C1: CONTAINMENT INDEX

(Volume 1)

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Attachment C1-1

DLD Containment Volumes
(Capacities & Limits)

Hazardous Waste Management Unit	Capacity (gallons)	Storage Limitation (gallons)
Current Containment Areas		
DLS-1	**2,893**	**2,860**
DLS-2	**4,822**	**3,300**
DLS-3	**54,894**	**42,500**
DLS-4	*Tank Storage Only*	
DLS-5	**41,805**	**11,440**
HWLB-1	**4,266**	**4,020**

Attachment C1-50 DLS-5 Rack System

Drug & Laboratory Disposal currently uses a teardrop-type rack system for the storage for non-hazardous waste in the area to be licensed as DLS-5. The racking system employs pairs of 5½" beams designed to support 6,000 pounds and pairs of 6" beams designed to support 8,000 pounds.

Each pair of 5½" beams is capable of storing eight 55-gallon drums of waste equating to an average weight of 750 pounds per drum. Each pair of 6" beams is capable of storing eight 55-gallon drums of waste equating to an average weight of 1,000 pounds per drum. The waste stream with the greatest per-drum weight generated by DLD averages 749 pounds.

Each pallet position could potentially accommodate one cubic-yard container of waste. The weight of the heaviest cubic-yard container of waste at DLD has been 2,461 pounds, which is far below the rated weight capacity for each pallet position.

Based on this information, the rack system in DLS-5 will be able to safely store any of the containers of waste that DLD produces. However, as a precaution the beams upon which the wastes are stored are marked with the weight capacity of each bay and employees are instructed to place the heaviest loads on the floor to prevent potential over-loading.

DLS-5 Rack System Photographs


RESIDUE
GLASS
RESIDUE
GLASS
RESIDUE
GLASS
8000 LBS


6000 LBS

Concrete Specifications for Flatwork

1. ~~5 lb~~ 1½ lb/cu. Yard Structured fiber such as TUF-STRAND–SF and 7 lb./cu. Yard stainless steel fiber
2. Limestone mix
3. 4000 psi mix
4. Mid range water reducer (~~5 to 6~~ 4 slump) or as recommended by vendor
5. Calcium Stearate is ~~1%~~ 2% of concrete powder by weight. Examples of this product are, Stearic Acid, Nopcote C 104, Calsan 50, DAVCO No. 1, Blocktite or Integral waterpeller by Euclid Chemical Co powder and COAD® 10 Calcium Stearate. Other Calcium Stearate products will be approved.
6. Air entrained. (6% +/- 1.5%)
7. Slab thickness 6" minimum
8. Stabilized compacted 3" minimum thickness recycled concrete drive way grade aggregate below main slab.
9. Vibrating Screed
10. Final finish; ~~broom (Float, no~~ power trowel)
11. Wire mesh 6 x 6 – 4 x 4 (6" x 6" spacing – No. 4 gage wire each way) (4" below finish surface)

Consumers CONCRETECORPORATION™

RECEIVED 09-16-05

COPY

TECHNICAL SERVICES DEPARTMENT

700 NAZARETH RD.
KALAMAZOO, MI. 49001

TELEPHONE (269) 384-0972
(269) 342-0501
FAX (269) 384-0194

FAX TRANSMITTAL

DATE: 9/16/05 NUMBER OF PAGES: 3

COMPANY: Johnson Poured Walls

ATTENTION: Bob Hillsburg / Ward Walters

FAX NUMBER: 269-668-5473 / 269-685-1130

FROM: Justin

RE: Drug + Laboratory Disposal

COMMENTS: Called Johnson Poured Walls to confirm to add fibers to mix. Also talked to Justin at Consumers to approve.

CALL (269) 342-0501 IF YOU HAVE NOT RECEIVED ALL PAGES

Consumers
CONCRETECORPORATION

September 16, 2005

Mr. Bob Hillsburg
Johnson Poured Walls
P.O. Box 68 McGillian St.
Mattawan, MI 49071

RE: Concrete Mix Design: Drug & Laboratory Disposal

Dear Sir:

Enclosed please find the above referenced mix design for your approval. Upon approval we will place the mix design on the computer to be used for your project.

We would like to be included in any pre - pour conference to answer questions that may arise concerning the mix design or concrete placement.

This mix design was prepared by Consumers Concrete Technical Services Department based upon your specifications, past statistical analysis, and following ACI guidelines.

Note:
Please notify the testing laboratory to forward any test results to us so that we may monitor your job in progress.

If we can be of further assistance, please advise.

Sincerely,

Vern Scott I.O.

Vern Scott
Regional Sales Representative

cell 1-269-217-3840

Enclosure:

Consumers
CONCRETECORPORATION

- P.O. Box 2229, Kalamazoo, Michigan 49003
- Telephone (269) 342-0136 • Fax (269) 384-0974

CONSUMERS CONCRETE CORPORATION
P.O. BOX 2229
KALAMAZOO, MI 49003
(269) 342-0501

CONCRETE MIX DESIGN

MIX ID : 16285 [01] 4000 PSI 09/16/05

CONTRACTOR : JOHNSON POURED WALLS
PROJECT : DRUG & LABORATORY DISPOSAL
SOURCE OF CONCRETE : CONSUMERS CONCRETE CORPORATION
CONSTRUCTION TYPE : NEW CONSTRUCTION
PLACEMENT : NORMAL OR PUMP PLACEMENT

WEIGHTS PER CUBIC YARD (SATURATED, SURFACE-DRY)

		YIELD, CU FT
LAFARGE CORPORATION ASTM C-150 (TYPE I), LB	564	2.87
CONSUMERS S & G ASTM C-33, LB	1279	7.73
PRESQUE ISLE CORP. ASTM C-33 (SIZE #57), LB	1705	10.43
WATER, LB (GAL-US)	263 (31.5)	4.21
TOTAL AIR, %	6.5 +/- 1.5	1.76
	TOTAL	27.00
MASTER BUILDERS CO. ASTM C-260, OZ-US	5.6	
WATER/CEMENT RATIO, LBS/LB	0.47	
SLUMP, IN	4.00	
CONCRETE UNIT WEIGHT, PCF	141.1	

(Calcium Stearate)

SPECIFICATIONS: 4000 PSI ASTM C-33 (#57) 1" - #4 (LIMESTONE)
MIX DESIGN: 6.0 SACK (I) AIR ENTRAINED
REQUIREMENT: EXTERIOR CONCRETE W/2 PERCENT INTEGRAL ~~WATERPELLER~~
NOTE: MIX DESIGN BASED UPON CUSTOMER REQUEST

+ Fiber #1½ per yd³
+7# per yd³ stainless steel fiber

PREPARED BY : Justin Clark

TECHNICAL SERVICES DEPARTMENT

Consumers
CONCRETECORPORATION

RECEIVED 08-08-05

Quotation

Emailed PDF File 08-08-05

Corporate Office
3805 Sprinkle Road P.O. Box 2229
Kalamazoo, Michigan 49003-2229
(616) 342-0136 or 1-800-843-4235
Fax (616) 384-0974

COPY

1-269-217-3810

Customers Name: Drug & Laboratory Disposal Date: 08-Aug-05

Address: 331 Broad St Contact Person: Ward Walters

City, State: Plainwell, MI 49080 Phone No. 685-9824 Fax No. 685-1130

Project: Location:

CONSUMERS CONCRETE CORPORATION as Seller is pleased to sell and deliver to you as Purchaser the total requirements of Ready Mixed Concrete for the project refered to above at the following prices. Prices are subject to verification that job specifications are consistent with our regular approved mixes for classes indicated below:

DESCRIPTION	PRICE	PER
Integral Waterpeller by EUCLID		
power in 25# bags	$20.00	bag
liquid-in-55-gal-drums	$304.45	drum
freight is additional (we will need to know about inorder to get freight costs)		
HEATED CONCRETE (NOVEMBER AND APRIL)	$3.00	CUYD
HEATED CONCRETE (DECEMBER THROUGH MARCH)	$6.00	CUYD
MIMIMUM AND SEASONAL LOAD CHARGES	$50.00	LOAD

Prices are net, due the 20th of the month following purchase and are subject to all applicable state and local sales taxes.

The terms and conditions of this proposal are only those expressly written and appearing herein and in the "General Terms and Conditions of Sale" stated on the reverse side hereof. There are no oral conditions or terms in connection with this proposal or with any contract or agreement resulting therefrom and therefore, no modification, amendments or change will be recognized, acknowledged or will be in any way effective or binding in connection therewith unless stated in writing and duly signed and approved by authorized representative of CONSUMERS CONCRETE CORPORATION.

Prices Firm Until: 01/01/2006

Signature Account Manager Title

THE EUCLID CHEMICAL COMPANY
19218 REDWOOD ROAD • Cleveland, OH 44110
(216) 531-9222 • (800) 321-7628 • FAX (216) 531-9596
www.euclidchemical.com

INTEGRAL WATERPELLER®

CONSTRUCTION PRODUCTS FOR VOX
A SAFER ENVIRONMENT

WATER REPELLANT ADMIXTURE FOR CONCRETE AND MORTAR

INTEGRAL WATERPELLER is a balanced blend of stearate water repellants and other chemicals which, when used as an admixture, forms an internal barrier against water penetration. INTEGRAL WATERPELLER also increases the plasticity of mortar, reduces water absorption and thereby guards against freeze-thaw damage.

It is available in powdered form without chlorides or in a liquid formula which contains chlorides for additional densification and acceleration of the mortar or concrete. INTEGRAL WATERPELLER will not increase the air content of mortar or concrete.

PRIMARY APPLICATIONS

- Mass concrete
- Foundation walls
- Floors
- Cement stucco
- Mortar for setting masonry and glass block

FEATURES / BENEFITS

- Reduces moisture absorption as much as 60%
- Reduces capillary action
- Reduces vapor transmission through walls and slabs
- Provides greater workability
- Does not effect bond strength of mortar

SPECIFICATIONS / COMPLIANCES

- INTEGRAL WATERPELLER is approved for use by The Veterans Administration and by The City of Cleveland Board of Building Standards & Appeals.

PACKAGING

INTEGRAL WATERPELLER LIQUID is packaged in 55 gal (208 liter) drums and 5 gal (18.9 liter) pails. INTEGRAL WATERPELLER POWDER is available in 25 lb (11.3 kg) bags.

TECHNICAL INFORMATION

Typical Engineering Data

Appearance

INTEGRAL WATERPELLER liquid has an amber color.

INTEGRAL WATERPELLER powder is a white powdery material.

Dosage Rates

1 to 1-1/2 gal (3.9 to 5.7 liter) liquid or 4 to 6 lb (1.8 to 2.7 kg) powder of INTEGRAL WATERPELLER will treat 1 yd³ (.76m³) of concrete or mortar.

Test Results	Absorption Ratio Fed. Spec. SS-C-161b	Relative Absorption	Concrete Absorption Total Immersion	
			10 minutes	24 Hours
Plain Mortar	.34	100%	1.28%	4.10%
Mortar with "Dry" Waterpeller	.18	53%	.47%	.65%
Mortar with "Liquid" Waterpeller	.16	47%	—	---

Shelf Life: 1 year in original, unopened package.

DIRECTIONS FOR USE

Add INTEGRAL WATERPELLER to concrete or mortar in the following proportions:

Liquid - 1 qt (0.95 liter) per 94 lb (42.7 kg) bag of cement

Powder - 1 lb (0.45 kg) per 94 lb (42.7 kg) bag of cement. 1/4 lb per bag of prepared mortar.

Material Safety Data Sheet

The Euclid Chemical Company

INTEGRAL WATERPELLER POWDER - 25 LB

Version *1.1*
REVISION DATE: 03/10/2006

Print Date 07/03/2007

SECTION 1 - PRODUCT IDENTIFICATION

Trade name	:	INTEGRAL WATERPELLER POWDER - 25 LB
Product code	:	020 25
COMPANY	:	Euclid Chemical Company 19218 Redwood Road Cleveland, OH 44110
Telephone	:	1-800-321-7628
Emergency Phone:	:	U.S. only: 1-800-255-3924 International Users Call Collect: 1-813-248-0585

SECTION 2 - HAZARDS IDENTIFICATION

Emergency Overview

Gray. Powder. Dust may irritate nose and throat. Dust irritating to the respiratory tract. Leave area to breathe fresh air. Avoid further overexposure. If symptoms persist, get medical attention.

Acute Potential Health Effects/ Routes of Entry

Inhalation	:	Dust may irritate nose and throat. Dust irritating to the respiratory tract.
Eyes	:	Direct contact may cause severe irritation. May cause mechanical irritation or abrasion, and possible chemical burns. May cause temporary injury.
Ingestion	:	May cause irritation to the mouth, throat and stomach. May cause gastrointestinal irritation, nausea, and vomiting.
Skin	:	May cause severe irritation. May cause dryness, cracking, irritation, and chemical burns. May produce cement dermatitis due to primary irritation from alkaline, hydroscopic and abrasive properties.

Aggravated Medical Conditions

Pre-existing eye, skin and respiratory disorders may be aggravated by exposure.

Chronic Health Effects

Inhalation of crystalline silica (quartz) can cause cancer based on animal data, and IARC concludes sufficient evidence in humans (Group 1). Prolonged and repeated overexposure to free crystalline silica dust above the TLV level may cause scarring of the lungs with cough and shortness of breath. A delayed lung injury, silicosis may result from breathing free silica.

SECTION 3 - PRODUCT COMPOSITION

Chemical Name	CAS-No.	Weight %
Silica, fused	60676-86-0	40.0 - 70.0
Clay	1332-58-7	30.0 - 60.0
Calcium stearate	1592-23-0	5.0 - 10.0
Crystalline Silica (Quartz)/ Silica Sand	14808-60-7	1.0 - 5.0
Calcium lignosulfonate	8061-52-7	1.0 - 5.0

INTEGRAL WATERPELLER POWDER - 25 LB

Version *1.1*
REVISION DATE: 03/10/2006

Print Date 07/03/2007

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Personal protection equipment

Respiratory protection : Wear appropriate, properly fitted NIOSH/MSHA approved dust respirator where airborne concentrations are expected to exceed exposure limits indicated on the MSDS. Follow manufacturer's directions for respirator use.

Hand protection : Use suitable impervious rubber or vinyl gloves and protective apparel to reduce exposure.

Eye protection : Wear appropriate eye protection.Wear chemical safety goggles and/or face shield to prevent eye contact. Do not wear contact lenses. Do not touch eyes with contaminated body parts or materials. Have eye washing facilities readily available.

Skin and body protection : Prevent contact with shoes and clothing.

Protective measures : Use professional judgment in the selection, care, and use.Wear gloves, head coverings and full body clothing as necessary to prevent skin irritation. Washable or disposable clothing may be used. Do not take unwashed clothing home. Work clothes should be washed separately from other clothing and the washing machine rinsed thoroughly following use. Inform the launderer of the proper procedures. Store work clothes and street clothes separately to prevent contamination.

Engineering measures : Use only in well ventilated areas. Provide maximum ventilation in enclosed areas.Use local exhaust when the general ventilation is inadequate.

Exposure Limits

Chemical Name	CAS Number	Regulation	Limit	Form
Silica, fused	60676-86-0	ACGIH TWA: OSHA PEL: OSHA PEL: OSHA TWA:	0.1 mg/m3 15 mg/m3 5 mg/m3 0.8 mg/m3	Respirable fraction. Total dust. Respirable fraction.
Clay	1332-58-7	ACGIH TWA: OSHA PEL: OSHA PEL: OSHA TWA: OSHA TWA:	2 mg/m3 15 mg/m3 5 mg/m3 15 mg/m3 5 mg/m3	Respirable fraction. Total dust. Respirable fraction. Total dust. Resplrable fraction.
Calcium stearate	1592-23-0	ACGIH TWA:	10 mg/m3	
Crystalline Silica (Quartz)/ Silica Sand	14808-60-7	ACGIH TWA: OSHA TWA: OSHA TWA: OSHA PEL: OSHA PEL:	0.05 mg/m3 0.1 mg/m3 0.3 mg/m3 15 mg/m3 5 mg/m3	Respirable fraction. Respirable. Total dust. Total dust. Respirable fraction.

The Euclid Chemical Company

INTEGRAL WATERPELLER POWDER - 25 LB

Version *1.1*
REVISION DATE: 03/10/2006

Print Date 07/03/2007

SECTION 14 - TRANSPORTATION / SHIPPING DATA

TDG / DOT Shipping Description:

NOT REGULATED

SECTION 15 - REGULATORY INFORMATION

North American Inventories:
All components are listed or exempt from the TSCA inventory.
This product or its components are listed on, or exempt from the Canadian Domestic Substances List.

U.S. Federal Regulations:

SARA 313 Components	:	None present or none present in regulated quantities.
SARA 311/312 Hazards	:	Acute Health Hazard Chronic Health Hazard

OSHA Hazardous Components :

Silica, fused	60676-86-0
Clay	1332-58-7
Calcium stearate	1592-23-0
Crystalline Silica (Quartz)/ Silica Sand	14808-60-7
Iron oxide	1309-37-1

OSHA Status: Considered hazardous based on the following criteria:	:	Irritant Carcinogen
OSHA Flammability	:	Not Regulated
Regulatory VOC (less water and exempt solvent)	:	0 g/l
VOC Method 310	:	0 %

Chemical is listed as an IARC, NTP, OSHA, or ACGIH Carcinogen:
Crystalline Silica (Quartz)/ Silica Sand 14808-60-7

U.S. State Regulations:

MASS RTK Components	:	Silica, fused	60676-86-0
		Clay	1332-58-7
		Crystalline Silica (Quartz)/ Silica Sand	14808-60-7
		Iron oxide	1309-37-1
Penn RTK Components	:	Silica, fused	60676-86-0
		Clay	1332-58-7
		Calcium stearate	1592-23-0
		Crystalline Silica (Quartz)/ Silica Sand	14808-60-7
		Iron oxide	1309-37-1
NJ RTK Components	:	Silica, fused	60676-86-0

you can **RELY** *on*

CEMENTAID

The Way to Better Concrete

EVERDURE CALTITE

HYDROPHOBIC PORE-BLOCKING INGREDIENT FOR NON-ABSORPTIVE, IMPERMEABLE CONCRETE

What the Industry Says....

Independent Reports & Conclusions

on Chloride Penetration:

- **Roads & Traffic Authority NSW (Aust.) (CTI Consultants)** "The (Caltite) hydrophobic pore-blocking additive performed very well, especially at the deeper intervals where chloride reductions in excess of 97% were recorded. These results are better than those for the organo-silanes, probable due to the presence of the hydrophobic additive throughout the concrete rather than only in the outer layer as is the case for the post-applied sealers"
- "Based on these results, (Caltite) can be used to protect concrete against moisture and chloride ingress unde conditions of atmospheric exposure."
- **Vicroads - Concrete Materials Tedchnology Dept. State Government of Victoria, Aust.** "The HPI (Caltite) concrete has been found to outperform both conventional and SCM's (slag, silica fume) concrete with far greater reductions in Volume of Permeable Voids (VPV). (Caltite) is an excellent material for reducing the VPV of conretes."
- **Engineering and Water Supply Department, Govt. of South Australia -** "(EVERDURE CALTITE) can be of enormous benefit in sustaining and prolonging the life of a concrete structure."
- **CTI Consultants for Roads & Traffic Authority of New South Wales (Aust). -** "The (Caltite) pore-blocking hydrophobic additive performed very well, especially at the deeper intervals where chloride reductions in excess of 97% were recorded. These results are better than those for the organo-silanes, probably due to the presence of the hydrophobic additive throughout the concrete, rather than only in the outer layer as is the case for the post-applied sealers."
- **City of Glenelg, South Australia** - "Recent inspection shows the CALTITE concrete to be still quite sound (after 20 years), whereas the normal concrete shows severe aggregate exposure and areas of cracking due to steel corrosion."
- **Taywood Engineering Ltd, UK** - "Cores taken from CALTITE concrete exposed to tidal immersion for up to 17 years showed no signs of corrosion of the embedded reinforcing bar and little surface erosion of the cement matrix."
- **TROW, Canada** - "The EVERDURE CALTITE mix meets the performance expectations of a latex modified concrete with regard to chloride penetration."
- **Institute TNO, Netherlands** - "Intrusion of chlorides by diffusion of seawater transport is diminished by the use of CALTITE."

on Water Penetration:

- **Queen's University, Belfast** - "Amongst the three modified concretes covered in this paper, (10% & 20% silica fume and Caltite), CALTITE concrete was observed to be the most efficient in reducing the water permeability."
- **British Board of Agrément, EEC** - "Everdure Caltite System forms a suitable alternative for compliance with ..BS 8007 :1987, BS 8102 :1990 and BS 8110 :Part 1:1985"
- **Dr. Adam Neville, UK** - "The use of Everdure Caltite in concrete as an alternative to the application of a membrane to the surface of the concrete seems to offer considerable benefits"
- **National University of Singapore** - "W4 (Caltite) was the only waterproofer, indeed, the only product tested, which dramatically reduced both pressure penetration and water absorption"
- "This mix (containing EVERDURE CALTITE) is thus recommended to make concrete "water-tight""
- **Taywood Engineering Ltd., UK** - "The water repellency of CALTITE concrete was found to be unaffected by tidal immersion over a period of up to 17 years."

on Chemical Attack:

- **Hardman Chemicals P/L, Australia** - "Our EVERDURE CALTITE Joint-free acid proof floor is now 19 years old in constant use - which compares extremely well with the life of our ordinary (concrete) earliest floors...that were destroyed in less than 9 months each.
- **Coal Products Limited, UK** - "I can advise that your EVERDURE CALTITE SYSTEM concrete is still in a satisfactory condition. Surrounding bases cast using a grade 30N/mm² concrete with SRC are now showing extreme degradation due to continuous acid attack."
- **Gudgeon, Mott, Hay, Anderson (Singapore)** - "We are pleased we used your "CALTITE" and other additives for these (fertiliser) floors and we must compliment you on a product that more than lives up to your specification."
- **Brisbane City Council, Australia** - "Both samples suffered from sulphide attack, but the sample containing CALTITE and PLASTET No. 2 suffered much less attack than did the ordinary 20Mpa concrete".
- **Sandberg, UK** - "The CALTITE specimen exhibited significantly less acid attack in terms of both depth of attack and area of deterioration."
- **University of Toronto, Canada** - "The mix containing EVERDURE CALTITE admixture showed a marked improvement in the ability of concrete to endure severe environments."

on Other Properties:

- **University of Liverpool, UK** - "The resistivity measurements show that the modified (EVERDURE CALTITE) concrete is considerably less conductive than the unmodified concrete."
- **Taywood Engineering, UK** - "Compared with conventional concretes, the values of resistivity were very high, particularly after soaking. For concrete with a typical moisture content of 3 - 5%, resistivity values are in the range of 50 k.ohm.cm. The Caltite concrete had a resistivity in excess of 1,000 k.ohm.cm, i.e. more than 20 times higher than conventional concrete"
- **Sandberg, UK** - "The expansion of the prisms of CALTITE concrete under freeze-thaw conditions was considerably lower than that of the control at all times during the 50 cycle test; the visible spalling was also considerably less and occurred later than on the specimen of control concrete."
- **Ready Mixed Concrete, Hong Kong** - "We have carried out exhaustive laboratory tests on concrete containing CALTITE and have found it to have no detrimental effects on strength development."
- **BRITISH BOARD OF AGRÉMENT (BBA)** *(*Ask your Cementaid representative for a copy of the certificate)* - "The Caltite System has no detrimental effects on the properties of the cured

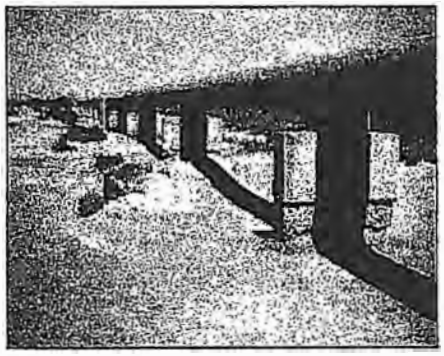
concrete. ..Site observations and other data show that the properties of concrete containing Everdure Caltite have been maintained for up to 30 years.

- "Petrographic analysis of concrete containing a known reactive aggregate showed no reaction in concrete containing the EVERDURE CALTITE System when subject to wetting and drying cycling."
- "Significantly greater resistance to carbonation."
- "The System has no detrimental effects on the properties of the cured concrete."
- "Site observations and other data show that the properties of concrete containing EVERDURE CALTITE have been maintained for up to 30 years."

The effects of the Caltite System ingredients are permanent. Independent testing on Caltite concretes after up to 20 years field exposure to severe chloride and sulphate environments, has proven no reduction of these outstanding properties, or the quality of Caltite concrete and embedded reinforcing, at all.

Case Studies - Long Term Performance:

Engineering & Water Supply Department; Government of South Australia
In 1960, un-reinforced OPC concrete pipeline support chairs for BHP were cast in a salt pan in Port Pirie, Spencer's Gulf, South Australia. (1:2:4 mix, @ approx. 280Kg / m3)



Groundwater Analysis:

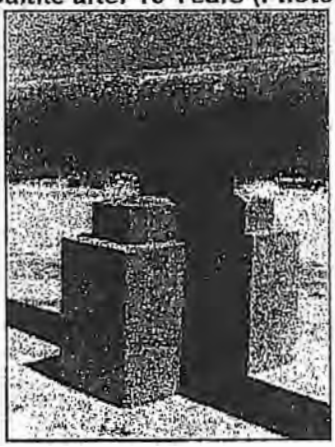
sulphates @ 7,200 mg/Lt.

chlorides @ 53,000 mg/Lt

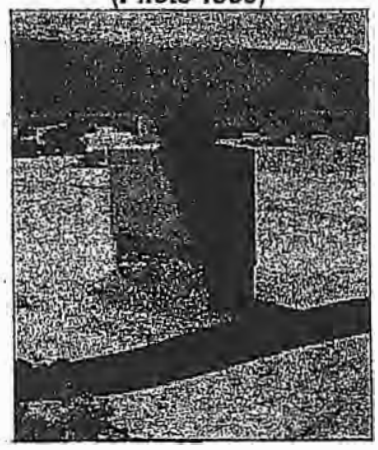
After less than two years, all of the ordinary concrete chairs suffered severe sulphate attack.

Additional chairs were cast in 1962 using exactly the same mix, but incorporating **Everdure Caltite @ 30 Lts / m3, as well as steel reinforcement.**

With Caltite after 18 Years (Photo 1980)



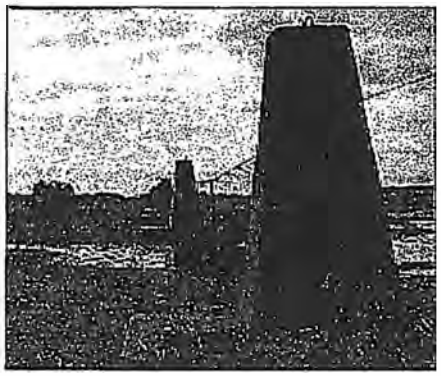
Without Caltite after 20 Years (Photo 1980)



After 18 years in service, the reinforced Caltite concrete has remained in excellent condition, with no re-bar corrosion, and only minor surface etching. The Caltite concrete remains in service today, corrosion-free after 37 years. This is in contrast to the non-Caltite chairs, which were severely damaged within only 4 years, and near to collapse after 20 years, as shown above.

Port Wakefield, Spencer's Gulf, SA - Artillery Range Markers (Dept. of Defence)

The chloride resistance of Caltite concrete is time-proven to be effective over the long-term by the Australian Department of Defence Artillery Range Markers in Port Wakefield, South Australia, in the Spencer's Gulf region. The Caltite concrete used an Ordinary Portland cement content of 400 Kg /m3, and a water /cement ratio of 0.45

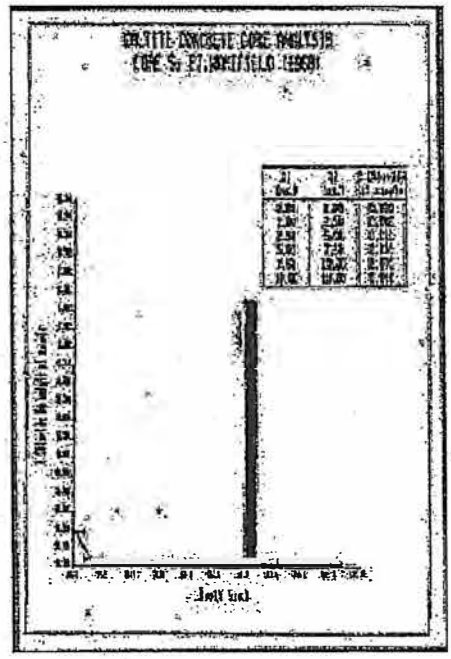


These were placed in the inter-tidal zone in 1968 to restrict public access, and are subject to daily tidal immersion cycles in the highly saline water of the Gulf.

In normal concretes, elevated drying temperatures such as those here greatly increase rates of salt penetration and of re-bar corrosion.

In 1985, after 17 years wet / dry cycling, cored samples were tested by drilling and measuring actual chloride penetration at varying depths.

Compared to the surface level (0 - 10mm), chloride penetration in the 10 - 25mm zone was reduced by 84%. Chloride reduction beyond the 10 - 25mm zone was 100%.



Examination and testing of these and other long term marine exposed Caltite structures by Taywood Engineering Ltd. confirmed the following;

· "Cores taken from Caltite System concrete exposed to tidal immersion for up to 17 years showed no signs of corrosion of the embedded reinforcing and little surface erosion.

· Compared with conventional concretes, the values of resistivity were very high, particularly after soaking. The Caltite concrete had a resistivity in excess of 20 times higher than conventional structural concrete."

· The capillarity of field "Caltite" concrete with an average cement content was lower than low w / c ratio lab concretes containing over 450 Kg/m3 of cement and superplasticisers.

· The water repellency of "Caltite" concrete was found to be unaffected by tidal immersion over a period of up to 17 years".

City of Glenelg, SA - Boat Launching Ramp

This project demonstrates long term evidence confirming that the high electrical resistivity of Caltite concrete provides an additional preventative protection against chloride attack.

This is the case even where chlorides are present at the level of reinforcement prior to final set (e.g. beach sand, contaminated aggregates, etc.), such as in this project.

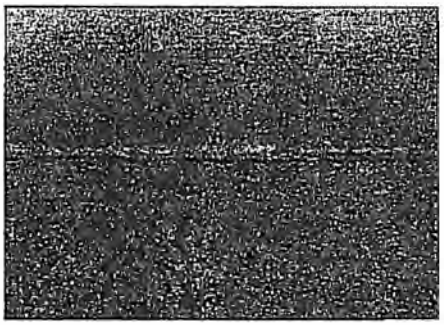
In 1965, the City of Glenelg (South Australia) re-constructed a corrosion-damaged boat launching ramp, this time using Everdure Caltite concrete for the lower, seaward section, to prevent chloride attack. The Caltite concrete used a 25 MPa mix with an Ordinary Portland cement content of approx. 280 Kg / m3. The upper portion (photo foreground) used exactly the same mix, only without Caltite.

PHOTO: 1985 (after 20 years)
Caltite section remains in good condition.

After 20 years, the section without Caltite shows evidence of severe chloride attack, with large cracks and patched areas over reinforcement lines (left of photo), as well as 8 - 10mm surface loss from salt scaling, so that the larger aggregates are clearly exposed.

By contrast, the Caltite concrete section has remained in very good condition, with no evidence of re-bar corrosion attack, and insignificant surface wear.

Being at the seaward end of the ramp, the Caltite section is subject to a shorter inter-tidal drying period. At the construction joint however, drying exposure conditions are equivalent, and a valid comparison of performance is provided.

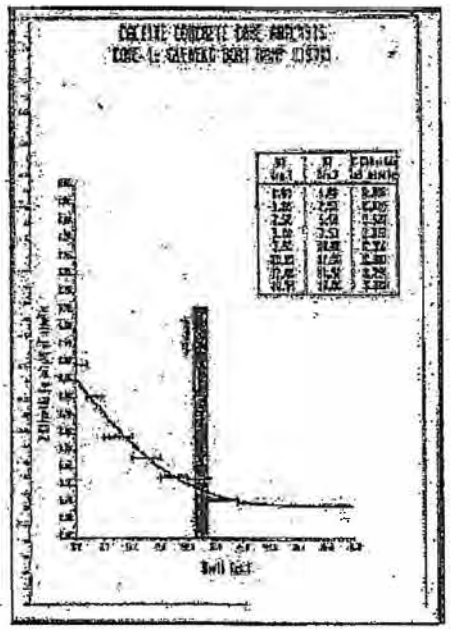


The adjacent photo (1985) shows the construction joint between the Caltite (top) and plain concrete (bottom), after 20 years exposure. The Caltite concrete has remained in excellent condition, and it is still possible to see the "broom-marks" made at the time of finishing, to provide traction. On the other hand, severe surface loss, aggregate exposure, and evidence of corrosion-induced cracking, is clearly visible in the plain concrete.

Chloride analysis of the Caltite concrete section in 1985 by Taywood Engineering confirmed no corrosion of steel reinforcement, despite inclusion in the Caltite mix of a calcium chloride accelerator at the time of casting, to prevent wash-out by the incoming tide. This resulted in a very high "background" level of chlorides, being present within the concrete from the day of casting.

This background level was approximately 4 times higher than that required for activation of steel, yet no corrosion had occurred, despite 20 years tidal exposure.

The absence of corrosion is primarily due to the low moisture content and very high electrical resistivity of the Caltite concrete.



Commenting on the extraordinary durability performance of the Caltite concrete, the researchers commented;

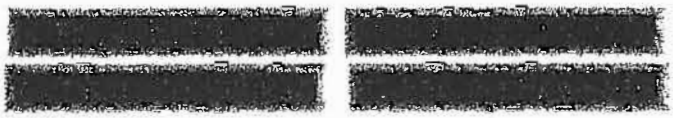
"Compared with conventional concretes, the values of resistivity were very high, particularly after soaking. For concrete with a typical moisture content of 3 - 5%, resistivity values are in the range of 50 k.ohm.cm. The Caltite concrete had a resistivity in excess of 1,000 k.ohm.cm, i.e. more than 20 times higher than conventional concrete"

The chloride profile in this instance shows an ingress "curve". Unusual for Caltite concrete, (see Pt.

Wakefield Artillery Markers, above), this is believed to be due to the presence of a crack in the slab at the coring location, (which had subsequently self-healed), and the fact that the Caltite concrete was "cured" in sea-water.

The Caltite ramp remained in service and in similarly good condition until middle of 1999, when the structure was de-commissioned, and the area subsequently re-developed.

The Caltite ramp achieved the Clients' requirement for a corrosion-free and maintenance-free service life of their marine exposed structure, being in this instance 34 years. This included daily wetting and drying under hot, salty and windy conditions, at least one known crack, and the presence of a very high level of admixed chlorides at the level of reinforcement since the day of casting.



Volume 1, Attachment C1-4.5 Calcium Stearate

MCI MARATHWADA CHEMICAL INDUSTRIES PVT LTD.

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Alumina Hydrate | Aluminium Stearate | Barium Stearate | Calcium Stearate | Gloss White | Green B | MONO | Sodium Aluminate | Zinc Stearate | Zinc Phosphate

CALCIUM STEARATE

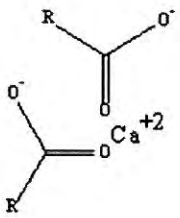
Our Products

- ALUMINA HYDRATE
- ALUMINIUM STEARATE
- BARIUM STEARATE
- CALCIUM STEARATE
- GLOSS WHITE
- GREEN B
- MONO
- SODIUM ALUMINATE
- ZINC STEARATE
- ZINC PHOSPHATE

CAS No. : 1592-23-0
H.S.Code : 2915.70

Name	CALCIUM STEARATE
Synonyms	Stearic Acid Calcium Salt,Calcium Octadecanoate, Octadecanoic Acid,Calcium Salt, Calcium distearate; Calcium stearato (Italian); Calciumdistearat (German); Diestearato de calcio (Spanish); Distéarate de calcium (French)
Chemical Formula	[CH3(CH2)16CO2]2Ca OR C36H70CaO4
Molecular Weigth	607.03 g/mol
EINECS No.	216-472-8
H.S.Code	2915.70

Structural Formula



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Tel : + 91-240-2376114, + 91-240-3090738.

Fax : + 91-240- 2376918.

Email: sales@marathwadachemicals.com

Product Description :

CALCIUM STEARATE is used as a stabilizer for plastics with co-stabilizer of Ba-Cd soap. It is also used as a plasticizer in plastic industry as well as in cosmetics. It is used as a flatting and sanding agent in lacquers, coatings & inks. It is applied in tablet manufacturing. It is used as a drying lubricant and dusting agent for rubbers. It is used as a catalyst in chemical synthesis. It is used as a waterproofing additive in concrete, rockwool, textiles and paper

Specifications

Volume 1, Attachment C1-4.5 Calcium Stearate

Characteristics	Properties
Appearance	Fine Smooth White Powder
Melting Point	160°C - 165°C
Solubility	Insoluble in Water, Ethanol & Ether
Moisture Content	Less than 2%.
Total Ash Content	Between 9.5 – 11 %
Free Stearic Acid	Less than 0.5%.
Calcium Content as CaO	8.5 – 10%
Bulk Density	App.0.2 -0.4 Gm/CC
Fineness through 240 mesh	99% passes.
Loss on Drying	2 % Max.

Solubility

CALCIUM STEARATE is insoluble in water; ether; chloroform; acetone; cold alcohol, slightly soluble in hot alcohol; hot vegetable & mineral oils, quite soluble in hot pyridine

CALCIUM STEARATE APPLICATIONS & USES :

Uses :
CALCIUM STEARATE is highly recommended as stabilizer for PVC resins, lubricant (release agent) for plastic molding powders and tablets, emulsions, cements, polymer pencils, for waterproofing NG base explosives; fabrics; cements & cement paints; mortar admixtures. Construction chemicals, flatting agent in paints; cosmetics. As lubricating agent in paper & paperboard coating compositions. In resin coated sands & foundry chemicals, in decaking food items like onions. As neutraliser; color stabiliser; fiber breakage reducer; and de-agglomeration agent in PP and HDPE applications.

APPLICATIONS:
ABS Processing, Acid Acceptor in PE, Acid Acceptor in Polystyrene, Acid Acceptor in PP, Anticaking Agent, Asbestos, External Lubricant for PVC, Fertiliser, Fibre, Internal Lubricant for PVC, Mould Release Agent, Paints Manufacturing, Paper Manufacturing, Plastic Processing, PVC Pipes, Stabiliser, Varnish Manufacturing, Water Proffing Agent. CALCIUM STEARATE is used for producing polyolefines, adhesives, PVC, paint, concrete, rubber, master batches, thermosetting resins.

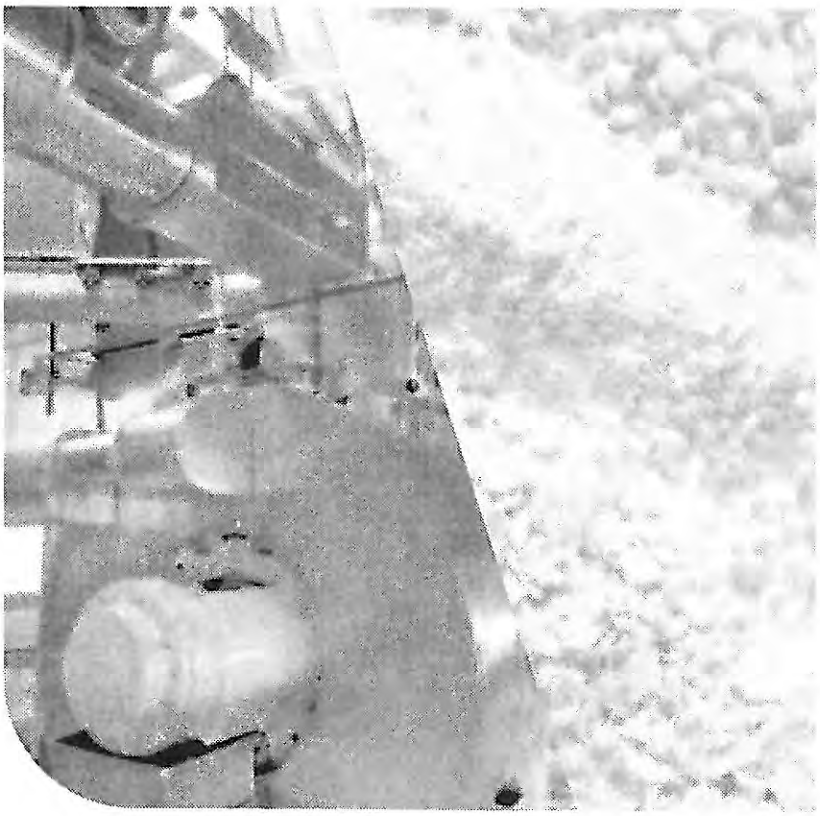
PACKING :
Laminated HDPE Bags with separate liner inside.

NOTE : The tests and results shown were conducted in our laboratories. They do not constitute a guarantee and it is suggested that you carry out your own evaluations prior to the adoption of these products.

NOTE : The products are offered without patent protection. For this reason and before submitting orders, it is purchaser's responsibility to ensure that products requested are not covered by any patent in his country.

Baerlocher Additives

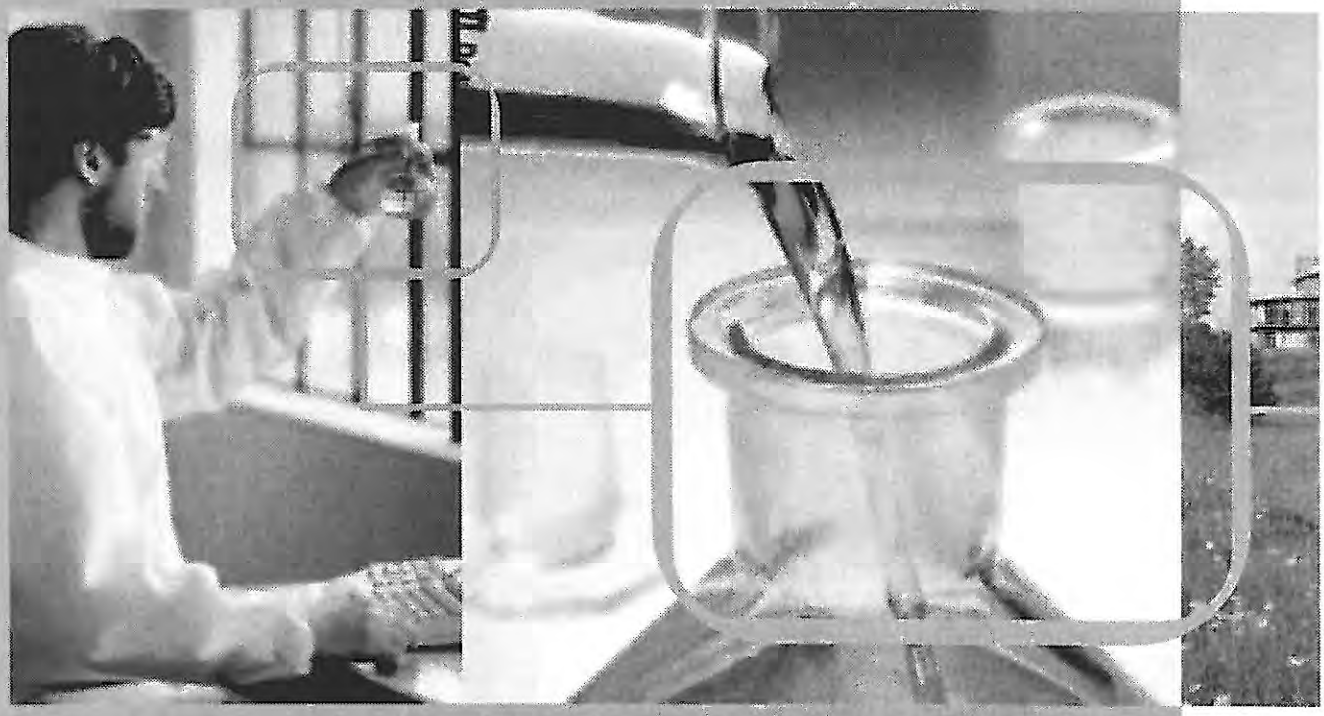
Metallic stearates



we add character to plastics

BÆRLOCHER

We add character to plastics



Plastics open new avenues for the future. Additives essentially determine properties and quality of the end product. As a global leader in additive supply, Baerlocher has for more than 50 years been successfully providing support to the plastics industry by developing and manufacturing high-quality plastics additives.

Baerlocher products

- Baeropan
- Baerostab
- Baeropol
- Baerodur
- Baerorapid
- Baerolub
- Baerocid
- Ceasit, Zincum

Thirteen production sites in Germany, Great Britain, Italy, France, the United States, Malaysia, India, Korea, Brazil, Peru and Argentina as well as a sales network covering more than 40 countries make the Baerlocher group of companies a strong partner. This global presence and more than 1200 employees worldwide make sure that we are always close to the customer. Future-oriented, we are continuously investing in research and development. A large number of in-house research scientists and technical experts ensure our considerable creative potential and innovative power. Baerlocher has R+D facilities in Germany (München-Unterschleissheim), France (Marseille), Italy (Lodi), the United States (Dover, Ohio) and India (Mumbai).

Environmentally sound production processes as well as the safety and protection of people and environment are key corporate goals. As a globally active group of companies we are aware of our responsibility, regardless of time or place. We are committed to the principles of "Responsible Care": Our quality management is certified to ISO 9001 and our environmental management system to ISO 14001, encouraging our employees to work together in a responsible way. This policy will not least benefit our customers.

www.baerlocher.com

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Introduction

Metallic stearates are compounds of long-chain fatty acids with metals of different valencies. The most important metallic stearates, in terms of quantity, are the metallic stearates of aluminium, calcium, magnesium and zinc.
The main advantage is their manifold range of use.
The most important ones are: lubricating properties, separating properties, water repellence, gelling capacity, stabilising effect, foam inhibition, acid scavenger.
Baerlocher metallic stearates are available in different product forms: as fine powders with a large surface, as prills, as flakes, as pastilles, as AV-granules, as rodlike-granules.

Baerlocher SPA-additives

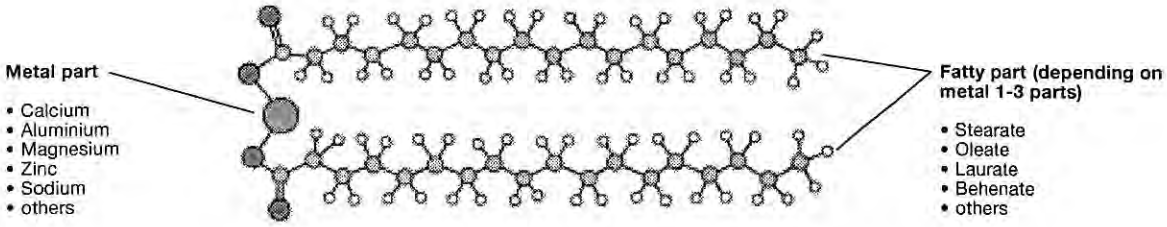
- highest quality
- variety of physical forms
- top performance
- cost effective
- globally available

Contents

6 Metallic stearates
14 Calcium stearates
18 Zinc stearates
20 Magnesium stearates
21 Aluminium stearates
22 Alkali stearates

Metallic Stearates

Metallic stearates are compounds of long-chain fatty acids with metals of different valencies; some metallic stearates are not soluble in water, whereas other stearates, i.e. compounds of long-chain fatty acids with alkaline metals or ammonia are soluble in water. The most important metallic stearates, in terms of number of applications and quantities produced, are the metallic stearates of calcium, zinc, magnesium and aluminium.



Stearates of greatest commercial importance are produced from the commercial fatty acids derived from natural sources, with the predominance of those being sources containing mostly stearic acid and palmitic acids. Due to the OH-group present in the fatty acid molecule, 12-hydroxystearates are usually more soluble in polar solvents and their melting point is higher than the metal salts of mixtures of predominantly stearic and palmitic acids.

Owing to the shorter chain length of the fatty acid, the properties of laurates are greatly influenced by the respective metal base. The basic properties of metallic stearates such as water repellence and gelation are maintained, whilst lubricating and separating properties are already significantly reduced. As a consequence of the double bond present in the fatty acid, oleates have a lower melting point than the corresponding stearates. Their solubility is usually slightly improved.

Among the many interesting properties of metallic stearates, the most important are:

- lubricating properties
- separating properties
- water repellence
- gelling capacity
- stabilising effect
- foam inhibition

Contrary to most other lubricants and release agents, metallic stearates are characterised by their relatively high melting point. Therefore, metallic stearates in the form of a fine dry powder can act as a dry lubricant (like graphite) when used in this solid powder form. In most cases, the hydrophobic nature of metallic stearates is highly desirable.

Lubrication and release properties, as well as water repellency, are characteristics of all metallic stearates. The special effects of these properties are determined by the cation, the chain length of the fatty acid and certain other properties of the respective metallic stearate (e.g. the water of crystallisation content).

The gelling properties of the aluminium stearates are particularly effective, however, satisfactory gelation depends on the type of stearate (mono-, di- or tribasic stearate), its polarity and the viscosity and solvent properties of the liquid component.

Calcium stearate, magnesium stearate and zinc stearate have stabilising and processing aid effects in a wide range of thermoplastics. Aluminium and magnesium stearates are used as foam inhibitors for various suspensions.

Interchangeable silos as environmentally friendly packaging

state-of-the-art production line

Applications in the plastics industry

Metallic stearates, which have been used primarily as acid scavengers, lubricants and release agents by the plastics industry, are becoming increasingly important in melt processing. In addition to optimising production, the use of metallic stearates allows the processor to produce finished articles with smoother surfaces and lower friction.

Metallic stearates are mainly produced from organic raw materials. Therefore, they tend to degrade to some degree when exposed to excessively high temperatures, resulting in discolouration. Baerlocher has developed a range of thermostable metallic stearates, which are highly resistant to discolouration when used in transparent or brightly coloured thermoplastics even at high processing temperatures

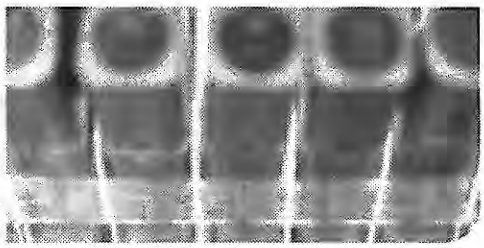
Main fields of plastics applications

Metallic Stearate	PE	PP	PS	ABS	PA	PVC	SMC/BMC
Calcium	•	•	•	•	•	•	•
Zinc	•		•		•	•	•
Ca/Zn	•					•	
Magnesium				•	•		
Aluminium					•		•

Applications in the pharmaceutical and cosmetics industry

Due to their outstanding lubrication and release properties, their thixotropic effect and their capacity for gelation, metallic stearates are used by the pharmaceutical and cosmetics industry. Their lubricating and release properties are utilised during dragée preparation and tablet pressing, whilst their gelation capacities assist in the production of creams and ointments. The hydrophobic properties of metallic stearates prevent pharmaceutical and cosmetic products in powder form from absorbing water and thus from forming agglomerates.

Additionally, metallic stearates are used in shampoos, eyeliners, lipsticks, sun protective lotions, medicated ointments, body and foot powders, etc. Although metallic stearates are added to these articles in relatively low dosages ranging from 0.05 to 1 %, significant volumes of metallic stearates are required for this application in Europe alone.



Further industrial applications

Metallic stearates prevent solid washing powders and detergents from water absorption. They are also used as anti-caking agents and mould release agents. In the textile industry, metallic stearates are applied for dry impregnation and as antistatic agents. The printing ink industry utilises metallic stearates as swelling and suspension aids for other additives such as pigments. They are also employed as lubricants and release agents for pastels and as matting agents for gravure inks. They are added to cements and fillers on account of their excellent oil binding properties. During the production of waxes and the processing of liquid wax compounds, they act as suspension agents and increase water repellency. They are added as anti-caking agents to different types of fillers and very hygroscopic salts and also in order to improve water resistance. The metal-processing industry uses metallic stearates as lubricants, release agents and dry-film lubricants.

Fields of application

Building Industry	Hydrophobic agents
Lacquer Industry	Matting agents and abrasives
Lubricant Industry	Thixotropic agents for the production of lubricants and greases
Rubber Industry	Mold release agents – Anti-tack agents
Paper Industry	Coating agents
Metal Industry	Lubricants for powder metallurgy, wire drawing and tubing
Pharmaceutical and Cosmetics Industry	Mold release agents for tabletting

Although we are familiar with many of the traditional metallic stearates applications, we often receive inquires about special applications. It is not always possible to comply with these highly specialised requests by offering standard products. We are therefore often asked to develop and produce special product types. For example: we may be asked to improve the free-flowing properties without changing granule size and structure, whilst maintaining surface properties and mean particle size; our customers may ask for particularly thermostable metallic stearates. For certain applications, e.g. the water repellent finishing of concrete, metallic stearates must be completely free from salt without losing their hydrophobic properties.

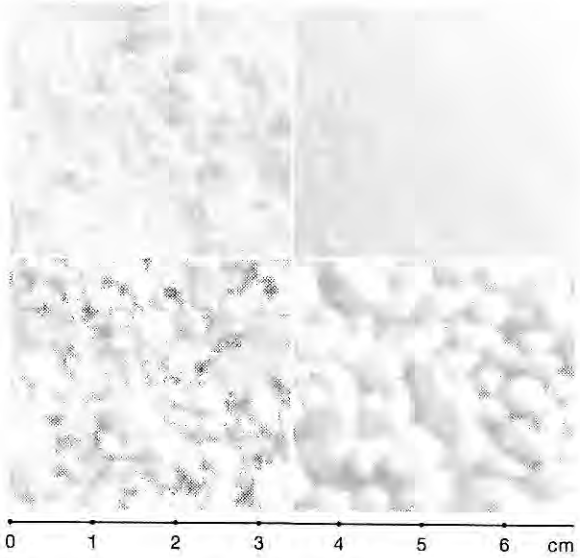
Heavy metal content and contamination must be reduced as much as possible. Customers may ask for metallic stearates with a specific pH-value, alkalinity or content of fatty acid. Odour and taste must often meet special requirements. Baerlocher has always been open to these requests (and welcomes any future challenges) and in most cases has been able to produce a metallic stearate corresponding to the special requirements of our customers. Baerlocher GmbH was the first company in Europe to produce metallic stearates on an industrial scale and our extensive experience in the manufacture, the applications and the development of our special stearates is always at the service of our customers.

Baerlocher has been the leader in producing metallic stearates in different product forms for the benefit of our broad customer base. Therefore, we are in a position to offer the appropriate product in the appropriate product form for almost any application.

The variety of product forms is as follows:

- Fine powders with a high surface area
- Coarse powders
- Prills
- Flakes
- Pastilles
- AV-granules
- Rod-shaped pellets

In addition to flexibility of producing many physical forms, most of our products are also offered as derivatives of either animal or vegetable based fatty acids.



Variety of physical forms

The Baerlocher group uses four different methods for the production of metallic stearates, with each method imparting its own specific properties to the final product:

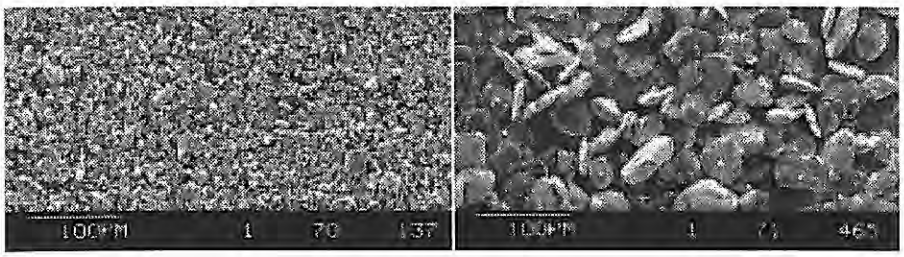
1. Precipitation (or double-decomposition) reaction

The fatty acid is first saponified in relatively large volume of heated water with an equimolar to a slight excess quantity of a strong alkali solution (sodium hydroxide, caustic potash solution, ammonia). The resulting alkali stearate is soluble in water (pict. 1). Particle size, surface area and particle morphology or shape are influenced by the concentration of reactants and precipitation rates. In general, the higher the dilution of the saponified fatty acid, the smaller the particles and the larger the surface will be. These properties determine the bulk (apparent) density, which is typically low for precipitated metallic stearates. The desired water-insoluble metallic stearate is subsequently produced by adding a metal salt solution (e.g. calcium chloride solution, aluminium sulphate solution). The reaction follows the formula (pict. 2).

The water-soluble salts such as sodium chloride or sodium sulphate, generated as by-products of the precipitation reaction, must be removed from the metallic stearate by filtration and washing. Finally, the resulting wet cake must be dried and the product deagglomerated or milled. This double-decomposition reaction typically produces very light, fine powders with a large surface area and a more platelet morphology. These types of metallic stearates are used in applications requiring fine particle size and high surface area for the best lubrication and release properties and where special emphasis is placed on good hydrophobic properties.

$C_{17}H_{35}COOH$	+	NaOH	→	$C_{17}H_{35}COO^-Na^+$	+	H_2O	Pict. 1
stearic acid	+	sodium hydroxide	→	sodium stearate	+	water	
$2\ C_{17}H_{35}COO^-Na^+$	+	$M^{2+}2X^-$	→	$(C_{17}H_{35}COO^-)_2M^{2+}$	+	$2Na^+X^-$	Pict. 2
sodium stearate	+	metal salt solution	→	metal stearate	+	water soluble salt	

M = Zn^{2+}, Ca^{2+} or similar; X = Cl^-, 1/2 SO_4^{2-} or similar



left: Zincum SW derived from the AV-process

right: Ceasit POE derived from direct reaction

2. Direct reaction

The reaction between stearic acid and metal oxide, hydroxide or carbonate takes place at an elevated temperature in a large excess of water. The reaction illustrates that there are no by-products (pict. 3).

Particle size, and thus particle surface and bulk weight are influenced by the relation of stearic acid to water. The higher the dilution, the smaller the particles and the larger the surface will be. The metallic stearates produced by direct reaction are also relatively fine powders with a high degree of purity, being free of water-soluble salts. Not all metallic stearates can be effectively produced by this method, due to low reactivity of certain metal oxides, hydroxides or carbonates. The reaction can be run effectively at atmospheric pressure, but an advantage of this method is that it can also be run under pressure and at higher temperatures (>100 °C) to produce certain types of metallic stearates, which cannot normally be obtained under atmospheric conditions by the direct reaction process. In most cases, the product must be filtered and dried to the final desired moisture content.

Direct reaction in water generally produces a more rounded, agglomerated particle, with higher bulk density than precipitated stearates.

2 $C_{17}H_{35}COOH$	+	$Ca(OH)_2$	→	$(C_{17}H_{35}COO^-)_2Ca^{2+} \cdot H_2O$	+	H_2O	Pict. 3
stearic acid	+	calcium hydroxide	→	calcium stearate	+	water	

3. Fusion process

During the fusion process, metal oxides or hydroxides and stearic acid are heated under pressure with continual stirring beyond the melting point of the metallic stearate product. As the melting point of most metallic stearates is higher than 100 °C, the water resulting from the reaction escapes as steam. Therefore, a drying step is unnecessary. A variety of physical forms can be produced from this process, depending on the melting range of the final product. For relatively low or sharp melting metallic stearates, all forms (pastilles, prills, flakes and powder) are generally feasible. A very high degree of purity is achievable with the fusion process (pict. 4).

2 $C_{17}H_{35}COOH$	+	ZnO	→	$(C_{17}H_{35}COO^-)_2Zn^{2+}$	+	H_2O	Pict. 4
stearic acid	+	zinc oxide	→	zinc stearate	+	water	

4. AV process

Baerlocher's AV process is a combination of the direct reaction and fusion processes. Metal oxides or hydroxides are heated according to a patented method with a fatty acid and a small quantity of water in a pressurised reactor, with the final temperature corresponding more or less to the melting point of the soap. The added water and the water resulting from the reaction are removed under reduced pressure at the end of the reaction cycle.

The AV process allows the very efficient production of a variety of stoichiometries, including very pure products. AV technology is generally used to produce metallic stearates in free-flowing granule or powder forms (pict. 5).

2 $C_{17}H_{35}COOH$	+	$Mg(OH)_2$	→	$(C_{17}H_{35}COO^-)_2Mg^{2+} \cdot H_2O$	+	H_2O	Pict. 5
stearic acid	+	magnesium hydroxide	→	magnesium stearate	+	water	

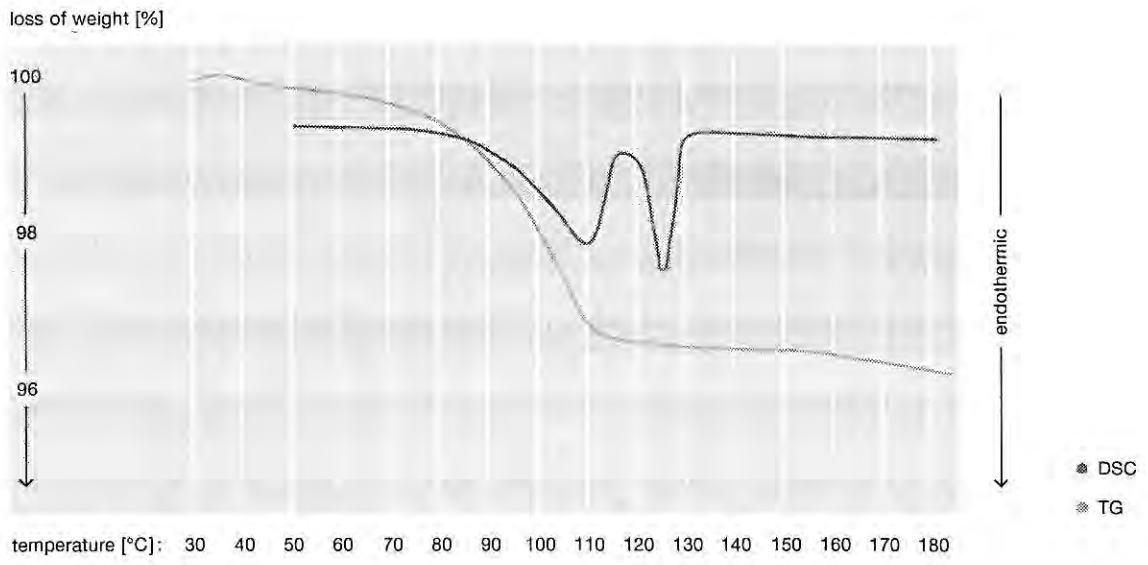
Calcium Stearates

Calcium stearates, which are recognized as physiologically safe, have become increasingly important in the last few years. They are insoluble in most solvents. They dissolve only slightly when heated in aromatic compounds, chlorinated hydrocarbons or vegetable and mineral oils and waxes. Calcium stearates are mainly used as lubricants, mold release agents and acid scavengers by the plastics industry. The pharmaceutical and cosmetics industry uses calcium stearate as an anti-caking additive for powders and granules and as an excipient for pressing tablets. The building industry uses it as hydrophobic agent for inhibiting moisture absorption and preservation of building materials and construction.

Behaviour of calcium stearate on heating

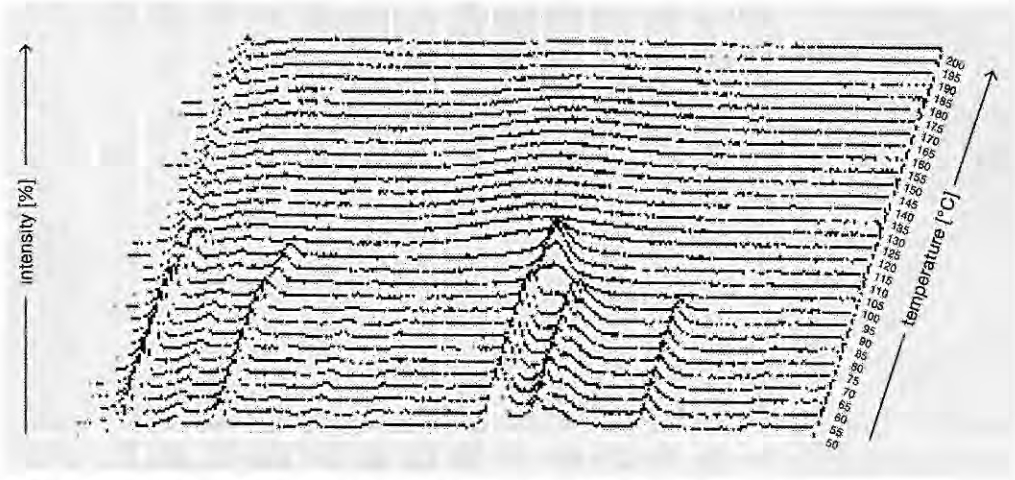
Calcium stearate shows some interesting effects when heated. It dehydrates and starts to soften at temperatures between 120 °C and 130 °C and takes a viscous consistency at approx. 160 °C. This state lasts whilst the material is heated occurring some slight discolouration. The thermogravimetric diagram (TG) shows that calcium stearate loses about 3 % of its weight at approx. 100 °C. This weight loss corresponds to one mole water of crystallisation, which is split off at this temperature. A differential scanning calorimetry-measurement (DSC) indicates this separation of water crystallisation by an endothermic peak. The temperature-dependent X-ray diffraction diagram demonstrates that the crystalline structure of calcium stearate changes as a consequence of the separation of water crystallisation.

TG and DSC measurement of calcium stearate



As the temperature increases, there is a second endothermic peak at approx. 125 °C, which correlates with the collapse of the crystal lattice. The TG diagram shows that the weight does not change. After the crystal lattice has collapsed, i.e. above 125 °C, there is still a very broad peak to be seen between approx. 15° and 25° on the 2-theta-scale in the X-ray diffraction diagram.
This peak is no longer derived from a crystalline substance and indicates that calcium stearate is not a classical melt, but rather an amorphous structure existing between the individual molecules, with only a short range order like in the case of glass for example. This explains the high viscosity of the calcium stearate "melt".

Temperature depending X-ray diffraction of calcium stearate



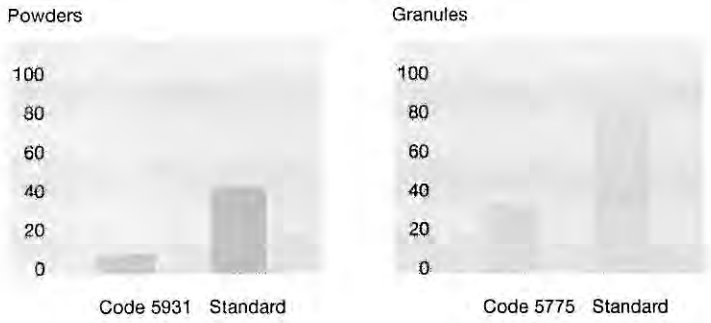
Heat stability of calcium stearates

If calcium stearates are used in transparent or lightly pigmented thermoplastics and thermosetting plastics, it is very important that there is no undesirable discolouration at normal processing temperatures. With Ceasit AV, Ceasit SW/F, Ceasit PC and Ceasit POE, Baerlocher is in a position to offer some particularly thermostable calcium stearates.

Calcium stearate for PE and PP film and fibre applications

Specific calcium stearate grades, designed with high purity and low filtration index, are especially suited for use as acid scavengers/lubricants in polyethylene and polypropylene film and fibre applications where very fine extruder screen packs are used. A low filtration index is related to minimizing the back-pressure build-up on extruder screen-packs, resulting in the minimum number of screen-pack changes and maximum output of the extruder.

Back-pressure build-up of calcium stearates on extruder screen-packs



High quality calcium stearate can be used to produce PE / PP film and fibres

Zinc Stearates

Zinc stearates are insoluble in polar solvents, but more soluble in aromatic compounds and chlorinated hydrocarbons when heated. Their main application areas are the plastics and rubber industries where they are used as release agents and lubricants which can be easily incorporated. The outstanding clarity and heat stability properties of our crystal clear zinc stearate grades make them particularly suitable for impact and crystal grade polystyrene and other clear polymers. Zinc stearate functions as an acid scavenger and processing aid in certain polyolefin applications.

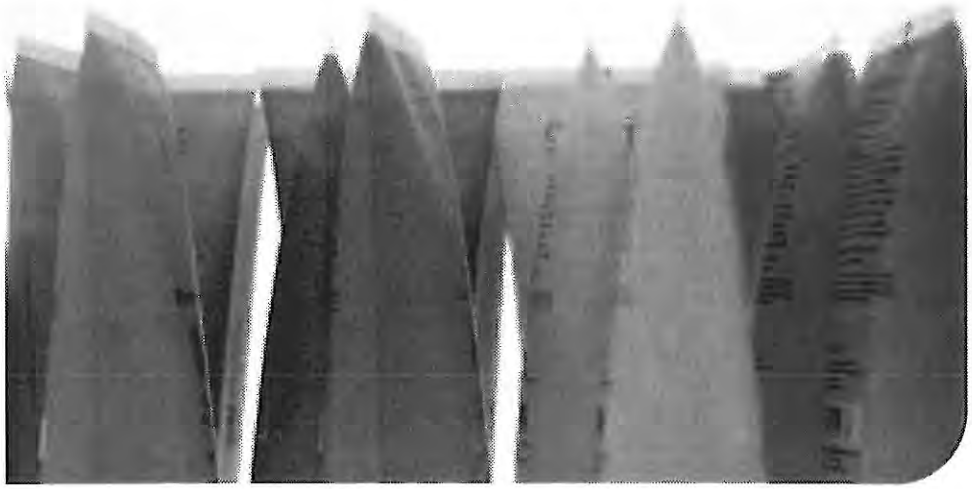
The paint and coatings industry uses our zinc stearates for pigment suspension and to improve grindability and matting. The building industry uses powdered, precipitated zinc stearates as hydrophobic agents for plasters.

Zinc stearate Code 8512
Clear melting - clear soluble

Precipitated Zincum 5 is used as hydrophobic agent in mortar and plasters

Magnesium Stearates

Like calcium stearates, magnesium stearates are almost insoluble in normal solvents. They are able to hold considerable quantities of water and take on a creamy consistency. Magnesium stearates are therefore used to improve the retention of creams and semi-rigid wax articles as well as to produce waxes.
Since they are recognized as physiologically safe, they are used by the cosmetics and pharmaceutical industry. Magnesium stearates improve the free-flowing properties and are added as anti-caking agents to powders.
One of the principle uses of magnesium stearate is as a tablet excipient in pharmaceutical dosage forms.
Thermostable magnesium stearates are used as lubricants and release agents for the processing of thermoplastics and thermosets.

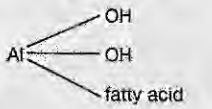
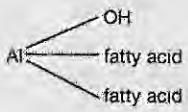
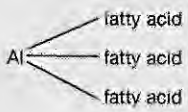


Aluminium Stearates

Aluminium stearates are produced by the precipitation process only. There are three possible combinations of aluminium with fatty acids:

The ratio of aluminium to fatty acid does not necessarily correspond to the stoichiometric values. Any ratio is possible between the extremes 1:1 and 1:3. Therefore there are many varieties of aluminium stearates, generically referred to as aluminium mono-, di- or tri-stearate, whose properties differ from one another in respect to physical properties such as melting point, free fatty acid and particularly the gelling properties. Oils with a low viscosity are best thickened by aluminium tri- and di-stearates, whilst very viscous oils form stiffer gel when combined with aluminium di- or mono-stearates.

The dropping point of aluminium greases usually range from 110 °C to 120 °C, but we are in a position to offer special stearates whose dropping point exceed 200 °C. All aluminium greases are highly hydrophobic and are characterised by outstanding transparency and good adhesion to metallic surfaces.
Due to their excellent water repellency, aluminium stearates are used in coatings and building industry materials as water repellent ingredients.
Aluminium mono-, di- and tri-stearates are insoluble in water, lower alcohols, esters and ketones. In benzenes, aromatic compounds and halogenated hydrocarbons as well as in natural and mineral oils, they dissolve to a gel when heated.

Aluminium mono stearates	Aluminium di stearates	Aluminium tri stearates
		

Alkali Stearates

Lithium stearates

Hydrophilic lithium stearates distinguish themselves by their excellent swelling properties. Different compositions of fatty acids are available in our product range. Depending on the product type properties like dropping point temperatures of greases containing lithium stearates are much higher than those of aluminium stearates.
Lithium stearates are widely used to thicken natural as well as synthetic oils and help to increase the melting point and flexibility of micro-crystalline waxes and paraffins. They are also used during the production of light weight metal mouldings. The advantage of lithium stearates with long fatty acid chain lengths is the minimal residue after thermal treatment.

Sodium stearates and Sodium Oleates

Sodium stearates and oleates are produced by direct reaction according to a Baerlocher patented process. Possible applications of these products are e.g. swelling of alcohols, lubrication and nucleating during the processing of thermoplastics.
Sodium oleates are mainly used as hydrophobic agents for building plasters, where homogenous dispersion is easily obtained due to its solubility in water. The alkaline components of the plaster and the sodium stearate forms a calcium stearate which is also finely dispersed, thus imparting high water-repellency properties to the plaste

we add character to plastics

The following brochures are available:

Baerlocher Additives for PVC

- Additives for PVC (Overview)
- Lead Stabilisers
- Organotin Stabilisers
- Lubricants
- Window and Technical Profiles
- Cables and Wires
- Calendered Films and Sheets
- Plastisol
- Sheets and Foamed Profiles
- Pipes and Fittings

Baerlocher Additives

- Metallic Stearates

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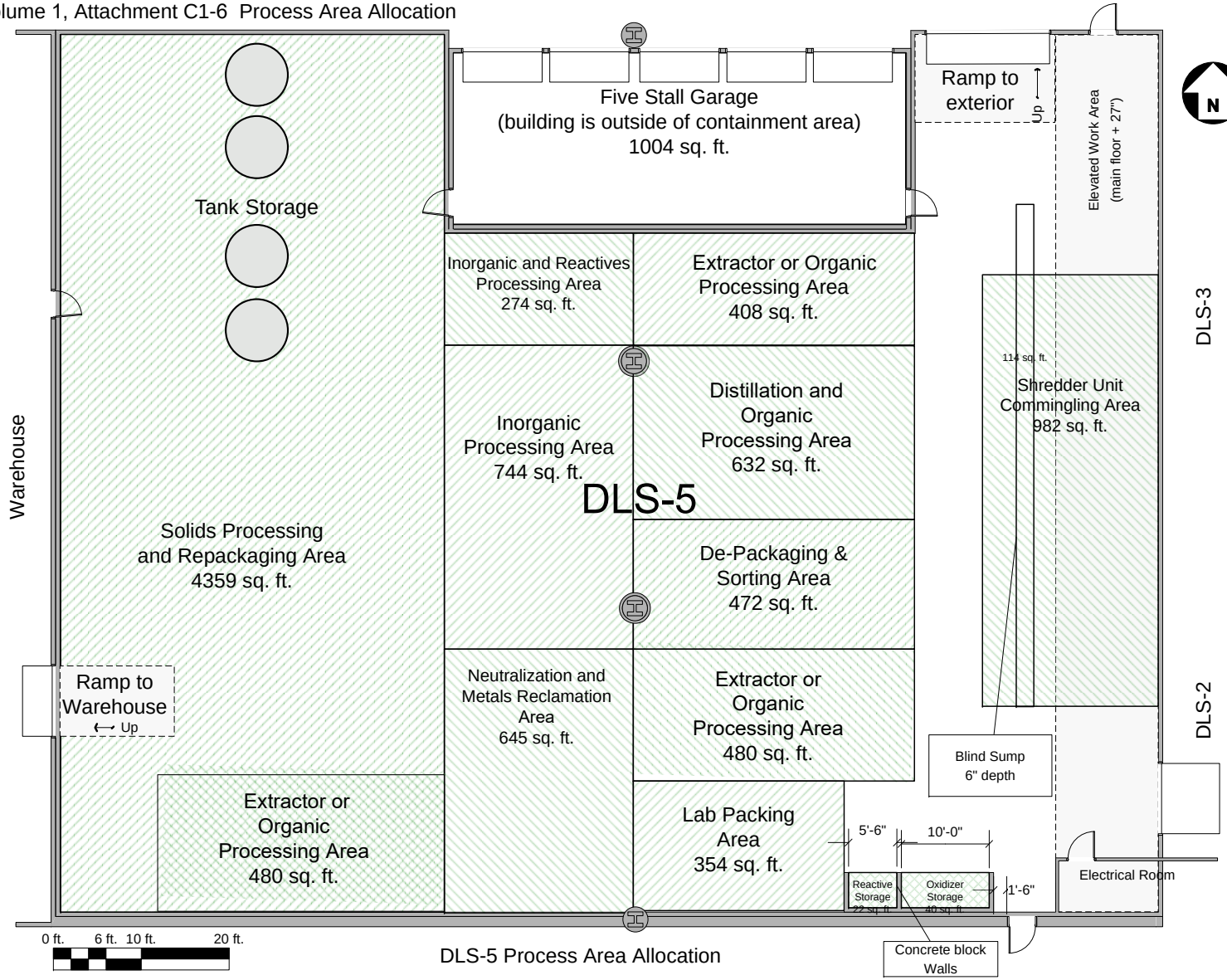
Version 2, December 2005



DLS-5 Process Area Allocation

FORM EQP 5111 ATTACHMENT C2
TANK SYSTEMS

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

R 299.9615 and R 299.9627 of the administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451); R 29.4101 to R 29.4505 promulgated pursuant to the provisions of the Michigan Fire Protection Act, PA 207, as amended (Act 207); and Title 40 of the Code of Federal Regulations (CFR) §§270.14(d), 270.16, 270.24, and 270.27 (Part 264, Subpart J and Part 60, Appendix A) establish requirements for tank systems. All references to 40 CFR citations specified herein are adopted by reference in R 299.11003.

This license application template addresses requirements for tank systems at the DLD Environmental Services, Inc facility in Plainwell, Michigan. This template includes assessments of new and existing tank systems; installation of new tank systems; secondary containment systems and release detection; variances for secondary containment; controls and practices to prevent spills and overfills; inspections; response to leaks or spills and disposition of leaking or unfit-for-use tank systems; closure and postclosure requirements; requirements for storing or treating ignitable, reactive, or incompatible wastes

This template is organized as follows:

(Check as appropriate)

☒ Existing Tank System

☒ New Tank System

Note: Template C11, Subpart CC, Air Emissions from Tanks, Containers, and Surface Impoundments, addresses air emissions for tanks. Also note that while specific closure requirements for tank systems are addressed in this template, you may reference information in Template A11, Closure and Postclosure Plan.

This template is organized as follows:

C2.A ASSESSMENT OF EXISTING TANK SYSTEM

- **C2.A.1 Design Standards**
- **C2.A.2 Dimensions and Capacity of Each Tank**
- **C2.A.3 Description of Feed Systems, Safety Cutoff, Bypass System, and Pressure Controls**
  - C2.A.3(a) Feed Systems
  - C2.A.3(b) Safety Cutoff or Bypass Systems
  - C2.A.3(c) Pressure Controls
- **C2.A.4 Diagram of Piping, Instrumentation, and Process Flow**
- **C2.A.5 Characteristics of Waste**
- **C2.A.6 Existing Corrosion Protection Measures**
- **C2.A.7 Documented Age of Tank System**
- **C2.A.8 Leak Tests, Inspections, and Other Examinations**
  - C2.A.8(a) Nonenterable Underground Tanks
  - C2.A.8(b) Other than Nonenterable Underground Tanks and for Ancillary Equipment
  - C2.A.8(c) Internal Inspections
- **C2.A.9 Ancillary Equipment Assessment**
- **C2.A.10 Leaking or Unfit-for-Use Tank Systems**
- **C2.A.11 Tank Labels**

C2.B ASSESSMENT OF NEW TANK SYSTEM

- **C2.B.1 Design Standards**
- **C2.B.2 Dimensions and Capacity of Each Tank**
- **C2.B.3 Description of Feed Systems, Safety Cutoff, Bypass System, and Pressure Controls**
  - C2.B.3(a) Feed
  - C2.B.3(b) Safety Cutoff or Bypass Systems
  - C2.B.3(c) Pressure Controls
- **C2.B.4 Diagram of Piping, Instrumentation, and Process Flow**
- **C2.B.5 Characteristics of Waste**
- **C2.B.6 External Corrosion Protection**
- **C2.B.7 Protection from Vehicular Traffic**

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C2.C.3(b) Piping

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C2.C.4 Ancillary Equipment Installation

C2.C.5 Corrosion Protection Installation

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C2.G.3 Daily Inspection of Construction Materials, Local Areas, and Secondary Containment System for Erosion and Leakage

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C2.G.5 Inspection Requirements Before Full Secondary Containment is Provided

Not Applicable. Full secondary containment has already been provided.

C2.G.6 Reporting Requirements

C2.H RESPONSE TO LEAKS OR SPILLS AND DISPOSITION OF LEAKING OR UNFIT-FOR-USE TANK SYSTEMS

C2.H.1 Response Actions for Leaks and Spills

C2.H.1(a) Waste Flow Stoppage

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C2.I.1(a) Closure Plan

C2.I.1(b) Closure Activities

C2.I.1(c) Cost Estimate for Closure

C2.I.1(d) Financial Assurance for Closure

C2.I.2 Category B

Not Applicable

C2.I.3 Category C

Not Applicable

C2.I.4 Category D

Not Applicable

C2.J SPECIAL REQUIREMENTS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTES

C2.J.1 Ignitable or Reactive Wastes Precautions

C2.J.2 Distance Requirements for Ignitable or Reactive Wastes

C2.J.3 Incompatible Wastes

C2.A ASSESSMENT OF EXISTING TANK SYSTEM

[R 299.9615(1) and 40 CFR, Part 264, Subpart J]

The DLD tank system consists of six 5,000-gallon stainless steel tanks placed in specially designed concrete vaults. Three tanks reside in a vault within the secondary containment area, designated DLS-3, which meets the requirements of 40 CFR §264.193 by approval of a technology- based variance (see C2.E, VARIANCES FOR SECONDARY CONTAINMENT). Three tanks reside in a vault, designated as DLS-4, which meets the requirements of 40 CFR §264.193.

C2.A.1 Design Standards

[R 299.9615 \(1) and 40 CFR §264.191(b)(1)]

The tanks at DLD were designed specifically to house ignitable waste. The three existing tanks in the DLS-3 vault were constructed to the specifications in Volume 1, Attachment B6-1.4 in 1984 and placed in service in 1985. Three additional tanks reside in the DLS-4 containment vault constructed in 1990 to the specifications in Volume 1, Attachment B6-1.5 and placed in service in 1991. All of the tanks were fabricated by Dowagiac Steel Tank Company following the criteria of the American Welding Society for stainless weldments of non-pressure vessels and the containment structural design was in accordance with the American Institute of Steel Construction, the American Concrete Institute and the Concrete re-Inforced Steel Institute current Codes and Specifications. These tanks were designed with sufficient structural strength and with regard to chemical compatibility with the wastes to ensure that they will not collapse, rupture, or fail. Included is a Certification and Assessment of Capability report for the tanks, ancillary equipment, and the containment area provided by an independent professional engineer (see Volume 1, Attachment C2-7.2).

While in service, these tanks have been regularly inspected, repaired, and maintained. Annual internal inspection of the tanks are conducted by an independent professional engineer. Reports for these inspections are on file at DLD with documentation that recommendations in each report have been implemented. Copies of the internal inspection reports are included in Volume 1, Attachments C2-5.1 through C2-5.6.

C2.A.2 Dimensions and Capacity of Each Tank

[R 299.9615(1) and 40 CFR §270.16(b)]

TANK DESCRIPTION

Tank Designation	Shape	Materials of Construction	Inside Diameter (feet)	Outside Height (feet)	Nominal Capacity (gallons)	Maximum Capacity (gallons)	Wall Thickness (inches)
Tank #1	Cylindrical	304 stainless steel	8	14	5,000	5,264	0.1875
Tank #2	Cylindrical	304 stainless steel	8	14	5,000	5,264	0.1875
Tank #3	Cylindrical	304 stainless steel	8	14	5,000	5,264	0.1875
Tank #4	Cylindrical	304 stainless steel	8	14	5,000	5,264	0.1875
Tank #5	Cylindrical	304 stainless steel	8	14	5,000	5,264	0.1875
Tank #6	Cylindrical	304 stainless steel	8	14	5,000	5,264	0.1875

APPURTENANCE DESCRIPTION

Tank Designation	Appurtenance Type	Size (inches)	Location	Comments
Tank #1	Manhole	24	Side	See Volume 1, Attachment B6-1.4
	Manhole	18	Top	
Tank #2	Manhole	24	Side	See Volume 1, Attachment B6-1.4
	Manhole	18	Top	
Tank #3	Manhole	24	Side	See Volume 1, Attachment B6-1.4
	Manhole	18	Top	
Tank #4	Manhole	24	Side	See Volume 1, Attachment B6-1.5
	Manhole	24	Top	
Tank #5	Manhole	24	Side	See Volume 1, Attachment B6-1.5
	Manhole	24	Top	
Tank #6	Manhole	24	Side	See Volume 1, Attachment B6-1.5
	Manhole	24	Top	

C2.A.3 Description of Feed Systems, Safety Cutoff, Bypass System, and Pressure Controls

[R 299.9615(1) and 40 CFR §270.16(c)]

DLD does not operate an automatic fill system for its tank system. The filling of these tanks is a manual operation. All valves are normally in the closed position except for the valves that are required for the tank being filled. Transfer of liquid into a tank requires an employee to physically open the valve to an individual tank and manually operate a pneumatic diaphragm pump. Overfilling of tanks is prevented by the presence of a high level warning alarm on each tank that activates whenever a tank becomes full. The high level warning alarm for each tank consists of an audible alarm that sounds for 20 seconds and a red indicator light in the immediate vacinity of the pneumatic pumping equipment that remains lit as long as the tank is full. There are no saftey cutoff or bypass mechanisms.

All tanks are top fill, independent, free standing, atmospheric tanks. Manifolds below the maximum fill level have purposely been omitted to prevent the emptying of all tanks in the event that one tank has a rupture or leak. A pressure equalizing vent system connecting all tanks is in place to preclude siphoning. This vent system is also used to capture and return vapors to the tank system when transferring liquid from a tank to a tanker. Each tank is also equipped with a second vent system containing charcoal for the absorption vapors before exiting the tank. This vent system is plumbed so as to require all air and vapor movement from within the tank to be passed through the charcoal.

The liquid transfer portion of the tank system piping consists of steel piping with welded flanges, valves, and pipe caps. The flanged connections are bolted together with gaskets sandwiched between the flanges. A manually operated pneumatic pump is connected via camlock fittings to a feed pipe with a check valve to transfer liquid into the tank system. Tank system piping is regularly inspected for leaks and loose bolts on flanged connections.

C2.A.3(a) Feed Systems

[R 299.9615(1) and 40 CFR §270.16(c)]

All tanks are top fill, independent, free standing, atmospheric tanks with manually operated valves. Tank valves remain in the closed position except when the tank is being used. Liquid transfer is accomplished with a manually connected and operated pneumatic diaphragm pump using plant-supplied compressed air. Each tank is equipped with a level sensor. When a tank is filled, the level sensor sounds a loud audible alarm for 20 seconds and activates a red light that indicates which tank is full which remains lit until the liquid level in the tank drops below the full level. The alarm is audible and the red light is visible to the employee operating the pneumatic pump and signals the cessation of pumping operation into that tank.

C2.A.3(b) Safety Cutoff or Bypass Systems

[R 299.9615(1) and 40 CFR §270.16(c)]

There are no safety cutoff or bypass mechanisms in DLD's tank system.

C2.A.3(c) Pressure Controls
[R 299.9615(1) and 40 CFR §270.16(c)]

A pressure equalizing vent system connecting all tanks is in place to preclude siphoning. This vent system is also used to capture and return vapors to the tank system when transferring liquid from a tank to a tanker. Each tank is also equipped with a second vent system containing charcoal for the absorption vapors before exiting the tank. This vent system is plumbed so as to require all air and vapor movement from within the tank to pass through the charcoal before exiting the system.

C2.A.4 Diagram of Piping, Instrumentation, and Process Flow
[R 299.9615(1) and 40 CFR §270.16(c)]

See Volume 1, Attachment C2-1, C2-2.1 and C2-3 for diagrams of the piping system.

C2.A.5 Characteristics of Waste
[R 299.9615(1) and 40 CFR §264.191(b)(2)]

In practice, DLD employees commingle liquid wastes with high water content, designated as low BTU (representative constituents from this waste stream are ethanol solutions, methanol solutions, acetone solutions, formalin solutions, and water contaminated with gasoline), separately from liquid wastes with low water content, designated as high BTU (representative constituents from this waste stream are benzene, toluene, and hexane) to meet the requirements of off-site facilities. While these commingled waste streams are stored in separate tanks, they both are ignitable (D001) and may contain constituents that are EPA toxic (D004 through D043). All six tanks at DLD have been used and will be used to store these liquid wastes. Detailed analytical reports of these waste streams can be found in Volume 1, Attachments C2-4.1, C2-4.2, & C2-4.3.

Unless it has been entered and cleaned, a tank will contain residual tankage because the port used to remove waste does not reach the floor of the tank, leaving approximately eight inches of depth in the tank. The commingling process, which is done in smaller containers, results in a waste that is similar to and compatible with the eight inch residual.

Tanks at DLD are constructed from corrosion and oxidation resistant 304 stainless steel or 316 stainless steel.

Tanks #1-3 in DLS-3 were put in service in 1984 and Tansk #4-6 were put in service in 1991. These tanks were designed with sufficient structural strength and with regard for compatibility with the wastes to be stored to ensure that they will not collapse, rupture, or fail. With proper inspection, maintenance, and repair, these tanks have been in regular use for the storage of waste with these characteristics for 37 years and 31 years, respectively. Based on the design, construction materials, and length of use, the DLD tank system has proven reliable to store such wastes.

C2.A.6 Existing Corrosion Protection Measures
[R 299.9615(1) and 40 CFR §264.191(b)(3)]

Not applicable.

(Check as appropriate)

External corrosion protection required:

☐ External shell of metal tank will be in contact with soil or water.

☐ Any external metal components of the tank system will be in contact with soil or water.

Protection from accelerated corrosion is afforded through the use of stainless steel for construction of each tank. Materials that are incompatible with this construction are not placed in the tanks. The tanks are in a concrete vault and placed on a series of 1" x 6" pressure treated boards with spacing in between each board for the purpose of leak detection. Under normal operation the external shell and metal components of the tanks do not come in contact with soil or water.

C2.A.7 Documented Age of Tank System
[R 299.9615(1) and 40 CFR §264.191(b)(4)]

Storage Tanks #1, #2, and #3 were designed in 1983 (see Volume 1, Attachment B6-1.4) and constructed for DLD in 1984. These tanks and their ancillary components were put into service in 1985. Storage Tanks #1, #2, and #3 are approximately 38 years old.

Storage Tanks #4, #5, and #6 were designed in 1990 (see Volume 1, Attachment B6-1.5). These tanks were constructed for DLD in 1990-1991. The tanks and their ancillary components were put in service in 1991. Storage Tanks #4, #5, and #6 are approximately 31 years old.

C2.A.8 Leak Tests, Inspections, and Other Examinations
[R 299.9615(1) and 40 CFR §264.191(b)(5)]

C2.A.8(a) Nonenterable Underground Tanks
[R 299.9615(1) and 40 CFR §264.191(b)(5)(i)]

DLD does not have nonenterable underground tanks.

C2.A.8(b) Other than Nonenterable Underground Tanks and for Ancillary Equipment
[R 299.9615(1) and 40 CFR §264.191(b)(5)(ii)]

As part of the Unit Certifications (see Volume 1, Attachment C2-7.2), assessment of the tanks and ancillary equipment was performed and approved by an independent certified professional engineer. Visual inspections of the tanks and ancillary equipment are performed regularly to ensure continued fitness of these components.

C2.A.8(c) Internal Inspections
[R 299.9615(1) and 40 CFR §264.191(b)(5)(ii)]

The existing tanks at DLD are above-ground enterable tanks. Leak testing is accomplished via internal inspection. Each tank is emptied, cleaned, and then inspected by an independent professional engineer once per year. Reports for the inspections can be found in Volume 1, Attachments C2-5.1 through C2-5.6.

C2.A.9 Ancillary Equipment Assessment
[{ 299.9615(1) and 40 CFR §264.191(b)(5)(ii)]

As part of the Unit Certifications (Volume 1, Attachment C2-7.2), assessment of the tanks and ancillary equipment was performed and approved by an independent certified professional engineer. Ancillary equipment, including piping, flanges, and valves, are regularly inspected for leaks and loose bolts on flanged connections. Any deterioration or malfunction discovered during inspection are recorded on the Daily Inspection Check Sheet and/or Monthly Inspection Sheet that are on file at DLD. Remediation/repair will also be noted on the appropriate inspection sheet.

C2.A.10 Leaking or Unfit-for-Use Tank Systems
[R 299.9615(1) and 40 CFR §264.191(b)(5)(ii)]

The tank system at DLD is fit for use.

C2.A.11 Tank Labels
[R 299.9615 (5)]

Each of the six stainless steel storage tanks are labeled in accordance with the provisions of National Fire Protection Association (NFPA) Standard No. 704. Photographs of the NFPA markings on each of the tanks are presented in Volume 1, Attachment C2-6.

C2.B ASSESSMENT OF NEW TANK SYSTEM
[R 299.9615(1) and 40 CFR §264.192]

C2.B.1 Design standards
[R 299.9615(1) and 40 CFR §264.192(a)(1)]

The tanks for the DLS-5 containment area are designed by the Kennedy Tank and Manufacturing Co., Inc. of Indianapolis, IN with the intent to house ignitable and/or corrosive wastes. The tanks will be built using stainless steel following the criteria of the American Welding Society for stainless weldments of non-pressure vessels, structural design to Kennedy Tank and Manufacturing standards, and in accordance with American Institute of Steel Construction codes and specifications (see Volume 3, Attachment B6-71).

C2.B.2 Dimensions and Capacity of Each Tank
[R 299.9615(1) and 40 CFR §270.16(b)]

The proposed nominal capacity of the tank design is 6,000 gallons with an actual capacity of 6,286 gallons. The dimensions and appurtenances will be enumerated in Volume 3, Attachment C2-70.

C2.B.3 Description of Feed Systems, Safety Cutoff, Bypass System, and Pressure Controls
[R 299.9615(1) and 40 CFR §270.16(c)]

Reference is made to Section C2.A.3, above.

C2.B.3(a) Feed Systems
[R 299.9615(1) and 40 CFR §270.16(c)]

Reference is made to Section C2.A.3(a), above.

C2.B.3(b) Safety Cutoff or Bypass Systems
[R 299.9615(1) and 40 CFR §270.16(c)]

Reference is made to Section C2.A.3(b), above.

C2.B.3(c) Pressure Controls
[R 299.9615(1) and 40 CFR §270.16(c)]

Reference is made to Section C2.A.3(c), above.

C2.B.4 Diagram of Piping, Instrumentation, and Process Flow
[R 299.9615(1) and 40 CFR §270.16(d)]

In accordance with 40 CFR §270.16(d), a diagram of piping, instrumentation, and process flow for each tank system is currently being created and should be similar to the system shown in Volume 3, for the new tank farm shown in volume 3 for the DLS-7 containment area.

C2.B.5 Characteristics of Waste
[R 299.9615(1) and 40 CFR §264.192(a)(2)]

Reference is made to Volume 1, Section C2.A.5, with the addition of the following information specific to DLS-5:

The tanks for the DLS-5 containment area will be a dish or cone-bottom design and may employ mixing units to prevent the accumulation of solids in the bottom of the tanks.

C2.B.6 External Corrosion Protection
[R 299.9615(1) and 40 CFR §264.192(a)(3)]

Not Applicable.

C2.B.7 Protection from Vehicular Traffic
[R 299.9615(1) and 40 CFR §264.192(a)(4]

Not Applicable.

C2.C INSTALLATION OF NEW TANK SYSTEMS
[R 299.9615(1) and 40 CFR §§264.192(b) through (g)]

The installation of the new tank system and component installation will be supervised by professional engineers to insure proper installation procedures are used. A written certification statement will be prepared by the professional engineers involved in the installation.

C2.C.1 Proper Handling Procedures
[R 299.9615(1) and 40 CFR §264.192(b)]

C2.C.1(a) Installation Inspectors
[R 299.9615(1) and 40 CFR §264.192(b)]

Qualifications for the inspector(s) or engineer(s) overseeing the installation shall be provided prior to commencement of the tank system and component installation.

C2.C.1(b) Installation Inspection Procedures
[R 299.9615(1) and 40 CFR §264.192(b)]

Procedures to inspect the tank systems and components for weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage or inadequate construction/installation will be determined and presented to DLD Environmental Services, Inc by the inspector(s)/engineer(s) overseeing the installation prior to the commencement of installation.

C2.C.1(c) Repairs
[R 299.9615(1) and 40 CFR §264.192(b)]

Prior to placing any portion of the tank system in use, all discrepancies in the tank system and components identified by the inspector(s)/engineer(s) overseeing the installation shall be repaired.

C2.C.2 Backfilling Underground Tank or Components
[R 299.9615(1) and 40 CFR §264.192(c)]

Not Applicable.

C2.C.2(a) Backfill Material
[R 299.9615(1) and 40 CFR §264.192(c)]

Not Applicable.

C2.C.2(b) Backfill Placement
[R 299.9615(1) and 40 CFR §264.192(c)]

Not Applicable.

C2.C.3 Pre-Service Tank and Ancillary Equipment
[R 299.9615(1) and 40 CFR §264.192(d)]

The tank system is designed for operation at atmospheric pressure and will be operated as such.

C2.C.3.a Tanks
[R 299.9615(1) and 40 CFR §264.192(d)]

Each tank will be filled tested prior to use. The test will consist of filling a tank with water, holding it full for 48 hours, and inspecting for leaks on all surfaces. The water will then be transferred to the remaining tanks in 48 hour intervals and the inspection of leaks will be repeated for each tank. Results for the leak tests will be recorded.

C2.C.3(b) Piping
[R 299.9615(1) and 40 CFR §264.192(d)]

Concurrent with the leak testing for the tanks, the piping will also be leak tested. During the filling and transfer of water in each of the tanks, the piping and ancillary equipment will be inspected for leaks. As the water is being transferred through the tank system and for each 48 hour storage interval, the pipes and ancillary equipment will be inspected for leaks. This leak inspection will be repeated each time the water is transferred from tank to tank. Results for the leak test will be recorded.

C2.C.3(c) Repairs
[R 299.9615(1) and 40 CFR §264.192(d)

All repairs of detected leaks will be supervised by the inspector(s)/engineer(s) overseeing the project. Repair of detected leaks will be recorded.

C2.C.4 Ancillary Equipment Installation
[R 299.9615(1) and 40 CFR §264.192(e)]

The piping, valves, and transfer equipment will be installed to National Plumbing Code using proper industry standards materials. Non-rigid hangers and independent pipe brackets will be employed to permit settlement, expansion, and contraction without stress build-up or vibration transfer.

C2.C.5 Corrosion Protection Installation
[R 299.9615(1) and 40 CFR §264.192(f)]

The storage tanks shall be constructed of corrosion resistant stainless steel. Each tank is to be emptied yearly and inspected by an independent professional engineer. No other corrosion protection is employed.

C2.C.6 Certification of Design and Installation
[R 299.9615(1) and 40 CFR §264.192(g)]

DLD Environmental Services, Inc will maintain all written statements and certifications required under 40 CFR 264.192(g), including the requirements from 40 CFR 264.192 (b) through (f) and 40 CFR 270.11(d), in its operating record.

C2.C.7 Description of Tank System Installation
[R 299.9615(1) and 40 CFR §270.16(f)]

Tank system installation procedures will be submitted by the inspector(s)/engineer(s) overseeing the project prior to the commencement of the installation process.

C2.C.8 Tank Labels
[R 299.9615]

The new tank system will be labeled in accordance to the provisions of NFPA Standard No. 704. Examples of the labeling to be placed on the tanks are provided in Volume 1, Attachment C2-6.

C2.D SECONDARY CONTAINMENT SYSTEMS AND RELEASE DETECTION
[R 299.9615(1) and 40 CFR §264.193(a)]

C2.D.1 Secondary Containment Implementation Schedule
[R 299.9615(1) and 40 CFR §264.193(a)]

The vault area of DLS-3 was constructed prior to the installation of storage tanks and was placed in service in 1986. The vault contains three stainless steel storage tanks.

The vault area of DLS-4 was constructed prior to the installation of storage tanks and was placed in service in 1991. The vault contains three stainless steel storage tanks.

For details of the construction of the DLS-5 containment area, see Section C1.F.1(a)

C2.D.2 Secondary Containment Type and Performance Criteria
[R 299.9615(1) and 40 CFR §264.193(b)]

(Check all that apply):

☐ *Liner external to the tank*

☒ *Vault*

☐ *Double-walled tank*

☐ *Device approved by the director*

C2.D.3 Design Parameters
[R 299.9615(1) and 40 CFR §264.193(c)]

The vault for the existing tank system in the DLS-3 containment area was constructed two years prior to the promulgation of the current regulations. This containment vault was constructed using a design similar to present requirements to prevent the escape of hazardous waste. DLD Environmental Services, Inc applied for and received a variance, as allowed in 40 CFR §264.193(g).

The construction of the tank vault designated DLS-4 was started in 1990 and complies with the requirements of 40 CFR §270.16(a) through (j) and 40 CFR 264 Subpart J.

For the letters of Certification and Assessment of Capability provided by an independent professional engineer for both of the vaults, see Volume 1, Attachment C2-7.2

The construction of the DLS-5 containment area was started in 2005 and complies with the requirements of 40 CFR §270.16(a) through (j) and 40 CFR 264 Subpart J. A Certification and

Assessment of Capability provided by an independent professional engineer for for DLS-5's suitability for the proposed tanks will be obtained prior to final license approval.

C2.D.3(a) Compatibility and Strength
[R 299.9615(1) and 40 CFR §264.193(c)(1)]

The vault area of DLS-3 was constructed using 3500 psi, 4% - 6% air entrained concrete. The vault walls are 8" reinforced poured concrete and the floor is 6" reinforced concrete. The tanks sit on 6" reinforced concrete slab that was poured on top of the vault floor that has been designed to handle full tank capacity static load and single tank eccentric loads. The concrete is compatible with the materials that are most likely encountered, but, for added protection against deterioration, a two-part epoxy coating has been applied to the walls and the floor of the vault.

The DLS-4 vault was also constructed using 3500 psi, 4% - 6% air entrained concrete. Three of the walls of this vault are 8" reinforced poured concrete while the fourth wall is 12" reinforced poured concrete. The floor of the vault is 12" poured concrete with two layers of reinforcement. The floor is designed to handle full tank static load and single tank eccentric loads. The concrete is compatible with the materials that are most likely encountered, but, for added protection against deterioration, a two-part epoxy coating has been applied to the walls and the floor of the vault.

For DLS-5, See section C2.D.3, above.

C2.D.3(b) Foundation Integrity
[R 299.9615(1) and 40 CFR §264.193(c)(2)]

The foundations of both the DLS-3 & DLS-4 vaults were designed to support full tank static loads and single tank eccentric loads. Each set of tanks rests on 12" of reinforced, air entrained concrete within the vaults.

For DLS-5, See section C2.D.3, above.

C2.D.3(c) Leak Detection Capability
[R 299.9615(1) and 40 CFR §264.193(c)(3)]

Tanks and ancillary equipment are visually inspected each day of operation for potential leaks and the vaults are visually inspected each day of operation for accumulated liquids. Accumulated liquids and potential leaks are noted on the Daily Inspection Check Sheet. Accumulated liquids are removed within 24 hours of detection or at such time that site conditions allow the safe removal of the release. Potential leaks are monitored and, if determined to be a leak, will be repaired within five (5) days of detection or at such time that replacement parts are available and/or site conditions allow the safe repair of the leak(s). In addition to visual inspection, each vault contains a float device that triggers a continuous audible alarm when sufficient quantities of accumulated liquids are released into a vault containment area.

C2.D.3(d) Adequate Drainage
[R 299.9615(1) and 40 CFR §264.193(c)(4)]

The floor of each vault is sloped to blinded sumps for ease of removal of accumulated liquid during a release event. Accumulated liquids are removed within 24 hours of detection or at such time that site conditions allow the safe removal of the release.

C2.D.4 External Liner Requirements
[R 299.9615(1) and 40 CFR §264.193(e)(1)]

Not Applicable. DLD does not employ external liners for its tank system.

C2.D.5 Vault systems Requirements
[R 299.9615(1) and 40 CFR §264.193(e)(2)]

C2.D.5(a) Capacity
[R 299.9615(1) and 40 CFR §264.193(e)(2)(i)]

The vault that contains tanks #1, #2, and #3 is part of the secondary containment area of DLS-3 and has a capacity of 54,894 gallons (see Volume 1, Attachment B6-1.4). This capacity exceeds the cumulative capacity of the three (3) 5,000 tanks residing within the vault.

The vault that contains tanks #4, #5, and #6 is designated as DLS-4 and has a capacity of 17,789 gallons (see Volume 1, Attachment B6-1.5). This capacity exceeds the cumulative capacity of the three (3) 5,000 tanks residing within the vault.

The DLS-5 hazardous waste containment area has a calculated containment capacity of 41,805 gallons and is currently limited to a container storage maximum of 114,400 gallons. Following regulation 40 CFR §264.175(b)(3), this area would require a total containment capacity of 11,484 gallons (10% of the volume of containers). Thus there is easily enough excess capacity to add an additional four (4) 6,000 gallon tanks. See Volume 1, Attachments C1-5 & C1-6.

C2.D.5(b) Stormwater Control
[R 299.9615(1) and 40 CFR §264.193(e)(2)(ii)]

The top of the walls of the DLS-3 and DLS-4 vaults are at the same elevation as Storage Area DLS-3, which is elevated 26 inches above ground level. These vault areas are within a building that is enclosed on three sides, covered by a roof, and surrounded by six-inch curbing or ramps (see Volume 1, Attachments B6-1.4 and B6-1.5). Because these areas are covered, elevated, and surrounded by curbing, no run-on occurs during a storm event.

DLS-5 is enclosed on three sides and has a concrete apron sloping away from the building on the open side to ensure no run-on occurs during a storm event. (see Volume 1, Attachments B6-1.6)

C2.D.5(c) Joint Construction
[R 299.9615(1) and 40 CFR §264.193(e)(2)(iii)]

The DLS-3 vault was constructed utilizing 8” reinforced concrete walls keyed and dowelled into the 6” reinforced concrete floor slab supported on a continuously reinforced footer. Upon completion of the containment structure, after allowing proper curing time, a ½” minimum filleted caulk joint was applied around the floor/wall joint using a silicone base caulking material.

Note: The existing tank system in the DLS-3 containment area was inspected by the Michigan Department of Natural Resources and found to be out of compliance with the requirements for joint construction, 40 CFR §264.193(e)(2)(iii). Subsequent inspection of the tank system by an independent professional engineer, as required for an out-of-compliance system under 40 CFR §265.191, has shown the system to be adequately designed and capable of containing the wastes to be stored. The engineer's inspection report can be found in Volume 1, Attachment C2-7.2. Since the DLS-3 containment vault was constructed using a design similar to present requirements to prevent the escape of hazardous waste, and since the system was constructed two years prior to the regulation change requiring chemical resistant waterstops which caused the out-of-compliance condition, a variance was applied for from the MDNR, as allowed in 40 CFR §264.193(g). DLD was notified by a letter dated October 3, 1990, of approval of our secondary containment variance request. See Section C2.E for variance details.

The existing tank system in the vault designated DLS-4 was built using a neoprene “dumb-bell” waterstop at the joints in the vault (see Volume 1, Attachment B6-1.5).

C2.D.5(d) Coating or Lining for Concrete
[R 299.9615(1) and 40 CFR §264.193(e)(2)(iv)]

The floor and the side walls of tank vaults DLS-3 and DLS-4 have been coated with a two-part epoxy sealant. This coating is compatible with the materials that will be encountered in our storage tank operations.

For the DLS-5 containment area, the floor concrete was formulated using calcium stearate as a hydrophobic additive to reduce the volume of permeable voids in the concrete. For additional information regarding the formulation and properties of this concrete, see Volume 1, Section C1.F.1(a) and attachments C1-4.3 and C1-4.4

C2.D.5(e) Prevention of Vapor Formation and Ignition
[R 299.9615(1) and 40 CFR §264.193(e)(2)(v)]

Each tank is equipped with a vent system containing charcoal for the absorption of vapors before exiting the tank. This vent system is plumbed so as to require all air and vapor movement from within the tank to be passed through the charcoal preventing the formation of vapors in the vault areas. Prevention of ignition is further accomplished through the use of non-sparking, pneumatic tools and/or hand tools, and explosion-proof electrical devices. When the use of high heat, open flame, or non explosion proof electrical devices are required, the air is monitored for explosive vapors before use.

C2.D.5(f) Exterior Moisture Barrier
[R 299.9615(1) and 40 CFR §264.193(e)(2)(vi)]

Neither of the vaults at DLD or the DLS-5 containment area concrete are subject to hydraulic pressure. As a precaution, however, DLS-4 was constructed using a neoprene “dumb-bell” waterstop at the joints in the vault (see Volume 1, Attachment B6-1.5). The vault in DLS-3 was built before the current regulations and thus was not constructed using chemical resistant

waterstops.

C2.D.6 Double-walled Tank Requirements
[R 299.9615(1) and 40 CFR §264.193(e)(3)(i)]

Not Applicable. DLD does not currently employ double-walled tanks.

C2.D.7 Ancillary Equipment with Secondary Containment
[R 299.9615(1) and 40 CFR §264.193 (f)]

Ancillary equipment for DLD tank systems are all above ground, reside inside secondary containment areas, and are all visually inspected for leaks during each day of operation. Because all of the piping is above-ground and visually inspected each day of facility operation, secondary containment is not required.

Secondary containment is provided for ancillary equipment as an added precaution and relevant design parameters and performance criteria are presented in the following Sections of Volume 1 of this document: C1.F Containment; C2.A.1 Design Standards; C2.D.3 Design Parameters; and C2.D.5 Vault System Requirements.

C2.D.7(a) Secondary Containment Type and Performance Criteria
[R 299.9615(1) and 40 CFR §264.193(f)]

Not Applicable. DLD visually inspects ancillary equipment for leaks during each day of operation.

C2.D.7(b) Design Parameters
[R 299.9615(1) and 40 CFR §264.193(f)]

Not Applicable. DLD visually inspects ancillary equipment for leaks during each day of operation.

C2.D.7(c) Exempted Ancillary Equipment and Inspections
[R 299.9615(1) and 40 CFR §264.193(f)]

Not Applicable. DLD does not claim any exempt ancillary equipment.

C2.D.8 Requirements for Tank Systems That Are Not in Compliance With Secondary Containment
[R 229.9615(2)]

A variance for the DLS-3 vault area was obtained October 3, 1990 (see section C2.A.1).

C2.D.8(a) Aboveground Tanks
[R 229.9615(2)(a)]

Not Applicable. A variance for the DLS-3 vault area was obtained October 3, 1990 (see Volume 1, Section C2.A.1, C2..D.5(c), C2.E.1 and Attachment C2-7.2).

C2.D.8(b) Underground Tanks
[R 229.9615(2)(a)]

Not Applicable. DLD does not employ underground tanks.

C2.E VARIANCES FOR SECONDARY CONTAINMENT
[R 299.9615(1) and 40 CFR §264.193(g)]

(Check as appropriate)

☒ Technology-based Variance

☐ Risk-based Variance

C2.E.1 Technology-based Variance
[R 299.9615(1) and 40 CFR §264.193(g)]

The DLS-3 vault was constructed utilizing an 8" reinforced concrete wall keyed and dowelled into the 6" reinforced concrete floor slab supported on a continuously reinforced footer. More than two years after the vault was constructed, the promulgation of 40 CFR §264.193(e)(2)(iii) on or after July 14, 1986, requiring the use of chemical resistant waterstops caused the DLS-3 vault to be in non-compliance.

The non-compliance issue was resolved by applying a silicone base caulking material around the wall/floor joint, coating the interior of the vault with a xylene base sealant, and performing a hydro-static fluid pressure check to determine the potential for hazardous waste material to exit the containment structure.

On October 3, 1990, DLD received a Secondary Containment Variance Approval from the Michigan Department of Natural Resources for the tank vault located in the DLS-3 secondary containment area. This letter, the Tank System Variance Request Report by a certified, independent, professional engineer, and all supporting documents are included in Volume 1, Attachments C2-7.1 through C2-7-5.

C2.E.1(a) Nature and Quantity of Wastes
[R 299.9615(1) and 40 CFR §264.193(g)(1)(i)]

Wastes to be accumulated in the three 5,000-gallon stainless steel storage tanks are ignitable (D001) and may contain constituents that are EPA toxic (D004 through D043). These wastes will not exhibit EPA corrosivity or reactivity.

C2.E.1(b) Design and Operation

[R 299.9615(1) and 40 CFR §264.193(g)(1)(ii)]

The DLS-3 vault was constructed utilizing 8" reinforced concrete walls keyed and dowelled into the 6" reinforced concrete floor slab supported on a continuously reinforced footer. Upon completion of the containment structure and allowing proper curing time, a ½" minimum filleted caulk joint was applied around the floor/wall joint using a silicone base caulking material. The interior of containment structure was coated with a xylene base, two-part epoxy sealant. The concrete floor slab is sloped to blind collection sumps to facilitate removal of accumulated liquids.

The tanks, ancillary equipment, and containment area are inspected during each day of operation. Spills/leaks are cleaned up within 24 hours of detection or at such time that site conditions allow the safe removal of the release.

To evaluate the integrity of the joint and the potential for hazardous waste exiting the containment structure through the keyed joint in the event of a rupture or leak, a hydrostatic fluid pressure test was performed. Assuming a spill of one tank of 5,000 gallons of fluid with a specific gravity of 1.25, the fluid level in the vault would be 0.56 feet deep and exert a hydrostatic pressure on the floor at the floor/wall interface of 0.3 pounds per square inch. It is the judgement of a certified independent professional engineer that such low pressure would not force the fluid past the caulked joint and keyway prior to discovery and subsequent removal of accumulated fluid.

C2.E.1(c) Hydrogeologic Setting

[R 299.9615(1) and 40 CFR §264.193(g)(1)(iii)]

DLD has requested a waiver for the hydrogeologic report (see Volume 1, Section B3).

C2.E.1(d) Other Factors

[R 299.9615(1) and 40 CFR §264.193(g)(1)(iv)]

Not Applicable.

C2.E.1(e) Zone of Engineering Control

[R 299.9615(1) and 40 CFR §264.193(g)(3)]

The zone of engineering control for the approved variance consists of the DLS-3 containment area. The vault in DLS-3 was constructed utilizing 8" reinforced concrete walls keyed and dowelled into the 6" reinforced concrete floor slab supported on a continuously reinforced footer. A ½" minimum filleted caulk joint was applied around the floor/wall joint using a silicone base caulking material and interior of the containment structure was also coated with a two-part chemical resistant epoxy sealant. The floor is sloped to the center of the vault to blind collection sumps to facilitate removal of accumulated liquids. The slope and sumps also serve to keep accumulated liquids from coming in contact with the floor/wall joint unless sufficient quantities of liquids accumulate before daily inspection discovers the leak/spill. The elevated portion of the

DLS-3 containment area consists of a concrete floor sloped to blind collection sumps on an appropriate foundation with six (6)-inch curbing, walls, or ramps surrounding each area. As added insurance against seepage of liquid, the elevated portion of DLS-3 was sealed with a waterproof, petroleum base sealer, and the curbing has been sealed with a two-part chemical resistant epoxy sealant.

C2.E.2 Risk-Based Variance
[R 299.9615(1) and 40 CFR §264.193(g)(2)]

Not Applicable.

C2.E.3 Variance Implementation Procedures
[40 CFR §264.193(h)]

On October 3, 1990, DLD received a Secondary Containment Variance Approval from the Michigan Department of Natural Resources for the tank vault located in the DLS-3 secondary containment area. This letter, the Tank System Variance Request Report by a certified, independent, professional engineer, and all supporting documents are included in Volume 1, Attachments C2-7.1 through C2-7.5.

C2.F CONTROLS AND PRACTICES TO PREVENT SPILLS AND OVERFILLS
[R 299.9615(1) and 40 CFR §264.194(b)]

C2.F.1 Spill Prevention Controls
[R 299.9615(1) and 40 CFR §264.194(b)]

All tanks are top fill, independent, free standing, atmospheric tanks with manually operated valves. Tank valves remain in the closed position except for the tank that is in use or was last in use when pumping operations ceased for the day. Liquid transfer is accomplished with a manually operated pump. The tank system feed piping is equipped with check valves to prevent back-flow of liquid once pumping operations are discontinued.

C2.F.2 Overfill Prevention Controls
[R 299.9615(1) and 40 CFR §264.194(b)]

Each tank is equipped with a level sensor. When a tank is filled, a level sensor sounds a loud alarm for 20 seconds and activates a red light, which remains lit until the liquid level in the tank drops below the full level, that indicates which tank is full. The alarm is audible and the red light is visible to the employee operating the pneumatic pump and signals the cessation of pumping operation into that tank.

C2.F.3 Freeboard Maintenance
[R 299.9615(1) and 40 CFR §264.194(b)]

Not Applicable. DLD does not operate uncovered tanks.

C2.G INSPECTIONS

[R 299.9615(1) and 40 CFR §264.195(a)]

Inspection procedures for the tank system enumerated here are also documented in Volume 1, Section A5.

C2.G.1 Schedule and Procedures for Overfill Control System Inspections

[R 299.9615(1) and 40 CFR §264.195(a)]

Overfill control equipment, noted on the Inspection Check Sheet as High Level Alarms, are checked and recorded weekly. Operational failure of any component and remediation of the failure are noted on this sheet as well.

C2.G.2 Daily Inspections of Aboveground Portions of Tank Systems and Monitoring and Leak Detection Data

[R 299.9615(1) and 40 CFR §264.195(b)]

DLD stainless steel hazardous waste storage tanks are all installed above ground in a containment area. Tanks and tank systems are inspected for leaks or corrosion of valves, fittings, and seams each day of operation and their conditon noted on the Daily Inspection Check Sheet.

The bolts on flanged connections of the tanks, ancillary equipment, and piping are tightened and inspected for deterioration every other month.

Detection of a potential leak is noted on the Daily Inspection Check Sheet and monitored to determine if a leak exists. Monitoring and identification of leakage is performed using the Potential Equipment Leak Form, per 40 CFR §264, Subpart BB, and the Defect Detection And Repair Form, per 40 CFR §264, Subpart CC.

C2.G.3 Daily Inspection of Construction Materials, Local Areas, and Secondary Containment System for Erosion and Leakage

[R 299.9615(1) and 40 CFR §264.195(b)(3)]

Each vault is regularly inspected for signs of leaks and to ensure that there has been no loss of integrity. Any deterioration or malfunction of containment structure that an inspection reveals will be noted on the Inspection Check Sheet and remedied to ensure that the problem does not lead to a loss of free liquids to the environment. The remediation will also be noted on the Inspection Check Sheet.

C2.G.4 Inspection of Cathodic Protection Systems

[R 299.9615(1) and 40 CFR §264.195(c)]

Not Applicable. DLD does not employ cathodic protection systems.

C2.G.5 Inspection Requirements before Full Secondary Containment is Provided
[R 299.9615(1) and 40 CFR §264.193(i)]

Not Applicable. Full secondary containment has already been provided.

C2.G.6 Reporting Requirements
[R 299.9615(1) and 40 CFR §264.193(i)(4)]

The Inspection Check Sheet is reviewed weekly and entered into the DLD Operating Record (see Volume 1, Section A5).

C2.H RESPONSE TO LEAKS OR SPILLS AND DISPOSITION OF LEAKING OR UNFIT-FOR-USE TANK SYSTEMS
[R 299.9615(1) and 40 CFR §264.196]

C2.H.1 Response Actions for Leaks and Spills
[R 299.9615(1) and 40 CFR §264.196(a)]

See Volume 1, Section A7.

C2.H.1(a) Waste Flow Stoppage
[R 299.9615(1) and 40 CFR §264.196(a)]

See Volume 1, Section A7.

C2.H.1(b) Waste Removal
[R 299.9615(1) and 40 CFR §264.196(b)]

See Volume 1, Section A7.

C2.H.1(c) Visible Release Containment
[R 299.9615(1) and 40 CFR §264.196(c)]

See Volume 1, Section A7.

C2.H.1(d) Repair, Replacement, or Closure
[R 299.9615(1) and 40 CFR §264.196(e)]

See Volume 1, Section A7.

C2.H.1(e) Certification of Major Repairs
[R 299.9615(1) and 40 CFR §264.196(f)]

See Volume 1, Section A7.

C2.H.2 Required Notifications and Reports
[R 299.9615(1) and 40 CFR §264.194(d)]

See Volume 1, Section A7.

C2.I CLOSURE AND POST CLOSURE REQUIREMENTS
[R 299.9615(1) and 40 CFR §270.14(b)]

(Check as appropriate)

☒ Category A - *where decontamination is practical and secondary containment is provided*

☐ Category B - *where decontamination or removal is not practical and where secondary containment is provided and tank system will be closed as a landfill*

☐ Category C - *where decontamination is practical and where secondary containment is not provided*

☐ Category D - *where decontamination or removal is not practical, and where secondary containment is not provided, and tank system will be closed as a landfill*

C2.I.1 Category A
[R 299.9615(1) and 40 CFR §264.197]

C2.I.1(a) Closure Plan
[40 CFR §264.112, except 264.112(d)(1)]

See Volume 1, Section A11, Closure and Postclosure Plan.

C2.I.1(b) Closure Activities
[40 CFR §264.111 through 114 and R 299.9613(3)]

See Volume 1, Section A11, Closure and Postclosure Plan.

C2.I.1(c) Cost Estimate for Closure
[R 299.9702 and 40 CFR §264.142]

See Volume 1, Section A12 Closure and Postclosure Cost Estimates.

C2.I.1(d) Financial Assurance for Closure
[R 299.9703 and 40 CFR §264.143]

See Volume 1, Section A15.

C2.I.2 Category B
[R 299.9615(1) and 40 CFR §264.197]

Not Applicable.

C2.I.3 Category C
[R 299.9615(1) and 40 CFR §264.197]

Not Applicable.

C2.I.4 Category D
[R 299.9615(1) and 40 CFR §264.197]

Not Applicable.

C2.J SPECIAL REQUIREMENTS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTES
[R 299.9615(1) and 40 CFR §270.16(j)]

Since the tank system at DLD is intended to store ignitable wastes, special consideration is given to prevent conditions which may cause the waste to ignite. Reactive wastes, as defined by 40 CFR §261.23(a), are not stored or treated in the tank system.

C2.J.1 Ignitable or Reactive Wastes Precautions
[R 299.9615(1) and 40 CFR §264.198]

The primary function of the tank system at DLD is to store ignitable wastes so appropriate safeguards are implemented to prevent conditions that may cause ignition of the waste. These precautions include employing LED lighting fixtures rated to at least an IP67 standard or explosion

proof lighting, as nececary and electrical fixtures in the processing area; no other source of electricity in the immediate area of the tanks; a facility designed using open air ventillation of the area; each tank being fitted with carbon absorption filters to prevent the escape of fugitive emissions; and the posting of “No Smoking” signs.

The tank system is not intended for the storage or treatment of reactive wastes, as defined by 40 CFR §261.23(a). DLD stores reactive wastes in intermediate bulk containers (IBC’s), if appropriate, or in quantities of 55 gallons or less. Reactive wastes are treated in quantites of 55 gallons or less and rendered non-reactive prior to being added to any tank.

C2.J.2 Distance Requirements for Ignitable or Reactive Wastes
[R 299.9615(1) and 40 CFR §264.198(a) and (b)]

The required buffer zone between the property lines and tanks containing ignitable liquids recommended by the National Fire Protection Association’s “Flammable and Combustible Liquids Code” is one-half the diameter of the tank. In addition, 40 CFR §264.176 and 40 CFR §265.176 require that ignitable waste be stored at least 50 feet from property lines. DLD meets these requirements for all hazardous waste containment areas. (See Volume1, Attachment A1-1)

C2.J.3 Incompatible Wastes
[R 299.9615(1) and 40 CFR §264.199]

The addition of incompatible materials or dissimilar waste types does not occur because of the commingling process (see Volume 1, Section C2.A.5, Characteristics of Waste and Volume 1, Section C4.B). Commingling, which is done in a smaller container before being added to a tank, results in a waste that is similar to and compatible with the residual tankage.

Should occasion arise that a hazardous waste that is incompatible with residual tankage require storage in a tank, that tank will be decontaminated prior to liquid transfer.

C2: TANKS - INDEX OF ATTACHMENTS

(VOLUME 1)

ATTACHMENT **DESCRIPTION**

C2-1 **Drawing M301, Blueprint 2009-410 M-301.dwg**
Storage Tank Piping Diagram (Dimensioned, Tanks #1 - #6)

C2-2.1 **Drawing M302, Blueprint 2009-410 M-301.dwg**
Storage Tank Piping Diagram (Labeled, Tanks #1 - #6)

C2-2.2 **Drawing M311, Blueprint M-311.dwg**
Storage Tank Vent Piping Diagram (Tanks #1 - #3)

C2-2.3 **Drawing M312, Blueprint M-312.dwg**
Storage Tank Vent Piping Diagram (Tanks #4 - #6)

C2-2.4 **Drawing M313, Blueprint M-313.dwg**
Storage Tank Vent Piping List

C2-3 **Drawing M308, Blueprint 2009-410 M-308.dwg**
Storage Tank Piping Lists (Existing Tank Farm & New Tank Farm)

Tank Analytical Reports

C2-4.1 Tank Analytical Report
C2-4.2 Tank Analytical Report
C2-4.3 Tank Analytical Report
C2-4.4 Tank Analytical Report

Tank Inspection Reports

C2-5.1 Tank #1 Inspection Report
C2-5.2 Tank #2 Inspection Report
C2-5.3 Tank #3 Inspection Report
C2-5.4 Tank #4 Inspection Report
C2-5.5 Tank #5 Inspection Report
C2-5.6 Tank #6 Inspection Report

C2-6 NFPA Markings on Tanks

Tank Vault Variance Correspondence and Approval

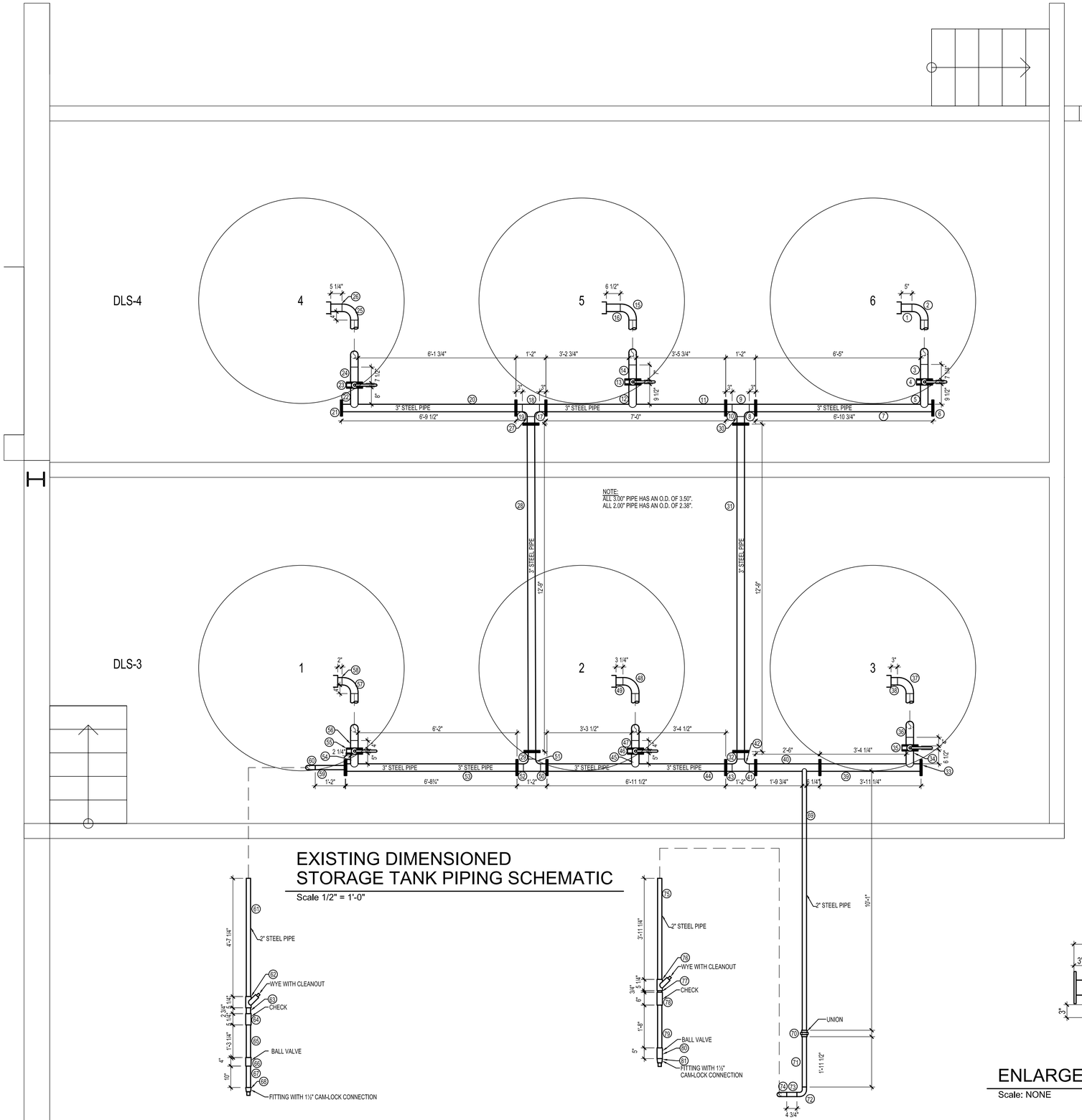
C2-7.1 Variance Correspondence (July 13, 1990)

C2-7.2 Variance Correspondence (March 16, 1990)

C2-7.3 Variance Correspondence (May 1, 1990)

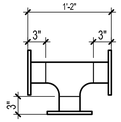
C2-7.4 Variance Approval (October 3, 1990)

C2-7.5 Variance Correspondence (May 25, 1990)



EXISTING DIMENSIONED STORAGE TANK PIPING SCHEMATIC

Scale 1/2" = 1'-0"



ENLARGED TEE - JOINT (TYP.)

Scale: NONE

Drug & Laboratory Disposal

Phase 3 - Tank Storage
Broad Street
Plainwell, Michigan 49080

E2W ENGINEERING
161 East Michigan Ave
Suite 200
Kalamazoo, MI 49007
PHONE: (269) 373-8000
FAX: (269) 373-5641
E2W JOB # 2008-145

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01/29/10 FOR STATE SUBMITTAL

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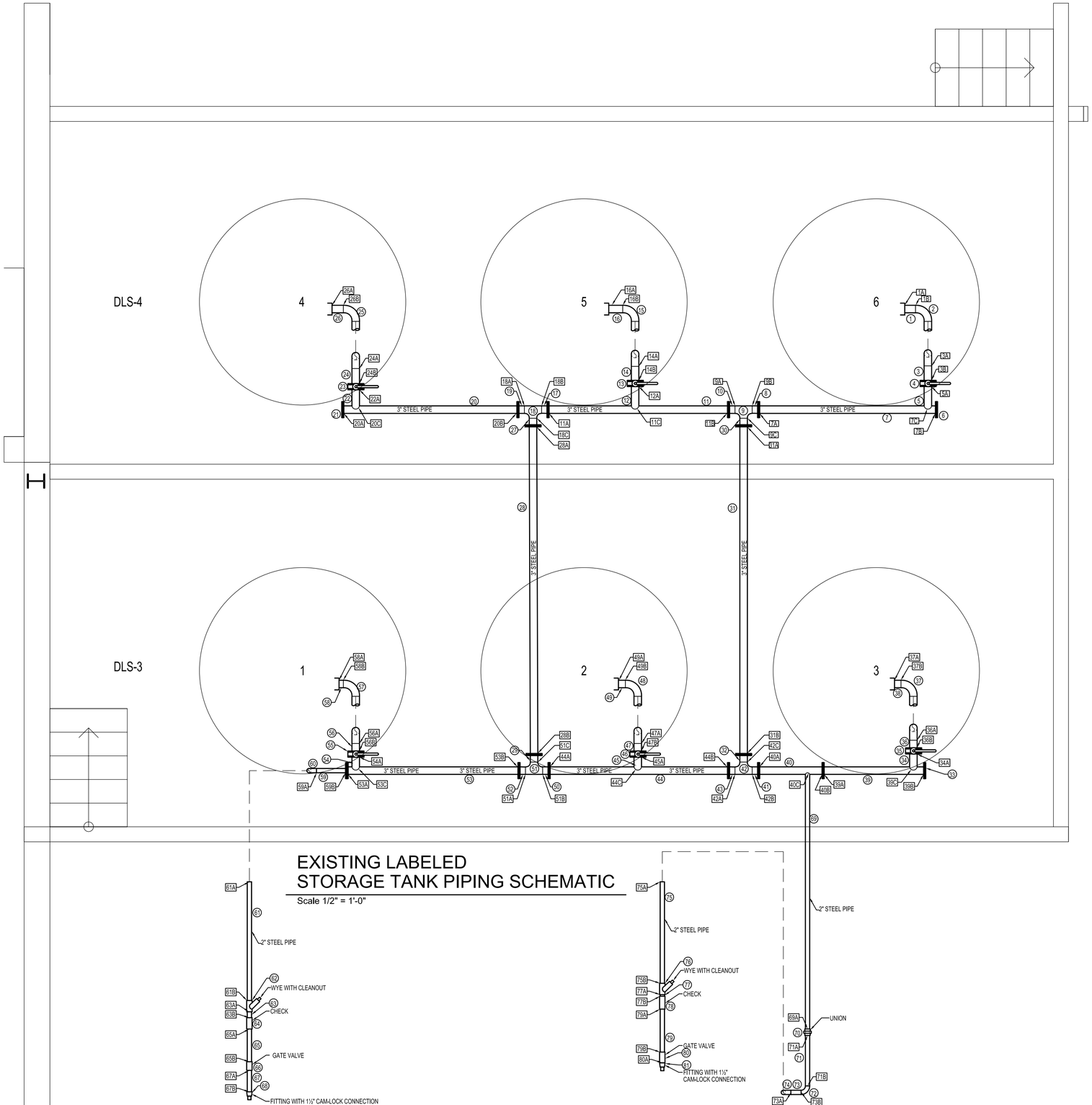
ARCHITECTURE
ENGINEERING
INTERIOR DESIGN
8175 Creekside Drive, Ste. 220
Portage, Michigan 49024
ph: 269-321-5151
www.boscharch.com

JOB NUMBER
09024

PHASE 3
EXISTING
STORAGE TANK
PIPING PLAN

M301

2009-410 M-301.dwg



EXISTING LABELED STORAGE TANK PIPING SCHEMATIC

Scale 1/2" = 1'-0"

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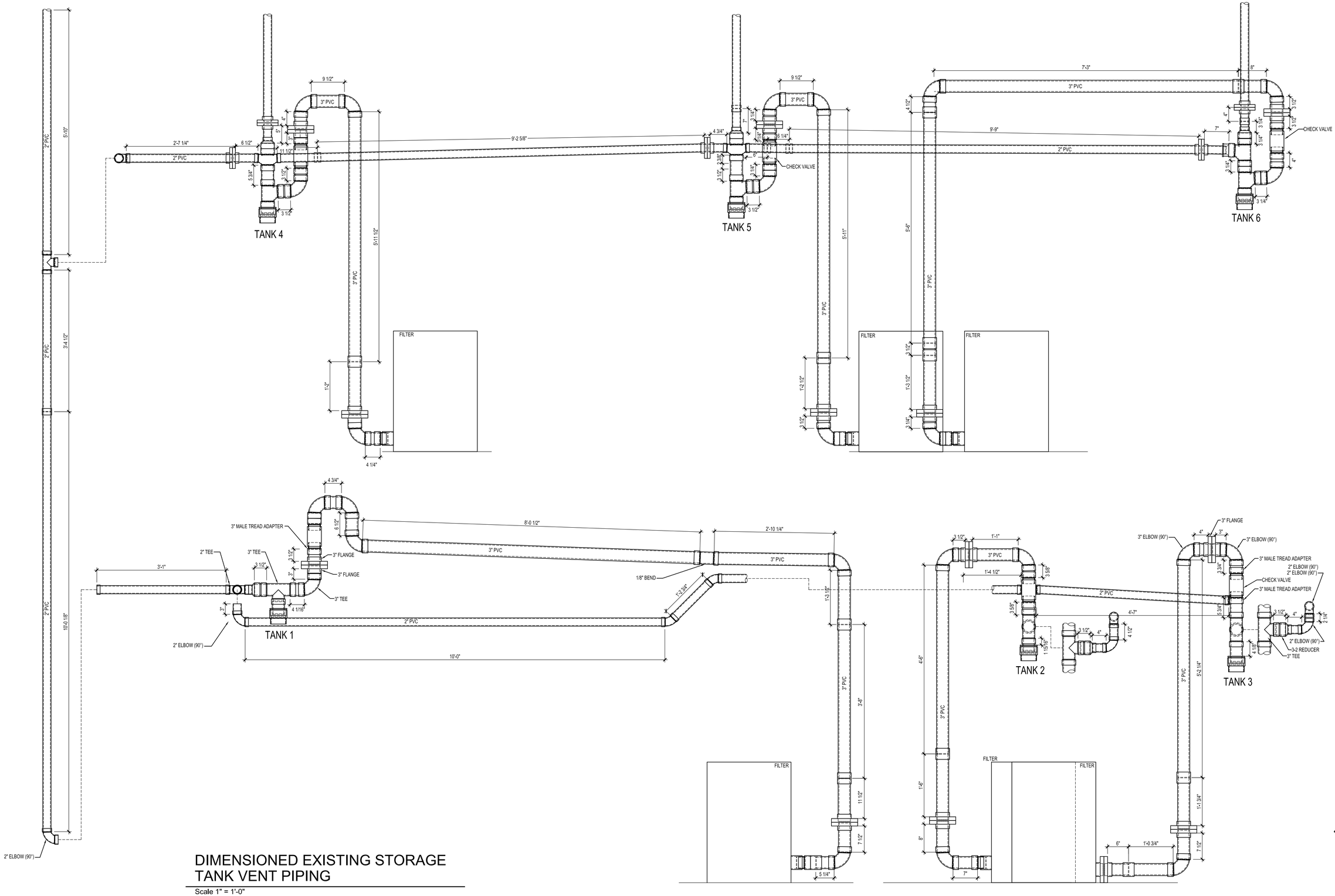
JOB NUMBER
09024

PHASE 3
EXISTING
STORAGE TANK
PIPING PLAN

M302

2009-410 M-302.dwg



DIMENSIONED EXISTING STORAGE TANK VENT PIPING

Scale 1" = 1'-0"

Drug & Laboratory Disposal

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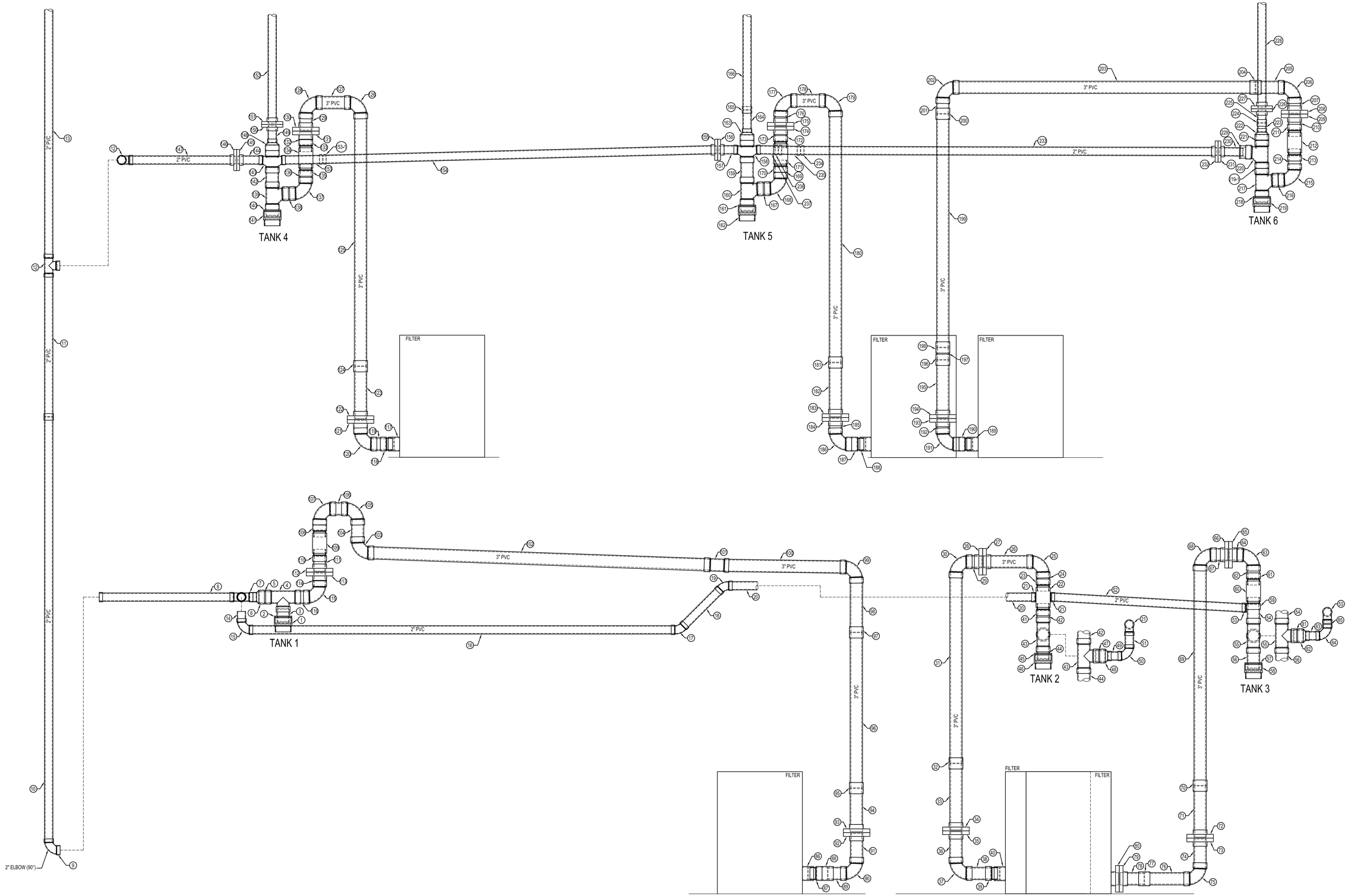
JOB NUMBER
09024C

PHASE 3
EXISTING
STORAGE TANK
VENT PIPING

M311

M311.dwg



LABELED EXISTING STORAGE TANK VENT PIPING

Scale 1" = 1'-0"

Drug & Laboratory Disposal

Phase 3 - Tank Storage

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JOB NUMBER
09024C

PHASE 3
EXISTING
STORAGE TANK
VENT PIPING

M312

M312.dwg

STORAGE TANK FARM #1 (EXISTING)

PIPE NUMBER	PIPE SIZE	PIPE LENGTH	JOINT #	PIPE END	JOINT #	PIPE END	JOINT #	PIPE END	COMMENTS
1		MALE ADAPTER							
2	3"	FLUSH BUSHING							
3	3"	3-7/16"	3A	GLUE	3B	GLUE			
4	3"	TEE							
5	3"	3-5/16"	5A	GLUE	5B	GLUE			
6	3" TO 2"	REDUCER							
7	2"	TEE							
8	2"	3' 1-11/16"	8A	GLUE	8B	GLUE			
9	2"	90° ELBOW							
10	2"	10"	10A	GLUE	10B	GLUE			
11	2"	3'-4¼"	11A	GLUE	11B	GLUE			
12	2"	TEE							
13	2"	-	13A	GLUE					
14	2"	2-7/8"	14A	GLUE	14B	GLUE			
15	2"	90° ELBOW							
16	2"	9'-11 7/8"	16A	GLUE	16B	GLUE			
17	2"	EITHTH BEND							
18	2"	1'-2 5/8"	18A	GLUE	18B	GLUE			
19	2"	EITHTH BEND							
20	2"	1'-4½"	20A	GLUE	20B	GLUE			
21	2"	TEE							
22	3"	CHECK VALVE	22A	THREAD	22B	THREAD			
23	3"	MALE ADAPTER							
24	3"	3-5/16"	24A	GLUE	24B	GLUE			
25	3"	90° ELBOW							
26	3"	1'-1½"	26A	GLUE	26B	GLUE			
27	3"	FLANGE	27A	BOLT					
28	3"	FLANGE							
29	3"	4-3/16"	29A	GLUE	29B	GLUE			
30	3"	90° ELBOW							
31	3"	4'-5 13/16"	31A	GLUE	31B	GLUE			
32	3'	COUPLER							
33	3"	1'-6½"	33A	GLUE	33B	GLUE			
34	3"	FLANGE	34A	BOLT					
35	3"	FLANGE							
36	3"	8½"	36A	GLUE	36B	GLUE			
37	3"	90° ELBOW							
38	3"	6½"	38A	GLUE	38A	GLUE			
39	3"	MALE ADAPTER	39A	THREAD					
40	3"	COUPLER							
41	3"	MALE ADAPTER							
42	3"	3-3/8"	42A	GLUE	42B	GLUE			
43	3"	TEE							
44	3"	3-3/8"	44A	GLUE	44B	GLUE			
45	3" TO 4"	FLUSH BUSHING	45A	GLUE	45B	GLUE			
46	4"	MALE ADAPTER							
47	3"	2-9/16"	47A	GLUE	47B	GLUE			
48	3" TO 2"	REDUCER							
49	2"	3-11/16"	49A	GLUE	49B	GLUE			
50	2"	90° ELBOW							
51	2"	4-3/16"	51A	GLUE	51B	GLUE			
52	2"	4'-6½"	52A	GLUE	52B	GLUE			
53	2"	90° ELBOW							
54	3"	5½"	54A	GLUE	52B	GLUE			
55	3"	TEE							
56	3"	5-11/16"	56A	GLUE	56B	GLUE			
57	3" TO 4"	FLUSH BUSHING	57A	GLUE	57B	GLUE			
58	4"	MALE ADAPTER							
59	3"	MALE ADAPTER							
60	3"	CHECK VALVE	60A	THREAD	60B	THREAD			
61	3"	MALE ADAPTER							
62	3"	3½"	62A	GLUE	62B	GLUE			
63	3"	90° ELBOW							
64	3"	3-11/16"	64A	GLUE	64B	GLUE			
65	3"	FLANGE	65A	BOLT					
66	3"	FLANGE							
67	3"	4½"	67A	GLUE	67B	GLUE			
68	3"	90° ELBOW							
69	3"	5'-2 1/16"	69A	GLUE	69B	GLUE			
70	3"	COUPLER							
71	3"	1'-2½"	71A	GLUE	71B	GLUE			
72	3"	FLANGE	72A	BOLT					
73	3"	FLANGE							
74	3"	8-3/16"	74A	GLUE	74B	GLUE			
75	3"	90° ELBOW							
76	3"	1'-9/16"	76A	GLUE	76B	GLUE			
77	3"	COUPLER							
78	3"	6½"	78A	GLUE	78B	GLUE			
79	3"	FLANGE	79A	BOLT					
80	3"	FLANGE							
81	3"	2-9/16"	81A	GLUE	81B	GLUE			
82	3" to 2"	REDUCER							
83	2"	3-11/16"	83A	GLUE	83B	GLUE			
84	2"	90° ELBOW							
85	2"	1-7/8"	85A	GLUE	85B	GLUE			
86	3"	COUPLER							
87	3"	MALE ADAPTER	87A	THREAD					
88	3"	COUPLER							
89	3"	5"	89A	GLUE	89B	GLUE			
90	3"	90° ELBOW							
91	3"	8½"	91A	GLUE	91B	GLUE			
92	3"	FLANGE	92A	BOLT					
93	3"	FLANGE							
94	3"	1'-½"	94A	GLUE	94B	GLUE			
95	3"	COUPLER							
96	3"	3'-7 13/16"	96A	GLUE	96B	GLUE			
97	3"	COUPLER							
98	3"	1'-3 5/16"	98A	GLUE	98B	GLUE			
99	3"	90° ELBOW							
100	3"	2'-10 1/16"	100A	GLUE	100B	GLUE			
101	3"	EITHTH BEND							
102	3"	8'-5/16"	102A	GLUE	102B	GLUE			
103	3"	90° ELBOW							
104	3"	6-5/16"	104A	GLUE	104B	GLUE			
105	3"	90° ELBOW							
106	3"	4-9/16"	106A	GLUE	106B	GLUE			
107	3"	90° ELBOW							
108	3"	MALE ADAPTER	108A	GLUE					
109	3"	CHECK VALVE	109A	THREAD	109B	THREAD			
110	3"	MALE ADAPTER							
111	3"	4½"	111A	GLUE	111B	GLUE			
112	3"	FLANGE	112A	BOLT					
113	3"	FLANGE							
114	3"	5-11/16"	114A	GLUE	114B	GLUE			
115	3"	90° ELBOW							
116	3"	3-13/16"	116A	GLUE	116B	GLUE			
117	3"	COUPLER							
118	3"	MALE ADAPTER	118A	THREAD					
119	3"	4"	119A	GLUE	119B	GLUE			
120	3"	90° ELBOW	120A	GLUE					
121	3"	FLANGE	121A	BOLT					
122	3"	FLANGE							
123	3"	1'-2 11/16"	123A	GLUE	123B	GLUE			
124	3"	COUPLER							
125	3"	5'-11 5/16"	125A	GLUE	125B	GLUE			
126	3"	90° ELBOW							
127	3"	9-5/16"	127A	GLUE	127B	GLUE			
128	3"	90° ELBOW							
129	3"	4-11/16"	127A	GLUE	127B	GLUE			
130	3"	FLANGE	130A	BOLT					
131	3"	FLANGE							
132	3"	3-11/16"	132A	GLUE	132B	GLUE			
133	3"	MALE ADAPTER							
134	3"	CHECK VALVE	134A	THREAD	134B	THREAD			
135	3"	MALE ADAPTER							
136	3"	3-5/16"	136A	GLUE	136B	GLUE			
137	3"	90° ELBOW							
138	3"	3-3/8"	138A	GLUE	138B	GLUE			
139	3"	TEE							
140	3" TO 4"	FLUSH BUSHING	140A	GLUE	140B	GLUE			
141	4"	MALE ADAPTER							
142	3"	5-9/16"	142A	GLUE	142B	GLUE			
143	3"-3"-3"-2"-2"	TEE							
144	2"	6-13/16"	144A	GLUE	144B	GLUE			
145	2"	FLANGE	145A	BOLT					
146	2"	FLANGE							
147	2"	2'-5 11/16"	147A	GLUE	147B	GLUE			
148	3" TO 2"	REDUCER	148A	GLUE					
149	2"	4-5/8"	149A	GLUE	149B	GLUE			
150	2"	FLANGE	150A	BOLT					
151	2"	FLANGE							
152	2"	-	152A	GLUE					
153	2"	11-3/8"	153A	GLUE	153B	GLUE			
153-1	2"	COUPLER							
154	2"	9'-3 1/16"	154A	GLUE	154B	GLUE			
155	2"	FLANGE	155A	BOLT					
156	2"	FLANGE							
157	2"	5-1/8"	157A	GLUE	157B	GLUE			
158	3"-3"-2"-2"	TEE							
159	3"	7-1/16"	159A	GLUE	159B	GLUE			
160	3"	TEE							
161	3" TO 4"	FLUSH BUSHING	161A	GLUE	161B	GLUE			
162	4"	MALE ADAPTER							
163	3" TO 2"	REDUCER	163A	GLUE					
164	2"	6-1/8"	164A	GLUE	164B	GLUE			
165	2"	COUPLER							
166	2"	-	166A	GLUE					
167	3"	3-3/8"	167A	GLUE	167B	GLUE			
168	3"	90° ELBOW							
169	3"	3-1/16"	169A	GLUE	169B	GLUE			
170	3"	MALE ADAPTER							
171	3"	CHECK VALVE	171A	THREAD	171B	THREAD			
172	3"	MALE ADAPTER							
173	3"	3-7/8"	173A	GLUE	173B	GLUE			
174	3"	FLANGE	174A	BOLT					
175	3"	FLANGE							
176	3"	3-15/16"	176A	GLUE	176B	GLUE			
177	3"	90° ELBOW							
178	3"	9-5/16"	178A	GLUE	178B	GLUE			
179	3"	90° ELBOW							
180	3"	5'-10 13/16"	180A	GLUE	180B	GLUE			
181	3"	COUPLER							
182	3"	1'-3½"	182A	GLUE	182B	GLUE			
183	3"	FLANGE	183A	BOLT					
184	3"	FLANGE							
185	3"	4-3/16"	185A	GLUE	185B	GLUE			
186	3"	90° ELBOW							
187	3"	MALE ADAPTER	187A	GLUE	187B	THREAD			
188	3"	COUPLER							
189	3"	COUPLER							
190	3"	MALE ADAPTER							
191	3"	90° ELBOW							
192	3"	3-15/16"	192A	GLUE	192B	GLUE			
193	3"	FLANGE	193A	BOLT					
194	3"	FLANGE							
195	3"	1'-4¼"	195A	GLUE	195B	GLUE			
196	3"	COUPLER							
197	3"	3-5/16"	197A	GLUE	197B	GLUE			
198	3"	COUPLER							
199	3"	5'-5 13/16"	199A	GLUE	199B	GLUE			
200	3"	COUPLER							
201	3"	4-5/16"	201A	GLUE	201B	GLUE			
202	3"	90° ELBOW							
203	3"	7'-1 1/8"	203A	GLUE	203B	GLUE			
204	3"	COUPLER							
205	3"	7-13/16"	205A	GLUE	205B	GLUE			
206	3"	90° ELBOW							
207	3"	4-3/16"	207A	GLUE	207B	GLUE			
208	3"	FLANGE	208A	BOLT					
209	3"	FLANGE							
210	3"	4-3/16"	210A	GLUE	210B	GLUE			
211	3"	MALE ADAPTER							
212	3"	CHECK VALVE	212A	THREAD	212B	THREAD			
213	3"	MALE ADAPTER							
214	3"	3-13/16"	214A	GLUE	214B	GLUE			
215	3"	90° ELBOW							
216	3"	3-1/8"	216A	GLUE	216B	GLUE			
217	3"	TEE							
218	3" TO 4"	FLUSH BUSHING	218A	GLUE	218B	GLUE			
219	4"	MALE ADAPTER							
219-1	3"	3-1/16"	219-1A	GLUE	219-1B	GLUE			
220	3"	TEE							
221	3"	3-1/8"	221A	GLUE	221B	GLUE			
222	3" TO 2"	REDUCER	222A	GLUE					
223	2"	2-3/8"	223A	GLUE	223B	GLUE			
224	2"	COUPLER							
225	2"	3-9/16"	225A	GLUE	225B	GLUE			
226	2"	FLANGE	226A	BOLT					
227	227	FLANGE							
228	2"	-	228A	GLUE					
229	3" TO 2"	FLUSH BUSHING	229A	GLUE					
230	2"	6-9/16"	230A	GLUE	230B	GLUE			
231	2"	FLANGE	231A	BOLT					
232	2"	FLANGE							
233	2"	9'-9 3/8"	233A	GLUE	233B	GLUE			
234	2"	COUPLER							
235	2"	6-1/8"	235A	GLUE	235B	GLUE			
236	2"	COUPLER							
237	2"	5-15/16"	237A	GLUE	237B	GLUE			

Drug & Laboratory Disposal

Phase 3 - Tank Storage

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E2W JOB # 2008-145

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09024C

PHASE 3
EXISTING STORAGE
TANK VENT PIPING
PARTS LIST

M313

M313.dwg

STORAGE TANK FARM #1 (EXISTING)

PIPE NUMBER	PIPE SIZE	PIPE LENGTH	JOINT #	PIPE END	JOINT #	PIPE END	JOINT #	PIPE END	COMMENTS
1	3"	5"	1A	THREAD	1B	WELD			CONNECTS TO TANK
2	3"	90 BEND	1B	WELD	3A	WELD			
3	3"	7 1/4"	3A	WELD	3B	FLANGE			
4	3"	VALVE	3B	FLANGE	5A	FLANGE			
5	3"	9 1/2"	5A	FLANGE	7C	WELD			
6	3"	BLIND FLANGE	7B	FLANGE					END OF LINE CLEAN OUT
7	3"	6'-10 3/4"	7A	FLANGE	7B	FLANGE	7C	WELD	PIPE #5 IS WELDED TO PIPE SEE SCHEMATIC
8	3"	3"	7A	FLANGE	9B	WELD			
9	3"	TEE	9A	WELD	9B	WELD	9C	WELD	PIPE #30 IS WELDED AS A BRANCH TO PIPE. SEE SCHEMATIC
10	3"	3"	9A	WELD	11B	FLANGE			
11	3"	7'	11A	FLANGE	11B	FLANGE	11C	WELD	PIPE #12 IS WELDED TO PIPE SEE SCHEMATIC
12	3"	9-1/2"	11C	WELD	12A	FLANGE			
13	3"	VALVE	12A	FLANGE	14B	FLANGE			
14	3"	7"	14B	FLANGE	14A	WELD			
15	3"	90 BEND	14A	WELD	1B	WELD			
16	3"	6 1/2"	1B	WELD	1A	THREAD			CONNECTS TO TANK
17	3"	3"	11A	FLANGE	18B	WELD			
18	3"	TEE	18A	WELD	18B	WELD	18C	WELD	PIPE #27 IS WELDED AS A BRANCH TO PIPE. SEE SCHEMATIC.
19	3"	3"	18A	WELD	20B	FLANGE			
20	3"	6'-9 1/2"	20B	FLANGE	20A	FLANGE	20C	WELD	PIPE #22 IS WELDED TO PIPE. SEE SCHEMATIC.
21	3"	BLIND FLANGE	20A	FLANGE					END OF LINE CLEAN OUT
22	3"	8"	20C	WELD	22A	FLANGE			
23	3"	VALVE	22A	FLANGE	24B	FLANGE			
24	3"	7 1/2"	24B	FLANGE	24A	WELD			
25	3"	90 BEND	24A	WELD	26B	WELD			
26	3"	5 1/4"	26B	WELD	26A	THREAD			CONNECTS TO TANK
27	3"	3"	18C	WELD	28A	FLANGE			
28	3"	12'-9"	28A	FLANGE	28B	FLANGE			
29	3"	3"	28B	FLANGE	51C	WELD			
30	3"	3"	9C	WELD	31A	FLANGE			
31	3"	12'-9"	31A	FLANGE	31B	FLANGE			
32	3"	3"	31B	FLANGE	9C	WELD			
33	3"	BLIND FLANGE	39B	FLANGE					END OF LINE CLEAN OUT
34	3"	6 1/2"	39C	WELD	34A	FLANGE			
35	3"	VALVE	34A	FLANGE	36B	FLANGE			
36	3"	4"	36B	FLANGE	36A	WELD			
37	3"	90 BEND	36A	WELD	37B	WELD			
38	3"	3"	37B	WELD	37A	THREAD			CONNECTS TO TANK
39	3"	3'-11 1/4"	39B	FLANGE	39A	FLANGE	39C	WELD	PIPE #34 IS WELDED TO PIPE. SEE SCHEMATIC.
40	3"	2' 6"	40B	FLANGE	40A	FLANGE	40C	WELD	PIPE #69 IS WELDED TO PIPE. SEE SCHEMATIC.
41	3"	3"	42B	WELD	40A	FLANGE			
42	3"	TEE	42A	WELD	42B	WELD	42C	WELD	PIPE #32 IS WELDED AS A BRANCH TO PIPE. SEE SCHEMATIC.
43	3"	3"	42A	WELD	44B	FLANGE			
44	3"	6'-11 1/2"	44B	FLANGE	44A	FLANGE	44C	WELD	PIPE #45 IS WELDED TO PIPE. SEE SCHEMATIC.
45	3"	5"	44C	WELD	45A	FLANGE			
46	3"	VALVE	45A	FLANGE	47B	FLANGE			
47	3"	4"	47B	FLANGE	47A	WELD			
48	3"	90 BEND	47A	WELD	49B	WELD			
49	3"	3 1/4"	49B	WELD	49A	THREAD			CONNECTS TO TANK
50	3"	3"	51B	WELD	44A	FLANGE			
51	3"	TEE	51A	WELD	51B	WELD	51C	WELD	PIPE #29 IS WELDED AS A BRANCH TO PIPE. SEE SCHEMATIC.
52	3"	3"	51A	WELD	53B	FLANGE			
53	3"	6'-8 3/4""	53B	FLANGE	53A	FLANGE	53C	WELD	
54	3"	5"	53C	WELD	54A	FLANGE			
55	3"	VALVE	54A	FLANGE	56B	FLANGE			
56	3"	4'	56B	FLANGE	56A	WELD			
57	3"	90 BEND	56A	WELD	58B	WELD			
58	3'	2"	58B	WELD	58A	THREAD			CONNECTS TO TANK
59	2"	1'-2"	59B	FLANGE	59A	THREAD			
60	2"	20"	59A	THREAD	61A	THREAD			
61	2"	4'-7 1/4"	61A	THREAD	61B	THREAD			
62	2"	WYE W/ CO	61B	THREAD	63A	THREAD			
63	2"	2 3/4"	63A	THREAD	63B	THREAD			
64	2"	VALVE	63B	THREAD	65A	THREAD			
65	2"	1'-3 1/4"	65A	THREAD	65B	THREAD			
66	2"	VALVE	65B	THREAD	67A	THREAD			
67	2"	10"	67A	THREAD	67B	THREAD			
68	2"	CAM-LOCK	67B	THREAD					
69	2"	121 1/2"	40C	WELD	69A	THREAD			
70	2"	UNION	69A	THREAD	71A	THREAD			
71	2"	1'-11 1/2"	71A	THREAD	71B	THREAD			
72	2"	90 BEND	71B	THREAD	73A	THREAD			
73	2"	4 3/4"	73A	THREAD	73B	THREAD			
74	2"	90 BEND	73B	THREAD	75A	THREAD			
75	2"	3'-11 1/4"	75A	THREAD	75B	THREAD			
76	2"	WYE W/ CO	75B	THREAD	77A	THREAD			
77	2"	3/4"	77A	THREAD	77B	THREAD			
78	2"	VALVE	77B	THREAD	79A	THREAD			
79	2"	20"	79A	THREAD	79B	THREAD			
80	2"	VALVE	79B	THREAD	80A	THREAD			
81	2"	CAM-LOCK	80A	THREAD					

STORAGE TANK FARM #2 (NEW)

PIPE NUMBER	PIPE SIZE	PIPE LENGTH	JOINT #	PIPE END	JOINT #	PIPE END	JOINT #	PIPE END	COMMENTS	249	3"	8"	249A	WELD	249B	WELD			SOCKET FLANGES WELDED ON ENDS
82	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	250	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
83	3"	10-1"	83A	WELD	83B	WELD			SOCKET FLANGES WELDED ON ENDS	251	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
84	3"	3'-2.75"	84A	WELD	84B	WELD			SOCKET FLANGES WELDED ON ENDS	252	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)
85	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	253	3"	3'-6.75"	253A	WELD	253B	WELD			SOCKET FLANGES WELDED ON ENDS
86	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	254	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
87	3"	10-1"	87A	WELD	87B	WELD			SOCKET FLANGES WELDED ON ENDS	255	3"	1'-11.75"	255A	WELD	255B	WELD			SOCKET FLANGES WELDED ON ENDS
88	3"	10-1"	88A	WELD	88B	WELD			SOCKET FLANGES WELDED ON ENDS	256	3"	10'-1"	256A	WELD	256B	WELD			SOCKET FLANGES WELDED ON ENDS
89	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	257	3"	8"	257A	WELD	257B	WELD			SOCKET FLANGES WELDED ON ENDS
90	3"	3'-6.75"	90A	WELD	90B	WELD			SOCKET FLANGES WELDED ON ENDS	258	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
91	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	259	3"	10'-1"	259A	WELD	259B	WELD			SOCKET FLANGES WELDED ON ENDS
92	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	260	3"	8"	260A	WELD	260B	WELD			SOCKET FLANGES WELDED ON ENDS
93	3"	6'-5.5"	93A	WELD	93B	WELD			SOCKET FLANGES WELDED ON ENDS	261	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
94	3"	5'-10.25"	94A	WELD	94B	WELD			SOCKET FLANGES WELDED ON ENDS	262	3"	BLIND FLANGE							SOCKET FLANGES WELDED ON ENDS
95	3"	10'-1"	95A	WELD	95B	WELD			SOCKET FLANGES WELDED ON ENDS	263	3"	1'-11.75"	263A	WELD	263B	WELD			SOCKET FLANGES WELDED ON ENDS
96	3"	10'-1"	96A	WELD	96B	WELD			SOCKET FLANGES WELDED ON ENDS	264	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
97	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	265	3"	10'-1"	265A	WELD	265B	WELD			SOCKET FLANGES WELDED ON ENDS
98	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	266	3"	8"	266A	WELD	266B	WELD			SOCKET FLANGES WELDED ON ENDS
99	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	267	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
100	3"	7'-11"	100A	WELD	100B	WELD			SOCKET FLANGES WELDED ON ENDS	268	3"	10'-1"	268A	WELD	268B	WELD			SOCKET FLANGES WELDED ON ENDS
101	3"	5'-5.75"	101A	WELD	101B	WELD			SOCKET FLANGES WELDED ON ENDS	269	3"	8"	269A	WELD	269B	WELD			SOCKET FLANGES WELDED ON ENDS
102	3"	7'-11"	102A	WELD	102B	WELD			SOCKET FLANGES WELDED ON ENDS	270	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)
103	3"	10-1"	103A	WELD	103B	WELD			SOCKET FLANGES WELDED ON ENDS	271	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
104	3"	10-1"	104A	WELD	104B	WELD			SOCKET FLANGES WELDED ON ENDS	272	3"	5'-11.75"	272A	WELD	272B	WELD			SOCKET FLANGES WELDED ON ENDS
105	3"	10-1"	105A	WELD	105B	WELD			SOCKET FLANGES WELDED ON ENDS	273	3"	3'-6.75"	273A	WELD	273B	WELD			SOCKET FLANGES WELDED ON ENDS
106	3"	1'-8.5"	106A	WELD	106B	WELD			SOCKET FLANGES WELDED ON ENDS	274	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
107	3"	11.5"	107A	WELD	107B	WELD			SOCKET FLANGES WELDED ON ENDS	275	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
108	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	276	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
109	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	277	3"	4'-5.75"	277A	WELD	277B	WELD			SOCKET FLANGES WELDED ON ENDS
110	3"	7'-10.375"	110A	WELD	110B	WELD			SOCKET FLANGES WELDED ON ENDS	278	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
111	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	279	3"	3'-6.75"	279A	WELD	279B	WELD			SOCKET FLANGES WELDED ON ENDS
112	3"	7'-11.25"	112A	WELD	112B	WELD			SOCKET FLANGES WELDED ON ENDS	280	3"	10'-1"	280A	WELD	280B	WELD			SOCKET FLANGES WELDED ON ENDS
113	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	281	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
114	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)	282	3"	8"	282A	WELD	282B	WELD			SOCKET FLANGES WELDED ON ENDS
115	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	283	3"	3'-6.75"	283A	WELD	283B	WELD			SOCKET FLANGES WELDED ON ENDS
116	3"	7"	115A	WELD	115B	WELD			SOCKET FLANGES WELDED ON ENDS	284	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)
117	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	285	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
118	3"	7"	118A	WELD	118B	WELD			SOCKET FLANGES WELDED ON ENDS	286	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
119	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	287	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
120	3"	7"	120A	WELD	120B	WELD			SOCKET FLANGES WELDED ON ENDS	288	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
121	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	289	3"	5'-11.75"	289A	WELD	289B	WELD			SOCKET FLANGES WELDED ON ENDS
122	4" TO 3"	ECCENTRIC REDUCER							3" TO 4" 125 lb flanged fittings (ANSI B 16.1)	290	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
123	3"	12"	184A	WELD	184B	THREAD			FLANGE TO TREAD WITH CAMLOCK	291	3"	3'-6.75"	291A	WELD	291B	WELD			SOCKET FLANGES WELDED ON ENDS
124	4"	90° Elbow LR							4" 125 lb flanged fittings (ANSI B 16.1)	292	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
125	4" TO 3"	ECCENTRIC REDUCER							3" TO 4" 125 lb flanged fittings (ANSI B 16.1)	293	3"	4'-5.75"	293A	WELD	293B	WELD			SOCKET FLANGES WELDED ON ENDS
126	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	294	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
127	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	295	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
128	3"	8"	128A	WELD	128B	WELD			SOCKET FLANGES WELDED ON ENDS	296	3"	3'-6.75"	296A	WELD	296B	WELD			SOCKET FLANGES WELDED ON ENDS
129	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	297	3"	10'-1"	297A	WELD	297B	WELD			SOCKET FLANGES WELDED ON ENDS
130	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	298	3"	8"	298A	WELD	298B	WELD			SOCKET FLANGES WELDED ON ENDS
131	3"	7"	131A	WELD	131B	WELD			SOCKET FLANGES WELDED ON ENDS	299	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
132	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	300	3"	3'-6.75"	300A	WELD	300B	WELD			SOCKET FLANGES WELDED ON ENDS
133	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)	301	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
134	3"	10'-1"	134A	WELD	134B	WELD			SOCKET FLANGES WELDED ON ENDS	302	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)
135	3"	4'-5"	135A	WELD	135B	WELD			SOCKET FLANGES WELDED ON ENDS	303	3"	1'-11.75"	303A	WELD	303B	WELD			SOCKET FLANGES WELDED ON ENDS
136	3"	10'-1"	136A	WELD	136B	WELD			SOCKET FLANGES WELDED ON ENDS	304	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
137	3"	6'-7"	137A	WELD	137B	WELD			SOCKET FLANGES WELDED ON ENDS	305	3"	10'-1"	305A	WELD	305B	WELD			SOCKET FLANGES WELDED ON ENDS
138	3"	10'-1"	138A	WELD	138B	WELD			SOCKET FLANGES WELDED ON ENDS	306	3"	8"	306A	WELD	306B	WELD			SOCKET FLANGES WELDED ON ENDS
139	3"	6'-11"	139A	WELD	139B	WELD			SOCKET FLANGES WELDED ON ENDS	307	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
140	3"	5'-3"	140A	WELD	140B	WELD			SOCKET FLANGES WELDED ON ENDS	308	3"	10'-1"	307A	WELD	308B	WELD			SOCKET FLANGES WELDED ON ENDS
141	3"	2'-0"	141A	WELD	141B	WELD			SOCKET FLANGES WELDED ON ENDS	309	3"	8"	308A	WELD	309B	WELD			SOCKET FLANGES WELDED ON ENDS
142	3"	1'-3.75"	142A	WELD	142B	WELD			SOCKET FLANGES WELDED ON ENDS	310	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)
143	3"	2"	143A	WELD	143B	WELD			SOCKET FLANGES WELDED ON ENDS	311	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
144	3"	6"	144A	WELD	144B	WELD			SOCKET FLANGES WELDED ON ENDS	312	3"	1'-11.75"	312A	WELD	312B	WELD			SOCKET FLANGES WELDED ON ENDS
145	3"	8'-7.375"	145A	WELD	145B	WELD			SOCKET FLANGES WELDED ON ENDS	313	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
146	3"	20'-1"	146A	WELD	146B	WELD			SOCKET FLANGES WELDED ON ENDS	314	3"	10'-1"	314A	WELD	314B	WELD			SOCKET FLANGES WELDED ON ENDS
147	3"	20'-1"	147A	WELD	147B	WELD			SOCKET FLANGES WELDED ON ENDS	315	3"	8"	315A	WELD	315B	WELD			SOCKET FLANGES WELDED ON ENDS
148	3"	20'-1"	148A	WELD	148B	WELD			SOCKET FLANGES WELDED ON ENDS	316	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
149	3"	20'-1"	149A	WELD	149B	WELD			SOCKET FLANGES WELDED ON ENDS	317	3"	10'-1"	317A	WELD	317B	WELD			SOCKET FLANGES WELDED ON ENDS
150	3"	20'-1"	150A	WELD	150B	WELD			SOCKET FLANGES WELDED ON ENDS	318	3"	8"	318A	WELD	318B	WELD			SOCKET FLANGES WELDED ON ENDS
151	3"	20'-1"	151A	WELD	151B	WELD			SOCKET FLANGES WELDED ON ENDS	319	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)
152	3"	20'-1"	152A	WELD	152B	WELD			SOCKET FLANGES WELDED ON ENDS	320	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
153	3"	20'-1"	153A	WELD	153B	WELD			SOCKET FLANGES WELDED ON ENDS	321	3"	5'-11.75"	321A	WELD	321B	WELD			SOCKET FLANGES WELDED ON ENDS
154	3"	20'-1"	154A	WELD	154B	WELD			SOCKET FLANGES WELDED ON ENDS	322	3"	3'-6.75"	322A	WELD	322B	WELD			SOCKET FLANGES WELDED ON ENDS
155	3"	WYE							3" 125 lb flanged fittings (ANSI B 16.1)	323	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
156	3"	20'-1"	156A	WELD	156B	WELD			SOCKET FLANGES WELDED ON ENDS	324	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
157	3"	1'-3"	157A	WELD	157B	WELD			SOCKET FLANGES WELDED ON ENDS	325	3"	4'-5.75"	325A	WELD	325B	WELD			SOCKET FLANGES WELDED ON ENDS
158	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)	326	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
159	3"	9'-4.75"	159A	WELD	159B	WELD			SOCKET FLANGES WELDED ON ENDS	327	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
160	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	328	3"	3'-6.75"	328A	WELD	328B	WELD			SOCKET FLANGES WELDED ON ENDS
161	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	329	3"	10'-1"	329A	WELD	329B	WELD			SOCKET FLANGES WELDED ON ENDS
162	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	330	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)
163	3"	10'-1"	163A	WELD	163A	WELD			SOCKET FLANGES WELDED ON ENDS	331	3"	8"	331A	WELD	331B	WELD			SOCKET FLANGES WELDED ON ENDS
164	3"	10'-1"	164A	WELD	164B	WELD			SOCKET FLANGES WELDED ON ENDS	332	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)
165	3"	WYE							3" 125 lb flanged fittings (ANSI B 16.1)	333	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)
166	3"	1'-8.5"	166A	WELD	166B	WELD			SOCKET FLANGES WELDED ON ENDS	334	3"	3'-6.75"	334A	WELD	334B	WELD			SOCKET FLANGES WELDED ON ENDS
167	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)	335	3"	5'-3"	335A	WELD	335B	WELD			SOCKET FLANGES WELDED ON ENDS
168	3"	10'-1"	168A	WELD	168B	WELD			SOCKET FLANGES WELDED ON ENDS	336	3"	10'-1"	336A	WELD	336B	WELD			SOCKET FLANGES WELDED ON ENDS
169	3"	10'-1"	169A	WELD	169B	WELD			SOCKET FLANGES WELDED ON ENDS	337	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
170	3"	8'-0"	170A	WELD	170B	WELD			SOCKET FLANGES WELDED ON ENDS	338	3"	10'-1"	338A	WELD	338B	WELD			SOCKET FLANGES WELDED ON ENDS
171	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)	339	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
172	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	340	3"	2'-8"	340A	WELD	340B	WELD			SOCKET FLANGES WELDED ON ENDS
173	3"	10'-1"	173A	WELD	173B	WELD			SOCKET FLANGES WELDED ON ENDS	341	3"	2'-8"	341A	WELD	341B	WELD			SOCKET FLANGES WELDED ON ENDS
174	3"	2'-0"	174A	WELD	174B	WELD			SOCKET FLANGES WELDED ON ENDS	342	3"	5'-3"	342A	WELD	342B	WELD			SOCKET FLANGES WELDED ON ENDS
175	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	343	3"	10'-1"	343A	WELD	343B	WELD			SOCKET FLANGES WELDED ON ENDS
176	3"	10'-1"	176A	WELD	176B	WELD			SOCKET FLANGES WELDED ON ENDS	344	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
177	3"	10'-1"	177A	WELD	177B	WELD			SOCKET FLANGES WELDED ON ENDS	345	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
178	3"	1'-4.25"	178A	WELD	178B	WELD			SOCKET FLANGES WELDED ON ENDS	346	3"	5'-3"	346A	WELD	2**B	WELD			SOCKET FLANGES WELDED ON ENDS
179	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	347	3"	10'-1"	347A	WELD	346B	WELD			SOCKET FLANGES WELDED ON ENDS
180	3"	12"	180A	WELD	180B	THREAD			FLANGE TO TREAD WITH CAMLOCK	348	3"	90° Elbow LR			347B				3" 125 lb flanged fittings (ANSI B 16.1)
181	3"	10'-1"	181A	WELD	181B	WELD			SOCKET FLANGES WELDED ON ENDS	349	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
182	3"	7'-9.25"	182A	WELD	182B	WELD			SOCKET FLANGES WELDED ON ENDS	350	3"	2'-8"	350A	WELD	350B	WELD			SOCKET FLANGES WELDED ON ENDS
183	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	351	3"	2'-8"	351A	WELD	351B	WELD			SOCKET FLANGES WELDED ON ENDS
184	3"	12"	184A	WELD	184B	THREAD			FLANGE TO TREAD WITH CAMLOCK	352	3"	5'-3"	352A	WELD	352B	WELD			SOCKET FLANGES WELDED ON ENDS
185	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	353	3"	10'-1"	353A	WELD	353B	WELD			SOCKET FLANGES WELDED ON ENDS
186	3"	4'-4.5"	186A	WELD	186B	WELD			SOCKET FLANGES WELDED ON ENDS	354	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
187	3"	10'-1"	187A	WELD	187B	WELD			SOCKET FLANGES WELDED ON ENDS	355	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
188	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)	356	3"	5'-3"	356A	WELD	356B	WELD			SOCKET FLANGES WELDED ON ENDS
189	3"	4'-4.75	189A	WELD	189B	WELD			SOCKET FLANGES WELDED ON ENDS	357	3"	10'-1"	357A	WELD	357B	WELD			SOCKET FLANGES WELDED ON ENDS
190	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	358	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
191	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	359	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
192	3"	1'-10.375"	192A	WELD	192B	WELD			SOCKET FLANGES WELDED ON ENDS	360	3"	2'-8"	360A	WELD	360B	WELD			SOCKET FLANGES WELDED ON ENDS
193	3"	4'-11"	193A	WELD	193B	WELD			SOCKET FLANGES WELDED ON ENDS	361	3"	5'-3"	361A	WELD	361B	WELD			SOCKET FLANGES WELDED ON ENDS
194	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	362	3"	10'-1"	362A	WELD	362B	WELD			SOCKET FLANGES WELDED ON ENDS
195	3"	10'-1"	195A	WELD	195B	WELD			SOCKET FLANGES WELDED ON ENDS	363	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
196	3"	9'-11.5"	196A	WELD	196B	WELD			SOCKET FLANGES WELDED ON ENDS	364	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
197	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	365	3"	2'-8"	365A	WELD	365B	WELD			SOCKET FLANGES WELDED ON ENDS
198	3"	4'-9"	198A	WELD	198B	WELD			SOCKET FLANGES WELDED ON ENDS	366	3"	2'-8"	366A	WELD	366B	WELD			SOCKET FLANGES WELDED ON ENDS
199	3"	10'-1"	199A	WELD	199B	WELD			SOCKET FLANGES WELDED ON ENDS	367	3"	5'-3"	367A	WELD	367B	WELD			SOCKET FLANGES WELDED ON ENDS
200	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	368	3"	10'-1"	368A	WELD	368B	WELD			SOCKET FLANGES WELDED ON ENDS
201	3"	1'-10"	201A	WELD	201B	WELD			SOCKET FLANGES WELDED ON ENDS	369	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
202	3"	10'-1"	202A	WELD	202B	WELD			SOCKET FLANGES WELDED ON ENDS	370	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
203	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	371	3"	5'-3"	371A	WELD	371B	WELD			SOCKET FLANGES WELDED ON ENDS
204	3"	7'-7.5"	204A	WELD	204B	WELD			SOCKET FLANGES WELDED ON ENDS	372	3"	10'-1"	372A	WELD	372B	WELD			SOCKET FLANGES WELDED ON ENDS
205	3"	10'-1"	205A	WELD	205B	WELD			SOCKET FLANGES WELDED ON ENDS	373	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
206	3"	10'-1"	206A	WELD	206B	WELD			SOCKET FLANGES WELDED ON ENDS	374	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
207	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	375	3"	2'-8"	375A	WELD	375B	WELD			SOCKET FLANGES WELDED ON ENDS
208	3"	9'-0.5"	208A	WELD	208B	WELD			SOCKET FLANGES WELDED ON ENDS	376	3"	2'-8"	3756A	WELD	376B	WELD			SOCKET FLANGES WELDED ON ENDS
209	3"	10'-1"	209A	WELD	209B	WELD			SOCKET FLANGES WELDED ON ENDS	377	3"	5'-3"	377A	WELD	377B	WELD			SOCKET FLANGES WELDED ON ENDS
210	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	378	3"	10'-1"	378A	WELD	378B	WELD			SOCKET FLANGES WELDED ON ENDS
211	3"	10'-1"	211A	WELD	211B	WELD			SOCKET FLANGES WELDED ON ENDS	379	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
212	3"	4'-9"	212A	WELD	212B	WELD			SOCKET FLANGES WELDED ON ENDS	380	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
213	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	381	3"	5'-3"	381A	WELD	381B	WELD			SOCKET FLANGES WELDED ON ENDS
214	3"	5'-11"	214A	WELD	214B	WELD			SOCKET FLANGES WELDED ON ENDS	382	3"	10'-1"	382A	WELD	382B	WELD			SOCKET FLANGES WELDED ON ENDS
215	3"	10'-1"	215A	WELD	215B	WELD			SOCKET FLANGES WELDED ON ENDS	383	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
216	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	384	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
217	3"	7'-7.5"	217A	WELD	217B	WELD			SOCKET FLANGES WELDED ON ENDS	385	3"	5'-3"	385A	WELD	385B	WELD			SOCKET FLANGES WELDED ON ENDS
218	3"	10'-1"	218A	WELD	218B	WELD			SOCKET FLANGES WELDED ON ENDS	386	3"	10'-1"	386A	WELD	386B	WELD			SOCKET FLANGES WELDED ON ENDS
219	3"	10'-1"	219A	WELD	219B	WELD			SOCKET FLANGES WELDED ON ENDS	387	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
220	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	388	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
221	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	389	3"	2'-8"	389A	WELD	389B	WELD			SOCKET FLANGES WELDED ON ENDS
222	3"	1'-11.75"	222A	WELD	222B	WELD			SOCKET FLANGES WELDED ON ENDS	390	3"	2'-8"	390A	WELD	390B	WELD			SOCKET FLANGES WELDED ON ENDS
223	3"	3'-6.75"	223A	WELD	223B	WELD			SOCKET FLANGES WELDED ON ENDS	391	3"	5'-3"	391A	WELD	391B	WELD			SOCKET FLANGES WELDED ON ENDS
224	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	392	3"	10'-1"	392A	WELD	392B	WELD			SOCKET FLANGES WELDED ON ENDS
225	3"	10'-1"	225A	WELD	225B	WELD			SOCKET FLANGES WELDED ON ENDS	393	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
226	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	394	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
227	3"	3'-6.75"	227A	WELD	227B	WELD			SOCKET FLANGES WELDED ON ENDS	395	3"	5'-3"	395A	WELD	395B	WELD			SOCKET FLANGES WELDED ON ENDS
228	3"	10'-1"	228A	WELD	228B	WELD			SOCKET FLANGES WELDED ON ENDS	396	3"	10'-1"	396A	WELD	396B	WELD			SOCKET FLANGES WELDED ON ENDS
229	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	397	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
230	3"	3'-6.75"	230A	WELD	230B	WELD			SOCKET FLANGES WELDED ON ENDS	398	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
231	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)	399	3"	2'-8"	399A	WELD	399B	WELD			SOCKET FLANGES WELDED ON ENDS
232	3"	5'-11.75"	232A	WELD	232B	WELD			SOCKET FLANGES WELDED ON ENDS	400	3"	2'-8"	400A	WELD	400B	WELD			SOCKET FLANGES WELDED ON ENDS
233	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	401	3"	5'-3"	401A	WELD	401B	WELD			SOCKET FLANGES WELDED ON ENDS
234	3"	4'-5.75"	234A	WELD	234B	WELD			SOCKET FLANGES WELDED ON ENDS	402	3"	10'-1"	402A	WELD	402B	WELD			SOCKET FLANGES WELDED ON ENDS
235	3"	8"	235A	WELD	235B	WELD			SOCKET FLANGES WELDED ON ENDS	403	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
236	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	404	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
237	3"	10'-1"	237A	WELD	237B	WELD			SOCKET FLANGES WELDED ON ENDS	405	3"	5'-3"	405A	WELD	405B	WELD			SOCKET FLANGES WELDED ON ENDS
238	3"	8"	238A	WELD	238B	WELD			SOCKET FLANGES WELDED ON ENDS	406	3"	10'-1"	406A	WELD	406B	WELD			SOCKET FLANGES WELDED ON ENDS
239	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	407	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
240	3"	8"	240A	WELD	240B	WELD			SOCKET FLANGES WELDED ON ENDS	408	3"	90° Elbow LR							3" 125 lb flanged fittings (ANSI B 16.1)
241	3"	5'-11.75"	241A	WELD	241B	WELD			SOCKET FLANGES WELDED ON ENDS	409	3"	2'-8"	409A	WELD	409B	WELD			SOCKET FLANGES WELDED ON ENDS
242	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	410	3"	BLIND FLANGE							3" 125 lb flanged fittings (ANSI B 16.1)
243	3"	3'-6.75"	243A	WELD	243B	WELD			SOCKET FLANGES WELDED ON ENDS	411	3"	4'-5.75"	411A	WELD	411B	WELD			SOCKET FLANGES WELDED ON ENDS
244	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)	412	3"	5'-3"	412A	WELD	412B	WELD			SOCKET FLANGES WELDED ON ENDS
245	3"	45° Elbow							3" 125 lb flanged fittings (ANSI B 16.1)	413	3"	90° Elbow LR	411A	WELD	411B	WELD			3" 125 lb flanged fittings (ANSI B 16.1)
246	3"	TEE							3" 125 lb flanged fittings (ANSI B 16.1)	414	3"	12"	414A	WELD	412B	THREAD			FLANGE TO TREAD WITH CAMLOCK
247	3"	3'-6.75"	247A	WELD	247B	WELD			SOCKET FLANGES WELDED ON ENDS	415									
248	3"	10'-1"	248A	WELD	248B	WELD			SOCKET FLANGES WELDED ON ENDS	416									

Drug & Laboratory Disposal

Phase 3 - Tank Storage
Broad Street
Plainwell, Michigan 49080

E2W ENGINEERING
161 East Michigan Ave
Suite 200
Kalamazoo, MI 49007
PHONE: (269) 373-8000
FAX: (269) 373-5641
E2W JOB # 2008-145

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Portage, Michigan 49024
ph: 269-321-5151
www.boscharch.com

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2009-410 M-308.dwg

(269) 685-9824
Phone

DLD Analytical

331 Broad Street
Plainwell, MI 49080

ANALYTICAL REPORT

Report Number: R7829

Sample number: **6093**

Client: Drug & Laboratory Disposal, Inc.
331 Broad Street
Plainwell, MI 49080

Report date: 08/29/08
Attention: Patricia Troost
Phone: (269) 685-9824

Sample ID: Tank 2-502HB (pull 1)
Generator: DLD
Suspects: organics

Sample type: outgoing waste

Sample date: 08/27/08
Date delivered: 08/27/08

METHOD	ANALYSIS		RESULTS	DATE	INITIALS
Gravimetric	density		0.93 g/ml	08/27/08	SW
EPA 1010A	flash point		74 °F	08/27/08	SW
ASTM D 240	heat of combustion		14700 Btu/lb	08/27/08	SW
EPA 9077A	halogens		2.3 %	08/29/08	SW
ASTM D 1364	water (Karl Fisher)		4.9 %	08/27/08	SW
Cyantesmo paper	cyanide (screen)	<	10 ppm	08/28/08	SW
ASTM D 4978A	sulfide (screen)	<	10 ppm	08/28/08	SW
EPA 8082	PCBs	<	2 ppm	08/27/08	AD / SW
EPA 7061A	arsenic	<	1 ppm	08/28/08	AD / SW
EPA 7000	barium		760 ppm	08/27/08	AD / SW
EPA 7000	cadmium	<	1 ppm	08/27/08	AD / SW
EPA 7000	chromium	<	2 ppm	08/27/08	AD / SW
EPA 7000	lead	<	7 ppm	08/27/08	AD / SW
EPA 7040A, 7471A	mercury		0.2 ppm	08/28/08	AD / SW
EPA 7741A	selenium	<	1 ppm	08/28/08	AD / SW
EPA 7000	silver	<	3 ppm	08/27/08	AD / SW

Environmentally Correct Chemical Waste Disposal Since 1977

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DLD Analytical

331 Broad Street
Plainwell, MI 49080

ANALYTICAL REPORT

Report Number: R7829

Sample number: **6093**

Client: Drug & Laboratory Disposal, Inc.
331 Broad Street
Plainwell, MI 49080

Report date: 08/29/08
Attention: Patricia Troost
Phone: (269) 685-9824

Sample ID: Tank 2-502HB (pull 1)
Generator: DLD
Suspects: organics

Sample type: outgoing waste

Sample date: 08/27/08
Date delivered: 08/27/08
Analysis date: 08/27/08
Analysis completed by: AD

VOLATILE SOLVENT SCAN (EPA 8015B, 8021A)

COMPOUND		CONCENTRATION (%)
acetone		3.0 %
acetonitrile	<	0.1 %
benzene	<	0.1 %
1-butanol	<	0.1 %
carbon tetrachloride	<	0.1 %
chlorobenzene	<	0.1 %
chloroform	<	0.1 %
ethyl acetate		7.9 %
ethyl benzene		0.9 %
ethyl ether	<	0.1 %
hexane		4.6 %
isopropanol	<	0.1 %
methanol	<	0.1 %
methylene chloride	<	0.1 %
tetrahydrofuran	<	0.1 %
toluene		34.6 %
xylenes		11.3 %

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331 Broad Street
Plainwell, MI 49080

ANALYTICAL REPORT

Report Number: R7717

Sample number: 5748
Page: 1 of 2

Client: Drug & Laboratory Disposal, Inc.
331 Broad Street
Plainwell, MI 49080

Report date: 07/10/08
Attention: Patricia Troost
Phone: (269) 685-9824

Sample ID: Tank 3-496LB (pull 1)
Generator: DLD
Suspects: organics

Sample type: outgoing waste

Sample date: 07/08/08
Date delivered: 07/08/08

METHOD	ANALYSIS		RESULTS	DATE	INITIALS
Gravimetric	density		1.02 g/ml	07/09/08	SW
EPA 1010A	flash point		75 °F	07/10/08	SW
ASTM D 240	heat of combustion		2700 Btu/lb	07/09/08	SW
EPA 9041A	pH		6 pH	07/09/08	SW
EPA 9077A	halogens		1.3 %	07/09/08	SW
ASTM D 1364	water (Karl Fisher)		71.3 %	07/10/08	SW
Cyantesmo paper	cyanide (screen)	<	10 ppm	07/10/08	SW
ASTM D 4978A	sulfide (screen)	<	10 ppm	07/10/08	SW
Method 8027	cyanide (Hach)		7 ppm	07/10/08	SW
Method 8150	nickel (Hach)		5 ppm	07/10/08	SW
EPA 8082	PCBs	<	2 ppm	07/08/08	AD / SW
EPA 7061A	arsenic		1.1 ppm	07/09/08	AD / SW
EPA 7000	barium		18 ppm	07/09/08	AD / SW
EPA 7000	cadmium	<	1 ppm	07/08/08	AD / SW
EPA 7000	chromium		17 ppm	07/08/08	AD / SW
EPA 7000	lead	<	10 ppm	07/08/08	AD / SW
EPA 7040A, 7471A	mercury		0.58 ppm	07/09/08	AD / SW
EPA 7000	lead	<	10 ppm	07/08/08	AD / SW
EPA 7741A	selenium	<	1 ppm	07/09/08	AD / SW
EPA 7000	silver		35 ppm	07/08/08	AD / SW

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331 Broad Street
Plainwell, MI 49080

ANALYTICAL REPORT

Report Number: R7717

Sample number: **5748**
Page: 2 of 2

Client: Drug & Laboratory Disposal, Inc.
331 Broad Street
Plainwell, MI 49080

Report date: 07/10/08
Attention: Patricia Troost
Phone: (269) 685-9824

Sample ID: Tank 3-496LB (pull 1)
Generator: DLD
Suspects: organics

Sample type: outgoing waste

Sample date: 07/08/08
Date delivered: 07/08/08
Analysis date: 07/08/08
Analysis completed by: AD

VOLATILE SOLVENT SCAN (EPA 8015B, 8021A)

COMPOUND		CONCENTRATION (%)
acetone		1.3 %
acetonitrile		3.2 %
benzene		0.0 %
1-butanol		0.0 %
carbon tetrachloride		0.6 %
chlorobenzene	<	0.0 %
chloroform		0.0 %
ethyl acetate		0.1 %
ethyl benzene		0.2 %
ethyl ether	<	0.0 %
hexane		0.3 %
isopropanol		1.2 %
methanol		15.2 %
methylene chloride		0.3 %
tetrahydrofuran		0.3 %
toluene		0.2 %
xylenes		2.9 %

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331 Broad Street
Plainwell, MI 49080

ANALYTICAL REPORT

Report Number: R7811 | Sample number: **6004**
Page: 1 of 2

Client: Drug & Laboratory Disposal, Inc.
331 Broad Street
Plainwell, MI 49080

Report date: 08/26/08
Attention: Patricia Troost
Phone: (269) 685-9824

Sample ID: Tank 4-501LB (pull 1)
Generator: DLD
Suspects: organics

Sample type: outgoing waste

Sample date: 08/20/08
Date delivered: 08/20/08

METHOD	ANALYSIS		RESULTS		DATE	INITIALS
Gravimetric	density		1.02	g/ml	08/21/08	SW
EPA 1010A	flash point		74	°F	08/25/08	SW
ASTM D 240	heat of combustion		2700	Btu/lb	08/21/08	SW
EPA 9041A	pH		6	pH	08/21/08	SW
EPA 9077A	halogens		1.9	%	08/21/08	SW
ASTM D 1364	water (Karl Fisher)		76.2	%	08/25/08	SW
Cyantesmo paper	cyanide (screen)	<	10	ppm	08/26/08	SW
ASTM D 4978A	sulfide (screen)	<	10	ppm	08/26/08	SW
Method 8027	cyanide (Hach)		11	ppm	08/25/08	SW
Method 8150	nickel (Hach)		5	ppm	08/25/08	SW
EPA 8082	PCBs	<	2	ppm	08/20/08	AD / SW
EPA 7061A	arsenic		25	ppm	08/21/08	AD / SW
EPA 7000	barium	<	17	ppm	08/21/08	AD / SW
EPA 7000	cadmium	<	1	ppm	08/21/08	AD / SW
EPA 7000	chromium		25	ppm	08/21/08	AD / SW
EPA 7000	lead	<	8	ppm	08/21/08	AD / SW
EPA 7040A, 7471A	mercury		0.25	ppm	08/20/08	AD / SW
EPA 7741A	selenium	<	1	ppm	08/21/08	AD / SW
EPA 7000	silver		17	ppm	08/21/08	AD / SW

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DLD Analytical

331 Broad Street
Plainwell, MI 49080

ANALYTICAL REPORT

Report Number:	R7811	Sample number:	**6004**
		Page:	2 of 2
Client	Drug & Laboratory Disposal, Inc.	Report date:	08/26/08
	331 Broad Street	Attention:	Patricia Troost
	Plainwell, MI 49080	Phone:	(269) 685-9824
Sample ID:	Tank 4-501LB (pull 1)		
Generator:	DLD	Sample type:	outgoing waste
Suspects:	organics		
Sample date:	08/20/08		
Date delivered:	08/20/08		
Analysis date:	08/20/08		
Analysis completed by:	AD		

VOLATILE SOLVENT SCAN (EPA 8015B, 8021A)

COMPOUND	CONCENTRATION (%)
acetone	1.86 %
acetonitrile	5.30 %
benzene	0.02 %
1-butanol	0.02 %
carbon tetrachloride	4.00 %
chlorobenzene	0.16 %
chloroform	4.24 %
ethyl acetate	0.62 %
ethyl benzene	0.44 %
ethyl ether	0.01 %
hexane	1.15 %
isopropanol	1.03 %
methanol	17.13 %
methylene chloride	0.49 %
tetrahydrofuran	0.66 %
toluene	0.52 %
xylenes	5.49 %

DLD Analytical

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331 Broad Street
Plainwell, MI 49080

ANALYTICAL REPORT

Report Number: R7789

Sample number: **5922**
Page: 1 of 2

Client: Drug & Laboratory Disposal, Inc.
331 Broad Street
Plainwell, MI 49080

Report date: 08/13/08
Attention: Patricia Troost
Phone: (269) 685-9824

Sample ID: Tank 6-499HB (pull 1)
Generator: DLD
Suspects: organics

Sample type: outgoing waste

Sample date: 08/04/08
Date delivered: 08/04/08

METHOD	ANALYSIS		RESULTS	DATE	INITIALS
Gravimetric	density		1.01 g/ml	08/04/08	SW
EPA 1010A	flash point		77 °F	08/05/08	SW
ASTM D 240	heat of combustion		12800 Btu/lb	08/04/08	SW
EPA 9077A	halogens		1.2 %	08/04/08	SW
ASTM D 1364	water (Karl Fisher)		9.4 %	08/05/08	SW
Cyantesmo paper	cyanide (screen)	<	10 ppm	08/06/08	SW
ASTM D 4978A	sulfide (screen)	<	10 ppm	08/06/08	SW
EPA 8082	PCBs	<	2 ppm	08/06/08	AD / SW
EPA 7061A	arsenic	<	1 ppm	08/11/08	AD / SW
EPA 7000	barium		1200 ppm	08/11/08	AD / SW
EPA 7000	cadmium	<	1 ppm	08/11/08	AD / SW
EPA 7000	chromium	<	3 ppm	08/11/08	AD / SW
EPA 7000	lead	<	9 ppm	08/11/08	AD / SW
EPA 7040A, 7471A	mercury		0.11 ppm	08/11/08	AD / SW
EPA 7741A	selenium	<	1 ppm	08/11/08	AD / SW
EPA 7000	silver	<	2 ppm	08/11/08	AD / SW

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331 Broad Street
Plainwell, MI 49080

ANALYTICAL REPORT

Report Number: R7789

Sample number: **5922**
Page: 2 of 2

Client: Drug & Laboratory Disposal, Inc.
331 Broad Street
Plainwell, MI 49080

Report date: 08/13/08
Attention: Patricia Troost
Phone: (269) 685-9824

Sample ID: Tank 6-499HB (pull 1)
Generator: DLD
Suspects: organics

Sample type: outgoing waste

Sample date: 08/04/08
Date delivered: 08/04/08
Analysis date: 08/12/08
Analysis completed by: AD

VOLATILE SOLVENT SCAN (EPA 8015B, 8021A)

COMPOUND	CONCENTRATION (%)
acetone	< 0.0 %
acetonitrile	< 0.0 %
benzene	< 0.0 %
1-butanol	< 0.0 %
carbon tetrachloride	< 0.0 %
chlorobenzene	< 0.0 %
chloroform	< 0.0 %
ethyl acetate	12.1 %
ethyl benzene	1.5 %
ethyl ether	< 0.0 %
hexane	< 0.0 %
isopropanol	< 0.0 %
methanol	< 0.0 %
methylene chloride	< 0.0 %
tetrahydrofuran	< 0.0 %
toluene	35.6 %
xylenes	17.7 %

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Drug & Laboratory Disposal, Inc
Tank #1

Prepared By:

John C. Root
Steel Tank Institute &
Level II Inspector

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ABOVE-GROUND VERTICAL STORAGE TANK DATA SHEET

GENERAL INFORMATION

TANK OWNER:	Drug & Laboratory Disposal, Inc.	DATE:	December 19th, 2016
LOCATION:	331 Broad Street Plainwell MI, 49080	S.O.:	457532
TANK ID:	Tank #1	TANK CONTENT:	Unknown
		SPECIFIC GRAVITY:	Unknown

TANK INFORMATION

Tank Manufacturer:	Dowagiac Steel Tank Company	Design Std:	Unknown
		MFG Serial#	0346
Manufacturer Date:	1984	Tank Material:	Stainless Steel
Data Plate Presence:	☒ YES ☒ NO	Jacket Thickness:	None
Cathodic Protection:	N/A	Coating:	None
Shell:	☒ Welded ☐ Riveted	Insulated:	☐ YES ☒ NO
Tank Classification	STI Category I		

TANK INSPECTION SUMMARY

Overall: An external inspection and ultrasonic thickness survey was performed per Steel Tank Institute (STI), SP001 5th Edition on this Tank noted as Tank 1. Tank is recognized as a category I, due to its vertical type and slightly elevated placement on a concrete housekeeping pad, which provides a means of continuous release detection method (CRDM), and proper for the entire volumetric capacity of the Atmospheric Storage Tank (AST). Next scheduled inspection to be done monthly and annually per STI SP001 Inspection Checklists. A formal external inspection shall be performed no later than 20 years. Overall tank is suitable for continued service providing the following recommendations detailed in this report are made.

Containment: Minor coating failures and no protective coatings (just bare concrete and joints) noted in a few locations. **TRIS recommends applying proper coating and sealing all joints as needed to ensure that containment is leak proof.** Coating failures were noted on stairway, platform and supports**.** Consideration should be given to prepping and applying proper protective coating.

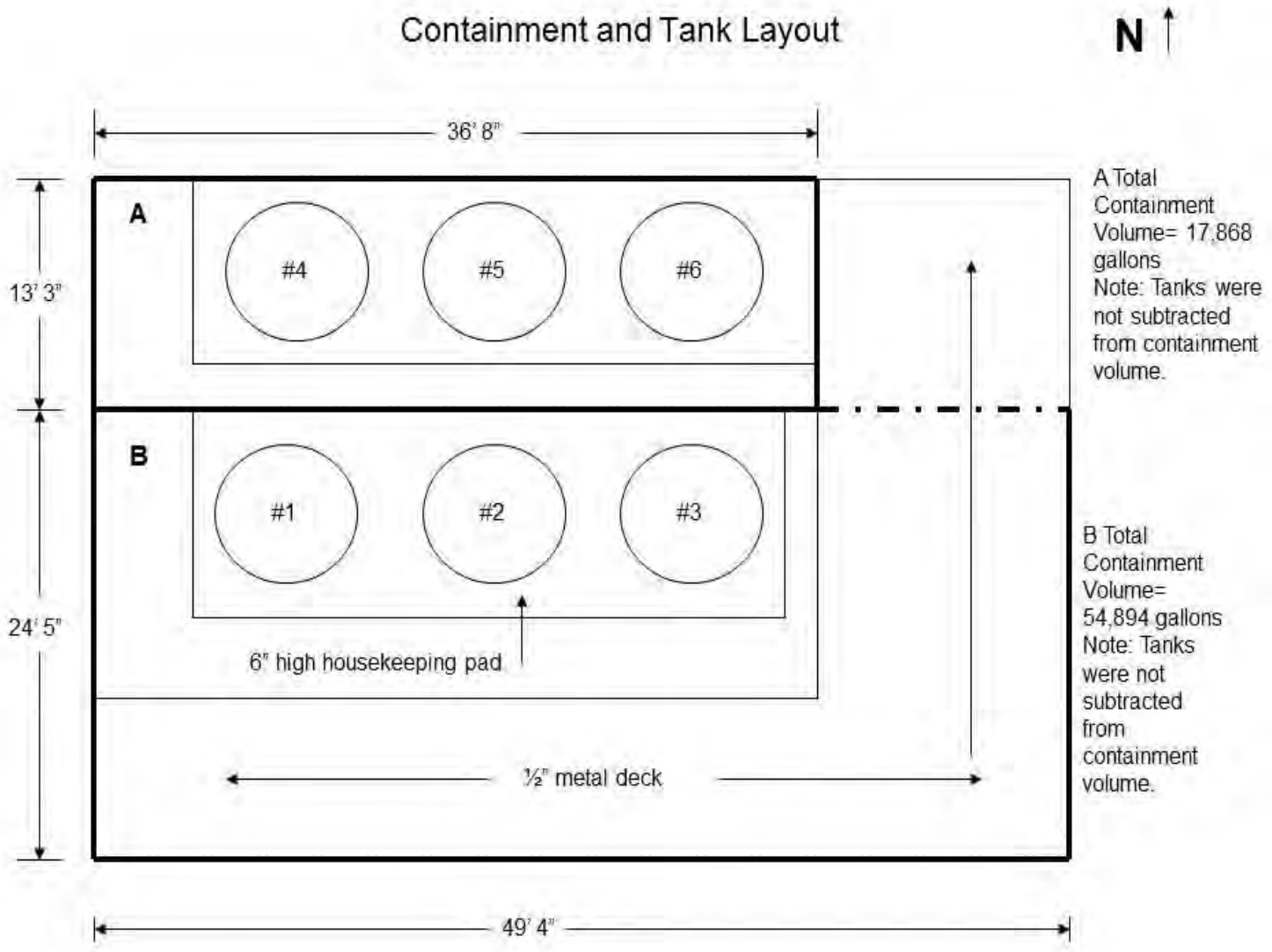
Foundation: The tank is slightly elevated and rests on what appears to be wooden panels. Consideration should be given to replacing wooden panels with two hour fire rating materials and possibly elevating tank to aid in (CRDM).

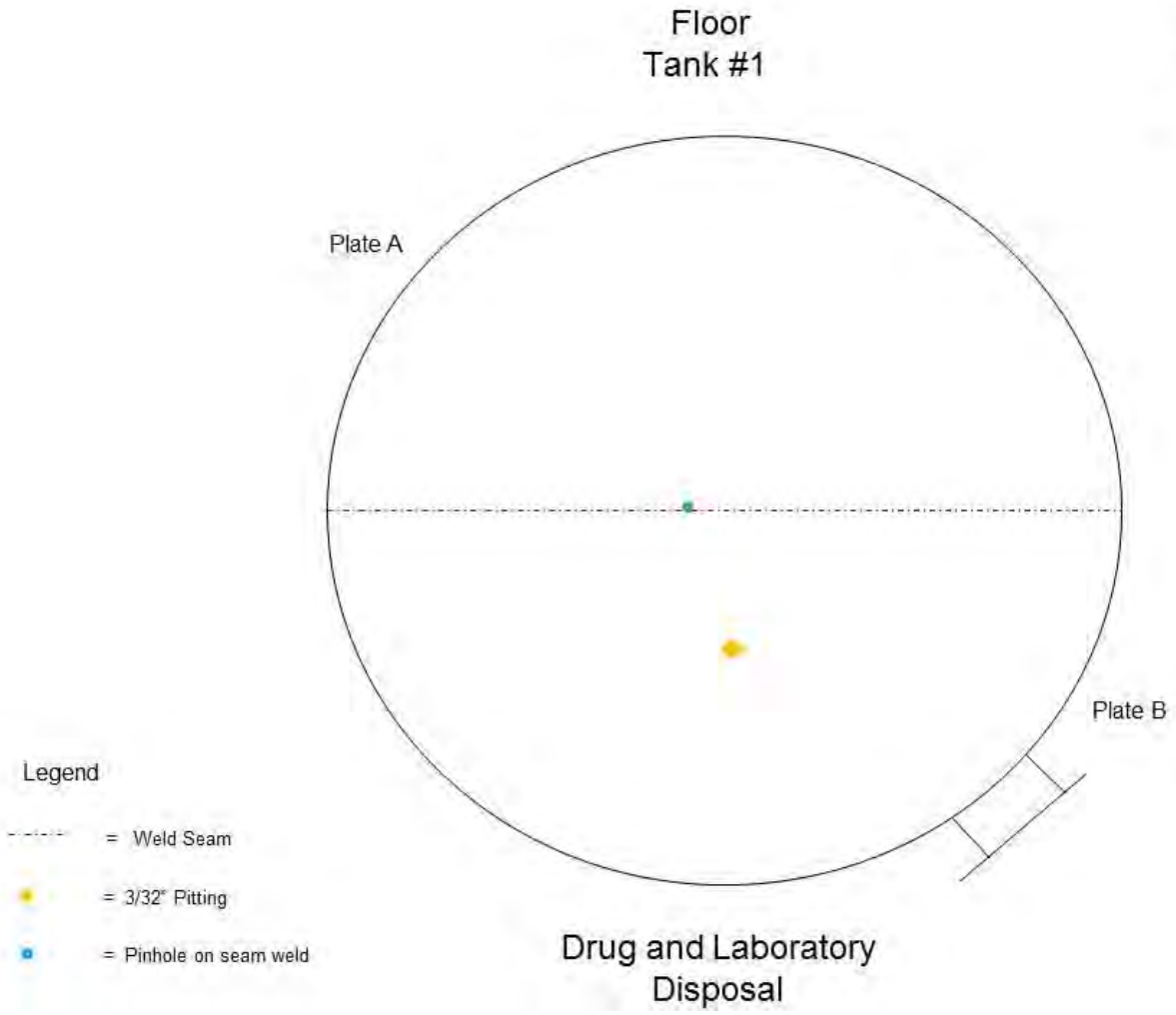
TANK INSPECTION SUMMARY (CONTINUED)

Tank Shell:	Tank shells appear to be constructed utilizing three (3) shell courses; nominal shell thickness appears to be 3/16" (.1875") stainless steel. Limited ultrasonic thickness survey was performed due to the cold weather with no relevant wall loss observed. Minor internal pitting was noted in numerous locations with deepest pitting measured at 1/32". **TRIS recommends monitoring pitting quantity and depth at next inspection interval.** Several previous weld repairs noted throughout shell displayed marginal weld quality. **TRIS recommends monitoring at next inspection interval.**
Tank Heads:	Tank roof appears to have been constructed utilizing three (3) 10 gauge (.135") stainless steel plates. Tank floor appears to have been constructed utilizing two (2) 3/16" (.1875") stainless steel plates. Limited ultrasonic thickness survey was performed due to the cold weather with no relevant wall loss observed. Tank floor displayed a previous weld repair which has deteriorated from corrosion causing a pit with depth measured at 3/32". Seam weld located in the center of tank displayed a pinhole of approximately 1/8" in diameter and 1/16" in depth. **TRIS recommends performing weld repairs by qualified welder and procedure.** All necessary weld repairs were marker with a yellow paint marker.
Nozzles and Venting System:	Tank utilizes a 3" normal vent which discharges outside of building. Normal venting is of adequate size due to inlet and outlet piping being 4" and reduced to 3", and inlet piping being reduced to 1.5". Tank is equipped with an adequate 8" emergency vent located on roof manway with 503,517 SCFH rating. PVC material was noted on the roof which is used for normal venting and charcoal filters. Charcoal filters utilize wooden bases for supports and are not secured to roof deck. **TRIS recommends installing two hour fire rated material as needed per local fire code and securing charcoal filters to roof deck as needed.** Fire valve at nozzle N-1 was disconnected at time of inspection. **TRIS recommends ensuring fire valve is functional prior to returning tank into service.**
Ancillary Equipment:	Inlet piping inside of displayed corrosion. **TRIS recommends monitoring and replacing inlet piping as needed.** No dedicated ground wire was noted to be attached to tank. **TRIS recommends installing dedicated ground wire to tank.** Associated piping used for filling tanks located in the tank farm displayed coating failures. Consideration should be given to prepping surfaces and apply protective coatings**.** Piping supports for PVC piping located on roof are not anchored to roof deck. **TRIS recommends installing anchors as needed to prevent movement.** No NFPA color diamonds were noted**. TRIS recommends installing appropriate NFPA color diamonds per NFPA 30.**

CONTAINMENT INFORMATION

Containment	Concrete with Coating	Visual Condition:	Acceptable
Containment Size:	24'5" X 49'4"	Coating:	☒ YES
Drain Valve:	☒ YES ☐ NO	Drain Valve Condition:	Acceptable




Floor
Tank #1
N
Plate A
Plate B
Legend
= Weld Seam
= 3/32" Pitting
= Pinhole on seam weld
Drug and Laboratory
Disposal

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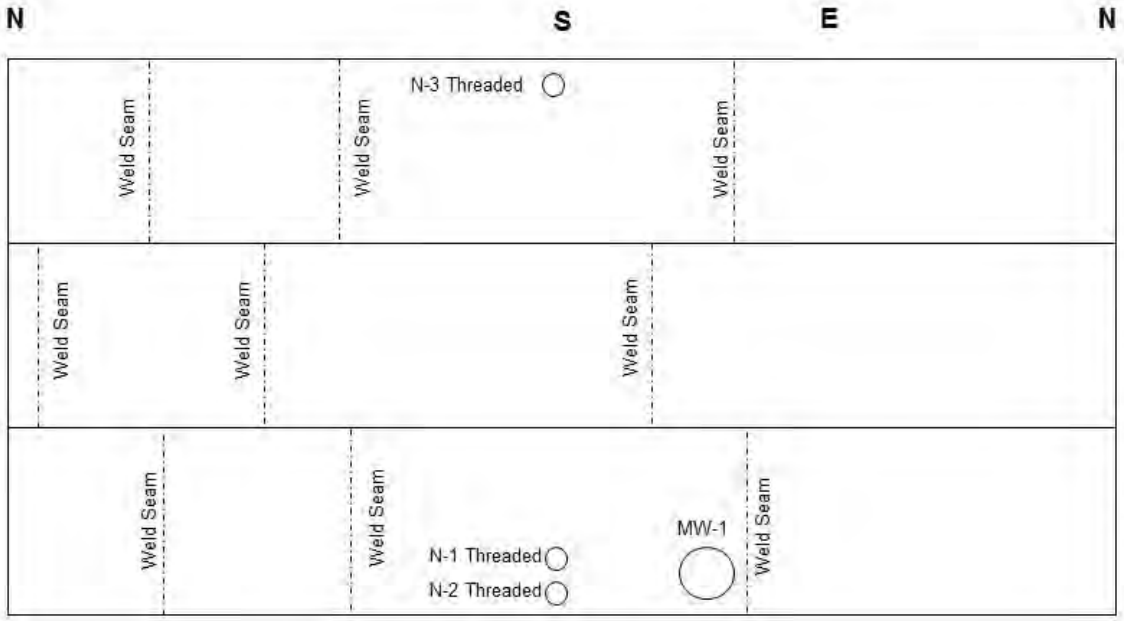
Shell Roll-Out
Tank #1



Drug and Laboratory
Disposal

Legend

- - - - - = Weld Seam

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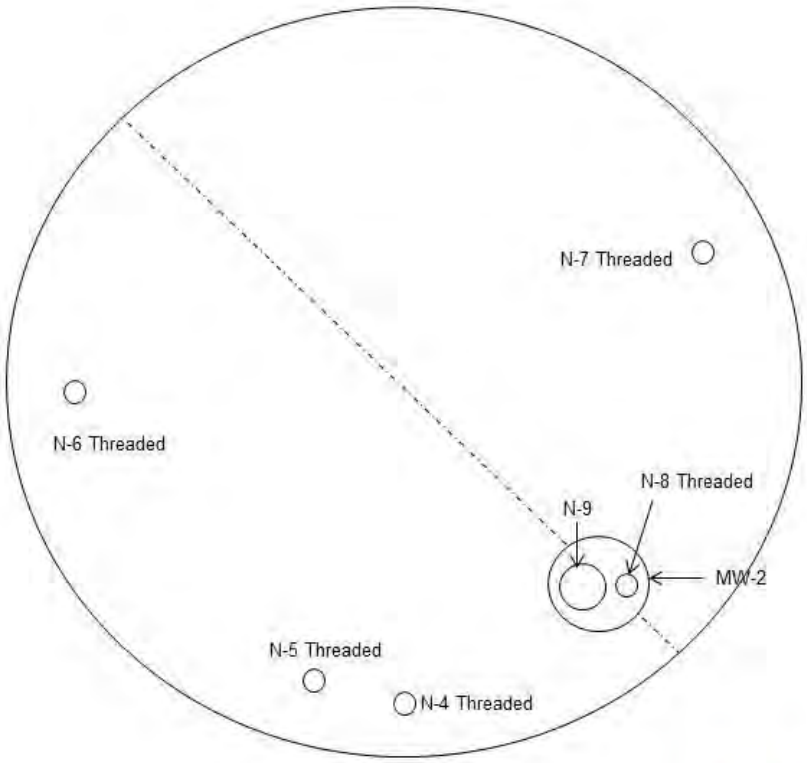

Legend

= Weld Seam

Drug and Laboratory Disposal

Shell Corrosion Rate

Year of Inspection	2016	Year
Year of Construction	1984	Year
Nominal Head Plate Thickness (inches)	0.1875	Inch
Minimum Remaining Shell Thickness	0.156	Inch
Material Lost Since Construction (1/32” pitting)	0.031	Inch
Estimated Corrosion Rate	.001	Inch/yr.
Next Internal Inspection	1	Years
Estimated Material Degradation in 1 Years	.155	Inch
Estimated Remaining Material at 5 Year Internal Inspection	.151	Inch
Minimum acceptable remaining shell thickness	0.0937	Inch

Floor Corrosion Rate

Year of Inspection	2016	Year
Year of Construction	1984	Year
Nominal Floor Plate Thickness (inches)	0.1875	Inch
Minimum Remaining Shell Thickness	0.094	Inch
Material Lost Since Construction (3/32” pitting)	0.094	Inch
Estimated Corrosion Rate	.003	Inch/yr.
Next Internal Inspection	1	Years
Estimated Material Degradation in 1 Years	.091	Inch
Estimated Remaining Material at 5 Year Internal Inspection	.079	Inch
Minimum acceptable floor thickness	0.0937	Inch

Nozzle and or Appurtenance Table

Item	Description	Size (in.)	Neck Thick (in.)	Cover Thick (in.)	Comments
MW-1	Shell Manway	24”	.247	.399	Manway
MW-2	Roof Manway	16”	.180	n/a	Manway
N-1	Nozzle	4”	n/a	n/a	Drain/Outlet Reduced to 3”
N-2	Nozzle	2”	n/a	n/a	Capped Nozzle
N-3	Nozzle	2”	n/a	n/a	Capped Nozzle
N-4	Nozzle	4”	n/a	n/a	Inlet Reduced to 1.5”
N-5	Nozzle	2”	n/a	n/a	Level Gauge
N-6	Nozzle	2 ”	n/a	n/a	Sample Port
N-7	Nozzle	3”	n/a	n/a	4” Reduced to 3” Normal Vent
N-8	Nozzle	4”	n/a	n/a	4” Capped
N-9	Nozzle	8”	.133	n/a	Emergency Vent

Previous weld repair has deteriorated causing a 3/32” pit

Pinhole noted on center seam weld

I-beam supports for platform displayed coating failures with active corrosion

Fusible fire valve was disconnected at time of inspection

Data Plate

TÜV RHEINLAND INDUSTRIAL SOLUTIONS, INC.

These test results report our findings at the time of inspection and shall be reviewed by the client for compliance to the project requirements. Due to the limitations of nondestructive testing in evaluating all of the factors that determine the overall component quality, no guarantee is made or liability assumed by TÜV Rheinland Industrial Solutions, Inc. ("TRIS") for the component quality or serviceability.

	Technician:	John Root
	Certifications:	STI / API Inspector / Level II
	Signed:	
	Certification:	Field Service Manager
	Reviewed by:	Mark Kroells
	Date:	12/22/2016

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Drug & Laboratory Disposal, Inc.
Plainwell, Michigan
Tank #2

Completed By:

Clayton Sawyer
Steel Tank Institute &
Level II Inspector
STI-SP001 ID# AST-121284
Expiration Date: May 15, 2023

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ABOVE-GROUND VERTICAL STORAGE TANK DATA SHEET

GENERAL INFORMATION

TANK OWNER:	Drug & Laboratory Disposal, Inc.	DATE:	November 8th, 2021
		MFG Serial#:	0346
LOCATION:	331 Broad Street Plainwell MI, 49080	S.O.:	234177134
TANK ID:	Tank #2	TANK CONTENT:	Unknown
		SPECIFIC GRAVITY:	Unknown

TANK INFORMATION

Tank Manufacturer:	Dowagiac Steel Tank Company	Design Std:	Unknown
Manufacturer Date:	1983	Tank Material:	Stainless Steel
Data Plate Presence:	☒ YES ☒ NO	Jacket Thickness:	None
Cathodic Protection:	N/A	Coating:	None
Shell:	☒ Welded ☐ Riveted	Insulated:	☐ YES ☒ NO
Tank Classification	STI Category I		

TANK INSPECTION SUMMARY

Overall: TUV Rheinland North America (TRNA) performed an internal and external formal inspection with an ultrasonic thickness survey was performed per Steel Tank Institute (STI), SP001 6th Edition on this Tank noted as #2. Tank is recognized as a category I, due to its vertical type and slightly elevated placement on a concrete housekeeping pad, which provides a means of continuous release detection method (CRDM), and proper for the entire volumetric capacity of the Atmospheric Storage Tank (AST). Next scheduled inspection to be done monthly and annually per STI SP001 Inspection Checklists. A formal internal inspection shall be performed no later than 5 years. Overall tank is suitable for continued service provided the following recommendations detailed in this report are made. Nominal thicknesses of the shell and roof were best guessed utilizing our ultrasonic thickness reading and information obtained during this inspection.

Containment: Minor coating failures and cracks were noted throughout containment in several locations. ***TRNA recommends replicating the coatings applied to the containment of the adjacent tanks; 4, 5, 6.*** Coating failures with active corrosion was noted on stairway, platform and structural steel supports for the catwalk and south floor deck. ***TRNA recommends prepping surfaces and applying protective coating.***

Foundation: The tank is slightly elevated and rests on what appears to be wooden planks. Consideration should be given to replacing wooden panels with two hour fire rating materials and possibly elevating tank to aid in (CRDM).

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TANK INSPECTION SUMMARY (CONTINUED)

Tank Shell:	Tank shell is constructed utilizing three (3) shell courses; nominal shell thickness appears to be 3/16" (.1875") stainless steel. A 12" seal band has been installed since our previous inspection on the bottom of the lower shell course utilizing what appears to be 3/16" stainless steel. No relevant wall loss was noted during our ultrasonic thickness survey.
Tank Heads:	Tank roof has been constructed utilizing five (5) stainless steel plates; nominal roof thickness appears to be 10 gauge (.135"). Depressions were noted on the roof located around manway nozzle (MW-2). ***TRNA recommends monitoring depressions for deficiencies at future inspection intervals.*** Tank floor appears to be 3/16" (.1875") stainless steel with five (5) sections. Ultrasonic thickness readings were taken on each section of the newly installed floor and should be utilized as a baseline for the next inspection interval. No relevant wall loss was noted on the roof during our ultrasonic thickness survey.
Nozzles and Venting System:	Tank utilizes a 3" normal vent which discharges outside of building. Normal venting is of adequate size due to inlet and outlet piping being 4" and reduced to 3", and inlet piping being reduced to 1.5". Tank is equipped with an adequate 8" emergency vent located on roof manway with 503,517 SCFH rating. PVC material was noted on the roof which is used for normal venting and charcoal filters. Charcoal filters utilize wooden bases for supports and are not secured to roof deck. ***TRNA recommends installing two hour fire rated material per local fire code and securing charcoal filters to roof deck.*** Fire valve at nozzle N-1 was disconnected at time of inspection. ***TRNA recommends ensuring fire valve is functional prior to returning the tank into service.*** Emergency vent piping located on the roof displayed no protective coatings***. TRNA recommends prepping surfaces and apply protective coatings.***
Ancillary Equipment:	Inlet piping inside of vessel displayed corrosion. ***TRNA recommends prepping surfaces and applying protective coatings with consideration given to replacing carbon steel with stainless steel.*** No dedicated ground wire was noted to be attached to tank. ***TRNA recommends installing dedicated ground wire to tank per NFPA 70 & 780.*** Associated piping used for filling the tanks located in the tank farm displayed coating failures. ***TRNA recommends prepping surfaces and apply protective coatings.*** Piping supports for PVC piping located on roof are not anchored to roof deck. ***TRNA recommends installing anchors as needed to prevent movement.***

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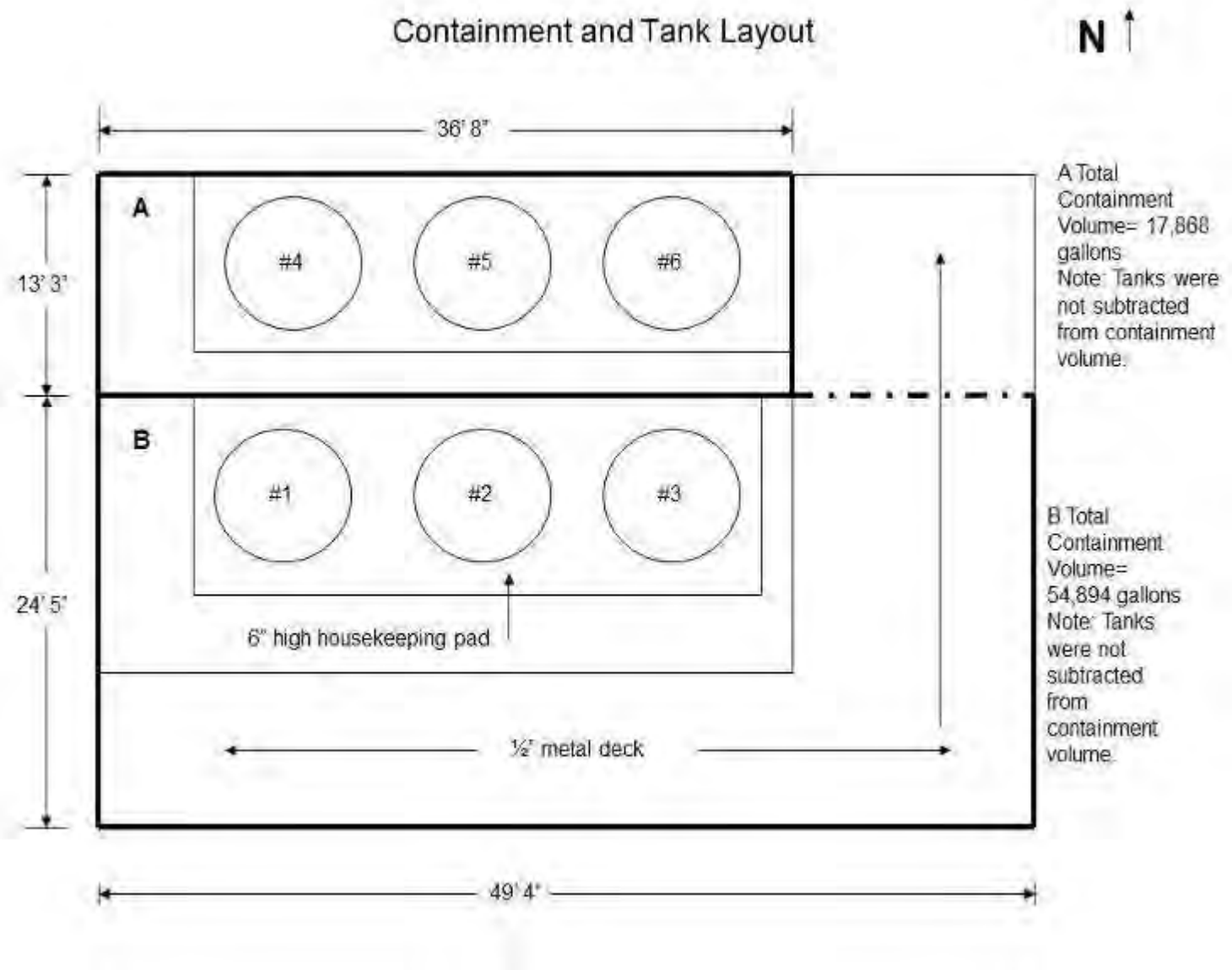
CONTAINMENT INFORMATION

Containment	Concrete with Coating	Visual Condition:	Acceptable
Containment Size:	24'5" X 49'4"	Coating:	☒ YES
Drain Valve:	☒ YES ☐ NO	Drain Valve Condition:	Acceptable



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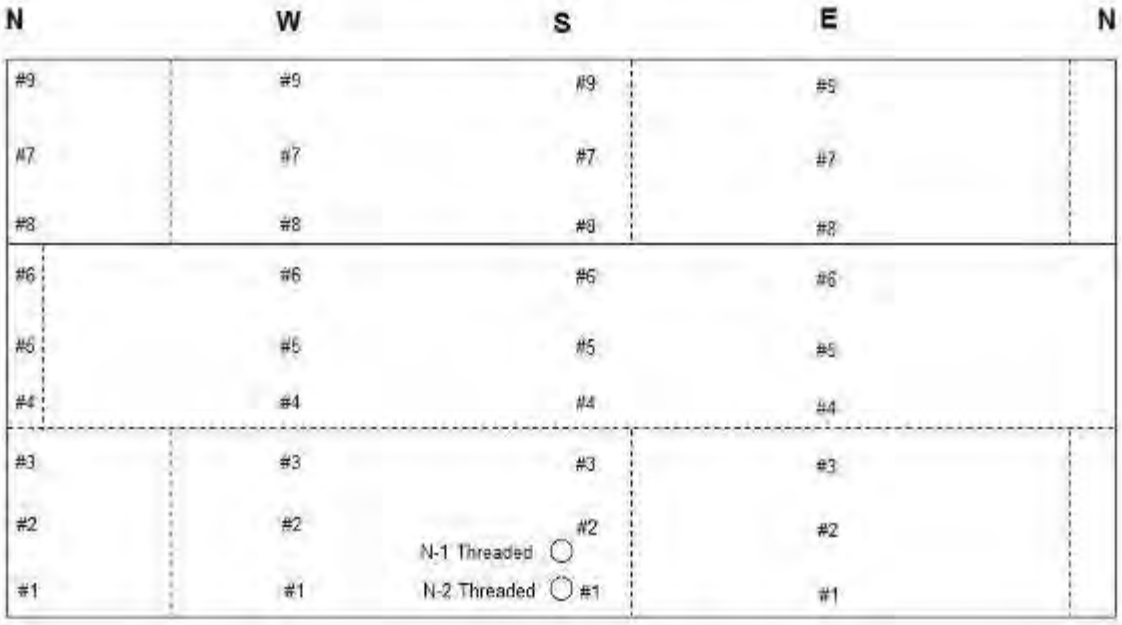
Shell Roll-Out
Tank #2



Drug and Laboratory Disposal

----- =Weld Seams

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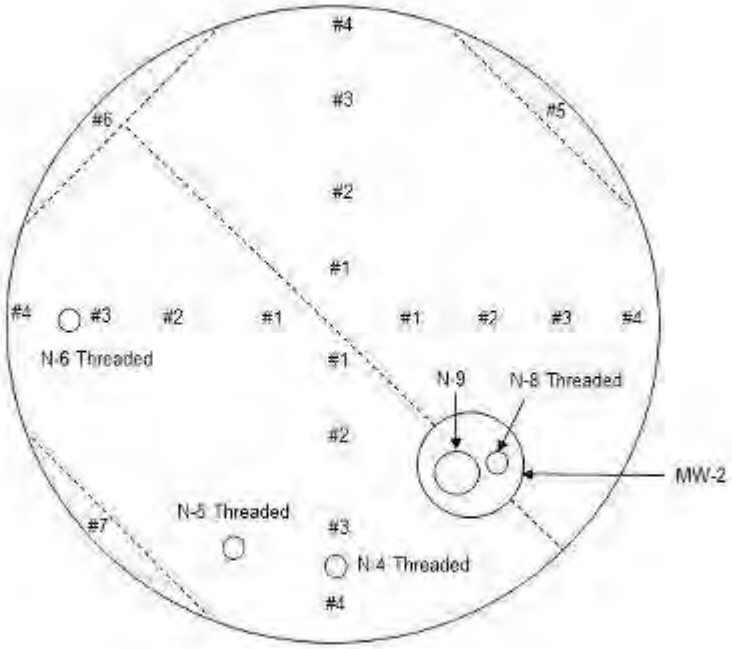
Roof
Tank #2

N



Drug and Laboratory
Disposal

------ = Weld Seams

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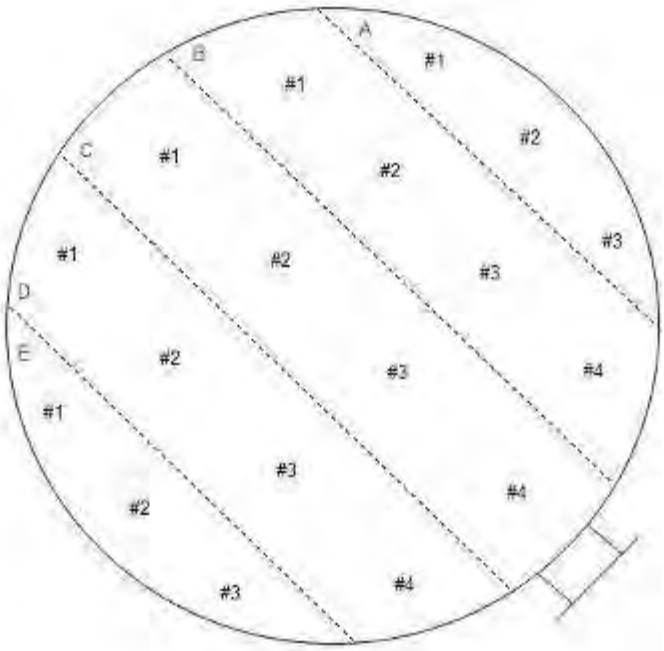
Floor
Tank #2

N



Drug and Laboratory
Disposal

------- = Weld Seams

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Reported To:	Drug & Laboratory Disposal, Inc.	Date:	November 8th, 2021
	331 Broad Street	Sales Order Number:	234177134
	Plainwell, MI	P/O Number:	21-TRNA-1118
		Report Number:	1 Final
		Project:	Tank #2

ULTRASONIC THICKNESS INSPECTION REPORT

Drug & Laboratory Disposal, Inc.			Report #:	1	Page	1	of	1
331 Broad Street			Sale Order #:	234177134				
Plainwell, MI			Project:	Tank #2				
Date:	November 8th, 2021			Floor & Roof				
Test Method Standard:	TRIS-NDE-UT-6	Acceptance Standards:		STI-SP001				

ULTRASONIC UNIT

Manufacturer:	Olympus 38 DL Plus	A-Scan & Direct Readout:	Yes				
Serial #:	140868604	A-Scan & Direct Readout:		X	Yes		No
Calibration Date:	08/18/2021	Calibration Due Date:	02/18/2022				

CALIBRATION BLOCK

Material Type:	Stainless Steel	Size: .100 - .500”	02-7278

SEARCH UNIT

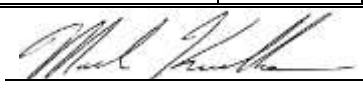
Size:	.375	Serial #	43031	Frequency:	5 MHz

COUPLANT

Manufacturer:	Sonotech	Batch:	2OC051	Type:	Glycerin Gel

MEASUREMENTS

Floor-Plate A	Readings	Floor-Plate D	Readings	Roof	
TML#1	.182	TML#1	.180	TML#1-South	.133
TML#2	.181	TML#2	.181	TML#2-South	.134
TML#3	.181	TML#3	.181	TML#3-South	.133
Floor-Plate B		TML#4	.181	TML#4-South	.134
TML#1	.180	**Floor-Plate E**		TML#1-East	.133
TML#2	.181	TML#1	.181	TML#2-East	.133
TML#3	.181	TML#2	.181	TML#3-East	.135
TML#4	.181	TML#3	.182	TML#4-East	.134
Floor-Plate C		**Roof**		TML#1-West	.134
TML#1	.182	TML#1-North	.132	TML#2-West	.132
TML#2	.180	TML#2-North	.131	TML#3-West	.130
TML#3	.187	TML#3-North	.133	TML#4-West	.130
TML#4	.183	TML#4-North	.132	TML#5-N/E	.133
				TML#6-N/W	.133
				TML#7-S/W	.132

Signed: 

Certification: Field Service Manager

Reviewed by: Mark Kroells

Date: 11.09.2021

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ULTRASONIC THICKNESS INSPECTION REPORT

Drug & Laboratory Disposal, Inc.				Report #:	1	Page	1	of	1
331 Broad Street				Sale Order #:	November 8th, 2021				
Plainwell, MI				Project:	Tank #2				
Date:	November 8th, 2020				Shell				
Test Method Standard:	TRIS-NDE-UT-6		Acceptance Standards:		STI-SP001				

ULTRASONIC UNIT

Manufacturer:	Olympus 38 DL Plus	A-Scan & Direct Readout:	Yes				
Serial #:	140868604	A-Scan & Direct Readout:		X	Yes		Serial #:
Calibration Date:	08/18/2021	Calibration Due Date:	02/18/2022				

CALIBRATION BLOCK

Material Type:	Stainless Steel	Size: .100 - .500”	02-7278

SEARCH UNIT

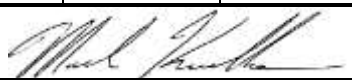
Size:	.375	Serial #	43031	Frequency:	5 MHz

COUPLANT

Manufacturer:	Sonotech	Batch:	2OC051	Type:	Glycerin Gel

MEASUREMENTS

Shell	Readings	Shell	Readings	Nozzles	
North		**East**		MW-1-Top	.245
TML#1	.181	TML#1	.182	MW-1-Bottom	.244
TML#2	.183	TML#2	.185	MW-1-North	.245
TML#3	.184	TML#3	.182	MW-1-South	.243
TML#4	.183	TML#4	.183	Cover	.387
TML#5	.184	TML#5	.184		
TML#6	.183	TML#6	.184	MW-2-North	.183
TML#7	.183	TML#7	.184	MW-2-South	.183
TML#8	.184	TML#8	.186	MW-2-East	.183
TML#9	.183	TML#9	.185	MW-2-West	.184
South		**West**		N-9-North	.134
TML#1	.218	TML#1	.213	N-9-South	.134
TML#2	.221	TML#2	.216	N-9-East	.134
TML#3	.217	TML#3	.214	N-9-West	.134
TML#4	.179	TML#4	.181		
TML#5	.181	TML#5	.181		
TML#6	.182	TML#6	.182		
TML#7	.183	TML#7	.182		
TML#8	.187	TML#8	.183		
TML#9	.184	TML#9	.182		

Signed: 

Certification: Field Service Manager

Reviewed by: Mark Kroells

Date: 11.09.2021

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Middle Shell Corrosion Rate

Year of Inspection	2020	Year
Year of Construction	1983	Year
Nominal Floor Plate Thickness (inches)	0.1875”	Inch
Minimum Remaining Shell Thickness	0.181”	Inch
Material Lost Since Construction	0.0065	Inch
Estimated Corrosion Rate	.0002	Inch/yr.
Next Internal Inspection	5	Years
Estimated Material Degradation in 5 Years	.001	Inch
Estimated Remaining Material at 5 Year Internal Inspection	.171	Inch
Minimum acceptable remaining shell thickness	0.0937	Inch

Roof Corrosion Rate

Year of Inspection	2020	Year
Year of Construction	1983	Year
Nominal Roof Plate Thickness (inches)	0.135	Inch
Minimum Remaining Roof Thickness	0.130	Inch
Material Lost Since Construction	0.005	Inch
Estimated Corrosion Rate	.001	Inch/yr.
Next Internal Inspection	1	Years
Estimated Material Degradation in 5 Years	.001	Inch
Estimated Remaining Material at 5 Year Internal Inspection	.125	Inch
Minimum acceptable roof thickness	0.0937	Inch

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Nozzle and or Appurtenance Table

Item	Description	Size (in.)	Neck Thick (in.)	Cover Thick (in.)	Comments
MW-1	Shell Manway	24”	.243	.389	Manway
MW-2	Roof Manway	16”	.183	n/a	Manway
N-1	Nozzle	4”	n/a	n/a	Drain/Outlet Reduced to 3”
N-2	Nozzle	2”	n/a	n/a	Capped Nozzle
N-3	Nozzle	2”	n/a	n/a	Capped Nozzle
N-4	Nozzle	4”	n/a	n/a	Inlet Reduced to 1.5”
N-5	Nozzle	2”	n/a	n/a	Level Gauge
N-6	Nozzle	2 ”	n/a	n/a	Sample Port
N-7	Nozzle	3”	n/a	n/a	4” Reduced to 3” Normal Vent
N-8	Nozzle	4”	n/a	n/a	4” Capped
N-9	Nozzle	8”	.134	n/a	Emergency Vent

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Fire valve at nozzle N-1 was disconnected at time of inspection

Tank is elevated on no-fire rated material

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Tank floor

Internal dip tube

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Coating failures with active corrosion noted on associated feed piping

Catwalk I-beams displayed coating failures with active corrosion

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South floor supports displayed coating failures with active corrosion

E-Vent piping displayed no protective coatings

PVC Piping being utilized instead of two hour fire rated material

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	Technician:	Clayton Sawyer
	Certifications:	STI / API / NDE Level II
	Signed:	
	Certification:	Field Service Manager
	Reviewed by:	Mark Kroells
	Date:	11.09.2021

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Drug & Laboratory Disposal, Inc
Tank #3

Prepared By:

John C. Root
Steel Tank Institute &
Level II Inspector
STI Inspector No: AST-22110
Expiration Date: August 18, 2025

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ABOVEGROUND VERTICAL STORAGE TANK DATA SHEET

GENERAL INFORMATION

TANK OWNER:	Drug & Laboratory Disposal, Inc.	DATE:	October 25, 2021
LOCATION:	331 Broad Street Plainwell MI, 49080	S.O.:	234177134
TANK ID:	Tank #3	TANK CONTENT:	Unknown
		SPECIFIC GRAVITY:	Unknown

TANK INFORMATION

Tank Manufacturer:	Dowagiac Steel Tank Company	Design Std:	Unknown
Manufacturer Date:	1984	Tank Material:	Stainless Steel
Data Plate Presence:	☒ YES ☒ NO	Jacket Thickness:	None
Cathodic Protection:	N/A	Coating:	None
Shell:	☒ Welded ☐ Riveted	Insulated:	☐ YES ☒ NO
Tank Classification	STI Category I		

TANK INSPECTION SUMMARY

Overall: TUV Rheinland North America (TRNA) performed an internal and external formal inspection with an ultrasonic thickness survey per Steel Tank Institute (STI), SP001 6th Edition on this Tank noted as #3. Tank is recognized as a category I, due to its vertical type and slightly elevated placement on a concrete housekeeping pad, which provides a means of continuous release detection method (CRDM), and is properly sized to contain the entire volumetric capacity of the Atmospheric Storage Tank (AST). Next scheduled inspection should be done monthly and annually per STI SP001 Inspection Checklists. A formal external and internal inspection should be performed no later than 5 years due to weld repairs performed. Weld repairs were performed since our previous inspection in 2020 with less than marginal weld quality observed. Lack of fill and undercut was still evident on the floor weld seams and both the top and bottom fillet welds of the circumferential reinforcement band. These welding deficiencies require filling and blending of the welds to a smooth contour finish in their entirety. ***TRNA recommends performing weld repairs at the next available opportunity to maintain structural integrity and prevent crevice corrosion. At a minimum, these fillet welds should be closely monitored at the next inspection interval for crevice corrosion.*** These welding deficiencies were discussed with DLD employee Will Ryan. The floor puddle welds displayed marginal weld quality with a high likelihood of crevice corrosion to occur. ***TRNA recommends grinding the puddle welds to a smooth contour finish to prevent crevice corrosion; consideration should be given to installing 2" circle patches over puddle weld locations to insure longevity of tank floor. At a minimum these puddle welds should be closely monitored at the next inspection interval for crevice corrosion.*** Overall, this tank is suitable for continued service providing the following recommendations detailed in this report are completed.

Containment: This AST is located inside a concrete containment of adequate size to contain the contents of this AST. Minor coating failures were noted throughout containment and in a few locations no coating is being utilized (just bare concrete and joints). ***TRNA recommends applying proper***

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coatings and sealing all joints to ensure that containment is impervious to the environment. The stairway and structural supports for the adjacent flooring under the containment have multiple coating failures and significant corrosion. ***TRNA recommends prepping these surfaces and applying proper protective coatings to the adjacent floor supports and stairway. Consideration should be given to consulting a structural engineer for replacement/repair of the adjacent floor supports due to the amount of corrosion observed.***

Foundation: The tank is slightly elevated and rests on wooden supports. The supports are saturated with unidentifiable moisture. ***TRNA recommends replacing wooden supports with two-hour fire rated material.*** Catwalk foundation displayed coating failures with active surface corrosion on the I-beam support and carbon steel diamond-plating floor. ***TRNA recommends prepping surfaces and apply protective coatings.***

Tank Shell: Tank shell is constructed utilizing three (3) shell courses; nominal shell thickness appears to be 3/16" (.1875") stainless steel. No relevant wall loss was observed during our ultrasonic thickness survey. See attached ultrasonic thickness report for detailed information. Uniform corrosion noted in the form of pitting was observed on the lower two shell courses. Pitting depth was measured between 1/32 of an inch and 1/16 of an inch. ***TRNA recommends monitoring at next inspection interval.***

Tank Heads: Tank roof is constructed utilizing three (3) 10 gauge (.135") stainless steel plates. Tank floor is constructed utilizing five (5) 5/16" (.312") stainless steel plates. No relevant wall loss was observed during our ultrasonic thickness survey. See attached ultrasonic thickness report for detailed information.

Nozzles and Venting System: Tank utilizes a 3" normal vent, which discharges outside of building. Normal venting is of adequate size due to inlet and outlet piping being 4" and reduced to 3", and inlet piping being reduced to 1.5". Tank is equipped with an adequate 8" emergency vent located on roof manway with 503,517 SCFH rating. PVC material was noted on the roof, which is used for normal venting and charcoal filters. Sample port which is used on occasion was noted in conjunction with normal venting. Per UL-142 normal venting shall be dedicated and be free from obstruction. ***TRNA recommends re-routing sample port to a new location such as manway nozzle N-7, which is capped, and replacing PVC material as needed with two-hour fire rated material per local fire codes.*** Fire valve at nozzle N-1 was disconnected at time of inspection. ***TRNA recommends ensuring fire valve is functional prior to returning tank into service.***

Ancillary Equipment: Inlet piping displayed signs of active surface corrosion. ***TRNA recommends monitoring for corrosion between inspection intervals. Consideration should be given to replacing inlet piping with stainless-steel material.*** No ground wire was noted at this time. ***TRNA recommends installing a ground wire to tank.*** Associated piping used for filling tanks located in the tank farm displayed coating failures. ***TRNA recommends prepping surfaces and apply protective coatings.*** PVC piping and filter located on roof are not anchored to roof deck. ***TRNA recommends installing anchors as needed to prevent movement.*** Coating failures were noted on the emergency vent piping and associated filter. ***TRNA recommends prepping surfaces and apply protective coatings as needed to prevent corrosion.***

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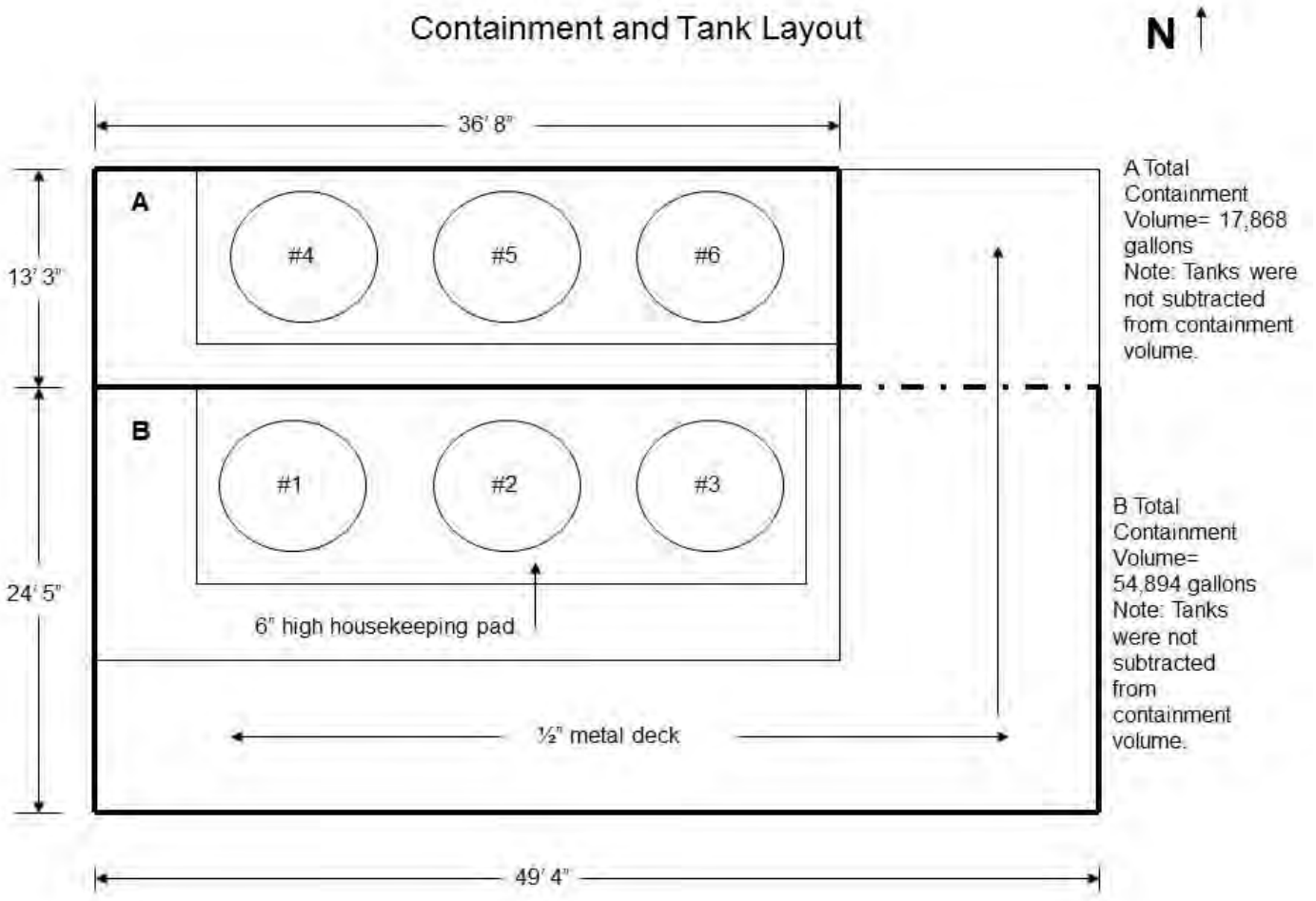
CONTAINMENT INFORMATION

Containment	Concrete with Coating	Visual Condition:	Acceptable
Containment Size:	24'5" X 49'4"	Coating:	☒ YES
Drain Valve:	☒ YES ☐ NO	Drain Valve Condition:	Acceptable



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Reported To:	Drug & Laboratory Disposal, Inc.	Date:	10/25/2021
	331 Broad Street	Sales Order Number:	230121912
	Plainwell, MI	P/O Number:	Quote 20-TRIS-0941
		Report Number:	1 Final
		Project:	Tank #3

ULTRASONIC THICKNESS INSPECTION REPORT

Test Method Standard:	TRIS-NDE-UT-6	Acceptance Standards:	STI-SP-001

ULTRASONIC UNIT

Manufacturer:	Panametrics 38 DL Plus	A-Scan & Direct Readout:	Yes				
Serial #:	140866004	A-Scan & Direct Readout:		X	Yes		No
Calibration Date:	6/28/2021	Calibration Due Date:	12/28/2021				

CALIBRATION BLOCK

Material Type:	Stainless Steel	Size: .100 - .500”	02-7278

SEARCH UNIT

Size:	.375	Serial #	630648	Frequency:	5 MHz

COUPLANT

Manufacturer:	Sonotech	Batch:	11442-A	Type:	Glycerin Gel

MEASUREMENTS

Floor-Plate A	Readings	Floor-Plate E	Readings	Roof	
TML#1	.324	TML#1	.323	TML#1-North	.132
TML#2	.323	TML#2	.323	TML#2-North	.133
TML#3	.324	TML#3	.324	TML#3-North	.134
Floor-Plate B				TML#4-North	.132
TML#1	.323			TML#1-South	.133
TML#2	.324			TML#2-South	.132
TML#3	.324			TML#3-South	.132
Floor-Plate C				TML#4-South	.132
TML#1	.323			TML#1-East	N/A
TML#2	.324			TML#2-East	N/A
TML#3	.324			TML#3-East	N/A
Floor-Plate D				TML#4-East	N/A
TML#1	.323			TML#1-West	.133
TML#2	.323			TML#2-West	.131
TML#3	.324			TML#3-West	.132
				TML#4-West	.132

Signed: 

Certification: Field Service Manager

Reviewed by: Mark Kroells

Date: 10/26/2021

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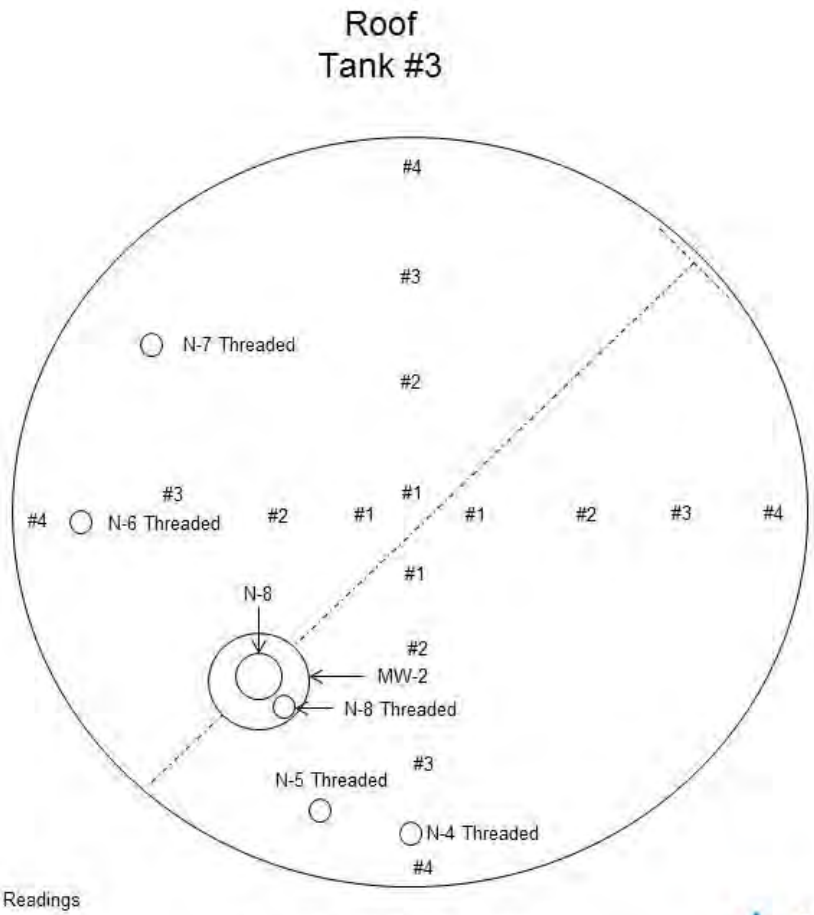

Legend

#'s = Ultrasonic Thickness Readings

= Weld Seam

Drug and Laboratory Disposal

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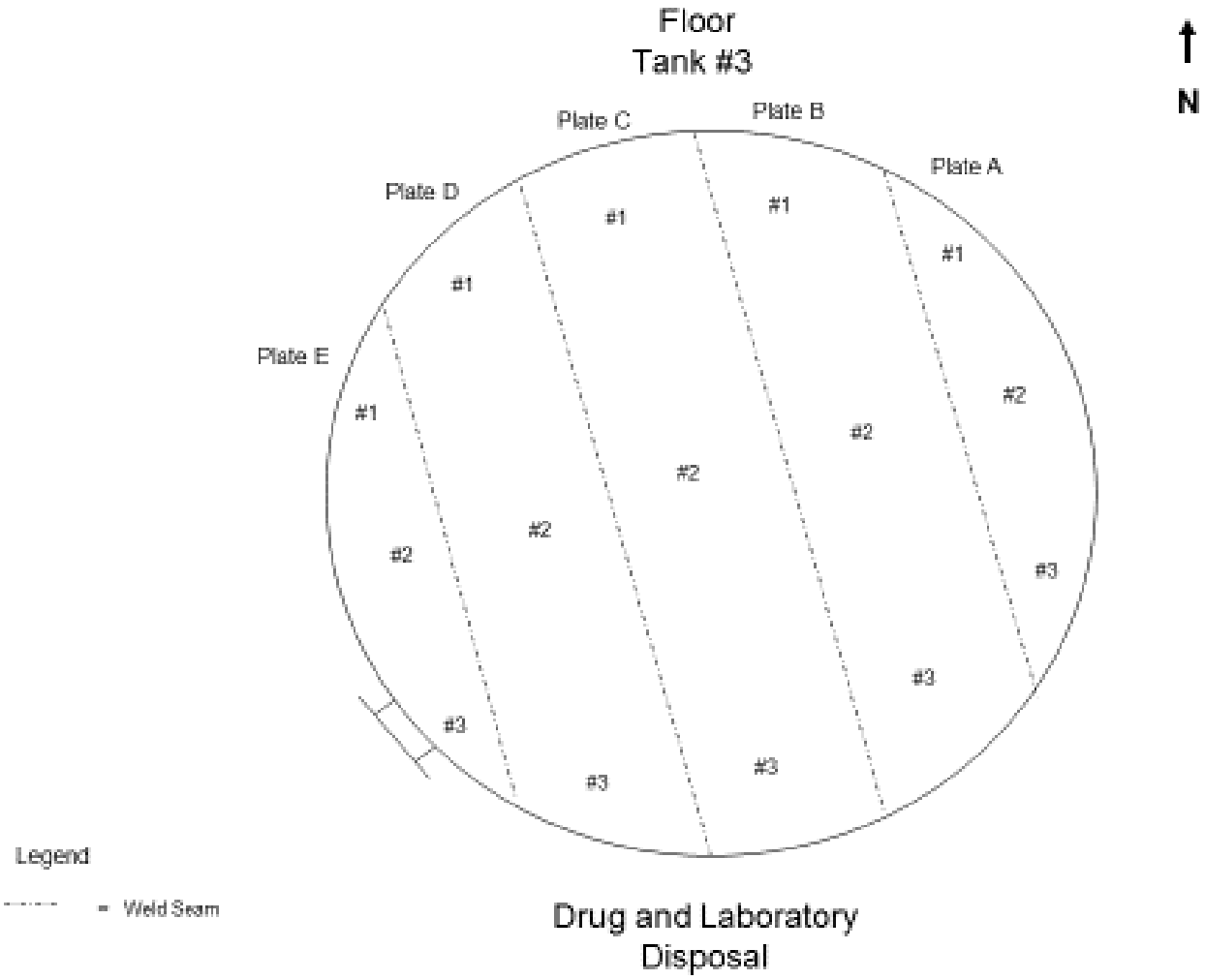

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Floor Corrosion Rate

Year of Inspection	2021	Year
Year of Construction	2017	Year
Nominal Floor Plate Thickness (inches)	0.325”	Inch
Minimum Remaining Shell Thickness	0.323”	Inch
Material Lost Since Construction	0.002”	Inch
Estimated Corrosion Rate	.0005”	Inch/yr.
Next External Inspection	5	Years
Estimated Material Degradation in 5 Years	.0025	Inch
Estimated Remaining Material at 5 Year Internal Inspection	.321	Inch
Minimum acceptable floor thickness	0.1615”	Inch

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ULTRASONIC THICKNESS INSPECTION REPORT

Date:	10/25/2021		Shell
Test Method Standard:	TRIS-NDE-UT-6	Acceptance Standards:	STI-SP-001

ULTRASONIC UNIT

Manufacturer:	Panametrics 38 DL Plus	A-Scan & Direct Readout:	Yes				
Serial #:	140866004	A-Scan & Direct Readout:		X	Yes		No
Calibration Date:	6/28/2021	Calibration Due Date:	12/28/2021				

CALIBRATION BLOCK

Material Type:	Stainless Steel	Size: .100 - .500”	02-7278

SEARCH UNIT

Size:	.375	Serial #	630648	Frequency:	5 MHz

COUPLANT

Manufacturer:	Sonotech	Batch:	11442-A	Type:	Glycerin Gel

MEASUREMENTS

Shell	Readings	Shell	Readings	Nozzles	
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TML#3	.179	TML#3	.173	MW-1-South	.250
TML#4	.180	TML#4	.185	Cover	.373
TML#5	.186	TML#5	.186		
TML#6	.188	TML#6	.186	MW-2-North	.186
TML#7	.181	TML#7	N/A	MW-2-South	.187
TML#8	.186	TML#8	N/A	MW-2-East	.185
TML#9	.183	TML#9	N/A	MW-2-West	.187
South		**West**		N-9-North	.131
TML#1	.179	TML#1	.182	N-9-South	.132
TML#2	.181	TML#2	.182	N-9-East	.132
TML#3	.175	TML#3	.180	N-9-West	.132
TML#4	.183	TML#4	.188		
TML#5	.186	TML#5	.189		
TML#6	.186	TML#6	.189		
TML#7	.187	TML#7	.192		
TML#8	.189	TML#8	.189		
TML#9	.187	TML#9	.186		

Signed: 
Certification: Field Service Manager
Reviewed by: Mark Kroells
Date: 10/26/2021

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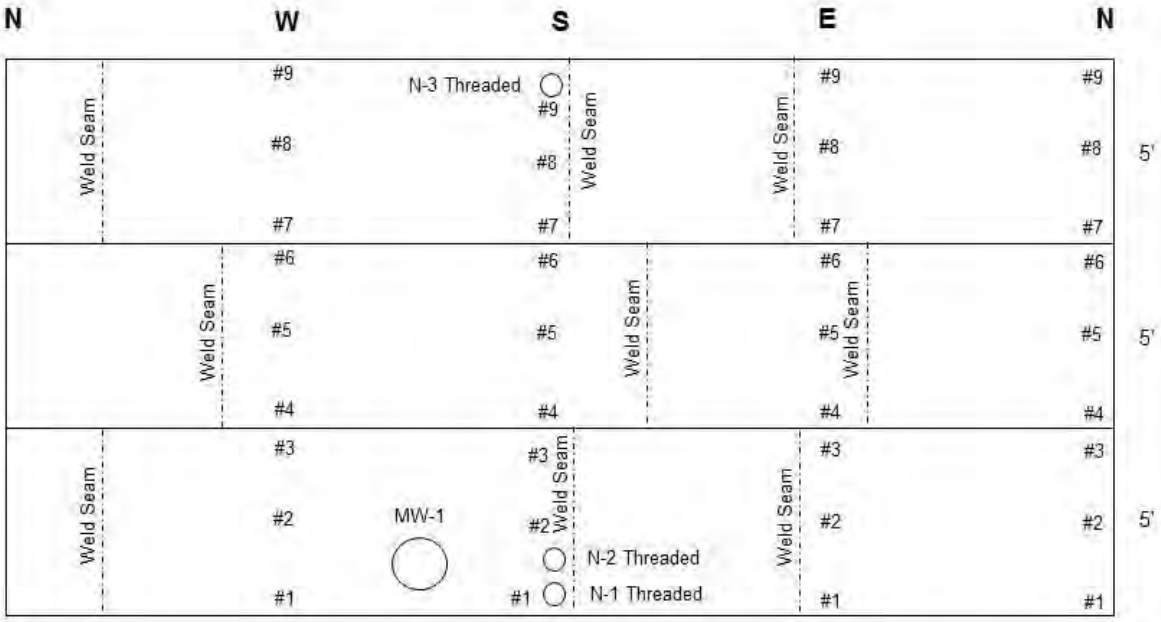
Shell Roll-Out
Tank #3



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Legend

#'s = Ultrasonic Thickness Readings

= Weld Seam

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Shell Corrosion Rate

Year of Inspection	2021	Year
Year of Construction	1984	Year
Nominal Head Plate Thickness (inches)	.187	Inch
Minimum Remaining Shell Thickness	.173 -.09 pitting= .164	Inch
Material Lost Since Construction	.023	Inch
Estimated Corrosion Rate	.0006	Inch/yr.
Next External Inspection	5	Years
Estimated Material Degradation in 5 Years	.003	Inch
Estimated Remaining Material at 5 Year Internal Inspection	.170	Inch

Minimum acceptable remaining shell thickness	0.0937	Inch

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Nozzle and or Appurtenance Table

Item	Description	Size (in.)	Neck Thick (in.)	Cover Thick (in.)	Comments
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MW-2	Roof Manway	16”	.185	n/a	Manway
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N-2	Nozzle	2”	Threaded	Threaded	Capped Nozzle
N-3	Nozzle	2”	Threaded	Threaded	Capped Nozzle
N-4	Nozzle	4”	Threaded	Threaded	Inlet
N-5	Nozzle	2”	Threaded	Threaded	Level Gauge
N-6	Nozzle	2 ”	Threaded	Threaded	Capped
N-7	Nozzle	3”	Threaded	Threaded	4” Reduced to 3” Normal Vent
N-8	Nozzle	4”	Threaded	Threaded	4” Capped
N-9	Nozzle	8”	Threaded	Threaded	Emergency Vent

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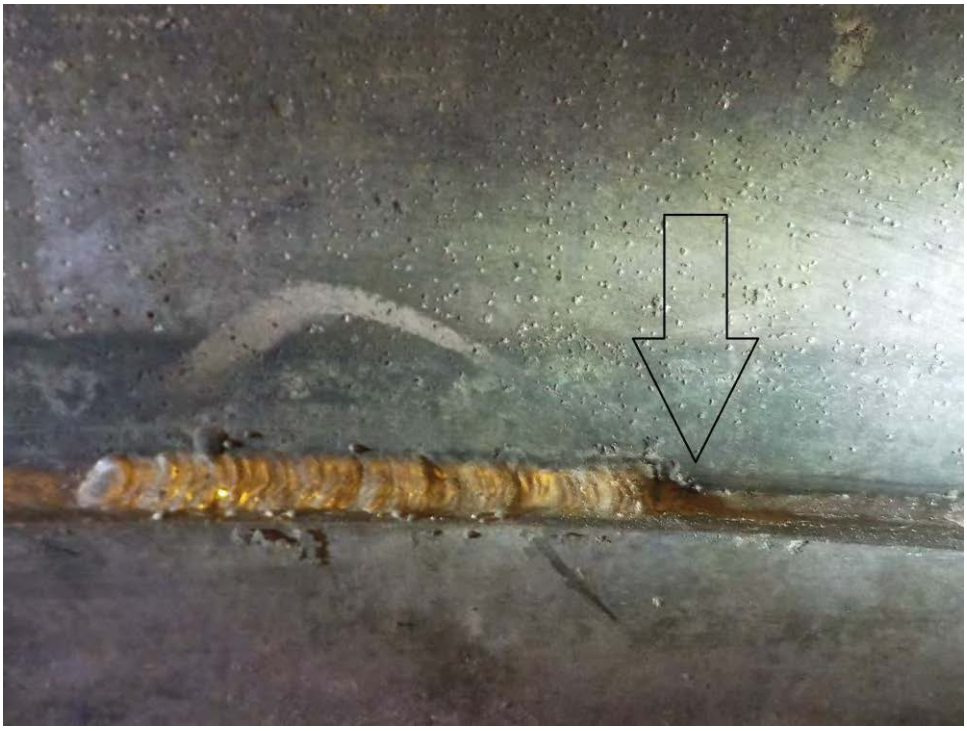

Upper circumferential reinforcement fillet weld repairs with lack of fill and possible crevice corrosion

Example of floor to reinforcement band fillet weld with poor weld quality

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Example of the floor circumferential weld repairs with less than marginal weld quality and possible crevice corrosion

Floor seam weld with lack of filler metal and weld spatter

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Floor seam weld repair with lack of fill and possible crevice corrosion

Floor seam weld with lack of filler metal and undercut

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Weld spatter observed in the floor

Example of puddle welding on the floor with possible crevice corrosion

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Example of puddle welding performed on the floor with weld spatter and possible crevice corrosion

Corrosion from upper adjacent platform under containment

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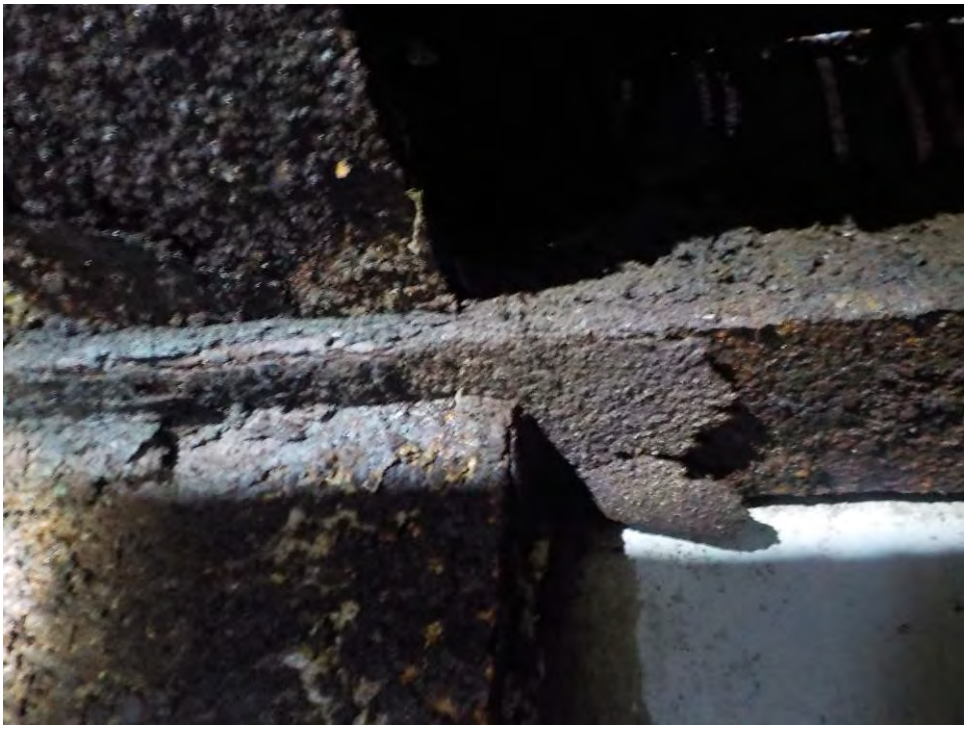

Significant corrosion under support structure located under containment

Surface corrosion observed on supports and underneath catwalk

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Drug & Laboratory Disposal, Inc.
Plainwell, Michigan
Tank #4

Prepared By:

Dana W. Bryan
Senior Inspector / Level II
STI-SP001 ID# STI AC-20810
Expiration Date: July, 2025

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ABOVE-GROUND VERTICAL STORAGE TANK DATA SHEET

GENERAL INFORMATION

TANK OWNER:	Drug & Laboratory Disposal, Inc.	DATE:	December 20, 2021
LOCATION:	331 Broad Street Plainwell MI, 49080	S.O.:	234177134
TANK ID:	Tank #4		

TANK INFORMATION

Tank Manufacturer:	Dowagiac Steel Tank	Design Std:	Unknown
		MFG Serial#	Unknown
Manufacturer Date:	Unknown	Tank Material:	Stainless Steel
Data Plate Presence:	☐ YES ☒ NO	Jacket Thickness:	None
Cathodic Protection:	N/A	Coating:	None
Shell:	☒ Welded ☐ Riveted	Insulated:	☐ YES ☒ NO
Tank Classification	STI Category I		

TANK INSPECTION SUMMARY

Overall: An annual internal and external inspection with an ultrasonic thickness survey was performed per Steel Tank Institute (STI), SP001 5th Edition on this Tank noted as Tank 4. Tank is recognized as a category I, due to its vertical type and slightly elevated placement on a concrete housekeeping pad, which provides a means of continuous release detection method (CRDM), and proper containment for the entire volumetric capacity of the Atmospheric Storage Tank (AST). Next scheduled inspection to be done monthly and annually per STI SP001 Inspection Checklists. A formal internal inspection shall be performed no later than 1 year due to accelerated corrosion, the amount of previous weld repairs and the unknown contents this tank may contain. In 2019, extensive Internal repairs were completed on Tank 4. The tank received a new 12" tall perimeter ring lining the internal perimeter radius of the Tank. In addition, the Tank received a new Floor Bottom. Overall the workmanship appears satisfactory. Since last year inspection (2020), weld deficiencies were repaired and corrected.

Containment: One (1) crack was observed on the south containment wall. ***TRNA recommends performing concrete repairs as needed to the containment floor and walls to insure containment is sufficiently impervious to the environment.*** Coating failures were noted on stairway, platform and supports**.** Stairway bolting has separated from the East Wall. ***TRNA recommends installing anchor bolt and prepping and applying proper protective coating.***

Foundation: The tank is slightly elevated and rests on what appears to be wooden planks. Consideration should be given to replacing wooden panels with two hour fire rating materials and possibly elevating this tank to aid in CRDM.

TANK INSPECTION SUMMARY (CONTINUED)

Tank Shell: Tank shell utilizes four (4) shell courses. Nominal shell thickness was best guessed utilizing our ultrasonic thickness survey and appears to be 3/16" (.1875") stainless steel. No drawings are available at this time. Weld repairs have been performed on the lower two (2) shell courses. The First Course has a 12" tall perimeter ring (added in 2019) welded at the base of the First Course. First and second course vertical welds as well as the horizontal weld between the first and second course displayed uniform pitting (minor depth [<0.030"). ***TRNA recommends annual internal inspection to monitor the pitting activities.*** See attached ultrasonic thickness survey.

Tank Floor: Tank Floor was replaced in 2019 and utilizes (5) five 3/16" (.1875") stainless steel plates. Tank Floor appears to be in satisfactory condition. Thickness readings were found consistent with minimal wall loss. Weld seams were repaired and corrected since last inspection. Minimal pitting activities were noted on the Floor. ***TRNA recommends annual internal inspection to monitor the pitting activities.*** See attached ultrasonic thickness survey.

Tank Roof: Tank Roof is slightly coned and consisted of four (4) Stainless Steel plates measuring approximately 0.1875" thick. Bottom Side of the Roof was limited due to access. Visually, the Bottom Side of the Roof appears satisfactory. Top Side of the Roof was also limited due to access. No significant distortion was noted from the Roof Nozzles. See attached ultrasonic thickness survey.

Nozzles and Venting System: Tank utilizes a 3" normal vent which discharges outside of building. Normal venting is of adequate size due to inlet and outlet piping being 4" and reduced to 3", and the inlet piping being reduced to 1.5". Tank emergency vent is mounted on Roof Manway and is vented through the building roof. The Emergency Vent consisted of 8" Morrison Brothers 244 Series Emergency Vent (503,517 SCFH rating) located top of the 8" pipe. This pipe is uncoated and bare. ***TRNA recommends prepping and applying protective coating.***
PVC material was noted on the roof which is used for normal venting and charcoal filters. A PVC piping is not anchored to the roof and a valve handle was broken. Sample port which is used on occasion was noted to be in conjunction with normal venting. Per UL-142 normal venting shall be dedicated and be free from obstruction. ***TRNA recommends re-routing the sample port to a new location such as manway nozzle N-7 which is capped and replacing PVC material with two hour fire rated material per local fire codes.*** Charcoal filters utilize wooden bases for supports and are not secured to roof deck. ***TRNA recommends installing two hour fire rated material as needed per local fire code and securing charcoal filters to roof deck as needed.***

Ancillary Equipment: Inlet piping inside of tank is badly corroded with through wall holes. ***TRNA recommends replacing inlet piping.*** Associated piping used for filling tanks located in the tank farm displayed coating failures. ***TRNA recommends prepping surfaces and apply protective coatings.*** I-beam and diamond decking for the catwalk support displayed surface corrosion and coating failures. ***TRNA recommends prepping surfaces and applying protective coating.***

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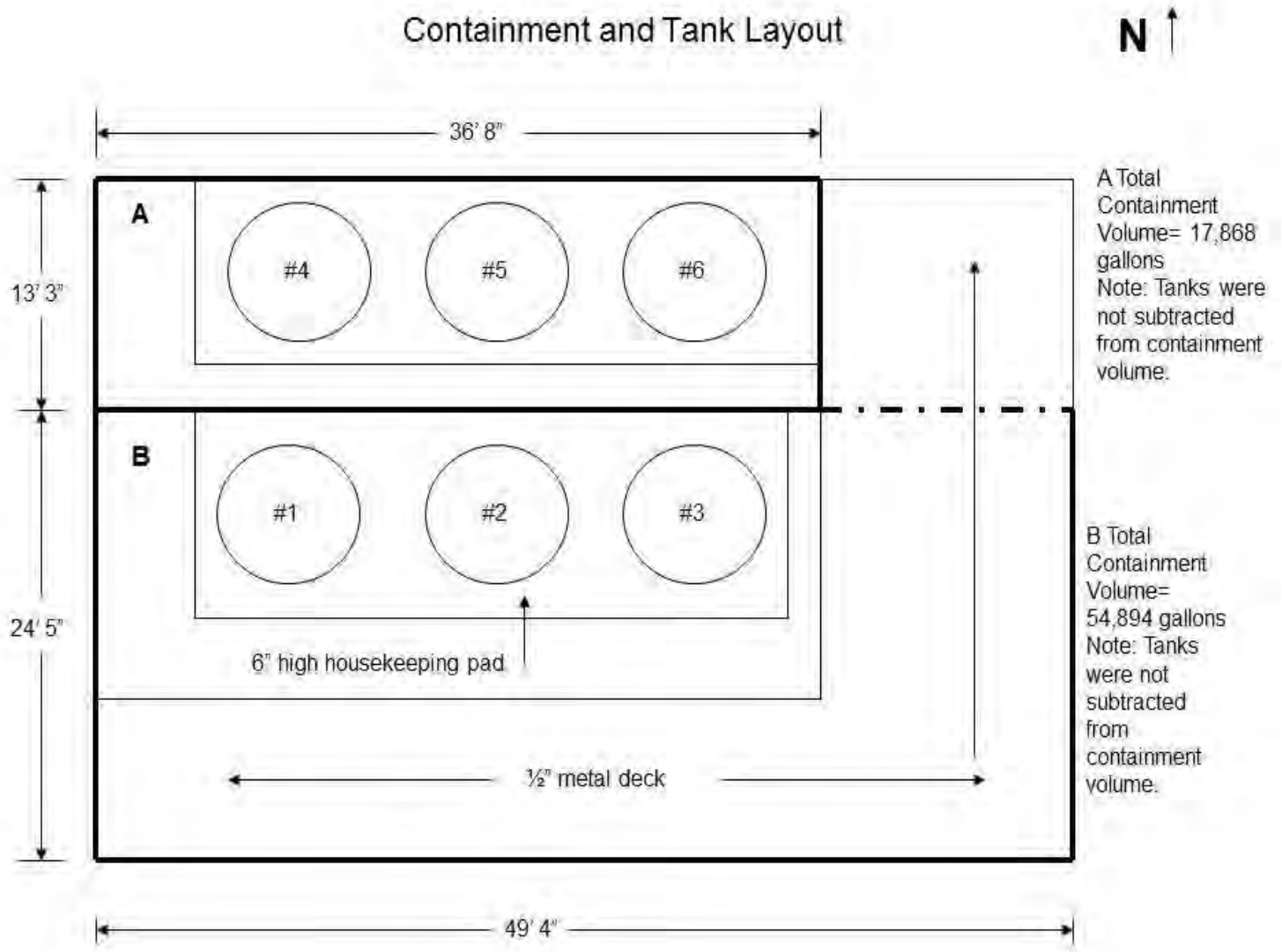
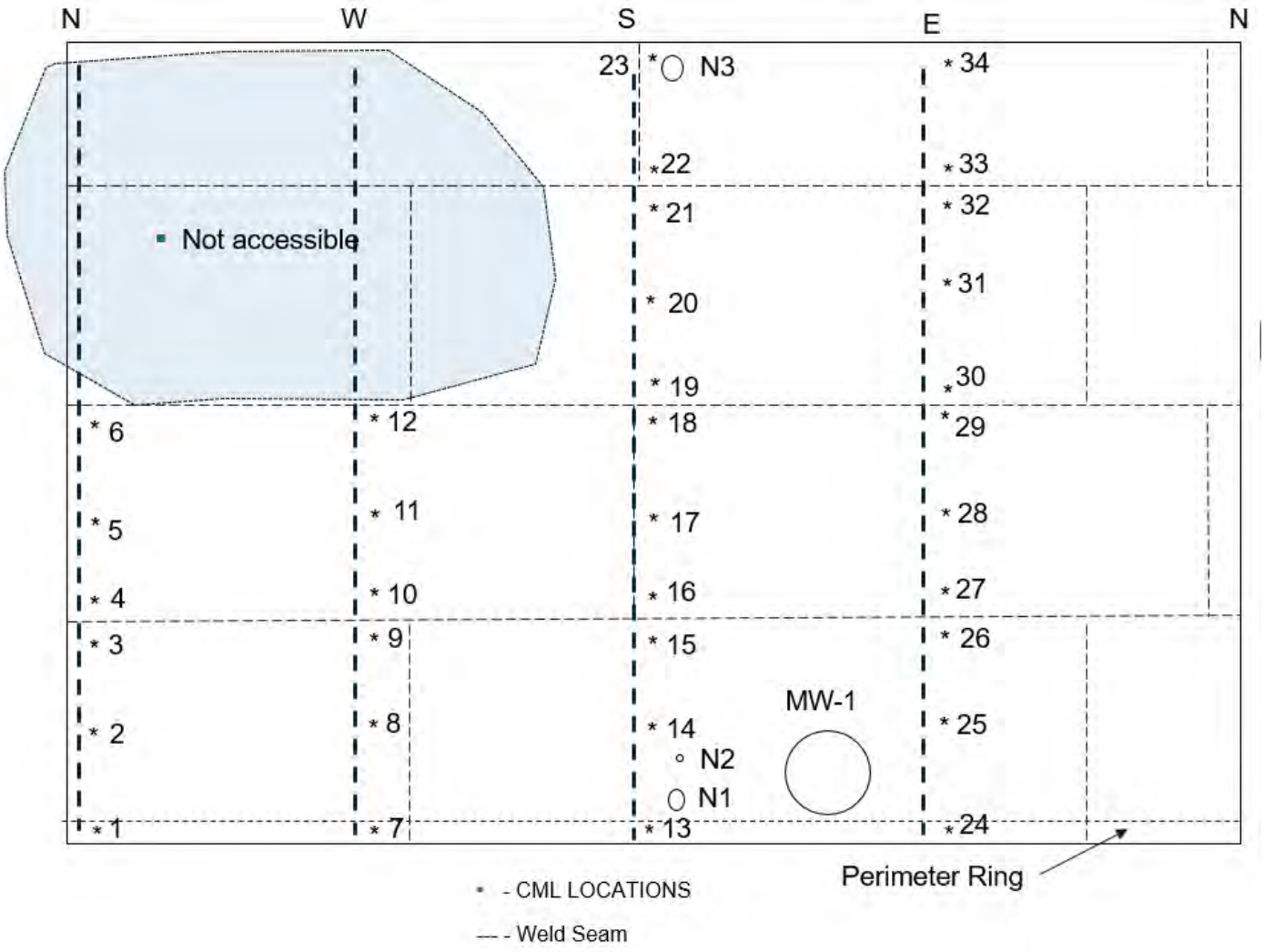
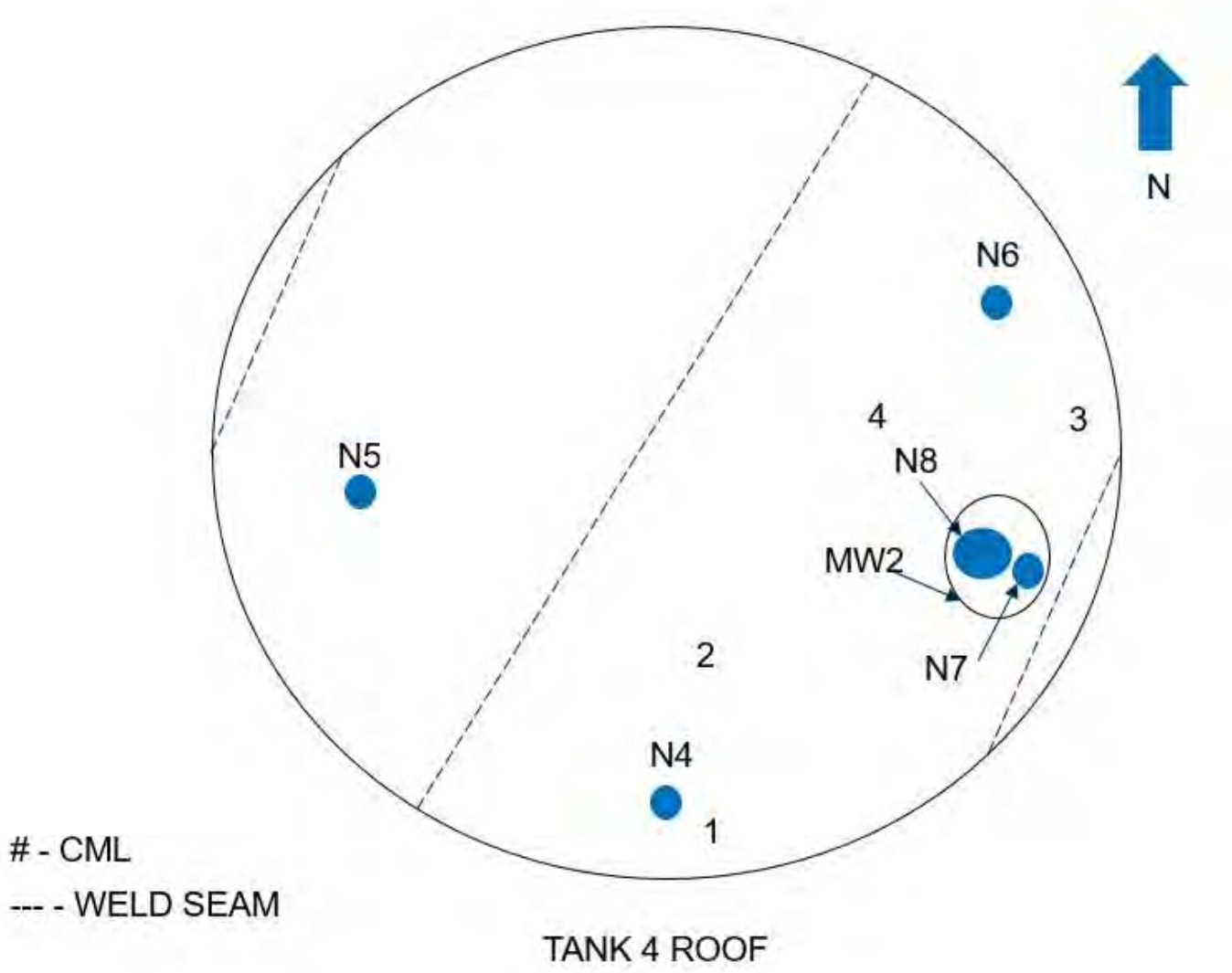
CONTAINMENT INFORMATION

Containment	Concrete with Coating	Visual Condition:	Acceptable
Containment Size:	24'5" X 49'4"	Coating:	☒ YES
Drain Valve:	☒ YES ☐ NO	Drain Valve Condition:	Acceptable

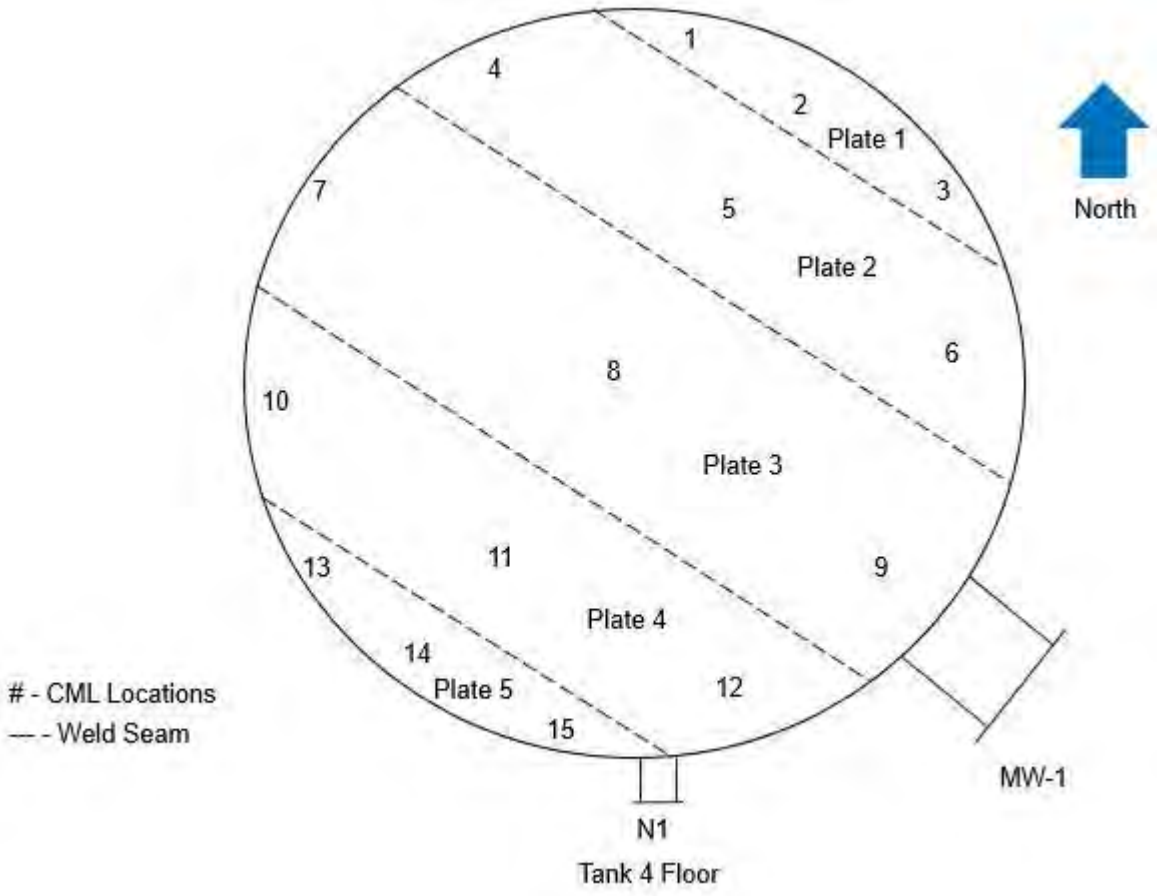




Tank 4 Shell Rollout



TANK 4 ROOF



Reported To:	Drug & Laboratory Disposal, Inc.	Date:	December 20, 2021
	331 Broad Street	Sales Order Number:	234177134
	Plainwell, MI	P/O Number:	Signed Quote
		Report Number:	1 Final
		Project:	Tank #4

ULTRASONIC THICKNESS INSPECTION REPORT

Drug & Laboratory Disposal, Inc.				Report #:	1	Page	1	of	1
331 Broad Street				Sale Order #:	234177134				
Plainwell, MI				Project:	Tank #4				
Date:	December 20, 2021				Shell				
Test Method Standard:	TRIS-NDE-UT-6		Acceptance Standards:		STI-SP-001				

ULTRASONIC UNIT

Manufacturer:	Olympus 38 DL Plus	A-Scan & Direct Readout:	Yes				
Serial #:	130743310	A-Scan & Direct Readout:		X	Yes		No
Calibration Date:	11/09/2021	Calibration Due Date:	05/09/2022				

CALIBRATION BLOCK

Material Type:	Stainless Steel	Size: .100 - .500”	55828

SEARCH UNIT

Size:	.375	Serial #	1242412	Frequency:	5 MHz

COUPLANT

Manufacturer:	Sonotech	Batch:	11442-A	Type:	Glycerin Gel

MEASUREMENTS

NORTH	CML	READING	WEST	CML	READING	SOUTH	CML	READING	EAST	CML	READING
RING	1	0.181	RING	7	0.182	RING	13	0.180	RING	24	0.182
1st Course	2	0.178	1st Course	8	0.174	1st Course	14	0.177	1st Course	25	0.179
1st Course	3	0.174	1st Course	9	0.174	1st Course	15	0.175	1st Course	26	0.177
2nd Course	4	0.177	2nd Course	10	0.176	2nd Course	16	0.175	2nd Course	27	0.179
2nd Course	5	0.177	2nd Course	11	0.178	2nd Course	17	0.179	2nd Course	28	0.176
2nd Course	6	0.175	2nd Course	12	0.176	2nd Course	18	0.178	2nd Course	29	0.175
						3rd Course	19	0.175	3rd Course	30	0.177
						3rd Course	20	0.174	3rd Course	31	0.180
						3rd Course	21	0.174	3rd Course	32	0.177
						4th Course	22	0.176	4th Course	33	0.177
						4th Course	23	0.176	4th Course	34	0.178

Signed: _____

Certification: Field Service Manager

Reviewed by: Mark Kroells

Date: 12/21/2021

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ULTRASONIC THICKNESS INSPECTION REPORT

Drug & Laboratory Disposal, Inc.			Report #:	1	Page	1	of	1
331 Broad Street			Sale Order #:	234177134				
Plainwell, MI			Project:	Tank #4				
Date:	December 20, 2021			Roof				
Test Method Standard:	TRIS-NDE-UT-6	Acceptance Standards:		STI-SP-001				

ULTRASONIC UNIT

Manufacturer:	Olympus 38 DL Plus	A-Scan & Direct Readout:	Yes
Serial #:	130743310	A-Scan & Direct Readout:	X Yes / No
Calibration Date:	11/09/2021	Calibration Due Date:	05/09/2022

CALIBRATION BLOCK

Material Type:	Stainless Steel	Size: .100 - .500”	55828

SEARCH UNIT

Size:	.375	Serial #	1242412	Frequency:	5 MHz

COUPLANT

Manufacturer:	Sonotech	Batch:	11442-A	Type:	Glycerin Gel

MEASUREMENTS

Roof	CML	Reading				
South	1	0.181				
South	2	0.183				
East	3	0.183				
East	4	0.183				

Signed: 

Certification: Field Service Manager

Reviewed by: Mark Kroells

Date: 12/21/2021

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ULTRASONIC THICKNESS INSPECTION REPORT

Drug & Laboratory Disposal, Inc.				Report #:	1	Page	1	of 1
331 Broad Street				Sale Order #:	234177134			
Plainwell, MI				Project:	Tank #4			
Date:	December 20, 2021				Floor			
Test Method Standard:	TRIS-NDE-UT-6		Acceptance Standards:		STI-SP-001			

ULTRASONIC UNIT

Manufacturer:	Olympus 38 DL Plus	A-Scan & Direct Readout:	Yes
Serial #:	130743310	A-Scan & Direct Readout:	X Yes / No
Calibration Date:	11/09/2021	Calibration Due Date:	05/09/2022

CALIBRATION BLOCK

Material Type:	Stainless Steel	Size: .100 - .500”	55828

SEARCH UNIT

Size:	.375	Serial #	1242412	Frequency:	5 MHz

COUPLANT

Manufacturer:	Sonotech	Batch:	11442-A	Type:	Glycerin Gel

MEASUREMENTS

PLATE	CML	READING				
1	1	0.180				
1	2	0.181				
1	3	0.180				
2	4	0.181				
2	5	0.180				
2	6	0.180				
3	7	0.181				
3	8	0.180				
3	9	0.181				
4	10	0.181				
4	11	0.181				
4	12	0.182				
5	13	0.181				
5	14	0.181				
5	15	0.181				

Signed: 

Certification: Field Service Manager

Reviewed by: Mark Kroells

Date: 12/21/2021

Shell Corrosion Rate

Year of Inspection	2021	Year
Year of Construction	1984	Year
Nominal Plate Thickness (inches)	0.1875	Inch
Minimum Remaining Shell Thickness (UTT)	0.174	Inch
Material Lost Since Construction	0.013	Inch
Remaining Shell Thickness	0.174	Inch
Estimated Corrosion Rate	0.006	Inch/yr.
Next Internal Inspection	1	Years
Estimated Remaining Material in 1 Year	0.168	Inch
Estimated Remaining Material at 5 Year Internal Inspection	0.144	Inch
Minimum acceptable remaining shell thickness	0.0937	Inch

Floor Corrosion Rate

Year of Inspection	2021	Year
Year of Construction	2019	Year
Nominal Floor Plate Thickness (inches)	0.1875	Inch
Minimum Remaining Shell Thickness (UTT)	0.180	Inch
Remaining Floor Thickness	0.180	
Material Lost Since Construction	0.007	Inch
Estimated Corrosion Rate	0.007	Inch/yr.
Next Internal Inspection	1	Years
Estimated Remaining Material in 1 Year	0.173	Inch
Estimated Remaining Material at 5 Year Internal Inspection	0.145	Inch
Minimum acceptable floor thickness	0.0937	Inch

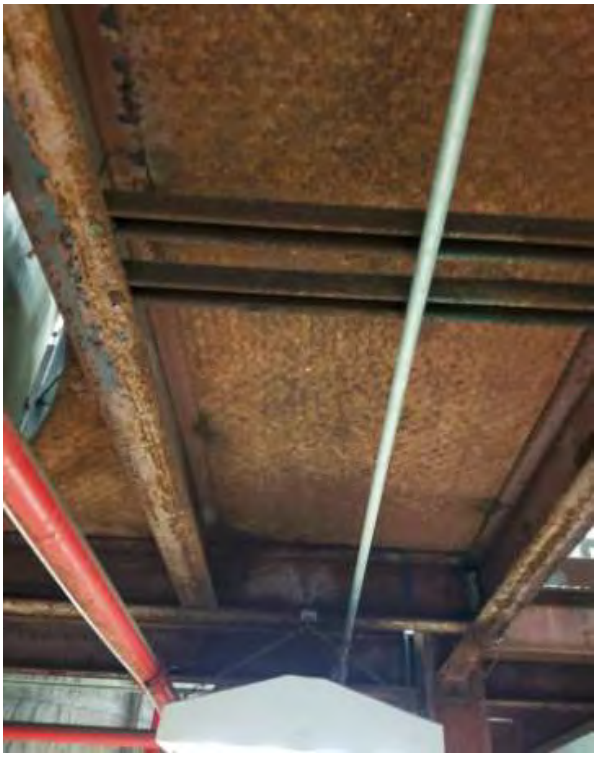
Nozzle and or Appurtenance Table

Item	Description	Size (in.)	Neck Thick (in.)	Cover Thick (in.)	Comments
MW-1	Shell Manway	24”	.249	.393	Manway
MW-2	Roof Manway	16”	.178	n/a	Manway
N-1	Nozzle	4”	n/a	n/a	Drain/Outlet Reduced to 3”
N-2	Nozzle	2”	n/a	n/a	Capped Nozzle
N-3	Nozzle	2”	n/a	n/a	Capped Nozzle
N-4	Nozzle	4”	n/a	n/a	Inlet Reduced to 1.5”
N-5	Nozzle	2”	n/a	n/a	Level Gauge
N-6	Nozzle	2 ”	n/a	n/a	Sample Port
N-7	Nozzle	3”	n/a	n/a	4” Reduced to 3” Normal Vent
N-8	Nozzle	4”	n/a	n/a	4” Capped
N-9	Nozzle	8”	.137	n/a	Emergency Vent

Wood planks beneath Tank

New Tank Floor with perimeter ring
Note corroded inlet piping (Left Photo)

Inlet piping is severely corroded



Catwalk supports with moderate corrosion

No protective coating observed on the external emergency vent piping

	Technician:	Dana Bryan
	Certifications:	STI / NDE Level II
	Signed:	
	Certification:	Field Service Manager
	Reviewed by:	Mark Kroells
	Date:	12/21/2021

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Drug & Laboratory Disposal, Inc
Tank #5

Prepared By:

Clayton Sawyer
Steel Tank Institute &
Level II Inspector
STI No: AST-121284
Exp. May 15, 2023

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ABOVE-GROUND VERTICAL STORAGE TANK DATA SHEET

GENERAL INFORMATION

TANK OWNER:	Drug & Laboratory Disposal, Inc.	DATE:	October 12, 2021
LOCATION:	331 Broad Street Plainwell MI, 49080	S.O.:	230121912
TANK ID:	Tank #5	TANK CONTENT:	Hazardous Waste
		SPECIFIC GRAVITY:	Unknown

TANK INFORMATION

Tank Manufacturer:	Unknown	Design Std:	Unknown
Manufacturer Date:	Unknown	Tank Material:	Stainless Steel
Data Plate Presence:	☐ YES ☒ NO	Jacket Thickness:	None
Cathodic Protection:	N/A	Coating:	None
Shell:	☒ Welded ☐ Riveted	Insulated:	☐ YES ☒ NO
Tank Classification	STI Category I		

TANK INSPECTION SUMMARY

Overall: TUV Rheinland North America (TRNA) performed a formal internal inspection with an ultrasonic thickness survey per Steel Tank Institute (STI), SP001 6th Edition on this 5,000 gallon hazardous waste tank noted as Tank #5. Tank is recognized as a category I, due to its vertical design with slight elevation and resting on solid concrete, which offers a means of continuous release detection method (CRDM), and proper containment providing the means of containment for the entire volumetric capacity of the Atmospheric Storage Tank (AST). Next scheduled inspection to be done monthly and annually per STI SP001 Inspection Checklists. A formal internal inspection shall be performed no later than 5 years due to previous weld repairs performed. Overall tank is suitable for continued service providing the following recommendations detailed in this report are made. Nominal thicknesses and year of construction was best guessed utilizing ultrasonic thickness reading and information obtained during this inspection.

Containment: Coating on containment floor displayed areas where paint is chipping. TRNA recommends applying new protective coating where needed. Stairway for tank access displayed coating failures with active surface corrosion. **TRNA recommends prepping surfaces and applying protective coatings.**

Foundation: The tank is slightly elevated and rests on wooden supports. The panels are saturated with unidentifiable moisture. **TRNA recommends replacing wooden supports with two hour fire rated material.** Catwalk foundation displayed coating failures with active surface corrosion on the I-beam support and diamond plating. **TRNA recommends prepping surfaces and apply protective coatings.**

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TANK INSPECTION SUMMARY (CONTINUED)

Tank Shell:	Tank shell is constructed utilizing four (4) shell courses. Nominal shell thickness appears to be 3/16" (.1875") stainless steel. No relevant wall loss was observed during our ultrasonic thickness survey. See attached ultrasonic thickness report for detailed information. Lower shell course has been removed and replaced with 3/16" (.1875") stainless steel plate. Our previous inspection revealed marginal weld quality noted throughout areas where the stainless steel shell was replaced. Weld deficiencies were noted as overlap, undercut, and underfill. These welding deficiencies have been repaired with no deficiencies noted.
Tank Heads:	Tank floor and roof appear to have been constructed utilizing 3/16" (.1875") stainless steel, with two (2) plates for the floor and four (4) plates for the roof. No relevant wall loss was observed during our ultrasonic thickness survey. See attached ultrasonic thickness report for detailed information. Tank floor been removed and replaced with 3/16" (.1875") stainless steel plate. Our previous inspection revealed marginal weld quality noted throughout areas where the stainless steel floor was replaced. Weld deficiencies were noted as overlap, undercut, and underfill. These welding deficiencies have been repaired with no deficiencies noted. 1/32" isolated localized pitting was noted on tank floor. **TRNA recommends monitoring isolated pitting for worsening at next inspection interval.**
Nozzles and Venting System:	Tank utilizes a 3" normal vent which discharges outside of building. Normal venting is of adequate size due to inlet and outlet piping being 4" and reduced to 3", and inlet piping being reduced to 1.5". Tank is equipped with an adequate 8" emergency vent located on roof manway with 503,517 SCFH rating. PVC material was noted on the roof which is used for normal venting and charcoal filters. Sample port which is used on occasion was noted in conjunction with normal venting. Per UL-142 normal venting shall be dedicated and be free from obstruction. **TRNA recommends re-routing sample port to a new location such as manway nozzle N-7 which is capped and replacing PVC material as needed with two hour fire rated material per local fire codes.** Charcoal filters utilize wooden bases for supports and are not secured to roof deck. **TRNA recommends installing two hour fire rated material as needed per local fire code and securing charcoal filters to roof deck as needed.** Fire valve at nozzle N-1 fusible kink displays signs of mechanical damage and fire rating is no longer legible. **TRNA recommends replacing fusible link and ensuring fire valve is functional prior to returning tank into service.** External emergency vent piping displayed coating failures with active surface corrosion. **TRNA recommends prepping surfaces and apply protective coatings.**
Ancillary Equipment:	No ground wire was noted to be attached to tank. **TRNA recommends installing ground wire to tank.** Associated piping used for filling tanks located in the tank farm displayed coating failures. **TRNA recommends prepping surfaces and apply protective coatings as needed to prevent corrosion.** Piping supports for PVC piping located on roof are not anchored to roof deck. **TRNA recommends installing anchors as needed to prevent movement.**

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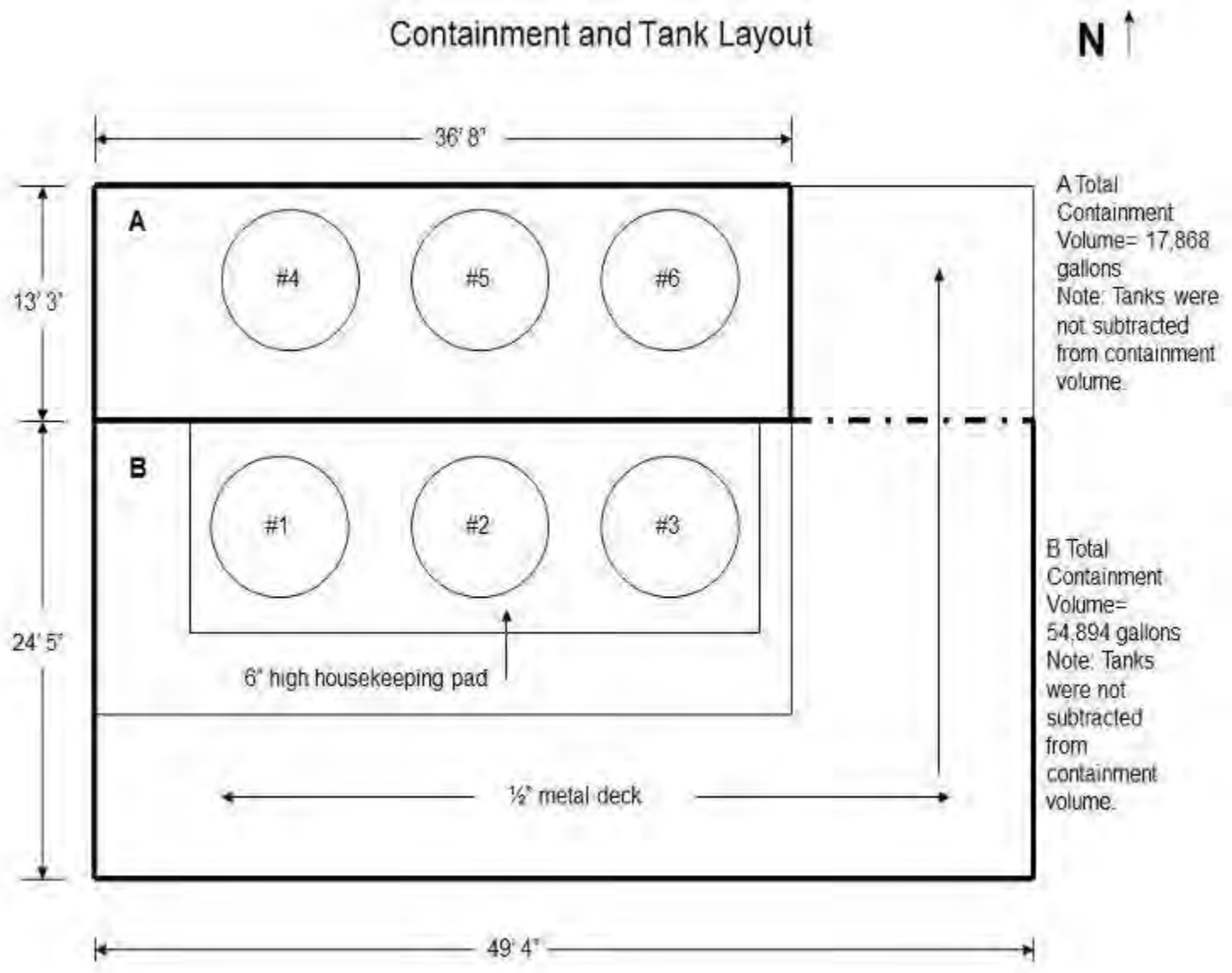
CONTAINMENT INFORMATION

Containment	Concrete with Coating	Visual Condition:	Acceptable
Containment Size:	36'8" x 13'3" x 5' wall height	Coating:	☒ YES
Drain Valve:	☐ YES ☒ NO	Drain Valve Condition:	N/A



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ULTRASONIC THICKNESS INSPECTION REPORT

Drug & Laboratory Disposal, Inc.				Report #:	1	Page	1	of 1
331 Broad Street				Sale Order #:	234177134			
Plainwell, MI				Project:	Tank #5			
Date:	October 12th, 2021				Heads-Floor & Roof			
Test Method Standard:	TRIS-NDE-UT-6		Acceptance Standards:		STI-SP-001			

ULTRASONIC UNIT

Manufacturer:	Panametrics 38 DL Plus	A-Scan & Direct Readout:	Yes
Serial #:	140868604	A-Scan & Direct Readout:	X Yes / No
Calibration Date:	08/18/2021	Calibration Due Date:	02/18/2022

CALIBRATION BLOCK

Material Type:	Stainless Steel	Size: .100 - .500”	1983-13

SEARCH UNIT

Size:	.375	Serial #	43031	Frequency:	5 MHz

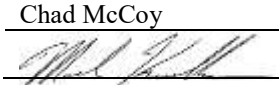
COUPLANT

Manufacturer:	Magnaflux	Batch:	2OC051	Type:	Glycerin Gel

MEASUREMENTS

Floor	Readings	Roof	Readings
TML#1	.181	TML#1	.185
TML#2	.180	TML#2	.184
TML#3	.181	TML#3	.185
TML#4	.181	TML#4	.186
TML#5	.182	TML#5	.186
TML#6	.182	TML#6	.185
TML#7	.181	TML#7	.188
TML#8	.181	TML#8	.189
TML#9	.181	TML#9	.190
TML#10	.181	TML#10	.186
TML#11	.181	TML#11	.187
TML#12	.179	TML#12	.183
TML#13	.180		
TML#14	.181		
TML#15	.182		
TML#16	.183		

Level II Name: Chad McCoy Date: 10/12/2021

Reviewer’s Signature:  Date: 10/18/2021

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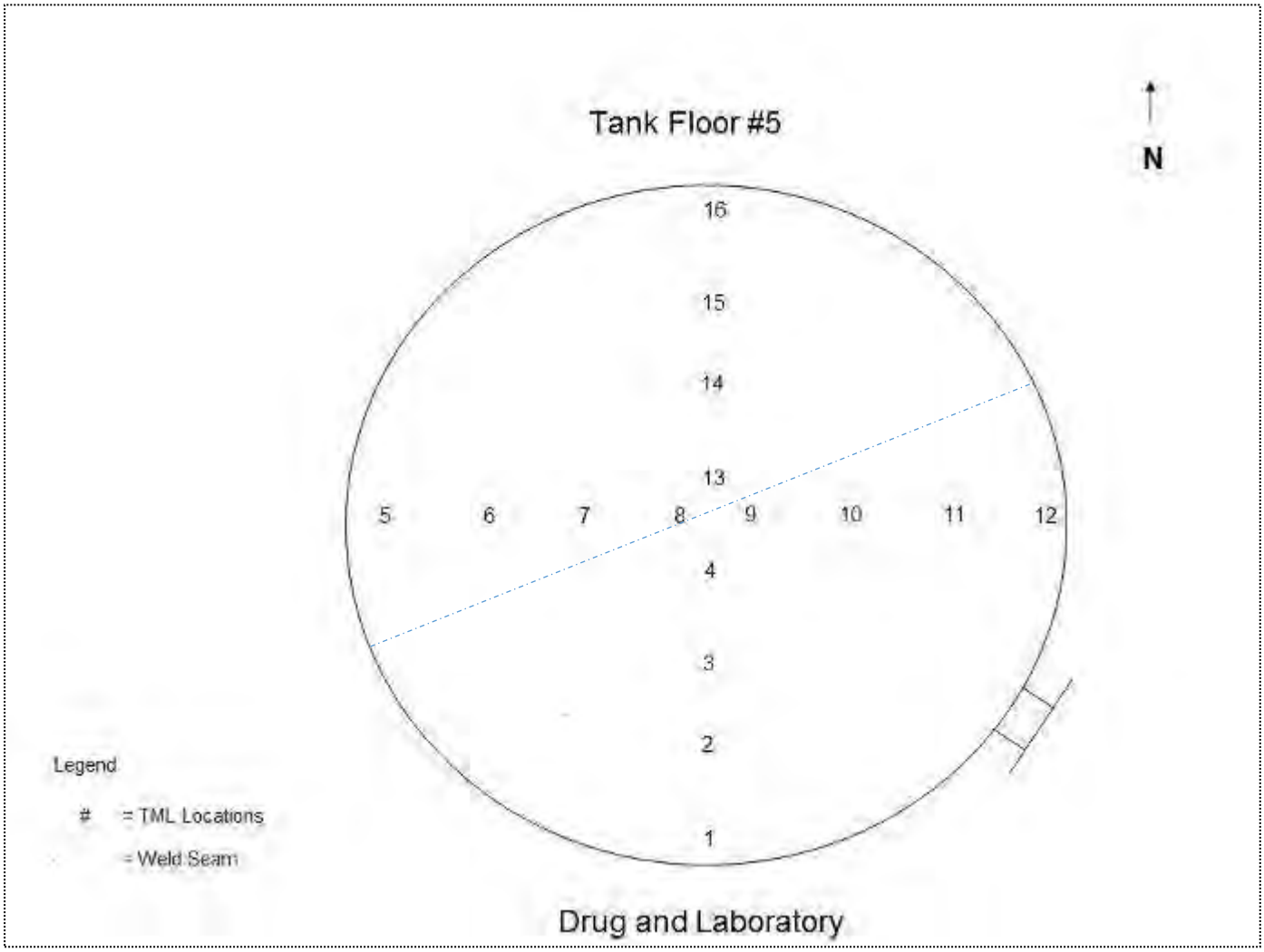

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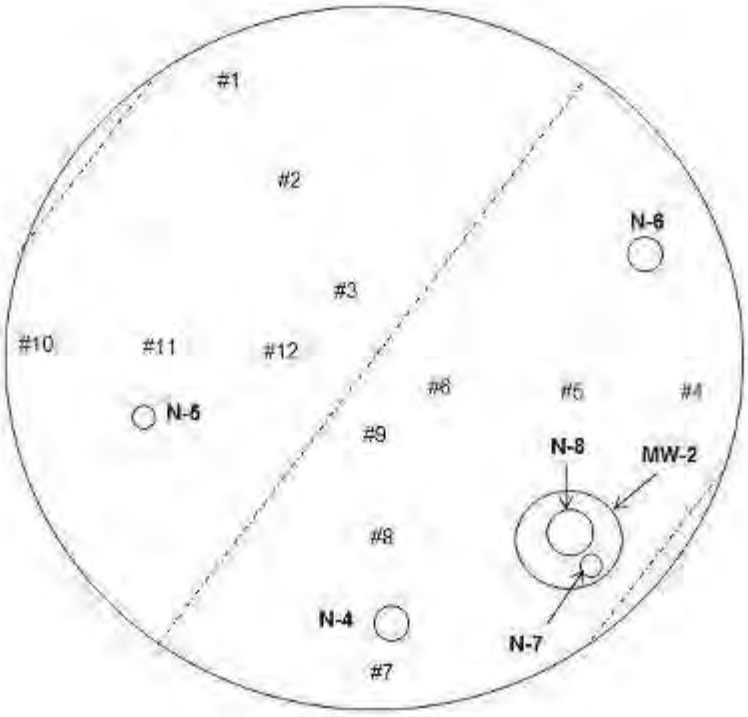
Tank Roof
Tank #5



Legend

----- = Weld seam

= TML Location

Drug and Laboratory
Disposal

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Floor Corrosion Rate

Year of Inspection	2021	Year
Year of Construction	2019	Year
2019 UTT Nominal Floor Plate Thickness (inches)	0.183	Inch
Minimum Remaining Floor Thickness	.179	Inch
Material Lost Since Construction	0.004	Inch
Estimated Corrosion Rate	N/A	Inch/yr.
Next External Inspection	N/A	Years
Estimated Material Degradation in 5 Years	N/A	Inch
Estimated Remaining Material at Next Internal Inspection	N/A	Inch
Minimum acceptable remaining shell thickness at next internal inspection	0.0937	Inch

Next internal inspection shall be performed no later than 5 years Aug. 2025

New tank floor was replaced in 2019, 1/32" localized pitting was noted during 2021 inspection.

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ULTRASONIC THICKNESS INSPECTION REPORT

Drug & Laboratory Disposal, Inc.				Report #:	1	Page	1	of	1
331 Broad Street				Sale Order #:	234177134				
Plainwell, MI				Project:	Tank #5				
Date:	October 12th, 2021				Shell				
Test Method Standard:	TRIS-NDE-UT-6		Acceptance Standards:		STI-SP-001				

ULTRASONIC UNIT

Manufacturer:	Panametrics 38 DL Plus	A-Scan & Direct Readout:	Yes				
Serial #:	140868604	A-Scan & Direct Readout:		X	Yes		No
Calibration Date:	08/18/2021	Calibration Due Date:	02/18/2022				

CALIBRATION BLOCK

Material Type:	Stainless Steel	Size: .100 - .500”	1983-13

SEARCH UNIT

Size:	.375	Serial #	43031	Frequency:	5 MHz

COUPLANT

Manufacturer:	Magnaflux	Batch:	2OC051	Type:	Glycerin Gel

MEASUREMENTS

Shell	Readings	Shell	Readings	Shell	Readings
TML#1	.182	TML#16	.181	TML#31	.183
TML#2	.183	TML#17	.181	TML#32	.183
TML#3	.182	TML#18	.177	TML#33	.180
TML#4	.184	TML#19	.183	TML#34	.183
TML#5	.181	TML#20	.183	TML#35	.182
TML#6	.181	TML#21	.184	TML#36	.183
TML#7	.177	TML#22	.179	TML#37	.180
TML#8	.180	TML#23	.181	TML#38	.182
TML#9	.181	TML#24	.183	TML#39	.181
TML#10	.183	TML#25	.183	TML#40	.181
TML#11	.179	TML#26	.183	TML#41	.183
TML#12	.182	TML#27	.182	TML#42	.181
TML#13	.184	TML#28	.182	TML#43	.183
TML#14	.183	TML#29	.183	TML#44	.182
TML#15	.182	TML#30	.183		

Level II Name: Chad McCoy Date: 10/12/2021

Reviewer’s Signature: Date: 10/18/2021

TÜV RHEINLAND OF NORTH AMERICA, INC.

These test results report our findings at the time of inspection and shall be reviewed by the client for compliance to the project requirements. Due to the limitations of nondestructive testing in evaluating all of the factors that determine the overall component quality, no guarantee is made or liability assumed by TÜV Rheinland of North America, Inc. (“TRNA”) for the component quality or serviceability. Statement of compliance made without factoring in effect of uncertainty unless otherwise specified

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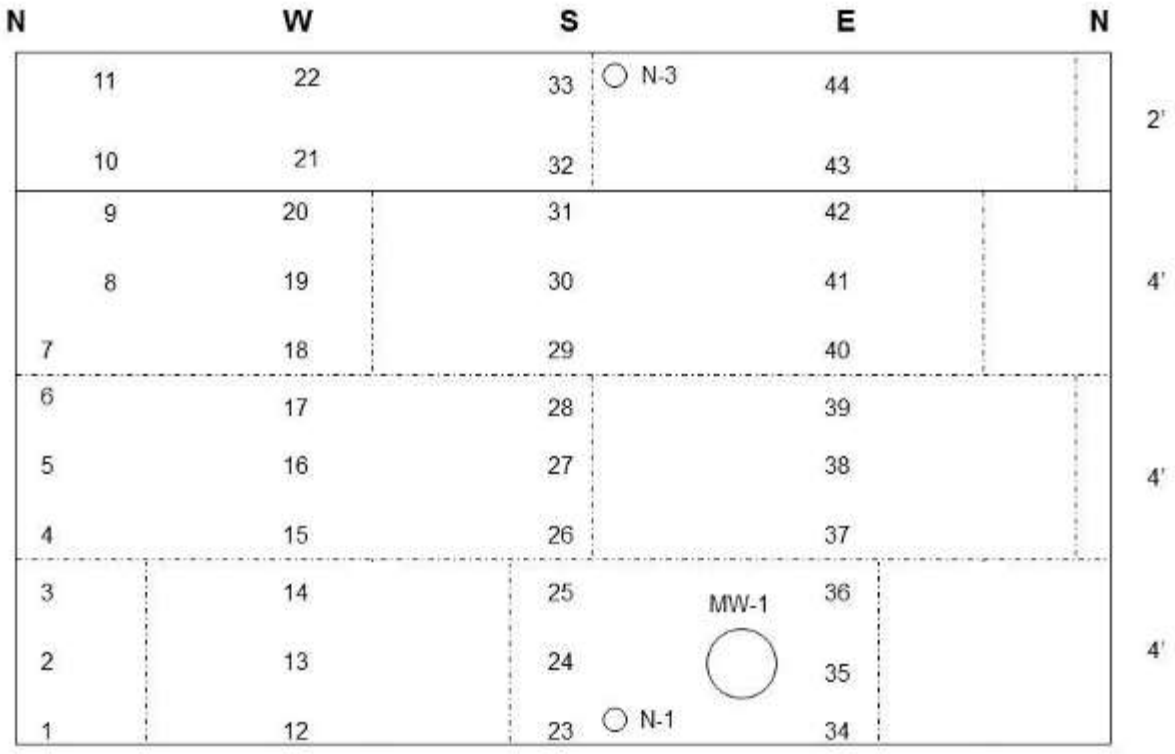
Shell Rollout Tank #5



----- = weld seam
#= TML locations

Drug and Laboratory Disposal

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Shell Corrosion Rate

Year of Inspection	2021	Year
Year of Construction	1984	Year
Nominal Shell Plate Thickness (inches)	.187	Inch
Minimum Remaining Shell Thickness	.177	Inch
Material Lost Since Construction	.010	Inch
Estimated Corrosion Rate	.0002	Inch/yr.
Next Internal Inspection	5	Years
Estimated Material Degradation in 5 Years	.01	Inch
Estimated Remaining Material at Next Internal Inspection	.167	Inch
Minimum acceptable remaining shell thickness at next internal inspection	0.0937	Inch

Next internal inspection shall be performed no later than (5 yrs.) Aug. 2026
Lower shell course was replaced in 2019, no relevant wall loss was noted from 2021 readings

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Nozzle and or Appurtenance Table

Item	Description	Size (in.)	Neck Thick (in.)	Cover Thick (in.)	Comments
MW-1	Shell Manway	24”	.182	.382	Manway
MW-2	Roof Manway	18”	.24	.378	Manway
N-1	Nozzle/Fire Valve	4”	n/a	n/a	Drain/Outlet Reduced to 3”
N-3	Nozzle	4”	n/a	n/a	Capped Nozzle
N-4	Nozzle	4”	n/a	n/a	Inlet Reduced to 1.5”
N-5	Nozzle	2”	n/a	n/a	Level Gauge
N-6	Nozzle	3”	n/a	n/a	4” Reduced to 3” Normal Vent
N-7	Nozzle	4”	n/a	n/a	4” Capped
N-8	Nozzle	8”	.134	n/a	Emergency Vent

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Coating failures with active corrosion noted on the platform supports and diamond plating

Coating failure observed on the I-beam supports with active corrosion

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Access ladder into the containment displayed coating failures with active corrosion

Mechanical damage noted on the fire valve fusible link

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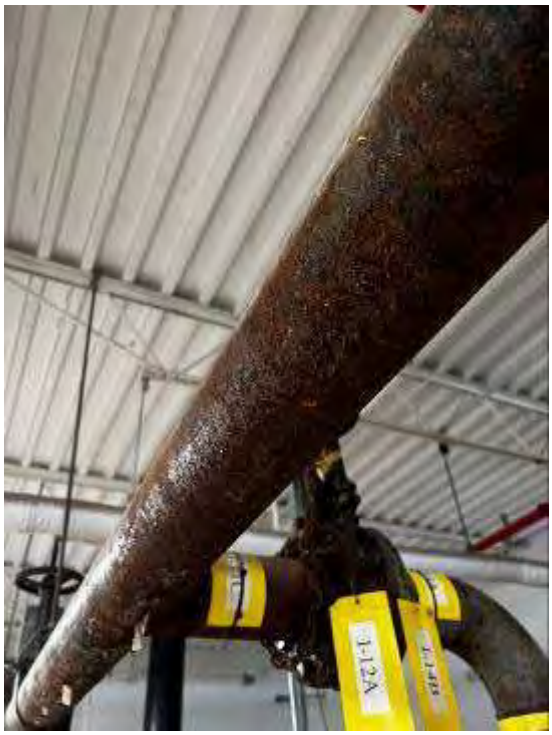
Sample port in conjunction with normal venting without 2 hour fire rating material



Coating failures observed on associated inlet piping

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Coating failures observed on external emergency vent piping

1/32” pitting on tank floor

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1/32" pitting on tank floor

1/32" pitting on tank floor

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Drug & Laboratory Disposal, Inc
Tank #6

Prepared By:

Clayton Sawyer
Steel Tank Institute &
Level II Inspector
STI-SP001 ID# AST-121284
Expiration Date: May 15, 2023

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ABOVE-GROUND VERTICAL STORAGE TANK DATA SHEET

GENERAL INFORMATION

TANK OWNER:	Drug & Laboratory Disposal, Inc.	DATE:	December 6, 2021
LOCATION:	331 Broad Street Plainwell MI, 49080	S.O.:	234177134
TANK ID:	Tank #6	TANK CONTENT:	Hazardous Waste
		SPECIFIC GRAVITY:	Unknown

TANK INFORMATION

Tank Manufacturer:	Unknown	Design Std:	Unknown
Manufacturer Date:	Unknown	Tank Material:	Stainless Steel
Data Plate Presence:	☐ YES ☒ NO	Jacket Thickness:	None
Cathodic Protection:	N/A	Coating:	None
Shell:	☒ Welded ☐ Riveted	Insulated:	☐ YES ☒ NO
Tank Classification	STI Category I		

TANK INSPECTION SUMMARY

Overall: TUV Rheinland North America (TRNA) performed a formal external inspection with an ultrasonic thickness survey per Steel Tank Institute (STI), SP001 6th Edition on this 5,000 gallon hazardous waste tank noted as Tank #6. Tank is recognized as a category I, due to its vertical design with slight elevation and resting on solid concrete, which offers a means of continuous release detection method (CRDM), and proper containment providing the means of containment for the entire volumetric capacity of the Atmospheric Storage Tank (AST). Next scheduled inspection to be done monthly and annually per STI SP001 Inspection Checklists. A formal internal inspection shall be performed no later than 1 year. Tank is suitable for continued service providing the following recommendations detailed in this report are addressed. Nominal thicknesses and year of construction was best guessed utilizing ultrasonic thickness reading and information obtained during this inspection.

Containment: Coating failures with active corrosion was noted on the containment stairway. ***TRNA recommends prepping surfaces and applying protective coating.*** Stairway anchor bolting has separated from the East wall. ***TRNA recommends installing anchor bolting as needed for support.***

Foundation: The tank is slightly elevated and rests on what appears to be wooden planks. Consideration should be given to replacing wooden panels with two hour fire rating materials and possibly elevating tank to aid in (CRDM). I-beam supports and diamond plate decking displayed coating failures with active corrosion. ***TRNA recommends prepping surfaces and apply protective coatings.***

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TANK INSPECTION SUMMARY (CONTINUED)

Tank Shell:	Tank shell is constructed utilizing four (4) shell courses. Nominal shell thickness appears to be 3/16" (.1875") stainless steel. No relevant wall loss was observed during our ultrasonic thickness survey. See attached ultrasonic thickness report for details.
Tank Heads:	Tank floor and roof appear to have been constructed utilizing 3/16" (.1875") stainless steel, with two (2) plates on roof and six (6) plates on the floor. Previous weld repairs were performed since previous inspection. Repairs displayed no deficiencies. Uniform pitting was observed on the tank floor measuring 1/16" deep and located in the heat affected zone (HAZ) next to where welding was previously performed. ***TRNA recommends monitoring pitting for worsening at next inspection interval.*** No significant wall loss was observed during our ultrasonic thickness survey. See attached ultrasonic thickness report for detailed information. The 1/16" pitting has been deducted from our remaining life calculations.
Nozzles and Venting System:	Tank utilizes a 3" normal vent which discharges outside of building. Normal venting is of adequate size due to inlet and outlet piping being 4" and reduced to 3", and inlet piping being reduced to 1.5". Tank is equipped with an adequate 8" emergency vent located from the roof manway with 503,517 SCFH rating. PVC material was utilized on the roof for normal venting and charcoal filters. Sample port which is used on occasion was noted in conjunction with normal venting. Per UL-142 normal venting shall be dedicated and be free from obstruction. ***TRNA recommends re-routing sample port to a new location such as manway nozzle N-7 which is capped and replacing PVC material as needed with two hour fire rated material per local fire codes.*** Charcoal filters utilize wooden bases for supports and are not secured to roof deck. ***TRNA recommends installing two hour fire rated material as needed per local fire code and securing charcoal filters to roof deck as needed to prevent movement.*** Fire valve at nozzle N-1 was disconnected at time of inspection. ***TRNA recommends ensuring fire valve is functional prior to returning the tank into service.*** Emergency vent piping located on the roof displayed no protective coatings**.** ***TRNA recommends prepping surfaces and apply protective coatings.***
Ancillary Equipment:	Inlet piping inside of tank is badly corroded with through wall holes. **T*RNA recommends replacing inlet piping with consideration given to utilizing stainless steel material.*** No ground wire was noted. ***TRNA recommends installing a dedicated ground wire to tank.*** Associated piping used for filling tanks displayed coating failures. ***TRNA recommends prepping surfaces and apply protective coatings.*** Piping supports for PVC piping located on roof are not anchored to roof deck. ***TRNA recommends installing anchors as needed to prevent movement.***

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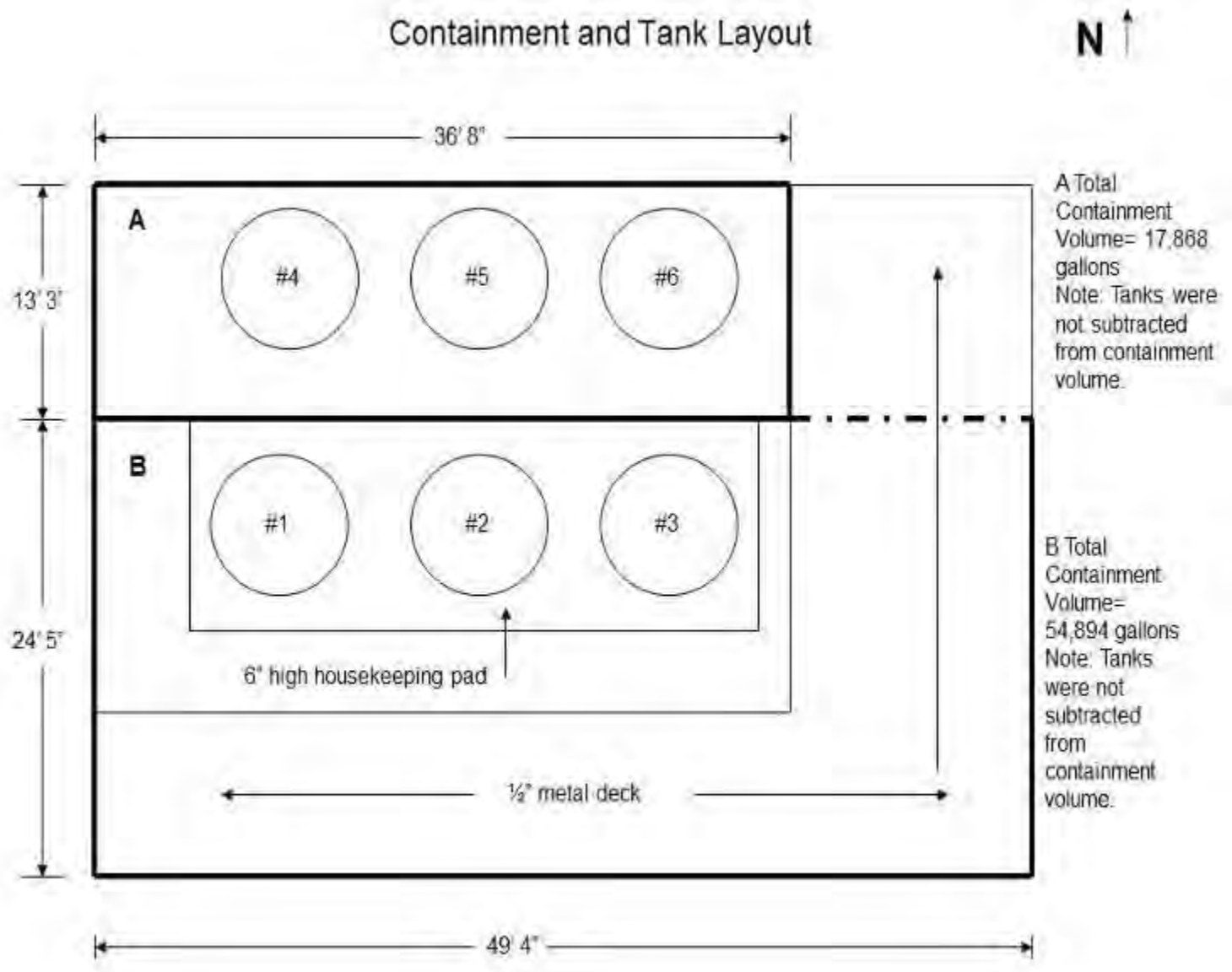
CONTAINMENT INFORMATION

Containment	Concrete with Coating	Visual Condition:	Acceptable
Containment Size:	36'8" x 13'3" x 5' wall height	Coating:	☒ YES
Drain Valve:	☐ YES ☒ NO	Drain Valve Condition:	N/A



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Reported To:	Drug & Laboratory Disposal, Inc.	Date:	12/06/2021
	331 Broad Street	Sales Order Number:	230177134
	Plainwell, MI	P/O Number:	Signed Quote
		Report Number:	1 Final
		Project:	Tank #6

ULTRASONIC THICKNESS INSPECTION REPORT

Drug & Laboratory Disposal, Inc.			Report #:	1	Page	1	of	1
331 Broad Street			Sale Order #:	230121912				
Plainwell, MI			Project:	Tank #6				
Date:	December 6, 2021			Heads-Floor & Roof				
Test Method Standard:	TRIS-NDE-UT-6	Acceptance Standards:		STI-SP-001				

ULTRASONIC UNIT

Manufacturer:	Olympus 38 DL Plus	A-Scan & Direct Readout:	Yes				
Serial #:	140868604	A-Scan & Direct Readout:		X	Yes		No
Calibration Date:	08/18/2021	Calibration Due Date:	02/18/2022				

CALIBRATION BLOCK

Material Type:	Stainless Steel	Size: .100 - .500”	02-7278

SEARCH UNIT

Size:	.375	Serial #	43031	Frequency:	5 MHz

COUPLANT

Manufacturer:	Sonotech	Batch:	2OC051	Type:	Glycerin Gel

MEASUREMENTS

Floor	Readings	Roof	Readings		
TML#1	.184	TML#1	.186		
TML#2	.181	TML#2	.187		
TML#3	.181	TML#3	.186		
TML#4	.182	TML#4	.187		
TML#5	.183	TML#5	.186		
TML#6	.184	TML#6	.184		
TML#7	.184	TML#7	.187		
TML#8	.184	TML#8	.186		
TML#9	.184	TML#9	.187		
TML#10	.185	TML#10	.187		
TML#11	.184	TML#11	.184		
TML#12	.183	TML#12	.184		
TML#13	.183				
TML#14	.184				
TML#15	.182				
TML#16	.183				
TML#17	.182				
TML#18	.183				

Technician:	Chad McCoy	Level:	**II**	

		
	Certification:	Field Service Manager
	Reviewed by:	Mark Kroells
	Date:	12/14/2021

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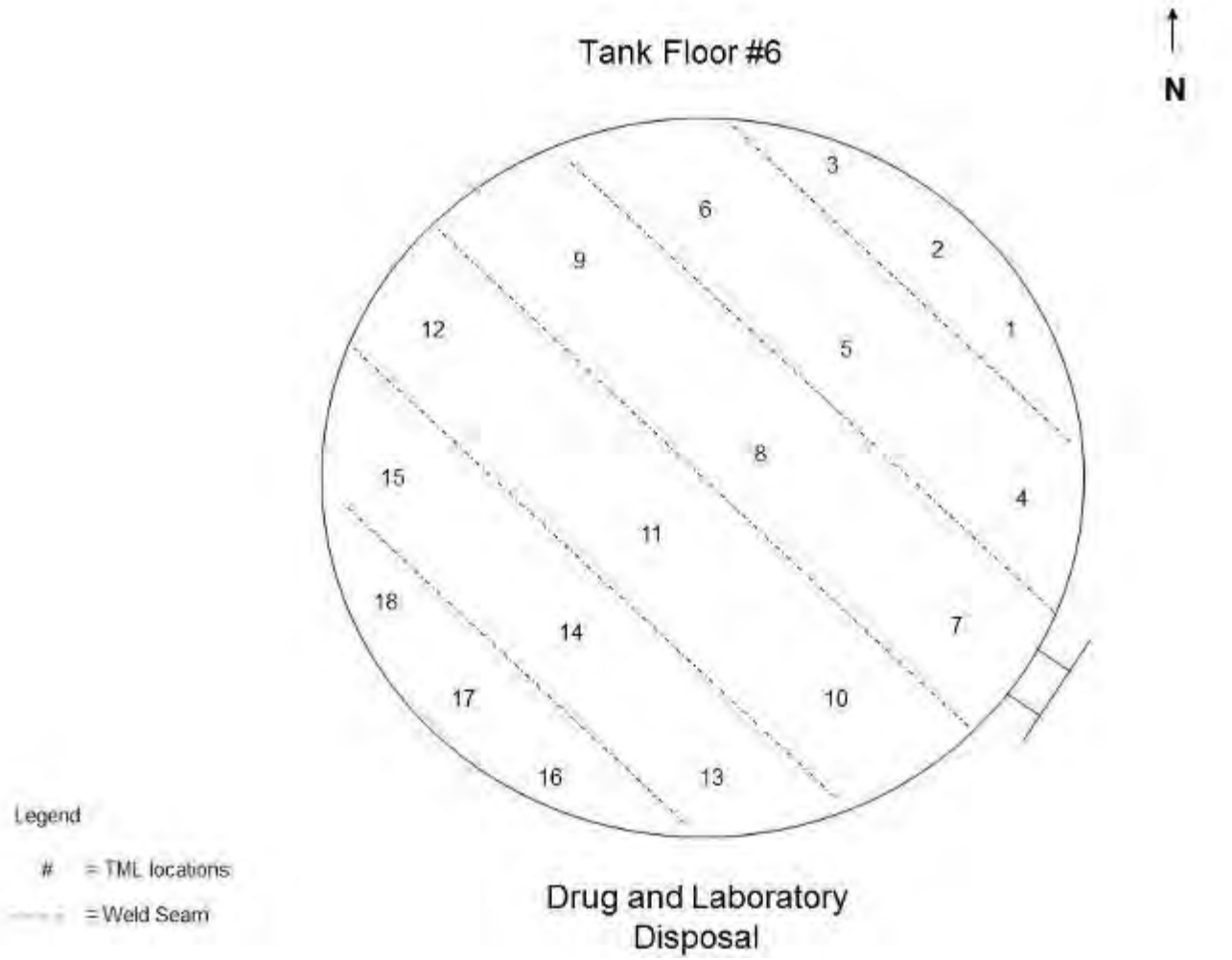

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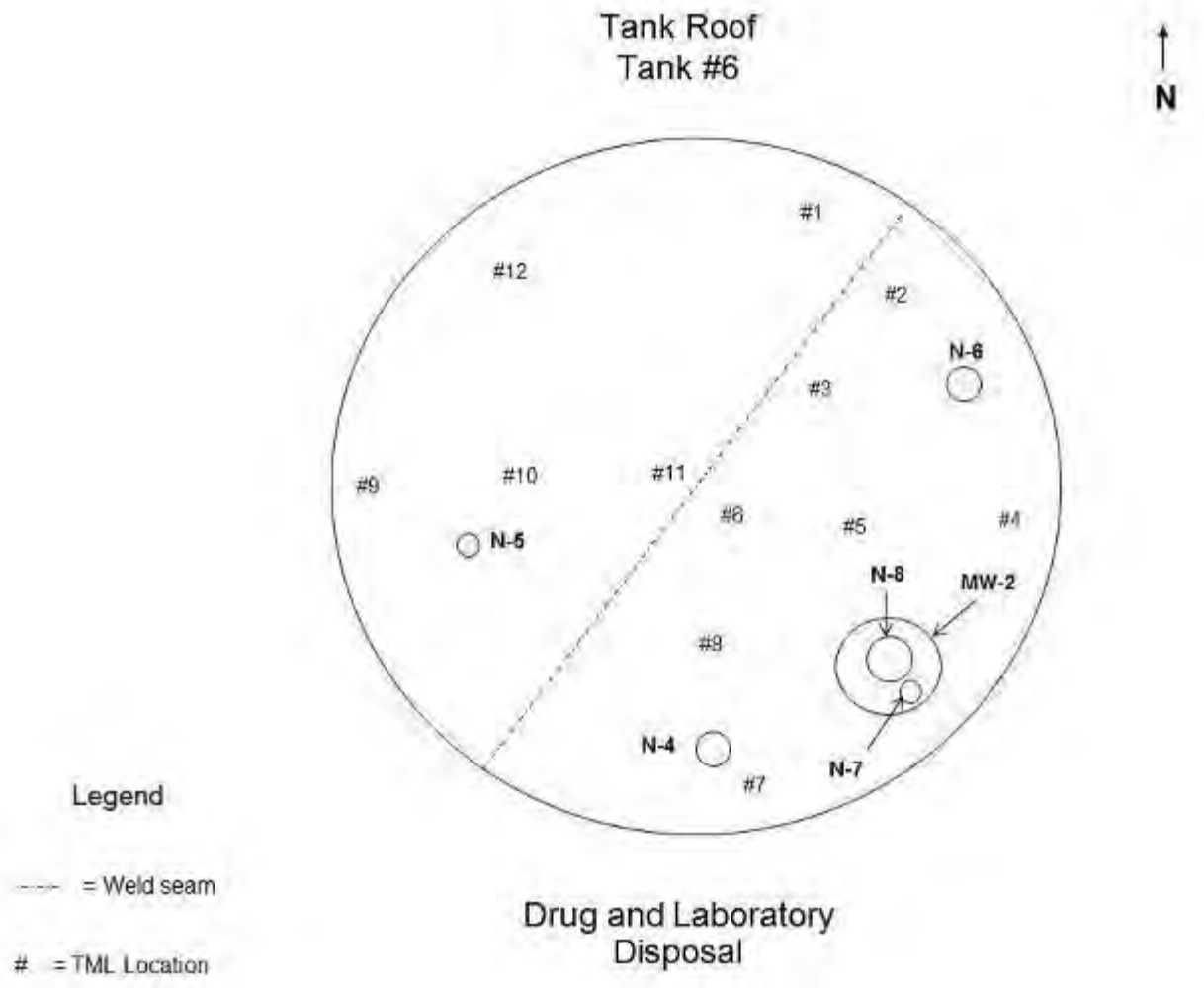

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Floor Corrosion Rate

Year of Inspection	2021	Year
Year of Construction (Newly installed)	2015	Year
Nominal Floor Plate Thickness (inches)	0.1875”	Inch
Minimum Remaining Floor Thickness	0.0937	Inch
Material Lost Since Construction	.181 UTT - .0625Pitting=.1185	Inch
Estimated Corrosion Rate	.014	Inch/yr.
Next Internal Inspection	1	Years
Estimated Material Degradation in 1 Years	.014	Inch
Estimated Remaining Material at Next External Inspection	.1045	Inch

Minimum acceptable remaining shell thickness at next internal inspection: 0.0937 Inch

Next Internal Inspection shall be performed no later than (1 yrs.) Dec. 2022

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Reported To:	Drug & Laboratory Disposal, Inc.	Date:	12/06/2021
	331 Broad Street	Sales Order Number:	234177134
	Plainwell, MI	P/O Number:	Signed Quote
		Report Number:	1 Final
		Project:	Tank #6

ULTRASONIC THICKNESS INSPECTION REPORT

Drug & Laboratory Disposal, Inc.			Report #:	1	Page	1	of	1
331 Broad Street			Sale Order #:	230121912				
Plainwell, MI			Project:	Tank #6				
Date:	December 6, 2021			Shell				
Test Method Standard:	TRIS-NDE-UT-6	Acceptance Standards:		STI-SP-001				

ULTRASONIC UNIT

Manufacturer:	Olympus 38 DL Plus	A-Scan & Direct Readout:	Yes
Serial #:	140868604	A-Scan & Direct Readout:	X Yes / No
Calibration Date:	08/18/2021	Calibration Due Date:	02/18/2022

CALIBRATION BLOCK

Material Type:	Stainless Steel	Size: .100 - .500”	02-7278

SEARCH UNIT

Size:	.375	Serial #	43031	Frequency:	5 MHz

COUPLANT

Manufacturer:	Sonotech	Batch:	2OC051	Type:	Glycerin Gel

MEASUREMENTS

Shell	Readings	Shell	Readings	Shell	Readings
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TML#2	.180	TML#17	.179	TML#32	.185
TML#3	.182	TML#18	.181	TML#33	.182
TML#4	.179	TML#19	.182	TML#34	.172
TML#5	.182	TML#20	.181	TML#35	.180
TML#6	.179	TML#21	.181	TML#36	.181
TML#7	.181	TML#22	.182	TML#37	.179
TML#8	.180	TML#23	.180	TML#38	.181
TML#9	.182	TML#24	.181	TML#39	.181
TML#10	.180	TML#25	.181	TML#40	.182
TML#11	.181	TML#26	.179	TML#41	.182
TML#12	.179	TML#27	.181	TML#42	.179
TML#13	.182	TML#28	.178	TML#43	.182
TML#14	.182	TML#29	.182	TML#44	.178
TML#15	.181	TML#30	.181		

Technician:	Chad McCoy			Level	**II**

		
	Certification:	Field Service Manager
	Reviewed by:	Mark Kroells
	Date:	12/14/2021

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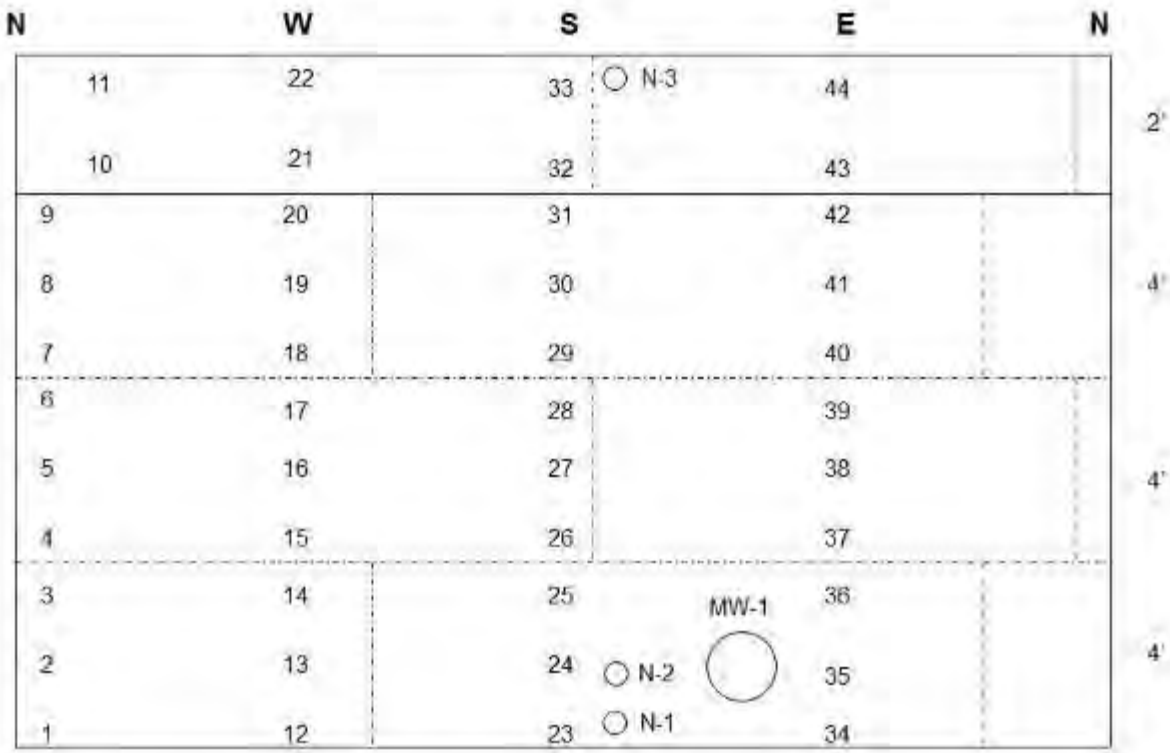
Shell Rollout Tank #6



---- = weld seam
#= TML locations

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Shell Corrosion Rate

Year of Inspection	2021	Year
Year of Construction	1984	Year
Nominal Head Plate Thickness (inches)	.1875	Inch
Minimum Remaining Shell Thickness	.172	Inch
Material Lost Since Construction	.0155	Inch
Estimated Corrosion Rate	.0004	Inch/yr.
Next Internal Inspection	1	Years
Estimated Material Degradation in 1 Years	.0004	Inch
Estimated Remaining Material at Next External Inspection	.168	Inch
Minimum acceptable remaining shell thickness at next internal inspection	0.0937	Inch

Next Internal Inspection shall be performed no later than (1 yrs.) Dec. 2022

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Nozzle and or Appurtenance Table

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MW-1	Shell Manway	24”	.252	.385	Manway
MW-2	Roof Manway	18”	.232	.377	Manway
N-1	Nozzle	4”	n/a	n/a	Drain/Outlet Reduced to 3”
N-2	Nozzle	2”	n/a	n/a	Capped Nozzle
N-3	Nozzle	4”	n/a	n/a	Capped Nozzle
N-4	Nozzle	4”	n/a	n/a	Inlet Reduced to 1.5”
N-5	Nozzle	2”	n/a	n/a	Level Gauge
N-6	Nozzle	3”	n/a	n/a	4” Reduced to 3” Normal Vent
N-7	Nozzle	4”	n/a	n/a	4” Capped
N-8	Nozzle	8”	.132	n/a	Emergency Vent

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General picture of tank floor

General picture of tank shell

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Example of uniform 1/16” pitting noted on the floor

Containment floor displayed coating failures

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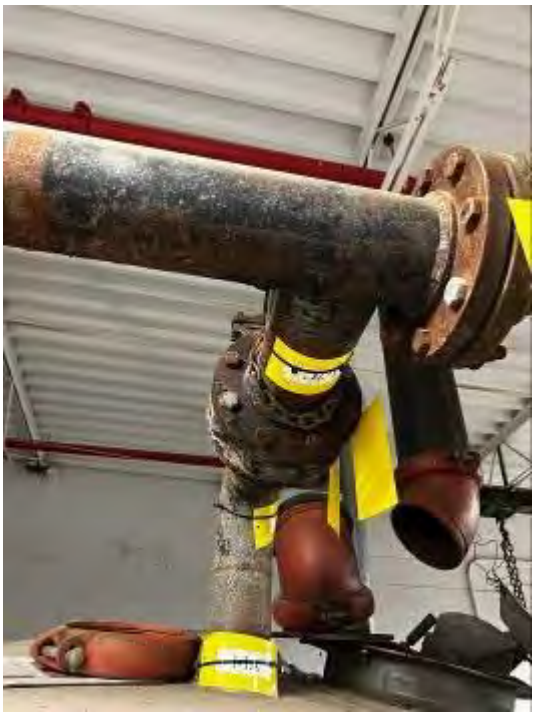

Auxiliary piping displayed coating failures in numerous locations

Fire valve was disconnected at time of inspection

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Dip tube inside of tank is badly corroded with through wall holes

External emergency vent piping displayed no protective coating

NFPA Markings on Tank #1

NFPA Markings on Tank #2

NFPA Markings on Tank #3

NFPA Markings on Tank #4

NFPA Markings on Tank #5

NFPA Markings on Tank #6

COPY (original in TSDF operating license file)

MIDNR Correspondence
License Requirements

STATE OF MICHIGAN

JAMES J. BLANCHARD, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
P.O. BOX 30028
LANSING, MI 48909

DAVID F. HALES, Director

July 13, 1990

Mr. Ward Walter
Drug and Laboratory Disposal, Inc.
331 Broad Street
Plainwell, Michigan 49080

Dear Mr. Walter:

SUBJECT: Public Notice of Secondary Containment Variance Request
Drug and Laboratory Disposal, Inc.
MID 092 947 928

On March 19, 1990, the Waste Management Division received your variance request for secondary containment of the hazardous waste storage tanks at the above referenced facility submitted pursuant to 1979 P.A. 64, as amended, the Hazardous Waste Management Act. Enclosed for your information is a copy of the public notice scheduled to appear in the Kalamazoo Gazette on or before July 23, 1990. The variance request is currently undergoing a review for completeness and technical adequacy.

If you have any questions regarding the variance request or the public notice process, please contact me.

Sincerely,

Liane J. Shekter Smith

Liane J. Shekter Smith
Environmental Engineer
Hazardous Waste Permits Section
Waste Management Division
517-335-4790

Enclosure
cc: Mr. Steve Buda, DNR
HWP/C&E File

R1026
3/89

PUBLIC NOTICE

NOTICE OF RECEIPT OF A SECONDARY CONTAINMENT VARIANCE REQUEST FOR A HAZARDOUS WASTE TREATMENT AND STORAGE FACILITY

The Michigan Department of Natural Resources (MDNR) and the United States Environmental Protection Agency (U.S. EPA) hereby give notice that Drug and Laboratory Disposal, Inc. has submitted a variance request for the secondary containment of the hazardous waste storage tanks at its facility located at 331 Broad Street in Plainwell, Michigan. Drug and Laboratory Disposal, Inc. currently operates a hazardous waste treatment and storage facility under an Act 64 operating license issued on February 5, 1986. This notice is given in accordance with R 299.9615 of the Act 64 administrative rules, and Title 40, Section 265.193(h) of the Code of Federal Regulations of the Resource Conservation and Recovery Act (RCRA). The MDNR and U.S. EPA invite public comment on the variance request submittal.

The existing secondary containment for the tank system at the Drug and Laboratory Disposal, Inc. facility was constructed prior to the promulgation of the current tank regulations. The existing secondary containment satisfies the current tank regulations in all aspects except that the concrete liner was not constructed with chemically resistant water stops at all joints. The secondary containment for tanks at Drug and Laboratory Disposal, Inc. was constructed with a keyway construction joint followed by a one-half inch minimum filleted caulk joint applied around the floor/wall joint, utilizing a silicone base caulking material. The interior of the containment structure has been sealed with an epoxy coating.

Secondary containment is a key element in U.S. EPA's strategy to ensure the proper management of hazardous wastes stored and treated in tank systems. The primary function of the secondary containment system is to provide a means for accumulating leaks from a storage or treatment system so that a leak can be detected by leak detection methods before its release to groundwater or surface water. In accordance with Act 64, secondary containment which meets the current standards must be provided for the existing tank system at Drug and Laboratory Disposal, Inc. by January 12, 1990, or by the time the tank system reaches 15 years of age, whichever comes later. The regulations indicate that secondary containment utilizing an external liner as at Drug & Laboratory Disposal, Inc. must ensure that the liner provides a complete envelope that will prevent both lateral and vertical migration of wastes from the containment system.

Federal regulations, adopted by Michigan's Act 64, allow an owner or operator to request a variance from the secondary containment requirements by demonstrating either a technology-based variance or a risk-based variance. Drug and Laboratory Disposal, Inc. has submitted a technology-based variance request. Regulations require that the technology-based variance demonstrate that "alternative design and operating practices, together with location characteristics, will prevent

the migration of hazardous waste or hazardous constituents into the groundwater or surface water at least as effectively as secondary containment during the active life of the tank system."

The company's variance request and demonstration may be reviewed at the Department of Natural Resources, Waste Management Division Office located on the First Floor, South Ottawa Building in Lansing, Michigan, and at the Waste Management Division District Office located at 621 North 10th Street in Plainwell, Michigan.

The MDNR and the U.S. EPA must determine whether or not to approve the variance request by August 29, 1990. Therefore, comments concerning the variance request must be received by the MDNR no later than August 24, 1990, to receive consideration.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
WASTE MANAGEMENT DIVISION
P.O. BOX 30241
LANSING, MICHIGAN 48909

Questions or comments regarding the facility should be addressed to Ms. Liane Shekter Smith, the permit engineer responsible for the review of the variance request, at 517-335-4790, or at the above address.

mailed 03-16-90

MIDNR

License Requirements

Drug & Laboratory Disposal, Inc.

Environmentally Correct
Disposal of all
Chemical Waste

P.O. Box 490
331 Broad Street
Plainwell, MI 49080

X-reference

COPY

(original filed in Licenses)

March 16, 1990

Director David F. Hales
MI Dept. of Natural Resources
Stevens T. Mason Bldg.
P.O. Box 30241
Lansing, MI 48909

Dear Director Hales:

RE: Request for Tank System Variance

Enclosed is a sealed engineering report and blueprint documenting the rationale for a variance to our tank system as allowed for in CFR 40 264.193(g).

We are requesting this variance because we believe that our construction, which occurred prior to the promulgation of the current regulations, is equivalent to the current regulations and, in fact, we consider the structure as constructed to be superior to the current regulations.

Your attention to this matter would be appreciated.

Yours truly,

Ward T. Walter, RPh MS

WTW:rs

Enclosure

cc: Al Howard, Chief
Waste Management Division

(616) 685-9824

FAX (616) 685-1130

TANK SYSTEM VARIANCE REQUEST REPORT

The purpose of this report is to document the appropriateness of a variance for a tank system at Drug & Laboratory Disposal, Inc. from the regulations 40 CFR Subpart J - Tank Systems; specifically paragraph 264.193(e)(2)(iii). Variances are permitted according to paragraph 264.193 (g).

This author, being the author and professional engineer of record for construction document sheet 1 dated June 6, 1983 "Dock & Tank Storage", Drug & Laboratory Disposal, Inc., presents the following information for consideration.

The detail Section "A" of the above document presents the construction procedure for containment structure licensed as DLS-3 containment area. The detail indicates an 8" reinforced concrete wall keyed and doweled into the 6" reinforced floor slab supported on a continuously reinforced footer. Interrogation of the Contractor and close examination of construction progress photographs by the author substantiated this Construction procedure. The non-compliance item is the missing "chemical-resistant water stop in place at all joints", as required in paragraph 264.193(e)(2)(iii).

It is herewith noted that paragraph 264.193(e)(2)(iii) of the regulation was promulgated on or after July 14, 1986, more than 2 years after construction completion.

During preparation of the construction document the author discussed the availability of "waterstops" for joint closure with the Owner. The author's design experience with swimming pools and basements and subsequent construction observation is, that effective installation of such waterstops is extremely difficult under the best detailed conditions and nearly impossible under everyday field construction conditions. Discussion with contractors, professional colleagues and building authorities support this conclusion. In the absence of a regulation and with consideration for a precise keyway construction joint detail, the decision was made to omit a "waterstop" and use keyways. Construction procedures were effected and monitored to insure a sound keyway joint. Upon completion of the containment structure and proper concrete curing time, a one half inch minimum filleted caulk joint was applied around the floor/wall joint using a silicone base caulking material. The interior of the containment structure was coated with a Xylene base sealant. Inspection of the caulking and sealant shows it has been maintained clean, sound and effectively bonded since construction to present day.

To further evaluate the integrity of the joint, the author performed a hydro-static fluid pressure check to determine the potential for the hazardous waste material exiting the containment structure thru the keyed joint in the event of a tank rupture or spill. A spill of one tank of 5,000 gallons would result in a fluid level of 0.56 feet deep in the containment area. Using a specific gravity for the fluid of 1.25, including safety factor, a resulting hydro-static pressure on the floor at the floor/wall interface would be 0.3 pounds per square inch. Calculations included. It is the author's judgement that such low pressure would not force the fluid past the caulked joint and keyway in the event of a spill prior to the Owners executed waste removal according to para. 264.193(c)(4).

Based on the integrity of the design detail, the construction procedure, the recent inspection and the hydro-static analysis, it is this authors judgement that the integrity of the containment structure designated DLS-3 is not compromised by the lack of a "chemical resistant water-stop" at the joints.

Respectfully submitted,

David R. Wilson

David R. Wilson, P.E.
Professional Engineer
7283 N. 450 E.
Kendallville, IN. 46755

Enclosure: Calcs.

CERTIFIED
David R Wilson, P.E.
STATE OF MICHIGAN
15749

HYDRO-STATIC FLUID PRESSURE

Containment Structure: A = 49'-2½ " x 24'-4"
= 1197.3 sq. ft.

Largest Tank: V = 5000 gallons
= 5000 x .13368 cu. ft. /gallon
= 668.4 cu. ft.

Fluid Depth @ Spill: d = V/A
= 668.4 / 1197.3
= 0.56 ft.

Specific Gravity of Fluid: 1.0 *
x 1.25 (25% Safety Factor)
S.G.= 1.25

Hydro Static Pressure: P = 62.4 x S.G. x d
= 62.4 #/cu. ft. x 1.25 x .56 ft.
= 43.7 # / sq. ft.

Pressure (pounds/square inch)= 43.7/144 sq. in./sq. ft.
= 0.30 psi.

* from owner equal to or less than H_2O (water)

License Requirement

STATE OF MICHIGAN

JAMES J. BLANCHARD, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
P.O. BOX 30028
LANSING, MI 48909

DAVID F. HALES, Director

May 1, 1990

Mr. Ward Walter
Drug and Laboratory Disposal, Inc.
331 Broad Street
Plainwell, Michigan 49080

Dear Mr. Walter:

SUBJECT: Request for Secondary Containment Variance
MID 092 947 928

On March 19, 1990, Waste Management Division received a request for variance for the secondary containment system at the above referenced facility. On March 28, 1990, you were contacted and requested to send information demonstrating the chemical compatibility of the sealant and caulking materials used in construction with the materials in the storage tanks. Please note that your demonstration is incomplete until all information necessary to make a final determination is received.

If you have any questions please contact me.

Sincerely,

Liane J. Shekter Smith

Liane J. Shekter Smith
Environmental Engineer
Hazardous Waste Permits Section
Waste Management Division
517-335-4790

cc: Ms. Marilyn Sabadaszka, U.S. EPA
Mr. Richard Traub, U.S. EPA
Mr. Steve Buda, DNR
Ms. Lynn Spurr, DNR-Plainwell
C&E File

R1026
3/89

COPY (original in operating license)

License Requirements

STATE OF MICHIGAN

JAMES J. BLANCHARD, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING
P.O. BOX 30028
LANSING, MI 48909

DAVID F. HALES, Director

October 3, 1990

Mr. Ward Walter
Drug and Laboratory Disposal, Inc.
331 Broad Street
Plainwell, Michigan 49080

Dear Mr. Walter:

SUBJECT: Secondary Containment Variance Approval
MID 092 947 928

The Waste Management Division (WMD) has completed its review of the secondary containment variance request submitted by Drug and Laboratory Disposal, Inc. on March 19, 1990, and additional information submitted to the WMD on May 29, 1990. Based on this review, and the fact that no significant comments were received during the public comment period, the Department of Natural Resources hereby approves the secondary containment variance, in accordance with 40 CFR 265.193(g) which is adopted by reference in R 299.11003.

If you have any questions or comments, please contact Ms. Liane Shekter Smith of my staff at 517-335-4790.

Sincerely,

Alan J. Howard, Chief
Waste Management Division
517-373-9523

cc: Ms. Marilyn Sabadaszka, U.S. EPA
Mr. Richard Traub, U.S. EPA
Mr. Steve Buda, DNR
Mr. Chuck Bikfalvy, DNR - Plainwell
Ms. Liane Shekter Smith, DNR
HWP/C&E File

mailed 05-25-90

License Requirements

Drug & Laboratory Disposal, Inc.

Environmentally Correct
Disposal of all
Chemical Waste

P.O. Box 490
331 Broad Street
Plainwell, MI 49080

May 25, 1990

Liane Shekter Smith
Waste Management Division
Michigan Dept. of Natural Resources
P.O. Box 30241
Lansing, MI 48909

Dear Liane:

RE: Tank System Variance Request

As you requested in our telephone conversation of March 28, enclosed are the Material Safety Data Sheets for the caulking and coating products used in our tank containment area.

These products were selected based on the manufacturer's recommendations or product description, a copy of which is also enclosed. The recommended two coats have been applied. Additionally, these products have been used on our commingling hood for several years and have held up well to the chemical exposure in that work area which is the same chemical exposure potentially likely to occur in the event of a spill into our tank system containment area.

I hope this meets the documentation requirements for the product used in the coating process.

Yours truly,

Ward T. Walter, RPh MS

WTW:rs

Enclosure

cc:dnrmsds.wtw

(616) 685-9824

FAX (616) 685-1130

product description CONTINUED

- **Aluminum**
  1 coat Wash Primer Green, P6062/R7K44 @ 0.3 mils DFT
  2 coats TILE-CLAD II Epoxy, B62 Series/B60V70 @ 4 mils DFT/coat
  Total DFT, mils: 8.3
- **Galvanized**
  2 coats TILE-CLAD II Epoxy, B62 Series/B60V70 @ 4 mils DFT coat
  Total DFT, mils: 8
  (Note: Rusty galvanized metal must be primed with TILE-CLAD II HIBild Primer, B62 N 71 / B60 V 70.)
- **Concrete Block**
  1 coat Heavy Duty Block Filler, B42 W 46 @ 10 mils DFT
  2 coats TILE-CLAD II Enamel, B62 Series/B60V70 @ 4.0 mils DFT/coat
  Total DFT, mils: 18
- **Masonry: Including floors**
  2 coats TILE-CLAD II Epoxy, B62 Series/B60V70 @ 4.0 mils DFT/coat
  Total DFT, mils: 8
- **Plaster and Wallboard**
  1 coat ProMar 200 Interior Latex Wall Primer, B28 W 200 @ 1.4 mils DFT/coat
  2 coats TILE-CLAD II Epoxy, B62 Series/B60V70 @ 4.0 mils DFT/coat
  Total DFT, mils: 9.4
- **Wood: Including Floors**
  2 coats TILE-CLAD II Epoxy, B62 Series/B60V70 @ 4.0 mils DFT/coat
  Total DFT, mils: 8
- **Steel: Epoxy Zinc Rich Primer**
  1 coat ZINC-CLAD PRIMER @ 3 mils DFT
  2 coats TILE-CLAD II Epoxy B62/B60V70 Series @ 4.0 mils DFT/coat.
  Total DFT, mils: 11

APPLICATION:
Clean spray equipment before use with Reducer #54. Strong solvents in the material may loosen old residual paint and cause blocking of the equipment. To eliminate possible blocking of equipment during spraying, clean equipment before extended downtime.

Thoroughly mix equal parts by volume of TILE-CLAD II, Part A and TILE-CLAD II, Hardener, Part B. Then allow material to "sweat-in" 1 hour when temperatures are between 65°F-90°F. When temperatures are between 55°F-65°F or when humidity is 60%-85%, "sweat-in" time must be 2 hours. Complete mixing and proper induction time is essential for TILE-CLAD II to dry. DO NOT SHAKE on mechanical shaker after catalyzation. Moisture condensation on TILE-CLAD II Epoxy which is not thoroughly dry will adversely affect its cure.

When using TILE-CLAD II Eggshell Hardener B60 VA 7, agitate before catalyzing to disperse flatting agent. Reduce catalyzed mixture up to 20% per gallon with Reducer #54, R7 K 54 before application.

- **Tinting:** Tint with BLEND-A-COLOR colorants into Part A only. **Do not use Red.** 15 minutes mixing on a mechanical shaker is required for complete dispersement of colorant.
- **Application Conditions:**
  Temperature ..... (air, surface, material) 50°F-95°F (at least 5°F above dew point)
  Relative Humidity ..... 85% max
- **Methods** ..... Brush, roll, conventional or airless spray
  Airless Spray: *
  Pressure ..... 2500 psi
  Filter ..... 60 mesh
  Tip ..... .015"
  Brush/Roller ..... Full body
  Conventional Spray: *
  Atomization Pressure ..... 80 psi
  Fluid Pressure ..... 20-25 psi
  Cap/Tip ..... 78 Cap/E Tip
- **Reducer** ..... Reducer #54, R7K54
  * Reduction ..... Up to 1 pint per gallon catalyzed material after induction. (See Note 4, page 74.)
- **Clean-up** . Reducer #54, R7K54 following supplier's safety recommendations.

TILE-CLAD® II HI-BILD PRIMER

B62 N 71/B60 V 70

PRODUCT DESCRIPTION:
A two-component polyamide cured high-build catalyzed epoxy primer with lead-free, rust-inhibitive pigmentation.

USES:
- For use as a field primer on interior and exterior steel as part of a system to be topcoated with catalyzed epoxy or urethane topcoats
- Paper mills
- Power plants
- Laboratories
- Storage tanks
- Structural steel
- Offshore structures
- Refineries
- Chemical processing equipment

CHARACTERISTICS:
- **Color/Finish:** Reddish brown/35±20 units @ 60°
- **Drying Schedule:** (temperature & humidity dependent) @ 77°F and 50% RH @ 8 mils wet
  To Touch: 1 hour
  Tack Free: 4 hours
  To Recoat: 6 hours minimum. Primed steel exposed to warm temperatures and exterior weathering must be topcoated within 90 days. For primed structural steel to be topcoated with HI-MIL SHER-TAR and placed in immersion service, prepare steel per SSPC-SP-10, Near White Blast. Prime the same day as blasted and topcoat within 7 days. If maximum recoat time is exceeded, brush blast before topcoating.
  To Cure: 2 weeks
- **Flash Point (catalyzed):** 100°F (Pensky-Martens Closed Cup)
- **Pot Life:** @ 77°F: 8 hours
- **Recommended Spreading Rate:** 190 sq. ft./gal. @ 8 mils wet, 4 mils dry (theoretical, no loss)
- **Spreading Rate Coverage:** 770 sq. ft./gallon @ 1.0 mil dry (theoretical, no loss)
- **"Sweat-In" Time:** 1 hour @ 65°F-95°F. 2 hours @ 55°F-65°F or when humidity is 60%-85%.
- **Volume Solids:** 48%±2%
- **Limitations:** For primed structural steel to be topcoated with coal tar epoxy, topcoat within 7 days.

PRECAUTIONS: See notes 2 and 3, page 74.

SURFACE PREPARATION: See pages 4 and 5.
- Galvanized (rusty only) ..... S-W 15 (SSPC-SP 3
- Steel (normal exposure, 1.5-2.0 mil profile) ..... S-W 15 (SSPC-SP3)
- Steel (severe exposure, 1.5-2.0 mil profile) ..... S-W 17 (SSPC-SP 6)
- Immersion Service ..... S-W 20 (SSPC-SP 10)
- Previously Painted Surfaces ..... S-W 12

APPLICATION:
Clean spray equipment before use with Reducer #54. Strong solvents in the material may loosen old residual paint and cause blocking of the equipment. To eliminate possible blocking of equipment during spraying, clean equipment before extended periods of downtime.

Thoroughly mix equal parts by volume of TILE-CLAD II PRIMER, Part A and TILE-CLAD II, Hardener, Part B. Then allow material to sweat-in 1 hour when temperatures are between 65°F-90°F. When temperatures are between 55°F-65°F or when humidity is 60%-85%, sweat-in time must be 2 hours. Complete mixing and proper induction time is essential for TILE-CLAD II PRIMER to dry. DO NOT SHAKE on mechanical shaker after catalyzation. Moisture condensation on TILE-CLAD II PRIMER which is not thoroughly dry will adversely affect its cure.

- **Application Conditions:**
  Temperature . (air, surface, material) 55°F-100°F (at least 5°F above dew point)
  Relative Humidity ..... 85% max
- **Methods** ..... Brush, roll, conventional or airless spray
  Airless Spray: *
  Pressure ..... 2500 psi
  Filter ..... 60 mesh
  Tip ..... .015"
  Brush/Roller ..... Full body
  Conventional Spray: *
  Atomization Pressure ..... 80 psi
  Fluid Pressure ..... 20-25 psi
  Cap/Tip ..... 78 Cap/E Tip
  Reducer ..... Reducer #54, R7K54
  (See Note 4, page 74.)
  * Reduction ..... Up to 1 pint per gallon catalyzed material after induction.
- **Clean-up** . Reducer #54, R7K54 following supplier's safety recommendations.

TILE-CLAD® II EPOXY

Series B62
Gloss Hardener, B60 V 70
Eggshell Hardener, B60 VA 7

PRODUCT DESCRIPTION:
A two-component polyamide/epoxy coating for heavy-duty use.

USES:
- Clean rooms
- Heavy-duty floor coating
- Laboratories
- Lavatories
- Machinery & equipment coating
- Masonry
- Storage tanks
- Offshore structures
- Paper mills
- Power plants
- Refineries
- Sanitary wall coating
- Schools

Performance Information:
- Abrasion-resistant
- Resists bacterial attack
- Chemical-resistant
- Stain-resistant/washable

Physical Properties:
- Abrasion Resistance ..... 132 mg
  (ASTM D4060, CS-17 wheel, 1,000 cycles, 1 kg. Taber Abraser)
- Direct Impact Resistance ..... 84 in. lbs
  (ASTM G14)
- Dry Heat Resistance ..... 250°F
  (ASTM D2485; OSHA Red: 150°F) (Discolors)
- Elcometer Adhesion ..... 750 psi
  (ASTM D4541)
- Exterior ..... Excellent
  (with nonprogressive chalk face developing in 3-6 months)
- Flexibility ..... Passes
  (ASTM D1737, 180° Bend, 1/4"mandrel)
- Moisture Condensation Resistance ..... No Failure
  (ASTM D2247, 100°F, 1500 hours)
- Pencil Hardness ..... B
  (ASTM D3363)
- Salt Fog Resistance ..... Good
  (ASTM B117, 1,000 hours)
- Scrub Resistance ..... No Gloss Change
  (ASTM D2986, 9,700 cycles)
- Thermal Shock ..... Excellent
  (ASTM B1211, 5 cycles)
- Washability and Stain Resistance ..... Maximum 25 cycles
  For complete removal of: Lipstick Tea Coke Butter Ketchup Fruit Juice

Resistance Guide: (per ASTM D3912)
- Alcohols, formaldehyde, glycol ethers, selected chlorinated solvents: MODERATE
- Aliphatic hydrocarbon solvents, gasoline, kerosene, fuel oil: SEVERE
- Alkalies: SEVERE
- Animal and vegetable fats and oils, cutting oils, lubricating oils: SEVERE
- Aromatic hydrocarbon solvents: MODERATE
- Fresh and salt water: SEVERE
- Weak solutions of mineral and organic acids; MODERATE

CHARACTERISTICS:
- **Color/Finish:** White, Black, OSHA colors, 4 tinting bases, wide range of color possible (OSHA Colors contain lead and cannot be used for domestic, institutional, educational or recreational facilities)
  Gloss: 90±10 units @ 60°
  Eg-Shel: 25±10 units @ 60°
- **Drying Schedule:** (temperature & humidity dependent) @ 77°F and 50% RH @ 9 mils wet
  To Touch: 1 hour
  Tack Free: 4 hours
  To Recoat: 6 hours minimum, 30 days maximum. If maximum recoat time is exceeded, brush blast before topcoating.
  To Cure: 2 weeks

NOTE: Lower temperatures, higher humidity and addition of colorants will extend drying time.)
- **Flash Point:** 95°F (Pensky-Martens Closed Cup)
- **Pot Life:** @ 77°F: 8 hours
- **Recommended Spreading Rate:** 185 sq. ft./gal. @ 9 mils wet, 4 mils dry (theoretical, no loss)
- **Spreading Rate Coverage:** 740 sq. ft./gallon @ 1.0 mil dry (theoretical, no loss)
- **Volume Solids:** Pure white: 46%±2%
- **"Sweat-In" Time:** 1 hour @ 65°F-95°F. 2 hours @ 55°F-65°F, or when humidity is 60°-85%.
- **Limitation:** Not for use in bakeries because of discoloration or for immersion service. OSHA Red limited to interior use only.

PRECAUTIONS: See notes 2 and 3, page 74. OSHA Orange, OSHA Red and OSHA Yellow, see notes 1, 2 and 3, page 74.

SURFACE PREPARATION: See pages 4 and 5.
- Aluminum ..... S-W 1
- Concrete Block ..... S-W 3
- Drywall ..... S-W 8
- Floors (concrete) ..... S-W 5
- Floors (wood) ..... S-W 24
- Galvanized ..... S-W 10
- Masonry ..... S-W 6 D or A
- Plaster ..... S-W 11
- Steel (normal exposure) ..... S-W 15 (SSPC-SP 3)
- Steel (severe exposure) ..... S-W 17 (SSPC-SP6)
- Wood ..... S-W 24
- Previously Painted Surfaces* ..... S-W 12

*Complete removal preferred. If not possible and lifting or bleeding occurs, use Universal Metal Primer B50 N 6 as a barrier coat. Apply a test area to check for lift. Not on floors.

Recommended Systems:
- **Steel: Universal Primer**
  1 coat Universal Metal Primer, B50 N 6 @ 3 mils DFT
  1 or 2 coats TILE-CLAD II Epoxy, B62 Series/B60V70 @ 4 mils DFT/coat
  Total DFT, mils: 7-11
- **Steel: Epoxy Primer**
  1 coat TILE-CLAD II Hi-Bild Primer, B62 N 71, @ 4 mils DFT/coat
  2 coats TILE-CLAD II Epoxy, B62 Series/B60V70 @ 4.0 mils DFT/coat
  Total DFT, mils: 12
- **Steel (Epoxy Primer)**
  1 coat Recoatable Epoxy Primer, B67H5/B67V5, @ 4 mils DFT
  2 coats Tile Clad II Epoxy, B62 Series/B60V70, @ 4 mils DFT/coat
  Total DFT, mils: 12
- **Steel: Epoxy Mastic Primer**
  1 coat Epoxy Mastic Aluminum B62S10/B60V11 or Epoxy Mastic Coating, B58 Series/B58V1 @ 6 mils DFT
  Note: Topcoat within 7 days
  1 coat TILE-CLAD II Epoxy, B62 Series/B60V70 @ 4 mils DFT
  Total DFT, mils: 11

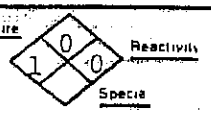
MINWAX®

CONSTRUCTION PRODUCTS DIVISION

102 CHESTNUT RIDGE PLAZA • MONTVALE • NEW JERSEY 07645

SEE HAZARD RATING DEFINITIONS PAGE 4

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT
* = CHRONIC HEALTH HAZARD—SEE SECTION V



DATE OF PREP 11/23/86

MATERIAL SAFETY DATA SHEET

EMERGENCY PHONE NO.
DAY: (201) 891-0253
NIGHT: (201) 573-5700

SECTION I - IDENTIFICATION

PRODUCT NAME
POR-ROK ANCHORING CEMENT

PRODUCT CLASS
Gypsum

CODE NUMBER
08-00484-000

UN No.
NONE

DOT

HAZARD CLASS (49CFR 172.101) NONE

PROPER SHIPPING NAME (49CFR 172.101) Hydraulic Cement

SECTION II - INGREDIENTS

PAINTS, PRESERVATIVES, SOLVENTS OR OTHER LIQUIDS, SOLIDS AND GASES		%	TLV (Units)
PIGMENTS			
CATALYST			
VEHICLE			
SOLVENTS			
ADDITIVES			
OTHERS			
Portland Cement	CAS #65997-15-1	- 2.0	50 mppcf
Calcium Sulphate	CAS #7778-18-9	68.0	50 mppcf
Silica	CAS #7631-86-9	30.0	10 mg/M^3 ÷ % SiO_2+2

SECTION III - PHYSICAL DATA

APPEARANCE Gray Powder, No Odor		**VAPOR DENSITY: HEAVIER/LIGHTER THAN AIR (Air = 1)** Not Applicable
SOLUBILITY IN WATER Partial	**VAPOR PRESSURE (mm Hg.)** Not Applicable	**PERCENT VOLATILE BY VOLUME (%)** Not Applicable
BOILING POINT (°F) Not Applicable	**EVAPORATION RATE (Butyl Acetate = 1)** Not Applicable	**WEIGHT PER GALLON** 80# per cu. ft.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME POR-ROK ANCHORING CEMENT

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASHPOINT	FLAMMABLE LIMITS LEL	UEL
NA	NA	NA

EXTINGUISHING MEDIA

Not Applicable

AUTOIGNITION TEMPERATURE NA

SPECIAL FIRE FIGHTING PROCEDURES

Not Applicable

UNUSUAL FIRE AND EXPLOSION HAZARDS

Not Applicable

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

See Page 5

EFFECTS OF OVEREXPOSURE - ROUTES OF EXPOSURE

INGESTION:	May cause obstruction.
INHALATION:	Inhalation of silica dust can produce pneumoconiosis, commonly called silicosis, which is a chronic, slowly developing disease. Symptoms are dyspnea, pain in chest, decreased vital capacity and cough.
EYE CONTACT:	Dust irritant.
SKIN CONTACT:	Abrasive.
NO REPORTS:	Carcinogenicity

EMERGENCY AND FIRST AID PROCEDURES

IF SWALLOWED:	If patient is conscious, first give large quantities of water or milk, and then induce vomiting using syrup of ipecac according to directions or by touching back of patient's throat with finger. CALL PHYSICIAN IMMEDIATELY.
FOR EYE CONTACT:	If present, remove contact lens, flush with plenty of water for at least 15 minutes. CALL PHYSICIAN.
FOR SKIN CONTACT:	Wash thoroughly with soap and water. If irritation persists, consult a physician.
IF AFFECTED BY INHALATION:	Remove to fresh air.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME POR-ROK ANCHORING CEMENT

SECTION VI - REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
	UNSTABLE	
	STABLE XX	NONE

INCOMPATABILITY (Materials to avoid)

NONE

HAZARDOUS DECOMPOSITION PRODUCTS

NONE

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	XX	NONE

SECTION VII - SPILL OR LEAK PROCEDURES

RCRA HAZARDOUS WASTE CLASSIFICATION NONE **NUMBER** NONE

CERCLA (SUPER FUND) REPORTABLE QUANTITY (RQ#) NONE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Sweep up, but avoid creating excessive dust.

WASTE DISPOSAL METHOD

To landfill, slurry may plug drains.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATDRY PROTECTION

Use NIOSH approved nuisance dust respirator.

VENTILATION

Provide a constant flow of fresh air to meet TLV requirements. Open windows and doors or use other means to permit fresh air entry during application and drying.

PROTECTIVE GLOVES	EYE PROTECTION
Neoprene or Rubber Gloves	Goggles

OTHER PROTECTIVE EQUIPMENT

Have eye bath in vicinity of use.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME

POR-ROK ANCHORING CEMENT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Store only in original container. Wash with soap and plenty of water before eating, drinking, smoking or using toilet facilities. Material will harden with high humidity or wetness during storage.

OTHER PRECAUTIONS

Avoid inhalation and use only with adequate ventilation. Remove contaminated clothing immediately and launder before reuse.

KEEP OUT OF REACH OF CHILDREN

N.F.P.A. HAZARD RATING DEFINITIONS

Minwax Company Inc. has provided hazard ratings solely as a convenience to its customers. However, since hazard ratings require subjective determinations, Minwax Company Inc. shall have no legal responsibility for the accuracy or significance of hazard ratings assigned or the use or reliance thereon.

HEALTH HAZARD RATING CHART

0	**INSIGNIFICANT**	no significant risk to health
1	**SLIGHT**	irritation or minor reversible injury possible.
2	**MODERATE**	temporary or minor injury may occur.
3	**HIGH**	major injury likely unless prompt action is taken and medical treatment is given
4	**EXTREME**	life threatening major or permanent damage may result from single or repeated exposures

FLAMMABILITY HAZARD RATING CHART

0	**INSIGNIFICANT**	materials which are normally stable and will not burn unless heated
1	**SLIGHT**	materials that must be preheated before ignition will occur. Flammable liquids in this category will have flash points (the lowest temperature at which ignition will occur) at or above 200 °F (NFPA Class 111B)
2	**MODERATE**	materials which must be moderately heated before ignition will occur, including flammable liquids with flash points at or above 100°F and below 200°F. (NFPA Class II and Class IIIA).
3	**HIGH**	materials capable of ignition under almost all normal temperature conditions, including flammable liquids with flash points below 73°F and boiling points above 100 F as well with flash points between 73°F and 100°F (NFPA Classes 1B and 1C).
4	**EXTREME**	very flammable gases or very volatile flammable liquids with flash points below 73 F and boiling points below 100°F (NFPA Class 1A).

REACTIVITY HAZARD RATING CHART

0	**INSIGNIFICANT**	materials which are normally stable, even under fire conditions, and which will not react with water
1	**SLIGHT**	materials which are normally stable, but can become unstable at high temperatures and pressures These materials may react with water, but will not release energy violently.
2	**MODERATE**	materials which in themselves are normally stable and will readily undergo violent chemical change, but will not detonate. These materials may also react violently with water.
3	**HIGH**	materials which are capable of detonation or explosive reaction, but require a strong initiating source, or must be heated under confinement before initiation, or materials which react explosively with water
4	**EXTREME**	these materials are readily capable of detonation or explosive decomposition at normal temperatures and pressures.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME POR-ROK ANCHORING CEMENT

SECTION V - HEALTH HAZARD DATA (continued)

THRESHOLD LIMIT VALUE

Silica (Respirable)	OSHA	TLV/TWA	10 mg/M^3 ÷ % SiO_2 + 2
	ACGIH	TLV/TWA	10 mg/M^3 ÷ % SiO_2 + 2
Calcium Sulphate	OSHA	TLV/TWA	50 mppcf Nuisance Dust
	ACGIH	TLV/TWA	30 mppcf
Portland Cement	OSHA	TLV/TWA	50 mppcf
	ACGIH	TLV/TWA	30 mppcf

MATERIAL SAFETY DATA SHEET

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MANUFACTURER'S NAME
THE SHERWIN-WILLIAMS COMPANY
101 Prospect Avenue N.W.
Cleveland, Ohio 44115

EMERGENCY TELEPHONE NO.
(216) 566-2917

DATE OF PREPARATION
17-Jan-89

INFORMATION TELEPHONE NO.
(216) 566-2902

Section I -- PRODUCT IDENTIFICATION

PRODUCT NAME
TILE-CLAD* II Enamel (Part A), Non-Lead Colors

* - Trade Mark

PRODUCT NUMBERS AND COLORS

This MSDS covers products with MSDS code B62XX, including:

TILE-CLAD* II Enamel (Part A)

B62 B 11	Black	B62 W 102	Midtone Base
B62 T 104	Ultradeep Base	B62 W 103	Deeptone Base
B62 W 101	Pure White		

TILE-CLAD* II Hi-Bild Primer (Part A)
B62 N 71

--- Including Lead Hazard Free B62 Custom Colors ---

PRODUCT CLASS
Pigmented component for 2-package Epoxy Coating

Section II -- HAZARDOUS INGREDIENTS

CAS No.	INGREDIENT	% by WEIGHT	ACGIH-TLV	OSHA-PEL	UNITS	V.P.
64742-47-8	Mineral Spirits.	0-5	100	500	PPM	2.0
100-41-4	Ethylbenzene	<5	100	100	PPM	7.1
1330-20-7	Xylene.	10-20	100	100	PPM	5.9
111-76-2	2-Butoxyethanol	0-5	25 (Skin)	50	PPM	0.6
108-65-6	1-Methoxy-2-Propanol Acetate	0-5	Not Established			1.8
Propriet.	Polyamide.	10-25	Not Established			
14807-96-6	Talc	15-25	2		Mg/M3	as Dust
13463-67-7	Titanium Dioxide.	0-30	Not Established			as Dust
1333-86-4	Carbon Black. [in Blacks only]	<5	3.50		Mg/M3	as Dust
---> the following in all except B62N71:						
64742-95-6	Light Aromatic Naphtha	15-25	100		PPM	3.8

Section III -- PHYSICAL DATA

PRODUCT WEIGHT -- 9-13 lb./gal.
SPECIFIC GRAVITY -- 1.08-1.56
BOILING RANGE -- 281-448 F
VOLATILE VOLUME -- 46-60 %

EVAPORATION RATE -- Slower than Ether
VAPOR DENSITY -- Heavier than Air
MELTING POINT -- N.A.
SOLUBILITY IN WATER -- N.A.

Continued on page 2

Section IV -- FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION FLASH POINT 80-90 F PMCC LEL 0.7

RED LABEL -- Flammable, Flash below 100 F

EXTINGUISHING MEDIA

Carbon Dioxide, Dry Chemical, Foam

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. Application to hot surfaces requires special precautions. During emergency conditions overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Obtain medical attention.

SPECIAL FIRE FIGHTING PROCEDURES

Full protective equipment including self-contained breathing apparatus should be used. Water spray may be ineffective. If water is used, fog nozzles are preferable. Water may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat.

Section V -- HEALTH HAZARD DATA

ROUTES OF EXPOSURE

Exposure may be by INHALATION and/or SKIN or EYE contact, depending on conditions of use. To minimize exposure, follow recommendations for proper use, ventilation, and personal protective equipment.

ACUTE Health Hazards

EFFECTS OF OVEREXPOSURE

Irritation of eyes, skin and respiratory system. May cause nervous system depression. Extreme overexposure may result in unconsciousness and possibly death.

SIGNS AND SYMPTOMS OF OVEREXPOSURE

Headache, dizziness, nausea, and loss of coordination are indications of excessive exposure to vapors or spray mists.

Redness and itching or burning sensation may indicate eye or excessive skin exposure.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

May cause allergic skin reaction in susceptible persons.

EMERGENCY AND FIRST AID PROCEDURES

If INHALED: If affected, remove from exposure. Restore breathing. Keep warm and quiet.

If on SKIN: Wash affected area thoroughly with soap and water. Remove contaminated clothing and launder before re-use.

If in EYES: Flush eyes with large amounts of water for 15 minutes. Get medical attention.

If SWALLOWED: Get medical attention.

CHRONIC Health Hazards

No ingredient in this product is an IARC, NTP or OSHA listed carcinogen.

Prolonged overexposure to solvent ingredients in Section II may cause adverse effects to the liver, urinary, blood forming, and reproductive systems.

Rats exposed to titanium dioxide dust at 250 mg./m3 developed lung cancer, however, such exposure levels are not attainable in the workplace.

Reports have associated repeated and prolonged overexposure to solvents with permanent brain and nervous system damage.

Section VI -- REACTIVITY DATA

STABILITY -- Stable

INCOMPATIBILITY

None known.

HAZARDOUS DECOMPOSITION PRODUCTS

By fire: Carbon Dioxide, Carbon Monoxide, Oxides of Nitrogen

HAZARDOUS POLYMERIZATION -- Will Not Occur

Continued on page 3

Continued on page 2

Section VII -- SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Remove all sources of ignition. Ventilate and remove with inert absorbent.

WASTE DISPOSAL METHOD

Waste from this product may be hazardous as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Waste must be tested for ignitability to determine the applicable EPA hazardous waste numbers.

Incinerate in approved facility. Do not incinerate closed container. Dispose of in accordance with Federal, State, and Local regulations regarding pollution.

Section VIII -- PROTECTION INFORMATION

PRECAUTIONS TO BE TAKEN IN USE

Use only with adequate ventilation. Avoid breathing vapor or spray mist. Do not get in eye or on skin.

This coating may contain materials classified as nuisance particulates, such as titanium dioxide or calcium carbonate (see ACGIH TLV List, Preface and Appendix D), which may be present at hazardous levels only during sanding or abrading of the dried film. If no specific dusts are listed in Section II, the applicable limits for nuisance dusts are ACGIH TLV 10 mg./m3 (total dust), OSHA PEL 15 mg./m3 (total dust), 5 mg./m3 (respirable fraction).

VENTILATION

Local exhaust preferable. General exhaust acceptable if the exposure to materials in Section II is maintained below applicable exposure limits. Refer to OSHA Standards 1910.94, 1910.107, 1910.108.

RESPIRATORY PROTECTION

If personal exposure cannot be controlled below applicable limits by ventilation, wear a properly fitted organic vapor/particulate respirator approved by NIOSH/MSHA for protection against materials in Section II.

When sanding or abrading the dried film, wear a dust/mist respirator approved by NIOSH/MSHA for dust which may be generated from this product, underlying paint, or the abrasive.

PROTECTIVE GLOVES

Wear gloves which are recommended by glove supplier for protection against materials in Section II.

EYE PROTECTION

Wear safety spectacles with unperforated sideshields.

OTHER PROTECTIVE EQUIPMENT

Use of barrier cream on exposed skin is recommended.

Section IX -- PRECAUTIONS

DOL STORAGE CATEGORY -- 1C

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Contents are FLAMMABLE. Keep away from heat, sparks, and open flame.

During use and until all vapors are gone: Keep area ventilated - Do not smoke - Extinguish all flames, pilot lights, and heaters - Turn off stoves, electric tools and appliances, and any other sources of ignition.

Consult NFPA Code. Use approved Bonding and Grounding procedures.

Keep container closed when not in use. Transfer only to approved containers with complete and appropriate labeling. Do not take internally. Keep out of the reach of children.

OTHER PRECAUTIONS

This product must be mixed with other components before use. Before opening the packages, READ AND FOLLOW WARNING LABELS ON ALL COMPONENTS.

Intentional misuse by deliberately concentrating and inhaling the contents can be harmful or fatal.

Continued on page 4

Continued on page 3

HEALTH	2*
FLAMMABILITY	3
REACTIVITY	0

MSDS for B62 Lead-Containing Colors Catalysts B60 V 70 B60 V A7 on following pages.

This Material Safety Data Sheet conforms to the Hazard Communication standard, 29 CFR 1910.1200(g)(4), for similar complex mixtures.

The above information pertains to this product as currently formulated, and is based on the information available at this time. Addition of reducers or other additives to this product may substantially alter the composition and hazards of the product. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information.

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B60 V 70

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MATERIAL SAFETY DATA SHEET

MANUFACTURER'S NAME
THE SHERWIN-WILLIAMS COMPANY
101 Prospect Avenue N.W.
Cleveland, Ohio 44115

EMERGENCY TELEPHONE NO.
(216) 566-2917

DATE OF PREPARATION
17-Jan-89

INFORMATION TELEPHONE NO.
(216) 566-2902

Section I -- PRODUCT IDENTIFICATION

PRODUCT NUMBER
B60 V 70

* - Trade Mark

PRODUCT NAME
TILE-CLAD* II Hardener (Part B)

PRODUCT CLASS
Coreactant for 2-package Epoxy Coating

Section II -- HAZARDOUS INGREDIENTS

CAS No.	INGREDIENT	% by WEIGHT	ACGIH-TLV	OSHA-PEL	UNITS	V.P.
1330-20-7	Xylene.	15	100	100	PPM	5.9
64742-95-6	Light Aromatic Naphtha	20	100		PPM	3.8
78-83-1	2-Methyl-1-propanol	<5	50	100	PPM	8.7
111-76-2	2-Butoxyethanol	10	25 (Skin)	50	PPM	0.6
Propriet.	Epoxy Polymer.	50	Not Established			

Section III -- PHYSICAL DATA

PRODUCT WEIGHT -- 8.48 lb./gal.
SPECIFIC GRAVITY -- 1.02
BOILING RANGE -- 222-360 F
VOLATILE VOLUME -- 55 %
VOC (Theoretical) -- 3.98 lb. 477 gm.

EVAPORATION RATE -- Slower than Ether
VAPOR DENSITY -- Heavier than Air
MELTING POINT -- N.A.
SOLUBILITY IN WATER -- N.A.

Section IV -- FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION FLASH POINT 91 F PMCC LEL 0.7
RED LABEL -- Flammable, Flash below 100 F

EXTINGUISHING MEDIA
Carbon Dioxide, Dry Chemical, Foam

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. Application to hot surfaces requires special precautions. During emergency conditions overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Obtain medical attention.

SPECIAL FIRE FIGHTING PROCEDURES
Full protective equipment including self-contained breathing apparatus should be used. Water spray may be ineffective. If water is used, fog nozzles are preferable. Water may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat.

Continued on page 2

Section V -- HEALTH HAZARD DATA

ROUTES OF EXPOSURE

Exposure may be by INHALATION and/or SKIN or EYE contact, depending on conditions of use. To minimize exposure, follow recommendations for proper use, ventilation, and personal protective equipment.

ACUTE Health Hazards

EFFECTS OF OVEREXPOSURE

Irritation of eyes, skin and respiratory system. May cause nervous system depression. Extreme overexposure may result in unconsciousness and possibly death.

SIGNS AND SYMPTOMS OF OVEREXPOSURE

Headache, dizziness, nausea, and loss of coordination are indications of excessive exposure to vapors or spray mists.

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MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

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If SWALLOWED: Get medical attention.

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No ingredient in this product is an IARC, NTP or OSHA listed carcinogen.

Prolonged overexposure to solvent ingredients in Section II may cause adverse effects to the liver, urinary, blood forming, and reproductive systems.

Reports have associated repeated and prolonged overexposure to solvents with permanent brain and nervous system damage.

Section VI -- REACTIVITY DATA

STABILITY -- Stable

INCOMPATIBILITY

None known.

HAZARDOUS DECOMPOSITION PRODUCTS

By fire: Carbon Dioxide, Carbon Monoxide

HAZARDOUS POLYMERIZATION -- Will Not Occur

Section VII -- SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Remove all sources of ignition. Ventilate and remove with inert absorbent.

WASTE DISPOSAL METHOD

Waste from this product may be hazardous as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Waste must be tested for ignitability to determine the applicable EPA hazardous waste numbers.

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Continued on page 3

Continued on page 2

Section VIII -- PROTECTION INFORMATION

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EYE PROTECTION

Wear safety spectacles with unperforated sideshields.

OTHER PROTECTIVE EQUIPMENT

Use of barrier cream on exposed skin is recommended.

Section IX -- PRECAUTIONS

DOL STORAGE CATEGORY -- 1C

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

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