
3004, 3006, 3016, 3017, 3018, 3024, 3041, 3701, 4295, 5160, 8814, H080, H488, H603, H985, V079, V571

2. Composition/Information on Ingredients

Ingredient	CAS No.	Percent	Hazardous
Methyl Alcohol	67-56-1	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! VAPOR HARMFUL. MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CANNOT BE MADE NONPOISONOUS. FLAMMABLE LIQUID AND VAPOR. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM AND LIVER.

SAF-T-DATA ™ Ratings

(Provided here for your convenience)

Health:	Flammability:	Reactivity:	Contact:
3 - Severe (Poison)	3 - Severe (Flammable)	1 - Slight	3 - Severe (Life)

Lab Protection Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:

A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Once absorbed into the body, it is very slowly eliminated. Symptoms of overexposure may include headache, drowsiness, nausea, vomiting, blurred vision, blindness, coma, and death. A person may get better but then worse again up to 30 hours later.

Ingestion:

Toxic. Symptoms parallel inhalation. Can intoxicate and cause blindness. Usual fatal dose: 100-125 milliliters.

Skin Contact:

Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure.

Eye Contact:

Irritant. Continued exposure may cause eye lesions.

Chronic Exposure:

Marked impairment of vision has been reported. Repeated or prolonged exposure may cause skin irritation.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Flash point: 12°C (54°F) CC
Autoignition temperature: 464°C (867°F)
Flammable limits in air % by volume:
lel: 6.0; uel: 36
Flammable Liquid and Vapor!

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Moderate explosion hazard and dangerous fire hazard when exposed to heat, sparks or flames. Sensitive to static discharge.

Fire Extinguishing Media:

Use alcohol foam, dry chemical or carbon dioxide. (Water may be ineffective.)

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Use water spray to blanket fire, cool fire exposed containers, and to flush non-ignited spills or vapors away from fire. Vapors can flow along surfaces to distant ignition source and flash back.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.
J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

For Methyl Alcohol:
- OSHA Permissible Exposure Limit (PEL):
  200 ppm (TWA)
- ACGIH Threshold Limit Value (TLV):
  200 ppm (TWA), 250 ppm (STEL) skin

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details. Use explosion-proof equipment.

Personal Respirator (NIOSH Approved)

If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). This substance has poor warning properties.

Skin Protection:

Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Characteristic odor.

Boiling Point:
64.5°C (147°F)

Melting Point:
-98°C (-144°F)

Solubility:
Miscible in water.

Specific Gravity:
0.8

pH:
No information found.

% Volatiles by volume @ 21°C (70°F):
100

Vapor Density (Air=1):
1.1

Vapor Pressure (mm Hg):
97 @ 20°C (68°F)

Evaporation Rate (BuAc=1):
5.9

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
May form carbon dioxide, carbon monoxide, and formaldehyde when heated to decomposition.

Hazardous Polymerization:
Will not occur.

Incompatabilities:
Strong oxidizing agents such as nitrates, perchlorates or sulfuric acid. Will attack some forms of plastics, rubber, and coatings. May react with metallic aluminum and generate hydrogen gas.

Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Methyl Alcohol (Methanol) Oral rat LD50: 5628 mg/kg; inhalation rat LC50: 64000 ppm/4H; skin rabbit LD50: 15800 mg/kg; Irritation data-standard Draize test: skin, rabbit: 20mg/24 hr. Moderate; eye, rabbit: 100 mg/24 hr. Moderate. Investigated as a mutagen, reproductive effector.

Cancer Lists

Ingredient	—NTP Carcinogen— Known	Anticipated	IARC Category
Methyl Alcohol (67-56-1)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into water, this material is expected to readily biodegrade. When released into the air, this material is expected to exist in the aerosol phase with a short half-life. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into air, this material is expected to have a half-life between 10 and 30 days. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition.

Environmental Toxicity:
This material is expected to be slightly toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations.

Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: METHANOL
Hazard Class: 3
UN/NA: UN1230 **Packing Group:** II
Information reported for product/size: 358LB

International (Water, I.M.O.)

Proper Shipping Name: METHANOL
Hazard Class: 3, 6.1
UN/NA: UN1230 **Packing Group:** II
Information reported for product/size: 358LB

15. Regulatory Information

Chemical Inventory Status

Ingredient	TSCA	EC	Japan	Australia	Korea	Canada DSL	Canada NDSL	Phil.
Methyl Alcohol (67-56-1)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Federal, State & International Regulations

Ingredient	SARA 302 RQ	SARA 302 TPQ	SARA 313 List	SARA 313 Chemical Catg.	CERCLA	RCRA 261.33	TSCA 8(d)
Methyl Alcohol (67-56-1)	No	No	Yes	No	5000	U154	No

Chemical Weapons Convention: No **TSCA 12(b):** No **CDTA:** No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No Reactivity: No (Pure / Liquid)
Australian Hazchem Code: 2PE **Australian Poison Schedule:** S6
WHMIS: This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings:
Health: 1 Flammability: 3 Reactivity: 0

Label Hazard Warning:
POISON! DANGER! VAPOR HARMFUL. MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CANNOT BE MADE NONPOISONOUS. FLAMMABLE LIQUID AND VAPOR. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM AND LIVER.

Label Precautions:
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Keep container closed.
Use only with adequate ventilation.
Keep away from heat, sparks and flame.

Label First Aid:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If

swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

No changes.

Disclaimer:

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

Prepared By: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

CYANTEK CORPORATION

MATERIAL SAFETY DATA SHEET

MIBK

SECTION I MATERIAL INFORMATION

MANUFACTURER:
CYANTEK CORPORATION
3055 OSGOOD COURT
FREMONT, CA 94539 (510) 651-3341

24 HOUR EMERGENCY RESPONSE
CHEMTREC: 800-424-9300 OR 202-483-7676

NFPA RATING

HEALTH: 2
FIRE: 3
REACTIVITY: 0

0=LEAST, 1=SLIGHT, 2=MODERATE, 3=SERIOUS, 4=SEVERE

TRADE NAME AND SYNONYMS: Methyl Isobutyl Ketone
4-Methyl-2Pentanone

CAS NUMBER: N/A

CHEMICAL FAMILY: Ketonic

FORMULA: C6H120

SECTION II HAZARDOUS INGREDIENTS

INGREDIENTS	% wt)	EXPOSURE LIMITS	CAS NUMBER
Methyl Isobutyl Ketone	100%	50 ppm	108-10-1

SECTION III PHYSICAL AND CHEMICAL CHARACTERISTICS

MOLECULAR WEIGHT:	100.16	SOLUBILITY IN WATER:	Slight
BOILING POINT (F):	241	SPECIFIC GRAVITY (g/ml):	0. 80
FREEZING POINT (F):	-119	APPEARANCE & COLOR:	Colorless Liquid
VAPOR PRESSURE (mm Hg):	16	ODOR:	Strong solvent odor
VAPOR DENSITY (Air =1):	3.5		
PERCENT VOLATILES (by vol):	100%		

CYANTEK CORPORATION

MIBK

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (F): 74° (TAG CLOSED CUP)

EXPLOSION LIMIT (% by vol.): LOWER: 1.4 UPPER: 7.5

EXTINGUISHING MEDIA:
Use alcohol foam, carbon dioxide, dry chemical, or water fog. All types of extinguish media could be used.

SPECIAL FIREFIGHTING PROCEDURES:
Prevent boiling of this formulation. Use water spray to cool exposed containers. Do not use direct attack with high pressure hose. Remove containers to cool area.

FIREFIGHTERS SHOULD WEAR:
Wear face shield. Wear full protective clothing.
Wear self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Explosive air/vapor mixtures may occur.
Dangerous when exposed to heat or flames. Vapors can travel and ignite.
Combustion products are toxic. Substance can react with oxidizing agents.

SECTION V HEALTH HAZARD INFORMATION

LISTED AS CARCINOGEN:
Not listed as a carcinogen.

EFFECTS OF OVEREXPOSURE:
Inhalation of vapors from hot material can cause narcosis. At high concentrations, it may cause drowsiness and unconsciousness. Excessive contact may cause irritation to the skin, eyes, nose, and throat.

FIRST AID PROCEDURES:

EYE CONTACT:
Flush with water at least 15 minutes. Get medical care.

SKIN CONTACT:
Flush affected areas with plenty of water. Get medical attention if skin shows irritation.

INHALATION:
Move to fresh air. Consult a physician if prolonged exposure occurs.

INGESTION:
Give large amounts of water. Get medical attention.

SECTION VI REACTIVITY DATA

STABILITY:
Stable.

INCOMPATIBILITY:
Incompatible with strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS:
Toxic gases and vapors such as carbon monoxide as a result of combustion. No hazardous decomposition products if it does not burn.

HAZARDOUS POLYMERIZATION:
No hazardous polymerization expected.

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN:
Remove all ignition sources. Do not smoke. Ventilate area of spill/leak. Possibility of explosive air/vapor mixture. Avoid skin contact with substance. Contain the spill by diking or absorbing the liquid. Persons with no protective equipment should be restricted from spill area.

WASTE DISPOSAL:
Dispose in approved disposal site following federal, state, local regulations. It does not contain heavy metals. Containers with residue may contain explosive air-vapor mixtures.

SECTION VIII SPECIAL PROTECTION

Use organic vapor respirator.
Use self-contained breathing apparatus for large spills.
Use gloves and face shield.

VENTILATION:
Provide general ventilation and local exhaust to meet TLV requirements in work place.
Ventilation should keep vapor/air mixture below explosive limits.
Use explosion -proof ventilation.

SECTION IX SPECIAL PRECAUTIONS

Separate from oxidizing materials.
Store in a cool area. Use only in an area equipped to handle flammable liquids.

CYANTEK CORPORATION

MIBK

SECTION X REGULATORY INFORMATION

SARA/TITLE III DATA For Ingredients)CERCLA HAZARDOUS SUBSTANCES: Methyl Isobutyl Ketone (5000#) (WITH REPORTABLE QUANTITIES)

EXTREMELY HAZARDOUS SUBSTANCES: None

TOXIC CHEMICALS (SECTION 313): Methyl Isobutyl Ketone

DOT INFORMATION

HAZARD CLASS: Flammable Liquid

PROPER SHIPPING NAME: Methyl Isobutyl Ketone

UN NUMBER: UN 1245

TSCA INVENTORY
(For Ingredients)

TSCA INVENTORY: All ingredients on TSCA inventory.

PROPOSITION 65 STATUS
(For Ingredients)

PROP. 65 LIST: No ingredients on Prop. 65 list.

THE INFORMATION SUPPLIED IS GIVEN IN GOOD FAITH BY CYANTEK CORPORATION. NO WARRANTY, EXPRESSED OR IMPLIED, IS MADE.

Dow (hereinafter, and for purposes of this MSDS only, refers to The Dow Chemical Company and to Dow Chemical Canada Inc.) encourages and expects you to read and understand the entire MSDS, as there is important information throughout the document. Dow expects you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1.1 IDENTIFICATION

Product Name Butyl Acetate, Urethane Grade

1.2 COMPANY IDENTIFICATION

The Dow Chemical Company
Midland, MI 48674

1.3 EMERGENCY TELEPHONE NUMBER

24-HOUR EMERGENCY TELEPHONE NUMBER: (989)636-4400.
Customer Information Number: 1-800-258-2436.

* or ® Indicates a Trademark of The Dow Chemical Company.

2. COMPOSITION INFORMATION

Component	CAS #	Amount (%W/W)
n-Butyl acetate	123-86-4	100 %

3. HAZARDS IDENTIFICATION

3.1 EMERGENCY OVERVIEW

Appearance Colorless

Physical State Liquid

Odor Sweet

Hazards of product
FLAMMABLE LIQUID AND VAPOR.
HARMFUL IF INHALED.
MAY CAUSE EYE IRRITATION.
MAY CAUSE SKIN IRRITATION.
MAY CAUSE ANESTHETIC EFFECTS.
MAY CAUSE RESPIRATORY TRACT IRRITATION.

3.2 POTENTIAL HEALTH EFFECTS

Effects of Single Acute Overexposure

Inhalation Prolonged excessive exposure may cause serious adverse effects, even death. Excessive exposure may cause irritation to upper respiratory tract (nose and throat) and lungs. Symptoms of excessive exposure may be anesthetic or narcotic effects; dizziness and drowsiness may be observed.

Eye Contact May cause moderate eye Irritation. Vapor may cause eye irritation experienced as mild discomfort and redness.

Skin Contact Brief contact is essentially nonirritating to skin. Prolonged or repeated contact may cause skin irritation. May cause drying and flaking of the skin.

Skin Absorption Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Swallowing Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

Chronic, Prolonged or Repeated Overexposure

Effects of Repeated Overexposure In animals, effects have been reported on the following organs: Upper respiratory tract. Has been toxic to the fetus in lab animals at doses nontoxic to the mother.
Other Effects of Overexposure No information available.

Medical Conditions Aggravated by Exposure

Excessive exposure may aggravate preexisting lung disease.

See Section 11 for toxicological information and additional information about potential health effects.

3.3 POTENTIAL ENVIRONMENTAL EFFECTS

See Section 12 for Ecological Information.

4. FIRST AID PROCEDURES

4.1 INHALATION

Move person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

4.2 EYE CONTACT

Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

4.3 SKIN CONTACT

Wash skin with plenty of water.

4.4 SWALLOWING

No emergency medical treatment necessary.

4.5 NOTES TO PHYSICIAN

No specific antidote.
Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. FIRE FIGHTING MEASURES

5.1 FLAMMABLE PROPERTIES - REFER TO SECTION 9, PHYSICAL AND CHEMICAL PROPERTIES

5.2 EXTINGUISHING MEDIA

Extinguish fires with water spray or apply alcohol-type or all-purpose-type foam by manufacturer's recommended techniques for large fires. Use carbon dioxide or dry chemical media for small fires.

5.3 FIRE FIGHTING PROCEDURES

Use water spray to cool fire-exposed containers and structures.

5.4 SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS

Use self-contained breathing apparatus and protective clothing.

5.5 UNUSUAL FIRE AND EXPLOSION HAZARDS

Vapors form from this product and may travel or be moved by air currents and ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges or other ignition sources at locations distant from product handling point.
Static ignition hazard can result from handling and use. Electrically bond and ground all containers, personnel and equipment before transfer or use of material. Special precautions may be necessary to dissipate static electricity for non-conductive containers. Use proper bonding and grounding during product transfer as described in National Fire Protection Association Document NFPA 77.
Avoid splash filling of containers when handling this flammable liquid because static electricity may be generated. Use proper bonding and grounding during product transfer as described in National Fire Protection Association Document NFPA 77.
See Section 8.3 - Engineering Controls
Vapors from this material may settle in low or confined areas or travel a long distance to an ignition source and flash back explosively.

Avoid accumulation of water. Product may be carried across water surface spreading fire or contacting an ignition source.

5.6 HAZARDOUS COMBUSTION PRODUCTS

Burning can produce the following products: Carbon monoxide and/or carbon dioxide. Carbon monoxide is highly toxic if inhaled; carbon dioxide in sufficient concentrations can act as an asphyxiant.

6. ACCIDENTAL RELEASE MEASURES

Steps to be Taken if Material is Released or Spilled:

Ground and bond all containers and handling equipment. Contain spilled material if possible. Collect in suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

Personal Precautions: Isolate area. Eliminate all sources of ignition in vicinity of spill or released vapor to avoid fire or explosion. Ground and bond all containers and handling equipment. Keep unnecessary and unprotected personnel from entering the area. Keep upwind of spill. Ventilate area of leak or spill. For large spills, warn public of downwind explosion hazard. Vapor explosion hazard. Keep out of sewers. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to Section 7, Handling for additional precautionary measures.

Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/ or groundwater. See Section 12, Ecological Information.

7. HANDLING AND STORAGE

7.1 HANDLING

General Handling

Keep away from heat, sparks and flame.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Use with adequate ventilation.
Keep container closed.
Wash thoroughly after handling.

No smoking, open flames or sources of ignition in handling and storage area.
See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Ventilation

Exhaust systems should be designed to move the air away from the source of vapor/aerosol generation and people working at this point

Other Precautions

This product is a poor conductor of electricity and can become electrostatically charged during handling and use (for example: during mixing, filtering or pumping). If this charge reaches a sufficiently high level, static discharges or sparks capable of causing ignition might occur.

7.2 STORAGE

Store at normal ambient temperatures. Additional storage and handling information is available from Dow's Customer Information Group at 1-800-258-2436 (U.S.) or 1-800-331-6451 (Canada).

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

8.1 EXPOSURE LIMITS

Component	Exposure Limits	Skin. Form
n-Butyl acetate	150 ppm TWA8 ACGIH 200 ppm STEL ACGIH 150 ppm TWA8 OSHA 710 mg/m3 TWA8 OSHA	

In the Exposure Limits Chart above, if there is no specific qualifier (i.e., Aerosol) listed in the Form Column for a particular limit, the listed limit includes all airborne forms of the substance that can be inhaled.

A "Yes" in the Skin Column indicates a potential significant contribution to overall exposure by the cutaneous (skin) route, including mucous membranes and the eyes, either by contact with vapors or by direct skin contact with the substance. A "Blank" in the Skin Column indicates that exposure by the cutaneous (skin) route is not a potential significant contributor to overall exposure.

8.2 PERSONAL PROTECTION

Respiratory Protection: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required, use an approved air-purifying or positive-pressure supplied-air respirator depending on the potential airborne concentration.
For emergency and other conditions where the exposure guideline may be exceeded, use an approved positive-pressure self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply.

Ventilation: Exhaust systems should be designed to move the air away from the source of vapor/aerosol generation and people working at this point

Eye Protection: Use chemical goggles.
If exposure causes eye discomfort, use a full-face respirator.

Other Protective Equipment: When prolonged or frequently repeated contact could occur, use chemically protective clothing resistant to this material. Selection of specific items such as faceshield, gloves, boots, apron, or full-body suit will depend on operation.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid

Appearance: Colorless

Odor: Sweet

Flash Point - Closed Cup: **29 °C 84 °F** *, Pensky-Martens Closed Cup ASTM D 93*

Flammable Limits In Air:
Lower **1.7 %(V)**
Upper **7.6 %(V)**

Autoignition Temperature: *No test data available.*

Vapor Pressure: **8 mmHg** *20 °C*

Boiling Point (760 mmHg): **126 °C 259 °F**

Vapor Density (air = 1): **4.0**

Specific Gravity (H2O = 1): **0.8826** *20 °C / 20 °C*

Freezing Point: **-73.5 °C -100.3 °F**

Melting Point: *Not applicable.*

Solubility in Water (by weight): **0.68 %** *20 °C*

pH: *No test data available.*

Molecular Weight: 116.16 g/mol

Octanol/Water Partition Coefficient - Measured: 1.82

Evaporation Rate (Butyl Acetate = 1): 1

Percent Volatiles: 100 Wt%

10. STABILITY AND REACTIVITY

10.1 STABILITY/INSTABILITY Stable.

Incompatible Materials: Strong oxidizing agents. Nitric acid. Sodium hydroxide. Alkali metal hydroxides.

10.2 HAZARDOUS POLYMERIZATION Will not occur.

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Peroral

Rat; LD50 = > 14500 mg/kg

Percutaneous

The LD50 for skin absorption in rabbits is >5000 mg/kg.

Inhalation

LC50 Rat; 4 hours = 2000 ppm

SENSITIZATION (ANIMAL AND HUMAN STUDIES)

Did not cause allergic skin reactions when tested in guinea pigs., Did not cause allergic skin reactions when tested in humans.

DEVELOPMENTAL TOXICITY

Birth defects are unlikely. Exposures having no effect on the mother should have no effect on the fetus. Did not cause birth defects in animals; other effects were seen in the fetus only at doses which caused toxic effects to the mother.

REPRODUCTIVE TOXICITY

In animal studies, did not interfere with reproduction.

GENETIC TOXICOLOGY

In Vitro

In vitro genetic toxicity studies were negative.

SIGNIFICANT DATA WITH POSSIBLE RELEVANCE TO HUMANS

In animals, effects have been reported on the following organs:
Upper respiratory tract.

12. ECOLOGICAL INFORMATION

12.1 ENVIRONMENTAL FATE

Biodegradation under aerobic static laboratory conditions is high (BOD20 or BOD28/ThOD > 40%). Degradation is expected in the atmospheric environment within minutes to hours.

BOD (% Oxygen consumption)

	Day 5	Day 10	Day 15	Day 20	Day 28/30
	57 %	67 %		82 %	

12.2 ECOTOXICITY

Material is slightly toxic to aquatic organisms on an acute basis (LC50/EC50 between 10 and 100 mg/L in the most sensitive species tested).

Toxicity to Aquatic Invertebrates
water flea (Daphnia magna); Acute LC50
Result value: 44 mg/L

Toxicity to Fish
fathead minnow (Pimephales promelas); Acute LC50
Result value: 18 mg/L

Toxicity to Fish
bluegill (Lepomis macrochirus); Acute LC50
Result value: 100 mg/L

Toxicity to Fish
tidewater silverside (Menidia beryllina); Acute LC50
Result value: 185 mg/L

12.3 FURTHER INFORMATION

Bioconcentration potential is low (BCF < 100 or Log Pow < 3). Potential for mobility in soil is very high (Koc between 0 and 50). Log soil organic carbon/water partition coefficient (log Koc) is estimated to be: 1.53 - 2.37 Henry's Law Constant (H) is estimated to be: 3.2E-04 atm-m3/mole. Log air/water partition coefficient (log Kaw) is -1.87.
Theoretical Oxygen Demand (THOD) - calculated: 2.21 mg/mg

Octanol/Water Partition Coefficient - Measured: 1.82

13. DISPOSAL CONSIDERATIONS

13.1 DISPOSAL

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. DOW HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION 2 (Composition/ Information on Ingredients). FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device. As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Group at 1-800-258-2436 or 1-989-832-1556 (U.S.), or 1-800-331-6451 (Canada) for further details .

14. TRANSPORT INFORMATION

14.1 U.S. D.O.T.

NON-BULK
Proper Shipping Name : BUTYL ACETATE
Hazard Class : 3
ID Number : UN1123
Packing Group : PG III

BULK
Proper Shipping Name : BUTYL ACETATE
Hazard Class : 3
ID Number : UN1123
Packing Group : PG III

Reportable Quantity : 5,000 LB

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

15.1 FEDERAL/NATIONAL

OSHA HAZARD COMMUNICATION STANDARD

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 TITLE III (EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986) SECTION 313

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (CERCLA) SECTION 103

This product contains the following substances which are subject to CERCLA Section 103 reporting requirements and which are listed in 40 CFR 302.4.

Component	CAS #	Amount
n-Butyl acetate	123-86-4	<= 100.0000%
Isobutyl acetate	110-19-0	<= 0.1000%
Butanol	71-36-3	<= 0.0400%
Isoamyl acetate	123-92-2	<= 0.0200%

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 TITLE III (EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986) SECTION 302

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 TITLE III (EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986) SECTIONS 311 AND 312

Delayed (Chronic) Health Hazard : Yes
Fire Hazard : Yes
Immediate (Acute) Health Hazard : Yes
Reactive Hazard : No
Sudden Release of Pressure Hazard : No

TOXIC SUBSTANCES CONTROL ACT (TSCA)

All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30.

EUROPEAN INVENTORY OF EXISTING COMMERCIAL CHEMICAL SUBSTANCES (EINECS)

The components of this product are on the EINECS inventory or are exempt from EINECS inventory requirements.

CEPA - DOMESTIC SUBSTANCES LIST (DSL)

All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

15.2 STATE/LOCAL

PENNSYLVANIA (WORKER AND COMMUNITY RIGHT-TO-KNOW ACT): PENNSYLVANIA HAZARDOUS SUBSTANCES LIST AND/OR PENNSYLVANIA ENVIRONMENTAL HAZARDOUS SUBSTANCE LIST:

The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Component	CAS #	Amount
n-Butyl acetate	123-86-4	<= 100.0000%

PENNSYLVANIA (WORKER AND COMMUNITY RIGHT-TO-KNOW ACT): PENNSYLVANIA SPECIAL HAZARDOUS SUBSTANCES LIST:

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

CALIFORNIA PROPOSITION 65 (SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986)

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

CALIFORNIA SCAQMD RULE 443.1 (SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT RULE 443.1, LABELING OF MATERIALS CONTAINING ORGANIC SOLVENTS)

VOC: 881 g/l Vapor Pressure 8 mmHg @ 20° C

This section provides selected regulatory information on this product including its components. This is not intended to include all regulations. It is the responsibility of the user to know and comply with all applicable rules, regulations and laws relating to the product being used.

16. OTHER INFORMATION

16.1 ADDITIONAL INFORMATION

Additional information on this product may be obtained by calling Dow's Customer Information Group at 1-800-258-2436 (U.S.) or 1-800-331-6451 (Canada).

16.2 HAZARD RATING SYSTEM

NFPA ratings for this product are: H - 3 **F** - 3 **R** - 0

These ratings are part of a specific hazard communication program and should be disregarded where individuals are not trained in the use of this hazard rating system. You should be familiar with the hazard communication programs applicable to your workplace.

16.3 RECOMMENDED USES AND RESTRICTIONS

For industrial use.

16.4 REVISION

Version: 8.0
Revision: 09/14/2004
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

16.5 LEGEND

Bacterial/NA	Non Acclimated Bacteria
F	Fire
H	Health
IHG	Industrial Hygiene Guideline
N/A	Not available
NFPA	National Fire Protection Association
O	Oxidizer
R	Reactivity
TS	Trade secret
VOL/VOL	Volume/Volume
W	Water Reactive
W/W	Weight/Weight

NOTICE: Dow urges each customer or recipient of this MSDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this MSDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given., Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that its activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of Dow, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product., Due to the proliferation of sources for information such as manufacturer-specific MSDSs, Dow is not and cannot be responsible for MSDSs obtained from any source other than Dow. If you have obtained a Dow MSDS from a non-Dow source or if you are not sure that a Dow MSDS is current, please contact Dow for the most current version.

Safety data sheet
N-Methylpyrrolidone EG

1. Substance/preparation and company identification

Company
BASF CORPORATION
100 Campus Drive
Florham Park, NJ 07932

24 Hour Emergency Response Information
CHEMTREC: (800) 424-9300
BASF HOTLINE: (800) 832-HELP

Molecular formula:	C(5)H(9)NO
Molecular weight:	99.00 g/mol
Chemical family:	heterocyclic, amines
Synonyms:	NMP TECHNICAL

2. Composition/information on ingredients

CAS Number	Content (W/W)	Chemical name
872-50-4	>= 99.8 %	N-Methylpyrrolidone
60544-40-3	<= 0.4 %	Pyrrolidinone, dimethyl-

3. Hazard identification

Emergency overview

DANGER: COMBUSTIBLE LIQUID. MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION.
PROLONGED OR REPEATED CONTACT MAY RESULT IN DERMATITIS.
INGESTION MAY CAUSE GASTRIC DISTURBANCES.
CONTAINS MATERIAL THAT MAY ADVERSELY AFFECT THE DEVELOPING FETUS BASED ON ANIMAL DATA.
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.
Use with local exhaust ventilation.
Wear chemical resistant protective gloves.
Avoid contact with the skin, eyes and clothing.

Potential health effects

Primary routes of exposure
Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquified gases.

Acute toxicity:
Information on: n-Methylpyrrolidone
NMP is moderately toxic by all routes of exposure; however, due to its low vapor pressure, dermal exposure represents the primary hazard in most settings. Contact with the liquid results in moderate eye irritation and may cause temporary corneal clouding. Skin contact results in mild irritation; prolonged skin contact may cause redness and dermatitis. Inhalation of the vapors of NMP may result in respiratory irritation. Accidental ingestion of the liquid causes gastric disturbances and may result in nausea and vomiting.

Irritation:
Information on: n-Methylpyrrolidone
Contact with the liquid can result in irritation. Skin contact should be avoided. Prolonged skin contact may result in redness and dermatitis.

Repeated dose toxicity:
Information on: n-Methylpyrrolidone

In animal studies NMP was embryotoxic by the oral, dermal and intraperitoneal routes, but only after repeated high doses that approached the LD50 or were maternally toxic. Embryotoxicity without maternal toxicity was observed at a high concentration in one rat inhalation study, but not in others. Testicular effects in rats were noted after repeated, high-dose oral and inhalation exposures. NMP was not carcinogenic in rats receiving lifetime exposures via inhalation (100 ppm) or the diet. This product contains a chemical known to the state of California to cause birth defects or other reproductive harm. In a mouse cancer study, high doses of NMP produced liver carcinomas & adenomas in males (1089 mg/kg) and liver adenomas in females (1399 mg/kg). Middle doses caused liver hypertrophy in males (173 mg/kg) but not females (221 mg/kg). No effects were noted at low doses in either males (89 mg/kg) or females (115 mg/kg).

Medical conditions aggravated by overexposure:
Data available do not indicate that there are medical conditions that are generally recognized as being aggravated by exposure to this substance/product.
See MSDS section 11 - Toxicological information.

4. First-aid measures

General advice:
Remove contaminated clothing.

If inhaled:
Remove the affected individual into fresh air and keep the person calm. Assist in breathing if necessary. Immediate medical attention required.

If on skin:
Wash affected areas thoroughly with soap and water. If irritation develops, seek medical attention.

If in eyes:
In case of contact with the eyes, rinse immediately for at least 15 minutes with plenty of water. If irritation develops, seek medical attention.

If swallowed:
Rinse mouth and then drink plenty of water. Induce vomiting. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions. Immediate medical attention required.

5. Fire-fighting measures

Flash point:	196 °F	(ASTM D93)
Autoignition:	245 °C	(DIN 51794)
Lower explosion limit:	1.3 %(V)	
Upper explosion limit:	9.5 %(V)	

Suitable extinguishing media:
water spray, dry extinguishing media, foam, carbon dioxide

Hazards during fire-fighting:
nitrous gases

Protective equipment for fire-fighting:
Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.

Further information:
Collect contaminated extinguishing water separately, do not allow to reach sewage or effluent systems.

NFPA Hazard codes:
Health : 2 Fire: 2 Reactivity: 0 Special:

6. Accidental release measures

Personal precautions:
Wear appropriate respiratory protection. Use personal protective clothing. Ensure adequate ventilation.

Environmental precautions:
This product is not regulated by RCRA. This product is not regulated by CERCLA ('Superfund').

Cleanup:
Spills should be contained, solidified, and placed in suitable containers for disposal.

For small amounts: Pick up with absorbent material (e.g. sand, sawdust, general-purpose binder). Dispose of absorbed material in accordance with regulations.
For large amounts: Pump off product.

7. Handling and storage

Handling

General advice:
Ensure thorough ventilation of stores and work areas.

Avoid contact with skin and eyes. Wear suitable gloves and eye/face protection.

Protection against fire and explosion:
The product is combustible.

Storage

General advice:
Containers should be stored tightly sealed in a dry place.

Storage stability:
Storage duration: 24 Months

8. Exposure controls and personal protection

Advice on system design:
Provide local exhaust ventilation to maintain recommended P.E.L.

Personal protective equipment

Respiratory protection:
Wear a NIOSH-certified (or equivalent) organic vapour respirator.

Hand protection:
Chemical resistant protective gloves (EN 374), Suitable materials also with prolonged, direct contact (Recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374):, butyl rubber (butyl) - 0.7 mm coating thickness, Manufacturer's directions for use should be observed because of great diversity of types., Supplementary note: The specifications are based on own tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined in accordance with EN 374.

Eye protection:
Wear face shield or tightly fitting safety goggles (chemical goggles) if splashing hazard exists. Safety glasses with side-shields.

Body protection:
Hardhat, Suitable materials, Body protection must be chosen based on level of activity and exposure.

General safety and hygiene measures:
Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is required additionally to the stated personal protection equipment. Eye wash fountains and safety showers must be easily accessible. Wear protective clothing as necessary to minimize contact. Wash soiled clothing immediately. When using do not eat or drink. When using do not smoke. Gloves must be inspected regularly and prior to each use. Replace if necessary (e.g. pinhole leaks). Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Form:	liquid	
Odour:	mild, amine-like	
Colour:	clear colourless	
pH value:	8.5 - 10	(100 g/l, 20 °C)
Melting point:	-23.6 °C	(760 mmHg)
Boiling point:	204.3 °C	(760 mmHg)
Vapour pressure:	0.32 mbar	(20 °C)
Density:	1.028 g/cm3	(25 °C) (DIN 51757)
Partitioning coefficient n-octanol/water (log Pow):	-0.46	
Viscosity, dynamic:	1.796 mPa.s	(20 °C)
Solubility in water:		miscible
Solubility (qualitative):	miscible solvent(s): organic solvents,	

10. Stability and reactivity

Substances to avoid:
strong acids, oxidizing agent

Hazardous reactions:
Exothermic reaction.
Reacts with oxidizing agents.

Decomposition products:
Hazardous decomposition products: carbon monoxide, Carbon dioxide, nitrogen oxides

Thermal decomposition:
approx. > 300 °C

Corrosion to metals:
No corrosive effect on metal.

11. Toxicological information

Acute toxicity

Oral:
LD50/rat: 3,600 mg/kg

Inhalation:
LC50/rat: > 5.1 mg/l / 4 h

Inhalation-risk test (IRT): No mortality within 8 hours as shown in animal studies. The inhalation of a highly saturated vapor-air mixture represents no acute hazard.

Dermal:
LD50/rabbit: 8,000 mg/kg

Eye irritation :
rabbit: Irritant. (BASF-Test)

Sensitization:
Skin sensitizing effects were not observed in animal studies.

Chronic toxicity

Genetic toxicity:
In the majority of studies performed with microorganisms and in mammalian cell culture, a mutagenic effect was not found. A mutagenic effect was also not observed in in vivo tests.

Carcinogenicity:
Results from a number of long-term carcinogenity studies and short-term tests are available. Taking into account all of the information, there is no indication that the substance itself is carcinogenic.

Developmental toxicity/teratogenicity:
No maternal toxicity.
Teratogenic.
Embryotoxic.
Effects observed at maternally toxic doses.
No embryotoxic effects.
No developmental effects.
Effects were observed only at the high dose.
No teratogenic effects.

12. Ecological information

Environmental fate and transport

Biodegradation:

Test method:	OECD 301E/92/69/EEC, C.4-B
Method of analysis:	DOC reduction
Degree of elimination:	> 90 %
Evaluation:	Readily biodegradable.

Chemical oxygen demand (COD):
1,600 mg/l

Biochemical oxygen demand (BOD):
Incubation period 5 d: < 2 mg/g

Adsorbable organically-bound halogen (AOX):

This product contains no organically-bound halogen.

Environmental toxicity

Acute and prolonged toxicity to fish:
golden orfe/LC50 (96 h): > 500 mg/l

Acute toxicity to aquatic invertebrates:
Daphnia magna/EC50 (24 h): > 1,000 mg/l

Toxicity to aquatic plants:
green algae/EC50 (72 h): > 500 mg/l

Toxicity to microorganisms:
OECD Guideline 209 bacterium/EC20 (30 min): > 600 mg/l
Inhibition of degradation activity in activated sludge is not to be anticipated during correct introduction of low concentrations.

13. Disposal considerations

Waste disposal of substance:
Incinerate in a licensed facility.
Do not discharge substance/product into sewer system.

Contaminated packaging:
Dispose of in a licensed facility. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

14. Transport information

Reference Bill of Lading

15. Regulatory information

Federal Regulations

Registration status:

TSCA, US	released / listed

OSHA hazard category: Skin and/or eye irritant, Combustible Liquid, Chronic target organ effects reported

State regulations

State RTK

CAS Number	Chemical name	State RTK
872-50-4	N-Methylpyrrolidone	MA, PA

CA Prop. 65:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

16. Other information

HMIS III rating
Health: 2¤ Flammability: 2 Physical hazard: 0

HMIS uses a numbering scale ranging from 0 to 4 to indicate the degree of hazard. A value of zero means that the substance possesses essentially no hazard; a rating of four indicates high hazard.

Local contact information
PROD_STEW_CA_CP_CZ@BASF.COM

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END OF DATA SHEET

Material Safety Data Sheet

Original Date: 10/17/2002
Revision Date: 10/17/2002

BASF CORPORATION
3000 CONTINENTAL DRIVE NORTH

MOUNT OLIVE, NJ 07828
(973) 426-4671

EMERGENCY TELEPHONE: (800) 424-9300 CHEMTREC
(800) 832-HELP (BASF Hotline)
BOTH NUMBERS ARE AVAILABLE DAYS, NIGHTS, WEEKENDS, & HOLIDAYS.

SECTION 1 - PRODUCT INFORMATION

METHOXYPROPYLACETATE EG
Product ID: NCI 687312
Common Chemical Name:
Propylene glycol monomethyl ether acetate
Synonyms:
1-Methoxy propyl acetate-2
Molecular Formula:
NONE
Chemical Family: Glycol
Molecular Wt.: NOT APPLICABLE

SECTION 2 - INGREDIENTS

Chemical Name:	CAS	Amount	
2-PROPANOL, 1-METHOXY-, A	108-65-6	99.5	%
PEL/TLV NOT ESTABLISHED			
PHENOL, 2,6-BIS(1,1-DIMET	128-37-0	< 0.1	%
ACGIH TLV TWA	10 MG/CU. M		
1-PROPANOL, 2-METHOXY-, A	70657-70-4	0.5	%
PEL/TLV NOT ESTABLISHED			

SECTION 3 - PHYSICAL PROPERTIES

Color: Clear
Form/Appearance: Liquid
Odor: MILD

	Typical	Low/High	U.O.M.			
Specific Gravity:		0.965- 0.97		@	20	DEG C
Viscosity:	1.2		MPAS	@	20	DEG.

pH: NOT AVAILABLE

	Typical	Low/High	Deg.	@	Pressure
Boiling Pt:		145 - 147	C	1	ATMOSPHERES

Freezing Pt: NOT AVAILABLE
Decomp. Tmp: NOT AVAILABLE

	Typical	Low/High	U.O.M.	@	Temperature	
Solubility:	209.3		G/L		20	C

SECTION 3 - PHYSICAL PROPERTIES (cont)

	Typical	Low/High	U.O.M.	@	Temperature
Vapor Pressure:		3.37	MILLIBARS X		20 DEG. C XX

Other Solvents:

SOLUBLE IN MANY ORGANIC SOLVENTS.

SECTION 4 - FIRE AND EXPLOSION DATA

	Typical	Low/High	Deg.	Method
Flash Point:	45		C	DIN 51755
Autoignition:	315		C	DIN 51794
Flam. Limits:		1.5 - 10.8	%	

Extinguishing Media:

Use water, dry extinguishing media, carbon dioxide (CO2) or foam.

Fire Fighting Procedures:

Firefighters should be equipped with self-contained breathing apparatus and turn out gear.

Unusual Hazards:

There are no known unusual fire or explosion hazards.

SECTION 5 - HEALTH EFFECTS

Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquified gases.

Toxicology Test Data:

Rat, Oral LD50 - 8,532 MG/KG
Slightly Toxic/Practically Nontoxic
Rat, Inhalation LC50 - >23.8 MG/L
Moderately Toxic
Rat, Dermal LD50 - >5,000 MG/KG
Slightly Toxic/Practically Nontoxic
Rabbit, Primary Skin Irritation -
Nonirritating
Rabbit, Eye Irritation -
Irritating
Sensitizing potential -
Not a sensitizer

Acute Overexposure Effects:

Prolonged contact with eyes and skin may result in irritation. Overexposure by ingestion, inhalation or skin absorption may result in central nervous system effects, including headache, nausea, dizziness and narcosis.

Chronic Overexposure Effects:

There are no other known chronic effects associated with this material.

First Aid Procedures - Skin:

Wash affected areas with soap and water. Remove and launder contaminated clothing before reuse. If irritation develops, get medical attention.

SECTION 5 - HEALTH EFFECTS (cont)

First Aid Procedures - Eyes:
Immediately rinse eyes with running water for 15 minutes. If irritation develops, get medical attention.

First Aid Procedures - Ingestion:
If swallowed, dilute with water. DO NOT INDUCE VOMITING. Never give fluids or induce vomiting if the victim is unconscious or having convulsions. Get immediate medical attention.

First Aid Procedures - Inhalation:
Move to fresh air. Aid in breathing, if necessary, and get immediate medical attention.

First Aid Procedures - Notes to Physicians:
None known.

First Aid Procedures - Aggravated Medical Conditions:
No data is available which addresses medical conditions that are generally recognized as being aggravated by exposure to this product. Please refer to the effects of overexposure section for effects (if any) observed in animals.

First Aid Procedures - Special Precautions:
None

SECTION 6 - REACTIVITY DATA

Stability Data:
Stable

Incompatability:
Oxidizing agents.

Conditions/Hazards to Avoid:
Strong oxidizers.

Hazardous Decomposition/Polymerization:
Hazardous decomposition products: None known.

Corrosive Properties:
Not corrosive.

Oxidizer Properties:
Not an oxidizer

SECTION 7 - PERSONAL PROTECTION

Clothing:
Gloves, coveralls, apron, and boots as necessary to prevent contact.

Eyes:
Safety glasses or goggles.

Respiration:
Approved organic vapor mist respirator as necessary.

Ventilation:
Use local exhaust to control vapors/mists.

Explosion Proofing:
None required.

Other Personal Protection Data:
None under normal conditions.

SECTION 8 - SPILL-LEAK/ENVIRONMENTAL

General:

SECTION 8 - SPILL-LEAK/ENVIRONMENTAL (cont)

containers for disposal in a licensed facility. This material is not regulated by RCRA or CERCLA ("Superfund"). Wear appropriate respiratory protection and protective clothing and provide adequate ventilation during clean-up.

Waste Disposal:

Incinerate in a licensed facility. Do not discharge into waterways or sewer systems.

Container Disposal:

Dispose of in a licensed facility. Recommend crushing or other means to prevent unauthorized reuse.

Environmental Toxicity Test Data:

Rainbow Trout, static 96 hr LC50 - 100-180 MG/L
Slightly Toxic
Daphnia magna, 48 hr static EC50 - >500 MG/L
Insignificant Hazard
Inhibition of Activated Sludge - >1000 MG/L
No adverse effect on activated sludge.
Elimination (OECD Test 302 B) - >90 PERCENT
Readily Biodegradable

SECTION 9 - STORAGE AND HANDLING

General:

Keep away from sources of ignition.
Keep in tightly closed container in a cool place.

Other Storage and Handling Data:

Prevent contact with air/oxygen (formation of peroxide).

SECTION 10 - REGULATORY INFORMATION

TSCA Inventory Status

Listed on Inventory: YES

RCRA Haz. Waste No .: NA
CERCLA: NO Reportable Qty.: (If YES)

State Regulatory Information: (By Component)	NJ/PA/MA RTK
CAS: 108-65-6	YES
NAME: 2-PROPANOL, 1-METHOXY-, A	
CAS: 128-37-0	YES
NAME: PHENOL, 2,6-BIS(1,1-DIMET	
CAS: 70657-70-4	NO
NAME: 1-PROPANOL, 2-METHOXY-, A	

Hazard Ratings:

	Health:	Fire:	Reactivity:	Special:
HMIS	2	2	0	NA

SECTION 11 - TRANSPORTATION INFORMATION

DOT Proper Shipping Name:

SEE BELOW

DOT Technical Name:

SEE BELOW

SECTION 11 - TRANSPORTATION INFORMATION (cont)

DOT Primary Hazard Class:
SEE BELOW
DOT Secondary Hazard Class:
SEE BELOW
DOT Label Required:
SEE BELOW
DOT Placard Required:
SEE BELOW
DOT Poison Constituent:
SEE BELOW
BASF Commodity Codes: UN/NA Code: E/R Guide:
Bill of Lading Description:
ESTERS, NOS, (METHOXYPROPYLACETATE), 3, UN3272, PGIII

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END OF DATA SHEET

MATERIAL SAFETY DATA SHEET

Date Printed: 02/06/2004
Date Updated: 09/06/2002
Version 1.2

Section 1 - Product and Company Information

Product Name	O-CRESOL, 99+%
Product Number	C85700
Brand	ALDRICH
Company	Sigma-Aldrich
Street Address	3050 Spruce Street
City, State, Zip, Country	SAINT LOUIS MO 63103 US
Technical Phone:	314 771 5765
Emergency Phone:	414 273 3850 Ext. 5996
Fax:	800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
O-CRESOL	95-48-7	Yes

Formula C7H8O

Synonyms 2-Cresol * o-Cresol (ACGIH:OSHA) * o-Cresylic acid * 1-Hydroxy-2-methylbenzene * o-Hydroxytoluene * 2-Hydroxytoluene * o-Kresol (German) * o-Methylphenol * 2-Methylphenol * o-Methylphenylol * Orthocresol * o-Oxytoluene * Phenol, 2-methyl- (9CI) * RCRA waste number U052 * o-Toluol

RTECS Number: GO6300000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Highly Toxic (USA) Very Toxic (EU).
Toxic in contact with skin and if swallowed. Very toxic by inhalation. Causes burns.
Readily absorbed through skin. Target organ(s): Liver. Kidneys.

HMIS RATING

HEALTH: 3*
FLAMMABILITY: 2
REACTIVITY: 1

NFPA RATING

HEALTH: 4
FLAMMABILITY: 2
REACTIVITY: 1

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately. Do not induce vomiting.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
177.8 °F 81 °C Method: closed cup

EXPLOSION LIMITS
Lower: 1.3 % Upper: 58 %

AUTOIGNITION TEMP
599 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.

SPECIAL REQUIREMENTS
Air and light sensitive.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Use only in a chemical fume hood.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.
Other: Faceshield (8-inch minimum).

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Discard contaminated shoes. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	TWA	5 PPM
Remarks: Skin			
USA	MSHA Standard-air	TWA	5 PPM (22 MG/M3)
USA	OSHA.	PEL	8H TWA 5 PPM (22 MG/M3) (SKIN)
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	2.3 PPM

Section 9 - Physical/Chemical Properties

Appearance
Physical State: Solid
Color: White
Form: Powder

Property	Value	At Temperature or Pressure
Molecular Weight	108.14 AMU	
pH	4.5	Concentration: 25 g/l
BP/BP Range	191 °C	760 mmHg
MP/MP Range	29 °C	
Freezing Point	N/A	
Vapor Pressure	0.3 mmHg	20 °C
Vapor Density	3.72 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	1.048 g/cm3	20 °C
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	177.8 °F 81 °C	Method: closed cup
Explosion Limits	Lower: 1.3 %	
	Upper: 58 %	
Flammability	N/A	
Autoignition Temp	599 °C	

Refractive Index	N/A
Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	Solubility in Water:25 mg/ml H2O, 20°C

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Conditions to Avoid: Sensitive to air. Sensitive to light.
Materials to Avoid: Oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes burns.
Skin Absorption: Toxic if absorbed through skin. Readily absorbed through skin.
Eye Contact: Causes burns.
Inhalation: May be fatal if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.
Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Liver. Kidneys. Pancreas. Spleen. Cardiovascular system. Central nervous system. Lungs.

SIGNS AND SYMPTOMS OF EXPOSURE
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin.
Inhalation may result in spasm, inflammation and edema of the larynxand bronchi, chemical pneumonitis, and pulmonary edema.
Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Can cause CNS depression. Exposure can cause:
Vomiting. Diarrhea. Headache. Gastrointestinal disturbances.

TOXICITY DATA

Oral
Rat
121 mg/kg
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold.
Lungs, Thorax, or Respiration:Dyspnea.
Gastrointestinal:Ulceration or bleeding from stomach.

Inhalation
Rat
> 1,220 mg/m3
LC50
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Behavioral:Somnolence (general depressed

activity).

Skin
Rat
620 mg/kg
LD50

Oral
Mouse
344 mg/kg
LD50

Inhalation
Mouse
179 mg/m3
LC50

Skin
Rabbit
890 mg/kg
LD50

IRRITATION DATA

Skin
Rabbit
524 mg
24H
Remarks: Severe irritation effect

Eyes
Rabbit
105 mg
Remarks: Severe irritation effect

CHRONIC EXPOSURE - CARCINOGEN

Species: Mouse
Route of Application: Skin
Dose: 4800 MG/KG
Exposure Time: 12W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and Appendages: Other: Tumors.

CHRONIC EXPOSURE - MUTAGEN

Species: Human
Dose: 8 MMOL/L
Cell Type: fibroblast
Mutation test: Sister chromatid exchange

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: EC50 Algae
Species: SELENASTRUM
Time: 72 h
Value: 100 mg/l

Test Type: EC50 Daphnia

Species: Daphnia magna
Time: 24 h
Value: 20 mg/l

Test Type: LC50 Fish
Species: Leuciscus idus
Time: 96 h
Value: 10 mg/l

Test Type: LC50 Fish
Species: Lepomis macrochirus (Bluegill)
Time: 96 h
Value: 18.4 - 24.20 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Cresols
UN#: 2076
Class: 6.1
Packing Group: Packing Group II
Hazard Label: Toxic substances.
Hazard Label: Corrosive
PIH: Not PIH

IATA
Proper Shipping Name: Cresols, solid (o-, m-, p-)
IATA UN Number: 2076
Hazard Class: 6.1
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T
Indication of Danger: Toxic.
R: 24/25 34
Risk Statements: Toxic in contact with skin and if swallowed. Causes burns.
S: 36/37/39 45
Safety Statements: Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Highly Toxic (USA) Very Toxic (EU).
Risk Statements: Toxic in contact with skin and if swallowed. Very toxic by inhalation. Causes burns.
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap-suds. Wear suitable protective clothing, gloves, and eye/face

protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
US Statements: Readily absorbed through skin. Target organ(s): Liver. Kidneys.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2004 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.

MATERIAL SAFETY DATA SHEET

Date Printed: 03/15/2004
Date Updated: 03/11/2004
Version 1.3

Section 1 - Product and Company Information

Product Name	1-METHOXY-2-PROPANOL, 98%
Product Number	268895
Brand	ALDRICH
Company	Sigma-Aldrich
Street Address	3050 Spruce Street
City, State, Zip, Country	SAINT LOUIS MO 63103 US
Technical Phone:	314 771 5765
Emergency Phone:	414 273 3850 Ext. 5996
Fax:	800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1-METHOXY-2-PROPANOL	107-98-2	No

Formula C4H10O2

Synonyms Dowanol 33B * Dowanol PM * Dowanol PM glycol ether * Dowtherm 209 * Glycol ether PM * Methoxy ether of propylene glycol * 1-Methoxy-2-propanol * Methyl proxitol * Poly-Solve MPM * Propasol solvent M * Propylene glycol methyl ether * Propylene glycol monomethyl ether * alpha-Propylene glycol monomethyl ether * Propylene glycol monomethyl ether (ACGIH) * Propylenglykol-monomethylaether (German) * Ucar Solvent LM (Obs.)

RTECS Number: UB7700000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Flammable. Irritant.
Irritating to eyes, respiratory system and skin. May form explosive peroxides.
Target organ(s): Liver. Kidneys.

HMIS RATING

HEALTH: 1*
FLAMMABILITY: 3
REACTIVITY: 0

NFPA RATING

HEALTH: 1
FLAMMABILITY: 3
REACTIVITY: 0

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

FLAMMABLE HAZARDS
Flammable Hazards: Yes
Organic Peroxide: Yes

EXPLOSION HAZARDS
Vapor may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions. Forms explosive mixtures in air. May form peroxides of unknown stability.

FLASH POINT
93 °F 34 °C Method: closed cup

EXPLOSION LIMITS
Lower: 1.8 % Upper: 16 %

AUTOIGNITION TEMP
278 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Flammable liquid. Emits toxic fumes under fire conditions.
Specific Method(s) of Fire Fighting: Use water spray to cool fire-exposed containers.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area. Shut off all sources of ignition.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP

Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING

User Exposure: Avoid breathing vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep container closed. Keep away from heat, sparks, and open flame. Store in a cool dry place.
Unsuitable: Minimize exposure to air. If peroxide formation is suspected, do not open or move container.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

Safety shower and eye bath. Use nonsparking tools. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash thoroughly after handling. Wash contaminated clothing before reuse.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	STEL	150 PPM
USA	ACGIH	TWA	100 PPM
USA	MSHA Standard-air	TWA	100 PPM (360 MG/M3)
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	100 PPM
		STEL	150 PPM

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	180 mg/m3
Poland		NDSCh	360 mg/m3
Poland		NDSP	

Section 9 - Physical/Chemical Properties

Appearance — Physical State: Clear liquid
Color: Colorless

Property	Value	At Temperature or Pressure
Molecular Weight	90.12 AMU	
pH	N/A	
BP/BP Range	118 - 119 °C	760 mmHg
MP/MP Range	N/A	
Freezing Point	N/A	
Vapor Pressure	10.9 mmHg	25 °C
Vapor Density	3.12 g/l	

Saturated Vapor Conc.	N/A
SG/Density	0.921 g/cm3
Bulk Density	N/A
Odor Threshold	N/A
Volatile%	N/A
VOC Content	N/A
Water Content	N/A
Solvent Content	N/A
Evaporation Rate	N/A
Viscosity	N/A
Surface Tension	N/A
Partition Coefficient	N/A
Decomposition Temp.	N/A
Flash Point	93 °F 34 °C Method: closed cup
Explosion Limits	Lower: 1.8 % Upper: 16 %
Flammability	N/A
Autoignition Temp	278 °C
Refractive Index	1.403
Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	Solubility in Water:Miscible.

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: May be harmful if inhaled. Material is irritating to mucous membranes and upper respiratory tract.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Liver. Kidneys.

TOXICITY DATA

Inhalation
Rat
10,000 ppm
LC50

Intraperitoneal
Rat
3720 MG/KG
LD50

Subcutaneous
Rat
7800 MG/KG
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Dyspnea.

Intravenous
Rat
4200 MG/KG
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Dyspnea.

Oral
Mouse
11700 mg/kg
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Dyspnea.

Intravenous
Mouse
5300 MG/KG
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Dyspnea.

Oral
Dog
5000 mg/kg
LD50

Intravenous
Dog
2 GM/KG
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Dyspnea.

Oral
Rabbit
5700 mg/kg
LD50

Skin
Rabbit
13000 mg/kg
LD50

Subcutaneous
Rabbit
5 GM/KG
LD50

Intravenous
Rabbit
1200 MG/KG
LD50

IRRITATION DATA

Skin
Rabbit
500 mg
Remarks: Open irritation test

Eyes
Rabbit
500 mg
24H
Remarks: Mild irritation effect

CHRONIC EXPOSURE - TERATOGEN

Species: Rat
Dose: 3000 PPM/6H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system.

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 3000 PPM/6H
Route of Application: Inhalation
Exposure Time: (MULTIGENERATION)
Result: Maternal Effects: Other effects. Effects on Newborn: Live birth index (# fetuses per litter; measured after birth). Effects on Newborn: Physical.

Section 12 - Ecological Information

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: 1-Methoxy-2-propanol
UN#: 3092
Class: 3
Packing Group: Packing Group III
Hazard Label: Flammable liquid
PIH: Not PIH

IATA
Proper Shipping Name: 1-Methoxy-2-propanol
IATA UN Number: 3092
Hazard Class: 3
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
R: 10

Risk Statements: Flammable.
S: 24
Safety Statements: Avoid contact with skin.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Flammable. Irritant.
Risk Statements: Irritating to eyes, respiratory system and skin. May form explosive peroxides.
Safety Statements: Keep away from sources of ignition - no smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing.
US Statements: Target organ(s): Liver. Kidneys.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
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MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

TOLUENE

1. Product Identification

Synonyms: Methylbenzene; Toluol; Phenylmethane
CAS No.: 108-88-3
Molecular Weight: 92.14
Chemical Formula: C6H5-CH3
Product Codes:
J.T. Baker: 5375, 5812, 9336, 9351, 9364, 9456, 9457, 9459, 9460, 9462, 9466, 9472, 9476
Mallinckrodt: 4483, 8092, 8604, 8608, 8610, 8611, V560

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Toluene	108-88-3	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Very high concentrations may cause unconsciousness and death.
Ingestion:
Swallowing may cause abdominal spasms and other symptoms that parallel over-exposure from inhalation. Aspiration of material into the lungs can cause chemical pneumonitis, which may be fatal.
Skin Contact:
Causes irritation. May be absorbed through skin.
Eye Contact:
Causes severe eye irritation with redness and pain.
Chronic Exposure:
Reports of chronic poisoning describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated or prolonged contact has a defatting action, causing drying, redness, dermatitis. Exposure to toluene may affect the developing fetus.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver or kidney function may be more susceptible to the effects of this substance. Alcoholic beverage consumption can enhance the toxic effects of this substance.

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4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.
Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give

anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.

Skin Contact:

In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:

Flash point: 7C (45F) CC

Autoignition temperature: 422C (792F)

Flammable limits in air % by volume:

lel: 3.3; uel: 19

Flammable liquid and vapor!

Dangerous fire hazard when exposed to heat or flame. Vapors can flow along surfaces to distant ignition source and flash back.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

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7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Toluene:
- OSHA Permissible Exposure Limit (PEL):
200 ppm (TWA); 300 ppm (acceptable ceiling conc.); 500 ppm (maximum conc.).
- ACGIH Threshold Limit Value (TLV):
50 ppm (TWA) skin, A4 - Not Classifiable as a Human Carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Aromatic benzene-like.

Solubility:
0.05 gm/100gm water @ 20C (68F).

Specific Gravity:

0.86 @ 20C / 4 C
pH:
No information found.
% Volatiles by volume @ 21C (70F):
00
Boiling Point:
111C (232F)
Melting Point:
-95C (-139F)
Vapor Density (Air=1):
3.14
Vapor Pressure (mm Hg):
22 @ 20C (68F)
Evaporation Rate (BuAc=1):
2.24

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetraoxide; will attack some forms of plastics, rubber, coatings.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 636 mg/kg; skin rabbit LD50: 14100 uL/kg; inhalation rat LC50: 49 gm/m3/4H; Irritation data: skin rabbit, 500 mg, Moderate; eye rabbit, 2 mg/24H, Severe. Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Has shown some evidence of reproductive effects in laboratory animals.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
luene (108-88-3)	No	No	3

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. This material has a log octanol-water partition coefficient of less than 3.0. Bioconcentration factor = 13.2 (eels).
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

International (Water, I.M.O.)

Proper Shipping Name: TOLUENE
Hazard Class: 3
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Toluene (108-88-3)	Yes	Yes	Yes	

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Toluene (108-88-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Toluene (108-88-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Toluene (108-88-3)	1000	U220	

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 3[Y]E
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:

Keep away from heat, sparks and flame.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.

Label First Aid:

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head below hips to prevent aspiration into lungs. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

Disclaimer:

****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

PROPYLENE GLYCOL

1. Product Identification

Synonyms: 1,2-propanediol; 1,2-dihdroxypropane; methyl glycol; methylethylene glycol
CAS No.: 57-55-6
Molecular Weight: 76.09
Chemical Formula: CH3CHOHCH2OH
Product Codes:
J.T. Baker: 9402, 9403, U510
Mallinckrodt: 1925, 6263

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Propylene Glycol	57-55-6	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY CAUSE IRRITATION TO SKIN AND EYES.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 0 - None
Flammability Rating: 1 - Slight
Reactivity Rating: 1 - Slight
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
No adverse health effects via inhalation.
Ingestion:
Relatively non-toxic. Ingestion of sizable amount (over 100ml) may cause some gastrointestinal upset and temporary central nervous system depression. Effects appear more severe in individuals with kidney problems.
Skin Contact:
Mild irritant and defatting agent, especially on prolonged contact.
Eye Contact:
May cause transitory stinging and tearing.
Chronic Exposure:
Lactic acidosis, stupor and seizures have been reported following chronic ingestion.
Aggravation of Pre-existing Conditions:
Kidney disorders.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. Not expected to require first aid measures.
Ingestion:
Not expected to require first aid measures. Give several glasses of water to drink to dilute. If large amounts were swallowed, get medical advice.
Skin Contact:
Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.
Eye Contact:
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Call a physician if irritation persists.

Note to Physician:
In case of ingestion, monitor for acidosis and central nervous system changes. Exposed persons with previous kidney dysfunction may require special treatment.

Fire Fighting Measures

Fire:
Flash point: 99C (210F) CC
Autoignition temperature: 371C (700F)
Flammable limits in air % by volume:
lel: 2.6; uel: 12.5
Material can support combustion.
Explosion:
Containers may explode in heat or fire.
Fire Extinguishing Media:
Dry chemical, foam, water or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Move exposed containers from fire area, if it can be done without risk. Use water to keep fire-exposed containers cool.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

---

7. Handling and Storage

Protect container from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture, and incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
AIHA Workplace Environmental Exposure Level (WEEL): Vapor and Aerosol = 50ppm; Aerosol, only = 10mg/m3.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of

the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face respirator with an organic vapor cartridge and particulate filter (NIOSH type P95 or R95 filter) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with an organic vapor cartridge and particulate filter (NIOSH P100 or R100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. Please note that N series filters are not recommended for this material. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear protective gloves and clean body-covering clothing.

Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear oily liquid.

Odor:
Odorless.

Solubility:
Miscible in water.

Specific Gravity:
1.0361 @ 20C/4C

pH:
No information found.

% Volatiles by volume @ 21C (70F):
No information found.

Boiling Point:
188.2C (370F)

Melting Point:
-59C (-74F)

Vapor Density (Air=1):
2.6

Vapor Pressure (mm Hg):
0.129 @ 25C (77F)

Evaporation Rate (BuAc=1):
0.01

Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition. Aldehydes or lactic, pyruvic or acetic acids may also be formed.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Oral rat LD50: 20g/kg. Skin rabbit LD50: 20.8g/kg.
Irritation: Eye rabbit/Draize, 500 mg/24H mild.
Investigated as a mutagen and reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Propylene Glycol (57-55-6)	No	No	None

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into water, this material is expected to readily biodegrade. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.
Environmental Toxicity:
No information found.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Not regulated.

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15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\----------------------------------
Ingredient                                      TSCA  EC   Japan  Australia
------------------------------------------------ ----  ---  -----  ---------
Propylene Glycol (57-55-6)                       Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\--------------------------------
                                                        --Canada--
Ingredient                                      Korea  DSL   NDSL  Phil.
------------------------------------------------ -----  ---   ----  -----
Propylene Glycol (57-55-6)                       Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------- ---   -----   ----  --------------
Propylene Glycol (57-55-6)                No    No      No         No

--------\Federal, State & International Regulations - Part 2\----------------
                                                        -RCRA-    -TSCA-
  gredient                                CERCLA        261.33     8(d)
  ------------------------------------- ------        ------    ------
Propylene Glycol (57-55-6)                No            No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: No   Fire: No  Pressure: No
Reactivity: No          (Pure / Liquid)
```

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **0** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY CAUSE IRRITATION TO SKIN AND EYES.
Label Precautions:
Avoid contact with eyes, skin and clothing.

Wash thoroughly after handling.

Label First Aid:

In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. Call a physician if irritation develops or persists.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 8.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Ethylene Glycol
Chemical formula	:	C2H6O2
Synonyms	:	1,2-Ethane diol
Product Use Description	:	General Industrial
Company	:	Air Products and Chemicals,Inc 7201 Hamilton Blvd. Allentown, PA 18195-1501
Telephone	:	1-800-345-3148 Chemicals 1-800-752-1597 Gases and Electronic Chemicals
Emergency telephone number	:	800-523-9374 USA 01-610-481-7711 International

2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Weight)
Ethylene glycol	107-21-1	90% - 100 %

3. HAZARDS IDENTIFICATION

Emergency Overview

Reproductive toxin.
Mild skin irritant.
Mild eye irritant.
Components of the product may affect the nervous system.

Potential Health Effects

Eye contact	:	Contact with eyes may cause irritation.
Skin contact	:	Mild skin irritation.
Ingestion	:	May cause central nervous system effects, such as headache, nausea, vomiting, abdominal pain, dizziness, confusion, breathing difficulties. Severe cases of overexposure can result in respiratory failure. Exposure to large amounts of ethylene glycol can damage the kidneys, heart, and nervous system. Contains Ethylene Glycol which may cause birth defects.
Chronic Health Hazard	:	This product contains no listed carcinogens according to IARC, ACGIH, NTP and/or OSHA in concentrations of 0.1 percent or greater. Reproductive toxin.

Exposure Guidelines

Target Organs : Reproductive hazard.

Aggravated Medical Condition

None known.

4. FIRST AID MEASURES

General advice	: Seek medical advice. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately.
Eye contact	: Rinse immediately with plenty of water also under the eyelids for at least 20 minutes. Remove contact lenses.
Skin contact	: Wash off immediately with plenty of water for at least 20 minutes. Wash off with soap and water. Immediately remove contaminated clothing, and any extraneous chemical, if possible to do so without delay.
Ingestion	: Never give anything by mouth to an unconscious person. Do not induce vomiting without medical advice. Prevent aspiration of vomit. Turn victim's head to the side.
Inhalation	: Move to fresh air.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	: Alcohol-resistant foam. The product itself does not burn. Carbon dioxide (CO2). Dry chemical. Dry sand. Limestone powder.
Specific hazards	: Incomplete combustion may form carbon monoxide. No special precautions required.
Special protective equipment for fire-fighters	: Use personal protective equipment. Wear self contained breathing apparatus for fire fighting if necessary.
Further information	: The product, as distributed, is noncombustible.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	: Wear suitable protective clothing, gloves and eye/face protection. Use self-contained breathing apparatus and chemically protective clothing. Evacuate personnel to safe areas.
Methods for cleaning up	: Contact Air Products' Emergency Response Center for advice. Place in appropriate chemical waste container.

Additional advice : If possible, stop flow of product.

7. HANDLING AND STORAGE

Handling

Emergency showers and eye wash stations should be readily accessible. Adhere to work practice rules established by government regulations. Avoid contact with eyes. Use personal protective equipment. When using, do not eat, drink or smoke.

Storage

Keep containers tightly closed in a cool, well-ventilated place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Provide readily accessible eye wash stations and safety showers.
Provide natural or explosion-proof ventilation adequate to ensure concentrations are kept below exposure limits.

Personal protective equipment

Respiratory protection	:	Not required for properly ventilated areas.
Hand protection	:	Neoprene gloves. Nitrile rubber. The breakthrough time of the selected glove(s) must be greater than the intended use period.
Eye protection	:	Chemical safety glasses.
Skin and body protection	:	Long sleeve shirts and trousers without cuffs.
Special instructions for protection and hygiene	:	Provide readily accessible eye wash stations and safety showers. Wash at the end of each workshift and before eating, smoking or using the toilet.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	Liquid.
Color	:	Colorless.
Odor	:	Slight. Sweet.
Molecular Weight	:	62.08 g/mol
Relative vapor density	:	2.14 (air = 1)
Relative density	:	1.1135 (water = 1)

Vapor pressure	:	< 1.00 mmHg
Density	:	69.482 lb/ft3 (1.113 g/cm3) at
Boiling point/range	:	387 °F (197 °C)
Melting point/range	:	9 °F (-13 °C)
Upper flammability limit	:	15.3 %(V)
Lower flammability limit	:	3.2 %(V)
Water solubility	:	Completely soluble.

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions.
Materials to avoid	:	Dehydrating Agents. Reactive metals (e.g. sodium, calcium, zinc etc.). Materials reactive with hydroxyl compounds. Oxidizing agents. Acids. Aluminium. Halogens.
Hazardous decomposition products	:	Carbon monoxide. Carbon dioxide (CO2). Aldehydes. Flammable hydrocarbon fragments (e.g., acetylene).

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

Ingestion	:	LD50 : 4,700 mg/kg Species : Rat.
Inhalation	:	No data is available on the product itself.
Skin.	:	LD50 : 9,530 mg/kg Species : Rabbit.
Eye irritation/corrosion	:	Mild eye irritation.
Acute dermal irritation/corrosion	:	Mild skin irritation.

Chronic Health Hazard

This product contains ETHYLENE GLYCOL, which has been shown to cause dose-related teratogenic effects in rats and mice when given by gavage or in drinking water at high concentrations or doses. Ethylene glycol has also caused teratogenic effects in mice when administered as an aerosol at a concentration of 2500 mg/m3 for 6 hours a day throughout the period of organogenesis. Repeated ingestion of ethylene glycol has caused bladder and kidney stone formation, and kidney damage in laboratory animals. Two chronic feeding studies, using rats and mice, have not produced any evidence that ethylene glycol caused dose-related increases in tumor incidence.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity	:	LC50 (96 h) : 27,540 mg/l Species : Bluegill sunfish (Lepomis macrochirus). LC50 (96 h) : > 10,000 mg/l Species : Fathead minnow (Pimephales promelas). LC50 (96 h) : 8,050 mg/l Species : Fathead minnow (Pimephales promelas).
Toxicity to other organisms	:	No data available.

Persistence and degradability

Mobility	:	No data available.
Bioaccumulation	:	Negligible bioaccumulation potential.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products	:	Contact supplier if guidance is required.
Contaminated packaging	:	Dispose of container and unused contents in accordance with federal, state, and local requirements.

14. TRANSPORT INFORMATION

CFR

not regulated

IATA

not regulated

IMDG

not regulated

CTC

not regulated

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard (29 CFR 1910.1200) Hazard Class(es)
No OSHA Hazards.

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on EINECS inventory or polymer substance, monomers included on EINECS inventory or no longer polymer.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

EPA SARA Title III Section 312 (40 CFR 370) Hazard Classification:
No SARA Hazards

EPA SARA Title III Section 313 (40 CFR 372) Component(s) above 'de minimus' level:
Ethylene glycol

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other harm.

16. OTHER INFORMATION

HMIS Rating

Health : 1
Flammability : 0
Physical hazard : 0

Prepared by : Air Products and Chemicals, Inc. Global EH&S Product Safety Department

For additional information, please visit our Product Stewardship web site at
http//www.airproducts.com/productstewardship/

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

XYLENES

1. Product Identification

Synonyms: Dimethyl benzene, xylol, methyltoluene
CAS No.: 1330-20-7
Molecular Weight: 106.17
Chemical Formula: C6H4(CH3)2
Product Codes:
J.T. Baker: 5377, 5810, 5813, 9483, 9489, 9490, 9493, 9494, 9499, 9516, X516
Mallinckrodt: 8664, 8668, 8671, 8672, 8685, 8802, V052

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
m-Xylene	108-38-3	40 - 65%	Yes
o-Xylene	95-47-6	15 - 20%	Yes
p-Xylene	106-42-3	< 20%	Yes
Ethyl Benzene	100-41-4	15 - 25%	Yes

3. Hazards Identification

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 2 - Moderate
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors may be irritating to the nose and throat. Inhalation of high concentrations may result in nausea, vomiting, headache, ringing in the ears, and severe breathing difficulties which may be delayed in onset. Substernal pain, cough, and hoarseness are also reported. High vapor concentrations are anesthetic and central nervous system depressants.
Ingestion:
Ingestion causes burning sensation in mouth and stomach, nausea, vomiting and salivation. Minute amounts aspirated into the lungs can produce a severe hemorrhagic pneumonitis with severe pulmonary injury or death.
Skin Contact:
Skin contact results in loss of natural oils and often results in a characteristic dermatitis. May be absorbed through the skin.
Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Chronic Exposure:
Chronic inhalation can cause headache, loss of appetite, nervousness and pale skin. Repeated or prolonged skin contact may cause a skin rash. Repeated exposure of the eyes to high concentrations of vapor may cause reversible eye damage. Repeated exposure can damage bone marrow, causing low blood cell count. May damage the liver and kidneys.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, blood, or respiratory function may be more susceptible to the effects of the substance.

---

4 First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.

Ingestion:

Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:

Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:

Flash point: 29C (84F) CC
Autoignition temperature: 464C (867F)
Flammable limits in air % by volume:
lel: 1.0; uel: 7.0

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. Sensitive to static discharge.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

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6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
100 ppm (TWA) xylene
100 ppm (TWA) ethylbenzene
-ACGIH Threshold Limit Value (TLV):
xylene: 100 ppm (TWA) 150 ppm (STEL), A4 - Not classifiable as a human carcinogen.
ethyl benzene: 100 ppm (TWA) 125 ppm (STEL), A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Physical and Chemical Properties

The following physical data is for xylene.
Appearance:
Clear, colorless liquid.
Odor:
Characteristic odor.
Solubility:
Insoluble in water.
Specific Gravity:
0.86 @ 20C/4C
pH:
Not applicable.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
137 - 140C (279 - 284F)
Melting Point:
-25C (-13F)
Vapor Density (Air=1):
3.7
Vapor Pressure (mm Hg):
8 @ 20C (68F)
Evaporation Rate (BuAc=1):
0.7

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Involvement in a fire causes formation of carbon monoxide and unidentified organic components.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents and strong acids.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

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11. Toxicological Information

Toxicological Data:
Xylene: oral rat LD50: 4300 mg/kg; inhalation rat LC50: 5000 ppm/4H; skin rabbit LD50: > 1700 mg/kg;

Irritation eye rabbit: 87 mg mild (Std. Draize); irritation skin rabbit 500 mg/24 moderate (Std. Draize); investigated as a tumorigen, mutagen, reproductive effector.
Ethyl benzene: oral rat LD50: 3500 mg/kg; skin rabbit LD50: 17800 uL/kg; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
m-Xylene (108-38-3)	No	No	3
o-Xylene (95-47-6)	No	No	3
p-Xylene (106-42-3)	No	No	3
Ethyl Benzene (100-41-4)	No	No	2B

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12. Ecological Information

Environmental Fate:
Following data for xylene: When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. (mixed xylenes: octanol / water partition coefficient 3.1 - 3.2; bioconcentration factor = 1.3, eels)
Environmental Toxicity:
For xylene: This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: RQ, XYLENES

Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
m-Xylene (108-38-3)	Yes	Yes	Yes	Yes
o-Xylene (95-47-6)	Yes	Yes	Yes	Yes
p-Xylene (106-42-3)	Yes	Yes	Yes	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
m-Xylene (108-38-3)	Yes	Yes	No	Yes
o-Xylene (95-47-6)	Yes	Yes	No	Yes
p-Xylene (106-42-3)	Yes	Yes	No	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
m-Xylene (108-38-3)	No	No	Yes	No
o-Xylene (95-47-6)	No	No	Yes	No
p-Xylene (106-42-3)	No	No	Yes	No
Ethyl Benzene (100-41-4)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
m-Xylene (108-38-3)	1000	No	No
o-Xylene (95-47-6)	1000	No	No
p-Xylene (106-42-3)	100	No	Yes
Ethyl Benzene (100-41-4)	1000	No	No

cal Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 3[Y]
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.
Label Precautions:
Keep away from heat, sparks and flame.
Avoid contact with eyes, skin and clothing.
Keep container closed.
Use only with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly after handling.
Label First Aid:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****

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INTERNATIONAL BUSINESS MACHINES CORPORATION

ESSEX JUNCTION, VT

INTERNAL SOLVENT WASTE TANK INSPECTION REPORT

GENERAL SOLVENT #2 & #3 TANKS

DECEMBER 4, 2002

Knight Consulting Engineers, Inc.
P.O. Box 29
Williston, VT 05495

S:\02488\REPORTS\REPORT2.wpd

INTERNATIONAL BUSINESS MACHINES CORPORATION

ESSEX JUNCTION, VERMONT

INTERNAL SOLVENT WASTE TANK INSPECTION REPORT

GENERAL SOLVENT #2 & #3 TANKS

DECEMBER 4, 2002

The following certificate applies only to my report titled "Internal Solvent Waste Tank Inspection Report - General Solvent #2 & #3 Tanks", December 4, 2002 and relates only to those conditions existing at the time of the report:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations.

Submitted by:

Eric Goddard

Eric Goddard, P.E.
Senior Vice President

STATE OF VERMONT
ERIC H. GODDARD
No. 6035
REGISTERED
PROFESSIONAL ENGINEER

EHG/ehg

S:\02488\REPORTS\SWTCERT2.wpd

KNIGHT CONSULTING ENGINEERS, INC.
P.O. BOX 29
WILLISTON, VERMONT 05495
Tel: 802-879-6343 Fax: 802-879-6376

STEPHEN C. KNIGHT, JR., P.E.
MARTIN W. HAIN, P.E.
ERIC H. GODDARD, P.E.
ROBERT A. LOVGREN, P.E.
BARBARA J. EVANS, P.E.

CIVIL ENGINEERING
STRUCTURAL ENGINEERING
GEOTECHNICAL ENGINEERING
HYDRAULIC ENGINEERING
CONSTRUCTION INSPECTION
CONSTRUCTION TESTING
SURVEYING

December 4, 2002

Mr. Eric Meyette
International Business Machines Corporation
Essex Junction, Vermont 05452

Re: Internal Solvent Waste Tank Inspection (General Solvent #2 & #3 Tanks)

Description of Work:

1. Internal inspection and ultrasonic thickness testing was performed for the 2 new stainless steel solvent waste tanks (GENERAL SOLVENT #2 & #3) at the CDC tank farm. These tanks replaced the former carbon steel tanks in 1997/1998. Both the internal inspections and the ultrasonic thickness testing were performed by AARON ENVIRONMENTAL from Plantsville, CT. Thickness readings were taken using a Panametrics Model 36DL Plus Digital Ultrasonic Thickness Gage (allowable testing range .020" - 20") with a resolution of 0.001". The instrument was calibrated each day prior to testing.

2. See enclosed sketches for actual ultrasonic thickness readings.

CONCLUSION:

1. From the visual inspections performed by AARON ENVIRONMENTAL, the tanks were generally found to be in excellent condition (see attached letter report). The digital photographs are included in disk form.

2. The findings of the internal thickness readings are consistent with the external thickness readings also taken in November, 2002. Internal readings for GENERAL SOLVENT #2 were 97% to 101% of the external readings for the cylindrical shell and 95% of the external readings at the center of the tank heads. Internal readings for GENERAL SOLVENT #3 were 102% to 103% of the external readings for the cylindrical shell and 101% of the external readings at the center of the tank heads. Projected Life calculations for these tanks are included in the "Solvent Waste Tank Testing Report", dated December 4, 2002.

Our firm appreciates this opportunity to assist you with this work. If there are any questions, please contact the undersigned.

Sincerely,

Eric Goddard

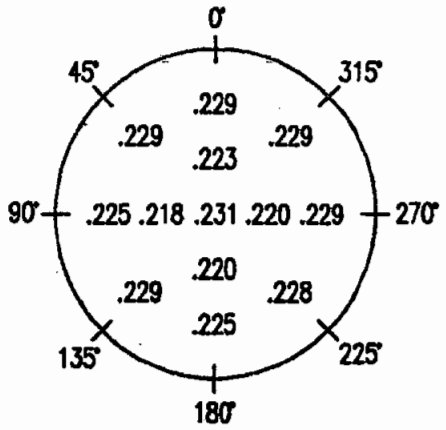
Eric Goddard, P.E.
Senior Vice President
KNIGHT CONSULTING ENGINEERS, INC.

EHG/ehg

File:S:\02488\REPORTS\SWTLTR2.WPD

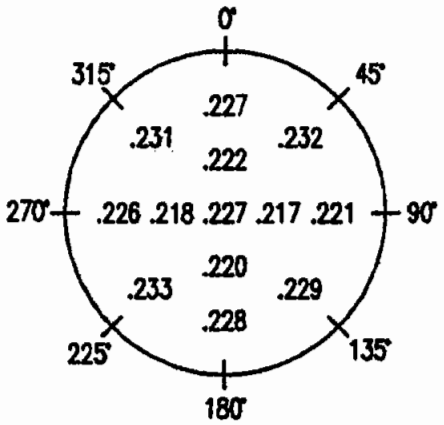
NOTES:

1. ALL THICKNESSES ARE IN INCHES.
2. DATA ACQUIRED BY AARON ENVIRONMENTAL ON 11/14/2002.



NORTH HEAD (INTERIOR VIEW)

0° TOP ℄	45°	90°	135°	180°	225°	270°	315°	0° TOP ℄
.251	.245	.245	.244	.246	.237	.247	.251	
.251	.247	.246	.243	.242	.241	.247	.226	
.250	.244	.243	.244	.241	.239	.246	.262	
.249	.243	.244	.248	.244	.240	.251	.252	
.250	.262	.242	.243	.242	.241	.247	.256	
.247	.271	.262	.242	.245	.241	.247	.251	
.253	.265	.243	.241	.246	.239	.246	.250	
.250	.247	.242	.241	.248	.239	.246	.249	
.251	.261	.243	.247	.245	.239	.252	.252	
.249	.241	.244	.241	.245	.239	.248	.257	
.250	.245	.241	.246	.244	.261	.251	.267	
.248	.247	.246	.246	.242	.238	.246	.255	
0°	45°	90°	135°	180°	225°	270°	315°	0°



SOUTH HEAD (INTERIOR VIEW)

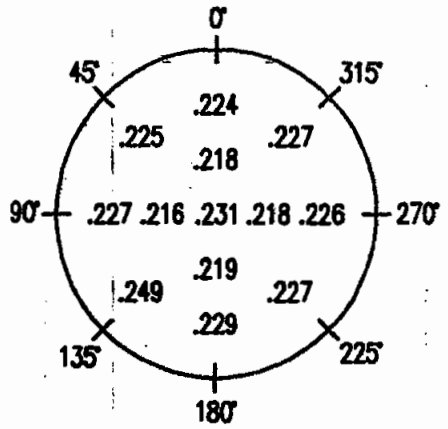
IBM SOLVENT WASTE TANK
INTERNAL ULTRASONIC TESTING
GENERAL SOLVENT #2

SHEET NO:	GS2
DWN BY: EHG	CHK BY: EHG
PROJ. NO:	02488
DATE:	12/4/02
SCALE:	1" = 6'
FILE:	GS2_3.DWG

KNIGHT CONSULTING ENGINEERS, INC.
P.O. BOX 29, WILLISTON VT 05495 (802) 879-6343

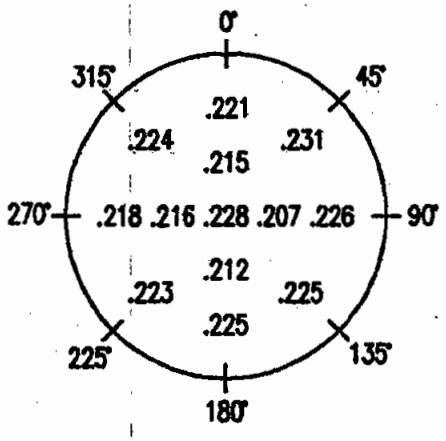
NOTES:

1. ALL THICKNESSES ARE IN INCHES.
2. DATA ACQUIRED BY AARON ENVIRONMENTAL ON 11/13/2002.



NORTH HEAD (INTERIOR VIEW)

0° TOP ℄	45°	90°	135°	180°	225°	270°	315°	0° TOP ℄
.248	.252	.252	.255	.251	.246	.249	.249	
.249	.251	.252	.254	.251	.250	.252	.245	
.250	.247	.248	.249	.251	.249	.255	.250	
.251	.247	.247	.249	.248	.249	.250	.244	
.250	.249	.253	.245	.246	.248	.249	.253	
.251	.247	.250	.249	.251	.249	.246	.257	
.250	.248	.248	.246	.251	.250	.247	.258	
.249	.249	.258	.251	.251	.250	.248	.251	
.250	.270	.250	.246	.249	.246	.246	.246	
.250	.247	.247	.247	.248	.248	.247	.254	
.253	.247	.250	.244	.248	.248	.247	.251	
.250	.246	.250	.246	.247	.248	.249	.243	
0°	45°	90°	135°	180°	225°	270°	315°	0°



SOUTH HEAD (INTERIOR VIEW)

IBM SOLVENT WASTE TANK
INTERNAL ULTRASONIC TESTING
GENERAL SOLVENT #3

SHEET NO:	GS3
DWN BY: EHG	CHK BY: EHG
PROJ. NO:	02488
DATE:	12/4/02
SCALE:	1" = 6'
FILE:	GS2_3.DWG

KNIGHT CONSULTING ENGINEERS, INC.
P.O. BOX 29, WILLISTON VT 05495 (802) 879-6343

AARON ENVIRONMENTAL

TANK MANAGEMENT GROUP
937 South Main Street
Plantsville, CT 06479
860-276-1201
FAX 860-276-1233
e-mail: info@aaronenvironmental.com

November 18, 2002

Eric Goddard
Knight Consulting Engineers, Inc.
51 Knight Lane
Williston, VT 05495
(802) 879-6343

RE: IBM Essex Junction
UT Measurements GS2 & GS3
AARON Project #2994

Dear Mr. Goddard:

On November 13 and 14, 2002, AARON Environmental conducted a limited interior visual inspection and collected ultrasonic thickness (UT) measurements on two (2) General Solvent aboveground storage tanks at the IBM facility in Essex Junction, Vermont.

Summary of Services:

1. Prior to entry, the interior atmosphere of each tank was monitored for Oxygen, LEL, Hydrogen Sulfide and Carbon Monoxide using a Scientific Instruments Multi-Gas Meter. Each tank was also checked for volatile organic compounds using a photoionization detector and for tank specific compounds using a Drager detector tube;
2. Each tank was entered under a Confined Space Entry Permit prepared by Techtron Environmental. Level C personal protective equipment including an air purifying respirator was utilized for entry. Interior surfaces and internal piping were visually inspected for signs of corrosion, pitting, scale and weld problems;
3. A total of 122 UT measurements were recorded (i.e., data logged) for each tank interior using a Panametrics Model 36DL Plus Digital Ultrasonic Thickness Gage; and,
4. Digital photographs were taken of each tank interior.

Findings:

1. The interior surfaces of each tank were in excellent condition, no signs of corrosion, pitting, scale or other deterioration were observed. Each tank is approximately 10 feet in

diameter and 17 feet long overall, head center to head center (each tank shell is 15 feet long, each tank head is bullet style and adds approximately 1 foot to each end of the tanks length at the center point). Each shell is made up of sixteen (16) rolled sheets of stainless steel, each sheet is approximately 7.5 feet long and 3.9 feet wide. Each tank head is a single piece of stainless steel. No problems were identified concerning the tank welds.

2. The pump suction pipe inside each tank is made of carbon steel and not stainless. As such, each suction pipe has a minor degree of surficial corrosion present. These pipes will require replacement in the future, as they will have a shorter life span than the other tank interior components and/or the tank shell.
3. The thickness Gage was field calibrated prior to use each day. UT data was collected for each tank, refer to the attached data tables. The attached drawings illustrate the location of each data point.
4. Representative digital photographs are also attached for each tank.

Thank you for the opportunity to provide our services. Should you have any questions or comments regarding this report or other environmental matters, please do not hesitate to contact me at 800-372-2766.

Sincerely,

Richard Vocke
Engineering Manager

Attachments: UT Data GS3
UT Data GS2
Drawing 1 of 2 (GS3)
Drawing 2 of 2 (GS2)
Photographs (GS3 Pics file)
Photographs (GS2 Pics file)

WinPlus Thickness Measurements Only

PANAMETRICS Ultrasonic Thickness Gage

Filename : IBMGS2IN **File Type :** Incremental **Survey Date** 11/14/2002
Erase Prote ON **File Descrip** IBM GS2 Interior Inspection
Inspector II RV or RM **Location-Nc** IBM Essex Juntion

Data Point ID	Thickness	Date	Units	Edit	Active	Setup	Comments
0001	0.245	11/14/2002	IN	No	Yes	02	—
0002	0.247	11/14/2002	IN	No	Yes	02	—
0003	0.244	11/14/2002	IN	No	Yes	02	—
0004	0.243	11/14/2002	IN	No	Yes	02	—
0005	0.262	11/14/2002	IN	No	Yes	02	—
0006	0.271	11/14/2002	IN	No	Yes	02	—
0007	0.265	11/14/2002	IN	No	Yes	02	—
0008	0.247	11/14/2002	IN	No	Yes	02	—
0009	0.261	11/14/2002	IN	No	Yes	02	—
0010	0.241	11/14/2002	IN	No	Yes	02	—
0011	0.245	11/14/2002	IN	No	Yes	02	—
0012	0.247	11/14/2002	IN	No	Yes	02	—
0013	0.245	11/14/2002	IN	No	Yes	02	—
0014	0.246	11/14/2002	IN	No	Yes	02	—
0015	0.243	11/14/2002	IN	No	Yes	02	—
0016	0.244	11/14/2002	IN	No	Yes	02	—
0017	0.242	11/14/2002	IN	No	Yes	02	—
0018	0.262	11/14/2002	IN	No	Yes	02	—
0019	0.243	11/14/2002	IN	No	Yes	02	—
0020	0.242	11/14/2002	IN	No	Yes	02	—
0021	0.243	11/14/2002	IN	No	Yes	02	—
0022	0.244	11/14/2002	IN	No	Yes	02	—
0023	0.241	11/14/2002	IN	No	Yes	02	—
0024	0.246	11/14/2002	IN	No	Yes	02	—
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0026	0.243	11/14/2002	IN	No	Yes	02	—
0027	0.244	11/14/2002	IN	No	Yes	02	—
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0031	0.241	11/14/2002	IN	No	Yes	02	—
0032	0.241	11/14/2002	IN	No	Yes	02	—
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0035	0.246	11/14/2002	IN	No	Yes	02	—
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0038	0.242	11/14/2002	IN	No	Yes	02	—
0039	0.241	11/14/2002	IN	No	Yes	02	—
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0041	0.242	11/14/2002	IN	No	Yes	02	—
0042	0.245	11/14/2002	IN	No	Yes	02	—
0043	0.246	11/14/2002	IN	No	Yes	02	—
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0051	0.239	11/14/2002	IN	No	Yes	02	—
0052	0.240	11/14/2002	IN	No	Yes	02	—
0053	0.241	11/14/2002	IN	No	Yes	02	—
0054	0.241	11/14/2002	IN	No	Yes	02	—
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0056	0.239	11/14/2002	IN	No	Yes	02	—
0057	0.239	11/14/2002	IN	No	Yes	02	—
0058	0.239	11/14/2002	IN	No	Yes	02	—

0059	0.261	11/14/2002	IN	No	Yes	02	—
0060	0.238	11/14/2002	IN	No	Yes	02	—
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0062	0.247	11/14/2002	IN	No	Yes	02	—
0063	0.246	11/14/2002	IN	No	Yes	02	—
0064	0.251	11/14/2002	IN	No	Yes	02	—
0065	0.247	11/14/2002	IN	No	Yes	02	—
0066	0.247	11/14/2002	IN	No	Yes	02	—
0067	0.246	11/14/2002	IN	No	Yes	02	—
0068	0.246	11/14/2002	IN	No	Yes	02	—
0069	0.252	11/14/2002	IN	No	Yes	02	—
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0071	0.251	11/14/2002	IN	No	Yes	02	—
0072	0.246	11/14/2002	IN	No	Yes	02	—
0073	0.251	11/14/2002	IN	No	Yes	02	—
0074	0.226	11/14/2002	IN	No	Yes	02	—
0075	0.262	11/14/2002	IN	No	Yes	02	—
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0077	0.256	11/14/2002	IN	No	Yes	02	—
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0079	0.250	11/14/2002	IN	No	Yes	02	—
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0082	0.257	11/14/2002	IN	No	Yes	02	—
0083	0.267	11/14/2002	IN	No	Yes	02	—
0084	0.255	11/14/2002	IN	No	Yes	02	—
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0086	0.251	11/14/2002	IN	No	Yes	02	—
0087	0.250	11/14/2002	IN	No	Yes	02	—
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0091	0.253	11/14/2002	IN	No	Yes	02	—
0092	0.250	11/14/2002	IN	No	Yes	02	—
0093	0.251	11/14/2002	IN	No	Yes	02	—
0094	0.249	11/14/2002	IN	No	Yes	02	—
0095	0.250	11/14/2002	IN	No	Yes	02	—
0096	0.248	11/14/2002	IN	No	Yes	02	—
0097	0.229	11/14/2002	IN	No	Yes	02	—
0098	0.229	11/14/2002	IN	No	Yes	02	—
0099	0.229	11/14/2002	IN	No	Yes	02	—
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0101	0.225	11/14/2002	IN	No	Yes	02	—
0102	0.229	11/14/2002	IN	No	Yes	02	—
0103	0.225	11/14/2002	IN	No	Yes	02	—
0104	0.229	11/14/2002	IN	No	Yes	02	—
0105	0.223	11/14/2002	IN	No	Yes	02	—
0106	0.220	11/14/2002	IN	No	Yes	02	—
0107	0.220	11/14/2002	IN	No	Yes	02	—
0108	0.218	11/14/2002	IN	No	Yes	02	—
0109	0.231	11/14/2002	IN	No	Yes	02	—
0110	0.227	11/14/2002	IN	No	Yes	02	—
0111	0.232	11/14/2002	IN	No	Yes	02	—
0112	0.221	11/14/2002	IN	No	Yes	02	—
0113	0.229	11/14/2002	IN	No	Yes	02	—
0114	0.228	11/14/2002	IN	No	Yes	02	—
0115	0.233	11/14/2002	IN	No	Yes	02	—
0116	0.226	11/14/2002	IN	No	Yes	02	—
0117	0.231	11/14/2002	IN	No	Yes	02	—
0118	0.222	11/14/2002	IN	No	Yes	02	—
0119	0.217	11/14/2002	IN	No	Yes	02	—
0120	0.220	11/14/2002	IN	No	Yes	02	—
0121	0.218	11/14/2002	IN	No	Yes	02	—
0122	0.227	11/14/2002	IN	No	Yes	02	—

Report Date : 11/15/2002

WinPlus Thickness Measurements Only

PANAMETRICS Ultrasonic Thickness Gage

Filename : IBMGS3IN **File Type :** Incremental **Survey Date** 11/13/2002
Erase Prote OFF **File Descrip** INT-INSP
Inspector II RV **Location-No** GS-3

Location	Data Point ID	Thickness	Date	Units	Edit	Active	Setup	Comments
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3	0023	0.250	11/13/2002	IN	No	Yes	02	—
4	0024	0.251	11/13/2002	IN	No	Yes	02	—
5	0025	0.250	11/13/2002	IN	No	Yes	02	—
6	0026	0.251	11/13/2002	IN	No	Yes	02	—
7	0027	0.250	11/13/2002	IN	No	Yes	02	—
8	0028	0.249	11/13/2002	IN	No	Yes	02	—
9	0029	0.250	11/13/2002	IN	No	Yes	02	—
10	0030	0.250	11/13/2002	IN	No	Yes	02	—
11	0031	0.253	11/13/2002	IN	No	Yes	02	—
12	0032	0.250	11/13/2002	IN	No	Yes	02	—
13	0033	0.252	11/13/2002	IN	No	Yes	02	—
14	0034	0.251	11/13/2002	IN	No	Yes	02	—
15	0035	0.247	11/13/2002	IN	No	Yes	02	—
16	0036	0.247	11/13/2002	IN	No	Yes	02	—
17	0037	0.249	11/13/2002	IN	No	Yes	02	—
18	0038	0.247	11/13/2002	IN	No	Yes	02	—
19	0039	0.248	11/13/2002	IN	No	Yes	02	—
20	0040	0.249	11/13/2002	IN	No	Yes	02	—
21	0041	0.270	11/13/2002	IN	No	Yes	02	—
22	0042	0.247	11/13/2002	IN	No	Yes	02	—
23	0043	0.247	11/13/2002	IN	No	Yes	02	—
24	0044	0.246	11/13/2002	IN	No	Yes	02	—
25	0045	0.252	11/13/2002	IN	No	Yes	02	—
26	0046	0.252	11/13/2002	IN	No	Yes	02	—
27	0047	0.248	11/13/2002	IN	No	Yes	02	—
28	0048	0.247	11/13/2002	IN	No	Yes	02	—
29	0049	0.253	11/13/2002	IN	No	Yes	02	—
30	0050	0.250	11/13/2002	IN	No	Yes	02	—
31	0051	0.248	11/13/2002	IN	No	Yes	02	—
32	0052	0.258	11/13/2002	IN	No	Yes	02	—
33	0053	0.250	11/13/2002	IN	No	Yes	02	—
34	0054	0.247	11/13/2002	IN	No	Yes	02	—
35	0055	0.250	11/13/2002	IN	No	Yes	02	—
36	0056	0.250	11/13/2002	IN	No	Yes	02	—
37	0057	0.255	11/13/2002	IN	No	Yes	02	—
38	0058	0.254	11/13/2002	IN	No	Yes	02	—
39	0059	0.249	11/13/2002	IN	No	Yes	02	—
40	0060	0.249	11/13/2002	IN	No	Yes	02	—
41	0061	0.245	11/13/2002	IN	No	Yes	02	—
42	0062	0.249	11/13/2002	IN	No	Yes	02	—
43	0063	0.246	11/13/2002	IN	No	Yes	02	—
44	0064	0.251	11/13/2002	IN	No	Yes	02	—
45	0065	0.246	11/13/2002	IN	No	Yes	02	—
46	0066	0.247	11/13/2002	IN	No	Yes	02	—
47	0067	0.244	11/13/2002	IN	No	Yes	02	—
48	0068	0.246	11/13/2002	IN	No	Yes	02	—
49	0069	0.251	11/13/2002	IN	No	Yes	02	—
50	0070	0.251	11/13/2002	IN	No	Yes	02	—
51	0071	0.251	11/13/2002	IN	No	Yes	02	—
52	0072	0.248	11/13/2002	IN	No	Yes	02	—
53	0073	0.246	11/13/2002	IN	No	Yes	02	—
54	0074	0.251	11/13/2002	IN	No	Yes	02	—
55	0075	0.251	11/13/2002	IN	No	Yes	02	—
56	0076	0.251	11/13/2002	IN	No	Yes	02	—
57	0077	0.249	11/13/2002	IN	No	Yes	02	—
58	0078	0.248	11/13/2002	IN	No	Yes	02	—

59	0079	0.248	11/13/2002	IN	No	Yes	02	—
60	0080	0.247	11/13/2002	IN	No	Yes	02	—
61	0081	0.246	11/13/2002	IN	No	Yes	02	—
62	0082	0.250	11/13/2002	IN	No	Yes	02	—
63	0083	0.249	11/13/2002	IN	No	Yes	02	—
64	0084	0.249	11/13/2002	IN	No	Yes	02	—
65	0085	0.248	11/13/2002	IN	No	Yes	02	—
66	0086	0.249	11/13/2002	IN	No	Yes	02	—
67	0087	0.250	11/13/2002	IN	No	Yes	02	—
68	0088	0.250	11/13/2002	IN	No	Yes	02	—
69	0089	0.246	11/13/2002	IN	No	Yes	02	—
70	0090	0.248	11/13/2002	IN	No	Yes	02	—
71	0091	0.248	11/13/2002	IN	No	Yes	02	—
72	0092	0.248	11/13/2002	IN	No	Yes	02	—
73	0093	0.249	11/13/2002	IN	No	Yes	02	—
74	0094	0.252	11/13/2002	IN	No	Yes	02	—
75	0095	0.255	11/13/2002	IN	No	Yes	02	—
76	0096	0.250	11/13/2002	IN	No	Yes	02	—
77	0097	0.249	11/13/2002	IN	No	Yes	02	—
78	0098	0.246	11/13/2002	IN	No	Yes	02	—
79	0099	0.247	11/13/2002	IN	No	Yes	02	—
80	0100	0.248	11/13/2002	IN	No	Yes	02	—
81	0101	0.246	11/13/2002	IN	No	Yes	02	—
82	0102	0.247	11/13/2002	IN	No	Yes	02	—
83	0103	0.247	11/13/2002	IN	No	Yes	02	—
84	0104	0.249	11/13/2002	IN	No	Yes	02	—
85	0105	0.249	11/13/2002	IN	No	Yes	02	—
86	0106	0.245	11/13/2002	IN	No	Yes	02	—
87	0107	0.250	11/13/2002	IN	No	Yes	02	—
88	0108	0.244	11/13/2002	IN	No	Yes	02	—
89	0109	0.253	11/13/2002	IN	No	Yes	02	—
90	0110	0.257	11/13/2002	IN	No	Yes	02	—
91	0111	0.258	11/13/2002	IN	No	Yes	02	—
92	0112	0.251	11/13/2002	IN	No	Yes	02	—
93	0113	0.246	11/13/2002	IN	No	Yes	02	—
94	0114	0.254	11/13/2002	IN	No	Yes	02	—
95	0115	0.251	11/13/2002	IN	No	Yes	02	—
96	0116	0.243	11/13/2002	IN	No	Yes	02	—
97	0117	0.224	11/13/2002	IN	No	Yes	02	—
98	0118	0.227	11/13/2002	IN	No	Yes	02	—
99	0119	0.226	11/13/2002	IN	No	Yes	02	—
100	0120	0.227	11/13/2002	IN	No	Yes	02	—
101	0121	0.229	11/13/2002	IN	No	Yes	02	—
102	0122	0.249	11/13/2002	IN	No	Yes	02	—
103	0123	0.227	11/13/2002	IN	No	Yes	02	—
104	0124	0.225	11/13/2002	IN	No	Yes	02	—
105	0125	0.218	11/13/2002	IN	No	Yes	02	—
106	0126	0.218	11/13/2002	IN	No	Yes	02	—
107	0127	0.219	11/13/2002	IN	No	Yes	02	—
108	0128	0.216	11/13/2002	IN	No	Yes	02	—
109	0129	0.231	11/13/2002	IN	No	Yes	02	—
110	0130	0.221	11/13/2002	IN	No	Yes	02	—
111	0131	0.231	11/13/2002	IN	No	Yes	02	—
112	0132	0.226	11/13/2002	IN	No	Yes	02	—
113	0133	0.225	11/13/2002	IN	No	Yes	02	—
114	0134	0.225	11/13/2002	IN	No	Yes	02	—
115	0135	0.223	11/13/2002	IN	No	Yes	02	—
116	0136	0.218	11/13/2002	IN	No	Yes	02	—
117	0137	0.224	11/13/2002	IN	No	Yes	02	—
118	0138	0.215	11/13/2002	IN	No	Yes	02	—
119	0139	0.207	11/13/2002	IN	No	Yes	02	—
120	0140	0.212	11/13/2002	IN	No	Yes	02	—
121	0141	0.216	11/13/2002	IN	No	Yes	02	—
122	0142	0.228	11/13/2002	IN	No	Yes	02	—
123	Report Date : 11/15/2002							

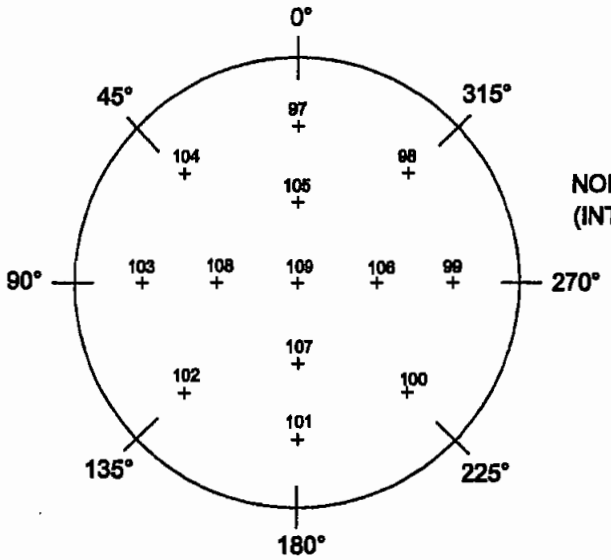
AARON ENVIRONMENTAL
Telephone (203) 753-2554
Fax (203)753-0512
1-800-372-2766

JOB: 2994 DATE: NOVEMBER 14, 2002 BY: RV

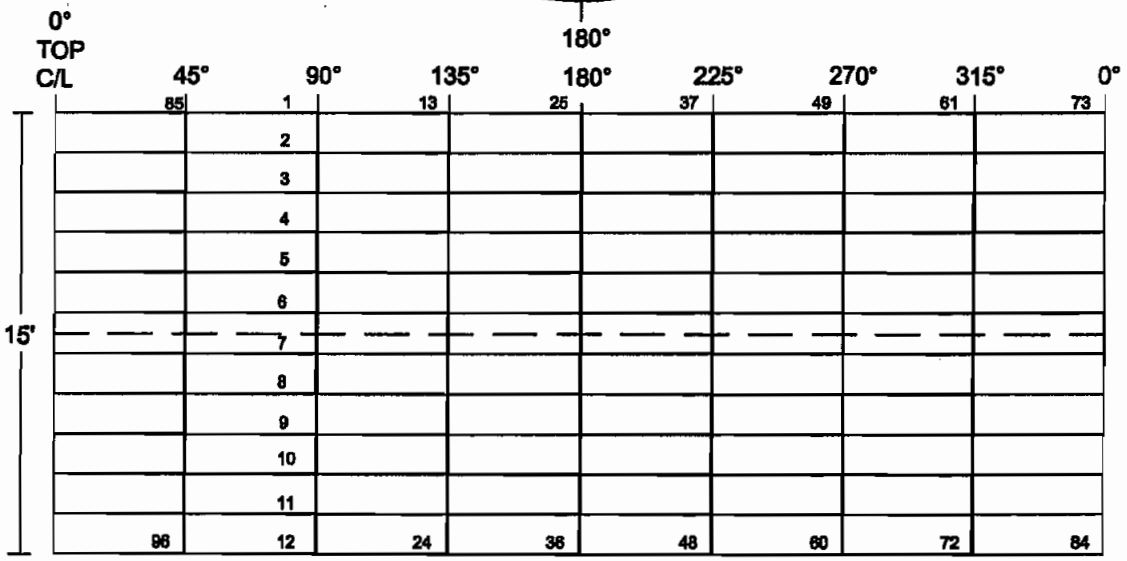
IBM ESSEX JUNCTION, VT

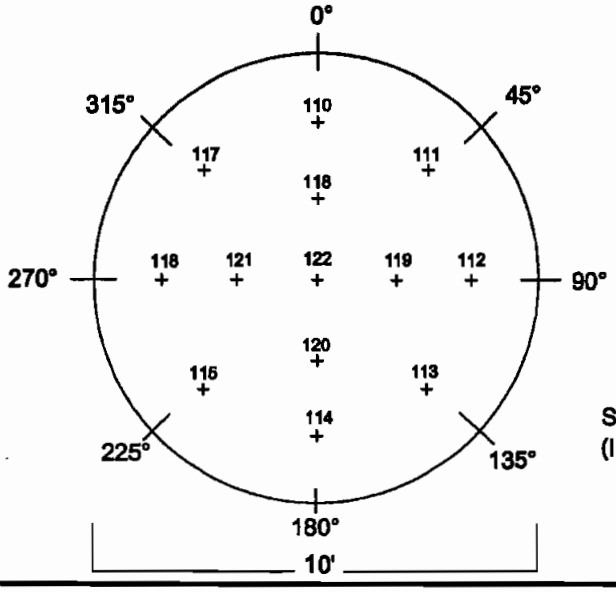
UT MEASUREMENT LOCATIONS
GS2

DRAWING NO. 2 OF 2
NOT TO SCALE



NORTH HEAD
(INTERIOR VIEW)





SOUTH HEAD
(INTERIOR VIEW)

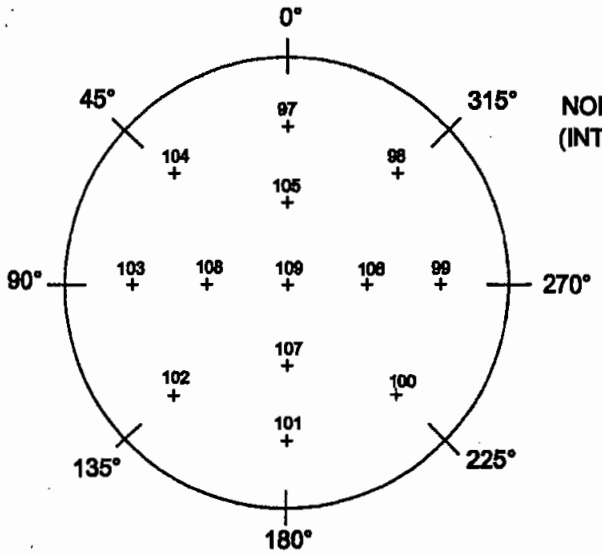
AARON ENVIRONMENTAL
Telephone (203) 753-2554
Fax (203)753-0512
1-800-372-2766

JOB: 2994 DATE: NOVEMBER 13, 2002 BY: RV

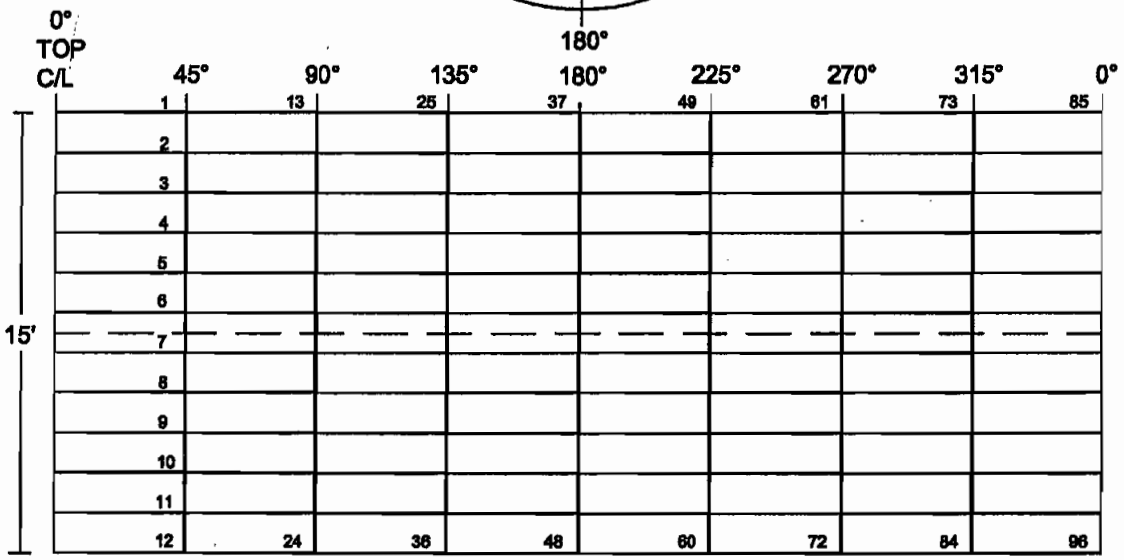
IBM ESSEX JUNCTION, VT

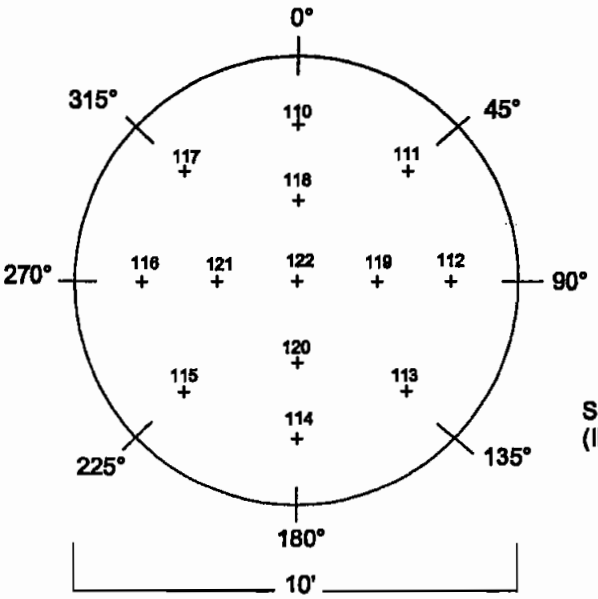
UT MEASUREMENT LOCATIONS
GS3

DRAWING NO. 1 OF 2
NOT TO SCALE



NORTH HEAD
(INTERIOR VIEW)





SOUTH HEAD
(INTERIOR VIEW)

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

TEL: 802-879-6343

STEPHEN C. KNIGHT, JR., P.E.

ROGER W. DORWART, P.E.
ELROY L. LANGDELL, P.E.
GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Two 2" future lines through South Ric-wiL pipe (3 and 5 o'clock positions looking east from CDC Building) terminations at ends of Ric-wil in organic storage room and tank farm.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 26, 1988/12:30 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

TEL: 802-879-6343

STEPHEN C. KNIGHT, JR., P.E.

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DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

N-Methyl Pyrrolidone Reclaim - 1½" stainless steel pipe from tie-in to NMP Bulk Tank No. 3 to tie-in to existing system in CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 24, 1988/5:00 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD
PA
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

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GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin N-Methyl Pyrrolidone Supply - 1½" stainless steel pipe from tie-ins at VNMP Bulk Tanks 1 and 2 through tank farm pump house to tie-in to existing system at CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 21, 1988/5:30 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

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DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin N-Methyl-Pyrrolidone - 2½" stainless steel pipe from tie-in to truck unloading pump at truck dock to VNMP Bulk Tank Nos. 1, 2, 3 tie-ins. Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 21, 1988/4:00 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD
PARKER
No.
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

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TEL: 802-879-6343

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DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Butyl Acetate - 1½" stainless steel pipe from tie-ins to VBA Bulk Tanks 1, 2, 3, through tank farm pump shack (pump removed from system during test) to tie-in to existing Butyl Acetate Supply System in CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 21, 1988/4:35 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. 5
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

TEL: 802-879-6343

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GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Butyl Acetate - 1½" stainless steel pipe from tie-in to VBA Bulk Tank No. 4 to tie-in to existing system at CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 21, 1988/3:10 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

TEL: 802-879-6343

STEPHEN C. KNIGHT, JR., P.E.

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ELROY L. LANGDELL, P.E.
GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Butyl Acetate - 2½" stainless steel pipe from truck off-loading pump to tie-in at bulk tanks 1, 2, 3, 4.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 21, 1988/10:25 A.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No.
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Perchloroethylene line (Stainless Steel) from pump tie-in at truck unloading station to bulk tank tie-in.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 18, 1988/9:50 A.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Isopropyl Alcohol Supply - 1¼" stainless steel pipe from VIPA Tanks 1,2 through pump house (pump removed from system during test) to connection to existing system at CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 18, 1988/1:10 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. 7
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

TEL: 802-879-6343

STEPHEN C. KNIGHT, JR., P.E.

ROGER W. DORWART, P.E.
ELROY L. LANODELL, P.E.
GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Butyl Acetate (Pos Resist) Waste - 2" black iron pipe from tie-in to existing system at CDC Building Penthouse through tank farm pump shack, tee to valve above WBA tank No. 1 (valve closed), to tie-in to WBA Tank No.2

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 24, 1988/11:40 A.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD
PARKER
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Methyl Pyrrolidone Cross Tie Line - 2 Inch black iron pipe from valve between iron and stainless steel pipes above virgin NMP Tank No. 3 to tie-in to 2½" black iron pipe above waste NMP Tank No. 1. Splits at tie-in to two pipes:

1. 2½" black iron to valve in horizontal run above General Solvent Waste Tank No. 4.
2. 2½" black iron trhough pump shack to tie-in to existing system at CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 18, 1988/1:45 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. 5
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Perchloroethylene line (Stainless Steel) from pump tie-in at truck unloading station to bulk tank tie-in.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 14, 1988/2:30 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

(Two) 2 inch future lines in center Ricwil pipe. (Terminations at ends of Ricwil in tank farm and organic storage room.)

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 13, 1988/1:20 P.M. (Line A 8 o'clock position - looking East from CDC Building.)

October 13, 1988/3:20 P.M. (Line at 6 o'clock position - looking East from CDC Building.)

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

(Three) 2 inch future lines in northern Ricwil pipe. (Terminations at ends of Ricwil in tank farm and organic storage room.)

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 13, 1988/2:00 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. 4149
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Virgin Perchloroethylene line (stainless steel) from bulk tank tie-in in tank farm, through pump room, (pump removed from system during test) to tie-in to existing system at CDC Building penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 14, 1988/3:25 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. 347
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Butyl Acetate Cross Tie Line (still bottoms). 1" black iron pipe from Waste Butyl Acetate Tank No. 2 (against upstream side of double check valves above virgin Butyl Acetate Tank No. 4) to tie-in to existing system at CDC Building Penthouse.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 18, 1988/3:50 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD
PARKER
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Waste N-Methyl Pyrrolidone (still bottoms) from tie-in to existing system at CDC building penthouse to bulk tank #2 in the farm.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 12, 1988 11:55 A.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. 3417
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Waste N-Methyl Pyrrolidone (still bottoms) from tie-in to existing system at CDC building penthouse to bulk tank #2 in the farm.

TEST PARAMETERS:

Compressed air at 100 psi, 2 hour duration with no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 12, 1988 11:55 A.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
No. 917
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Waste perchloroethylene piping from tie-in to existing system at chemical distribution center penthouse to bulk tank in tank farm.

TEST PARAMETERS:

100 psi air pressure, 2 hour duration, with no pressure loss.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 6, 1988 1:00 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD
PARKER
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

Waste truck loading system from individual tank tie-ins to down stream side of pneumatic actuators at truck loading station.

TEST PARAMETERS:

100 psi compressed air, 2 hour duration, no loss of pressure.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

September 26, 1988 3:05 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED
PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
PIPE TEST ACCEPTANCE RECORD

PIPE OR SYSTEM TESTED:

General solvent waste piping from tie-in to existing system in chemical distribution center penthouse to general solvent tanks 1,2, and 3 in tank farm.

TEST PARAMETERS:

100 psi compressed air, 2 hour duration, with no pressure loss.

Pressure test was conducted as outlined above and witnessed in its entirety by the undersigned.

Date/Time of Acceptance:

October 6, 1988 1:50 P.M.

Witnessed by: Robert A. Lovgren

Reviewed by: Donald J. Parker, P.E.

STATE OF VERMONT
DONALD J. PARKER
REGISTERED PROFESSIONAL ENGINEER

FILE: 87522C-LAB2-1

53004 (7-86)

BETHLEHEM ST L CORPORATION
QUALITY ASSU. NCE DEPARTMENT

REPORT OF TESTS AND ANALYSES

VENDOR	SOLD TO	SHIP TO
BETHLEHEM STEEL CORPORATION BURNS HARBOR PLANT BOX 248 CHESTERTON, INDIANA 46304	RELIANCE STEEL INC 62 OAK CIRCLE DRIVE COLCHESTER VT 05446	RELIANCE STEEL INC C/O TRIANGLE SHEET METAL CATAMOUNT INDUSTRIAL PARK MILTON VT 05468

SHIPMENT NO.	DATE SHIPPED	MILL ORDER NO.	CAR OR VEHICLE NO.	PURCHASE ORDER NO.
305-22839	06/03/88	BSC-GH 001-07412	TRLR HT1010	R0710

MATERIAL DESCRIPTION

GAUGE	WIDTH	LENGTH	CUSTOMER APPLICATION	SPECIFICATION
1/4 A IN	48 IN	144 IN	LINING UNDER CHEMICAL TANKS-SUITABLE FOR BENDING	STRIP PLATE SHEARED EDGE---ASTM A588-85 GR B

ITEM — TEST RESULTS

COIL/LIFT NUMBER	NO. PCS.	WEIGHT	HEAT NUMBER	TEST LOC.	YLD PT TRANS	TENSILE KSI-T	ELONG. IN. L/T	ELONG. PCNT.-T	BEND TRAN.
245863E	12	5880	803864830	F	62.6	79.9	2	27	OK
				M	63.8	77.7	2	29	OK
248500C	17	8330	803865270	F	67.9	85.4	2	30	OK
				M	61.6	75.2	2	29	OK
248500E	17	8330	803865270	F	67.9	85.4	2	30	OK
				M	61.6	75.2	2	29	OK
245901A	17	8330	803865270	F	67.8	84.2	2	24	OK
				M	63.1	77.0	2	32	OK

MELTED AND MANUFACTURED IN THE U.S.A.

CHEMICAL ANALYSIS

HEAT NUMBER	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Ti	Al	Cb	N
803864830	.12	.99	.009	.014	.364	.282		.56		.032				
803865270	.12	.93	.016	.016	.369	.267		.56		.030				

I certify that the above results are a true and correct copy of records prepared and maintained by Bethlehem in compliance with the requirements of the specification cited above.

SUPERINTENDENT QUALITY ASSURANCE A.J. BARSOPHY

53004 (7-86)

BETHLEHEM S' L CORPORATION
QUALITY ASSU. NCE DEPARTMENT

REPORT OF TESTS AND ANALYSES

VENDOR	SOLD TO	SHIP TO
BETHLEHEM STEEL CORPORATION BURNS HARBOR PLANT BOX 248 CHESTERTON, INDIANA 46304	RELIANCE STEEL INC 62 OAK CIRCLE DRIVE COLCHESTER VT 05446	RELIANCE STEEL INC C/O TRIANGLE SHEET METAL CATAMOUNT INDUSTRIAL PARK MILTON VT 05468

HIPMENT NO.	DATE SHIPPED	MILL ORDER NO.	CAR OR VEHICLE NO.	PURCHASE ORDER NO.
805-22839	06/03/88	BSC-GH 001-07412	TRLR HT1010	R0710

MATERIAL DESCRIPTION

GAUGE	WIDTH	LENGTH	CUSTOMER APPLICATION	SPECIFICATION
1/4 A IN	48 IN	144 IN	LINING UNDER CHEMICAL TANKS-SUITABLE FOR BENDING	STRIP PLATE SHEARED EDGE---ASTM A588-85 GR B

ITEM — TEST RESULTS

COIL/LIFT NUMBER	NO. PCS.	WEIGHT	HEAT NUMBER	TEST LOC.	YLD PT TRANS	TENSILE KSI-T	ELONG. IN. L/T	ELONG. PCNT.-T	BEND TRAN.
2485010	17	8330	803865270	F	67.8	84.2	2	24	OK
				M	63.1	77.0	2	32	OK

MELTED AND MANUFACTURED IN THE U.S.A.

CHEMICAL ANALYSIS

HEAT NUMBER	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Ti	Al	Cb	N
803865270	.12	.93	.016	.016	.369	.267		.56		.030				

certify that the above results are a true and correct copy of records prepared and maintained by Bethlehem in compliance with the requirements of the specification cited above.

SUPERINTENDENT
QUALITY ASSURANCE A.J. BARSUPHY

IBM CHEMICAL DISTRIBUTION CENTER UPGRADE
KCE PROJECT NO. 87522C
STEER PLATE LINER STATUS AS OF JANUARY 2, 1989

- South Unloading Station
  - Welds vacuum tested - No leaks detected.
  - Basin filled with water - 12 hour duration with no less of water. Accepted 8-19-88

- Truck Scale Pit
  - Welds vacuum tested - No leaks detected.
  - Basin filled with water - 12 hour duration with no loss of water. Accepted 11-19-88

- Pump Shack Pan
  - Welds vacuum tested - No leaks detected.

- Pump Pan at Truck Loading/Unloading area
  - Welds vacuum tested - No leaks detected.

- Tank Farm Basin Liners (10 Basins)
  - Welds vacuum tested - No leaks detected.

Note: Completion of watertightness testing and final acceptance of containment basins will occur as weather permits (Spring 89).

Robert A. Lovgren/kld

FIELD

KNIGHT CONSULTING ENGINEERS, INC.

P.O. BOX 29
WILLISTON, VERMONT 05495

STEPHEN C. KNIGHT, JR., P.E.

TEL: 802-879-6343

ROGER W. DORWART, P.E.
ELROY L. LANGDELL, P.E.
GILL BARLOW, P.E.
DONALD J. PARKER, P.E.
BONNIE L. CARPENTER, P.E.

July 10, 1989

Mr. M. Weinstein
International Business Machines Corporation
Department 741, Building 615-2
Essex Junction, Vermont 05452

Re: Tank Farm Leak Testing

Dear Mike:

Steel plate lines at tank basins and associated overflow piping at CDC tank farm have been tested for watertightness. Results of testing indicate that at this time all basins and overflow piping are free of leaks and found to be acceptable in accordance with the procedures agreed upon by the Owner.

The following is a summary of test procedures and acceptance parameters:

Welded Steel Plate Containment Basins: Tank containment basins were tested by filling with water to just below top of weir plates. Prior to filling, leak sump in concrete basin was inspected by sighting down standpipe to insure an initial dry condition. Basins were left filled for 24 hours. Leak sump was again inspected visually and in each case found to be dry. Water was then pumped to an adjacent basin and the procedure repeated until all basins were accepted. The attached sketch plan indicates dates of acceptance of each basin.

Overflow Piping: Overflow piping in the central trench from each basin to the 18 inch main line in the vault on the north side of the scale pit was tested in the following manner. A section of overflow pipe adjacent to the main line was removed and an inflatable test ball was inserted. (Main pipe from the vault to the final retention basin was tested previously and accepted by the project coordinator, Mr. Gerlack.) Overflow piping was filled with water until pipe and weir boxes at each tank basin were completely full. Test was held for 24 hours.

At the end of this time each welded connection throughout the weir and overflow system was examined visually for signs of leakage. No leakage was noted. Test ball was removed and section of pipe was replaced. Welds at this location were inspected visually and noted to be of acceptable quality.

If further information is required please contact the undersigned.

Testing Witnessed By:

Robert A. Lovgren

Reviewed by:

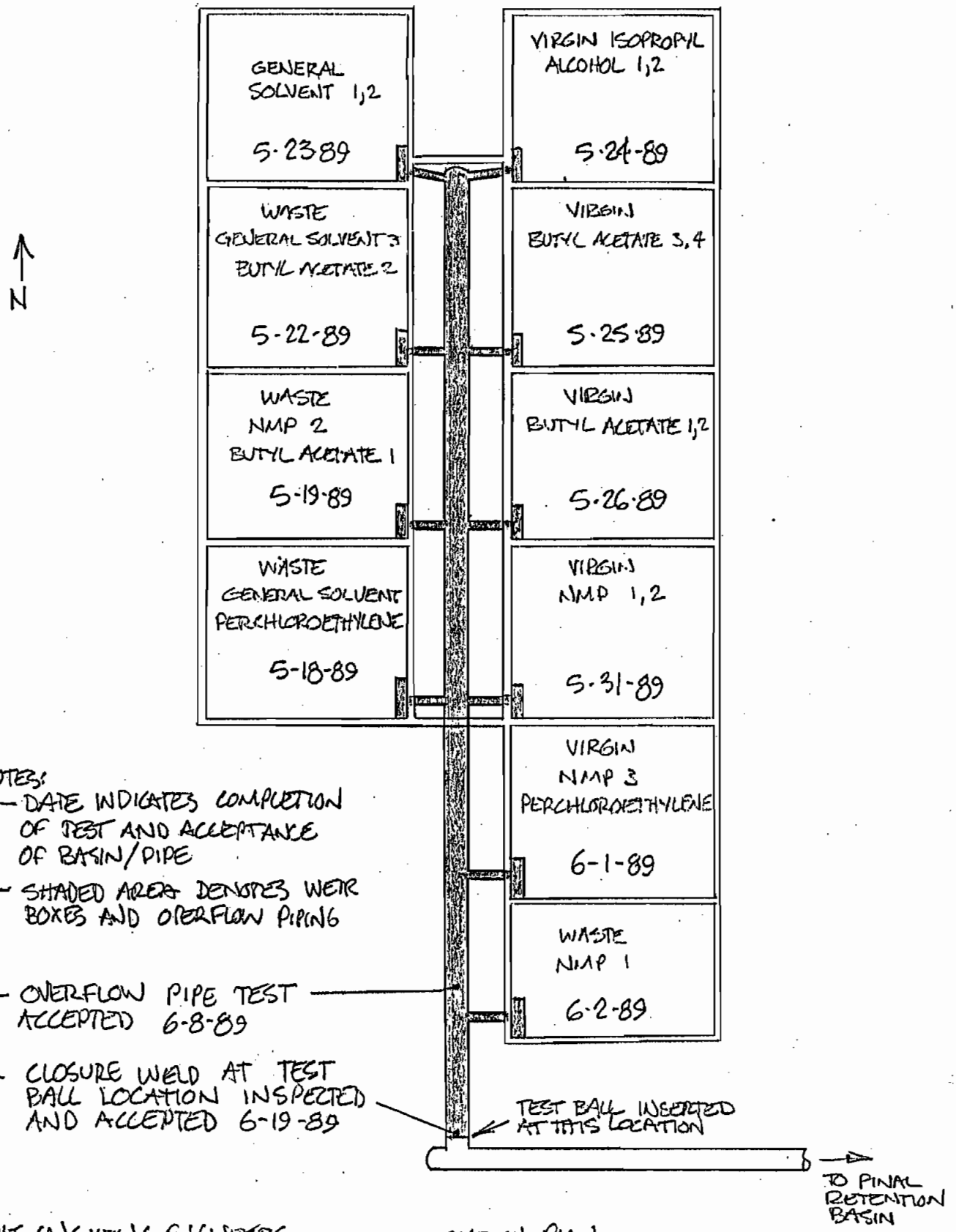
Donald J. Parker, P.E.

RAL/kld

File: 87522-C33-1

STATE OF VERMONT
DONALD
PARKER
No. 947
REGISTERED
PROFESSIONAL ENGINEER

IBM CHEMICAL DISTRIBUTION CENTER
TANK FARM UPGRADE
WELDED STEEL CONTAINMENT BASIN LEAK TEST SUMMARY



NOTES:
- DATE INDICATES COMPLETION OF TEST AND ACCEPTANCE OF BASIN/PIPE
- SHADED AREA DENOTES WEIR BOXES AND OVERFLOW PIPING
- OVERFLOW PIPE TEST ACCEPTED 6-8-89
- CLOSURE WELD AT TEST BALL LOCATION INSPECTED AND ACCEPTED 6-19-89

KNIGHT CONSULTING ENGINEERS
PROJECT NO 87522

SKETCH PLAN
NOT TO SCALE

Appendix 7
Chemical Compatibility

	Tanks - 304 Stainless Steel		Secondary Containment Liner - Carbon Steel	
	Cat Pumps Chemical Compatibility Guide	**Cole-Palmer Compatibility Guide**	**Cat Pumps Chemical Compatibility Guide**	**Cole-Palmer Compatibility Guide**
Acetic Acid	C-Questionable	Ranges from B-Good to D-Severe Effect depending on the concetration.	A-Acceptable	D-Severe Effect
Acetone	A-Acceptable	A-Excellent	A-Acceptable	B-Good
Cyclohexanone	No information.	A-Excellent	No Information	A-Excellent
Ethyl Lactate	No Information.	No Information.	No Information	No Information
2-Propanal	A-Acceptable	B-Good	A-Acceptable	A-Excellent
M-Cresol	A-Acceptable	A-Excellent	No Information	A-Excellent
Methyl Alcohol	A-Acceptable	A-Excellent	A-Acceptable	A-Excellent
MIK Methyl Isobutyl Ketone	A-Acceptable	B-Good	No Information	A-Excellent
Butyl Acetate, Urethane Grade	C-Questionable	B-Good	A-Acceptable	A-Excellent
N-Methylpyrrolidone EG	No information.	No Information.	No Information	No Information
Methoxypropylacetate EG	Propylene glycol is rated B-Fair	Propylene glycol is rated B-Good	Propylene glycol is rated B-Fair	Propylene glycol is rated B-Good
O-Cresol	A-Acceptable	A-Excellent	No Information	A-Excellent
1-Methoxy-2-Propanol	A-Acceptable	Propylene glycol is rated B-Good	Propylene glycol is rated B-Fair	Propylene glycol is rated B-Good
Toluene	A-Acceptable	A-Excellent	A-Acceptable	A-Excellent
Propylene Glycol	B-Fair	B-Good	B-Fair	B-Good
Ethylene Glycol	A-Acceptable	B-Good	C-Questionable	B-Good
Xylenes	A-Acceptable	B-Good	B-Fair	A-Excellent

CDC TANK FARM INSPECTION LOG

Inspector's Name	Title	Date of Inspection (Month/Day/Year)	Time of Inspection (Military Time)
	CHEMICAL SERVICES		

ITEM	TYPE OF PROBLEM	STATUS (X)		OBSERVATIONS	DATE/ NATURE OF REPAIRS REMEDIAL ACTIONS
		Acceptable	Unacceptable		
SECURITY DEVICES					
1) Fence	Corrosion Damage to Chain Link Fence				
2) Gate and Lock 2 gates at load / unload sta. 12 gates around tank farm	Corrosion Damage to Gate, Sticking or Corroding Lock, Unlocked Locks, Doors Open				
SAFETY AND EMERGENCY EQUIPMENT					
3) Warning Signs	Missing, Damaged or Illegible (signs should be posted at all approaches to the facility)				
4) Eye Wash	Frozen, Damaged, Schedule Checked				
OPERATING AND STRUCTURAL EQUIPMENT					
5) Pipes, Fittings, and Valves	Leaks, Corrosion, Deterioration				
6) Control Panel, Opened	Keys in Panel, Opened				
TANK STORAGE AREA AND ANCILLARY EQUIPMENT					
7) Concrete Pads and Ramps	Concrete Deterioration, Cracking or Spalling, Visible signs of Leaks				
8) Secondary Containment System	Debris, Erosion, Leaks				
9) Hoses and Fittings	Cracks, Corrosion, Distortion, Leaks				

CDC TANK F M INSPECTION LOG

Inspector's Name	Title	Date of Inspection (Month/Day/Year)	Time of Inspection (Military Time)
	CHEMICAL SERVICES		

ITEM	TYPE OF PROBLEM	STATUS (X)		OBSERVATIONS	DATE/NATURE OF REPAIRS/ REMEDIAL ACTIONS
		Acceptable	Unacceptable		
EXTERNAL TANK INSPECTION					
10) Ladders / Stairs	Damaged / Structural Stability				
11) Foundation / Structural Supports	Cracks, Spalling, Uneven Settlement Erosion, Wet Spots, Leaks				
12) Pipe Connections	External Corrosion, Cracks, Distortions, Leaks				
13) Anchor Bolts	Distortion, Erosion				
14) Tank Cover	Malfunction of Seals, Corrosion				
15) Cat Walk	Grates out of position, Corrosion, Distortion, Structural Stability				
16) Pump Pad	Leaks, Wet Spots, Corrosion				
MONITORING EQUIPMENT					
17) Alarms	High Level Alarm Conditions				

Attachment 2

2018 Endyne Inc. Laboratory Report for DUV Solvent Waste

ENDYNE Inc.
Environmental Laboratories

GLOBALFOUNDRIES U.S. 2 LLC	
1000 River Road - B966	100519
Essex Jct, VT 05452	
Atten: Andrea Pomroy-McCullen	

PROJECT: HW-DUV
WORK ORDER: **1808-20278**
DATE RECEIVED: August 14, 2018
DATE REPORTED: September 05, 2018
SAMPLER: Scott

Laboratory Report

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. All required method quality control elements including instrument calibration were performed in accordance with method requirements and determined to be acceptable unless otherwise noted.

The column labeled Lab/Tech in the accompanying report denotes the laboratory facility where the testing was performed and the technician who conducted the assay. A "W" designates the Williston, VT lab under NELAC certification ELAP 11263; "R" designates the Lebanon, NH facility under certification NH 2037 and “N” the Plattsburgh, NY lab under certification ELAP 11892. “Sub” indicates the testing was performed by a subcontracted laboratory. The accreditation status of the subcontracted lab is referenced in the corresponding NELAC and Qual fields.

The NELAC column also denotes the accreditation status of each laboratory for each reported parameter. “A” indicates the referenced laboratory is NELAC accredited for the parameter reported. “N” indicates the laboratory is not accredited. “U” indicates that NELAC does not offer accreditation for that parameter in that specific matrix. Test results denoted with an “A” meet all National Environmental Laboratory Accreditation Program requirements except where denoted by pertinent data qualifiers. Test results are representative of the samples as they were received at the laboratory

Endyne, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose.

Reviewed by:

Harry B. Locker, Ph.D.
Laboratory Director

Laboratory Report DATE REPORTED: 09/05/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC
PROJECT: HW-DUV

WORK ORDER: **1808-20278**
DATE RECEIVED: 08/14/2018

001 Site: DUV Date Sampled: 8/13/18 Time: 14:30

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
TCLP Extract-SVOA/Metals	Completed		EPA 1311	8/21/18	W FAA	A	
Water Content, Karl Fisher	14.90	%	Titration	8/29/18	SWSUB	U	STA
TCLP Mercury Digestion	Digested		EPA 7470A	8/27/18	W MGT	A	
TCLP Metals Digestion	Digested		EPA 3015A	8/22/18	W FAA	A	
Arsenic, Total TCLP	1.4	mg/L	EPA 6010C	8/22/18	W FAA	A	
Barium, Total TCLP	< 0.20	mg/L	EPA 6010C	8/22/18	W FAA	A	
Cadmium, Total TCLP	< 0.020	mg/L	EPA 6010C	8/22/18	W FAA	A	
Chromium, Total TCLP	< 0.050	mg/L	EPA 6010C	8/22/18	W FAA	A	
Lead, Total TCLP	< 0.20	mg/L	EPA 6010C	8/22/18	W FAA	A	
Mercury, Total TCLP	< 0.010	mg/L	EPA 7470A	8/27/18	W MGT	A	
Nickel, Total TCLP	< 0.10	mg/L	EPA 6010C	8/22/18	W FAA	A	
Selenium, Total TCLP	< 0.20	mg/L	EPA 6010C	8/22/18	W FAA	N	
Silver, Total TCLP	< 0.20	mg/L	EPA 6010C	8/22/18	W FAA	A	
Volatile Organic Compounds							
Prep EPA 5035A	Completed		EPA 5035A-H	8/27/18	W TEL	A	
Dichlorodifluoromethane	< 20,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Chloromethane	< 12,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Vinyl chloride	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Bromomethane	< 20,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Chloroethane	< 20,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Trichlorofluoromethane	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Diethyl ether	< 20,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
1,1-Dichloroethene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Acetone	< 40,300	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Carbon disulfide	< 20,100	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Methylene chloride	< 20,100	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
t-Butanol	< 101,000	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Methyl-t-butyl ether (MTBE)	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
trans-1,2-Dichloroethene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Di-isopropyl ether (DIPE)	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	U	
1,1-Dichloroethane	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Ethyl-t-butyl ether (ETBE)	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	U	
2-Butanone	< 40,300	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
2,2-Dichloropropane	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
cis-1,2-Dichloroethene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Bromochloromethane	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Chloroform	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Tetrahydrofuran	< 40,300	ug/Kg	EPA 8260C	8/27/18	W TEL	U	
1,1,1-Trichloroethane	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Carbon tetrachloride	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1-Dichloropropene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Benzene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
t-Amylmethyl ether (TAME)	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	U	
1,2-Dichloroethane	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Trichloroethene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dichloropropane	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	

Laboratory Report DATE REPORTED: 09/05/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC
PROJECT: HW-DUV

WORK ORDER: **1808-20278**
DATE RECEIVED: 08/14/2018

001 Site: DUV Date Sampled: 8/13/18 Time: 14:30

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Dibromomethane	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Bromodichloromethane	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
cis-1,3-Dichloropropene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
4-Methyl-2-pentanone (MIBK)	< 40,300	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Toluene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
trans-1,3-Dichloropropene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1,2-Trichloroethane	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Tetrachloroethene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,3-Dichloropropane	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
2-Hexanone	< 60,400	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Dibromochloromethane	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dibromoethane	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Chlorobenzene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Ethylbenzene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1,1,2-Tetrachloroethane	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Xylenes, Total	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Styrene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Bromoform	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Isopropylbenzene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,1,2,2-Tetrachloroethane	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
Bromobenzene	< 4,030	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
n-Propylbenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,3-Trichloropropane	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
2-Chlorotoluene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
1,3,5-Trimethylbenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
4-Chlorotoluene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
t-Butylbenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,4-Trimethylbenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
s-Butylbenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
4-Isopropyltoluene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,3-Dichlorobenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,4-Dichlorobenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,3-Trimethylbenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
n-Butylbenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dichlorobenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2-Dibromo-3-Chloropropane	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
1,2,4-Trichlorobenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
1,3,5-Trichlorobenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Hexachlorobutadiene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Naphthalene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	A	
1,2,3-Trichlorobenzene	< 8,050	ug/Kg	EPA 8260C	8/27/18	W TEL	N	
Surr. 1 (Dibromofluoromethane)	101	%	EPA 8260C	8/27/18	W TEL	U	
Surr. 2 (Toluene d8)	100	%	EPA 8260C	8/27/18	W TEL	U	
Surr. 3 (4-Bromofluorobenzene)	101	%	EPA 8260C	8/27/18	W TEL	U	
Unidentified Peaks	2		EPA 8260C	8/27/18	W TEL	U	
Solvent Scan Package							

Laboratory Report DATE REPORTED: 09/05/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC WORK ORDER: **1808-20278**
PROJECT: HW-DUV DATE RECEIVED: 08/14/2018

001 Site: DUV Date Sampled: 8/13/18 Time: 14:30

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Acetone	< 20000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
2-Propanol	< 20000	.	EPA 8015D	9/4/18	W DPD	U	
Surrogate-MIBK	29	%	EPA 8015D	9/4/18	W DPD	U	
n-Butyl Acetate	39400	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
n-Butanol	< 20000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Ethyl Lactate	< 20000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
PGME	< 20000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
PGMEA	1110000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Acetic Acid	< 100000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Propylene Glycol	48400	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Ethylene Glycol	257000	ppm, v/v	EPA 8015D	9/4/18	W DPD	N	
g-Butyrolactone	136000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
n-Methyl-2-Pyrrolidone (NMP)	< 20000	ppm, v/v	EPA 8015D	9/4/18	W DPD	U	
Unidentified Peaks	0		EPA 8015D	9/4/18	W DPD	U	
EPA 8270C Semi-VOA							
Ultrasonic Extraction	Completed		EPA 3580A	9/5/18	W EEP	A	
N-Nitrosodimethylamine	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Pyridine	< 172	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Aniline	< 172	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Bis(2-chloroethyl)ether	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1,2-Dichlorobenzene	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1,3-Dichlorobenzene	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1,4-Dichlorobenzene	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzyl alcohol	< 344	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2,2'-Oxybis(1-chloropropane)	< 172	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
N-Nitrosodi-n-propylamine	< 172	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Hexachloroethane	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Nitrobenzene	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
N-Nitrosopiperidine	< 172	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Isophorone	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Bis(2-chloroethoxy)methane	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1,2,4-Trichlorobenzene	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Naphthalene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Chloroaniline	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Hexachlorobutadiene	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
N-Nitrosodi-n-butylamine	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2-Methylnaphthalene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1-Methylnaphthalene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
Hexachlorocyclopentadiene	< 344	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2-Chloronaphthalene	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1-Chloronaphthalene	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2-Nitroaniline	< 344	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Dimethyl phthalate	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,6-Dinitrotoluene	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Acenaphthylene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
3-Nitroaniline	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	N	

Laboratory Report DATE REPORTED: 09/05/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC WORK ORDER: **1808-20278**
PROJECT: HW-DUV DATE RECEIVED: 08/14/2018

001 Site: DUV Date Sampled: 8/13/18 Time: 14:30

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Acenaphthene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Dibenzofuran	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2,4-Dinitrotoluene	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
1-Naphthylamine	< 172	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
2-Naphthylamine	< 172	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Fluorene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Diethyl phthalate	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Chlorophenyl phenyl ether	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Nitroaniline	< 344	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
N-Nitrosodiphenylamine	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Azobenzene/1,2-Diphenylhydrazine	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
4-Bromophenyl phenyl ether	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Hexachlorobenzene	< 17.2	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Phenanthrene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Anthracene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Carbazole	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
Di-n-butylphthalate	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Fluoranthene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzidine	< 344	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Pyrene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Butyl benzyl phthalate	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(a)anthracene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Chrysene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
3,3'-Dichlorobenzidine	< 172	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Bis(2-ethylhexyl)phthalate	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Di-n-octylphthalate	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(b)fluoranthene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(k)fluoranthene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(a)pyrene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Indeno(1,2,3-cd)pyrene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Dibenzo(a,h)anthracene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Benzo(g,h,i)perylene	< 8.6	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Phenol	< 34.4	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2-Chlorophenol	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2-Methylphenol (o-cresol)	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
3&4-Methylphenol (m&p-cresol)	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Cresols, Total	< 172	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
2-Nitrophenol	< 172	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4-Dimethylphenol	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4-Dichlorophenol	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,6-Dichlorophenol	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	N	
4-Chloro-3-methylphenol	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4,5-Trichlorophenol	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4,6-Trichlorophenol	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
2,4-Dinitrophenol	< 344	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
4-Nitrophenol	< 86.1	mg/Kg	EPA 8270D	9/5/18	W EEP	A	

Laboratory Report DATE REPORTED: 09/05/2018

CLIENT: GLOBALFOUNDRIES U.S. 2 LLC
PROJECT: HW-DUV

WORK ORDER: **1808-20278**
DATE RECEIVED: 08/14/2018

001 Site: DUV Date Sampled: 8/13/18 Time: 14:30

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
4,6-Dinitro-2-methylphenol	< 344	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
Pentachlorophenol	< 172	mg/Kg	EPA 8270D	9/5/18	W EEP	A	
BaP Toxic Equiv. Quotient	< 19.9	mg/Kg	EPA 8270D	9/5/18	W EEP	U	
B/N Surr.1 Nitrobenzene-d5	64	%	EPA 8270D	9/5/18	W EEP	U	
B/N Surr.2 2-Fluorobiphenyl	78	%	EPA 8270D	9/5/18	W EEP	U	
B/N Surr.3 Terphenyl-d14	88	%	EPA 8270D	9/5/18	W EEP	U	
Acid Surr.1 2-Fluorophenol	53	%	EPA 8270D	9/5/18	W EEP	U	
Acid Surr.2 Phenol-d5	57	%	EPA 8270D	9/5/18	W EEP	U	
Acid Surr.3 Tribromophenol	86	%	EPA 8270D	9/5/18	W EEP	U	
Unidentified Peaks	> 10		EPA 8270D	9/5/18	W EEP	U	

Report Summary of Qualifiers and Notes

VOC samples were collected without chemical preservation in the field. Samples were extracted and preserved at the laboratory. Reported concentrations less than 200 ug/Kg may be biased low due to the sample not being collected according to 5035/5035A low-level specifications.

STA: Analysis performed by subcontracted laboratory, Sterling Analytical Services, Inc. Results are presented here for your convenience. Refer to the complete subcontracted report, which has been appended to this report, for detailed information regarding this result.

Sterling Analytical, Inc.
15 Agawam Avenue
West Springfield, MA 01089
Phone (413) 214-6541 Fax (413) 214-6842
email-madhu@sterlinganalytical.com

Visit our website: www.sterlinganalytical.com

Mass Certification - MA-00071
Conn Certification - PH-0520

Report Date August 30, 2018

Customer	Contact	Laboratory Supervisor	eMail
Endyne, Inc.	E. Toomey	Madhu Shah	customerservice@sterlinganalytical.com

Sample Description
Analysis of Sample for Karl Fischer moisture

Samples Analyzed

Enclosed are Report No(s): 64355

Thank you for your business

madhu shah

Madhu Shah, Laboratory Supervisor

8/30/2018

Date

ALL the information contained in this report has been reviewed for accuracy and checked against all quality control requirements outlined in each applicable method.

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Sample	Description	Source	Taken/Time	Received
64355	1808-20278	Endyne, Inc.	8/13/18	8/22/18

Parameter	Results		RDL	Method	Analyzed/Time	Tech
Water, Karl Fischer, Vol	14.90	%	0.10	ASTM E203	08/29/18	dfp

HW-DUV

Endyne Inc. COC

Prepared: 6/30/17

1808-20278

1808-20278

GLOBALFOUNDRIES U.S. 2 LLC
HW-DUV

Bill to:

GLOBALFOUNDRIES U.S. 2 LLC
1000 River Road - B966
Essex Jct VT 05452
Ph: 1-518-681-6332

Report to:

Andrea Pomroy-McCullen
GLOBALFOUNDRIES U.S. 2 LLC
1000 River Road - B966
Essex Jct VT 05452
GFHZ

Cust # 10

C

W-10029

ID: _____ Sampled Date/Time: 08 / 13 / 18 @1430 Sampler: JMN

TCLP Metals Package
TCLP Mercury Package

Karl Fisher

SVOC BNAs

VOC w/ Oxygenates, Water

GF Scan Package

Minimum Total Mass Required = 200 grams

3 - 40ml vials (No Air Bubbles)
1-250ml Amber Glass

Relinquished by: [signature] 8/14/18 803 Date Time

Accepted by: E. Toomey 8/14/18@ 8:03 Date Time

Relinquished by: _____ Date Time

Received by: _____ Date Time

Sites/Parameters correct as listed. Client Initials _____

Client Authorization to use Subcontract lab Client Initials _____

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#) _____

Requested Turnaround Time: Routine: Rush Due Date _____

Lab use Only

Delv: Client
Temp C: 6.0
Comment:

Tmpl Ck
Log by

ENDYNE Inc.
www.endynelabs.com

160 James Brown Dr.
Williston, VT 05495
Ph 802-879-4333
Fax 802-879-7103

56 Etna Road
Lebanon, NH 03766
Ph 603-678-4891
Fax 603-678-4893

315 New York Rd.
Plattsburgh, NY 12903
Ph 518-563-1720
Fax 518-563-0052

Attachment 3

2011 Out-of-Service Tank Inspection for General Solvent #2 Tank

Knowledge | Commitment | Experience

September 2, 2011

PC Construction
Attn: Lisa Martinez

Re: Inspection of General Solvent #2 Waste Tank

Dear Lisa:

On June 21 and 22, 2011, the above referenced tank was inspected by personnel of Aaron Environmental working as a sub-contractor for Knight Consulting Engineers, Inc. The inspection was routine in nature and not triggered by a specific event such as mechanical damage or leakage. The tank was taken out of service, emptied and cleaned prior to the inspection.

A report prepared by Aaron Environmental dated August 18, 2011, containing their findings and recommendations as a result of this inspection is attached. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations.

Sincerely,

STATE OF VERMONT
MARTIN W. HAIN
No. 5490
REGISTERED
PROFESSIONAL ENGINEER

Martin W. Hain, P.E.
President
Knight Consulting Engineers, Inc.

File: C:\11172\GS2.doc

OUT-OF-SERVICE ABOVEGROUND STORAGE TANK INSPECTION REPORT

KNIGHT CONSULTING ENGINEERS
IBM ESSEX JUNCTION
RIVER STREET, ESSEX JUNCTION, VERMONT
Inspection Dates: June 21 & 22, 2011

Prepared for:

Martin Hain, P.E.
Knight Consulting Engineers
51 Knight Lane, Williston, Vermont 05495
Phone: 802-879-6343

Prepared by:

AARON ENVIRONMENTAL

189 Atwater Street
Plantsville, CT 06479
860-276-1201

August 18, 2011

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Ultrasonic Thickness Data

Tank Photographs

Preface

Throughout this document, `Customer' or `Client' refers to Knight Consulting Engineers (KCE) and/or IBM Corporation; and `Consultant', `Engineer' or `AARON' refers to AARON Environmental.

The field observations and research reported herein are considered sufficient in detail and scope to form a reasonable basis for an out-of-service evaluation of the referenced tank(s). The methods used to acquire the information as well as compile and analyze the data are considered current and widely accepted methods in the industry. These methods have been developed to provide the Client with information regarding apparent indications of existing or potential conditions relating to the tank(s) and are limited to the accessibility to the tank(s) and information available at the time of the site visit and inspection. Conclusions listed in this document may have been based in-part on information provided by the current facility owner, their agents and/or third parties (including, but not limited to, state and local authorities); pursuant to this, the accuracy of said information is not guaranteed by AARON.

LIMITATIONS

Notwithstanding anything contained in this report, nothing herein shall be construed as a representation, warranty or guarantee, either expressed or implied, regarding the future structural integrity, life expectancy, or performance of any of the items evaluated. This report and the analysis provided is in all respects subject to and shall be interpreted within the limitations and parameters of the test procedures performed. In the event testing is performed using a sampling procedure, this report and any analysis shall be limited to those areas actually tested and the type of test conducted, and the customer is cautioned not to extrapolate the results of the test samples.

I. INSPECTION PROCEDURES

The aboveground storage tank(s) were inspected following portions of the applicable procedures contained in the Steel Tank Institute (STI) Standard SP001 4th Edition "Standard for Inspection of Aboveground Storage Tanks".

Where applicable, AARON provided the following inspection and testing services on the tank(s):

1. Perform the periodic inspections (monthly and annual) described in the STI Standard.

2. Visually inspect the outside of each tank in detail. At a minimum, the following tank components were inspected (where applicable):

    a. Primary Tank
    b. Secondary Tank
    c. Tank Supports
    d. Tank Anchors
    e. Tank Foundation and external supports
    f. Tank gauges and alarms
    g. Insulation covering
    h. Tank appurtenances
    i. Normal Vents
    j. Emergency Vents
    k. Release Prevention Barriers
    l. Spill Control Systems

3. Visually inspect the interior of each tank in detail. At a minimum, the following areas of concern were addressed (where applicable):
    a. Identify, inspect and record AST internal appurtenances
    b. Inspect for mechanical damage, corrosion, cracking, etc.
    c. Inspect for deteriorating or corroding internal attachments and piping
    d. Visually inspect welds
    e. Ultrasonic thickness measurements
    f. Vacuum box examination of questionable welds

4. Inspect the tank based on its construction, per the following:

    a. Single Wall Tank, Not in Contact with the Ground
        i. Either conduct ultrasonic testing (from the exterior) to determine the shell thickness as described in the STI Standard, or visually examine the interior of the tank as described in the STI Standard.

To obtain the residual metal thickness readings, a Panametrics 36DL Plus datalogging ultrasonic digital thickness gauge with a D790 or D791 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The meter is capable of collecting readings using a scan mode or single point mode. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material. Field data was stored in the unit and downloaded to a computer using Panametrics' WINplus interface software.

This report documents the findings of our inspections. It is intended to provide the tank owner/operator with an assessment of the tank's current condition, recommendations for improvements to maintain the long term integrity of the structure and an opinion of the tank's suitability for continued service.

II. GENERAL SITE AND TANK DESCRIPTION

AARON Environmental (AARON) was asked to conduct an out-of-service inspection of one aboveground waste solvent storage tanks located at IBM Corporation, River Street, Essex Junction, VT. The tanks were inspected on June 21 and 22, 2011. The subject tank is described in the table below.

TANK ID / LOCATION	SIZE (GALLONS)	TANK CONSTRUCTION MATERIAL	MANWAY ACCESS	PRODUCT STORED
GENERAL SOLVENT #2	10,000	SINGLE WALL STAINLESS STEEL WITH CONCRETE/STEEL CONTAINMENT DIKE	YES	WASTE SOLVENT

The subject tanks were identified as shop-fabricated, welded, Stainless steel construction. The age, size, orientation, and appurtenances of the tank are described in further detail in Section III of this report.

Two historical reports by Knight Consulting Engineers addressing prior inspections of the subject tanks were provided to AARON for review. One report dated December 10, 2004 included exterior ultrasonic thickness data for the subject tank, referred to as General Solvent #2.

III. INSPECTION SUMMARY

The following sections provide a summary of the inspection completed for the tank. The visual and ultrasonic thickness (if applicable) summaries are also provided for the tank.

General Solvent #2

This 10,000-gallon tank is a horizontal, cylindrical design with a diameter of 120 inches and an overall length 180 inches (15 feet), and is used to store waste solvent. The tank consists of single wall Stainless steel, welded construction and rests within a covered concrete secondary containment structure. The containment dike is steel lined and has a calculated containment capacity of 23,170 gallons. There was no nameplate observed on the tank; however, the tank is insulated and a nameplate may not be visible. The age of the tank was verified based on Form U-1A installed in 1996 according to the Manufacturers Data Report for Pressure Vessels.

For the purposes of this inspection, the subject tank is considered to be single wall, not in contact with the ground. The tank is equipped with a manway and was inspected both externally and internally.

The tank is equipped with the following fittings and equipment located along the centerline:

24" ID access manway, tight bolted with high-level warning alarm switch
2" tank top flanged fitting inlet/outlet
6" tank top flanged fitting with emergency venting
2" tank top flanged fitting with an inlet for nitrogen
6" tank top flanged fitting with a level indicator
2" tank top flanged fitting with a normal vent
4" tank top flanged fitting
Tank top fitting with pump
24" ID diameter manway

The following details were observed as part of the overall tank inspection. The tank inspection summary is provided following the STI periodic inspection criteria (monthly and annual), formal external inspection criteria, and additional inspection items. The periodic inspection items for this tank are described as follows:

Monthly Inspection Checklist

1. Tank Containment
   1.1. The tank was emptied and cleaned prior to our inspection. No liquid was present on the tank bottom.
   1.2. The containment area was inspected for debris and fire hazards. None were observed.
   1.3. The drain associated with the secondary containment area was clear of debris and appeared to be in working order.
   1.4. Containment egress pathways were inspected. No problems were identified.
2. Leak Detection
   2.1. The tank and containment area were inspected for signs of leakage. No leaks were observed.

3. Tank Attachments and Appurtances
   3.1. The tank stairs and topside access platform were inspected. These structures are secure with no signs of significant corrosion or damage.
   3.2. The tank liquid level gauge was inspected. The tank was empty during our inspection so the proper and accurate operation of the gauge was not verified.
   3.3. Tank openings were inspected to confirm proper sealing. Openings appeared to be properly sealed.
4. Other Conditions
   4.1. No conditions were identified which would be considered unsafe or that would significantly affect the site SPCC Plan.

Annual Inspection Checklist

1. Tank Containment
   1.1. The steel lined concrete secondary containment structure was inspected and found to be in satisfactory condition.
   1.2. The drainage pipe and/or valves associated with the secondary containment structures were inspected and found to be in satisfactory condition.
2. Tank Foundation and Supports
   2.1. No signs of tank settlement or foundation washout were identified.
   2.2. The concrete containment structure is not visible because there is a steel lining over it. The steel lining (i.e., overlay) was observed to be in good condition. Cracking and/or spalling were not identified. There is no ring wall associated with the subject tank.
   2.3. The tank rests on steel support saddles which rest on elevated concrete foundations which are covered with steel plate. Portions of the steel saddles have some limited paint failure. The foundations are in good condition.
   2.4. The area around the concrete containment structure is located under a roof. Drainage is not a concern.
   2.5. The tank stairs and platform are bonded to the steel building structure which is bonded to an earth ground rod. The grounding equipment was observed to be in good condition.
3. Cathodic Protection System
   3.1. There is no cathodic protection system associated with the subject tank. There is no buried steel associated with the tank or piping.
4. Tank External Coating
   4.1. The S.S. tank had no paint. The entire tank shell is covered with insulation. Some paint failure was observed on the steel support saddles.
5. Tank Shells/Heads
   5.1. Evidence of shell/head distortions, buckling, denting or bulging was not observed.
   5.2. Evidence of shell/head corrosion was not observed.
6. Tank Manways, Piping and Equipment within Secondary Containment
   6.1. The tank manhole and bolts were observed in good condition with no significant signs of wear or corrosion.
   6.2. The piping and equipment associated with the subject tank and located within the secondary containment was inspected and found to be in good condition.
7. Tank Roof
   7.1. Not applicable, the tank is a horizontal cylindrical design.
8. Venting
   8.1. The normal vents are in good condition and free from obstructions.
   8.2. The tank has emergency venting which appeared to be in good condition and working properly.
9. Insulated Tanks
   9.1. The tank shell is insulated. No missing insulation was identified.
   9.2. Areas of moisture associated with the insulation were not identified.
   9.3. No mold was observed.
   9.4. No damage to the insulation was observed.
   9.5. The tank is located under a roof; therefore, the insulating material is protected from precipitation.

10. Level and Overfill Prevention Instrumentation of Shop Fabricated Tanks
    10.1. The tank level sensing device was inspected, found to be in good condition but not tested for proper operation.
    10.2. The overfill prevention device includes an electronic high level warning alarm. This device is in good condition but was not tested for proper operation.
11. Electrical Equipment
    11.1. The tank grounding cable and/or connections were inspected and found to be in good condition. There were some electrical conduits that were not sealed and would not meet NFPA 30 flammable and combustible liquid codes.
    11.2. Heat trace tape is located on the exterior of the tank under the insulation layer. This was not visible and was not inspected. Other electrical wiring associated with the tank equipment is in good condition.

Formal External Inspection

1. General
    1.1. A formal external inspection was performed by an STI certified inspector.
    1.2. The subject aboveground storage tank (AST) is single wall stainless steel, horizontal, cylindrical design. The tank is 120 inches in diameter, 15 feet long with a nominal capacity of 10,000 gallons and is used to store waste solvent. The tank was reportedly installed in 1996.
    1.3. According to facility personnel, the subject tank has been evaluated for integrity in the past. Refer to the historical reports from Knight Consulting Engineers.
    1.4. There was no nameplate observed on the tank; however, according to available information the tank was built by Stainless Fabrication Inc. Springfield, MO, fabricated the tank in 1996.
    1.5. The fabrication of the AST was inspected using UL 142 as a baseline.
    1.6. The AST foundations were inspected for indications of settlement, cracking, exposed rebar, and general disrepair. No evidence of the above conditions was observed.
    1.7. The AST supports were inspected for indications of cracking, spalling, and general disrepair. The supports include three steel saddles which are not bolted to the concrete foundation. The supports have some isolated paint failure.
    1.8. The subject tank is located within a concrete secondary containment structure which is lined with plate steel. An electronic high level warning alarm is located in the tank. The containment area associated with the tank was inspected and found to be in good condition.
        1.8.1. No breaches or damage were identified with the containment structure.
        1.8.2. There were no foreign materials or liquid located within the containment structure.
        1.8.3. There is a drainage system associated with the containment structure. There were no penetrations observed which would lead to failure of the secondary containment.
    1.9. Ancillary equipment was inspected for condition and operability.
        1.9.1. Piping and piping connections were inspected for visible signs of stress or leakage such as severe corrosion, rusted bolted connections, or other severe degradation. Piping and piping connections were observed to be in good condition.
        1.9.2. The tank has a 2" diameter normal vent which terminates just above the building roof top and was observed to be in good condition. The tank has a 6" diameter

emergency vent and was observed to be in good condition.

1.9.3. The tank level systems were out-of-service during our inspection and were not tested for operation.

1.10. The tank system is grounded. The ground systems were observed to be in good condition.

1.11. The stairs and topside platform were inspected and found to be in good condition with no indications of significant corrosion or damage.

1.12. The tank has beige topcoat paint. The majority of the tank shells and heads are covered with insulation and are not visible for inspection. The steel supports have minor paint failure.

2. Original Shell Thickness of the AST
   - 2.1. Original tank documentation was provided for review and is attached to this report.
   - 2.2. The tank manufacturer was Stainless Fabrication Inc. .
   - 2.3. The tank was manufactured to the ASME Pressure Vessel Code.
   - 2.4. According to the manufacturer's data, the original shell thickness was ¼ inches (0.25 inches). The original head thickness was 1/4 inches (0.250 inches).
   - 2.5. The tank was rated for a maximum working pressure of 20 psi at a maximum temperature of 140 degrees F.
3. Horizontal ASTs
   - 3.1. Shell plates, welds and ancillary equipment were inspected for indications of exterior corrosion, bucking, distortion of stress, cracking, pinholes and mechanical damage.
     - 3.1.1. The insulating material and jacketing was not removed. With the exception of several four-inch diameter access ports, the exterior surfaces of the tank shell were not inspected.
   - 3.2. The tank shell was inspected for indications of changes that may have been made to the AST after it was fabricated. No evidence of changes to the original tanks was identified; however, the tank heads and shell surfaces could not be visually inspected due to the presence of insulation.

<u>Formal Internal Inspection</u>

1. General
   - 1.1. A formal internal inspection was performed by an STI certified inspector.
   - 1.1. The tank was cleaned by the owner prior to our inspection.
2. Horizontal AST Internal Inspection
   - 2.1. Internal appurtenances were documented and visually inspected. Stainless steel appurtenances were in good condition. No mechanical damage, cracking or other concerns were identified.
   - 2.2. Welds were visually inspected. No problems were identified.
   - 2.3. Ultrasonic Thickness Scanning (UTS) was performed on the interior surfaces of the tank heads. Data collected ranged from 0.218 to 0.224 inches.
     - 2.3.1. The entire interior shell had no scale. Data collected ranged from 0.251 to 0.255 inches.
     - 2.3.2. No pitting was identified.
   - 2.4. The fabrication of the AST was inspected using UL 142 as a baseline.

Suitability for Continued Service

Based on the STI criteria and result of the current inspection, the subject tank is suitable for continued service. The interval until the next certified inspection is 10 years. Federal, state and/or local regulations may require more frequent inspections of the subject AST.

Recordkeeping

1. AST records should be retained for the life of the AST system.
2. Monthly Inspection Checklists should be completed by the owner/operator and retained for a minimum of 36 months.
3. Annual Inspection Checklists should be completed by the owner/operator and retained for a minimum of 3 years.
4. Certified Inspection Reports should be retained for the life of the AST system.

IV. ULTRASONIC THICKNESS MEASUREMENTS SUMMARY

To obtain the residual metal thickness readings, a Panametrics 36DL Plus datalogging ultrasonic digital thickness gauge with a D790 transducer was used. The meter has a resolution of +/- 0.001 inches intended for use on steel plate and piping materials used in storage tank applications. The calibration of the instrument is performed by the manufacturer and confirmed prior to and during testing using a steel calibration block; the couplant used was Sonotech UT-X or an equivalent glycerin based material.

Refer to the attachment of this report for a tank sketch and UT thickness measurements.

V. REQUIREMENTS FOR CONTINUED SERVICE

The following items are based on the requirements of SP-001 and UL 142. These documents are industry standards. Additional regulatory requirements may apply to the subject AST.

General Solvent #2 (1) 10,000-gallon tank

1. Based on the STI Standard (SP-001), the interval until the next certified inspection is not to exceed 10 years. If the facility uses an alternate Standard or chooses to provide "equivalent environmental protection" in lieu of routine integrity testing, the method and schedule for such should be included in the facility's SPCC Plan.

If the facility's SPCC Plan requires the use of routine "integrity testing" using the STI procedure SP-001, then the following routine inspections should be completed as described by the owner/operator. Specific inspection items may be modified for tank specific use as necessary; however, deviations from or alterations of the STI Standard should be discussed in the facility SPCC Plan.

Shop Fabricated Steel Tanks

The Steel Tank Institute (STI) Standard for Inspection requires the owner or operator of an aboveground tank to perform and document periodic inspections. Refer to the attached checklists. These documents should be completed by the owner or operator on a monthly and annual basis. All records should be maintained.

VI. RECOMMENDATIONS

The following recommendations are based on good engineering practices and industry standards; however, they are not specific regulatory requirements or requirements for continued service.

General Solvent #2 (1) 10,000-gallon tank

1. There was some isolated paint failure located on the tank saddles.
   a. The saddles should be prepped and repainted.
   b. The electrical conduits should be sealed.

PROFESSIONAL OPINION

The subject above ground storage tank(s) at the IBM Essex Junction facility, Essex Junction, VT have been inspected using procedures found in STI SP001 4th edition publication "Standard for the Inspection of Aboveground Storage Tanks".

It is the professional opinion of this firm that the structural integrity of the subject stailess steel tank is acceptable. Unless a different interval is indicated in this report, a certified inspection should be completed within 10 years of the date of this inspection, no later than June 2021.

This is not to be construed as an expressed or implied warranty of future performance.

Should you have any questions or comments concerning this inspection report, please do not hesitate to contact the undersigned at 860-276-1201.

Sincerely,

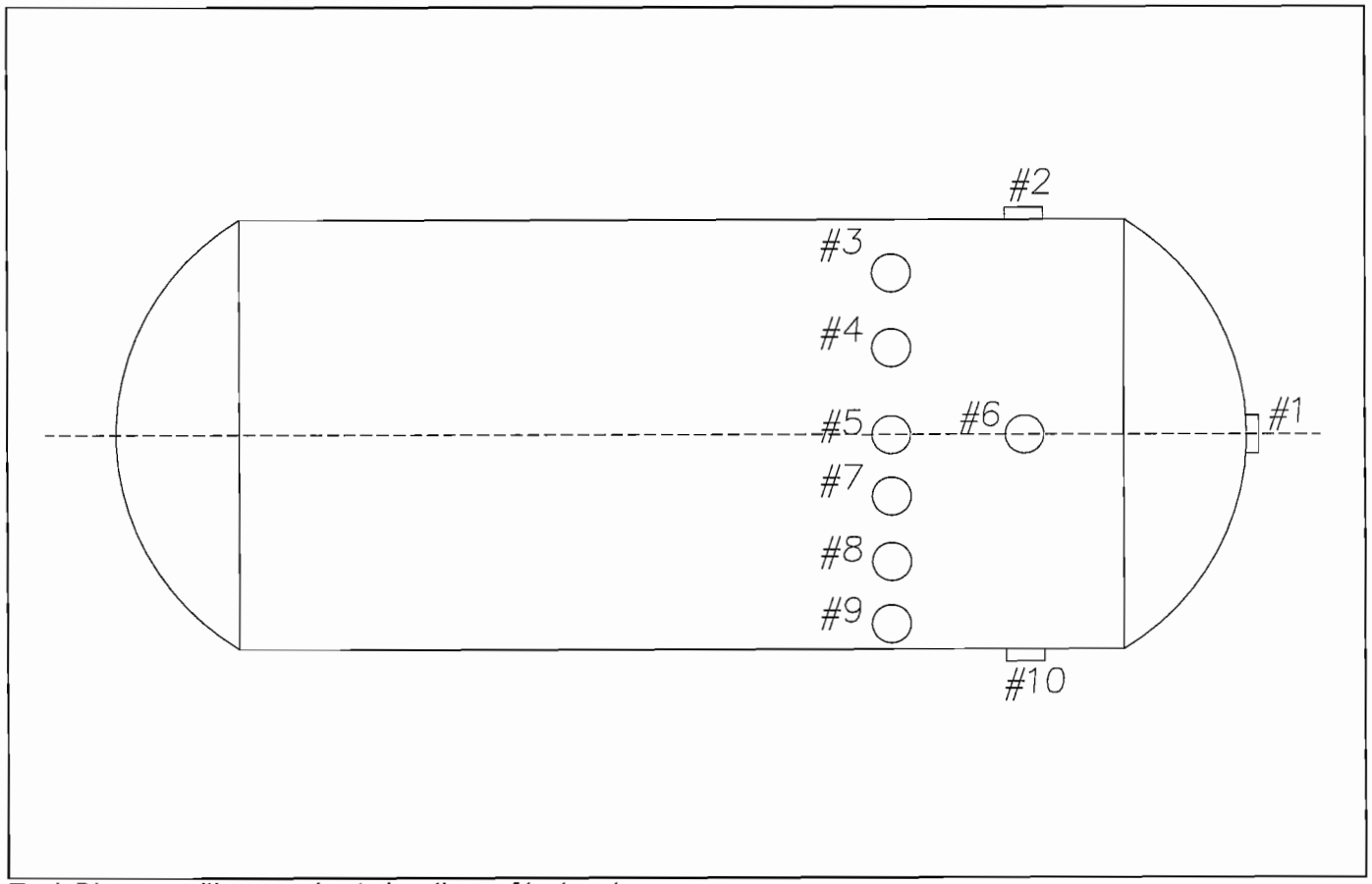
Joseph Paterak (ext. 109)
AST Inspector (STI #AST-RO9117)

Attachments

External Thickness Measurements

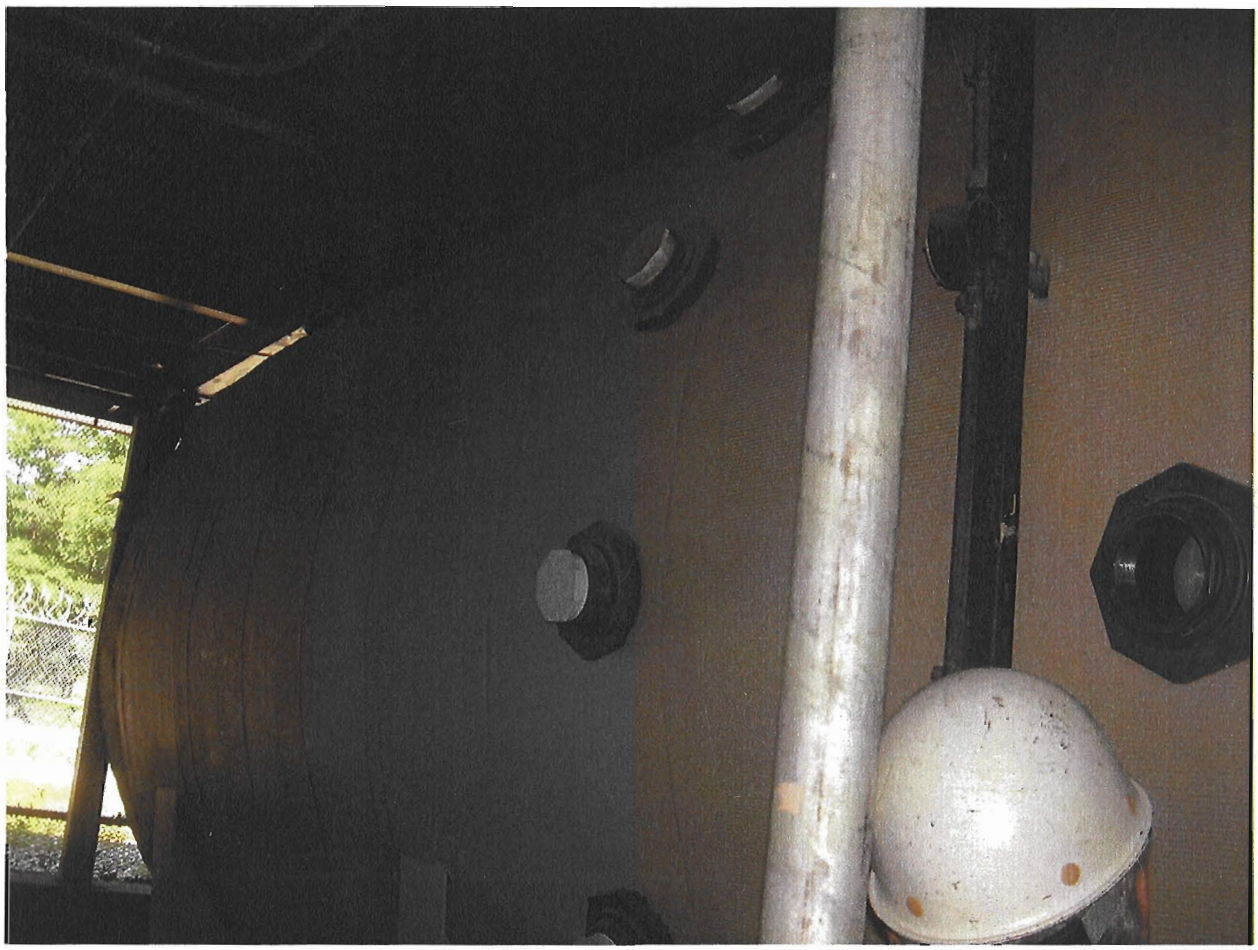
Tank Name: General Solvent #2
Inspector: Joe Paterak
Survey Date: 6/22/2011

External Inspection Readings	
Data Point ID	**Thickness (in.)**
#1	0.265
#2	no access
#3	0.263
#4	0.252
#5	0.289
#6	0.265
#7	0.279
#8	0.254
#9	0.247
#10	0.271



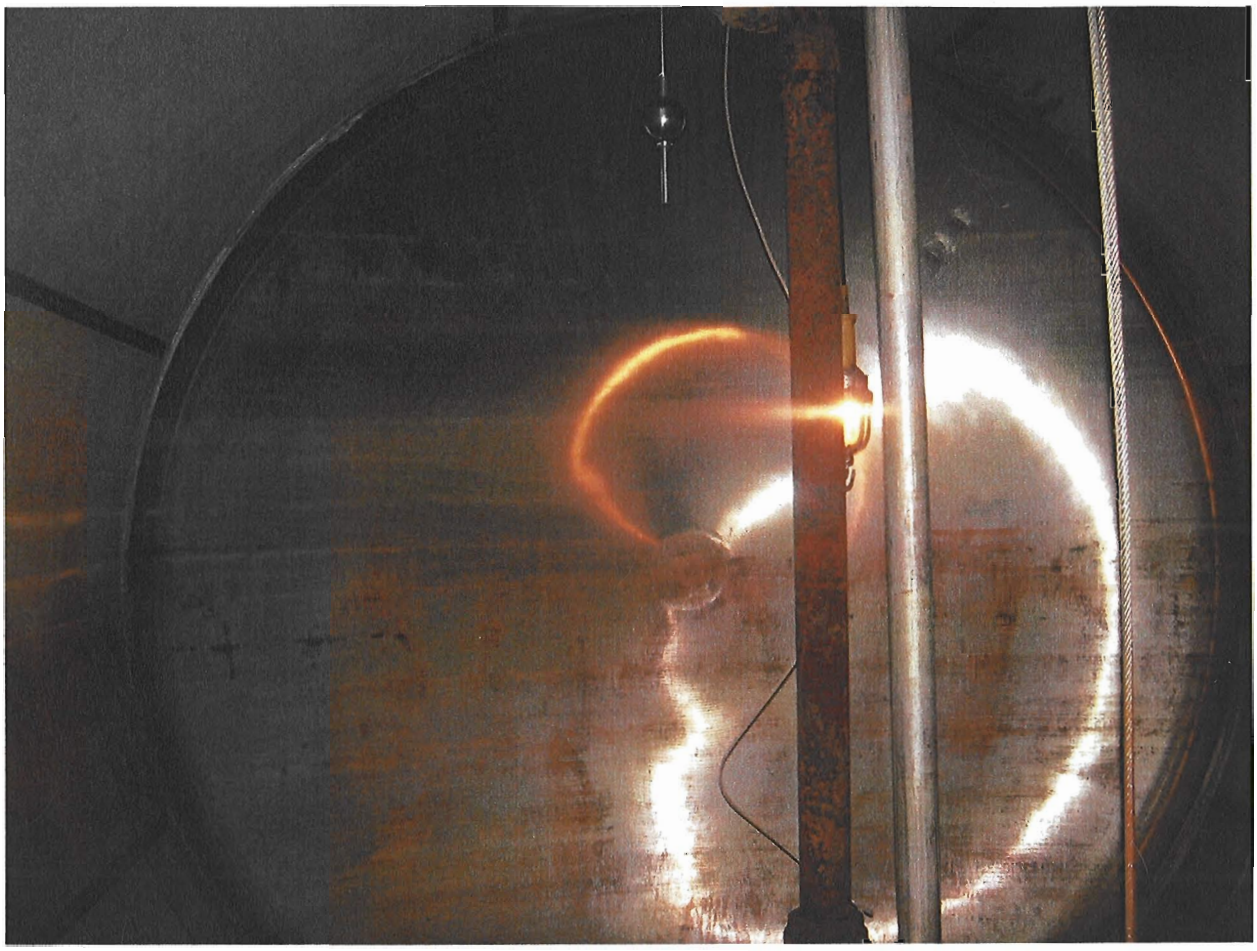
Tank Diagram with approximate locations of test ports.

TANK EXTERIOR

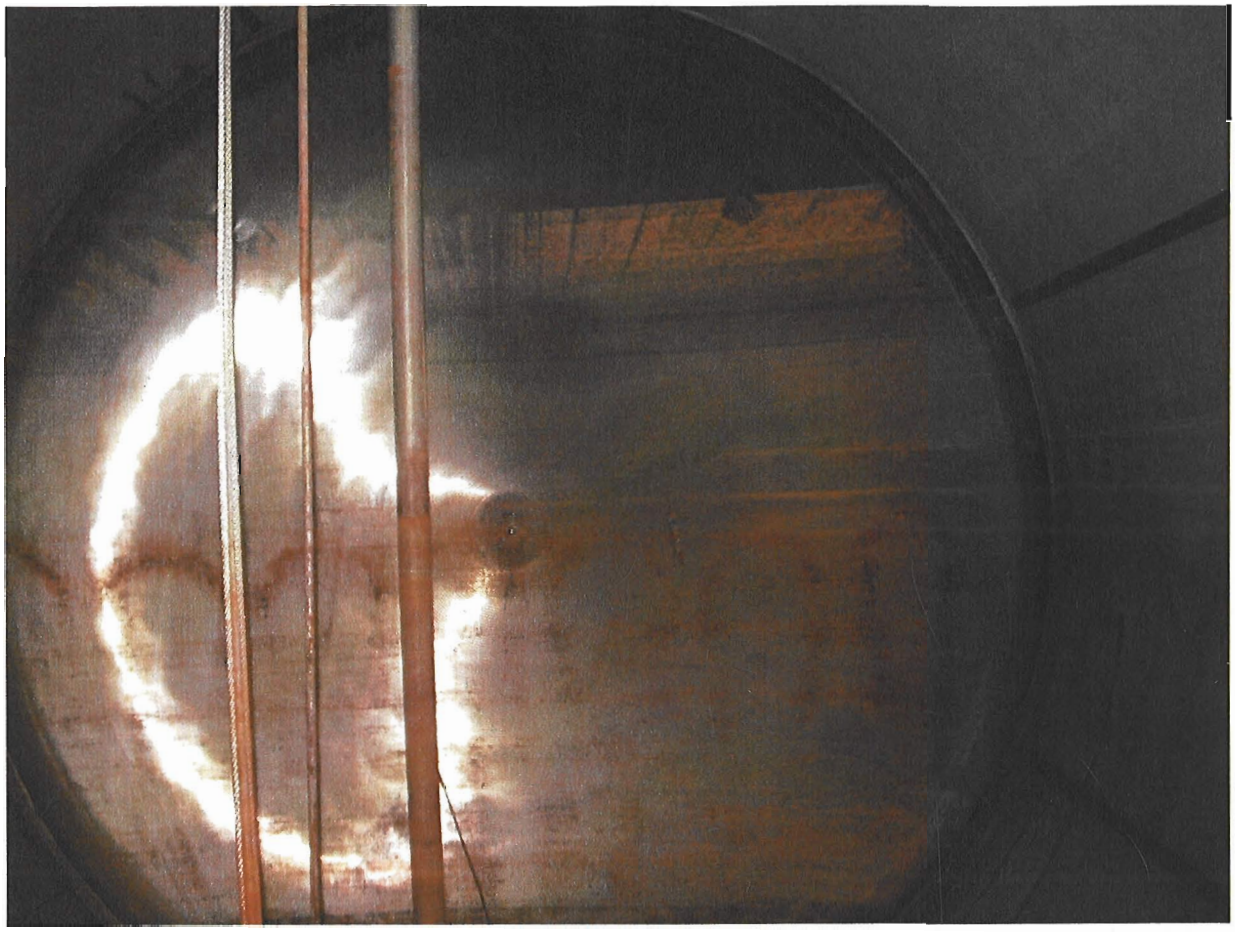


TANK SADDLE (WITH MINOR CORROSION)

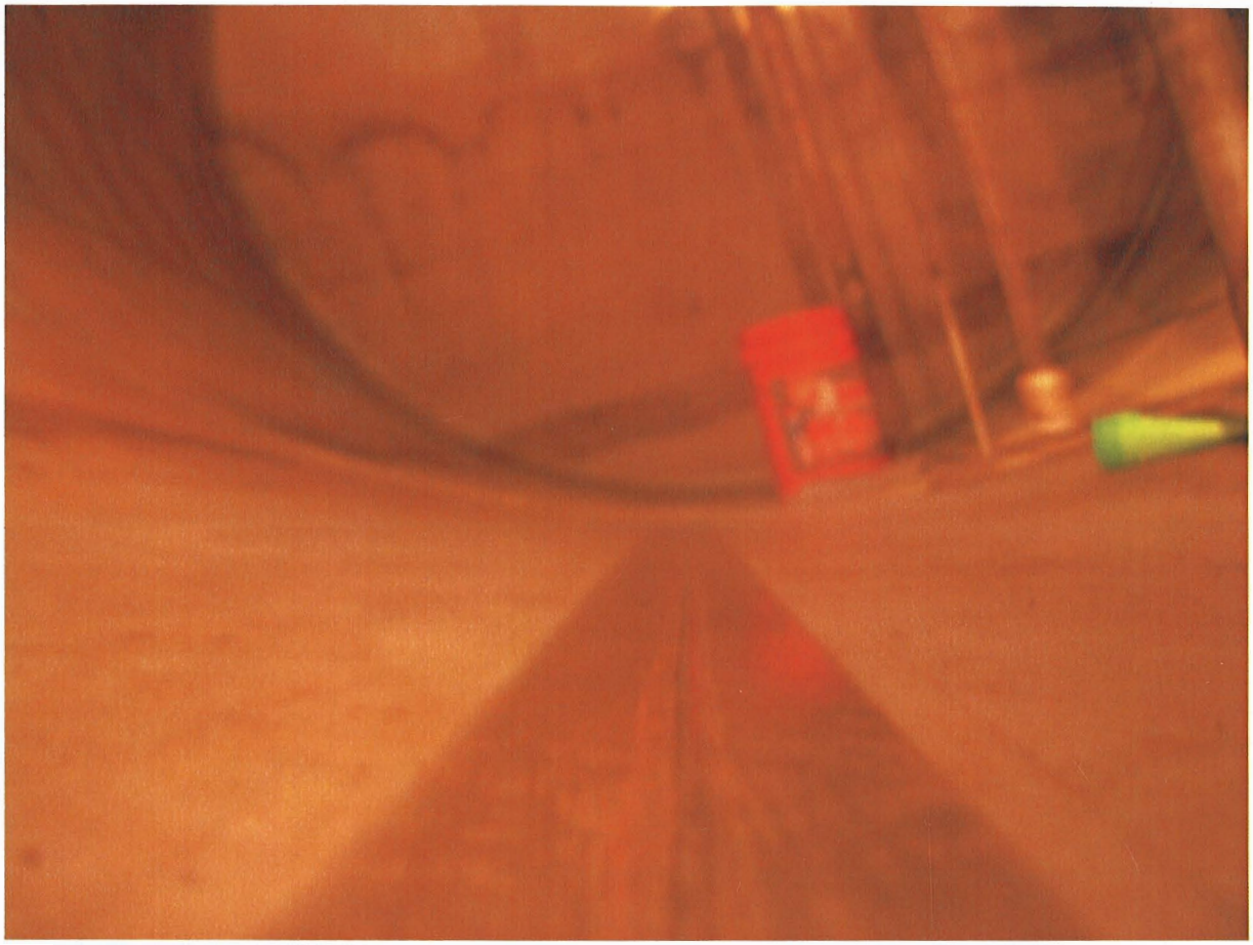
TANK HEAD (INTERIOR)



TANK HEAD (INTERIOR)



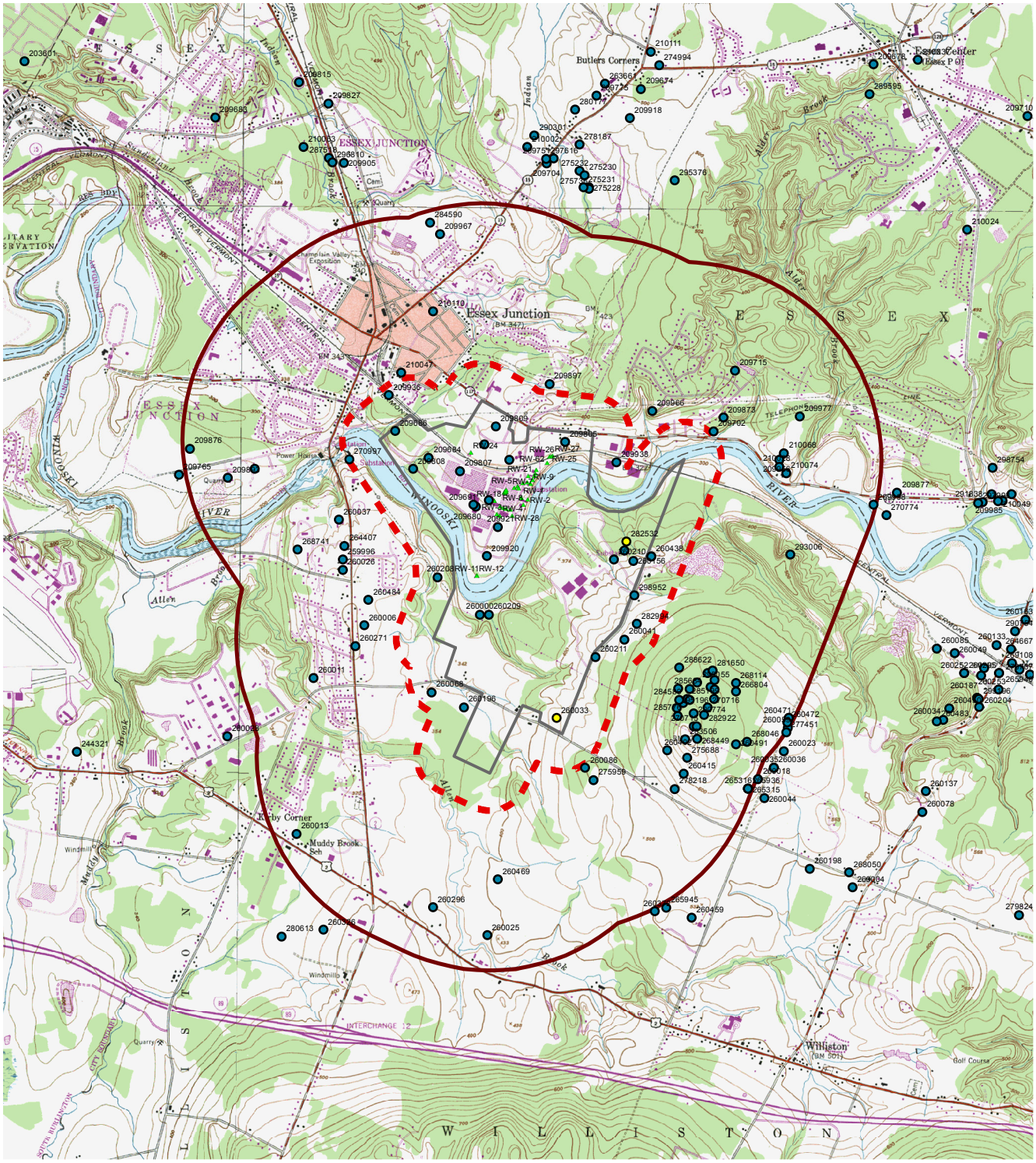
TANK BOTTOM (INTERIOR)



TANK TOP (INTERIOR)

APPENDIX B

FACILITY DESCRIPTION FIGURES



Source:
USGS Quadrangles,
7.5 Minute Series
Essex Junction, Vermont
Dated 1948, Photorevised 1987.

Private Well Not Owned by GF (Location Unconfirmed)
Private Water Supply Wells
IBM Owned Corrective Action Well
Prop_Line_Buffer1
Approximate Property Line
Approximate 1 Mile Radius
From Center of Facility

TRC

0 1,300 2,600 3,900 5,200 Feet

FIGURE B-1

Water Supply Wells Within 1000 Feet of Property Line

GLOBALFOUNDRIES
Essex Junction, Vermont

2011 Essex Junction Zoning

Zoning District

- Residential 1
- Residential 2
- Multi-Family Residential 1
- Multi-Family Residential 2
- Multi-Family Residential 3
- Multi-Family/Mixed Use 1
- Multi-Family/Mixed Use 2
- Village Center
- Transit Oriented Development
- Residential-Office
- Mixed Commercial Use
- Highway-Arterial
- Light Industrial
- Planned Exposition
- Planned Agriculture
- Open Space
- Flood Plain
- North Lincoln Overlay District
- Professional Office Overlay
- 2010 Tax Parcel Boundary
- Stream Centerline
- Winooski River
- Railroad
- Village Boundary

Disclaimer:
The accuracy of information presented is determined by its sources. Errors and Omissions may exist. Map is to be utilized for Planning purposes only.
Map produced by P.Brangan using ArcGIS 10.
All data is in State Plane Coordinate System, NAD83.
Sources:
Zoning districts - developed by CCRPC, 2003 as directed by Village Planning Office. Updated by CCRPC, 2010
Parcels - Essex Town - 2010
Surface Water - VT Hydrography Dataset - VCGI - 2008

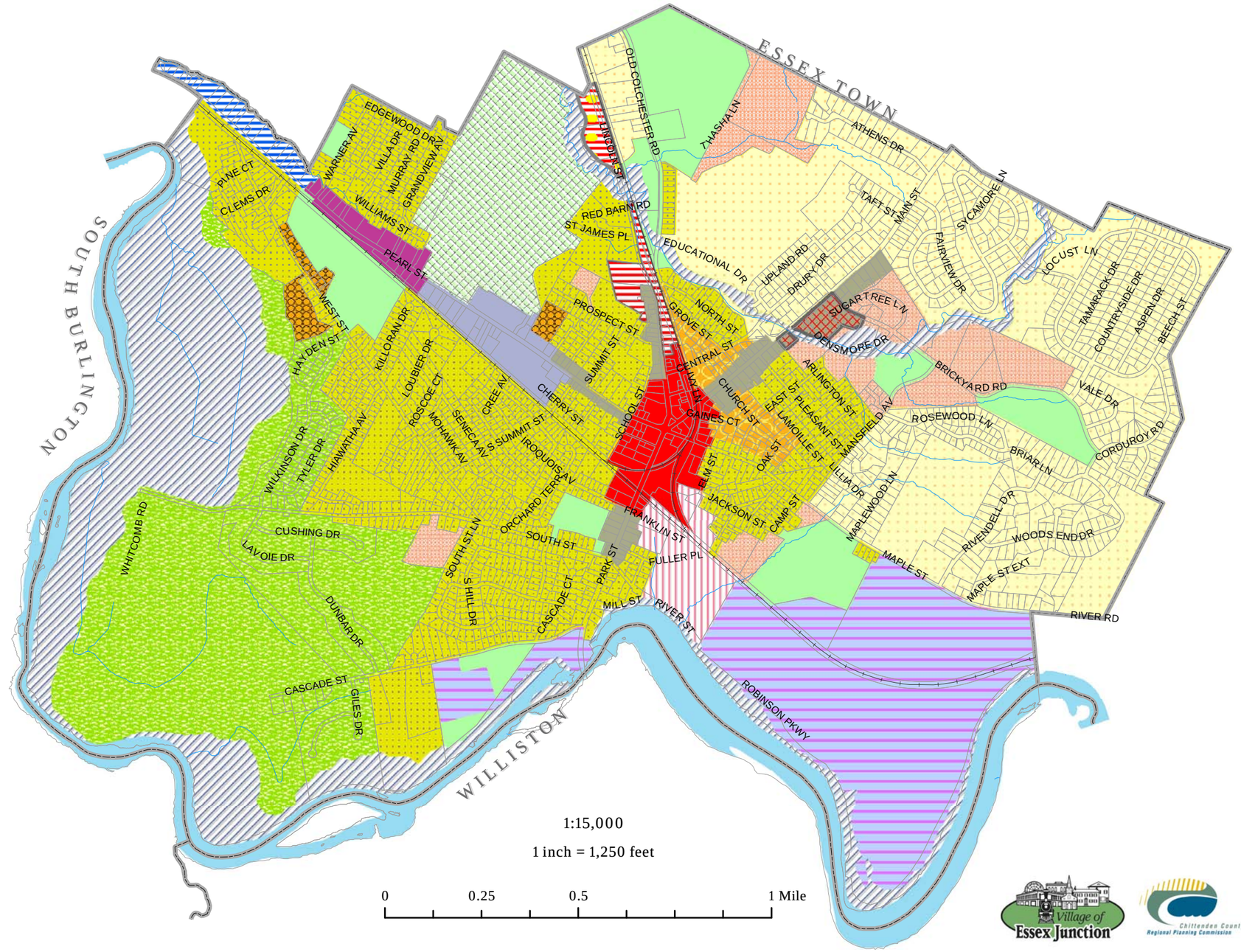
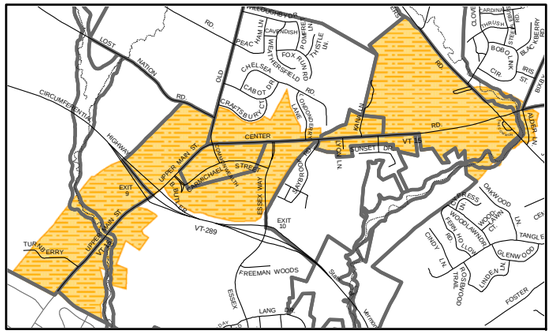


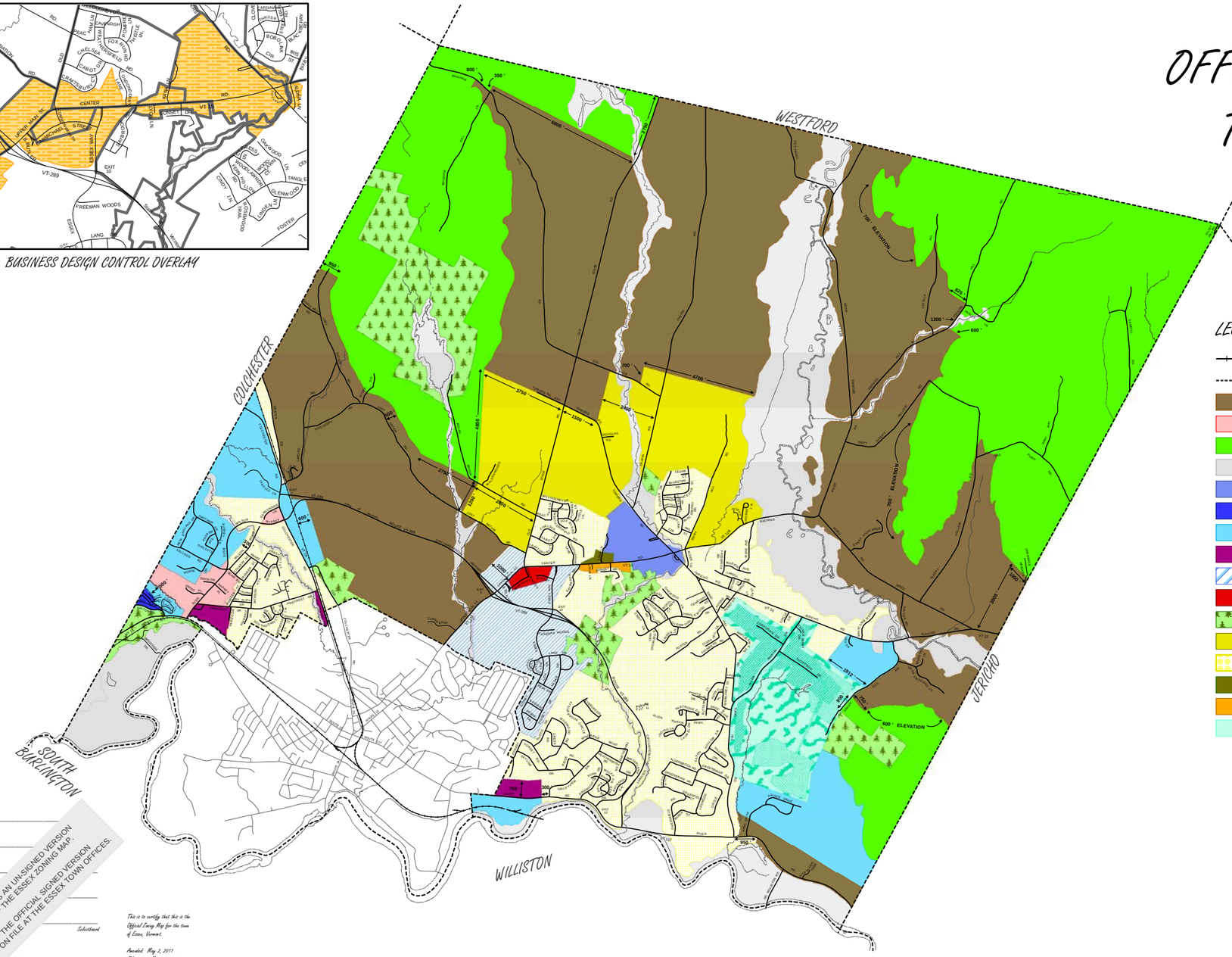
Figure B-2

Land Use - Village of Essex Junction Zoning Map

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT



BUSINESS DESIGN CONTROL OVERLAY



OFFICIAL ZONING MAP
TOWN OF ESSEX
VERMONT

2011

LEGEND

- RAILROAD
- SURFACE WATER
- (AR) AGRICULTURAL - RESIDENTIAL
- (B1) RETAIL - BUSINESS
- (C1) CONSERVATION
- (C2) FLOODPLAIN
- (CTR) CENTER
- (HP-DC) HISTORIC PRESERVATION - DESIGN CONTROL
- (I1) INDUSTRIAL
- (MXD) MIXED USE
- (MXD-PUD) MIXED USE - PLANNED UNIT DEVELOPMENT
- (MXDC) MIXED USE COMMERCIAL
- (O1) OPEN RECREATION
- (R1) LOW DENSITY RESIDENTIAL
- (R2) MEDIUM DENSITY RESIDENTIAL
- (R3) HIGH DENSITY RESIDENTIAL
- (RB) RESIDENTIAL - BUSINESS
- (RPD-I) RESOURCE PRESERVATION DISTRICT - INDUSTRIAL
  - (RPD-I) 60% (represents only a portion of the 60% - see the Forestdale Technology Park Official 60/40 map)
  - (RPD-I) 25%
  - (RPD-I) 15%

  For the RPD-I districts Refer to the Forestdale Technology Park Official 60 / 40 map, effective Nov 8, 2001 for specific delineations

0 — 1 Miles

LOCATOR

Source:
Zoning district boundaries from Zoning maps and town ordinances.
Linework from 1:5000 town digital parcel maps, and road centerlines.
Road Centerlines - 1:5000 1999 orthophotos with additions digitized onto the town. Road attributes from 2000 VT Agency of Transportation General Highway Map. Surface Waters - Stream centerlines from 1:20000 1978 orthophoto composites with additions from 1:5000 1999 orthophotos; shorelines from 1:15840 SCS soil survey.
Political Boundaries - 1:24000 USGS topographic quadrangles, modified with town parcel map. All data is NAD83, Vermont State Plane coordinate system.
Last revision: May 6, 2010 by Town of Essex G. I. S. Office.

LINDA K. MYERS, Chair

MAX G. LEVY, Vice Chair

IRENE A. WRENNER, Clerk

BRUCE E. POST

DAVID A. ROGERSON — Selectboard

Attest: _____ Town Clerk

THIS IS AN UN-SIGNED VERSION OF THE ESSEX ZONING MAP. THE OFFICIAL SIGNED VERSION IS ON FILE AT THE ESSEX TOWN OFFICES.

This is to certify that this is the Official Zoning Map for the town of Essex, Vermont.

Amended: May 2, 2011
Effective: May 23, 2011

Figure B-3

Land Use - Town of Essex Zoning Map

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

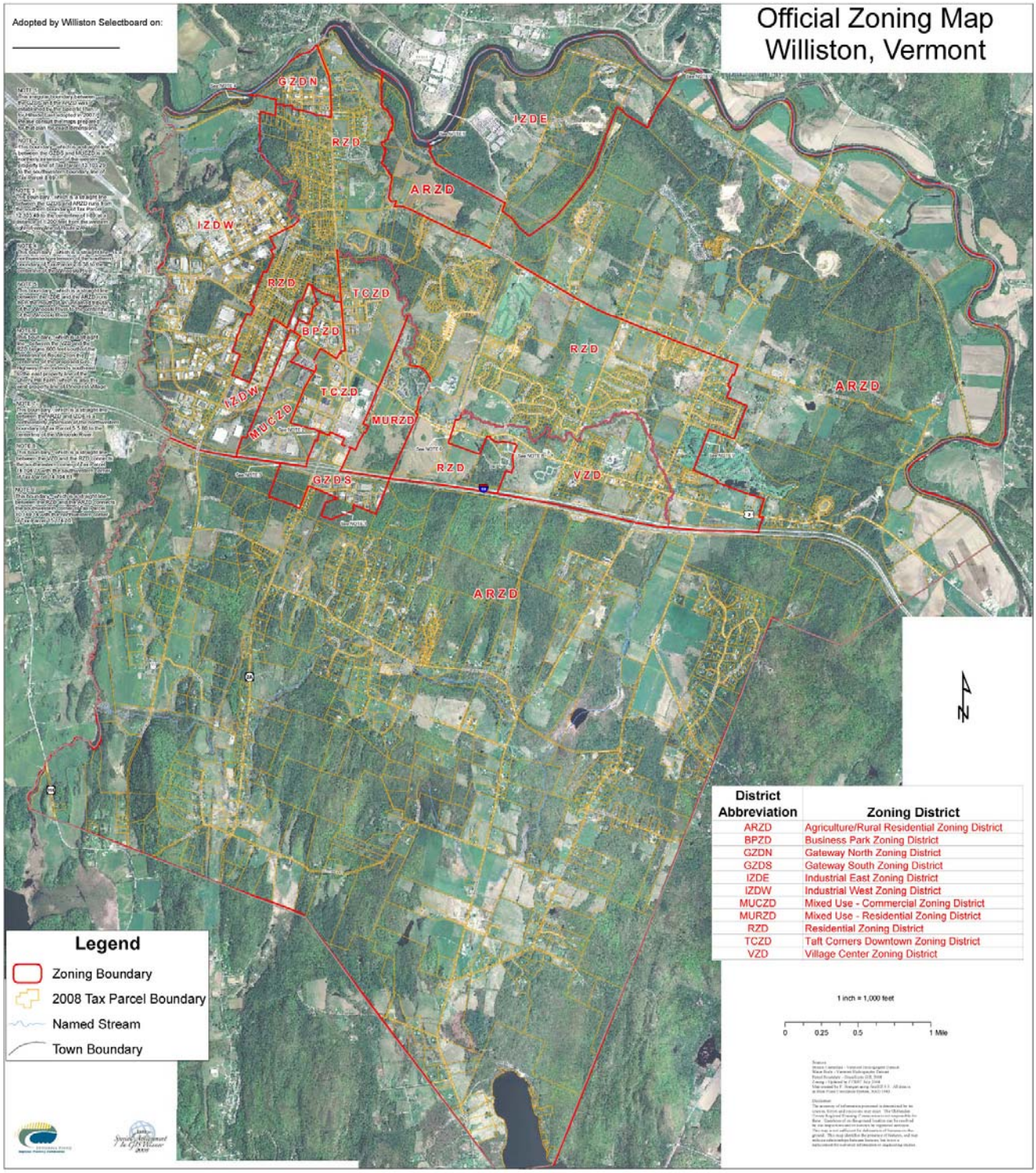


Figure B-4

Land Use - Town of Williston Zoning Map

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

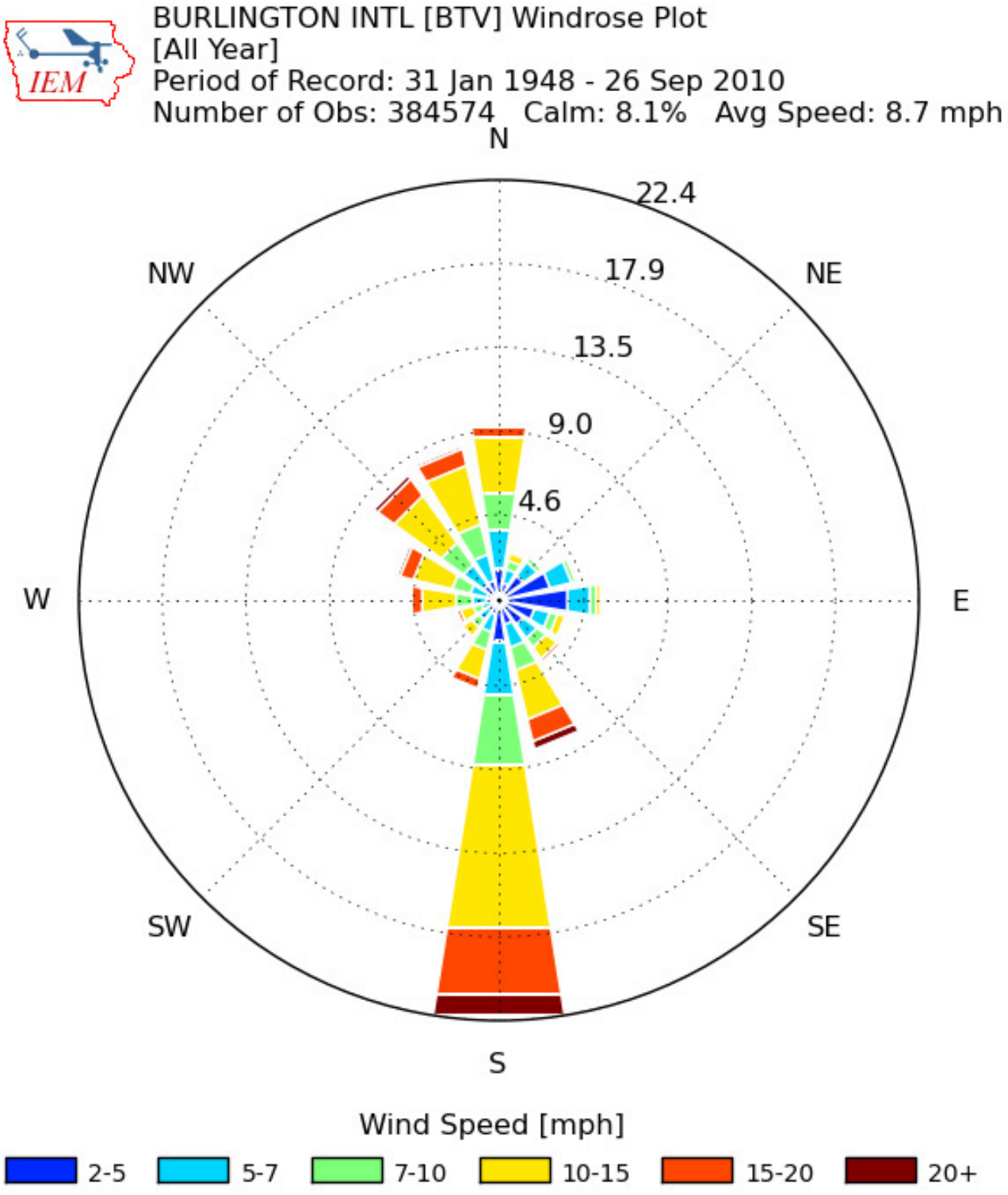


Figure B-5

Annual Wind Rose for Burlington International Airport

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

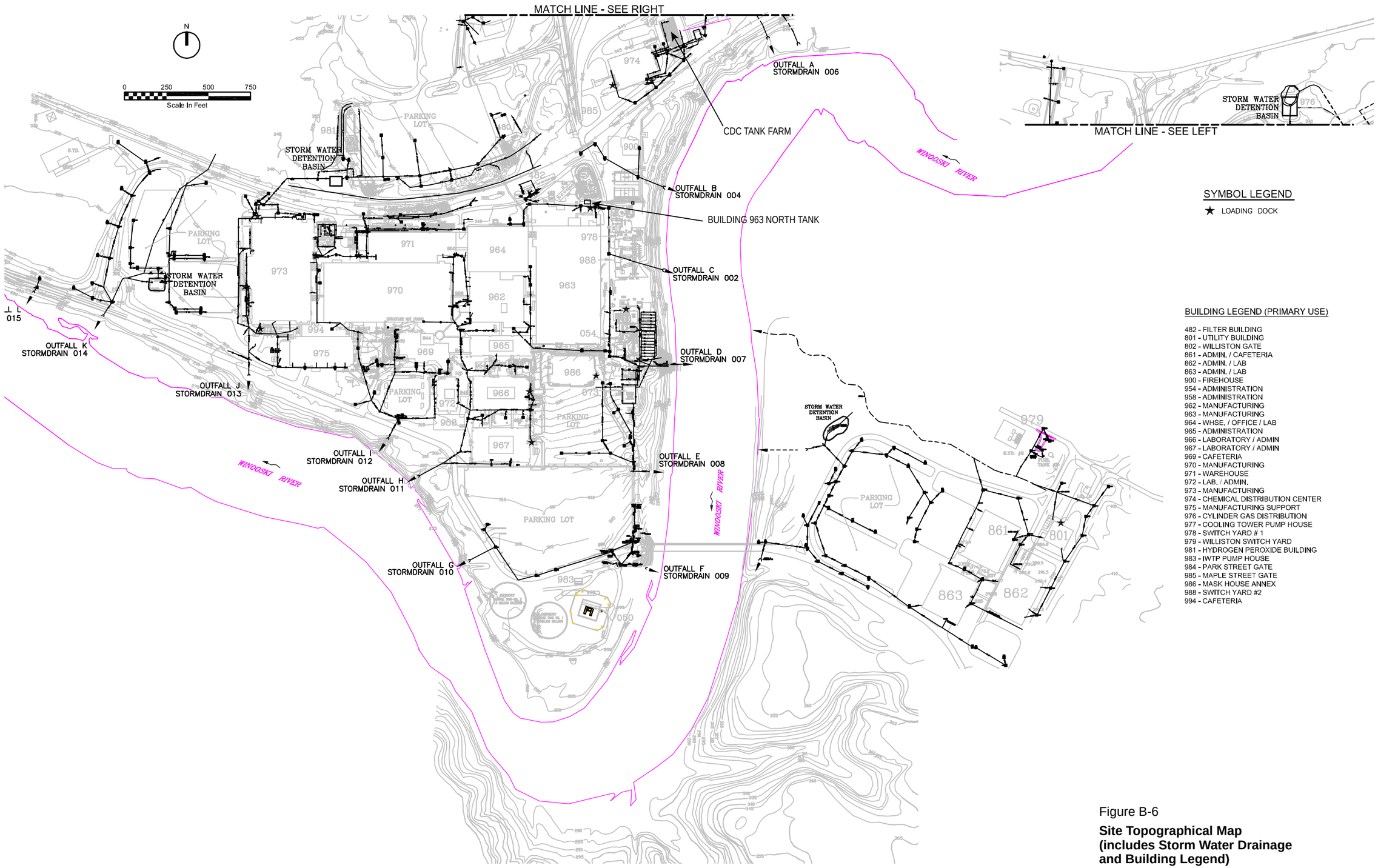


Figure B-6

Site Topographical Map (includes Storm Water Drainage and Building Legend)

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

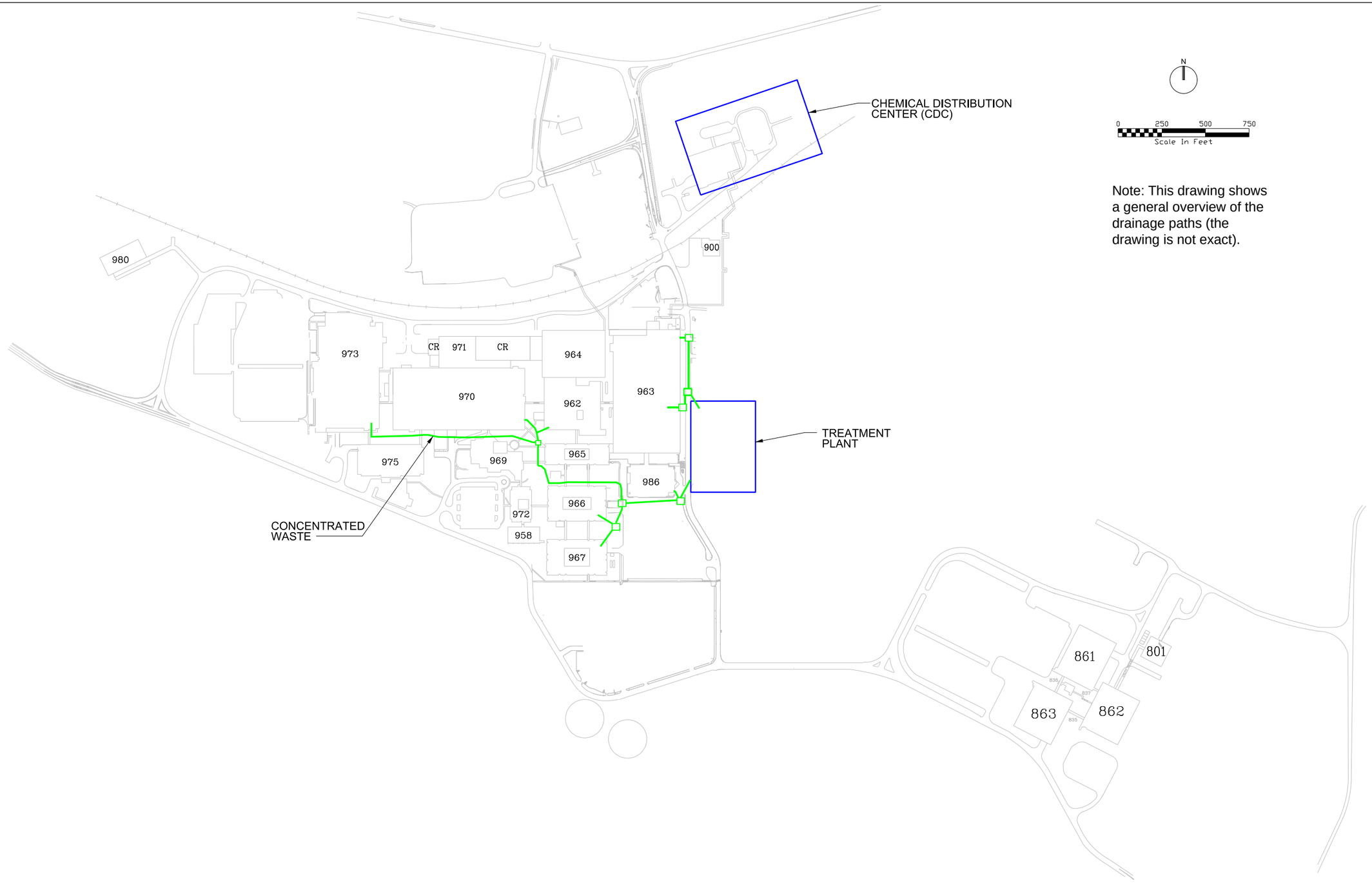


Figure B-7

Essex Junction Facility
Concentrated Waste Drainage Path
General Overview

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

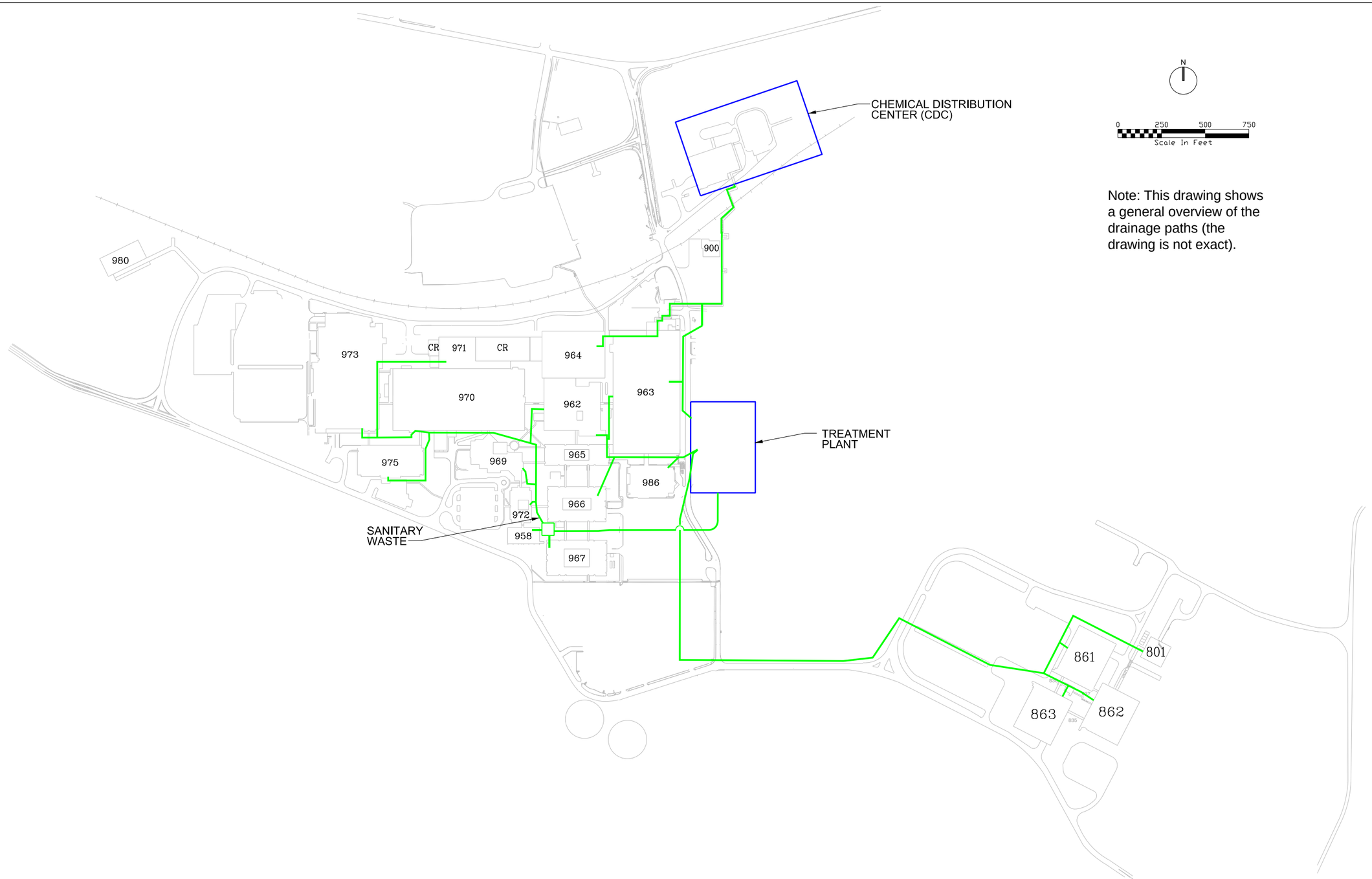


Figure B-8

Essex Junction and Williston Facility
Sanitary Waste Drainage Path
General Overview

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

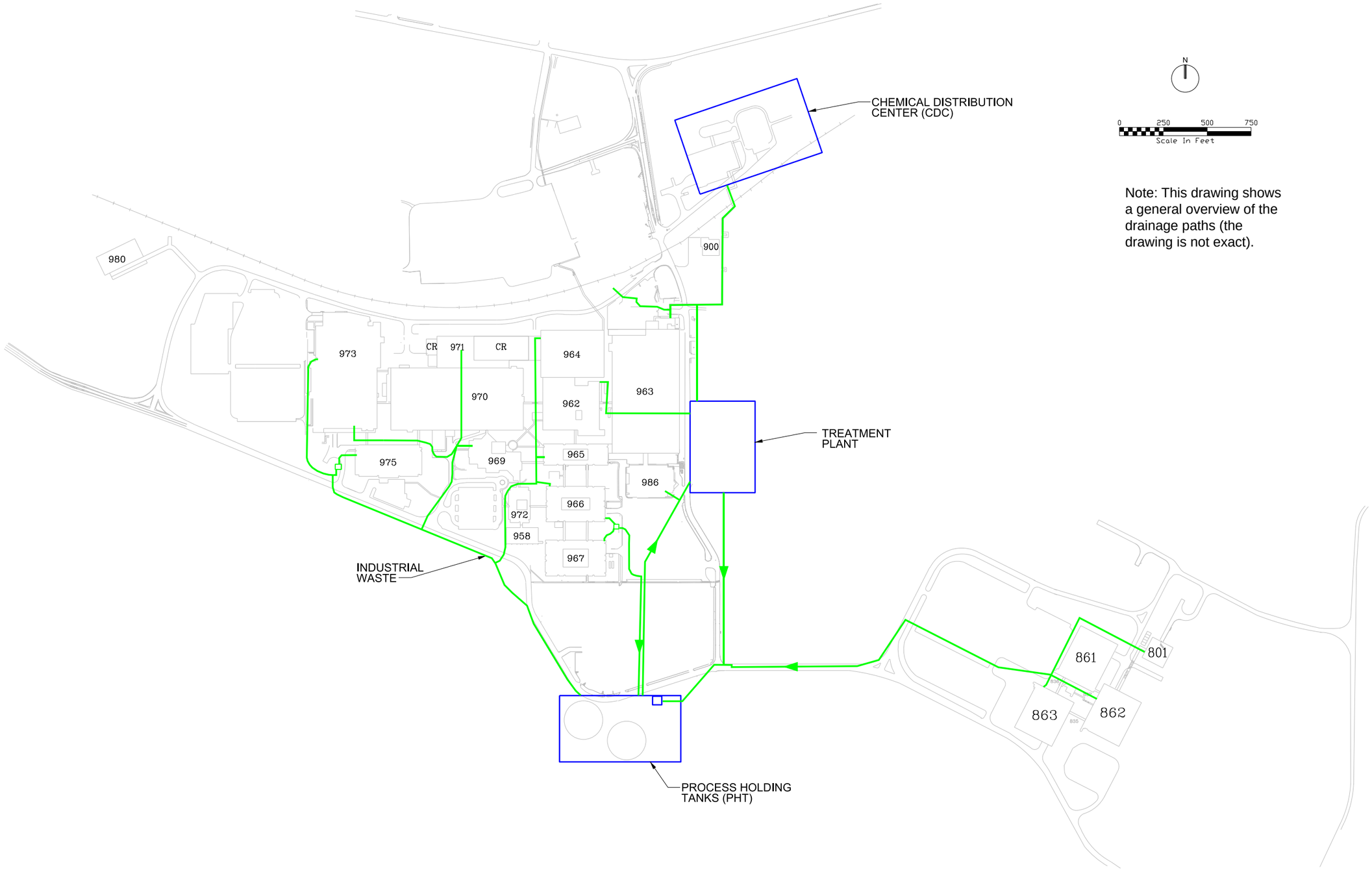


Figure B-9

Essex Junction and Williston Facility Industrial Waste Drainage Path General Overview

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

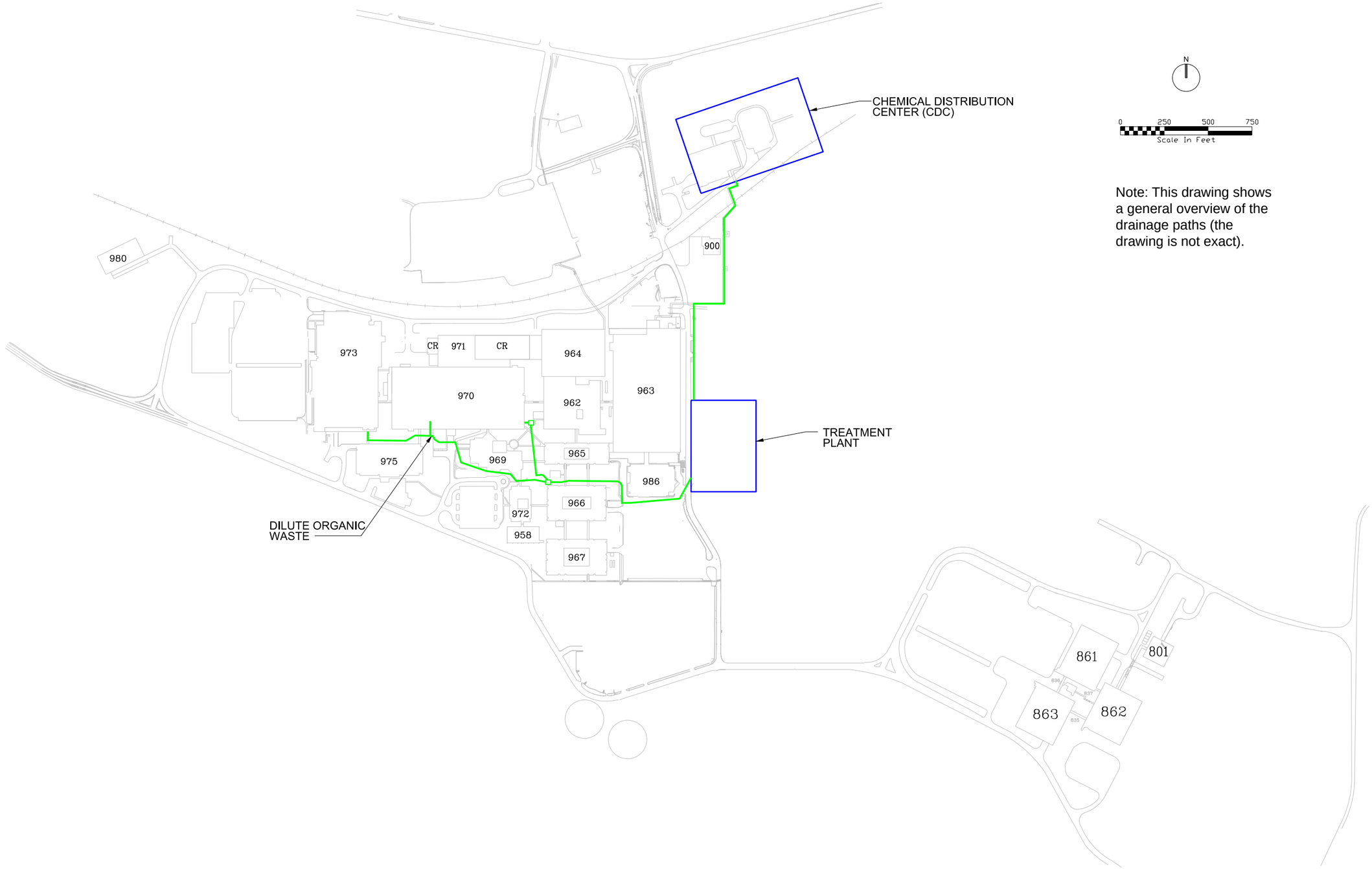


Figure B-10

Essex Junction Facility
Dilute Organic Waste Drainage Path
General Overview

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

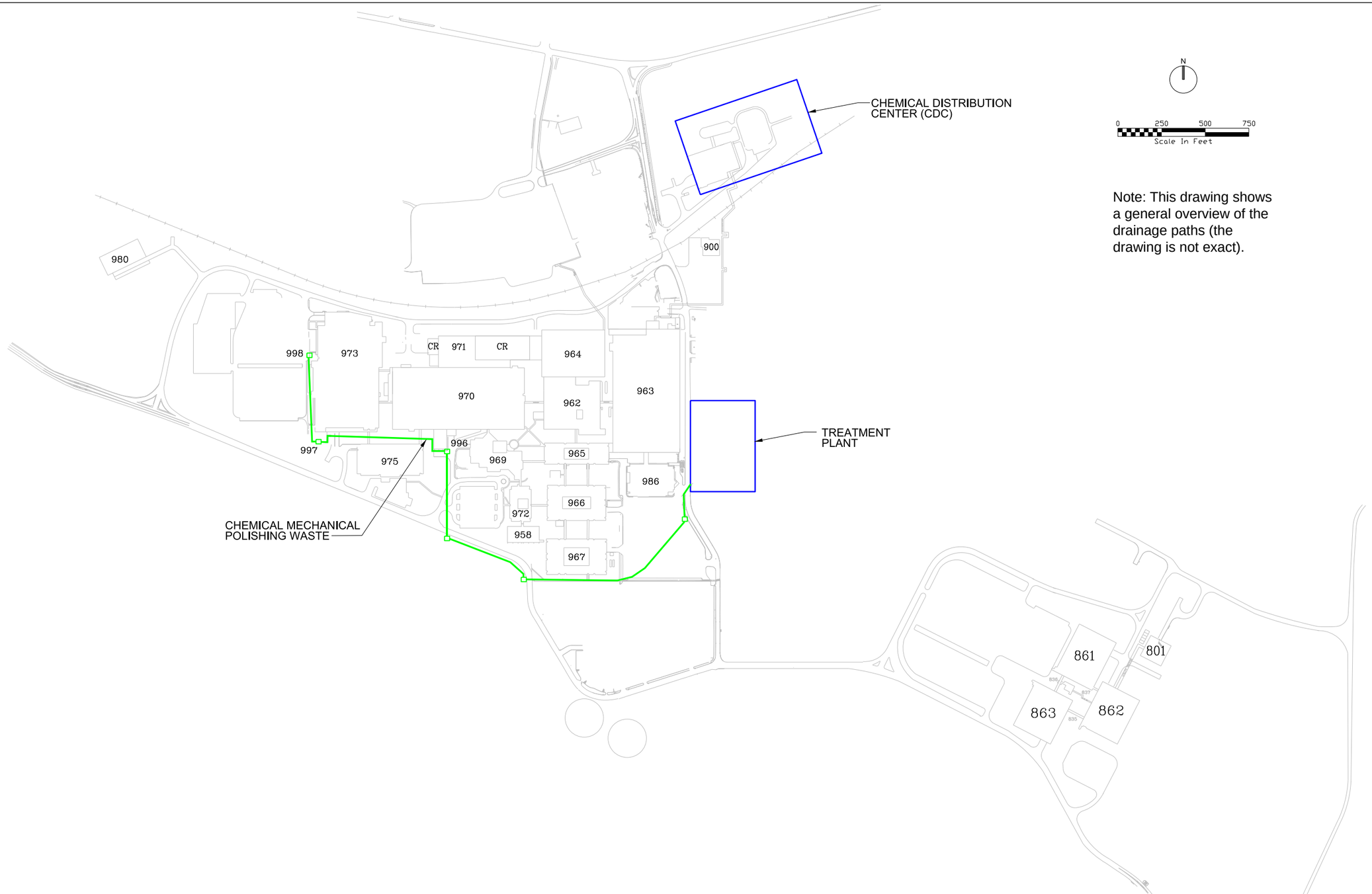


Figure B-11

Essex Junction Facility
Chemical Mechanical Polishing
Waste Drainage Path General Overview

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

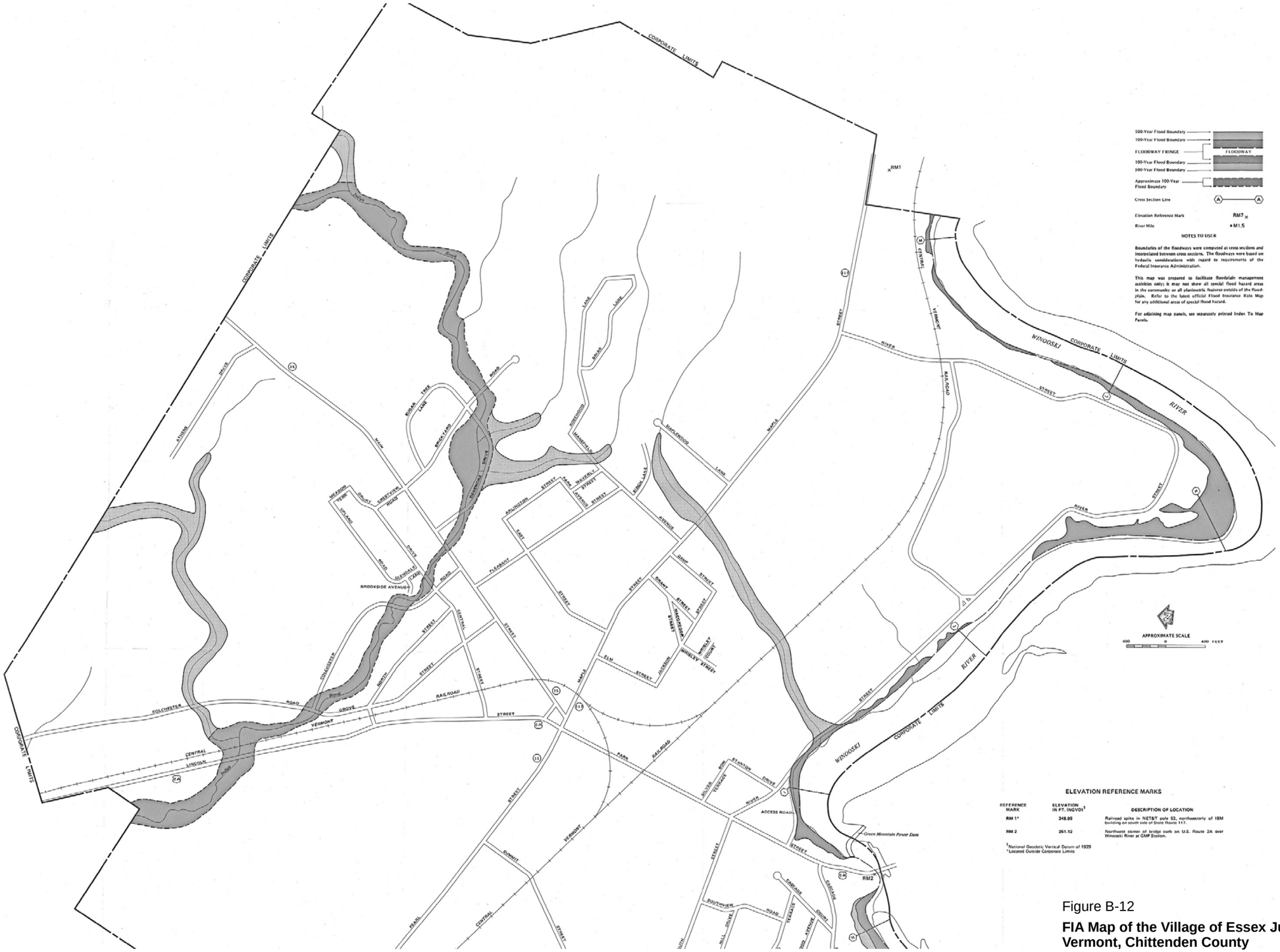


Figure B-12

FIA Map of the Village of Essex Junction Vermont, Chittenden County

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

Figure B-13

Essex Junction and Williston Facility Fire Protection Water System Layout

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

APPENDIX C

BIENNIAL HAZARDOUS WASTE REPORT

AND INTERNATIONAL SHIPMENTS REPORT

2017 HAZARDOUS WASTE REPORT

Cycle	Site Name	Site ID
2017	GLOBALFOUNDRIES US 2 LLC-VERMONT FACILITY	VTR000524868

GM 1 Waste Characteristics

A. Description of hazardous waste

IGNITABLE LIQUID, SPENT COATING/PHOTORESIST FROM SEMICONDUCTOR MANUFACTURING, PROPYLENE GLYCOL METHYL ETHER ACETATE/N-BUTYL ACETATE

B. EPA Hazardous Waste Code(s)

D001

C. State Hazardous Waste Code(s)

D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G06		W203	B	285446.0	POUNDS	

On-site Generation and Management of Hazardous Waste

Off-site Shipment of Hazardous Waste

Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*
	NJD002182897	H020	254200.0

Comments

GM 2 Waste Characteristics

A. Description of hazardous waste

SOLID, ARSENIC/PHOSPHORUS DEBRIS - DUCTWORK/PIPING/PARTS

B. EPA Hazardous Waste Code(s)

D001, D003, D004, D007, D008

C. State Hazardous Waste Code(s)

D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G15		W002	X	4177.0	POUNDS	

On-site Generation and Management of Hazardous Waste

Off-site Shipment of Hazardous Waste

Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*
	ILD098642424	H040	4591.0

Comments

GM 3 Waste Characteristics

A. Description of hazardous waste

SOLID, CLEAN UP DEBRIS FROM SEMI-CONDUCTOR MANUFACTURING AND LEAD ABATEMENT, TOXIC

B. EPA Hazardous Waste Code(s)

D004, D005, D006, D007, D008, D011

C. State Hazardous Waste Code(s)

D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G19		W002	X	1040.0	POUNDS	

On-site Generation and Management of Hazardous Waste

Off-site Shipment of Hazardous Waste

Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*
	OHD093945293	H061	500.0
Site 2	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*
	ARD069748192	H040	1602.0

Comments

PROTECTIVE CLOTHING, RAGS, DEBRIS, CONTAMINATED FROM THE REMOVAL OF LEAD PAINT. (WS# 81, 113)

GM 4 Waste Characteristics

A. Description of hazardous waste

SOLID, CARBON FILTERS FROM SEMICONDUCTOR MANUFACTURING, CORROSIVE

B. EPA Hazardous Waste Code(s)

C. State Hazardous Waste Code(s)

VT20

D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G09		W310	X	2375.0	POUNDS	

On-site Generation and Management of Hazardous Waste

Off-site Shipment of Hazardous Waste

Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*
	ARD069748192	H040	2130.0

Comments

REMOVAL OF SPENT MANUFACTURING FILTERS IMPREGNATED WITH CORROSIVE CHEMICALS (WS#377)

GM 5 Waste Characteristics

A. Description of hazardous waste

SOLID, OIL CONTAMINATED MATERIALS FROM UTILITY/MAINTENANCE SERVICES AND SPILL CLEANUP

B. EPA Hazardous Waste Code(s)

C. State Hazardous Waste Code(s)

VT02

D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G16		W002	X	621.0	POUNDS	

On-site Generation and Management of Hazardous Waste

Off-site Shipment of Hazardous Waste

Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*
	ARD069748192	H040	1119.0

Comments

SECTION 1: BOX D- WASTE STREAM MAY ALSO CONTAIN SOURCE CODES G15, G32, G33 (WS#6)

GM 6 Waste Characteristics

A. Description of hazardous waste

FLAMMABLE SOLID, SOLVENT CONTAMINATED FILTERS AND DEBRIS FROM SEMICONDUCTOR MFG, TOXIC

B. EPA Hazardous Waste Code(s)

F003, F005, U002, U031, U057, U079, U080, U154, U159, U161, U210, U211, U220, U226, U228, U239, D001, D004, D005, D006, D007, D008, D010, D011, D018, D019, D021, D022, D023, D024, D025, D026, D027, D028, D029, D035, D039, D040, D043, F001, F002

C. State Hazardous Waste Code(s)

VT02, VT08

D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G09		W409	A	6671.0	POUNDS	

On-site Generation and Management of Hazardous Waste

Off-site Shipment of Hazardous Waste

Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*
	ARD069748192	H040	6249.0

Comments

G09-CLEANUP & PRODUCTION PROCESS DEBRIS; W409-DEBRIS, FILTERS, ORGANIC SLUDGES, CHEMICAL BLADDERS; WASTE MIN-DECREASE CHEMICAL BLADDERS BY REDUCING CHEMICALS USING THIS TYPE OF PKG (WS#23)

GM 7 Waste Characteristics

A. Description of hazardous waste

LIQUID, ARSENIC COMPOUNDS FROM SEMICONDUCTOR MANUFACTURING, TOXIC

B. EPA Hazardous Waste Code(s)

D007, D008, D004

C. State Hazardous Waste Code(s)

D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G09		W519	X	12791.0	POUNDS	

On-site Generation and Management of Hazardous Waste

Off-site Shipment of Hazardous Waste

Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*
	ARD069748192	H040	11254.0

Comments

SECTION 1: BOX D - SANDBLASTING OF MANUFACTURING TOOL PARTS, BOX E- SANDBLASTING SLURRY (WS#27)

GM 8 Waste Characteristics

A. Description of hazardous waste

SOLID, PCB BALLASTS AND CAPACITORS

B. EPA Hazardous Waste Code(s)

C. State Hazardous Waste Code(s)

VT01

D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G15		W320	X	58.0	POUNDS	

On-site Generation and Management of Hazardous Waste

Off-site Shipment of Hazardous Waste

Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*
	TXD055141378	H040	166.0

Comments

WS#35

GM 9 Waste Characteristics

A. Description of hazardous waste

SOLID, SOLVENT CONTAMINATED CLEANUP DEBRIS FROM SEMICONDUCTOR MFG, TOXIC, MIXED SOLVENTS

B. EPA Hazardous Waste Code(s)

D005, D006, D004, D007, D008, D010, D011, D018, D019, D021, D022, D023, D024, D025, D026, D027, D028, D029, D035, D039, D040, D043, F001, F002, F003, F005, U002, U031, U057, U079, U080, U154, U159, U161, U210, U211, U220, U226, U228, U239

C. State Hazardous Waste Code(s)

VT02, VT08

D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G09		W002	A	43402.0	POUNDS	

On-site Generation and Management of Hazardous Waste

Off-site Shipment of Hazardous Waste

Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*
	KYD053348108	H040	21795.0
Site 2	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*
	KYD053348108	H061	22049.0

Comments

G09-CLEANUP DEBRIS, PROTECTIVE CLOTHING, RAGS, WIPES, SPEEDI-DRI; MAY ALSO CONTAIN SOURCE CODE G32; WASTE MIN-SORTING & DECONTAMINATION OF SOLVENT CONTAMINATED PARTS IN ONSITE DECONTAMINATION FACILITY REDUCES HAZ WASTE SENT OFFSITE (WS#39)

GM 10 Waste Characteristics						
A. Description of hazardous waste						
SOLID, CORROSIVE CLEANUP DEBRIS FROM SEMICONDUCTOR MFG, INORGANIC ACIDS						
B. EPA Hazardous Waste Code(s)						
D002						
C. State Hazardous Waste Code(s)						
VT20						
D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G09		W002	A	214043.0	POUNDS	
On-site Generation and Management of Hazardous Waste						
Process System 1	*Management Method Code*		*Quantity*			
	H121		198998.0			
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped*		*C. Management Method Code*		*D. Total Quantity Shipped*	
	ARD069748192		H040		11908.0	
Comments						
G09-CLEANUP DEBRIS,PROTECTIVE CLOTHING,RAGS,WIPES; MAY ALSO CONTAIN SOURCE CODE G32; WASTE MIN-SORTING & NEUTRALIZATION OF WASTE STREAM IN ONSITE DECONTAMINATION FACILITY SIGNIFICANTLY REDUCES HAZ WASTE SHIPPED OFFSITE (W#40)						

GM 11 Waste Characteristics						
A. Description of hazardous waste						
IGNITABLE LIQUID, SPENT SOLVENT FROM SEMICONDUCTOR MANUFACTURING, ISOPROPANOL/PROPYLENE GLYCOL METHYL ETHER ACETATE						
B. EPA Hazardous Waste Code(s)						
D001, F003, U161						
C. State Hazardous Waste Code(s)						
VT08						
D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G08		W219	B	86274.0	POUNDS	
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped*		*C. Management Method Code*		*D. Total Quantity Shipped*	
	NJD002454544		H061		76460.0	
Comments						
MAY ALSO CONTAIN SOURCE CODES G09 (RESIDUES FROM EMPTY CONTAINER CLEANING), G21; W219-DILUTE NON-HALOGENATED SOLVENT MIXTURE; WASTE MIN-SOURCE REDUCTION, AT TOOL CHEMICAL RECYCLE, & ONSITE TREATMENT OF IPA AT THE BIOLOGICAL WWTP (WS#41)						

GM 12 Waste Characteristics						
A. Description of hazardous waste						
IGNITABLE LIQUID, MIXED ORGANIC WASTE FROM SEMICONDUCTOR MFG AND MAINTENANCE OPERATIONS						
B. EPA Hazardous Waste Code(s)						
U154, U159, U161, U210, U211, U220, U226, U228, U239, D001, D004, D005, D006, D007, D008, D009, D010, D018, D019, D021, D022, D023, D024, D025, D026, D027, D028, D029, D035, D039, D040, D043, F001, F002, F003, F005, U002, U031, U057, U079, U080						
C. State Hazardous Waste Code(s)						
VT02, VT08						
D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G08		W219	B	129134.0	POUNDS	
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*			
	NYD080469935	H050	70500.0			
Site 2	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*			
	NYD080469935	H040	42020.0			
Comments						
MAY ALSO INCLUDE SOURCE CODES G11,G13,G15,G16,G21,G22,G42; W219-DILUTE HALOGENATED/NON-HALOGENATED SOLVENT MIXTURE; WASTE STREAM (WS#43)						

GM 13 Waste Characteristics						
A. Description of hazardous waste						
SOLID, SPENT CARBON FROM EMISSIONS CONTROL, TOXIC, SOLVENT CONTAMINATED						
B. EPA Hazardous Waste Code(s)						
D027, D028, D029, D035, D039, D040, F001, F002, F003, F005, U002, U031, U057, U079, U080, U154, U159, U161, U210, U211, U226, U228, U239, D018, D019, D021, D022, D023, D024, D025, D026						
C. State Hazardous Waste Code(s)						
D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G21		W310	X	1542.0	POUNDS	
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Comments						
WS#96						

GM 14 Waste Characteristics						
A. Description of hazardous waste						
SOLID, BROKEN FLUORESCENT LAMPS, TOXIC						
B. EPA Hazardous Waste Code(s)						
D008, D006, D009						
C. State Hazardous Waste Code(s)						
D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G19		W320	B	242.0	POUNDS	
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*			
	MAC300017498	H010	309.0			
Comments						
SECTION 1: BOX D - BROKEN FLUORESCENT LAMPS FOR RECYCLE, BOX G - CONTINUED EXISTING PROGRAM OF SENDING OFF-SITE FOR MERCURY RECLAIM (WS#108)						

GM 15 Waste Characteristics						
A. Description of hazardous waste SOLID, INORGANIC SPENT DRY SCRUBBER MEDIA, TOXIC, ARSENIC						
B. EPA Hazardous Waste Code(s) D004, D006, D010, D011						
C. State Hazardous Waste Code(s) VT20						
D. Source Code G21	*Management Method Code*	*E. Form Code* W316	*F. Waste Minimization Code* X	*G. Quantity* 1926.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* ILD098642424	*C. Management Method Code* H040	*D. Total Quantity Shipped* 1926.0			
Comments						
(WS#165)						

GM 16 Waste Characteristics						
A. Description of hazardous waste SOLID, RESIN FROM SEMICONDUCTOR MANUFACTURING OPERATIONS, CONTAMINATED WITH ETHYLENE GLYCOL						
B. EPA Hazardous Waste Code(s)						
C. State Hazardous Waste Code(s) VT08						
D. Source Code G09	*Management Method Code*	*E. Form Code* W310	*F. Waste Minimization Code* X	*G. Quantity* 4426.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* ARD069748192	*C. Management Method Code* H040	*D. Total Quantity Shipped* 4012.0			
Comments						
SECTION 1: BOX D - SPENT RESIN REMOVED FROM MANUFACTURING TOOL COOLING UNITS (WS#209B)						

GM 17 Waste Characteristics						
A. Description of hazardous waste SOLID, ARSENIC CONTAMINATED DEBRIS FROM EQUIPMENT MAINTENANCE, CONSTRUCTION, AND CLEANUP ACTIVITIES, TOXIC, ARSENIC						
B. EPA Hazardous Waste Code(s) D004, D007, D008						
C. State Hazardous Waste Code(s)						
D. Source Code G09	*Management Method Code*	*E. Form Code* W002	*F. Waste Minimization Code* X	*G. Quantity* 9127.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* ARD069748192	*C. Management Method Code* H040	*D. Total Quantity Shipped* 9648.0			
Comments						
SECTION 1: BOX D - REMOVAL OF CONSUMABLE PARTS DURING MANUFACTURING MAINTENANCE ACTIVITIES AND DEBRIS FROM PARTS CLEANING OPERATIONS, WASTE STREAM MAY ALSO CONTAIN SOURCE CODES G15, G33 (WS#366)						

GM 18 Waste Characteristics						
A. Description of hazardous waste						
SOLID, ARSENIC CONTAMINATED DUST COLLECTOR WASTE AND DEBRIS, TOXIC						
B. EPA Hazardous Waste Code(s)						
D004, D007, D008						
C. State Hazardous Waste Code(s)						
D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G21		W319	X	9841.0	POUNDS	
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*			
	ARD069748192	H040	9233.0			
Comments						
SECTION 1: BOX E - BAGHOUSE DUST AND PPE (WS#367)						

GM 19 Waste Characteristics						
A. Description of hazardous waste						
SOLID, CONTAMINATED QUARTZ, GRAPHITE, CERAMIC, CORROSIVE						
B. EPA Hazardous Waste Code(s)						
C. State Hazardous Waste Code(s)						
VT20						
D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G09		W002	X	6870.0	POUNDS	
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*			
	ARD069748192	H040	1981.0			
Comments						
SECTION 1: BOX D - QUARTZ, CERAMIC, GRAPHITE CONTAMINATED WITH CORROSIVE PROCESS GASES (WS#422)						

GM 20 Waste Characteristics						
A. Description of hazardous waste						
LIQUID, SLURRY WITH A LOW PH, CORROSIVE						
B. EPA Hazardous Waste Code(s)						
D002						
C. State Hazardous Waste Code(s)						
D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G09		W119	A	20929.0	POUNDS	
On-site Generation and Management of Hazardous Waste						
Process System 1	*Management Method Code*	*Quantity*				
	H129	20046.0				
Off-site Shipment of Hazardous Waste						
Comments						
G09-ROUTINE MAINTENANCE ON SLURRY SUPPLY SYSTEMS; W119- CORROSIVE SLURRY; WASTE MIN-ONSITE TREATMENT AT WWTP ELIMINATED OFFSITE SHIPMENTS; H129-NEUTRALIZATION & SOLIDS PRECIPITATION IN ONSITE WWTP (WS#427A, 427B, 447) L						

GM 21 Waste Characteristics						
A. Description of hazardous waste LIQUID, ETHYLENE/PROPYLENE GLYCOL FROM MAINTENANCE ACTIVITIES, TOXIC						
B. EPA Hazardous Waste Code(s)						
C. State Hazardous Waste Code(s) VT08						
D. Source Code G19	*Management Method Code*	*E. Form Code* W219	*F. Waste Minimization Code* A	*G. Quantity* 12853.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Process System 1	*Management Method Code* H081		*Quantity* 11676.0			
Off-site Shipment of Hazardous Waste						
Comments						
G19-REMOVAL OF GLYCOL SOL'NS DURING MAINTENANCE OPERATIONS; W219-ETHYLENE GLYCOL & PROPYLENE GLYCOL SOL'NS; WASTE MIN- ONSITE WWTP ELIMINATES OFFSITE SHIPMENTS & USE OF PROPYLENE GLYCOL IN LEIU OF ETHYLENE GLYCOL WHERE FEASIBLE (GS#3)						

GM 22 Waste Characteristics						
A. Description of hazardous waste IGNITABLE LIQUID, SPENT COATING/PHOTORESIST FROM SEMICONDUCTOR MANUFACTURING, PROPYLENE GLYCOL METHYL ETHER ACETATE/N-BUTYL ACETATE						
B. EPA Hazardous Waste Code(s) D001, D023, D024, D025, D026						
C. State Hazardous Waste Code(s)						
D. Source Code G06	*Management Method Code*	*E. Form Code* W203	*F. Waste Minimization Code* B	*G. Quantity* 400873.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* NJD002182897		*C. Management Method Code* H020		*D. Total Quantity Shipped* 391460.0	
Comments						
MAY ALSO CONTAIN SOURCE CODES G01, G08, G11; WASTE MIN-WATER FROM BONDER/DEBONDER TOOL IS SEGREGATED FROM SOLVENT WASTE STREAM & TREATED ONSITE AT WWTP. CONTINUED TO SEND THIS WASTE STREAM OFF-SITE FOR SOLVENT RECOVERY.(WS#320 & 476) N						

GM 23 Waste Characteristics						
A. Description of hazardous waste LIQUID, FIREFIGHTING FOAM AND WATER, ETHYLENE GLYCOL PFOS/PFOA						
B. EPA Hazardous Waste Code(s)						
C. State Hazardous Waste Code(s) VT08						
D. Source Code G19	*Management Method Code*	*E. Form Code* W113	*F. Waste Minimization Code* X	*G. Quantity* 16528.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* ARD069748192		*C. Management Method Code* H040		*D. Total Quantity Shipped* 30614.0	
Comments						
SECTION C - FIREFOAM (IN WATER) MATERIAL IS VT HAZARDOUS VT21 AND VT22; THESE CODES ARE NOT AVAILABLE FROM SELECTION WS#420H SECTION D - WASTE IS GENERATED FROM ANNUAL TESTING OF FIRE SUPPRESSION SYSTEM						

GM 24 Waste Characteristics						
A. Description of hazardous waste						
IGNITABLE LIQUID, WASTE PAINT AND PAINT RELATED MATERIALS						
B. EPA Hazardous Waste Code(s)						
D001, D004, D005, D006, D007, D008, D011, D018, D019, D022, D035, D040, F003, F005						
C. State Hazardous Waste Code(s)						
VT08, VT02						
D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G06		W209	X	954.0	POUNDS	
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*			
	ARD069748192	H040	954.0			
Comments						
WS#24						

GM 25 Waste Characteristics						
A. Description of hazardous waste						
IGNITABLE SOLID, WASTE SOLVENT SLUDGE FROM TANK CLEANING, PROPYLENE GLYCOL METHYL ETHER ACETATE						
B. EPA Hazardous Waste Code(s)						
D004, D005, D001, D006, D007, D008, D010, D011, D018, D019, D021, D022, D023, D024, D025, D026, D027, D028, D029, D035, D039, D040, D043, F001, F002, F003, F005, U002, U031, U057, U079, U080, U154, U159, U161, U210, U211, U220, U226, U228, U239						
C. State Hazardous Waste Code(s)						
VT08, VT02						
D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G14		W504	X	1604.0	POUNDS	
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*			
	ARD069748192	H040	856.0			
Comments						
PERIODIC TANK SLUDGE CLEAN OUT FOR TANK INSPECTIONS GENERAL SOLVENT 4, AND DUV						

GM 26 Waste Characteristics						
A. Description of hazardous waste						
SOLID, VACUUM DEBRIS FROM PERIODIC CLEANING, WITH METALS, LEAD TOXIC						
B. EPA Hazardous Waste Code(s)						
D004, D006, D007, D008, D010, D011						
C. State Hazardous Waste Code(s)						
D. Source Code	*Management Method Code*	*E. Form Code*	*F. Waste Minimization Code*	*G. Quantity*	*UOM*	*Density*
G09		W002	X	512.0	POUNDS	
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped*	*C. Management Method Code*	*D. Total Quantity Shipped*			
	ARD069748192	H040	512.0			
Comments						
G09 - CENTRAL HOUSE VACUUM DEBRIS FROM PERIODIC CLEANING, WITH METALS, LEAD TOXIC WS#216						

GM 27 Waste Characteristics						
A. Description of hazardous waste SOLID, CLEAN UP DEBRIS FROM SEMI-CONDUCTOR MANUFACTURING AND LEAD PAINT REMOVAL, TOXIC						
B. EPA Hazardous Waste Code(s) D002, D004, D005, D006, D007, D008, D011						
C. State Hazardous Waste Code(s) VT20						
D. Source Code G19	*Management Method Code*	*E. Form Code* W002	*F. Waste Minimization Code* X	*G. Quantity* 470.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Comments						
PROTECTIVE CLOTHING, RAGS, DEBRIS, CONTAMINATED FROM THE REMOVAL OF LEAD PAINT. (WS# 89)						

GM 28 Waste Characteristics						
A. Description of hazardous waste IGNITABLE LIQUID, LABPACK, WASTE HMDS & OXIDIZERS						
B. EPA Hazardous Waste Code(s) D001, D003						
C. State Hazardous Waste Code(s)						
D. Source Code G19	*Management Method Code*	*E. Form Code* W001	*F. Waste Minimization Code* X	*G. Quantity* 140.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* NJD980536593		*C. Management Method Code* H040		*D. Total Quantity Shipped* 140.0	
Comments						
G19 - WASTE GENERATED DURING EQUIPMENT MAINTENANCE AND/OR TOOL REMOVAL- MAY CONTAIN SOURCE CODE G15						

GM 29 Waste Characteristics						
A. Description of hazardous waste LIQUID, CORROSIVE INDUSTRIAL AND CONCENTRATED WASTE, AMMONIA, HYDROFLUORIC ACID, SULFURIC ACID, HYDROCHLORIC ACID						
B. EPA Hazardous Waste Code(s) D002						
C. State Hazardous Waste Code(s)						
D. Source Code G09	*Management Method Code*	*E. Form Code* W119	*F. Waste Minimization Code* A	*G. Quantity* 8745.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Process System 1	*Management Method Code* H129		*Quantity* 7335.0			
Off-site Shipment of Hazardous Waste						
Comments						
G09- WASTE, AMMONIA, HYDROFLUORIC ACID, SULFURIC ACID, HYDROCHLORIC ACID GENERATED DURING WAFER MANUFACTURE PROCESS (WS #49 & #73)						

GM 30 Waste Characteristics						
A. Description of hazardous waste LIQUID, CORROSIVE LABPACK, WASTE DIETHYLENETRIAMINE						
B. EPA Hazardous Waste Code(s) D002						
C. State Hazardous Waste Code(s)						
D. Source Code G09	*Management Method Code*	*E. Form Code* W001	*F. Waste Minimization Code* X	*G. Quantity* 60.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* NJD980536593	*C. Management Method Code* H040	*D. Total Quantity Shipped* 10.0			
Site 2	*B. EPA ID of facility to which waste was shipped* ILD098642424	*C. Management Method Code* H040	*D. Total Quantity Shipped* 50.0			
Comments						
G09 - WASTE AMINES GENERATED DURING WAFER MANUFACTURE PROCESS, EQUIPMENT MAINTENANCE - MAY CONTAIN SOURCE CODES G15, & G19						

GM 31 Waste Characteristics						
A. Description of hazardous waste SOLID, CORROSIVE LABPACK, CORROSIVE GAS SENSORS AND GAUGES						
B. EPA Hazardous Waste Code(s)						
C. State Hazardous Waste Code(s) VT20						
D. Source Code G09	*Management Method Code*	*E. Form Code* W001	*F. Waste Minimization Code* X	*G. Quantity* 30.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* NJD980536593	*C. Management Method Code* H040	*D. Total Quantity Shipped* 30.0			
Comments						
G09- CORROSIVE CONTAMINATED WASTE GENERATED DURING WAFER MANUFACTURING OR EQUIPMENT MAINTENANCE - MAY ALSO CONTAIN SOURCE CODES G15 & G19						

GM 32 Waste Characteristics						
A. Description of hazardous waste IGNITABLE SOLID, LABPACK WASTE AEROSOLS						
B. EPA Hazardous Waste Code(s) D018, D001, D035						
C. State Hazardous Waste Code(s)						
D. Source Code G09	*Management Method Code*	*E. Form Code* W001	*F. Waste Minimization Code* X	*G. Quantity* 95.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* OHD093945293	*C. Management Method Code* H061	*D. Total Quantity Shipped* 80.0			
Site 2	*B. EPA ID of facility to which waste was shipped* OHD093945293	*C. Management Method Code* H039	*D. Total Quantity Shipped* 15.0			
Comments						
G09- IGNITABLE WASTE GENERATED DURING WAFER MANUFACTURING PROCESS AND EQUIPMENT MAINTENANCE- MAY ALSO CONTAIN SOURCE CODES G15 & G19						

GM 33 Waste Characteristics						
A. Description of hazardous waste SOLID, LABPACK WASTE CORROSIVE SOLID ,TOXIC ANTIMONY						
B. EPA Hazardous Waste Code(s) D003						
C. State Hazardous Waste Code(s)						
D. Source Code G09	*Management Method Code*	*E. Form Code* W001	*F. Waste Minimization Code* X	*G. Quantity* 10.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* ILD098642424	*C. Management Method Code* H040	*D. Total Quantity Shipped* 10.0			
Comments						
G09-WASTE GENERATED DURING WAFER MANUFACTURING AND EQUIPMENT MAINTENANCE - MAY ALSO CONTAIN SOURCE CODES G13, G15 & G19						

GM 34 Waste Characteristics						
A. Description of hazardous waste IGNITABLE SOLID, LABPACK BROKEN GLASS CONTAMINATED WITH SOLVENTS, HEXANE						
B. EPA Hazardous Waste Code(s) D001, F002						
C. State Hazardous Waste Code(s)						
D. Source Code G09	*Management Method Code*	*E. Form Code* W001	*F. Waste Minimization Code* X	*G. Quantity* 40.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* OHD093945293	*C. Management Method Code* H061	*D. Total Quantity Shipped* 40.0			
Comments						
G09 - WASTE GENERATED DURING WAFER MANUFACTURE PROCESS AND EQUIPMENT MAINTENANCE - MAY CONTAIN SOURCE CODES G15, & G19						

GM 35 Waste Characteristics						
A. Description of hazardous waste SOLID, LABPACK WASTE FILTERS WITH CRESOLS						
B. EPA Hazardous Waste Code(s) D024, D025, D023, D026						
C. State Hazardous Waste Code(s)						
D. Source Code G09	*Management Method Code*	*E. Form Code* W001	*F. Waste Minimization Code* X	*G. Quantity* 150.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* OHD093945293	*C. Management Method Code* H040	*D. Total Quantity Shipped* 150.0			
Comments						
G09 - WASTE GENERATED DURING WAFER MANUFACTURE PROCESS AND EQUIPMENT MAINTENANCE - MAY CONTAIN SOURCE CODES G15, & G19						

GM 36 Waste Characteristics						
A. Description of hazardous waste SOLID LABPACK, WASTE FILTERS WITH CHROMIUM HEXACARBONYL						
B. EPA Hazardous Waste Code(s) D003, D007						
C. State Hazardous Waste Code(s)						
D. Source Code G09	*Management Method Code*	*E. Form Code* W001	*F. Waste Minimization Code* X	*G. Quantity* 10.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* NJD980536593	*C. Management Method Code* H040	*D. Total Quantity Shipped* 10.0			
Comments						
G09 - WASTE GENERATED DURING WAFER MANUFACTURING PROCESS AND EQUIPMENT MAINTENANCE - MAY ALSO CONTAIN SOURCE CODES G15 & G19						

GM 37 Waste Characteristics						
A. Description of hazardous waste IGNITABLE LABPACK, WASTE POLYIMIDE, PROPANE CYLINDERS, COMPRESSED GASES						
B. EPA Hazardous Waste Code(s) D001						
C. State Hazardous Waste Code(s)						
D. Source Code G09	*Management Method Code*	*E. Form Code* W001	*F. Waste Minimization Code* X	*G. Quantity* 665.0	*UOM* POUNDS	*Density*
On-site Generation and Management of Hazardous Waste						
Off-site Shipment of Hazardous Waste						
Site 1	*B. EPA ID of facility to which waste was shipped* NJD980536593	*C. Management Method Code* H040	*D. Total Quantity Shipped* 220.0			
Site 2	*B. EPA ID of facility to which waste was shipped* ILD098642424	*C. Management Method Code* H040	*D. Total Quantity Shipped* 195.0			
Site 3	*B. EPA ID of facility to which waste was shipped* OHD093945293	*C. Management Method Code* H061	*D. Total Quantity Shipped* 250.0			
Comments						
G09 - WASTE GENERATED DURING WAFER MANUFACTURING AND EQUIPMENT MAINTENANCE - MAY INCLUDE SOURCE CODES G15 AND G19 INCLUDES WASTE POLYIMIDE SHIPPED FOR FUEL BLENDING						

GLOBALFOUNDRIES®

WASTE MINIMIZATION UPDATE

February 28, 2019

This report represents the full calendar year 2018 waste minimization activities.

WASTE MINIMIZATION PROGRAMS AND PROCESSES

GLOBALFOUNDRIES US2 LLC uses the following hierarchy in implementing waste minimization techniques:

1) Source Reduction
2) Reuse (recycling w/o treatment)
3) Recycling (w/treatment)
4) Treatment
5) Land disposal

GLOBALFOUNDRIES Vermont has focused on achieving waste minimization through the implementation and effective management of the following programs and processes, which directly or indirectly aid in minimizing the generation of hazardous waste. These programs and processes are continuously being refined to enhance the site's waste minimization efforts.

- Chemical Authorization Process
  - All chemicals that are new to the site or existing chemicals with a new use are reviewed for environmental and safety impacts. Less toxic substitutes are required when available.
- Process Environmental Impact Assessment
  - All new chemical using manufacturing and facilities equipment are reviewed to identify potential significant impacts to the environment from GLOBALFOUNDRIES processes; to consider feasible alternatives for avoiding potential impacts; and to ensure compliance with applicable legal and regulatory requirements.
- Waste Disposal Characterization
  - The site has a waste disposal process that allows containerized chemical waste to be tracked from the point of generation to the point of disposal. Based on the waste characteristics, the proper disposal method is established, including reuse and recycling when feasible.
- Toxics Use and Hazardous Waste Reduction Planning
  - GLOBALFOUNDRIES Vermont also has a plan identifying source reduction and waste minimization opportunities for all SARA 313 chemicals and hazardous waste streams that fall under the planning requirements, per the requirements of Vermont's ACT 100. Waste minimization efforts are reported to the State of Vermont in the annual Pollution Prevention Progress Report. A new Toxics Use and Hazardous Waste Reduction plan identifying new chemical use reduction and waste minimization opportunities to be evaluated for technical and economic feasibility, a new plan was be submitted to the State of Vermont July 1, 2017. An annual progress report will be submitted on March 31, 2019.
  - GLOBAL FOUNDRIES has a Corporate Environmental Management System (EMS). Its current set of environmental goals covers the range of its environmental programs, including climate protection, energy and water

conservation, pollution prevention, waste management. These goals and objectives are tracked and reported to management periodically, minimum once per year.

- Product Stewardship Program
    - In addition to its processes, GLOBALFOUNDRIES must also ensure that its products do not have a detrimental effect on the environment and that all products are introduced in compliance with Global, Federal, State and Customer GLOBALFOUNDRIES Corporate rules and regulations.

2018 WASTE MINIMIZATION RESULTS

RESTRICTION OF HAZARDOUS SUBSTANCES (ROHS)

GLOBALFOUNDRIES continued its efforts in 2018 on completing remaining qualification of lead-free technologies. All products are now converted to lead free with the exception of a few that need the lead solder use for high end applications for reliability reasons. In 2018 GLOBALFOUNDRIES updated their compliance program to amend requirements per Commission Delegated Directive (EU) 2015/863 for 4 phthalates.

REGISTRATION, EVALUATION, AUTHORIZATION AND RESTRICTION OF CHEMICAL SUBSTANCES (REACH)

GLOBALFOUNDRIES also continued the assessment of the newly proposed REACH Substances of Very High Concern (SVHC) list with regards to impact on GLOBALFOUNDRIES products/packaging. As part of this assessment, GLOBALFOUNDRIES worked with supply chain to ensure new SVHC chemicals in 2018 are not in GLOBALFOUNDRIES products and packaging. Where REACH SVHCs are identified in the supply chain GLOBALFOUNDRIES works with suppliers to assess the feasibility of eliminating any identified SVHC(s) and to develop a plan and schedule for the removal of the substance(s).

CHEMICAL USAGE REDUCTION PROJECTS IN WAFER MANUFACTURING OPERATIONS

CAD-11 elimination in photo lithography

Elimination of DUV Surfactant in the process. Eliminate use of DUV surfactant (CAD-11). Surfactant is used to facilitate wetting of the wafer during the develop process, primarily to reduce developer shot size. Project evaluation was completed in 2016. Full qualification continued through 2017. Chemical savings will be realized in 2018. This project will result in a reduction of chemical use and waste generation of 86 % of the chemical use in this process which equates to 13,500 gals reduction in 2018.

Water Phase from Bonder/Debonder Tool Segregated for On-site Treatment:

Water waste from this tool is segregated from the solvent waste for on-site treatment at the wastewater treatment plant to maximize on-site treatment and minimize the amount of waste being sent off site. This tool was brought online in August 2011. In 2018, 319 pounds/day of water was segregated for on-site treatment. If this water was not treated, it would have been sent offsite for disposal as part of the MUV waste stream. Introducing water to the MUV waste stream can also reduce the reclaim potential for the Propylene Glycol Monomethyl Ether Acetate (PGMEA) in the MUV waste stream.

The chemicals and processes proposed to be used on new tool installations in 2018 were reviewed to see whether any solvent (preferably lower concentrations) containing waste could be routed to the biological wastewater treatment plant for on-site treatment. No new waste streams were identified from solvent using tools for on-site treatment in 2018.

Photochemical Waste Reduction Efforts

A concerted effort is being made to reduce photochemical waste by improved housekeeping and inventory management practices. This is an ongoing effort during the course of the year. The waste minimization results from this ongoing effort cannot be quantified.

PFOA-Related compound reduction in photolithography chemical

From 2017 thru 2018, the Fab 9 photolithography team further focused on qualifying replacements for the PFOA-like chemistries used in Photoresists. The team worked with chemical suppliers to find replacement chemicals (PFAS free or lower Carbon chains), evaluated these substitutes for technical feasibility, and then fully qualified them as a process of record chemical. A total of 11 chemicals containing PFOA-like chemistries were eliminated. This effort reduced the use and waste generation of PFAS chemicals by 5,488 grams in 2018.

RECOVERY OF FOMBLIN OILS USED IN PRECISION VACUUM PUMPS

Segregation of waste perfluorinated oil allows the perfluorinated oil to be recovered and returned to the site for reuse. In 2018, 1,615 pounds of used Fomblin oil were sent for reclaim instead of disposal.

ON-SITE TREATMENT OF WASTE AT WASTEWATER TREATMENT PLANT

The GLOBALFOUNDRIES Vermont manufacturing facility owns and operates a state-of-the-art, NPDES permitted on-site wastewater treatment plant. This wastewater treatment plant consists of four main wastewater treatment processes: Concentrated Wastewater Treatment, Biological Wastewater Treatment, Chemical Mechanical Polish Wastewater Treatment, and Industrial Wastewater Treatment. Utilizing the capabilities of these treatment processes allowed GLOBALFOUNDRIES to treat approximately 51,138 pounds of waste on-site in lieu of sending it off-site for treatment. On-site treatment dramatically reduces the number of waste shipments required, reducing the need for transportation of those wastes.

Table 1 below outlines the types and estimated quantities of waste treated in 2018:

Table 1

Waste Stream Name	***Portion of Treatment Facility Where Treatment Occurred***	***Total Treated (estimated pounds)***	***Percent of Waste Generated***
Ethylene Glycol Solutions	Biological Wastewater Treatment Plant (BWTP)	9,299	100
Miscellaneous Containerized Waste	Chemical Mechanical Polish (CMP) Wastewater Treatment Plant and or BWTP	25,178	100
Miscellaneous Containerized Waste	Industrial WWTP Treatment	14,780	100
	TOTAL =	51,138	

DECONTAMINATION FACILITY OPERATIONS

The GLOBALFOUNDRIES Vermont facility operates a decontamination facility on site. This facility handles the sorting of contaminated as well as non-contaminated trash. The facility processes corrosive and solvent contaminated trash, scrap metal, plastic, and other materials. Contaminated items are cleaned and decontaminated, where applicable, and sorted into the appropriate waste streams. The decontamination facility also segregates metals, high density plastics, computer boards and modules, wood, silicon parts, and other recyclables into the appropriate recycle streams. In addition, the facility has two bottle wash stations for cleaning empty chemical containers and a cleaning process for chemical Nowpak ™ containers.

Decontaminated items leave the facility as recyclable glass, plastic, or metal, or general trash instead of chemical or hazardous waste. In 2018, over 294,859 pounds of waste was decontaminated at this facility.

Table 2 below outlines the types and estimated quantities of waste decontaminated in 2018:

Table 2

Waste Stream Name	***Total Decontaminated (estimated pounds)***
Glass and Plastic Chemical & Nowpak ™ Bottles for Recycle	29,831
Other Plastics for Recycle	4,862
Corrosive Contaminated Trash	126,626
Metal Reclaim (Deconed contaminated metals sent for recycle)	133,540
TOTAL =	294,859

DEEP-ULTRAVIOLET (DUV) AND MID-ULTRAVIOLET (MUV) WASTE STREAMS FOR RECLAMATION

The main constituent in both the DUV and MUV waste streams is Propylene Glycol Monomethyl Ether Acetate (PGMEA). In 2018, the amount of DUV and MUV waste shipped off site was sent for reclaim was 725,440 pounds. The reclaimed PGMEA is used by other companies that can utilize the material at the purity level achieved by reclamation.

N- METHYL-2-PYRROLIDONE (NMP) WASTE RECLAMATION

In 2018 all NMP waste was reclaimed and fuel blended for Energy Recovery. The total amount of NMP waste sent for fuel blend in 2018 was 90,200 pounds.

GLASS MASK RECLAIM

Masks are manufactured in the GLOBALFOUNDRIES Vermont mask house and consist of quartz plates covered on one side with a chromium oxy-nitride film. Phase shift masks also have a molybdenum silicide layer. Most used or defective masks have a market value and are shipped to a vendor where they are stripped to bare quartz. Once stripped of their images the glass is purchased by the reclaim vendor for reuse. In 2018, 15,110 pounds of glass masks were sent for reclaim instead of being sent off-site for disposal.

GENERAL SOLVENT #4 WASTE REDUCTIONS

In 2018, 35,180 pounds of waste for off-site shipment for energy recovery.

GENERAL SOLVENT #1 WATER REDUCTIONS

During 2018 the water content in the General Solvent #1 waste stream was reduced to from 88% in 2017 to 3.7% in 2018. The water content reduction allowed for 42,280 pounds of General Solvent 1 waste to be sent off-site for energy recovery instead of disposal.

INDUSTRIAL WASTEWATER TREATMENT PLANT (IWTP) OPTIMIZATIONS

In 2018, there were ongoing efforts regarding data analysis to identify opportunities and optimize treatment. In one successfully identified and implemented project, trends were discovered showing biological treatment efficiency could be improved by adjusting the cycle times in the Sequential Batch Reactors. Adjustments were implemented resulting in a 67% decrease in the instance of Fill-Decant occurrences resulting in more controlled, improved, and optimized biological treatment.

Additional analysis tools were also installed in 2018 with data collection currently in progress. One such tool is a turbidity meter for the collection of data to be analyzed in developing a means for early detection of clarifier blanket disruptions in order to better control total suspended solids.

INDUSTRIAL WASTEWATER TREATMENT PLANT (IWTP) SLUDGE

Although the IWTP sludge falls under the F006 RCRA definition, it meets none of the original listing criteria for F006. Since the sludge is a functionally non-hazardous waste stream, GLOBALFOUNDRIES Vermont worked with EPA Region 1 to pursue a federal delisting of this waste.

Since July 2015, GLOBALFOUNDRIES has shipped the delisted sludge to a Subtitle D landfill where it is used as alternative daily cover, which is considered a beneficial use for the waste material. In 2018 GLOBALFOUNDRIES continued to perform annual sampling and analysis and completed ongoing change evaluations, per the Federal delisting, to monitor the sludge composition and maintain the delisting. In 2018 4,468,440 lbs of the sludge was used as an alternative daily cover versus being sent off-site as hazardous waste for landfill disposal.

OFF SITE SCRAP LEADED WAFER RECYCLE:

GLOBALFOUNDRIES Vermont scrap wafers and wafer pieces, since they contain sensitive information such as defense articles and technical data, fall within unique circumstances where the disposal of this waste must satisfy both the Resource Conservation and Recovery Act (RCRA) regulations and the Arms Export Control Act (AECA). AECA is implemented through the International Traffic in Arms Regulations (ITAR). Previous disposal options were determined in April 2013 to not satisfy specific impairment and destruction requirements as regulated under ITAR. Therefore, GLOBALFOUNDRIES has been evaluating alternatives for recycling or disposal of the scrap wafers that meet all applicable regulations. Under Federal Regulations, there is a broad definition of scrap commercial chemical product that applies to these wafers and exempts them from hazardous waste regulation when reclaimed. The State of Vermont has not adopted this specific exemption, so GLOBALFOUNDRIES is operating under a variance from the Vermont Hazardous Waste Management Regulations (VHWMR) for scrap wafers and wafer pieces containing lead. The variance approval was received by IBM on 01/30/15 and renewed under GLOBALFOUNDRIES 11/25/15. Scrap wafers are no longer considered hazardous waste and are being sent to a certified ITAR destruction facility and then to a lead reclaim facility. In 2018, 2,492 pounds of scrap wafers was sent off-site for reclaim.

WASTE MINIMIZATION PLANS FOR 2019

Actively work through the year in evaluating and implementing economically and technically feasible waste reduction and toxic reduction opportunities on focus chemicals identified in the pollution prevention and waste minimization plans.

SOLVENT AND RESIST DISPENSE VOLUME REDUCTIONS IN PHOTOLITHOGRAPHY OPERATIONS

Optimizing Photochemical Usage:

Photochemical waste returned as partial or full Nowpaks™ will be tracked and evaluated to determine why the chemical was not fully utilized. Chemical usage trends will also be tracked by toolset to identify any areas for improvement. This is an ongoing activity from 2010.

In addition, reduce photochemical waste through source reductions and shelf life extensions. Photochemical waste will be avoided by reducing the number of photo tools on which the variety of photoresists are deployed, thereby reducing the number of wasted partial or full Photoresist extend the shelf life of the photoresists, where it is determined that the chemical quality remains suitable. This will allow these photoresists to be utilized rather than be disposed of as Hazardous Waste.

Shot size reductions for photoresist and solvents in photolithography:

Evaluate reduced shot size for certain photoresists and solvents used in photolithography processes.

Solvent use reduction project:

Reduce 70/30 GBL NBA use in the pre-wet process by using blended solvent process and reducing puddle size. Project evaluation was completed in 2016. Full project implementation expected to occur in 2019. An estimate of chemical use reduction and waste reduction will be calculated after project implementation.

Evaluate strategy for consolidation of Resists and Polyimides in the fabricator:

Reduce the number of resists and polyimides used in manufacturing which have a dual use. This result in reduced tool checks, reduced chemical use and waste generation.

Investigate Bonder/Debonder Process for Chemical Use Optimization:

Investigate chemical use optimization on the bonder/debonder process including PGMEA recirculation and adhesive use reduction:

Bonder/Debonder project elimination on certain set of products:

Currently we do the bond coat and bond clean on one set of products, to protect the front side of the wafer. A new process is being qualified, where we do not use the adhesive coating on these products, so the adhesive will become essentially zero after that new process is qualified. This would reduce adhesive usage (cost savings) as well as 2,900 L of PGMEA per year for the cleans. This project is expected to be fully implemented in 1Q2019.

INVESTIGATE DECON BOTTLE WASH PROCESS/TOOL FOR GREATER ON-SITE TREATMENT

The Biological waste treatment plant currently treats IPA from manufacturing. The biological waste treatment plant might be able to treat some or all of the IPA from the bottle wash facility. Investigation of treating IPA from manufacturing at BWTP was put on hold during 2018. Investigation of treatment of IPA at biological waste treatment will begin in 2019.

PHOTORESIST WASTE SEGREGATION FOR SOLVENT RECOVERY

Continue to investigate the possibility of sending low volumes of drummed photoresist waste containing large amounts of PGMEA solvent for recovery if feasible.

GENERAL SOLVENT 1 WATER REDUCTION PROJECT

Continuation of General Solvent 1 water reduction project waste stream output. The investigation verified high amount of water in General Solvent 1 waste stream. General Solvent output in 2018 was 33,980 pounds less than in 2017. GLOBALFOUNDRIES will continue investigating process controls to better manage the water content and work to reduce General Solvent 1 output throughout 2019.

INDUSTRIAL WASTEWATER TREATMENT PLANT OPTIMIZATION

In 2019, the IWTP plans to focus on the following projects:

- In 2019 the third clarifier will be brought online full-time to treat CMP waste. In the past the 3rd clarifier was mainly used during maintenance projects on one of the other two. This additional retention time for CMP waste will serve to improve treatment efficiencies.

- Continuing work with smart data and collection tools. The focus will be on increasing treatment efficiencies and reducing chemical usage. With better tracking the IW plant will be able to trend and look at chemical use reductions in a smarter fashion.

- Working to maximize planned maintenance shutdown of clarifiers and bypassing the EQ basin to realize electrical, chemical, and sludge generation reductions.

ON-SITE TREATMENT OF SOLVENT, MISCELLANEOUS CONTAINERIZED WASTE STREAMS

Biotreatment of ethylene/propylene glycol will continue in 2019, including continued efforts to determine the maximum practical loading for this waste streams in the BWTP.

Miscellaneous containerized waste treatment through portions of the Industrial Wastewater Treatment Plant (IWTP) and biological waste treatment plant will also continue in 2019 as allowed.

In 2019 GLOBALFOUNDRIES will investigated the feasibility of treating the some or all Deep UV (PGMEA) waste stream at IWTP.

DECONTAMINATION FACILITY OPERATIONS

The decontamination facility will continue to process corrosive and solvent contaminated trash, scrap metal, chemical bottles, high density plastic, and other materials in 2019. In 2019, GLOBALFOUNDRIES plans to continue to improve the efficiency of the decontamination processes and evaluate additional waste streams for addition to the decontamination processes.

In addition, GLOBALFOUNDRIES plans to continue to optimize decontamination of tools and ancillary equipment so they can be sold for re-use or scrap metal recovery.

ANNUAL REPORT OF INTERNATIONAL SHIPMENTS OF HAZARDOUS WASTE

Annual Report of International Shipments of Hazardous Waste
2018 Calendar Year

GLOBALFOUNDRIES

Vermont Facility
1000 River Road – B966
Essex Junction, VT 05452

February 22, 2019

Office of Enforcement and Compliance Assurance
Office of Federal Activities
International Compliance Assurance Division (2254A)
Environmental Protection Agency
1200 Pennsylvania Ave., NW
Washington, DC 20460

Via UPS Mail and Email

Re: GLOBALFOUNDRIES 2 U.S. LLC Essex Junction, VT (EPA ID No. VTR000524868)

To Whom It May Concern:

There were no international shipments of hazardous waste for the GLOBALFOUNDRIES 2 U.S. LLC Essex Junction Facility, Vermont in 2018. This letter serves as notification as required by 40 CFR 262.83(g) and Section 7-708(c) of the Vermont Hazardous Waste Management Regulations.

If you have any questions please feel free to contact me (Andrea McCullen) at (802) 288-6030 or at *andrea.pomroy-mccullen@globalfoundries.com* with any questions or for further information.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

Sincerely,

Andrew Lacourciere
GlobalFoundries Northeast Regional Environmental Manager

cc: Mr. Marc Roy
Vermont Department of Environmental Conservation
Waste Management Division (via email)

Waste Import Export Tracking System

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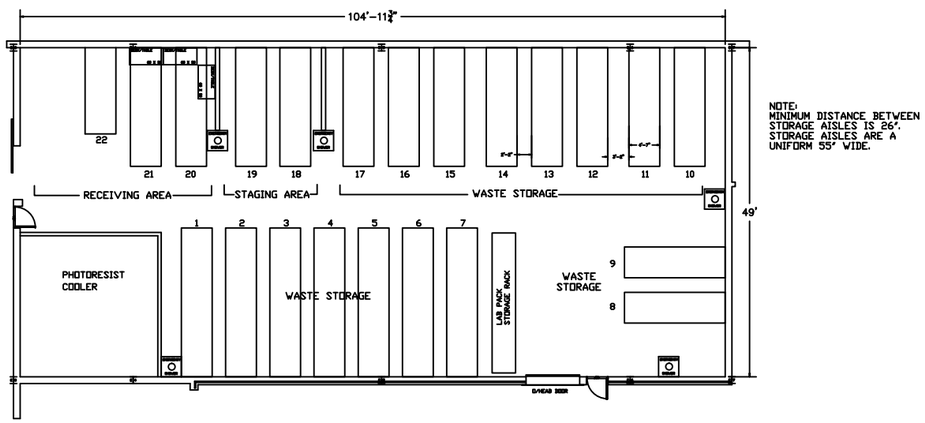
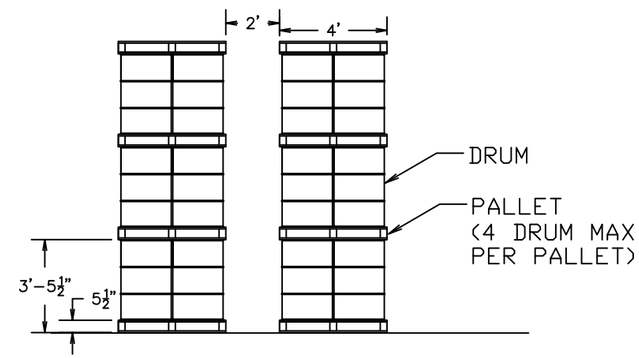
APPENDIX D

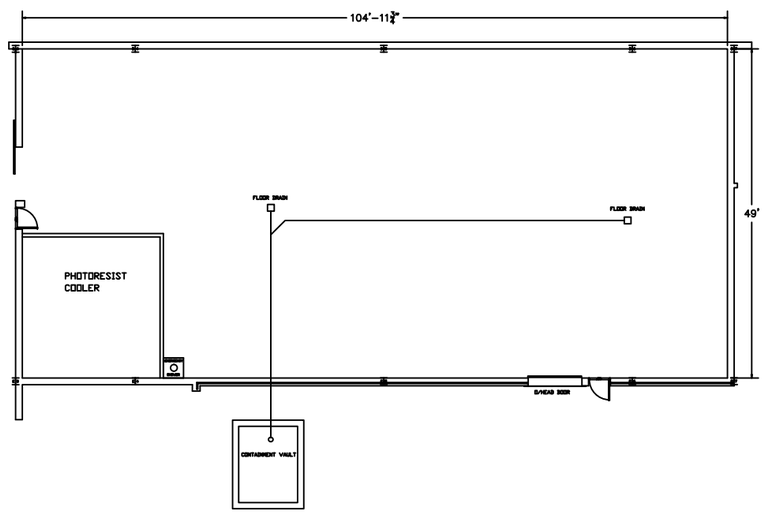
FIGURES



FLOOR LAYOUT



CONTAINER STORAGE DETAIL



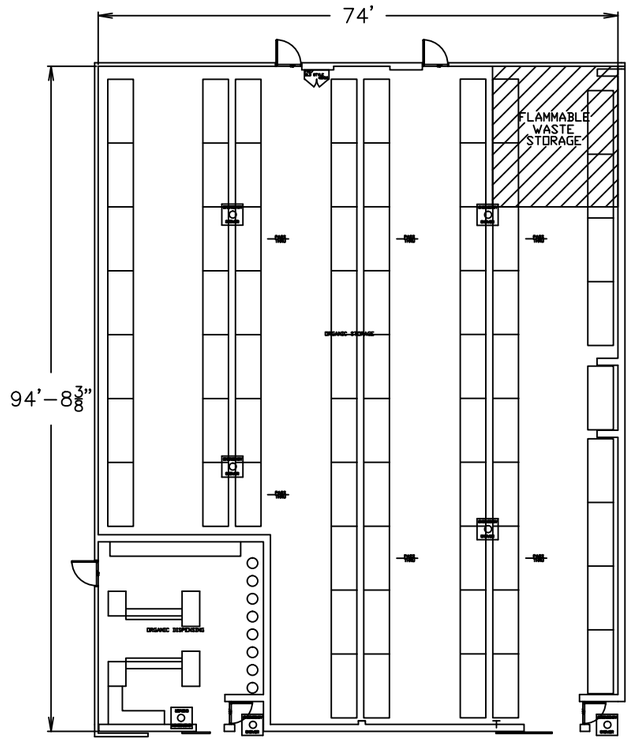
DRAINAGE

SECTION VIEW

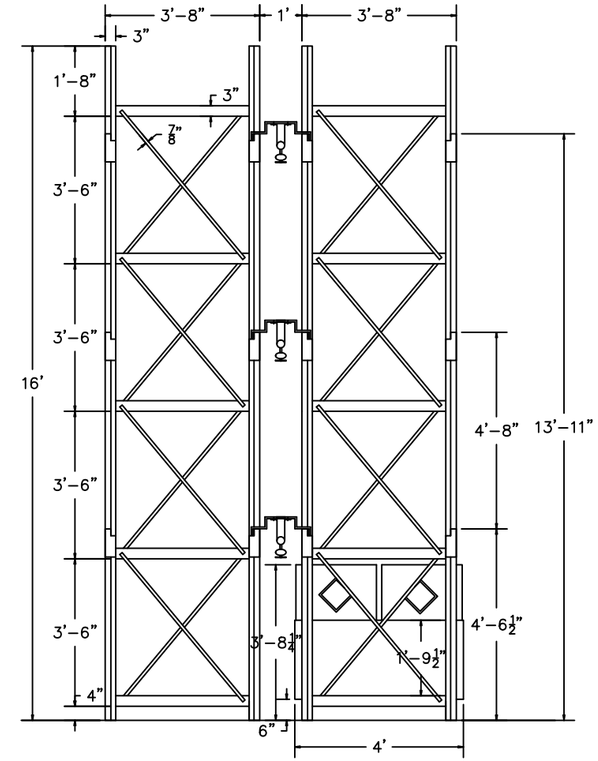
Figure D-1-1

CDC Waste Storage Room

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

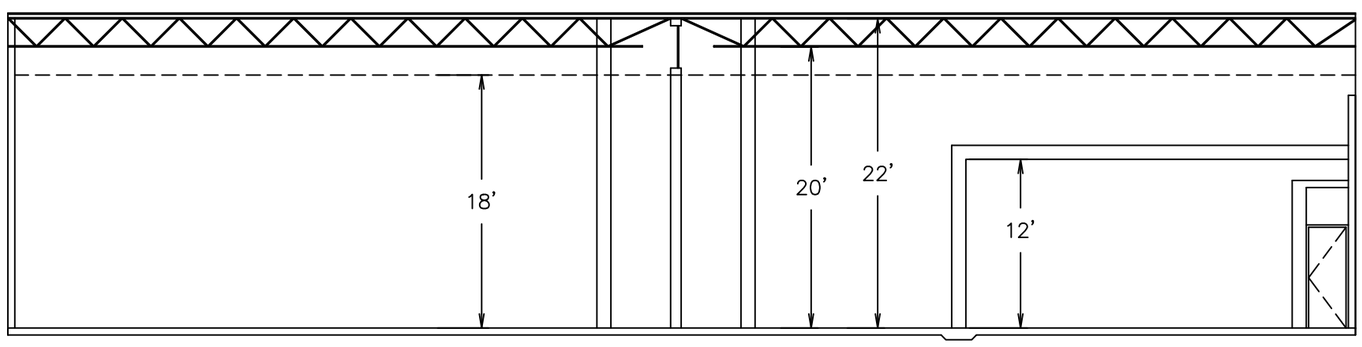


STORAGE ROOM LAYOUT



STORAGE RACKS

NOTE:
12" SPACE BETWEEN BACK TO BACK UPRIGHT TRUSSES
6" SPACE BETWEEN UPRIGHT TRUSS AND WALL



STORAGE ROOM- SIDE VIEW

Figure D-1-2

CDC Organic Storage Room

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

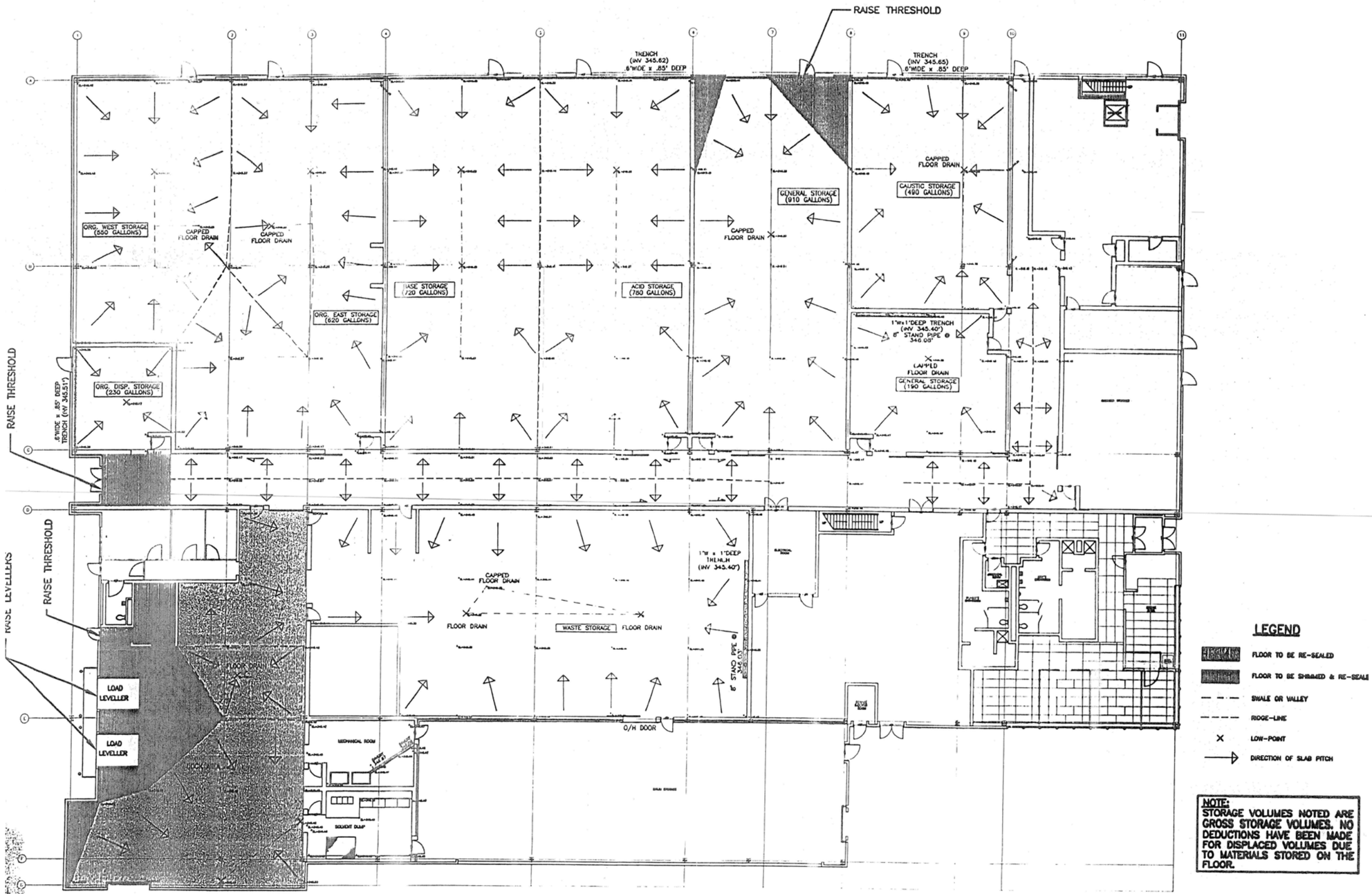


Figure D-1-3

CDC Floor Sloping Detail

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

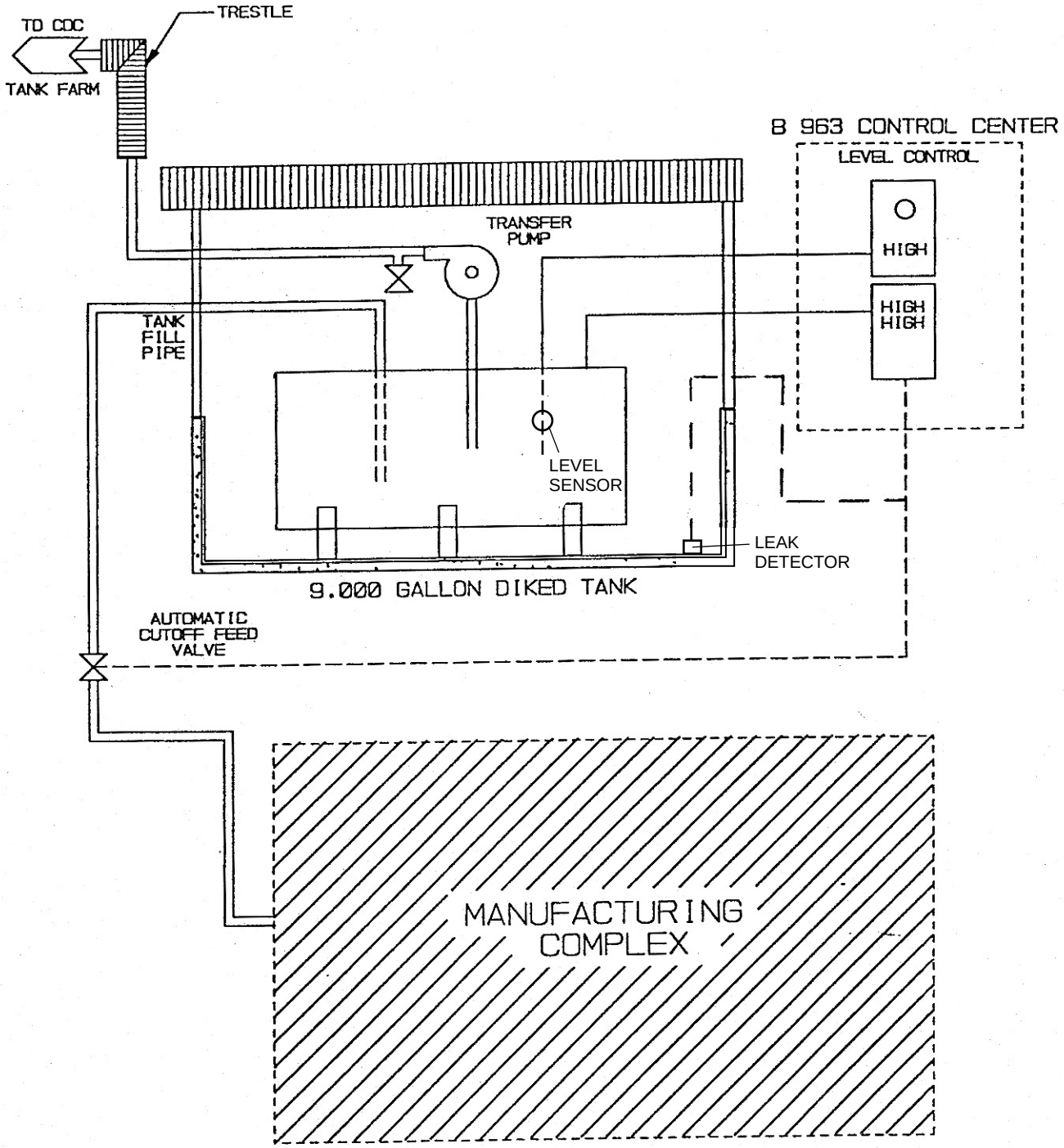


Figure D-2-A

Piping and Instrumentation for the Building 963 North Tank

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

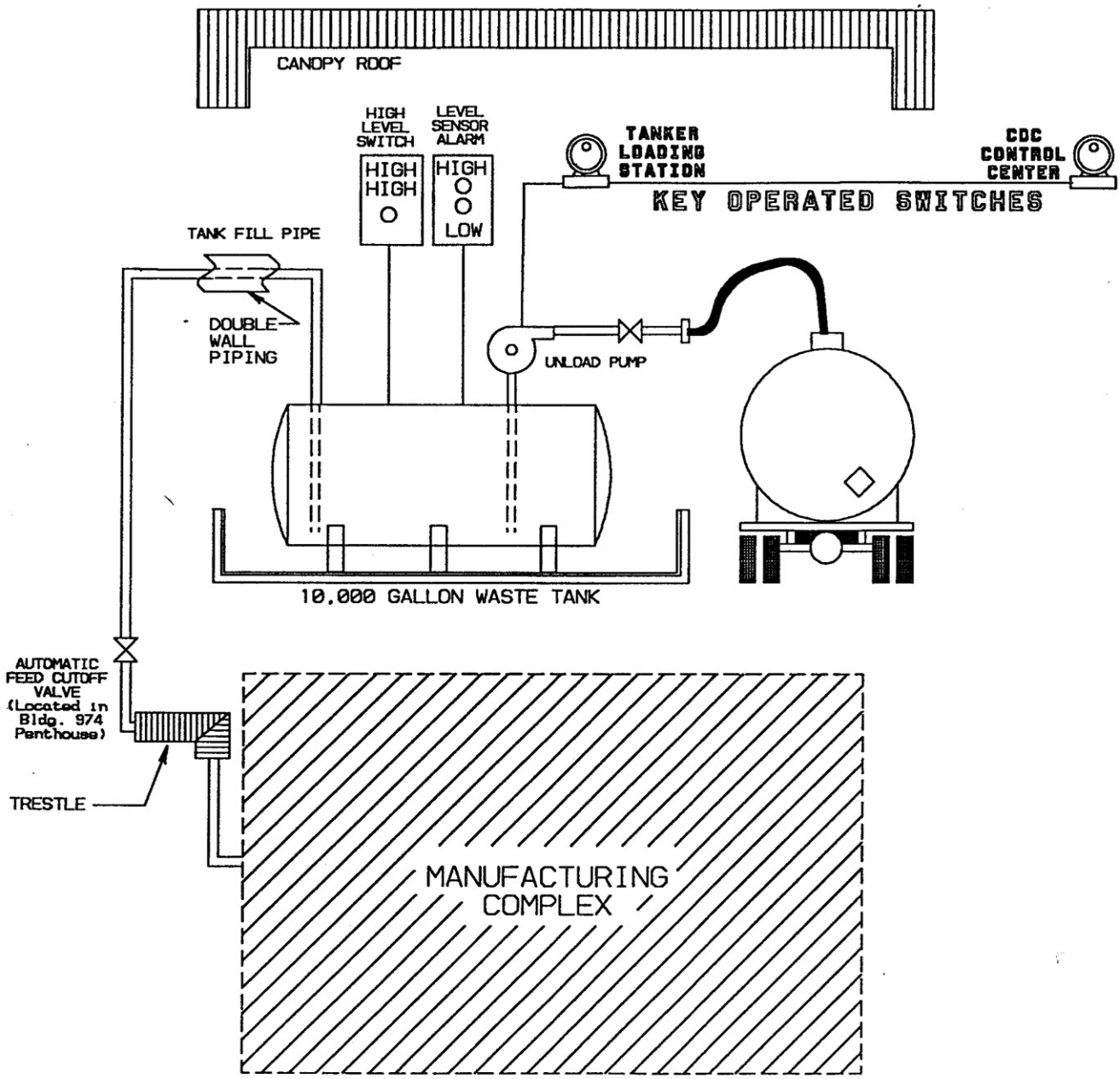


Figure D-2-B

Piping and Instrumentation for the Waste Storage Tank at the CDC Tank Farm

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

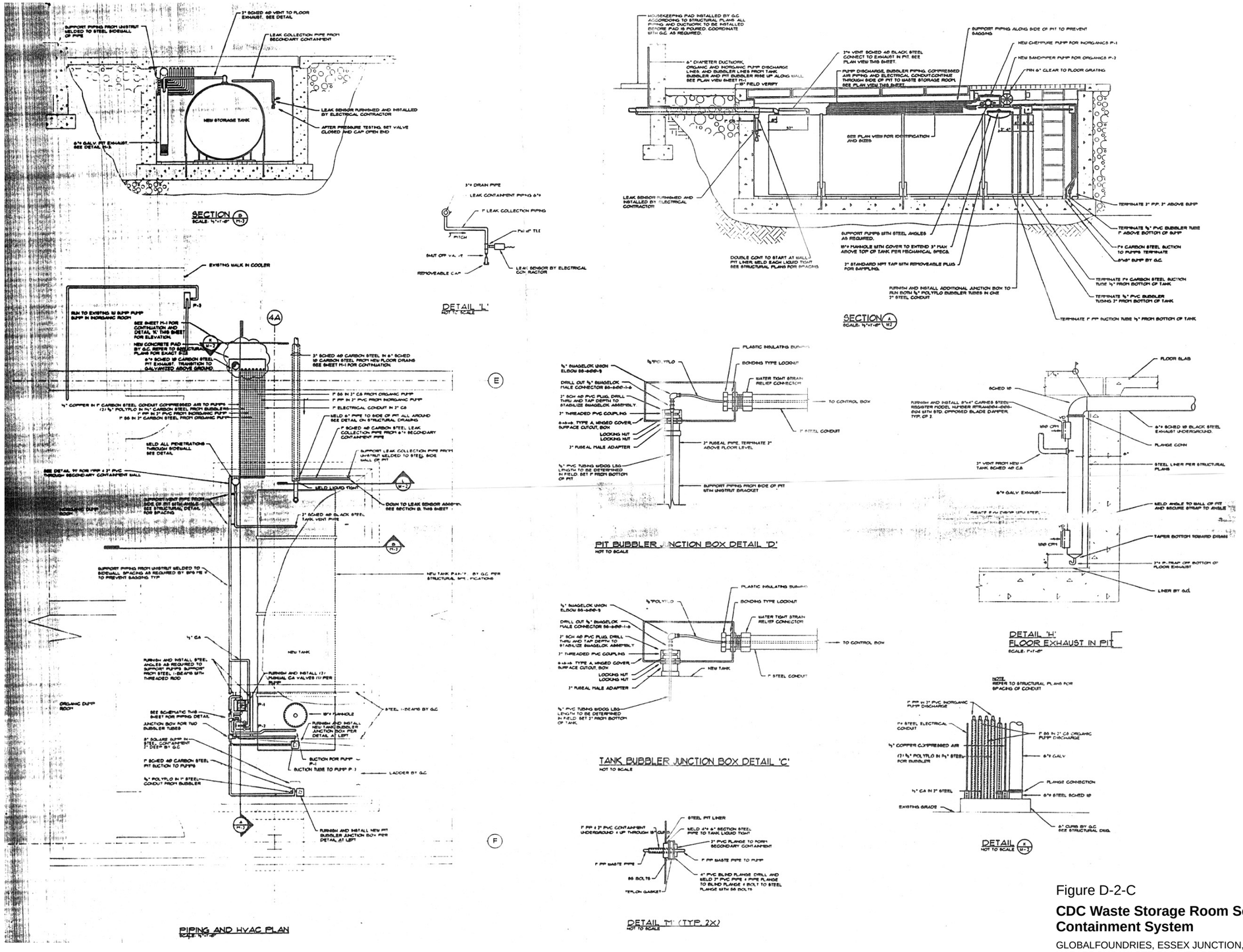


Figure D-2-C

CDC Waste Storage Room Secondary Containment System

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

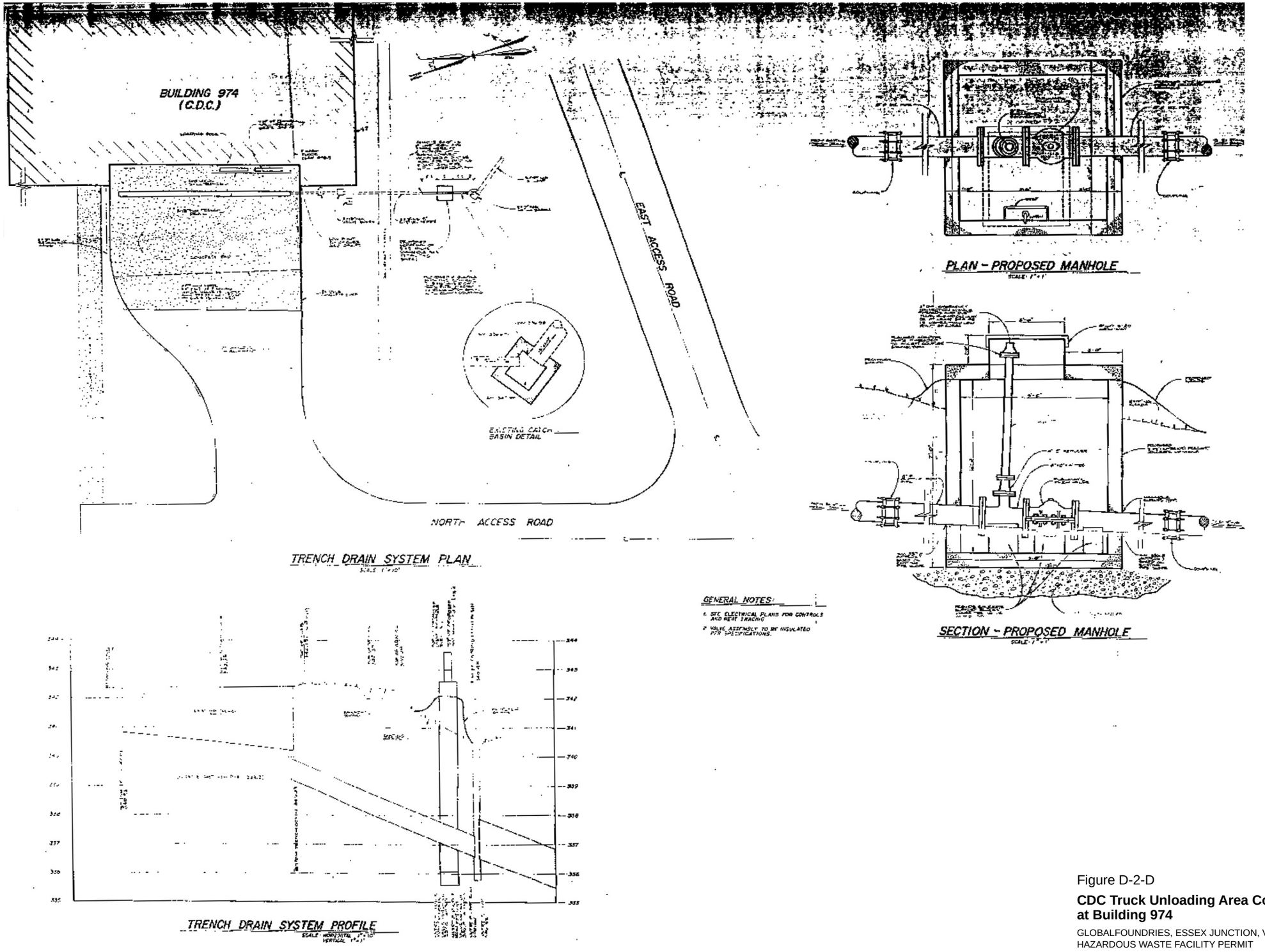


Figure D-2-D

CDC Truck Unloading Area Containment at Building 974

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

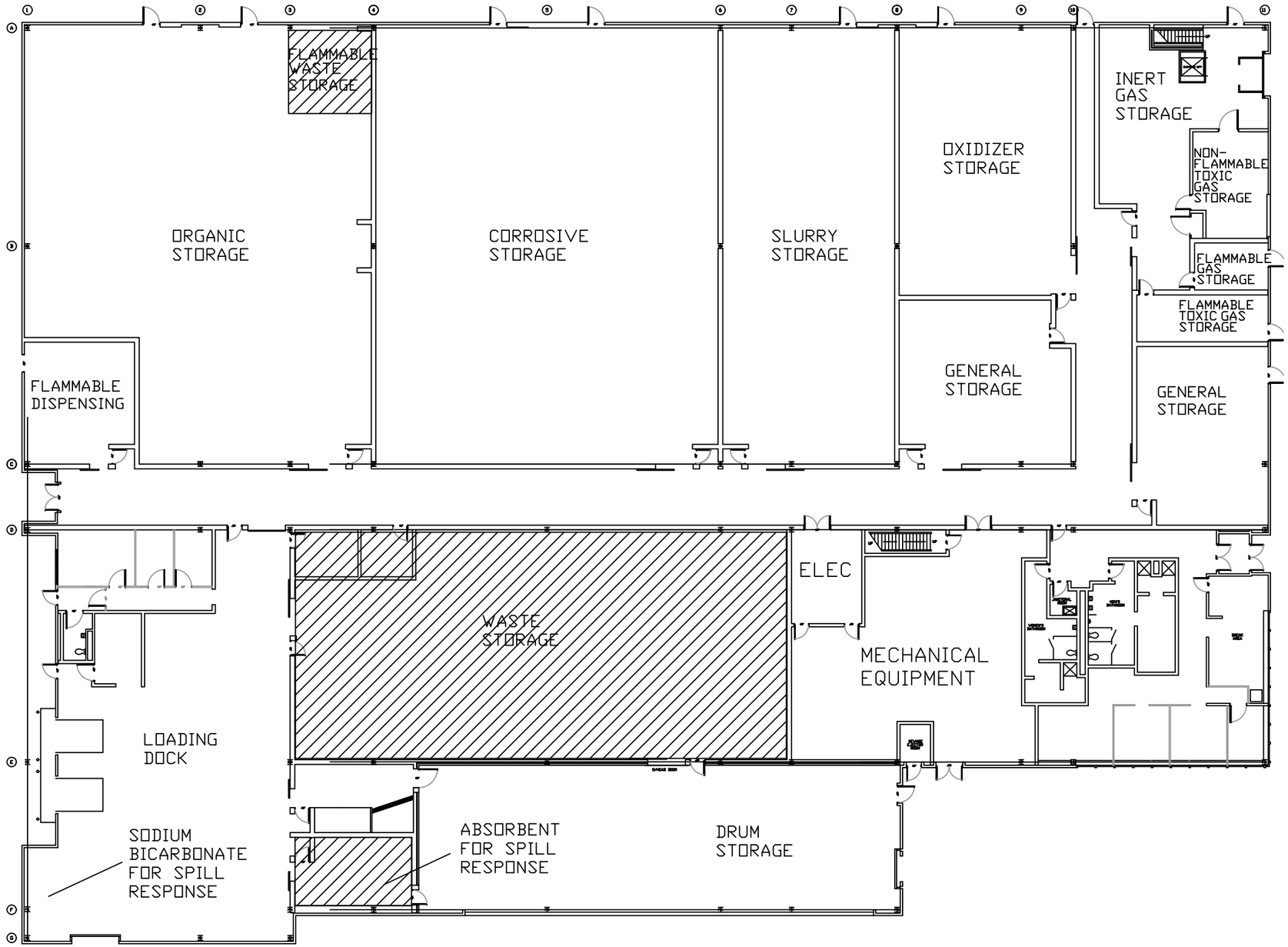


Figure D-2-E

CDC Room Layout and Emergency Response Equipment Locations

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

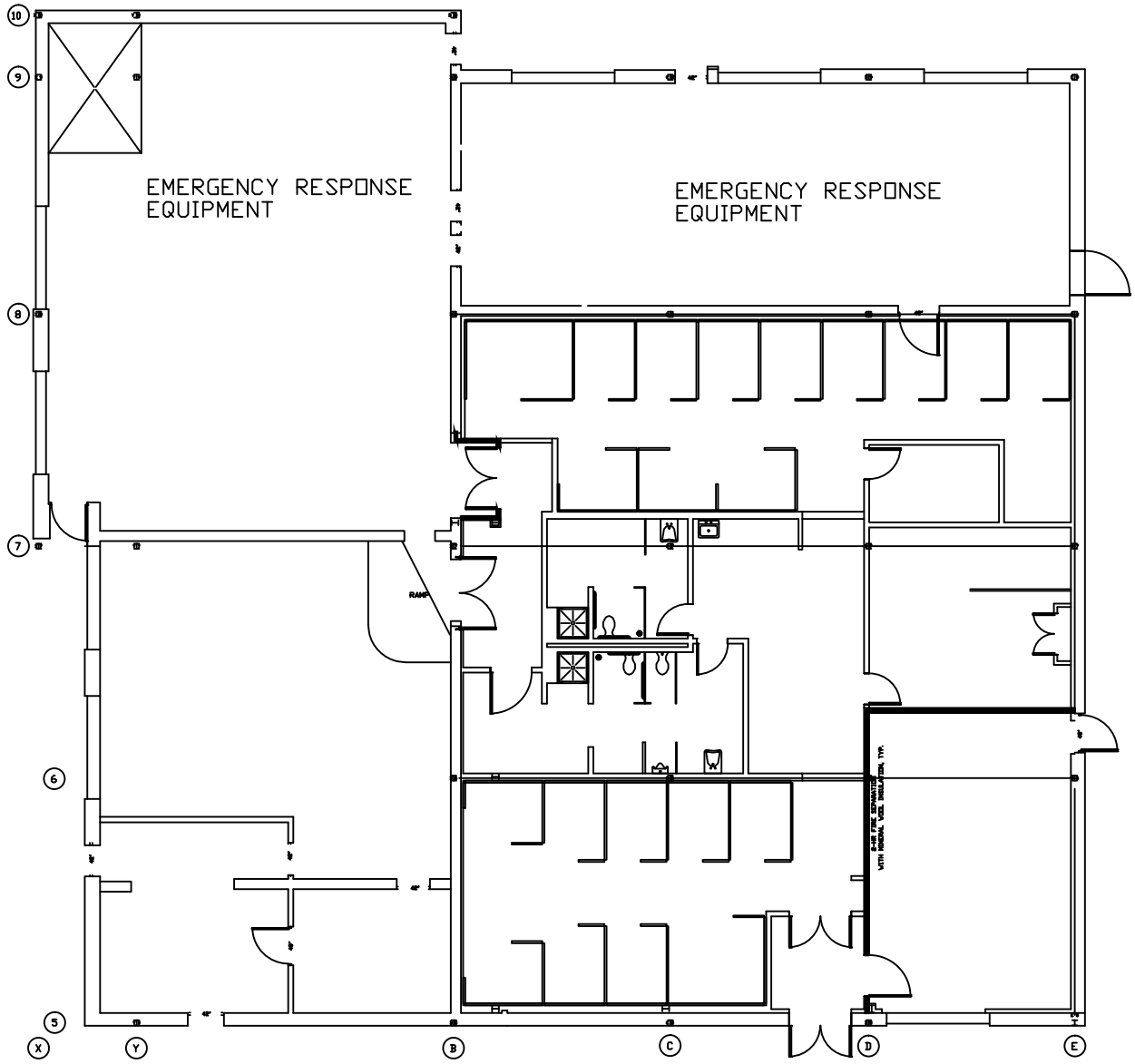


Figure D-2-F

Building 900 Layout and Emergency Response Equipment Locations

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

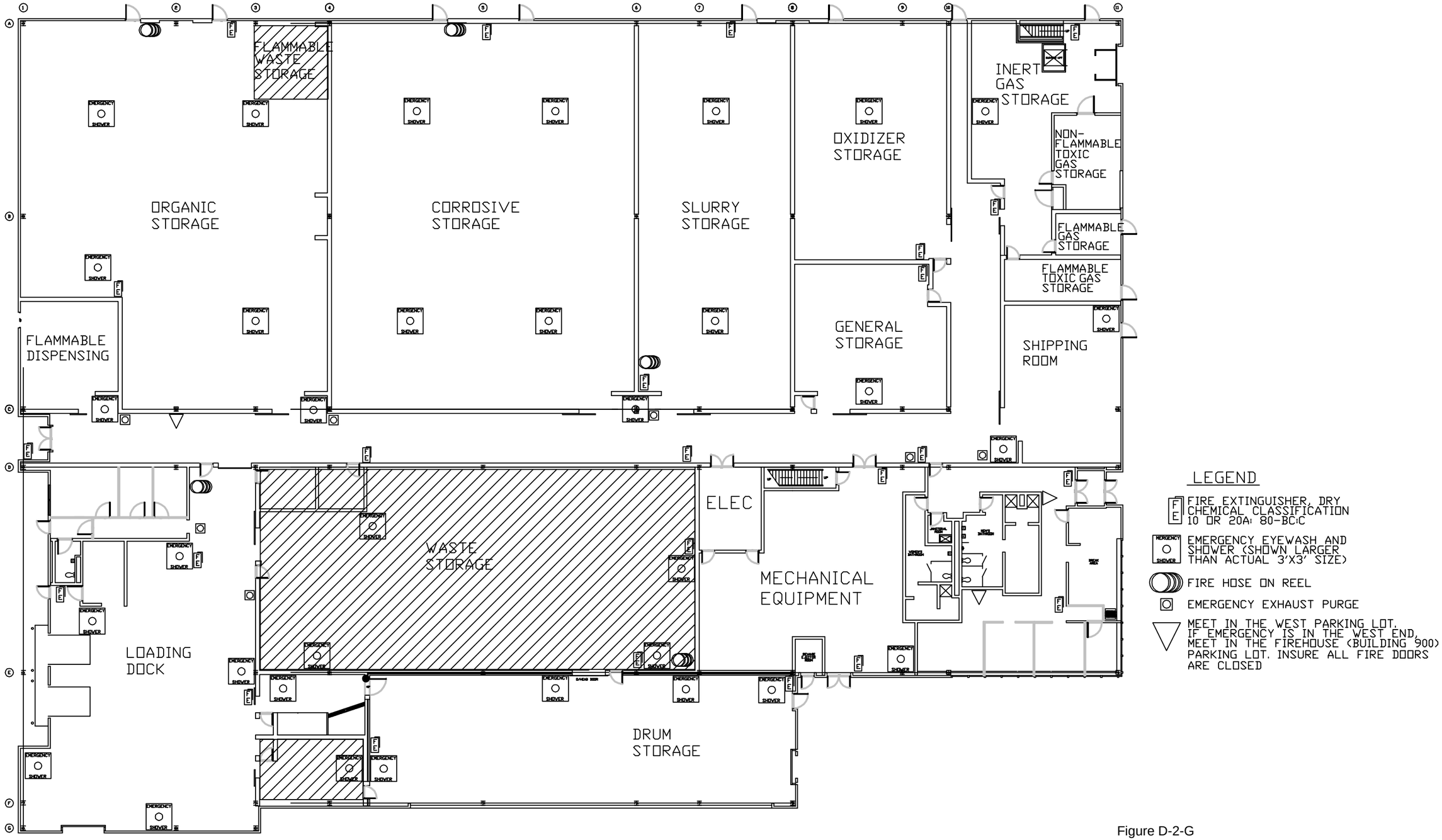
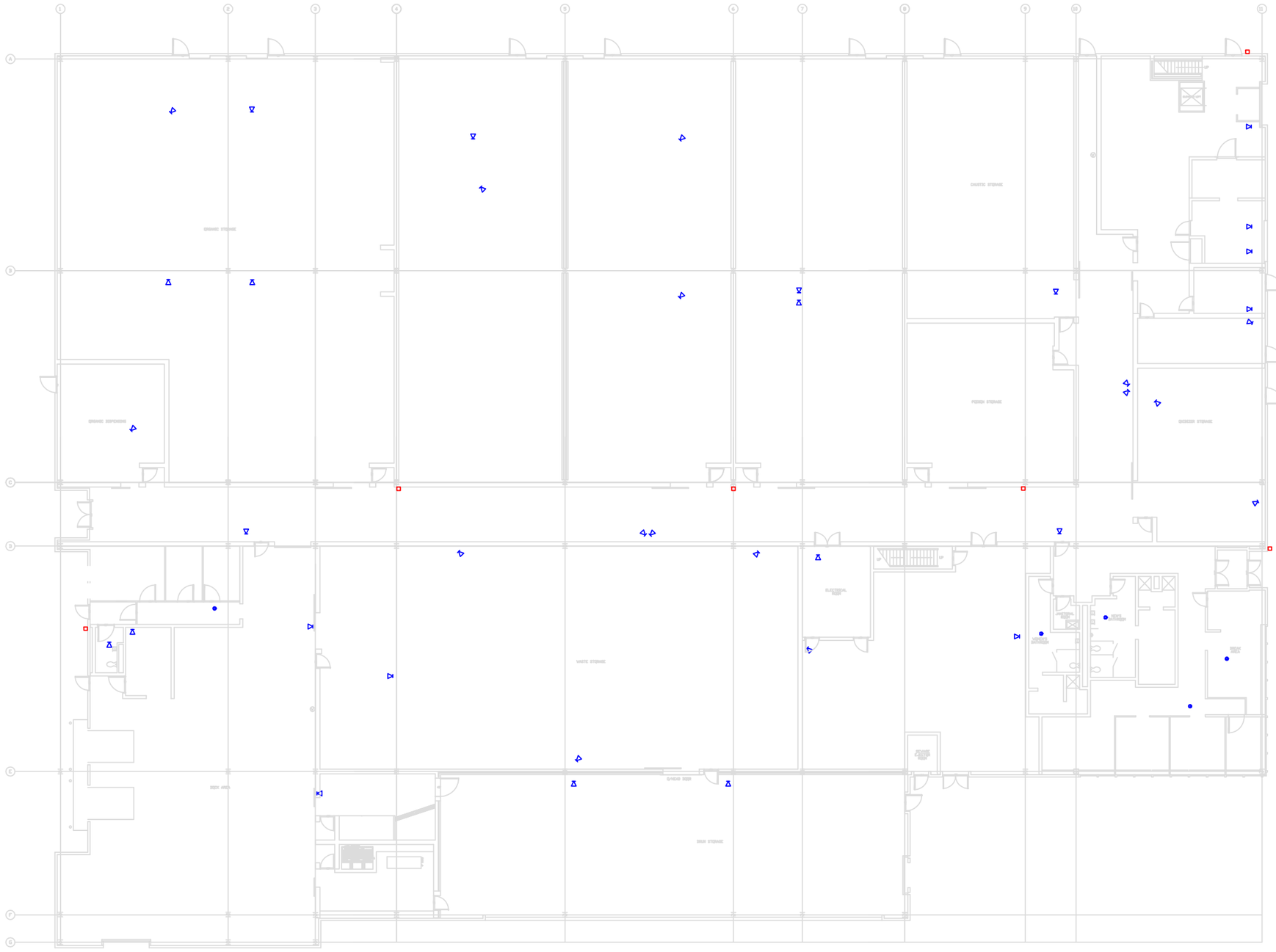


Figure D-2-G

CDC Fire Protection, Evacuation Route, Eyewashes

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT



PA Horn Speaker

Telephone

Figure D-2-H

CDC Public Address and Telephone System Layout

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

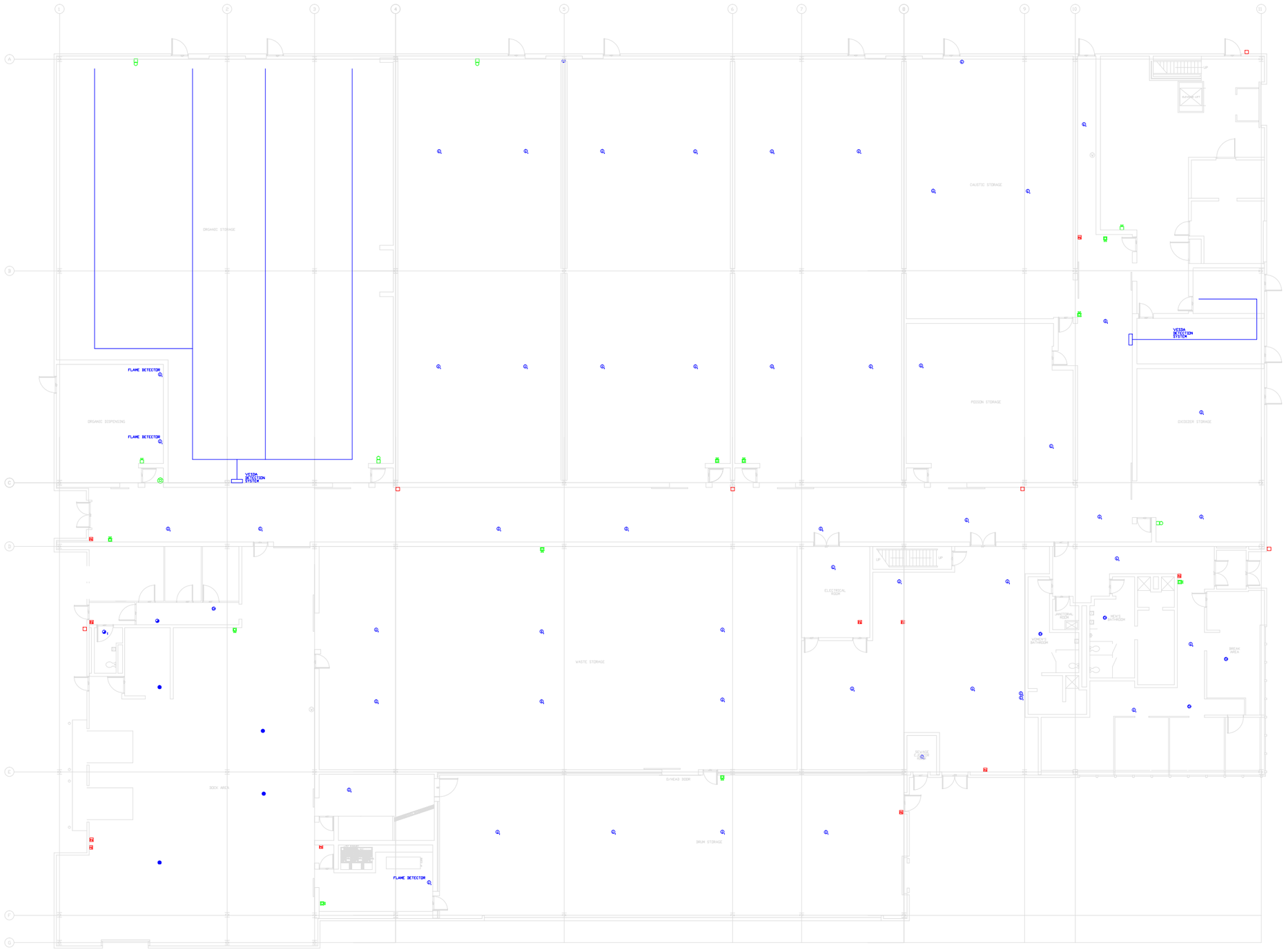


FIGURE D-2-1

CDC Automatic Fire Detection System Layout

GLOBALFOUNDRIES ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

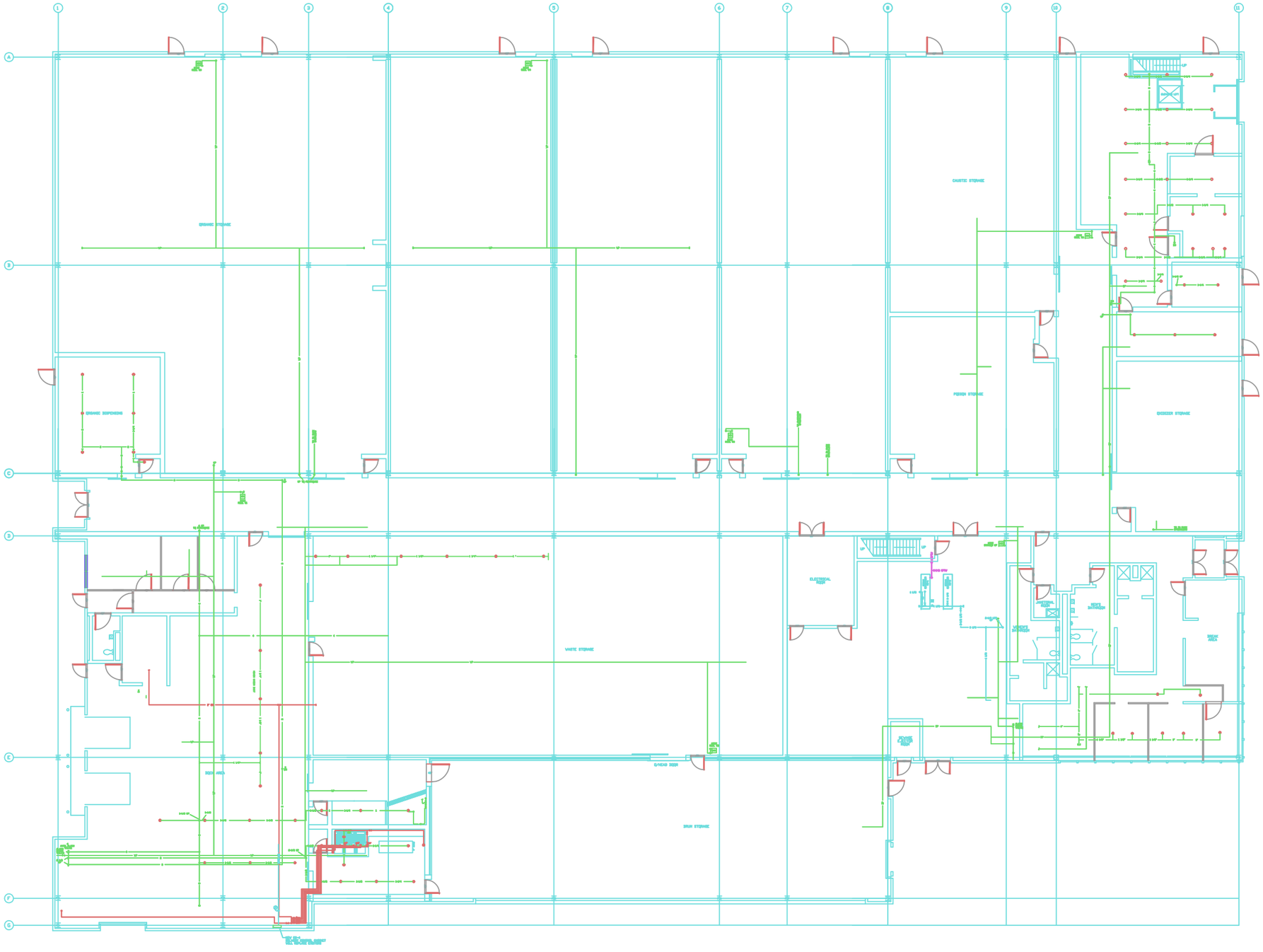


Figure D-2-J

CDC Sprinkler System Layout

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

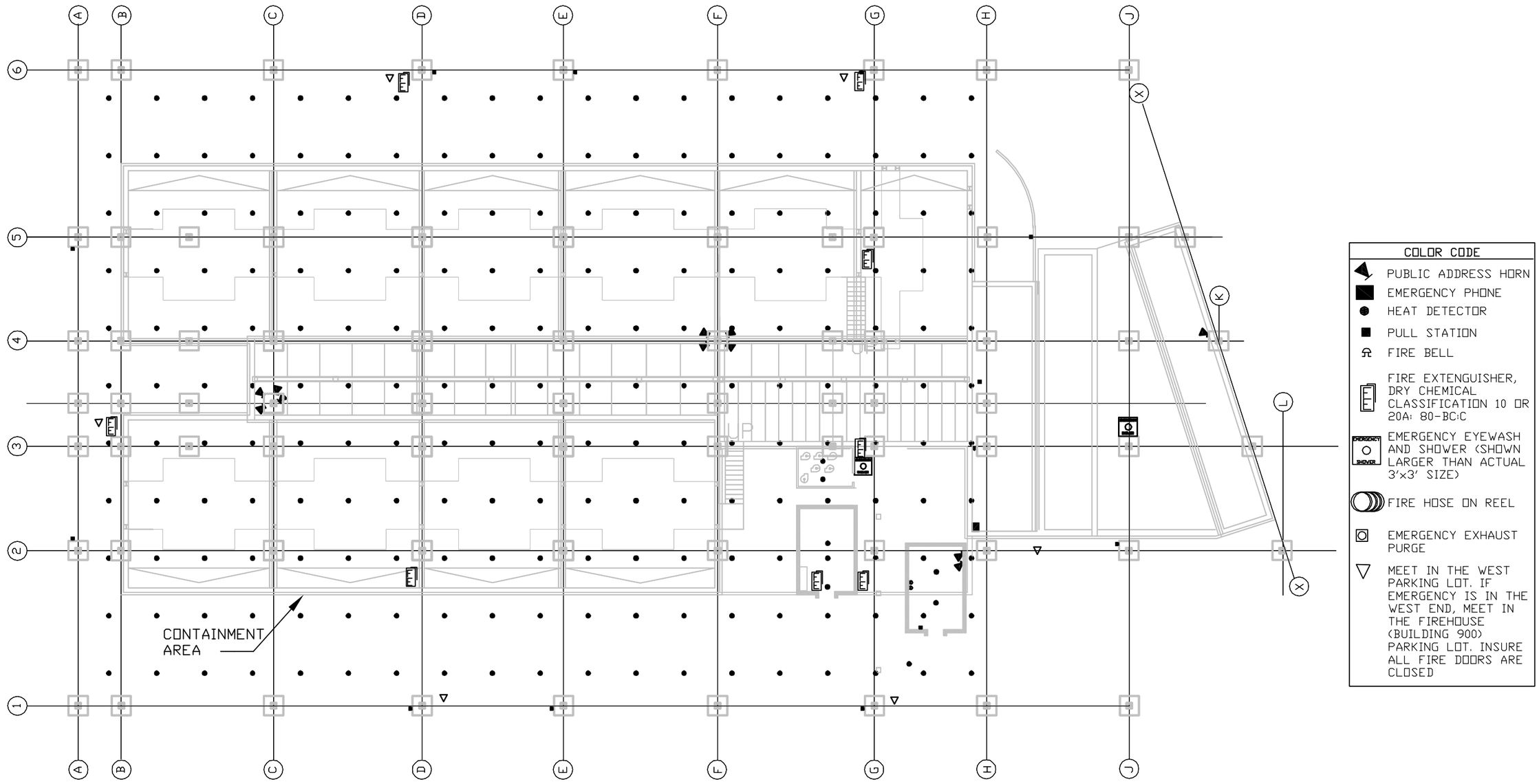


Figure D-2-K

CDC Tank Farm Public Address/Telephone and Automatic Fire Detection System Layout

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

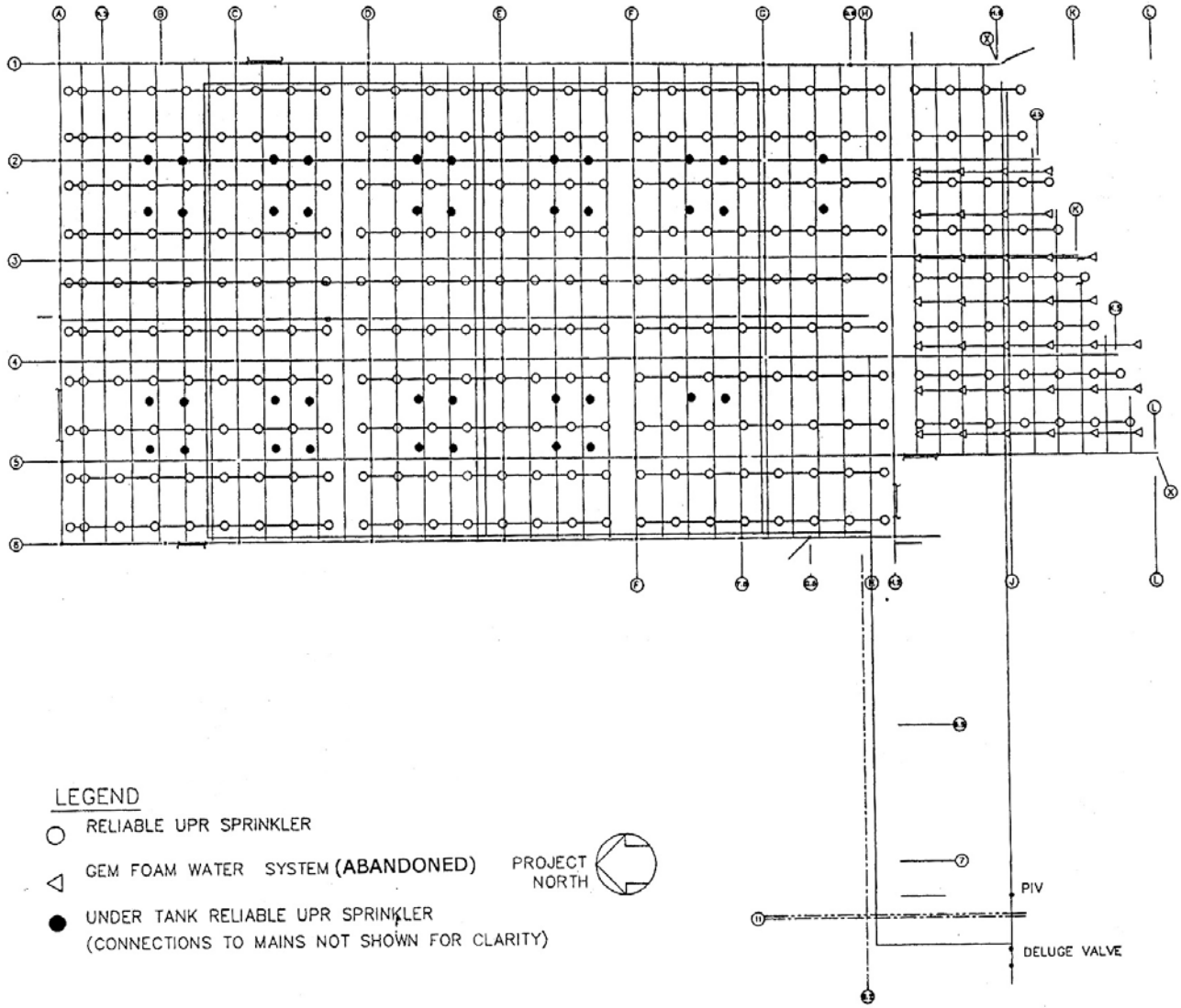


Figure D-2-L

CDC Tank Farm Sprinkler System Layout

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

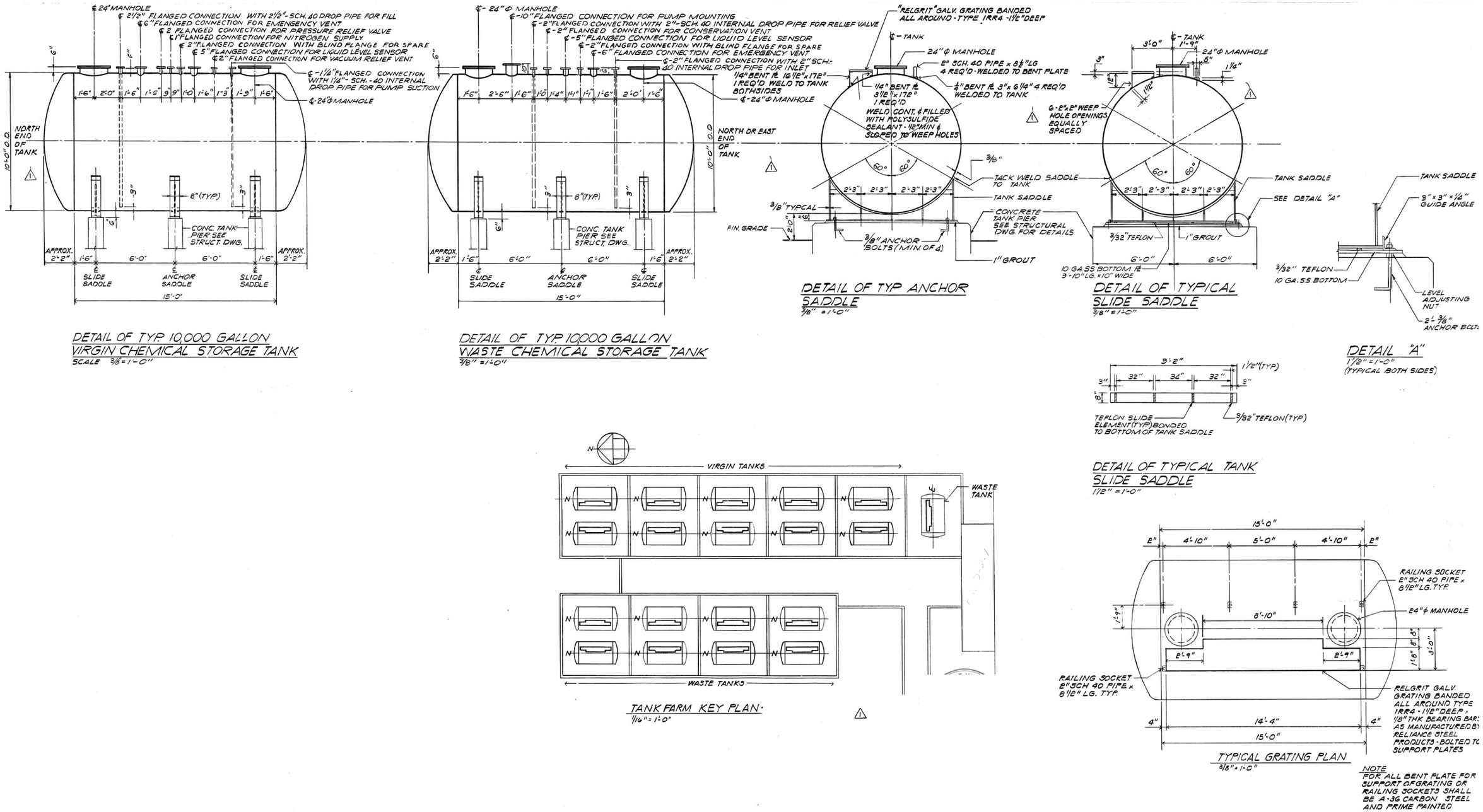


Figure D-2-1

CDC Waste Tank Support Structures

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

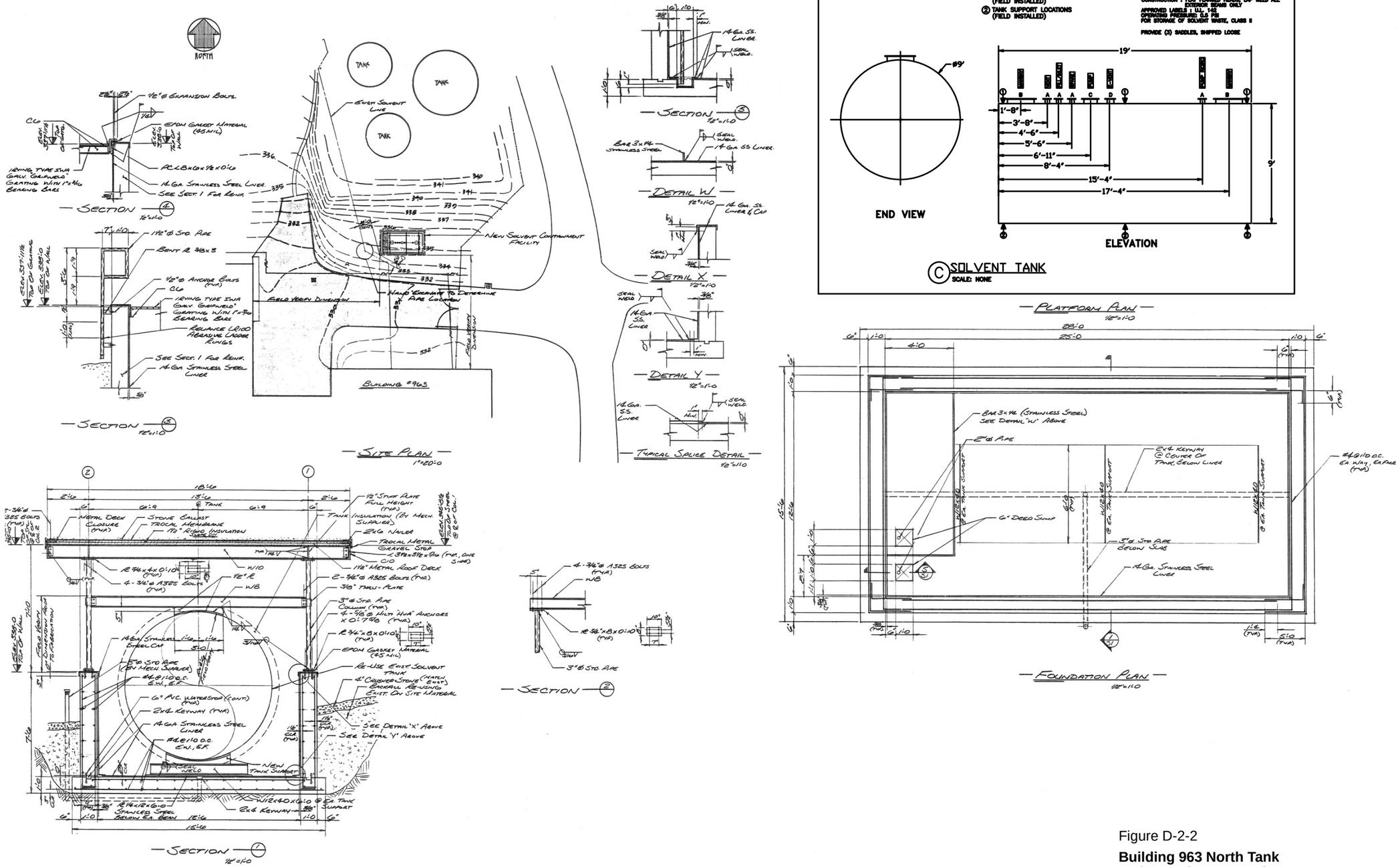


Figure D-2-2

Building 963 North Tank and Containment Vault

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

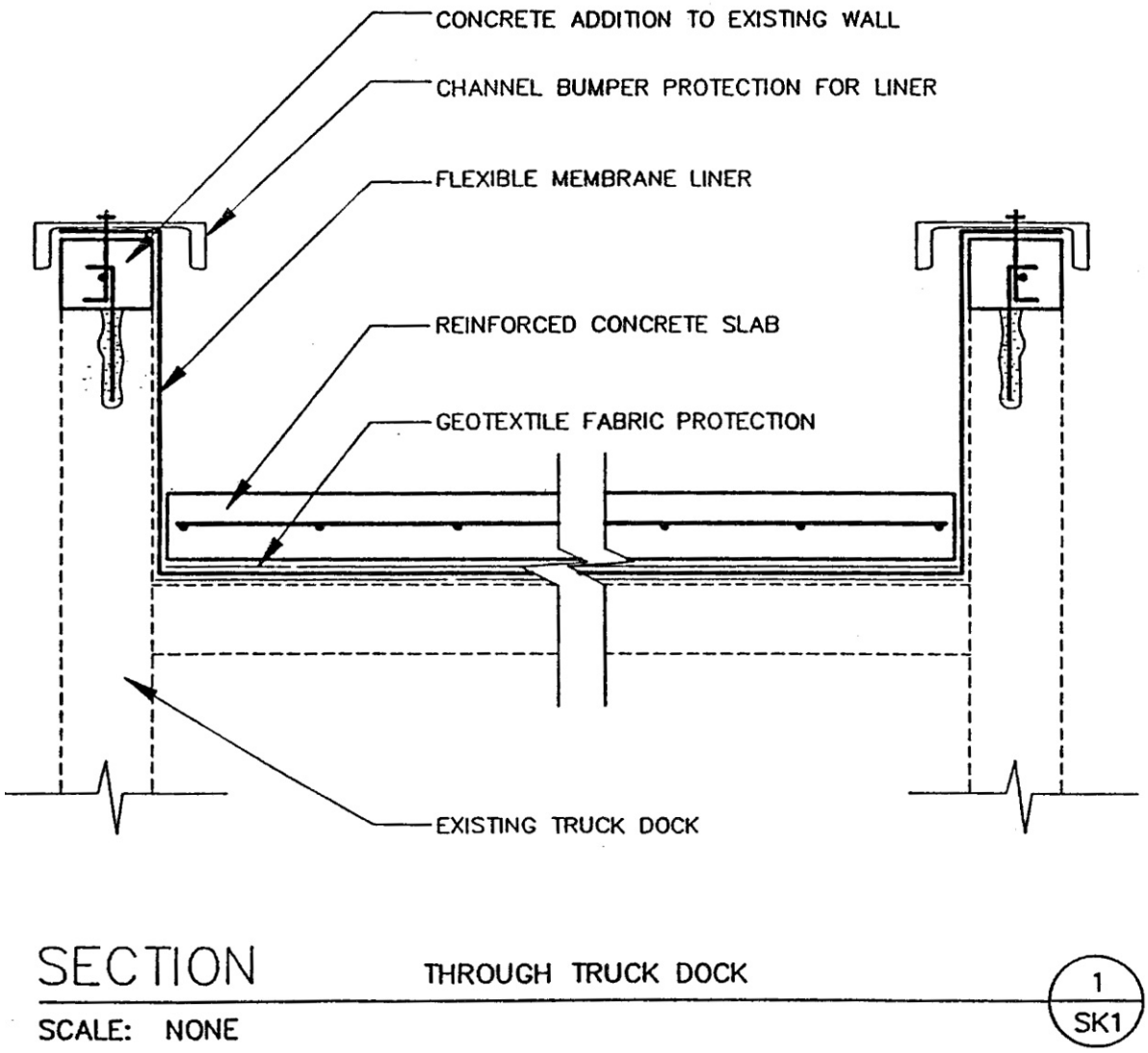
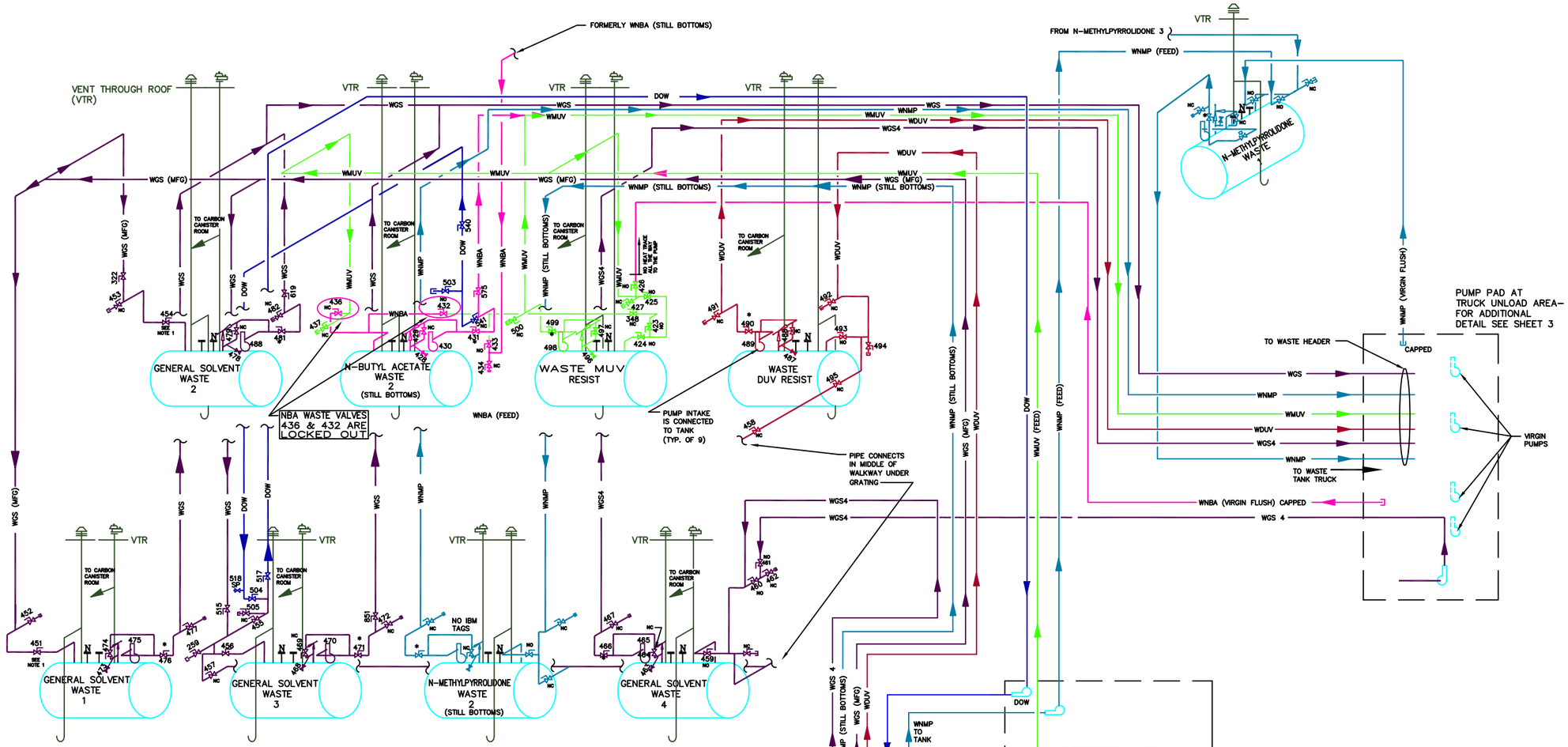


Figure D-2-3

Building 963 Tank Farm Load / Unload Station Upgrade

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT



NOTES:

1 FOR GENERAL SOLVENT 1 & 2 WASTE TANKS, ONLY ONE OF TWO VALVES (#451, 454) SHALL BE OPEN DEPENDING ON WHICH WGS TANK IS ON-LINE

2 ALL PIPING IS HEAT TRACED AND INSULATED, EXCEPT WHERE NOTED

3 NO IBM TAG #'S FOR VALVES AND PUMPS ON WNMP TANKS

WASTE PIPING

LEGEND

- WASTE MUV RESIST (WMUV)
- WASTE GENERAL SOLVENT (WGS)
- WASTE N-BUTYL ACETATE (WNBA)
- WASTE N-METHYLPYRROLIDONE (WNMP)
- WASTE DEEP UV RESIST (WDUV)
- DILUTE ORGANIC WASTE (DOW)
- VENT PIPING

INTAKE / DISCHARGE — PUMP

SAMPLE PORT

NORMAL PROCESS FLOW

PNEUMATIC VALVE
ALL FAIL CLOSE UNLESS MARKED FO (FAIL OPEN)

MANUAL VALVE
NO NORMALLY OPEN
NC NORMALLY CLOSED
* OPENED WHEN PUMP IS TURNED ON FOR EMPTYING TANK

NITROGEN LINE

PRESSURE RELIEF VALVE

CHECK VALVE

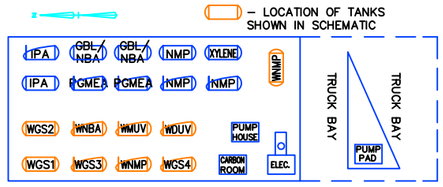
REDUCER

VACUUM VENT

VTR — EMERGENCY PRESSURE VENT

VTR — CONSERVATION BREATHER VENT

LOCATION PLAN



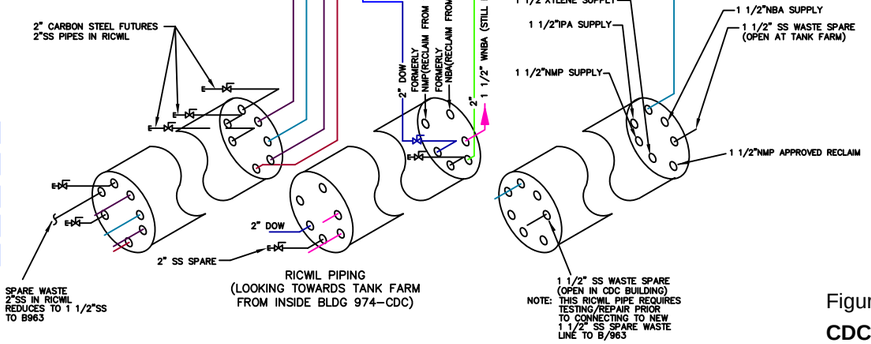


Figure D-2-4

CDC Tank Farm Waste Piping Isometric

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

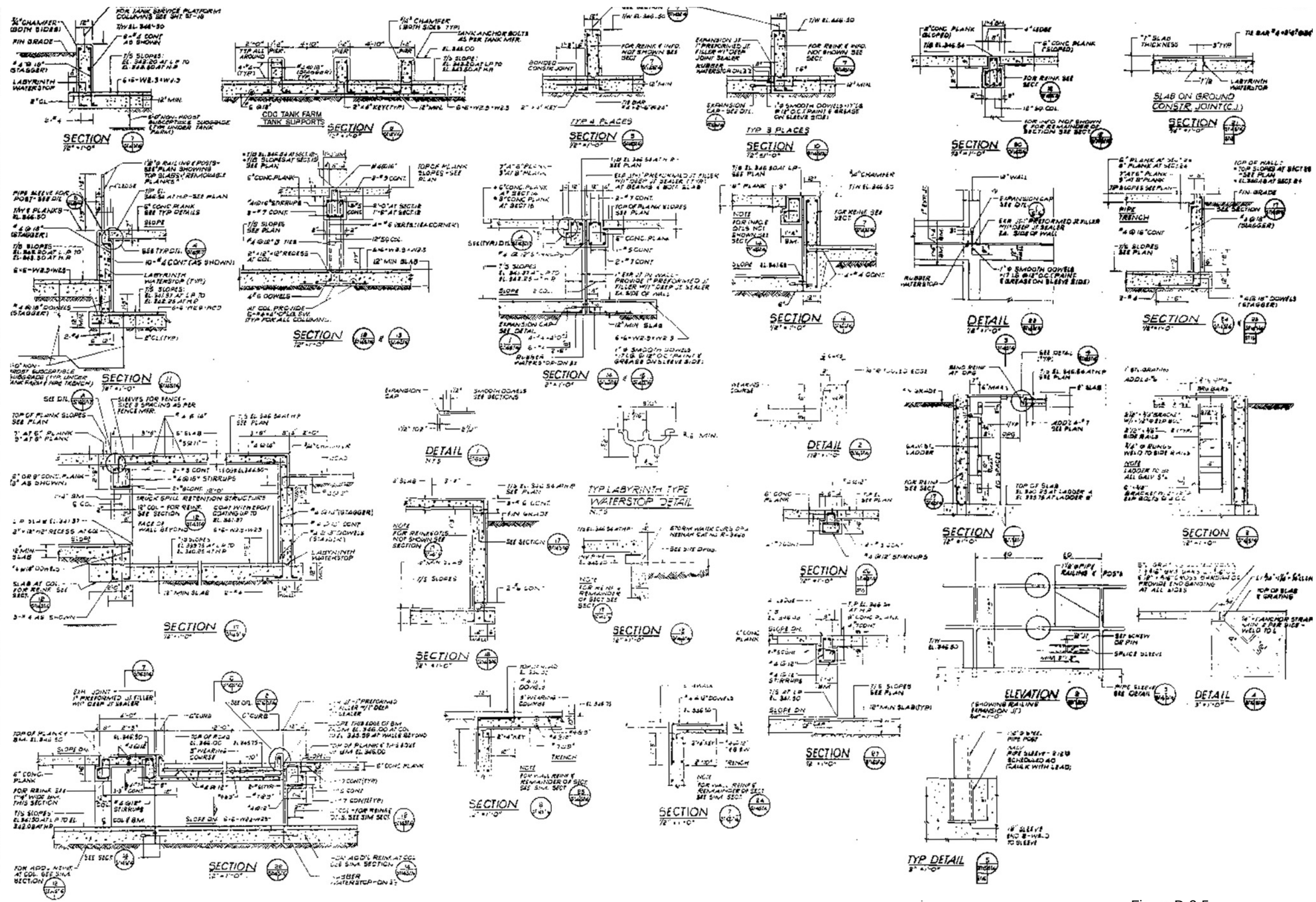


Figure D-2-5

CDC Tank Farm Foundation and Slab Plan

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

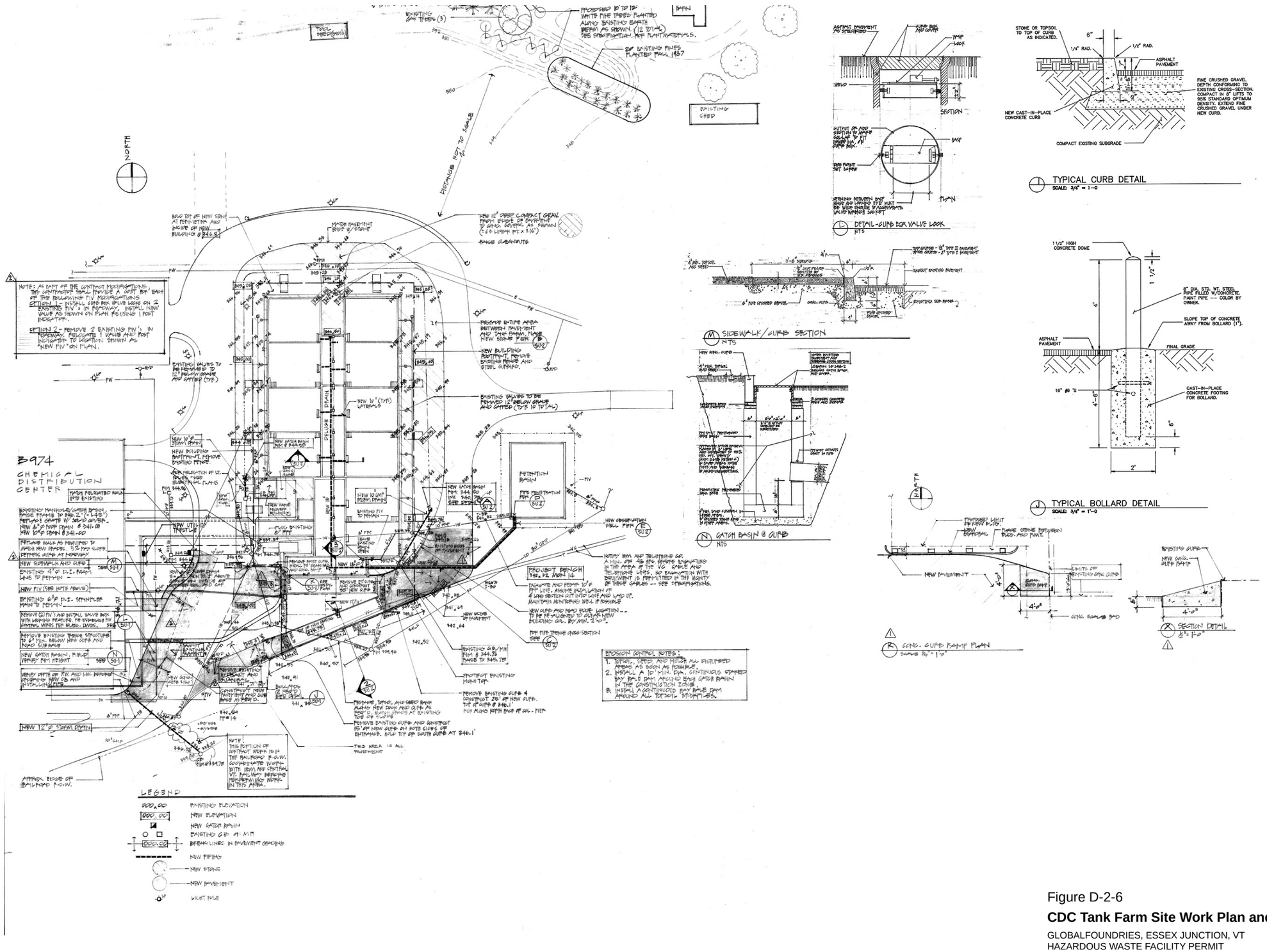
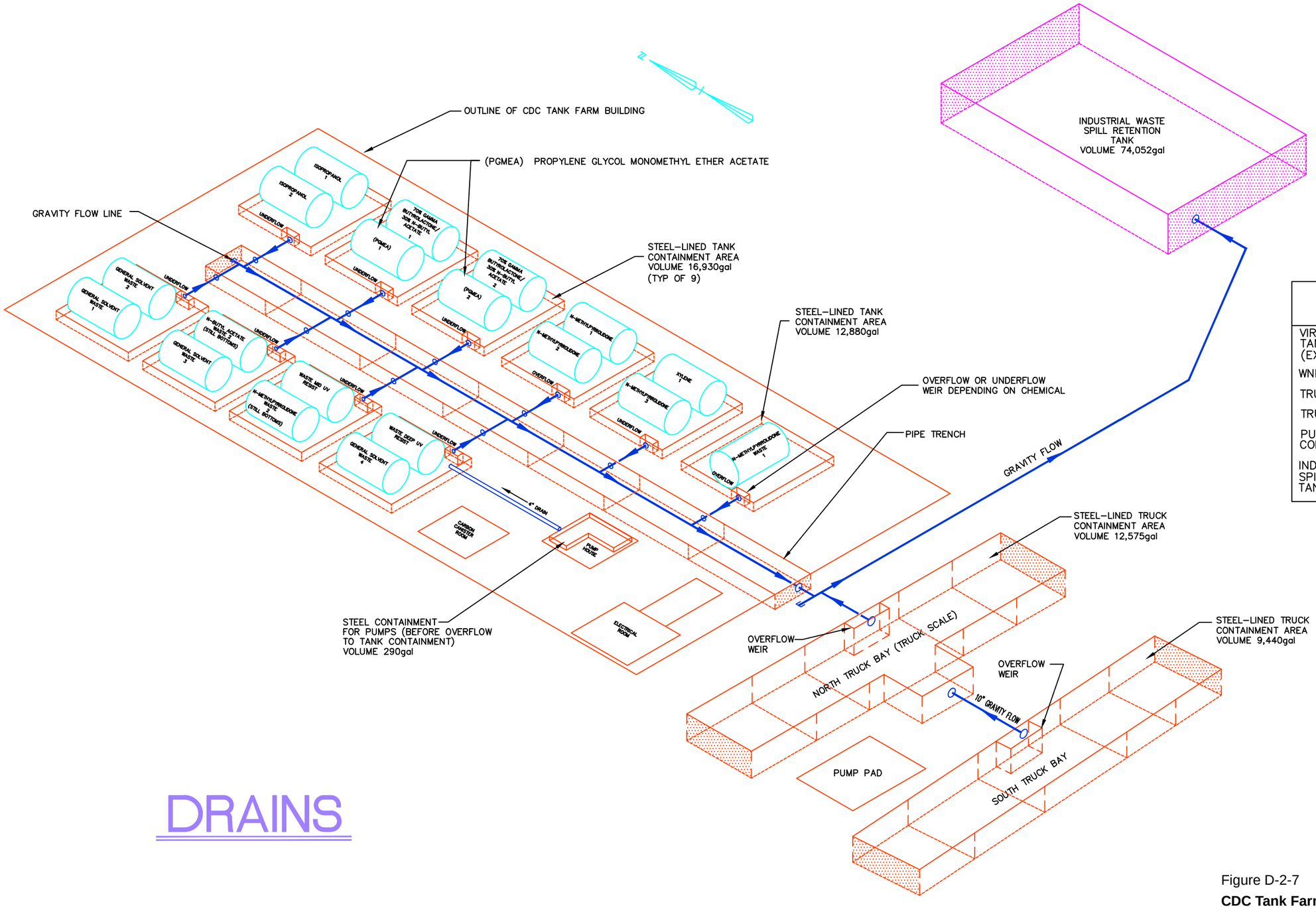


Figure D-2-6

CDC Tank Farm Site Work Plan and Details

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT



AREA	VOLUME (GALLONS)
VIRGIN AND WASTE TANK CONTAINMENT (EXCEPT WNMP 1)	16,930
WNMP 1 CONTAINMENT	12,880
TRUCK SCALE	12,575
TRUCK UNLOAD	9,440
PUMP HOUSE PUMP CONTAINMENT	290
INDUSTRIAL WASTE SPILL RETENTION TANK	74,052

DRAINS

Figure D-2-7

CDC Tank Farm and Load/Unload Station Spill Retention Tank

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

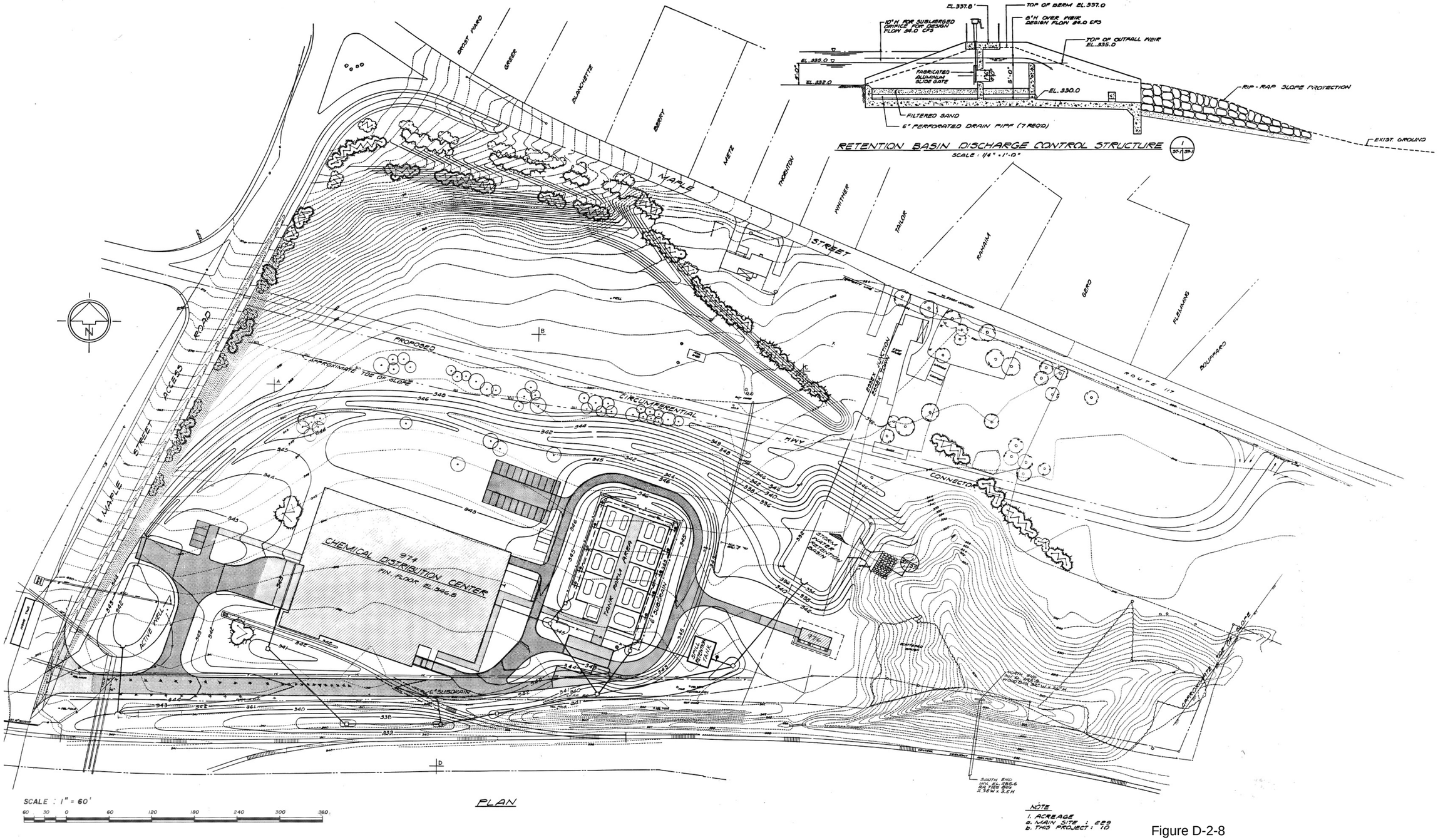


Figure D-2-8

CDC Tank Farm Spill Retention Discharge Control

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

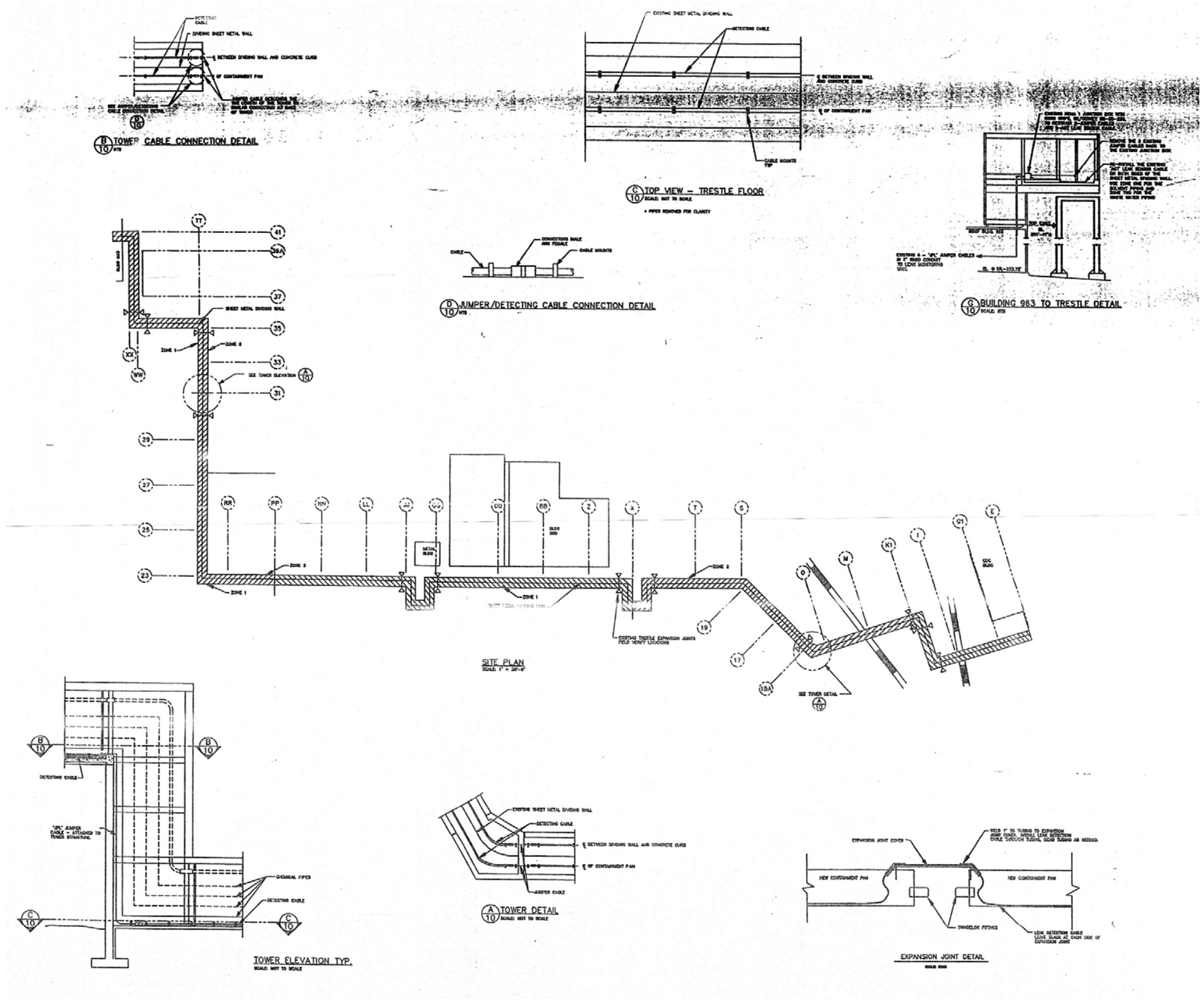
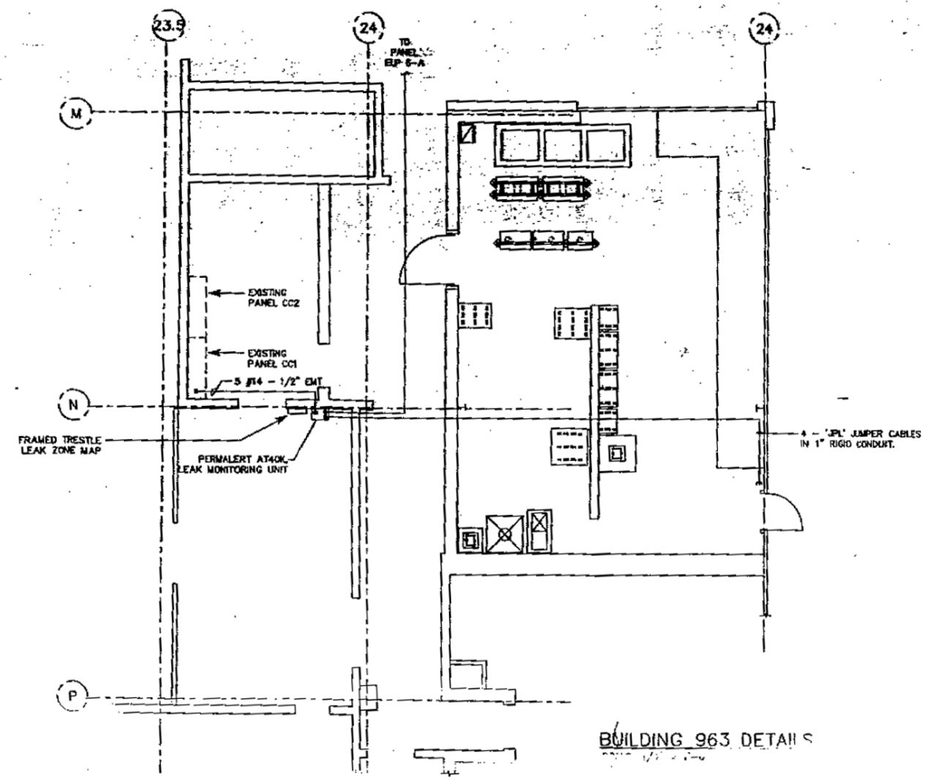


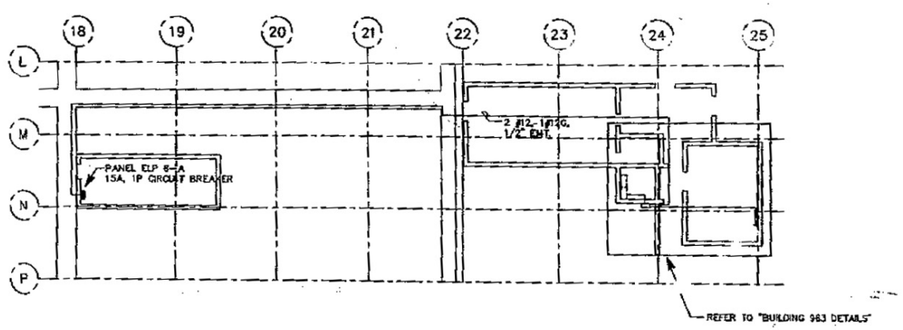
Figure D-2-11

Pipe Trestle Leak Detection Cable Installation

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

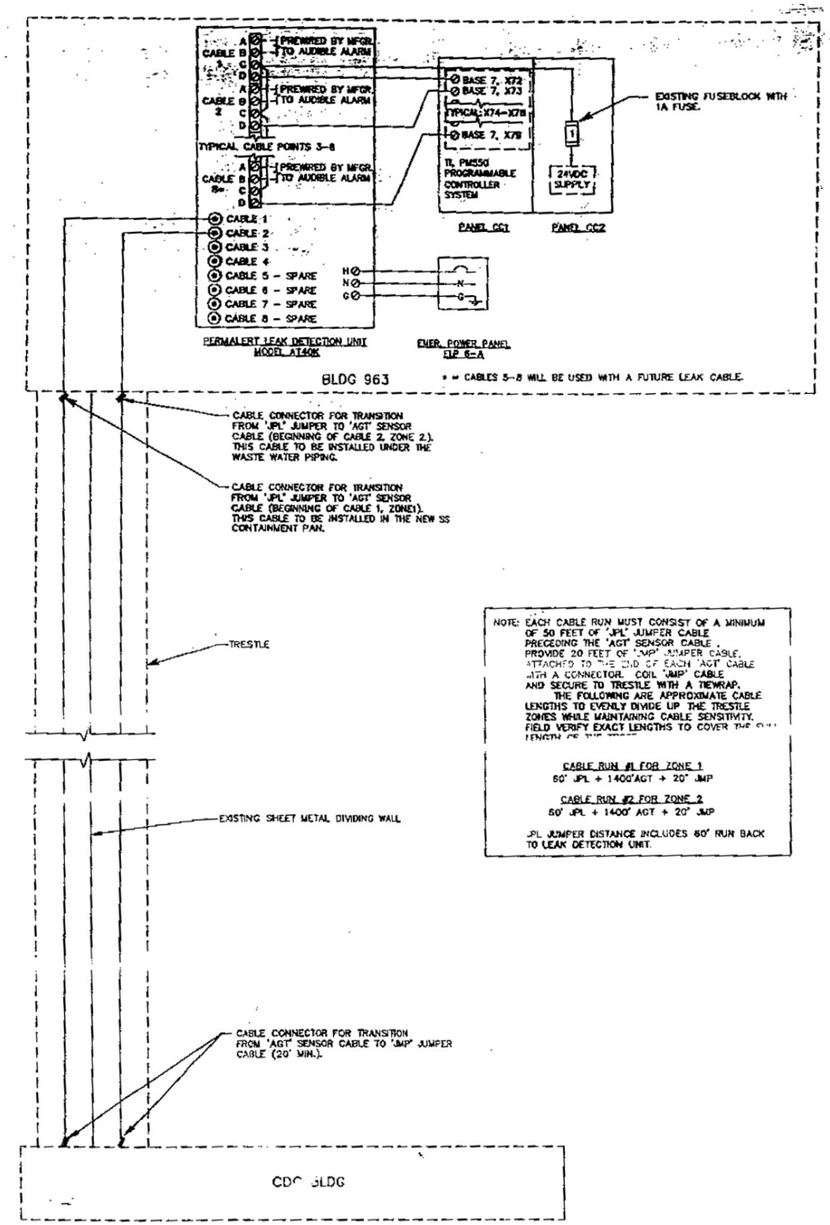


BUILDING 963 DETAILS



BUILDING 963

SCALE: NONE



NOTE: EACH CABLE RUN MUST CONSIST OF A MINIMUM OF 50 FEET OF 'JPL' JUMPER CABLE PRECEDING THE 'AGT' SENSOR CABLE. PROVIDE 20 FEET OF 'JMP' JUMPER CABLE, ATTACHED TO THE END OF EACH 'AGT' CABLE WITH A CONNECTOR. COIL 'JMP' CABLE AND SECURE TO TRESTLE WITH A TIEWRAP.

THE FOLLOWING ARE APPROXIMATE CABLE LENGTHS TO EVENLY DIVIDE UP THE TRESTLE ZONES WHILE MAINTAINING CABLE SENSITIVITY. FIELD VERIFY EXACT LENGTHS TO COVER THE [illegible]

CABLE RUN #1 FOR ZONE 1
60' JPL + 1400'AGT + 20' JMP

CABLE RUN #2 FOR ZONE 2
50' JPL + 1400' AGT + 20' JMP

JPL JUMPER DISTANCE INCLUDES 60' RUN BACK TO LEAK DETECTION UNIT.

LEAK DETECTION RISER

NTS

Figure D-2-12

Pipe Trestle Leak Detection Circuit Details

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT

GENERAL NOTES

01. All work shall be done in accordance with the latest edition of the National Electrical Code (NEC), OSHA, State and local rulings, National Electrical Manufacturers Association (NEMA), Insulated Power Cable Engineers Association (IPCEA), Institute of Electrical and Electronics Engineers (IEEE), American National Standards Institute (ANSI) and IBM (BFS) Standards.

02. At the end of each work day the Contractor shall leave all equipment and materials so that normal operation can be made on short notice if an emergency should arise.

03. Materials and equipment, for which UL standards exist, shall be listed by Underwriters' Laboratories and shall be installed in conformance with such listings.

04. Continuity of electrical services shall be maintained at all times in areas where occupancy is to be retained during the construction period. Interruption of services, if necessitated shall be done only upon consent of IBM and at a time and duration specified by IBM.

05. All materials shall be new and the quality specified. Where manufacturer's catalog numbers of types are mentioned in the Specifications or Drawings, it is not for the purpose of limiting competition. Unless specifically stated otherwise, the bidder may assume the phrase 'or approved equal', except that the burden is upon the bidder to prove such equality. He must request the Engineer's approval in writing to substitute such item for the specified item.

06. As there may be various conditions at the site which do not show on the accompanying Drawings, or which are at variance with the conditions indicated on the Drawings, it is important that each bidder visit the site and acquaint himself with existing conditions and take these conditions into consideration when preparing his bid. Each bidder shall obtain information or make measurements desired. Lack of knowledge relative to existing site conditions will not be allowed as a basis for extra compensation.

ELECTRICAL SPECIFICATIONS

01. GENERAL CONDITIONS

A. All work under this Contract is specifically subject to the Conditions and Supplementary Conditions of the Construction Contract.

02. SCOPE OF WORK

It is the intent of these Specifications and accompanying drawings that the Contractor shall, unless otherwise specified, furnish all labor, materials, tools and equipment to complete the installation of the systems as specified. Contractor shall properly install, equip, adjust and put into perfect operation, the respective portions of the installation specified, and to so interconnect the various items or sections of the work in order to form a complete and properly operating whole. The work shall consist of, but shall not necessarily be limited to the following:

A. Provide a leak detection system for the chemical trestle between building 963 and the CDC building.

B. Install leak detection cable on both sides of the trestle, each side will be a separate zone. The existing leak detection cable can be reutilized, splice where necessary. Only the the manufacturers recommended materials and methods to be used to splice the cable.

03. EQUIPMENT AND MATERIALS FURNISHED BY IBM

All other items included in the BFS as IBM furnished, unless noted otherwise.

04. ELECTRICAL EQUIPMENT AND INSTALLATION

All work performed by Contractor shall be in accordance with IBM Burlington Facilities Standards (BFS). The contractor shall refer to, but not be limited to the following standards:

16010-1	Introduction, Design, and Abbreviations
16020-1	Critical Electrical Areas
16170-1	Grounding and Bonding
16050-1	Electrical Labeling, Conductor Identification and Marking
16030-2	Safety in Practice and Design
16040-1	Required Procedures For Construction and Tags and Lockouts

05. APPLICABLE CODES AND STANDARDS

A. National Electrical Codes (NEC)
B. National Electrical Manufacturer's Association (NEMA)
C. Insulated Power Cable Engineers Association (IPCEA)
D. Institute of Electrical and Electronic Engineers (IEEE)
E. American National Standard Institute (ANSI)
F. Laws, rules and regulations of Federal, state and local authorities having jurisdiction.

06. JUNCTION BOXES

Standard, stamped, galvanized steel, size as noted or required by NEC.

07. LABELING

A. Refer to BFS 16050-1, Electrical Labeling

B. Provide a water resistant tag for each connector location along the leak detecting cable. Each tag shall be labeled:

Permalert
Leak Detection Cable
Type ZA50
AT40K Monitoring Unit
Channel No. *
Zone No. *

(* Denotes channel number)

B. Label on the outside bottom flashing of the trestle every twenty feet, the zone number and corresponding cable leak detection point. Labelling shall be black on yellow with one inch tall lettering. Typical for both sides of the trestle.
Example: ZONE 1, 160 Feet

08. CLEANING

Protect equipment against mortar, dust, weather, etc. during the construction period; and leave all equipment, etc. clean. Remove from the premises all debris and unused material resulting from operations and leave the premises in a clean and neat condition.

09. TESTS

A. Test all wiring, leak cable system, etc. set or wired under this section of the specifications. Leave same free from any grounds, crosses, shorts, etc. and leave all materials and apparatus in proper satisfactory working condition.

B. Make a test run at full load, or at reasonable overload, for a period of not less than three hours, to determine that no excessive heat is developed at terminals, switches, panels, etc. Check such locations during this period. Check and coordinate all such tests with other trades involved.

C. Check leak sensors for dry to wet transition. Verify that the leak detecting cable activates the appropriate input module point.

D. Contractor shall include in price quote a bid sum for leak detection system testing by the manufacturer or manufacturer's representative.

10. MISCELLANEOUS STEEL ITEMS

Refer to drawings for electrical items which required unistrut supports. the contractor shall furnish and install all necessary unistrut and anchor bolts for securing to wall.

11. CONDUIT AND INSTALLATION

A. Furnish and install all conduit, boxes, conduits, sleeves and waterproof sleeves, conduit seals, and all other required fittings for all electrical power and control wiring, as shown on the drawings, and as specified herein.

B. Conduit sizes shall be as indicated or where not indicated, shall meet NEC requirements for the number of conductors to be accommodated.

C. Hot dipped or metalized rigid conduit shall be used in the following locations unless otherwise indicated:

1. For feeders buried in earth as noted.

2. Exposed on exterior of the building.

3. In hazardous areas.

Fittings for rigid conduit shall be threaded. Install rigid conduit in accordance with Article No. 346 of NEC.

12. LEAK DETECTION EQUIPMENT

A. Provide all leak detection equipment as indicated on the drawings.

B. All leak detection equipment shall be Permalert Environmental Specialty Products, Inc., a subsidiary of Midwesco, Inc. Contact Mr. John Fedkiw at Vari-tech Accoc. 315-437-0600.

1. Provide one Micropressor Upgrade Chip part number 8027840 version 9. Chip to be installed by Permalert factory representative.

2. Provide Leak Detection Cable type AGW GOLD , quantity if necessary for a proper and complete installation.

3. Provide cable connectors part no. 8027695. Connectors shall be provided so that cable may be installed in 100 foot sections and all jumper cables can be connected.

4. Provide jumper cable type JMP, as required.

5. Provide jumper cable type JPL, as required.

6. Provide nylon cable mounts part no. 8057290 model no. CMA to secure leak detection cable. Provide construction mastic similar to 3M's adhesive #4323 to properly secure all cable mounts.

7. All cables, conduit and boxes should be installed so there is no penetration of the containment.

13. PROGRAMMABLE CONTROLLER (PC) CONNECTIONS

A. Provide all PC connections as indicated on drawings.

B. Contractor shall work closely with Mr. Alan Shover, IBM Chemical Services, during all work involving PC equipment.

14. TRESTLE LEAK ZONE MAP

A. Contractor shall include in price quote a bid sum for manufacturer, or manufacturer's representative, to provide a display map of the leak detection zones of the trestle.

B. Provide a water resistant picture frame and mount to wall adjacent to leak detection monitoring unit. Install Trestle Leak Detection Zone map in frame.

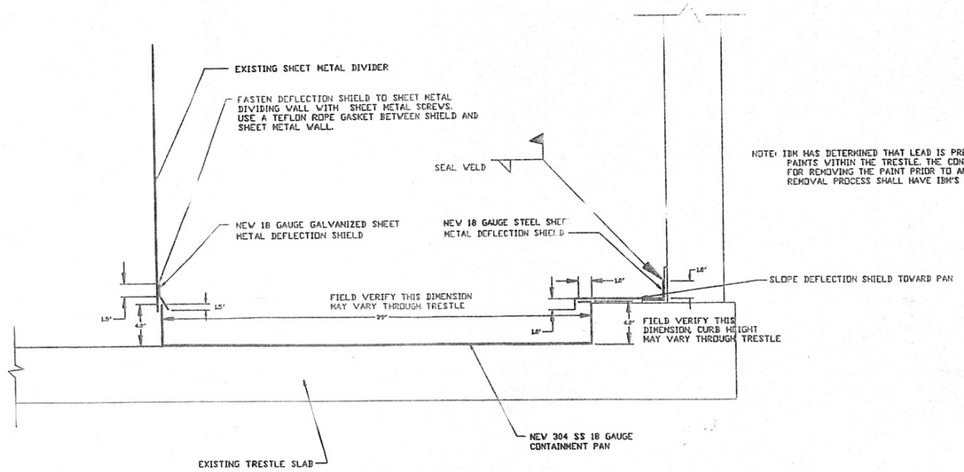
C. Trestle Leak Detection Zone Map shall include:

1. Distances for each zone corresponding to leak detection display distances.

Figure D-2-13

Pipe Trestle Leak Detection Specifications

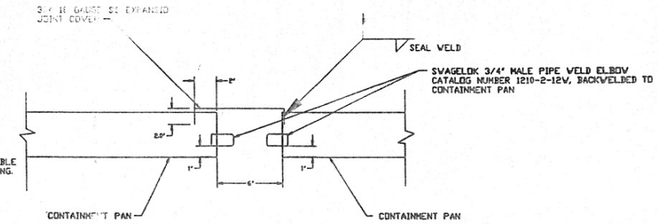
GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT



CONTAINMENT PAN SECTION A-A

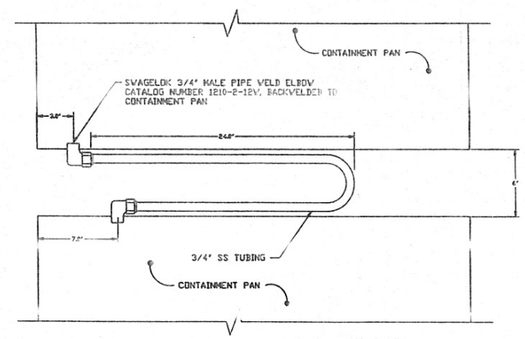
SCALE: 3"=1'-0"

NOTE: IBM HAS DETERMINED THAT LEAD IS PRESENT IN ALL PAINTS WITHIN THE TRESTLE. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING THE PAINT PRIOR TO ANY WELDING OR CUTTING. REMOVAL PROCESS SHALL HAVE IBM'S SAFETY APPROV



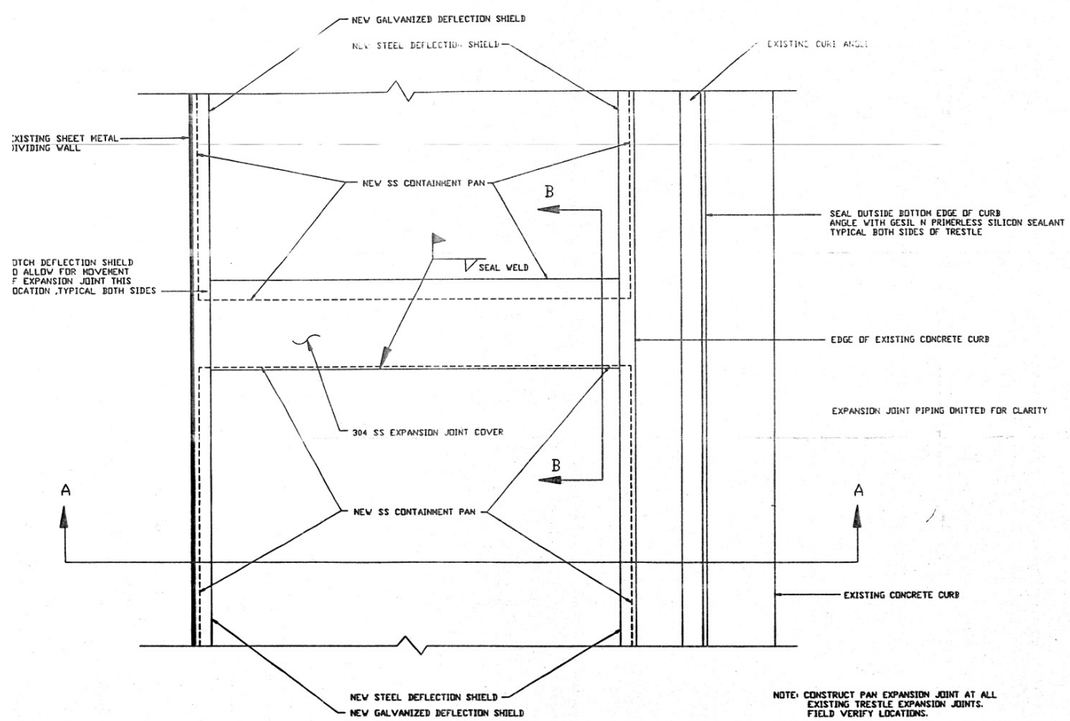
EXPANSION JOINT SECTION B-B

SCALE: 3"=1'-0"



EXPANSION JOINT SECTION

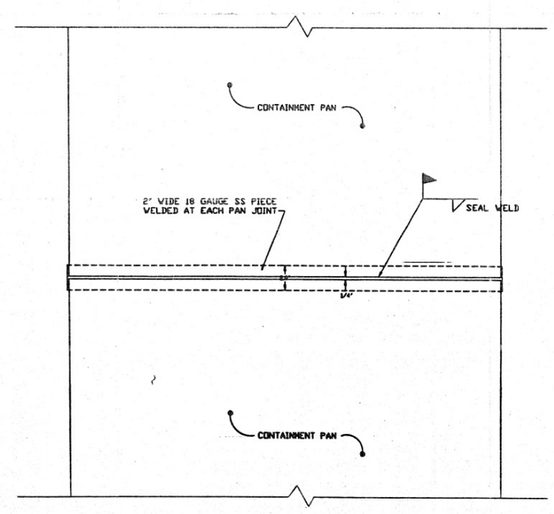
SCALE: 3"=1'-0"



EXPANSION JOINT DETAIL - PLAN VIEW

SCALE: 3"=1'-0"

NOTE: CONSTRUCT PAN EXPANSION JOINT AT ALL EXISTING TRESTLE EXPANSION JOINTS. FIELD VERIFY LOCATIONS.



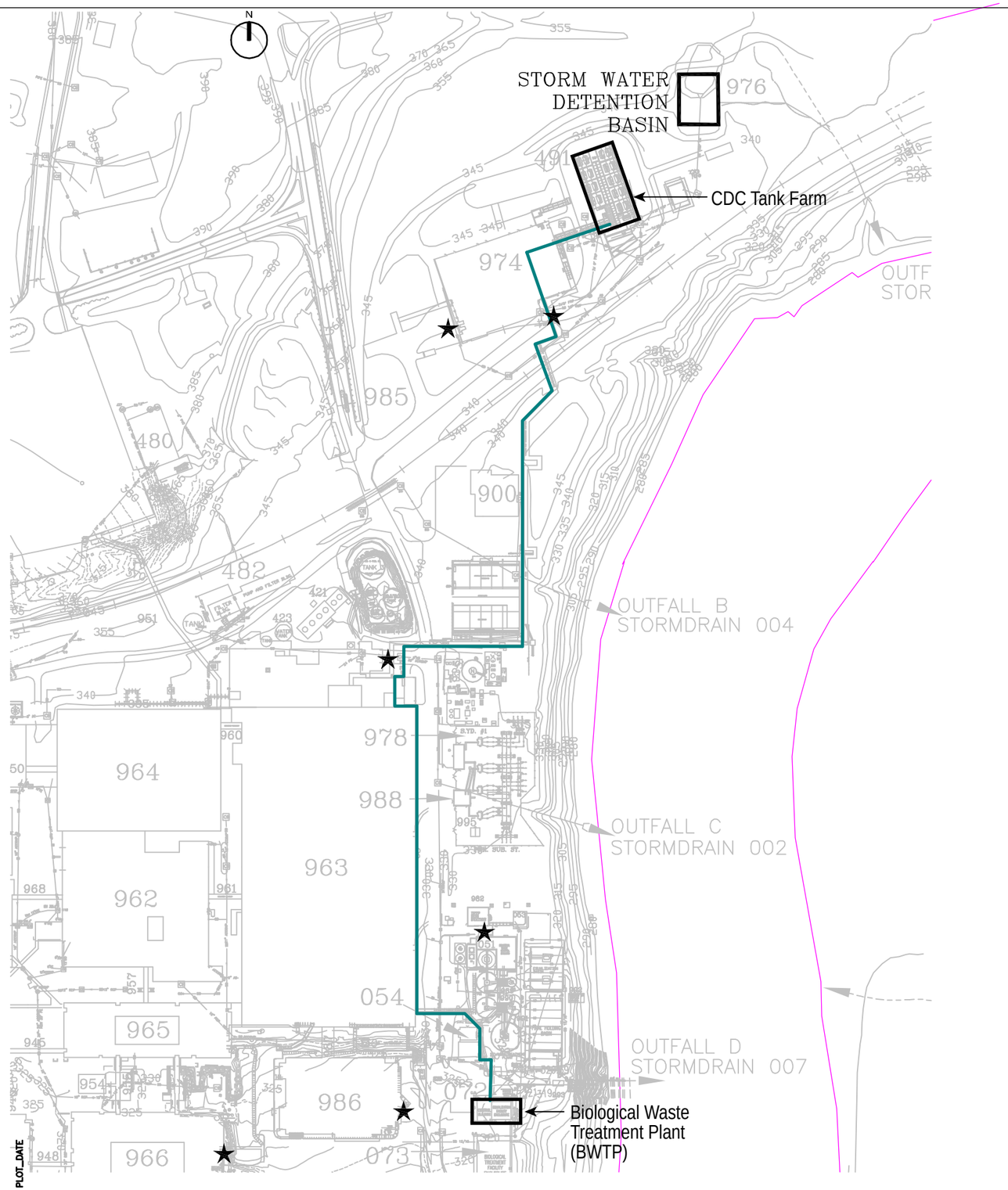
TYPICAL PAN JOINT DETAIL

SCALE: 3"=1'-0"

Figure D-2-14

Pipe Trestle Containment Pan

GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT



SYMBOL LEGEND

★ LOADING DOCK

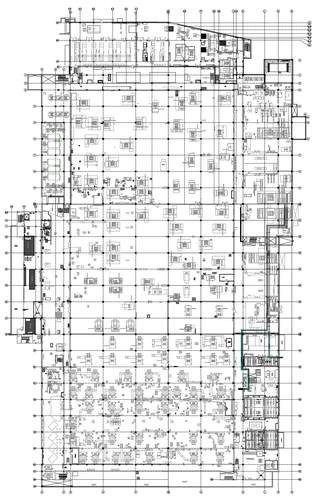
BUILDING LEGEND (PRIMARY USE)

482 - FILTER BUILDING
491 - CDC TANK FARM
801 - UTILITY BUILDING
802 - WILLISTON GATE
861 - ADMIN. / CAFETERIA
862 - ADMIN. / LAB
863 - ADMIN. / LAB
900 - FIREHOUSE
954 - ADMINISTRATION
958 - ADMINISTRATION
962 - MANUFACTURING
963 - MANUFACTURING
964 - WHSE. / OFFICE / LAB
965 - ADMINISTRATION
966 - LABORATORY / ADMIN
967 - LABORATORY / ADMIN
969 - CAFETERIA
970 - MANUFACTURING
971 - WAREHOUSE
972 - LAB. / ADMIN.
973 - MANUFACTURING
974 - CHEMICAL DISTRIBUTION CENTER
975 - MANUFACTURING SUPPORT
976 - CYLINDER GAS DISTRIBUTION
977 - COOLING TOWER PUMP HOUSE
978 - SWITCH YARD # 1
979 - WILLISTON SWITCH YARD
981 - HYDROGEN PEROXIDE BUILDING
983 - IWTP PUMP HOUSE
984 - PARK STREET GATE
985 - MAPLE STREET GATE
986 - MASK HOUSE ANNEX
988 - SWITCH YARD #2
994 - CAFETERIA

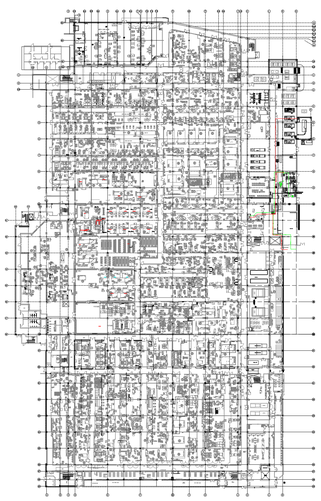
Figure D-2-15

Dilute Organic Waste Piping Route from CDC Tank Farm to BWTP

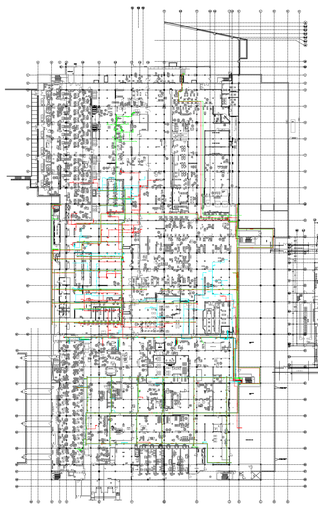
GLOBALFOUNDRIES, ESSEX JUNCTION, VT
HAZARDOUS WASTE FACILITY PERMIT



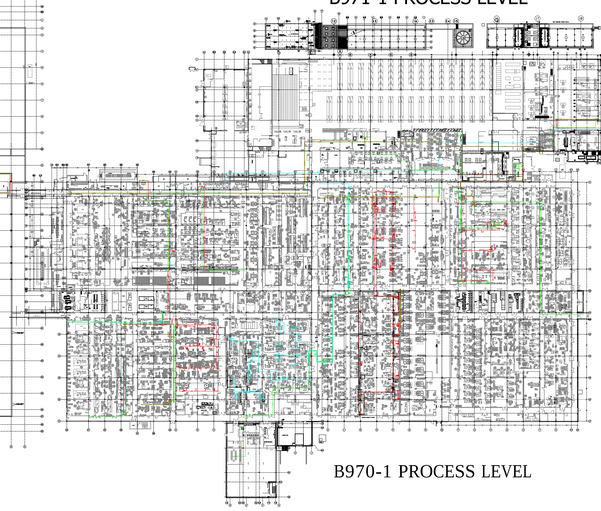
B973-3 PENTHOUSE



B973-2 PROCESS LEVEL

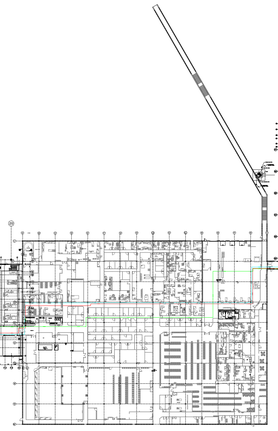


B973-1 BASEMENT

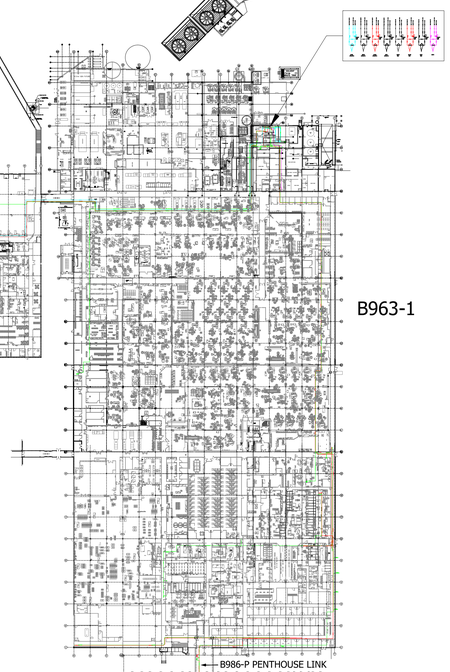


B971-1 PROCESS LEVEL

B970-1 PROCESS LEVEL

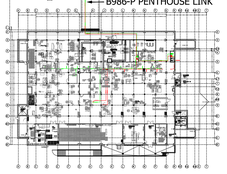


B964-1

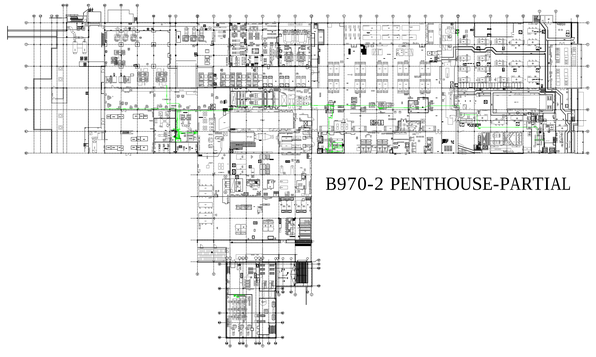


B963-1

B986-P PENTHOUSE LINK



B986-1 BASMENT



B970-2 PENTHOUSE-PARTIAL

Figure D-2-16

Piping Routes Within Manufacturing Areas for Ancillary Piping Associated with Permitted Waste Tank Systems

GLOBALFOUNDRIES, ESSEX JUNCTION, VT

HAZARDOUS WASTE FACILITY PERMIT

APPENDIX E

INSPECTION LOGS

Chemical Distribution Center Inspection Log

Chemical Distribution Center Inspection Log

Inspector's Name	*Inspector's Signature*	*Date of Inspection (Month/Day/Year)*	*Time of Inspection (Military Time)*

Item	Type of Problem	Status (X) Acceptable	Status (X) Unacceptable	Observations	Date and Nature of Repairs/Remedial Action
Security Devices					
1.) Door Controls and Alarms	Power Failure, Inoperative, Damaged, Tampered with				
Container Storage Area					
2.) Container Placement and Stacking	Aisle Space (24" min), Height of Stacks (max. 3 drums high)				
3.) Sealing of Containers	Open Lids				
4.) Labeling of Containers	Improper Identification, Date Missing, Codes Missing (DOT, GLOBALFOUNDRIES)				
5.) Containers	Corrosion, Leakage, Structural Defects, Bulging, Dirty				
6.) Segregation of Incompatible Waste	Storage of Different Waste Types in Same Area/Pallet				
7.) Pallets	Damaged: Broken Wood, Warped, Nails Missing				
8.) Debris and Refuse	Clogged Drains, Aesthetics				
9.) Slab or Foundation	Cracks, Spalling, Uneven Settlement, Wet Spots, Erosion				
10.) Warning Signs	Missing, Damaged, Illegible (should be signs at all approaches to facility)				
11.) Housekeeping	Trash, Debris				

Chemical Distribution Center Inspection Log

Inspector's Name	*Inspector's Signature*	*Date of Inspection (Month/Day/Year)*	*Time of Inspection (Military Time)*

Item	Type of Problem	Status (X)		Observations	Date and Nature of Repairs/Remedial Action
		Acceptable	Unacceptable		
12.) Safety Equipment	Missing, Damaged				
Receiving/Staging Area					
13.) Lab Packs	Improper Identification, Date Missing, Codes Missing (DOT, GLOBALFOUNDRIES)				
14.) Receiving Area	Trash, Debris, Visible Signs of Leaks				
15.) Incoming Staging Area	Trash, Debris, Visible Signs of Leaks				

CDC Tank Farm Inspection Log

CDC Tank Farm Inspection Log

Inspector's Name	*Inspector's Signature*	*Date of Inspection (Month/Day/Year)*	*Time of Inspection (Military Time)*

Item	Type of Problem	Status (X) Acceptable	Status (X) Unacceptable	Observations	Date and Nature of Repairs/Remedial Action
Security Devices					
1.) Fence	Corrosion Damage to Chain Link Fence				
2.) Gate and Lock 2 Gates at load/unload station 12 gates around tank farm	Corrosion Damage to Gate, Sticking or Corroding Lock, Unlocked Locks, Doors Open				
Safety and Emergency Equipment					
3.) Warning Signs	Missing, Damaged or Illegible (signs should be posted at all approaches to the facility)				
4.) Eye Wash	Frozen, Damaged, Schedule Checked				
Operating and Structural Equipment					
5.) Pipes, Fittings, and Valves	Leaks, Corrosion, Deterioration				
6.) Control Panel Opened	Keys in Panel, Opened				
Tank Storage Area and Ancillary Equipment					
7.) Concrete Pads and Ramps	Concrete Deterioration, Cracking or Spalling, Visible signs of leaks				
8.) Secondary Containment System	Debris, Erosion, Leaks				
9.) Hoses and Fittings	Cracks, Corrosion, Distortion, Leaks				

CDC Tank Farm Inspection Log

Inspector's Name	*Inspector's Signature*	*Date of Inspection (Month/Day/Year)*	*Time of Inspection (Military Time)*

Item	Type of Problem	Status (X) Acceptable	Status (X) Unacceptable	Observations	Date and Nature of Repairs/Remedial Action
External Tank Inspection					
10.) Ladders/Stairs	Damaged/Structural Stability				
11.) Foundation/Structural Supports	Cracks, Spalling, Uneven Settlement Erosion, Wet Spots, Leaks				
12.) Pipe Connections	External Corrosion, Cracks, Distortions, Leaks				
13.) Anchor Bolts	Distortion, Erosion				
14.) Tank Cover	Malfunction of Seals Corrosion				
15.) Cat Walk	Grates out of position, Corrosion, Distortion, Structural Stability				
16.) Pump Pad	Leaks, Wet Spots, Corrosion				
Monitoring Equipment					
17.) Alarms	High Level Alarm Conditions				

Building 963 North Tank Inspection Log

Building 963 North Tank Inspection Tank

Inspector's Name	*Inspector's Signature*	*Date of Inspection (Month/Day/Year)*	*Time of Inspection (Military Time)*

Item	Type of Problem	Status (X) Acceptable	Status (X) Unacceptable	Observations	Date and Nature of Repairs/Remedial Action
Security Devices					
1.) Fence	Corrosion Damage to Chain Link Fence				
2.) Gate and Lock	Corrosion Damage to Gate, Sticking or Corroding Lock, Unlocked Locks				
Safety and Emergency Equipment					
3.) Warning Signs	Missing, Damaged or Illegible (warning signs should be posted at all approaches to the tank area)				
Operating and Structural Equipment					
4.) Pipes, Fittings, and Valves	Leaks, Corrosion, Deterioration				
Tank Storage Area and Ancillary Equipment					
5.) Concrete Pads and Ramps	Concrete Deterioration, Cracking or Spalling, or Leaks				
6.) Secondary Containment System	Debris, Erosion, Leaks				
7.) Hoses and Fittings	Cracks, Corrosion, Distortion, Leaks				

Building 963 North Tank Inspection Tank

Inspector's Name	*Inspector's Signature*	*Date of Inspection (Month/Day/Year)*	*Time of Inspection (Military Time)*

Item	Type of Problem	Status (X) Acceptable	Status (X) Unacceptable	Observations	Date and Nature of Repairs/Remedial Action
External Tank Inspection					
8.) Ladders/Stairs	Damaged/Structural Stability				
9.) Foundation/Structural Supports	Cracks, Spalling, Uneven Settlement Erosion, Wet Spots, Leaks				
10.) Pipe Connections	External Corrosion, Cracks, Distortions				
11.) Anchor Bolts	Distortion, Erosion				
12.) Tank Cover	Deterioration of Seals, Corrosion				
13.) Grating	Grates out of position, Corrosion, Distortion, Structural Stability				
Monitoring Equipment					
14.) High Tank Level Alarm	Alarm Conditions				
15.) Housekeeping	Debris, Safety Apparel				

Transfer Room Inspection Log

Transfer Room Inspection Log

Inspector's Name	*Inspector's Signature*	*Date of Inspection (Month/Day/Year)*	*Time of Inspection (Military Time)*

Item	Type of Problem	Status (X)		Observations	Date and Nature of Repairs/Remedial Action
		Acceptable	Unacceptable		
1.) Door Controls	Inoperative, Damaged				
2.) Ventilation System	Functional				
3.) Waste Pumps	Leaking				
4.) Pump Containment	Visible Signs of Leaks				
5.) Housekeeping	Trash, Debris, Visible Signs of Leaks, Spills				
6.) Warning Signs	Missing, Damaged, Illegible				

Flammable Waste Storage Area Waste Drum Inspection Log

Flammable Waste Storage Area Waste Drum Inspection Log

Inspector's Name	*Inspector's Signature*	*Date of Inspection (Month/Day/Year)*	*Time of Inspection (Military Time)*

Item	Type of Problem	Status (X) Acceptable	Status (X) Unacceptable	Observations	Date and Nature of Repairs/Remedial Action
Container Storage Area					
1.) Door Controls	Inoperative, Damaged				
2.) Container Placement and Stacking	Containers Placed Improperly in Pallets and on Racks				
3.) Sealing of Containers	Open Lids				
4.) Labeling of Containers	Improper Identification, Date Missing, Codes Missing (DOT, GLOBALFOUNDRIES)				
5.) Containers	Corrosion, Leakage, Structural Defects				
6.) Segregation of Incompatible Waste	Storage of Different Waste Types in Same Area/Pallet				
7.) Debris and Refuse	Clogged Drains, Aesthetics				
8.) Secondary Containment Pallets	Damage, Corrosion, Indication of Leaks				
9.) Housekeeping	Trash, Debris				
10.) Safety Equipment	Missing, Damaged				
11.) Warning Signs	Missing, Damaged, Illegible (should be signs at all approaches to facility)				
12.) Slab or Foundation	Cracks, Spalling, Uneven Settlement, Wet Spots, Erosion				

CDC Waste Piping Inspection Log

CDC Waste Piping Inspection Log

Date (M/D/Y)	Time (Military)	Inspector's Name	Inspector's Signature	Visible Leaks or Corrosion?		Date and Nature of Repairs/Remedial Action
				Yes	No	
Saturday		Chemical Services				
Sunday		Chemical Services				
Monday		Chemical Services				
Tuesday		Chemical Services				
Wednesday		Chemical Services				
Thursday		Chemical Services				
Friday		Chemical Services				

APPENDIX F

FINANCIAL ASSURANCE

GLOBALFOUNDRIES

Vermont Facility
1000 River Road – B966
Essex Junction, VT 05452

February 12, 2019

Mr. Charles Schwer, Division Director
Vermont Agency of Natural Resources
Department of Environmental Conservation
1 National Life Dr. – Davis 1
Montpelier, VT 05620-3704

Via e-mail

Re: Annual Closure Plan Update
GLOBALFOUNDIES U.S. 2 LLC Essex Junction Facility, VT (EPA ID No. VTR000524868)

Dear Mr. Schwer:

GLOBALFOUNDRIES is submitting a revision to Table 10-1 of the Closure Plan (Section 10 of GLOBALFOUNDRIES current Hazardous Waste Facility Certification, No. VTR000524868), which includes updates to the hazardous waste facility closure costs. These costs are reflected in GLOBALFOUNDRIES Letter of Credit Amendment submitted on February 7, 2019. The annual update of the closure cost estimate has been adjusted for inflation, the new closure cost estimate is $5,056,003.

This annual update is required by GLOBALFOUNDRIES Hazardous Waste Facility Permit (Part 9: Facility Closure) and no unique adjustments have been made to the calculation methodologies, therefore, a permit modification is not required for this years revision.

If you have any questions, please contact me at (802) 288-6030 or *andrea.pomroy-mccullen@globalfoundries.com*

Sincerely,

Andrea McCullen
Waste Program Engineer
GLOBALFOUNDRIES Fab 9 Essex Junction Vermont

cc: Marc Roy, Vermont DEC, Waste Management & Prevention Division
Marc.Roy@vermont.gov

Steve Simoes, Vermont DEC, Waste Management & Prevention Division
Steve.Simoes@vermont.gov

Anna Bourakovsky, Vermont DEC Waste Management & Prevention Division
Anna.Bourakovsky@vermont.gov

Attachment: Closure Plan

Citibank,N.A.

OUR REFERENCE NO : 69606241

DATE : FEB. 07, 2019

L/C AMENDMENT

IRREVOCABLE STANDBY LC

FROM:
CITIBANK,N.A.
C/O ITS SERVICER, CITICORP NORTH AMERICA, INC.
3800 CITIBANK CENTER
BUILDING B, 1ST FLOOR
TAMPA, FL 33610

AMENDMENT(S) TO STANDBY LETTER OF CREDIT

CREDIT NO.
69606241

ADVISING BANK:

APPLICANT:
GLOBAL FOUNDRIES US INC ON BEHALF
OF GLOBALFOUNDRIES US 2 LLC
2070 ROUTE 52 HOPEWELL JUNCTION,
NY 12533 U.S.A.

BENEFICIARY:
COMISSIONER DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
ONE NATIONAL LIFE DRIVE, MAIN 2
MONTPELIER VT 05620-3520 U.S.A.

DEAR SIR(S),

THE LETTER OF CREDIT REFERENCED ABOVE IS AMENDED AS FOLLOWS:

L/C AMOUNT INCREASED BY: USD 108,837.00

NEW L/C AMOUNT AFTER AMENDMENT: USD 5,056,003.00

NEW TERMS AND CONDITIONS:
ADDITIONAL CONDITIONS:
.

ALL OTHER TERMS AND CONDITIONS OF THE ORIGINAL CREDIT INSTRUMENT REMAIN UNCHANGED.

THIS AMENDMENT(S) IS AN INTEGRAL PART OF THE ORIGINAL CREDIT AND MUST BE ATTACHED THERETO.

Citibank,N.A.

OUR REFERENCE NO : 69606241

PLEASE DIRECT ANY INQUIRIES, QUOTING OUR REFERENCE NUMBER, TO:

CUSTOMER SERVICE DEPARTMENT,
CITIBANK,N.A. C/O ITS SERVICER, CITICORP NORTH AMERICA, INC.3800 CITIBANK CENTERBUILDING B, 1ST FLOORTAMPA, FL 33610
TEL: 866-498-8670()
FAX: ()

WEBSITE:WWW.TRANSACTIONSERVICES.CITIGROUP.COM (CLICK ON TRADE SERVICES AND FINANCE)

AUTHORIZED SIGNATURE
CITIBANK,N.A.