



**Idaho
Department of Environmental Quality**

AMWTP HWMA/RCRA Permit

**Idaho National Laboratory
EPA ID No. ID4890008952**

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Volume I of V



APPENDIX IX**WMF-676 GENERAL ARRANGEMENT DRAWINGS**

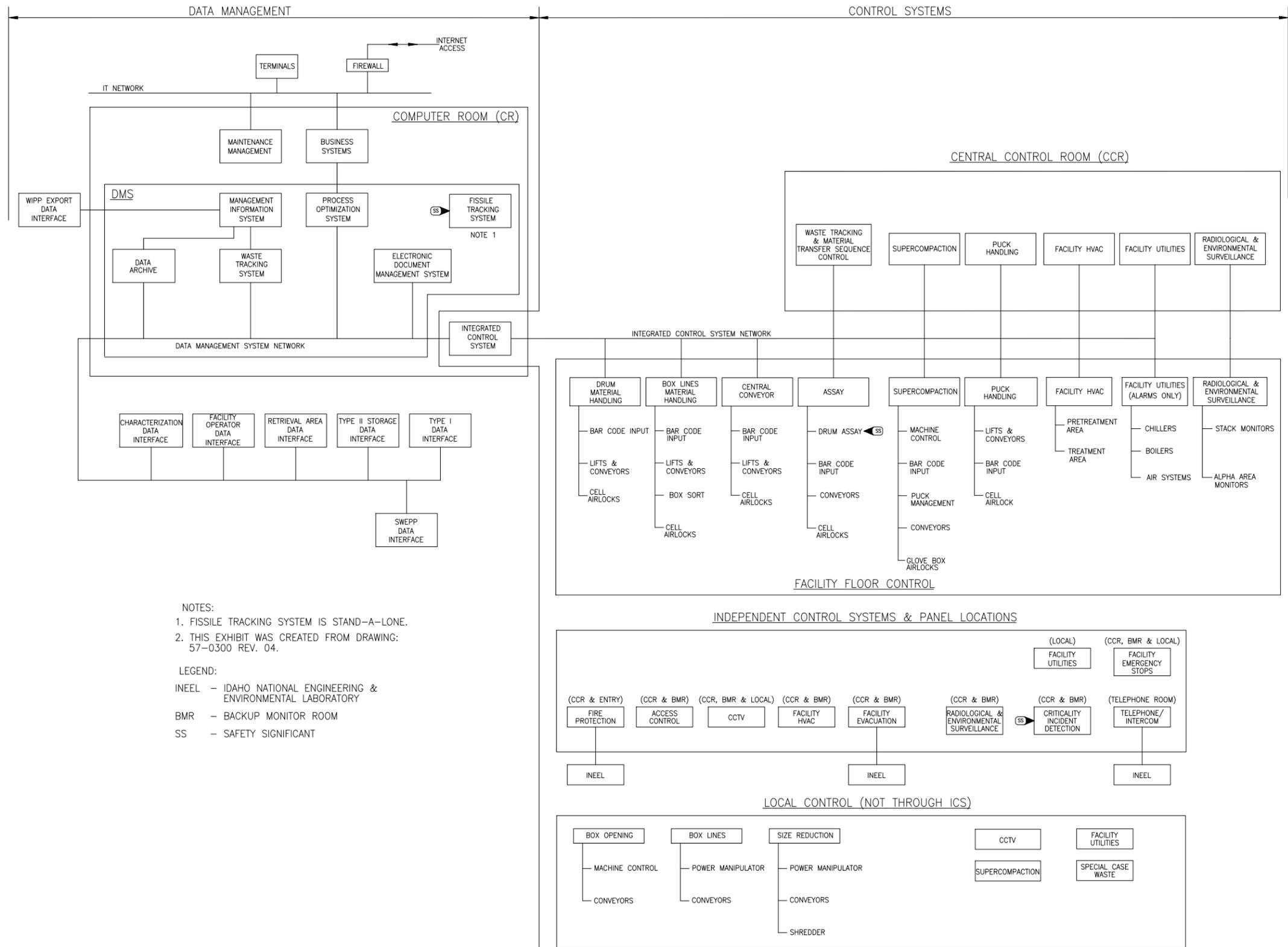
Item Number	Description	Drawing Number	Revision Number	PE Certification Date	Revision Approval Date
1	First Floor Plan General Arrangement	53-0201	09	07/19/11	07/19/11
2	Second Floor Plan General Arrangement	53-0207	12	04/14/11	04/13/11
3	Interstitial Plan General Arrangement	53-0212	06	06/28/06	06/29/06
4	Penthouse Plan HVAC	53-0624	05	06/28/06	06/29/06
5	West and South Exterior Elevations	51-0201	07	06/28/06	06/29/06
6	East and North Exterior Elevations	51-0202	10	06/10/08	06/10/08
7	Building Sections	51-0301	10	07/19/11	07/19/11
8	Building Sections	51-0302	09	06/28/06	06/29/06
9	Main Substation One-Line Diagram	54-0101	06	07/06/06	07/06/06
10	Facility One-Line Diagram	54-0102	08	07/06/06	07/06/06
11	Electrical Elec RM 116 Backup Power One-Line Diagram	54-0103	08	06/29/06	06/29/06

Appendix IX
WMF-676 General Arrangement Drawings
(Items 1 – 11)

These large, fold-out drawings are not available in electronic form; however, hard copies can be requested from the Idaho Department of Environmental Quality

APPENDIX X**AMWTP CONTROL SYSTEM AND DATA MANAGEMENT EXHIBITS**

Item Number	Description	Exhibit Number	Revision Number	Revision Approval Date
1	Control System and Data Management Functional Block Diagram	X-1	01	Not Applicable
2	DMS Interface Block Diagram	X-2	01	Not Applicable



- NOTES:
1. FISSILE TRACKING SYSTEM IS STAND-A-LONE.
 2. THIS EXHIBIT WAS CREATED FROM DRAWING: 57-0300 REV. 04.

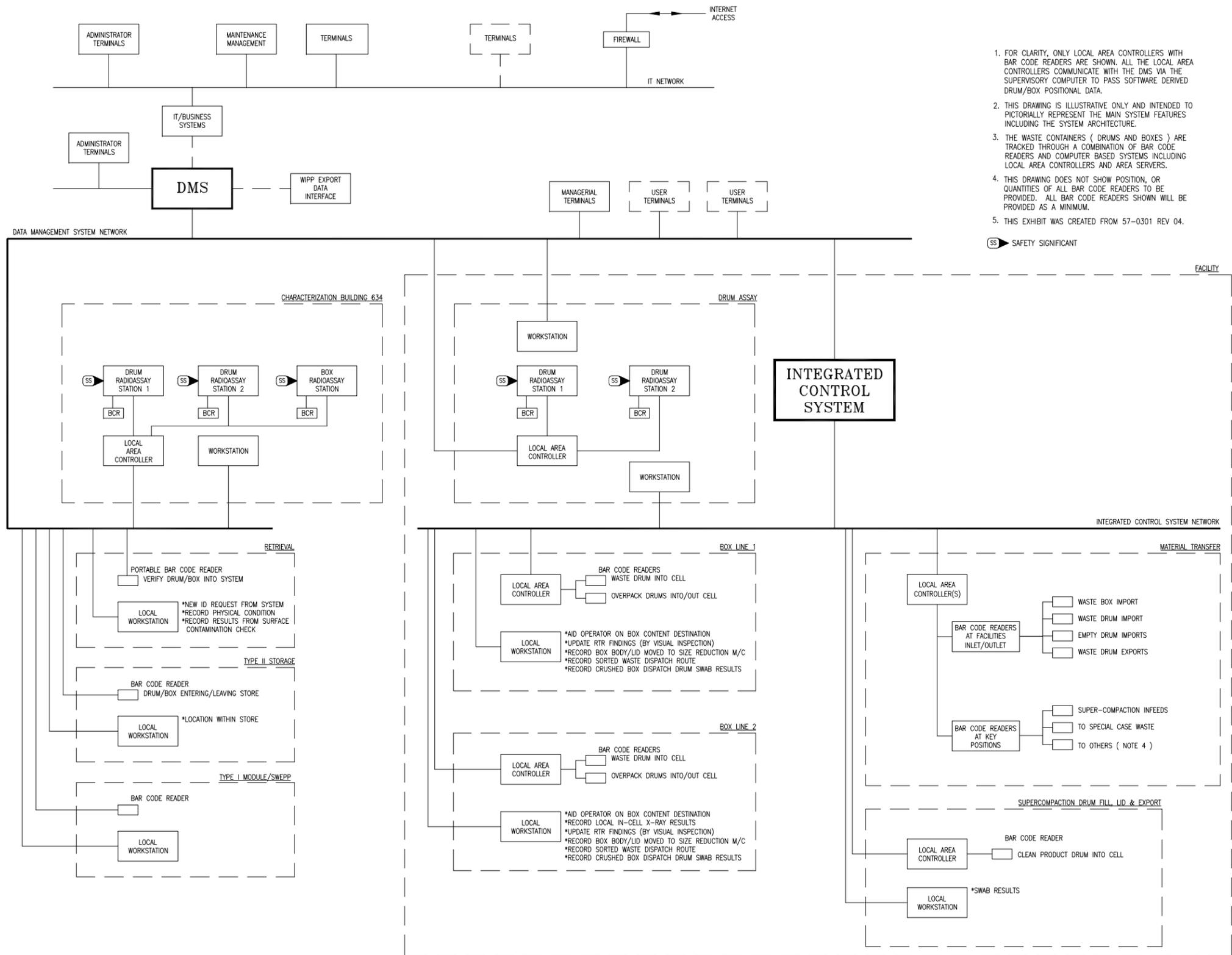
LEGEND:

INEEL - IDAHO NATIONAL ENGINEERING & ENVIRONMENTAL LABORATORY

BMR - BACKUP MONITOR ROOM

SS - SAFETY SIGNIFICANT

Exhibit X-1: Control System & Data Management Functional Block Diagram



1. FOR CLARITY, ONLY LOCAL AREA CONTROLLERS WITH BAR CODE READERS ARE SHOWN. ALL THE LOCAL AREA CONTROLLERS COMMUNICATE WITH THE DMS VIA THE SUPERVISORY COMPUTER TO PASS SOFTWARE DERIVED DRUM/BOX POSITIONAL DATA.
2. THIS DRAWING IS ILLUSTRATIVE ONLY AND INTENDED TO PICTORIALLY REPRESENT THE MAIN SYSTEM FEATURES INCLUDING THE SYSTEM ARCHITECTURE.
3. THE WASTE CONTAINERS (DRUMS AND BOXES) ARE TRACKED THROUGH A COMBINATION OF BAR CODE READERS AND COMPUTER BASED SYSTEMS INCLUDING LOCAL AREA CONTROLLERS AND AREA SERVERS.
4. THIS DRAWING DOES NOT SHOW POSITION, OR QUANTITIES OF ALL BAR CODE READERS TO BE PROVIDED. ALL BAR CODE READERS SHOWN WILL BE PROVIDED AS A MINIMUM.
5. THIS EXHIBIT WAS CREATED FROM 57-0301 REV 04.

SS SAFETY SIGNIFICANT

Exhibit X-2: DMS Interface Block Diagram

APPENDIX XI

SECONDARY CONTAINMENT SYSTEM CAPACITY AND MAXIMUM WASTE VOLUME CALCULATIONS

EDF-0017, Revision 02: Secondary Containment System Capacity Calculations Summary

EDF-0270, Revision 03: Secondary Containment System Capacity Calculations – Non-Facility Buildings

EDF-0271, Revision 02: Secondary Containment System Capacity Calculations – HWMA/RCRA, WMF-676 Treatment Facility

EDF-0272, Revision 02: Secondary Containment System Capacity Calculations – HWMA/RCRA, WMF-676 Treatment Facility – NFPA Secondary Containment Requirements

EDF-0277, Revision 01: Maximum Waste Storage Capacity for WMF-636 Pad 2 and AMWTP Outside Storage Area



Engineering Design File Record Sheet

Form-1590, Rev. 2
Effective: 06/05/06

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Implementing Document: MP-CDMT-11.6

EDF No.: EDF-0017	Revision Number: 02
Title: Secondary Containment System Capacity Calculations Summary	Building/System No.: AMWTP General / System 000

Summary: (Revision 02 changes shown in bold/italics)

The secondary containment system (SCS) calculations, references 1, 2 and 3, demonstrate the maximum allowable volume of liquid waste allowable in the storage area(s) of each *permitted waste treatment and/or storage facility at the Advanced Mixed Waste Treatment Project (AMWTP)*. The *SCS calculations use* the worst-case scenario storage configurations, while maintaining compliance with the HMWA/RCRA SCS capacity requirements.

The SCS capacity has been determined by calculating the maximum available capacity, based on the as-built building configuration, then reducing that capacity based on displacement by building structures, equipment, and the containers in the worst-case storage configuration. The calculations utilize minimum aisle space requirements identified in the AMWTP HWMA/RCRA Storage Permit to ensure compliant storage configurations while deriving the maximum SCS capacity.

In general, the available SCS capacity at the maximum storage configuration for each *permitted* storage area surpasses the requirement to contain the greater of 10% of the volume of containers or the volume of the largest container containing free liquids (see reference 4).

References:

- 1) **EDF-0270**; Secondary Containment System Capacity Calculations, Non-Treatment Facility Buildings
- 2) **EDF-0271**; Secondary Containment System Capacity Calculations – HWMA/RCRA, WMF-676 Treatment Facility
- 3) **EDF-0272**; Secondary Containment System Capacity Calculations - NFPA, WMF-676 Treatment Facility
- 4) 40 CFR 264.175; Containment Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.
- 5) TQ-MK-144, Maximum / Minimum Dimensions of Boxes Allowed into the AMWTF
- 6) AMWTP Drawing 53-10484, AMWTP Corrugated Overpack Box Assembly

Originator: V. C. Gunnell *Vincent Curry Gunnell* **Date:** 10-03-07

Technical Review: *M.M. Clarke* *M. Clarke* **Date:** 10-03-07

Additional Reviewers: (by title)

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<i>Print Title:</i>		
	Signature	Date

Distribution List:

Approval: *Lincoln Griswold* *[Signature]* 10/4/07
Resident Eng. Mgr
Date

(Print name and title of cognizant manager)

CONTINUATION SHEET

EDF No.: EDF-0017	Revision Number: 02
Title: Secondary Containment System Capacity Calculations Summary	Building/System No.: AMWTP General / System 000
<p>Summary (continued from page 1):</p> <p>The SCS calculations for WMF-676, Reference 3, include containment analyses as required by the Uniform Fire Code (UFC), National Fire Protection Association (NFPA), and DOE order 420.1. These calculations show that the containment curbing, etc. within the various areas of WMF-676 are sufficient and meet the <i>fire protection sprinkler water</i> containment requirements.</p> <p><i>The SCS calculations for WMF-676, Reference 2, include containment analyses as required by HWMA/RCRA. These calculations show that the containment curbing, etc. within the various areas of WMF-676 are sufficient and meet the HWMA/RCRA containment requirements with the exception of Room 009, Box Elevator, which is classified as an "in process" area and a "storage" area.</i></p> <p>The allowable container volume calculated in Reference 2 used the limiting volume of the smallest containment area for storing waste box containers in WMF-676.</p> <p>The limiting dimensions for a waste box container to physically enter WMF-676 are 56-inches wide by 96-inches long by 76-½-inches tall (Reference 5) with a volume equal to 238 cubic feet. Given that the allowable container volume is 184.35 cubic feet (1,379 gal; Reference 2), waste box containers with an interior volume capacity greater than 184.35 cubic feet will not enter WMF-676 for storage.</p> <p>Short of implementing significant physical modifications to increase the containment volume of Containment Areas 2-03 and 2-04 (Reference 2, Attachment 1), and considering that the largest box currently projected to enter WMF-676 has an interior volume of 165.63 cubic feet (Reference 6), Design Engineering recommends implementing administrative or software engineering controls as required to prohibit the entrance of waste boxes possessing an interior volume in excess of 184.35 cubic feet into WMF-676 for storage. It is anticipated that waste boxes will contain no free liquids or relatively small amounts.</p>	



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Effective: 06/05/06

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Implementing Document: MP-CDMT-11.6

EDF No.: EDF-0270	Revision Number: 01
Title: Secondary Containment System Capacity Calculations – Non-Facility Buildings	Building/System No.: AMWTP / System 000

Summary:

Purpose/Scope:

This EDF supersedes AMWTP OPS Engineering Calculation OPSCAL-ME-0032 which replaced Appendix IX of the AMWTP HWMA/RCRA Storage Permit, Revised August 05, 2005. Text shown in bold/italics indicates changes made at this revision.

The secondary containment system (SCS) calculations provided in this *EDF* demonstrate the maximum allowable volume of liquid waste that can be placed into the storage area(s) of each *Type I or Type II storage module at the AMWTP*, using the worst-case scenario storage configurations, while maintaining compliance with the HWMA/RCRA SCS capacity requirements.

Conclusion / Recommendations:

The SCS capacity has been determined by calculating the maximum available SCS capacity, based on the as-built building configuration, then reducing that capacity based on displacement by building structures, equipment, and the containers in the worst-case storage configuration. *These calculations apply the minimum aisle-spacing* requirements identified in the AMWTP HWMA/RCRA Storage Permit to ensure compliant storage configurations while deriving the maximum SCS capacity.

In summary, the *following table shows the* available SCS capacity at the maximum storage configuration for each building storage area(s). *In addition, the table shows* the maximum potential storage area liquid waste volume at this capacity; the available SCS capacity must be at least 10% of that volume.

STORAGE AREA	TOTAL FREE LIQUIDS STORED (gal)	10% OF TOTAL FREE LIQUIDS (gal)	AVAILABLE SECONDARY CONTAINMENT CAPACITY (gal)
WMF-634	320,172	32,017	72,541
Type II Module (<i>WMF-629 through WMF-633</i>)	561,596	56,160	82,907
<i>WMF-628</i>	<i>332,366</i>	<i>33,237</i>	<i>74,594</i>
Type I Module: MSA	41,821	4,182	36,463
Type I Module: PAAA/WCRA	128,450	12,845	41,659
Type I Module: TLA	200	20	85
SWEPP	28,380	2,838	3,294



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Effective: 06/05/06

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Implementing Document: MP-CDMT-11.6

EDF No.: EDF-0270	Revision Number: 01	
Title: Secondary Containment System Capacity Calculations – Non-Facility Buildings	Building/System No.: AMWTP / System 000	
References:		
<ol style="list-style-type: none"> 1. AMWTP HWMA/RCRA Storage Permit, Appendix IX, Revised August 05, 2005 2. EDF-0017, Secondary Containment System Capacity Calculations Summary 3. 53-1921, Type II Module (WMF-634) Characterization Facility General Arrangement 4. <i>AMWTP OPSCAL-ME-0032, Secondary Containment System Capacity Calculations for AMWTP Non-Facility Buildings</i> 		
Attachments:		
<ol style="list-style-type: none"> 1. <i>AMWTP Drawing 53-10374, Revision 02; Type II Module (WMF-634) Characterization Facility Permit General Arrangement.</i> 2. <i>AMWTP Drawing 51-10009, Revision 02; Type II Module WMF-628 General Arrangement.</i> 3. <i>AMWTP Drawing 51-9907, Revision 04; Type II Module (WMF-629 Thru WMF-633) General Arrangement.</i> 4. <i>AMWTP Drawing 51-9912, Revision 04; Type I Module (WMF-635) General Arrangement.</i> 5. <i>AMWTP Drawing 51-9906, Revision 04; SWEPP (WMF-610) General Arrangement.</i> 		
Originator: Mike Main	Date: 5-5-08	
Technical Review: LARRY LEWIS	Date: 5-5-08	
Additional Reviewers: (by title)		
<i>Environmental</i>		5-5-08
	Signature	Date
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	Signature	Date
<i>Print Title:</i>		
	Signature	Date
Distribution List:		
Approval: L. GRISWOLD ENGR MGR		5/5/08
(Print name and title of cognizant manager)		Date

CONTINUATION SHEET

SECTION 1. WMF-634 SCS CALCULATIONS

For the purposes of these calculations, the “storage area” in WMF-634 is defined as the south half of the building; the characterization equipment, control rooms, and structures are installed in the north half of the building.

1. WMF-634 Floor Area/Capacity

WMF-634 is a rectangular-shaped building 120-ft wide and 240-ft long. The foundation walls and a 6-in. high curb extend the full perimeter of the building. Building floors are sloped 3 in. from the outer walls to the center of the building on the long axis. The 3-in. slope extends 30 ft from the end walls. Floor area capacity equals the volume contained within the 6-in. curbed area plus the volume of the sloped floor below the curbing.

A. Volume within the Curbed Area

$$= [240 \text{ ft} - (2 \times 19 \text{ in. wall and curb})] \times [120 \text{ ft} - (2 \times 19 \text{ in. wall and curb})] \times 6 \text{ in.}$$

$$= 236.83 \text{ ft} \times 116.83 \text{ ft} \times 0.5 \text{ ft}$$

Total = 13,835 ft³

B. Volume of Sloped Areas Below Curbing (to be conservative, calculations do not address the end wall slope)

$$= (1/2 \text{ base} \times \text{height} \times \text{length}) \times 2 = 0.25 \text{ ft}/2 \times 58.4 \text{ ft} \times 180 \text{ ft} \times 2$$

Total = 2,628 ft³

C. Total Floor Area Capacity

$$A + B = 13,835 \text{ ft}^3 + 2,628 \text{ ft}^3 = 16,463 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3$$

Total = 123,143 gal

2. Volume Displaced by Building Structures in WMF-634

Building structures within WMF-634 include access ramps *at rollup doors* and aprons at each end of the building, personnel access door landings on each wall, and wall column supports. In addition, the coring room, box assay walls, and two control rooms displace available volume in WMF-634.

A. Volume Displaced by Door Ramps and Aprons

Door ramp dimensions are 28-ft wide by 15.5-ft deep, sloping 6 in. into the building.

$$\text{Door ramp volume} = 1/2 (\text{length} \times \text{width} \times \text{height}) = (28 \text{ ft} \times 15.5 \text{ ft} \times 0.5 \text{ ft}) / 2 = \mathbf{108.5 \text{ ft}^3}$$

Apron dimensions are 15.5-ft long by 5-ft wide by 0.5-ft high at highest point.

$$\text{Apron volume} = 1/2 \text{ the volume of a wedge} \times 2 \text{ aprons} = [(15.5 \text{ ft} \times 5 \text{ ft} \times 0.5 \text{ ft}) / 2] \times 2$$

$$= \mathbf{38.75 \text{ ft}^3}$$

$$\text{Volume displaced by ramps and aprons} = (108.5 \text{ ft}^3 + 38.75 \text{ ft}^3) \times 2 \text{ ramps}$$

$$= 294.5 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3$$

Total = 2,203 gal

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B. Volume Displaced by Personnel Door Landings

Personnel door landing dimensions are 4-ft long by 8-ft wide by 0.5-ft high.

$$\begin{aligned} \text{Landing volume} &= \text{length} \times \text{width} \times \text{height} = 4 \text{ ft} \times 8 \text{ ft} \times 0.5 \text{ ft} = 16 \text{ ft}^3 \times 4 \text{ door landings} \\ &= 64 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 \end{aligned}$$

Total = 479 gal

C. Volume Displaced by Support Columns

There are 14 columns that are 2.6-ft by 0.9-ft and 4 columns that are 1.3-ft by 0.9-ft. Containment curbing is 0.5-ft high.

$$\begin{aligned} \text{Volume displaced by columns} &= 14 (2.6 \text{ ft} \times 0.9 \text{ ft} \times 0.5 \text{ ft}) + 4 (1.3 \text{ ft} \times 0.9 \text{ ft} \times 0.5 \text{ ft}) \\ &= 16.38 \text{ ft}^3 + 2.34 \text{ ft}^3 = 18.72 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 \end{aligned}$$

Total = 140 gal

D. Volume Displaced by Coring Room

The coring room footprint is 1,503 ft². The depth at each end of the coring room is

$$\frac{0.25 \text{ ft}}{60 \text{ ft}} = \frac{y_1}{15.167 \text{ ft}}; y_1 = 0.063 \text{ ft} \quad \text{and} \quad \frac{0.25 \text{ ft}}{60 \text{ ft}} = \frac{y_2}{45.167 \text{ ft}}; y_2 = 0.188 \text{ ft}$$

$$\text{Volume of rectangle} = (0.063 + 0.5) \text{ ft} \times 1,503 \text{ ft}^2 = 846.2 \text{ ft}^3$$

$$\text{Volume of wedge} = \frac{1}{2} \times (0.188 - 0.063 \text{ ft}) \times 1,503 \text{ ft}^2 = 93.9 \text{ ft}^3$$

$$\text{Volume displaced by coring room} = 846.2 \text{ ft}^3 + 93.9 \text{ ft}^3 = 940.1 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 7,032 gal

E. Volume Displaced by Box Assay Area Walls

The footprint of the box assay area walls is 91 ft².

$$\text{Volume} = 91 \text{ ft}^2 \times (28/60 \times 0.25 + 0.5) \text{ ft} = 91 \text{ ft}^2 \times (0.117 + 0.5) \text{ ft} = 56.1 \text{ ft}^3$$

$$\text{Volume of box assay walls} = 56.1 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 420 gal

F. Volume Displaced by RTR and Assay Control Rooms

The RTR control room footprint is 449 ft².

$$\text{Volume of rectangle} = 449 \text{ ft}^2 \times 0.5 \text{ ft} = 224.5 \text{ ft}^3$$

$$\text{Volume of wedge} = \frac{1}{2} \times (33/60 \times 0.25) \text{ ft} \times 449 \text{ ft}^2 = \frac{1}{2} \times 0.138 \times 449 \text{ ft}^2 = 30.9 \text{ ft}^3$$

$$\text{Volume displaced by RTR control room} = 224.5 \text{ ft}^3 + 30.9 \text{ ft}^3 = 255.4 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

= 1,910 gal

The assay control room footprint is 504 ft².

$$\text{Volume of rectangle} = 504 \text{ ft}^2 \times 0.5 \text{ ft} = 252 \text{ ft}^3$$

$$\text{Volume of wedge} = \frac{1}{2} \times (43/60 \times 0.25) \text{ ft} \times 504 \text{ ft}^2 = \frac{1}{2} \times 0.179 \text{ ft} \times 504 \text{ ft}^2 = 45.1 \text{ ft}^3$$

$$\text{Volume displaced by assay control room} = 252 \text{ ft}^3 + 45.1 \text{ ft}^3 = 297.1 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

= 2,222 gal

$$\text{Volume displaced by control rooms} = 1,910 \text{ gal} + 2,222 \text{ gal}$$

Total = 4,132 gal

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G. Total Facility Structural Displacement

2,203 gal + 479 gal + 140 gal + 7,032 gal + 420 gal + 4,132 gal

Total = 14,406 gal

3. Volume Displaced by Containers and Pallets in WMF-634

To determine the volume displaced by containers stored in the storage area of WMF-634, *this calculation considers* the configuration for the maximum number of rows that could potentially be stored in the available space. The number of rows was determined by maintaining a minimum 20-ft aisle space (excluding support beams and portable equipment) the length of the building, and 3-ft aisle spaces (excluding support beams and portable equipment) between each row of containers and the building walls.

Using these criteria, the number of rows of 4-ft by 4-ft by 8-ft boxes that could be potentially configured in the south half of WMF-634 is 6 full rows, 32-ft wide by 44-ft long, and 2 partial rows, 8-ft wide by 36-ft long. This provides a total area of 9,024 ft². The number of rows of 55-gal drums that could be potentially configured in the south half of WMF-634 is 19 full rows, 8-ft wide by 44-ft long, and 2 partial rows, 8-ft wide by 36-ft long. This provides a total area of 7,264 ft². Therefore, the maximum storage configuration occurs using boxes. Drawing 53-1921 (attached) illustrates a typical storage configuration for WMF-634.

A. Pallet Displacement

The metal pallets used to store waste are 4-ft by 4-ft, 4-ft by 8 ft, and/or 4-ft-10-in. by 8-ft. Use of the 4-ft by 8-ft pallets provides the maximum storage capacity (refer to Section 3.B below). Each 4-ft by 8-ft pallet consists of twelve 4-in. wide by 4-ft long slats, supported by four 4-in. wide by 3.5-in. high by 8-ft long U-shaped beams (i.e., stringers). The slats and stringers are made of 10-gauge-galvanized steel, with a density of 495 lb/ft³. Each slat is lipped 0.5 in. along each side, with a V-groove down the center. Each stringer is lipped 0.5 in. at the top to support the slats. Each stringer has four 2-in. high by 10-in. long holes, two in each side, with 0.5 in. extruded lips. Each 4-ft by 8-ft pallet weighs approximately 300 lb.

$$\text{Volume displaced by one pallet} = 300 \text{ lb} / (495 \text{ lb/ft}^3) = 0.61 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 4.534 gal/pallet

B. Total Number of Pallets for Boxes

The maximum storage area storage configuration and, therefore, maximum number of pallets is associated with using the 4-ft by 8-ft pallets. The total number of pallets required is determined from the maximum storage area configuration described above. The six full rows are each 32-ft wide by 44-ft long. The two partial rows are each 8-ft wide by 36-ft long.

$$\text{Full rows deep} = 44 \text{ ft} \div 4 \text{ ft / pallet} = 11 \text{ pallets deep}$$

$$\text{Full rows wide} = 32 \text{ ft} \div 8 \text{ ft / pallet} = 4 \text{ pallets wide}$$

$$\text{Total pallets required to support full row} = 4 \times 11 = 44 \text{ pallets} \times 6 \text{ full rows} = \mathbf{264 \text{ pallets}}$$

$$\text{Partial rows deep} = 36 \text{ ft} \div 4 \text{ ft / pallet} = 9 \text{ pallets}$$

$$\text{Partial rows wide} = 8 \text{ ft} \div 8 \text{ ft / pallet} = 1 \text{ pallet wide}$$

$$\text{Total pallets required to support partial row} = 1 \times 9 = 9 \text{ pallets} \times 2 \text{ partial rows} = \mathbf{18 \text{ pallets}}$$

$$\text{Total pallets required for storing waste boxes in WMF-634} = 264 \text{ pallets} + 18 \text{ pallets}$$

CONTINUATION SHEET

= 282 pallets × 4.534-gal displacement / pallet

Total = 1,279 gal

C. Total Number of Pallets for 55-gal Drums

The total number of pallets required is determined from the maximum storage configuration described above. The 19 full rows are each 8-ft wide by 44-ft long. The two partial rows are each 8-ft wide by 36-ft long.

Full rows deep = 44 ft ÷ 4 ft / pallet = 11 pallets deep

Full rows wide = 8 ft ÷ 8 ft / pallet = 1 pallet wide

Total pallets required to support full row = 1 × 11 = 11 pallets × 19 full rows = **209 pallets**

Partial rows deep = 36 ft ÷ 4 ft / pallet = 9 pallets

Partial rows wide = 8 ft ÷ 8 ft / pallet = 1 pallet wide

Total pallets required to support partial row = 1 × 9 = 9 pallets × 2 partial rows = **18 pallets**

Total pallets required for storing waste drums in WMF-634 = 209 pallets + 18 pallets

= 227 pallets × 4.534-gal displacement / pallet

Total = 1,029 gal

D. Waste Container Displacement – for Boxes

Calculations *for volume displacement by boxes use* the assumption that all rows of waste *possess the same slope as* floor. Rows of boxes are 32-ft wide and 44-ft deep, with 3-ft aisle spacing (excluding support beams and portable equipment) between rows and walls. The boxes are stored on pallets 4.25-in. high. The volume of waste displaced by a row of boxes is a summation of the wedge formed by the level line between the high end of the pallet nearest the wall and the bottom of the boxes aligned with the sloped floor; plus the rectangle formed between the liquid line and the level line above the pallets.

Volume displaced by full rows = (wedge + rectangle) × # of full rows

Volume of wedge = $1/2 \times 44 \text{ ft} \times (47/58.4 \times 3 \text{ in.}) \times 1 \text{ ft}/12 \text{ in.} \times 32 \text{ ft} = 141.64 \text{ ft}^3$

Volume of rectangle = $\{[6 \text{ in.} + (3/58.4 \times 3 \text{ in.}) - 4.25 \text{ in.}] \times 1 \text{ ft}/12 \text{ in.}\} \times 44 \text{ ft} \times 32 \text{ ft}$
= 223.42 ft³

Total for six full rows = 223.42 ft³ + 141.64 ft³ = 365.06 ft³ × 6 full rows = **2,190 ft³**

Volume displaced by partial rows = (wedge + rectangle) × # of partial rows

Volume of wedge = $1/2 \times 36 \text{ ft} \times (39/58.4 \times 3 \text{ in.}) \times 1 \text{ ft}/12 \text{ in.} \times 8 \text{ ft} = 24.04 \text{ ft}^3$

Volume of rectangle = $\{[(6 \text{ in.} + 3/58.4 \times 3 \text{ in.}) - 4.25 \text{ in.}] \times 1 \text{ ft}/12 \text{ in.}\} \times 36 \text{ ft} \times 8 \text{ ft}$
= 45.7 ft³

Total for two partial rows = 24.04 ft³ + 45.7 ft³ = 69.74 ft³ × 2 partial rows = **139 ft³**

Total volume displaced by containers = volume displaced by the full rows + volume displaced by partial rows = 2,190 ft³ + 139 ft³ = 2,329 ft³ × 7.48 gal/ft³

Total = 17,421 gal

E. Waste Container Displacement – for Drums

The first two paragraphs of Section 1.3 have demonstrated that the volume displaced by boxes is greater than the volume displaced by drums. Therefore, *this Section must prove that* the available SCS capacity *of WMF-634* related to *volume displaced by boxes is* adequate.

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4. Volume Displaced by Characterization Equipment in WMF-634

A. RTR Equipment

Each RTR unit footprint is 391 ft².

Volume of rectangle = 391 ft² × (6/60 × 0.25 + 0.5) ft = 391 ft² × (0.025 + 0.5) ft = 205.3 ft³

Volume of wedge = ½ × (36/60 × 0.25 - 0.025) ft × 391 ft² = ½ × (0.150 - 0.025) ft × 391 ft²
= 24.4 ft³

Total volume for one RTR = 205.3 ft³ + 24.4 ft³ = **229.7 ft³**

Total for two RTRs = 2 × 229.7 ft³ × 7.48 gal/ft³

Total = 3,436 gal

B. Air Compressor

The air compressor footprint is 24 ft².

Volume displaced by air compressor = 24 ft² × (5/60 × 0.25 + 0.5) ft
= 24 ft² × (0.021 + 0.5) ft × 7.48 gal/ft³ = 93.5 gal

Second Air Compressor

Volume displaced by compressor legs and base plates = 4 × 12.25 in × 14 in × 0.5 in + 4 × 4.5 in² × 4.63 in + 4 × 100 in² × 0.88 in + 19 in × 11 in × 3 in = 1403.25 in³/1728 in³/ft³ = 0.8121 ft³ × 7.48 gal/ft³ = 6.07 gal

Total = 100 gal

C. Master Control Centers (MCCs)

Nominal dimensions of the MCC on the north wall are 5-ft by 2-ft. Dimensions of the MCC located along the west box assay wall are 15-ft by 2-ft.

Volume displaced by north MCC = 5 ft × 2 ft × (3/60 × 0.25 + 0.5) ft
= 10 ft² × (0.013 + 0.5) ft = 5.13 ft³ × 7.48 gal/ft³ = **38 gal**

Volume displaced by central MCC = 15 ft × 2 ft × (43.667/60 × 0.25 + 0.5) ft
= 30 ft² × (0.182 + 0.5) ft = 20.5 ft³ × 7.48 gal/ft³ = **153 gal**

Volume displaced by both MCCs = 38 gal + 153 gal

Total = 191 gal

D. Drum Vent and Headspace Gas Sampling Unit

The drum vent system footprint is 140 ft².

Volume of rectangle = 140 ft² × (26/60 × 0.25 + 0.5) ft = 140 ft² × (0.108 + 0.5) ft = 85.1 ft³

Volume of wedge = ½ (38/60 × 0.25 - 0.108) ft × 140 ft² = ½ × 0.050 ft × 140 ft² = 3.5 ft³

Volume displaced by one DVS = 85.1 ft³ + 3.5 ft³ = 88.6 ft³ × 7.48 gal/ft³ = 663 gal

Volume displaced by two DVS systems = 2 × 663 gal = **1,326 gal**

E. Drum Radioassay Systems

The footprint for each drum radioassay system is 106 ft².

Volume of rectangle = 106 ft² × (12/60 × 0.25 + 0.5) ft = 106 ft² × (0.050 + 0.5) ft = 58.3 ft³

Volume of wedge = ½ (19/60 × 0.25 - 0.050) ft × 106 ft² = 1.55 ft³

Volume displaced by one drum radioassay system = 58.3 ft³ + 1.55 ft³

CONTINUATION SHEET

$$= 59.9 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 = \mathbf{448 \text{ gal}}$$

Volume displaced by two drum radioassay systems = $2 \times 448 \text{ gal}$

Total = 896 gal

F. Box Radioassay System

The footprint of the box radioassay system is 304 ft^2 .

$$\text{Volume displaced by box radioassay system} = 304 \text{ ft}^2 \times (39.6/60 \times 0.25 + 0.5) \text{ ft}$$

$$= 304 \text{ ft}^2 \times (0.165 + 0.5) \text{ ft} = 202.2 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 1,512 gal

G. Conveyors

Using the projected area on the floor from the conveyors *helps* determine the volume displaced by the conveyors. This is a very conservative approach as the conveyors are supported by legs. The cumulative nominal conveyor length (not including the conveyor inside the coring room and vestibule) is approximately 170-ft.

$$\text{Volume displaced by conveyors} = 170 \text{ ft} \times 2.33 \text{ ft} \times (45.167/60 \times 0.25 + 0.5) \text{ ft}$$

$$= 396.1 \text{ ft}^2 \times 0.688 \text{ ft} = 272.5 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 2,038 gal

H. Total Volume Displaced by Characterization Equipment

RTRs	3,436 gal
Air Compressor	100 gal
MCCs	191 gal
DVSs	1,326 gal
Drum Assays	896 gal
Box Assay	1,512 gal
Conveyors	<u>2,038 gal</u>
Total	9,499 gal

5. Available SCS Capacity in WMF-634

Available WMF-634 SCS Capacity for boxes equals the building capacity minus the volume displaced by building structures minus the volume displaced by box pallets minus the volume displaced by boxes minus the volume displaced by characterization equipment.

$$\text{Available SCS Capacity} = 123,143 \text{ gal} - 14,406 \text{ gal} - 1,279 \text{ gal} - 17,421 \text{ gal} - 9,499 \text{ gal}$$

Total = 80,538 gal

6. Free Liquid Volume in WMF-634

The *basis for the* maximum liquid waste volume for mixed waste in WMF-634 is 26% of the total waste volume stored. The 26% represents the number of containers that contained some liquids when more than 17,000 containers were examined at the Stored Waste Examination Pilot Plant (SWEPP).

$$\text{Maximum number of boxes (stacked 4 boxes high)} = 6 \text{ rows of boxes 4 wide and 11 deep}$$

$$+ 2 \text{ partial rows of boxes 1 wide and 9 deep}$$

$$= 6 \times 44 + 2 \times 9 = 282 \times 4 \text{ high} = 1,128 \text{ Total Boxes}$$

CONTINUATION SHEET

Free liquid volume for box storage = $128 \text{ ft}^3 / \text{box} \times 1,128 \text{ boxes} = 144,384 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$
 $= 1,079,992 \text{ gal} \times 0.26$

Total = 280,798 gal

Section 1.3 demonstrates that boxes provide the maximum free liquid content for this type of configuration.

7. Containers Stored Amidst Characterization Equipment on North Side of WMF-634

The following calculations show that adequate capacity remains for optional storage of containers amidst the characterization equipment on the north half of WMF-634 to accommodate characterization activities.

Floor area taken by characterization equipment:

RTRs	782 ft ²
Air Compressor	24 ft ²
MCCs	40 ft ²
DVSs	280 ft ²
Drum Assays	318 ft ²
Box Assay	304 ft ²
Conveyors	<u>396 ft²</u>
Total	2,144 ft²

Floor area taken by characterization rooms/walls:

Coring Room	1,503 ft ²
RTR Control Room	449 ft ²
Assay Control Room	504 ft ²
Box Assay Walls	<u>91 ft²</u>
Total	2,547 ft²

The area remaining if the characterization equipment and rooms/walls were superimposed on the area taken by the footprint of the maximum drum storage configuration for the south half of the building:

Area available in north half for drums on floor (amidst equipment)
 $= 7,264 \text{ ft}^2 - (2,144 \text{ ft}^2 + 2,547 \text{ ft}^2) = 7,264 \text{ ft}^2 - 4,691 \text{ ft}^2 = \mathbf{2,573 \text{ ft}^2}$

Number of drums that can fit in available area = $2,573 \text{ ft}^2 / 4 \text{ ft}^2/\text{drum} = \mathbf{643 \text{ drums}}$

In addition to drums amidst the characterization equipment, a number of drums are in process (i.e., on conveyors and within equipment):

Approximate drums in process:

On conveyor @ 170 ft	
x 2 ft/drum	85 drums
In RTRs	8 drums
In radioassay units	2 drums
In drum vent unit	1 drums
In coring room	<u>26 drums</u>
Total	122 drums

Approximate total drums in north half amidst and atop equipment: $643 + 122 = \mathbf{765 \text{ drums}}$

Volume of drums in north half = $765 \text{ drums} \times 55 \text{ gal/drum} = \mathbf{42,075 \text{ gal}}$

CONTINUATION SHEET

Potential free liquid volume for containers in north half = 42,075 gal × 0.26 = **10,940 gal**
 Volume displaced by one drum if stored on floor (conservative worst-case for comparison only) = $\pi \times (1 \text{ ft})^2 \times (0.5 \text{ ft}) \times 7.48 \text{ gal/ft}^3 = \mathbf{11.75 \text{ gal}}$
 Capacity displaced by drums on floor in north half = 643 drums × 11.75 gal/drum = **7,555 gal**
 Available capacity for containers in north and south halves of the building
 = 80,538 gal – 7,555 gal = **72,983 gal**

8. Demonstration of Adequate WMF-634 SCS Capacity

TOTAL FREE LIQUIDS STORED	10% OF TOTAL FREE LIQUIDS	AVAILABLE SECONDARY CONTAINMENT CAPACITY
291,738 gal	29,174 gal	72,983 gal

As shown, the maximum WMF-634 potential free liquid storage volume for the worst-case south half storage area scenario of storing boxes is 280,798 gal. The maximum potential free liquid storage volume for the worst-case north half in-process scenario is 10,940 gal. The SCS must provide capacity for 10% of the maximum liquid volume.

$$(280,798 + 10,940) \times 0.10 = 29,174 \text{ gal}$$

The required SCS capacity for the maximum storage area configuration is 29,174 gal, which is less than the 72,983 gal of available SCS capacity; therefore, adequate SCS capacity is provided in WMF-634.

9. Demonstration of Total Free Liquids Stored Based on WMF-634 SCS Capacity

As shown, the maximum WMF-634 potential free liquid storage volume for the worst-case physical storage area scenario of storing boxes is 291,738 gal. If the secondary containment capacity is used to calculate the allowable maximum waste volume stored, then it can be shown that the maximum waste volume stored for containers based on secondary containment capacity is greater than the maximum waste volume stored based on physical storage limitations.

Maximum liquid waste volume stored in WMF-634

$$= \text{Secondary Containment Capacity} / 0.10$$

$$= 123,143 \text{ gal} / 0.10 = \mathbf{1,231,430 \text{ gal}}$$

Potential free liquid volume for containers in WMF-634 = **1,231,430 gal** × 0.26

$$= \mathbf{320,172 \text{ gal}}$$

10 % of total free liquid stored in WMF-634 = Potential free liquid volume × 0.10

$$= 320,172 \text{ gal} \times 0.10 = 32,017 \text{ gal}$$

TOTAL FREE LIQUIDS STORED	10% OF TOTAL FREE LIQUIDS	AVAILABLE SECONDARY CONTAINMENT CAPACITY
320,172 gal	32,017 gal	72,983 gal

The required SCS capacity for the maximum storage area configuration based on the secondary containment capacity is 32,017 gal, which is less than the 72,983 gal of available SCS capacity; therefore, adequate SCS capacity is provided in WMF-634.

CONTINUATION SHEET

SECTION 2. TYPE II MODULE SCS CALCULATIONS (WMF-629 Through WMF-633)

1. Type II Module Floor Area/Capacity

Each Type II Module (*WMF-629* through *WMF-633*) is a rectangular-shaped building 120-ft wide and 240-ft long. The foundation walls and a 6-in. high curb extend the full perimeter of the building. Building floors are sloped 3 in. from the outer walls to the center of the building on the long axis. The 3-in. slope extends 30 ft from the end walls. Floor area capacity equals the volume contained within the 6-in. curbed area plus the volume of the sloped floor below the curbing.

A. Volume within the Curbed Area

$$= [240 \text{ ft} - (2 \times 19 \text{ in. wall and curb})] \times [120 \text{ ft} - (2 \times 19 \text{ in. wall and curb})] \times 6 \text{ in.}$$

$$= 236.83 \text{ ft} \times 116.83 \text{ ft} \times 0.5 \text{ ft}$$

Total = 13,835 ft³

B. Volume of Sloped Areas Below Curbing (to be conservative, calculations do not address the end wall slope)

$$= (\frac{1}{2}\text{-base} \times \text{height} \times \text{length}) \times 2 = 0.25 \text{ ft}/2 \times 58.4 \text{ ft} \times 180 \text{ ft} \times 2$$

Total = 2,628 ft³

C. Total Floor Area Capacity = A + B

$$= 13,835 \text{ ft}^3 + 2,628 \text{ ft}^3 = 16,463 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3$$

Total = 123,143 gal

2. Volume Displaced by Building Structures in the Type II Modules

Building structures within each Type II Module include truck door-access ramps and aprons at each end of the building, personnel-access door landings on each wall, and wall column supports.

A. Volume Displaced by Door Ramps and Aprons

Door ramp dimensions are 28-ft wide by 15.5-ft deep, sloping 6 in. into the building.

$$\text{Door ramp volume} = \frac{1}{2} (\text{length} \times \text{width} \times \text{height}) = (28 \text{ ft} \times 15.5 \text{ ft} \times 0.5 \text{ ft}) / 2 = 108.5 \text{ ft}^3$$

Apron dimensions are 15.5-ft long by 5-ft wide by 0.5-ft high at highest point.

$$\text{Apron volume} = \frac{1}{2} \text{ the volume of a wedge} \times 2 \text{ aprons} = [(15.5 \text{ ft} \times 5 \text{ ft} \times 0.5 \text{ ft}) / 2] \times 2$$

$$= 38.75 \text{ ft}^3$$

$$\text{Volume displaced by ramps/aprons} = (108.5 \text{ ft}^3 + 38.75 \text{ ft}^3) \times 2 \text{ ramps} = 294.5 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3$$

Total = 2,203 gal

B. Volume Displaced by Personnel Door Landings

Personnel door landing dimensions are 4-ft long by 8-ft wide by 0.5-ft high.

$$\text{Landing volume} = \text{length} \times \text{width} \times \text{height} = 4 \text{ ft} \times 8 \text{ ft} \times 0.5 \text{ ft} = 16 \text{ ft}^3 \times 4 \text{ door landings}$$

$$= 64 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3$$

Total = 479 gal

C. Volume Displaced by Support Columns

There are 14 columns that are 2.6-ft by 0.9-ft and four columns that are 1.3-ft by 0.9-ft.

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Containment curbing is 0.5-ft high.

$$\begin{aligned} \text{Volume displaced by columns} &= 14 (2.6 \text{ ft} \times 0.9 \text{ ft} \times 0.5 \text{ ft}) + 4 (1.3 \text{ ft} \times 0.9 \text{ ft} \times 0.5 \text{ ft}) \\ &= 16.38 \text{ ft}^3 + 2.34 \text{ ft}^3 = 18.72 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 \end{aligned}$$

Total = 140 gal

D. Total Facility Structural Displacement

$$= 2,203 \text{ gal} + 479 \text{ gal} + 140 \text{ gal}$$

Total = 2,822 gal

3. Volume Displaced by Containers and Pallets in the Type II Modules

To determine the volume displaced by containers stored in each Type II Module, the configuration for the maximum number of rows that could potentially be stored in the available space was considered. The number of rows was determined by maintaining a minimum 20-ft aisle space (excluding support beams and portable equipment) the length of the building, and 3-ft aisle spaces (excluding support beams and portable equipment) between each row of containers and the building walls.

Using these criteria, the number of rows of 4-ft by 4-ft by 8-ft boxes that could be potentially configured in each half of a Type II Module is six full rows, 32-ft wide by 44-ft long, and two partial rows, 8-ft wide by 36-ft long. This provides an area of 9,024 ft² for each half, for a total of 18,048 ft² per building. The number of rows of 55gal drums that could be potentially configured in each half of a Type II Module is 19 full rows, 8-ft wide by 44-ft long, and two partial rows, 8-ft wide by 36-ft long. This provides an area of 7,264 ft² for each half, for a total of 14,528 ft² per building. Therefore, the maximum storage configuration occurs using boxes. Drawings 51-9907 and 51-10009 (attached) illustrate a typical storage configuration for the Type II Modules.

A. Pallet Displacement

The metal pallets, which can be used to store waste, are 4-ft by 4-ft, 4-ft by 8-ft, and/or 4-ft 10-in. by 8-ft. Use of the 4-ft by 8-ft pallets provides the maximum storage capacity (refer to Section 3.B below). Each 4-ft by 8-ft pallet consists of 12 slats, 4-in. wide by 4-ft long, supported by four 4-in. wide by 3.5-in. high by 8-ft long U-shaped beams (i.e., stringers). The slats and stringers are made of 10-gauge-galvanized steel, with a density of 495 lb/ft³. Each slat is lipped 0.5 in. along each side, with a V-groove down the center. Each stringer is lipped 0.5 in. at the top to support the slats. Each stringer has four 2-in. high by 10-in. long holes, two in each side, with 0.5-in. extruded lips. Each 4-ft by 8-ft pallet weighs approximately 300 lb.

$$\text{Volume displaced by one pallet} = 300 \text{ lb} / (495 \text{ lb/ft}^3) = 0.65 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 4.534 gal/pallet

B. Total Number of Pallets for Boxes

The maximum storage configuration and, therefore, maximum number of pallets is associated with using the 4-ft by 8-ft pallets. The total number of pallets required is determined from the maximum storage configuration described above. The 12 full rows are each 32-ft wide by 44-ft long. The four partial rows are each 8-ft wide by 36-ft long.

$$\text{Full rows deep} = 44 \text{ ft} \div 4 \text{ ft / pallet} = 11 \text{ pallets deep}$$

CONTINUATION SHEET

Full rows wide = 32 ft ÷ 8 ft / pallet = 4 pallets wide
 Total pallets required to support full row = 4 × 11 = 44 pallets × 12 full rows = **528 pallets**
 Partial rows deep = 36 ft ÷ 4 ft / pallet = 9 pallets
 Partial rows wide = 8 ft ÷ 8 ft / pallet = 1 pallet wide
 Total pallets required to support partial row = 1 × 9 = 9 pallets × 4 partial rows
 = **36 pallets**
 Total pallets required for storing waste boxes = 528 pallets + 36 pallets
 = 564 pallets × 4.534-gal displacement / pallet
Total = 2,557 gal

C. Total Number of Pallets for 55-gal Drums

The total number of pallets required is determined from the maximum storage configuration described above. The 38 full rows are each 8-ft wide by 44-ft long. The four partial rows are each 8-ft wide by 36-ft long.

Full rows deep = 44 ft ÷ 4 ft / pallet = 11 pallets deep
 Full rows wide = 8 ft ÷ 8 ft / pallet = 1 pallet wide
 Total pallets required to support full row = 1 × 11 = 11 pallets × 38 full rows = **418 pallets**
 Partial rows deep = 36 ft ÷ 4 ft / pallet = 9 pallets
 Partial rows wide = 8 ft ÷ 8 ft / pallet = 1 pallet wide
 Total pallets required to support partial row = 1 × 9 = 9 pallets × 4 partial rows = **36 pallets**
 Total pallets required for storing waste drums = 418 pallets + 36 pallets
 = 454 pallets × 4.534-gal displacement / pallet
Total = 2,058 gal

D. Waste Container Displacement for Boxes

Calculations are determined with the assumption that all rows of waste are positioned over the sloped floor. Rows of boxes are 32-ft wide and 44-ft deep, with 3-ft aisle (excluding support beams and portable equipment) spacing between rows and wall. The boxes are stored on pallets 4.25-in. high. The volume of waste displaced by a row of boxes is a summation of the wedge formed by the level line between the high end of the pallet nearest the wall and the bottom of the boxes aligned with the sloped floor; plus the rectangle formed between the liquid line and the level line above the pallets.

Volume displaced by full rows = (wedge + rectangle) × # of full rows
 Volume of wedge = $1/2 \times 44 \text{ ft} \times (47/58.4 \times 3 \text{ in.}) \times 1 \text{ ft}/12 \text{ in.} \times 32 \text{ ft} = 141.64 \text{ ft}^3$
 Volume of rectangle = $\{[6 \text{ in.} + (3/58.4 \times 3 \text{ in.}) - 4.25 \text{ in.}] \times 1 \text{ ft}/12 \text{ in.}\} \times 44 \text{ ft} \times 32 \text{ ft}$
 = 223.42 ft³
 Total for twelve full rows = $223.42 \text{ ft}^3 + 141.64 \text{ ft}^3 = 365.06 \text{ ft}^3 \times 12 \text{ full rows} = 4,381 \text{ ft}^3$
 Volume displaced by partial rows = (wedge + rectangle) × # of partial rows
 Volume of wedge = $1/2 \times 36 \text{ ft} \times (39/58.4 \times 3 \text{ in.}) \times 1 \text{ ft}/12 \text{ in.} \times 8 \text{ ft} = 24.04 \text{ ft}^3$
 Volume of rectangle = $\{[(6 \text{ in.} + 3/58.4 \times 3 \text{ in.}) - 4.25 \text{ in.}] \times 1 \text{ ft}/12 \text{ in.}\} \times 36 \text{ ft} \times 8 \text{ ft} = 45.7 \text{ ft}^3$
 Total for four partial rows = $24.04 \text{ ft}^3 + 45.7 \text{ ft}^3 = 69.74 \text{ ft}^3 \times 4 \text{ partial rows} = 279 \text{ ft}^3$

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Total volume displaced by containers = volume displaced by the full rows + volume displaced by partial rows = $4,381 \text{ ft}^3 + 279 \text{ ft}^3 = 4,660 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$
Total = 34,857 gal

E. Waste Container Displacement for Drums

The first two paragraphs of Section 2.3 have demonstrated that the volume displaced by boxes is greater than the volume displaced by drums. Therefore, **this Section must prove that** the available SCS capacity *of the Type II Modules* related to **volume displaced by boxes is adequate.**

4. Available SCS Capacity in the Type II Modules

Available Type II Module SCS Capacity for boxes equals the building capacity minus the volume displaced by building structures minus the volume displaced by box pallets minus the volume displaced by boxes.

Available SCS Capacity = $123,143 \text{ gal} - 2,822 \text{ gal} - 2,557 \text{ gal} - 34,857 \text{ gal}$
Total = 82,907 gal

5. Free Liquid Volume in the Type II Modules

The maximum liquid waste volume for mixed waste in each Type II Module is based on 26% of the total waste volume stored. The 26% represents the number of containers that contained some liquids when more than 17,000 containers were examined at the Stored Waste Examination Pilot Plant (SWEPP).

Maximum number of boxes (stacked 4 boxes high)
 = 12 rows of boxes 4 wide and 11 deep + 4 partial rows of boxes 1 wide and 9 deep
 = $12 \times 44 + 4 \times 9 = 564 \times 4 \text{ high} = 2,256 \text{ Total Boxes}$
 Free liquid volume for box storage = $128 \text{ ft}^3 / \text{box} \times 2,256 \text{ boxes} = 288,768 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$
 = $2,159,985 \text{ gal} \times 0.26$
Total = 561,596 gal

Section 2, Paragraph 3 demonstrates that boxes provide the maximum free liquid content for this type of configuration

6. Demonstration of Adequate Type II Module SCS Capacity

TOTAL FREE LIQUIDS STORED	10% OF TOTAL FREE LIQUIDS	AVAILABLE SECONDARY CONTAINMENT CAPACITY
561,596 gal	56,160 gal	82,907 gal

As shown, the maximum Type II Module potential free liquid storage volume for the worst-case storage scenario of storing boxes is 561,596 gal. The SCS must provide capacity for 10% of the maximum liquid volume.

$561,596 \times 0.10 = 56,160 \text{ gal}$

The required SCS capacity for the maximum storage configuration is 56,160 gal, which is less than the 82,907 gal of available SCS capacity; therefore, adequate SCS capacity is provided in each Type II Module.

CONTINUATION SHEET

SECTION 3. WMF-628 SCS CALCULATIONS (Entire Section 3 revised at Revision 01)

For the purposes of these calculations, the “storage area” in WMF-628 is defined as two full rows and three quarters of a full row on the north half of the building assuming only boxes are stored, four full rows, one quarter of a full row and one partial row on the south half of the building assuming only boxes are stored, the characterization equipment installed in the north half of the building, the drum treatment tent (DTT) installed in the south half of the building, and building structures.

1. WMF-628 Floor Area/Capacity

WMF-628 is a rectangular-shaped building 120-ft wide and 240-ft long. The foundation walls and a 6-in. high curb extend the full perimeter of the building. Building floors are sloped 3 in. from the outer walls to the center of the building on the long axis. The 3-in. slope extends 30 ft from the end walls. Floor area capacity equals the volume contained within the 6-in. curbed area plus the volume of the sloped floor below the curbing.

A. Volume within the Curbed Area

$$= [240 \text{ ft} - (2 \times 19 \text{ in. wall and curb})] \times [120 \text{ ft} - (2 \times 19 \text{ in. wall and curb})] \times 6 \text{ in.}$$

$$= 236.83 \text{ ft} \times 116.83 \text{ ft} \times 0.5 \text{ ft}$$

Total = 13,835 ft³

B. Volume of Sloped Areas Below Curbing (to be conservative, calculations do not address the end wall slope)

$$= (1/2 \text{ base} \times \text{height} \times \text{length}) \times 2 = 0.25 \text{ ft/2} \times 58.4 \text{ ft} \times 180 \text{ ft} \times 2$$

Total = 2,628 ft³

C. Total Floor Area Capacity

$$A + B = 13,835 \text{ ft}^3 + 2,628 \text{ ft}^3 = 16,463 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 123,143 gal

2. Volume Displaced by Building Structures in WMF-628

Building structures within WMF-628 include access ramps at rollup doors and aprons at each end of the building, personnel access door landings on each wall, and wall column supports.

A. Volume Displaced by Door Ramps and Aprons

Door ramp dimensions are 28-ft wide by 15.5-ft deep, sloping 6 in. into the building.

$$\text{Door ramp volume} = 1/2 (\text{length} \times \text{width} \times \text{height}) = (28 \text{ ft} \times 15.5 \text{ ft} \times 0.5 \text{ ft}) / 2 = \mathbf{108.5 \text{ ft}^3}$$

Apron dimensions are 15.5-ft long by 5-ft wide by 0.5-ft high at highest point.

$$\text{Apron volume} = 1/2 \text{ the volume of a wedge} \times 2 \text{ aprons} = [(15.5 \text{ ft} \times 5 \text{ ft} \times 0.5 \text{ ft}) / 2] \times 2$$

= 38.75 ft³

CONTINUATION SHEET

$$\begin{aligned}\text{Volume displaced by ramps and aprons} &= (108.5 \text{ ft}^3 + 38.75 \text{ ft}^3) \times 2 \text{ ramps} \\ &= 294.5 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3\end{aligned}$$

$$\text{Total} = 2,203 \text{ gal}$$

B. Volume Displaced by Personnel Door Landings

Personnel door landing dimensions are 4-ft long by 8-ft wide by 0.5-ft high.

$$\begin{aligned}\text{Landing volume} &= \text{length} \times \text{width} \times \text{height} = 4 \text{ ft} \times 8 \text{ ft} \times 0.5 \text{ ft} = 16 \text{ ft}^3 \times 4 \text{ door landings} \\ &= 64 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3\end{aligned}$$

$$\text{Total} = 479 \text{ gal}$$

C. Volume Displaced by Support Columns

There are 14 columns that are 2.6-ft by 0.9-ft and 4 columns that are 1.3-ft by 0.9-ft. Containment curbing is 0.5-ft high.

$$\begin{aligned}\text{Volume displaced by columns} &= 14 (2.6 \text{ ft} \times 0.9 \text{ ft} \times 0.5 \text{ ft}) + 4 (1.3 \text{ ft} \times 0.9 \text{ ft} \times 0.5 \text{ ft}) \\ &= 16.38 \text{ ft}^3 + 2.34 \text{ ft}^3 = 18.72 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3\end{aligned}$$

$$\text{Total} = 140 \text{ gal}$$

D. Total Facility Structural Displacement

$$2,203 \text{ gal} + 479 \text{ gal} + 140 \text{ gal}$$

$$\text{Total} = 2,822 \text{ gal}$$

3. Volume Displaced by Containers and Pallets in WMF-628

To determine the volume displaced by containers stored in the storage area of WMF-628, this calculation considers the configuration for the maximum number of rows that could potentially be stored in the available space. The number of rows was determined by maintaining a minimum 20-ft aisle space (excluding support beams and portable equipment) the length of the building, and 3-ft aisle spaces (excluding support beams and portable equipment) between each row of containers and the building walls.

Using these criteria, the number of rows of 4-ft by 4-ft by 8-ft boxes that could be potentially configured in the south half of WMF-628 is 4.25 full rows, 32-ft wide by 44-ft long, and 1 partial row, 8-ft wide by 36-ft long. The number of rows of 4-ft by 4-ft by 8-ft boxes that could be potentially configured in the north half of WMF-628 is 2.75 full rows, 32-ft wide by 44-ft long, and no partial rows. This provides a total area of 10,144 ft².

The number of rows of 55-gal drums that could be potentially configured in the south half of WMF-628 is 13 full rows, 8-ft wide by 44-ft long, and 1 partial row, 8-ft wide by 36-ft long. The number of rows of 55-gal drums that could be potentially configured in the north half of WMF-628 is 9 full rows, 8-ft wide by 44-ft long and no partial rows. This provides a total area of 8,032 ft². Drawing 51-10009 (attached) illustrates a typical storage configuration for WMF-628.

CONTINUATION SHEET

A. Pallet Displacement

The metal pallets used to store waste are 4-ft by 4-ft, 4-ft by 8 ft, and/or 4-ft-10-in. by 8-ft. Use of the 4-ft by 8-ft pallets provides the maximum storage capacity (refer to Section 3.B below). Each 4-ft by 8-ft pallet consists of twelve 4-in. wide by 4-ft long slats, supported by four 4-in. wide by 3.5-in. high by 8-ft long U-shaped beams (i.e., stringers). The slats and stringers are made of 10-gauge-galvanized steel, with a density of 495 lb/ft³. Each slat is lipped 0.5 in. along each side, with a V-groove down the center. Each stringer is lipped 0.5 in. at the top to support the slats. Each stringer has four 2-in. high by 10-in. long holes, two in each side, with 0.5 in. extruded lips. Each 4-ft by 8-ft pallet weighs approximately 300 lb.

$$\text{Volume displaced by one pallet} = 300 \text{ lb} / (495 \text{ lb/ft}^3) = 0.61 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 4.534 gal/pallet

B. Total Number of Pallets for Boxes

The maximum storage area storage configuration and, therefore, maximum number of pallets is associated with using the 4-ft by 8-ft pallets. The total number of pallets required is determined from the maximum storage area configuration described above. The seven full rows are each 32-ft wide by 44-ft long. The five partial rows are each 8-ft wide by 36-ft long.

$$\text{Full rows deep} = 44 \text{ ft} \div 4 \text{ ft / pallet} = 11 \text{ pallets deep}$$

$$\text{Full rows wide} = 32 \text{ ft} \div 8 \text{ ft / pallet} = 4 \text{ pallets wide}$$

$$\text{Total pallets required to support full row} = 4 \times 11 = 44 \text{ pallets} \times 7 \text{ full rows} = \mathbf{308 \text{ pallets}}$$

$$\text{Partial rows deep} = 36 \text{ ft} \div 4 \text{ ft / pallet} = 9 \text{ pallets}$$

$$\text{Partial rows wide} = 8 \text{ ft} \div 8 \text{ ft / pallet} = 1 \text{ pallet wide}$$

$$\text{Total pallets required to support partial row} = 1 \times 9 = 9 \text{ pallets} \times 1 \text{ partial rows} = \mathbf{9 \text{ pallets}}$$

$$\text{Total pallets required for storing waste boxes in WMF-628} = 308 \text{ pallets} + 9 \text{ pallets}$$

$$= 317 \text{ pallets} \times 4.534\text{-gal displacement / pallet}$$

Total = 1,438 gal

C. Total Number of Pallets for 55-gal Drums

The total number of pallets required is determined from the maximum storage configuration described above. The 22 full rows are each 8-ft wide by 44-ft long. The one partial row is 8-ft wide by 36-ft long.

$$\text{Full rows deep} = 44 \text{ ft} \div 4 \text{ ft / pallet} = 11 \text{ pallets deep}$$

$$\text{Full rows wide} = 8 \text{ ft} \div 8 \text{ ft / pallet} = 1 \text{ pallet wide}$$

$$\text{Total pallets required to support full row} = 1 \times 11 = 11 \text{ pallets} \times 22 \text{ full rows} = \mathbf{242 \text{ pallets}}$$

CONTINUATION SHEET

Partial rows deep = $36 \text{ ft} \div 4 \text{ ft} / \text{pallet} = 9 \text{ pallets}$

Partial rows wide = $8 \text{ ft} \div 8 \text{ ft} / \text{pallet} = 1 \text{ pallet wide}$

Total pallets required to support partial row = $1 \times 9 = 9 \text{ pallets} \times 1 \text{ partial rows} = \mathbf{9 \text{ pallets}}$

Total pallets required for storing waste drums in WMF-628 = $242 \text{ pallets} + 9 \text{ pallets}$

= $251 \text{ pallets} \times 4.534\text{-gal displacement} / \text{pallet}$

Total = 1,138 gal

D. Waste Container Displacement – for Boxes

Calculations for volume displacement by boxes use the assumption that all rows of waste possess the same slope as floor. Rows of boxes are 32-ft wide and 44-ft deep, with 3-ft aisle spacing (excluding support beams and portable equipment) between rows and walls. The boxes are stored on pallets 4.25-in. high. The volume of waste displaced by a row of boxes is a summation of the wedge formed by the level line between the high end of the pallet nearest the wall and the bottom of the boxes aligned with the sloped floor; plus the rectangle formed between the liquid line and the level line above the pallets.

Volume displaced by full rows = $(\text{wedge} + \text{rectangle}) \times \# \text{ of full rows}$

Volume of wedge = $1/2 \times 44 \text{ ft} \times (47/58.4 \times 3 \text{ in.} \times 1 \text{ ft}/12 \text{ in.}) \times 32 \text{ ft} = 141.64 \text{ ft}^3$

Volume of rectangle = $\{[6 \text{ in.} + (3/58.4 \times 3 \text{ in.}) - 4.25 \text{ in.}] \times 1 \text{ ft}/12 \text{ in.}\} \times 44 \text{ ft} \times 32 \text{ ft}$
= 223.42 ft^3

Total for seven full rows = $223.42 \text{ ft}^3 + 141.64 \text{ ft}^3 = 365.06 \text{ ft}^3 \times 7 \text{ full rows} = \mathbf{2,555 \text{ ft}^3}$

Volume displaced by partial rows = $(\text{wedge} + \text{rectangle}) \times \# \text{ of partial rows}$

Volume of wedge = $1/2 \times 36 \text{ ft} \times (39/58.4 \times 3 \text{ in.} \times 1 \text{ ft}/12 \text{ in.}) \times 8 \text{ ft} = 24.04 \text{ ft}^3$

Volume of rectangle = $\{[(6 \text{ in.} + 3/58.4 \times 3 \text{ in.}) - 4.25 \text{ in.}] \times 1 \text{ ft}/12 \text{ in.}\} \times 36 \text{ ft} \times 8 \text{ ft}$
= 45.7 ft^3

Total for one partial row = $24.04 \text{ ft}^3 + 45.7 \text{ ft}^3 = 69.74 \text{ ft}^3 \times 1 \text{ partial rows} = \mathbf{69.74 \text{ ft}^3}$

Total volume displaced by containers = volume displaced by the full rows + volume displaced by partial rows = $2,555 \text{ ft}^3 + 69.74 \text{ ft}^3 = 2,625 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3$

Total = 19,636 gal

E. Waste Container Displacement – for Drums

The first two paragraphs have demonstrated that the volume displaced by boxes is greater than the volume displaced by drums. Therefore, that the following calculations will be based on the available SCS capacity of WMF-628 related to volume displaced by boxes.

CONTINUATION SHEET

4. Volume Displaced by Characterization/Treatment Equipment in WMF-628**A. HENC Unit**

The footprint of the HENC unit is $12 \text{ ft} \times 30 \text{ ft} = 360 \text{ ft}^2$

Volume of rectangle = $360 \text{ ft}^2 \times (7/60 \times 0.25 + 0.5) \text{ ft} = 360 \text{ ft}^2 \times (0.0292 + 0.5) \text{ ft} = 190.5 \text{ ft}^3$

Volume of wedge = $\frac{1}{2} \times (37/60 \times 0.25 - 0.0292) \text{ ft} \times 360 \text{ ft}^2 = \frac{1}{2} \times (0.1542 - 0.0292) \text{ ft} \times 360 \text{ ft}^2$
 $= 22.5 \text{ ft}^3$

Volume displaced by HENC unit = $190.5 \text{ ft}^3 + 22.5 \text{ ft}^3 = 213 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 = \mathbf{1,593 \text{ gal}}$

B. HSGS Unit

The footprint of the HSGS unit is $16 \text{ ft} \times 24 \text{ ft} = 384 \text{ ft}^2$

Volume of rectangle = $384 \text{ ft}^2 \times (9/60 \times 0.25 + 0.5) \text{ ft} = 384 \text{ ft}^2 \times (0.0375 + 0.5) \text{ ft} = 206.4 \text{ ft}^3$

Volume of wedge = $\frac{1}{2} (33/60 \times 0.25 - 0.0375) \text{ ft} \times 384 \text{ ft}^2 = \frac{1}{2} \times 0.100 \text{ ft} \times 384 \text{ ft}^2 = 19.2 \text{ ft}^3$

Volume displaced by TGS unit = $206.4 \text{ ft}^3 + 19.2 \text{ ft}^3 = 225.6 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 = \mathbf{1,687.5 \text{ gal}}$

C. Drum Treatment Tent (DTT) Unit

The footprint of the DTT unit is $21 \text{ ft} \times 52 \text{ ft} = 1,092 \text{ ft}^2$

This is a conservative estimate, as the DTT is a soft-sided containment tent, which is supported by structural steel. The actual volume displaced by the DTT is minimal compared to that used for the SCS calculations.

Volume of rectangle = $1,092 \text{ ft}^2 \times (10/60 \times 0.25 + 0.5) \text{ ft} = 1,092 \text{ ft}^2 \times (0.0417 + 0.5) \text{ ft} = 591.5 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 = \mathbf{4,424 \text{ gal}}$

D. Gas Generation Testing (GGT) Equipment

Up to 80 canisters-GGT units may be located within WMF-628.

Canister Diameter: 26 in.; Base Diameter: 30 in.

Platform Dimensions: 34 in. x 34 in.

Secondary Containment Curb Height: 6 in.

(Although most of the canister platforms will be elevated off the floor, assume the footprint of canisters/platforms will consume the entire secondary containment to curb height of six inches.)

Platform of each canister = $34 \text{ in.} \times 34 \text{ in.} \times 6 \text{ in.} = 6,936 \text{ in.}^3 / 1,728 \text{ in.}^3/\text{ft}^3 = 4 \text{ ft}^3$

Platform of 80 canisters = $80 \text{ canisters} \times 4 \text{ ft}^3/\text{canister} = 320 \text{ ft}^3 = 320 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$

Total = 2,394 gal

CONTINUATION SHEET

E. Misc. Equipment

Two 8'x10' metal storage boxes

$$\text{Volume of rectangle} = 80 \text{ ft}^2 \times (39/60 \times 0.25 + 0.5) \text{ ft} = 80 \text{ ft}^2 \times (0.1625 + 0.5) \text{ ft} = 53.0 \text{ ft}^3$$

$$\text{Volume of wedge} = \frac{1}{2} (49/60 \times 0.25 - 0.1625) \text{ ft} \times 80 \text{ ft}^2 = \frac{1}{2} \times 0.417 \text{ ft} \times 80 \text{ ft}^2 = 1.67 \text{ ft}^3$$

$$\text{Volume displaced by metal storage boxes} = 53.0 \text{ ft}^3 + 1.67 \text{ ft}^3 = 2 \times 54.67 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 = \mathbf{818 \text{ gal}}$$

F. Total Volume Displaced by Characterization Equipment

HENC unit	1,593.0	gal
HSGS unit	1,687.5	gal
DTT unit	4,424.0	gal
GGT units	2,394.0	gal
Misc. equip.	818.0	gal
Total	10,916.5	gal

5. Available SCS Capacity in WMF-628

Available WMF-628 SCS Capacity for boxes equals the building capacity minus the volume displaced by building structures, the volume displaced by box pallets, the volume displaced by boxes and the volume displaced by characterization equipment.

$$\text{Available SCS Capacity} = 123,143 \text{ gal} - 2,822 \text{ gal} - 1,438 \text{ gal} - 19,636 \text{ gal} - 10,916.5 \text{ gal}$$

$$\mathbf{\text{Total} = 88,330 \text{ gal}}$$

6. Free Liquid Volume in WMF-628

The basis for the maximum liquid waste volume for mixed waste in WMF-628 is 26% of the total waste volume stored. The 26% represents the number of containers that contained some liquids when more than 17,000 containers were examined at the Stored Waste Examination Pilot Plant (SWEPP).

$$\text{Maximum number of boxes (stacked 4 boxes high)} = 7 \text{ rows of boxes 4 wide and 11 deep} + 1 \text{ partial row of boxes 1 wide and 9 deep} = 7 \times 44 + 9 = 317 \times 4 \text{ high} = 1,268 \text{ Total Boxes}$$

$$\text{Free liquid volume for box storage} = 128 \text{ ft}^3 / \text{box} \times 1,268 \text{ boxes} = 162,304 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 = 1,214,304 \text{ gal} \times 0.26$$

$$\mathbf{\text{Total} = 315,649 \text{ gal}}$$

Section 3 demonstrates that boxes provide the maximum free liquid content for this type of configuration.

CONTINUATION SHEET

7. Containers Stored Amidst Characterization/Treatment Equipment on North and South Sides of WMF-628

The following calculations show that adequate capacity remains for optional storage of containers amidst the characterization equipment on the north and south sides of half of WMF-628 to accommodate characterization/treatment activities.

Floor area taken by characterization/treatment equipment:

HENC unit	360 ft ²
HSGS unit	384 ft ²
DTT	1,092 ft ²
GGT units	642 ft ²
Misc. equip.	160 ft ²
Total	2,638 ft²

The area remaining if the characterization/treatment equipment is superimposed on the area taken by the footprint of the maximum drum storage configuration for the area of the building:

Area available for drums on floor (amidst equipment) is the area of 17 full drum rows + area of 3 partial rows – area taken by equipment footprints = (17 x 8 ft x 44 ft) + (3 x 8 ft x 36 ft) – 2,638 ft² = 5,984 ft² + 864 ft² - 2,838 ft² = 6,848 ft² – 2,638 ft² = **4,210 ft²**

Number of drums that can fit in available area = 4,210 ft² / 4 ft²/drum = **1,053 drums**

In addition to drums amidst the characterization equipment, a number of drums are in process (i.e., within equipment):

Approximate drums in process:

In HENC unit	4 drums
In HSGS unit	2 drums
In DTT	30 drums
In GGT units	80 drums
Total	116 drums

Approximate total drums amidst and within equipment: 1,053 + 116 = **1,169 drums**

Volume of drums = 1,169 drums x 55 gal/drum = **64,295 gal**

Potential free liquid volume for containers amidst and within equipment = 64,295 gal x 0.26 = **16,717 gal**

Volume displaced by one drum if stored on floor (conservative worst-case for comparison only) = $\pi \times (1 \text{ ft})^2 \times (0.5 \text{ ft}) \times 7.48 \text{ gal/ft}^3 = \mathbf{11.75 \text{ gal}}$

Capacity displaced by drums amidst and within equipment = 1,169 drums x 11.75 gal/drum = **13,736 gal**

Total Free Liquids Stored in WMF-628 = free liquid volume for stored containers + free liquid volume for containers in process = 315,649 gal + 16,717 gal = **332,366 gal**

10% of total free liquids = (0.10) x 332,366 = **33,237 gal**

CONTINUATION SHEET

Available SCS capacity in WMF-678
 = 88,330 gal – 13,736 gal = **74,594 gal**

8. Demonstration of Adequate WMF-628 SCS Capacity

TOTAL FREE LIQUIDS STORED	10% OF TOTAL FREE LIQUIDS	AVAILABLE SECONDARY CONTAINMENT CAPACITY
332,366 gal	33,237 gal	74,594 gal

As shown, the maximum WMF-628 potential free liquid storage volume for the worst-case storage area scenario of storing boxes is 315,649 gal. The maximum potential free liquid storage volume for the worst-case storage of drums in-process scenario is 16,717 gal. The SCS must provide capacity for 10% of the maximum liquid volume.

$$(315,649 \text{ gal} + 16,717 \text{ gal}) \times 0.10 = \mathbf{332,366 \text{ gal}} \times 0.10 = \mathbf{33,237 \text{ gal}}$$

The required SCS capacity for the maximum storage area configuration is 33,237 gal, which is less than the 74,594 gal of available SCS capacity; therefore, adequate SCS capacity is provided in WMF-628.

9. Demonstration of Total Free Liquids Stored Based on WMF-628 SCS Capacity

As shown, the maximum WMF-628 potential free liquid storage volume for the worst-case physical storage area scenario of storing boxes is 332,366 gal. If the secondary containment capacity is used to calculate the allowable maximum waste volume stored, then it can be shown that the maximum waste volume stored for containers based on secondary containment capacity is greater than the maximum waste volume stored based on physical storage limitations.

Maximum liquid waste volume stored in WMF-628

$$= \text{Secondary Containment Capacity} / 0.10$$

$$= 123,143 \text{ gal} / 0.10 = \mathbf{1,231,430 \text{ gal}}$$

$$\text{Potential free liquid volume for containers in WMF-628} = \mathbf{1,231,430 \text{ gal}} \times 0.26$$

$$= \mathbf{320,172 \text{ gal}}$$

$$10 \% \text{ of total free liquid stored in WMF-628} = \text{Potential free liquid volume} \times 0.10$$

$$= 320,172 \text{ gal} \times 0.10 = 32,017 \text{ gal}$$

CONTINUATION SHEET

TOTAL FREE LIQUIDS STORED	10% OF TOTAL FREE LIQUIDS	AVAILABLE SECONDARY CONTAINMENT CAPACITY
320,172 gal	32,017 gal	74,594 gal

The required SCS capacity for the maximum storage area configuration based on the secondary containment capacity is 32,017 gal, which is less than the 74,594 gal of available SCS capacity; therefore, adequate SCS capacity is provided in WMF-628.

SECTION 4. TYPE I MODULE SCS CALCULATIONS

The Type I storage module houses three storage areas: the main storage area (MSA); the Payload Assembly and Aspiration Area/Waste Characterization and Repackaging Area (PAAA/WCRA), which consists of two rooms; and the TRUPACT loading area (TLA). The SCS calculations provided in this section demonstrate that adequate/excess secondary containment is available based on the waste configuration. The *calculation provides separate* SCS capacity calculations for each storage area.

1. Type I Module MSA SCS Calculations

A. MSA Floor Area/Capacity

The MSA is a rectangle-shaped area with the north portion measuring 82.5-ft by 72.4-ft. The south portion of the MSA, by the Drum Venting Facility (DVF), measures 84.4-ft by 83.75-ft. The minimum depth of the SCS curb for the MSA is 0.5 ft.

$$\text{MSA floor area} = (82.5 \text{ ft} \times 72.4 \text{ ft}) + (84.4 \text{ ft} \times 83.75 \text{ ft}) = 13,041.5 \text{ ft}^2$$

$$\text{The initial capacity of the MSA without deductions} = 13,041.5 \text{ ft}^2 \times 0.5 \text{ ft}$$

$$\text{Total} = 6,520.75 \text{ ft}^3 \text{ (48,775 gal)}$$

B. Volume Displaced by MSA Building Structures

The following physical building structures are within the MSA SCS, causing a reduction in SCS capacity: door ramps, an interior ramp, step-off pads, curbs; columns; the DVF area; scales, office space, and the fire protection room.

Volume Reduced by Door Ramps, Interior Ramp, Step-off Pads, and Curbs

DOOR RAMPS (2)

$$\text{Volume} = [\text{length (L)} \times \text{width (W)} \times \text{height (H)}] / 2$$

$$\text{1st Volume} = (12 \text{ ft} \times 10.5 \text{ ft} \times 0.5 \text{ ft}) / 2 = 31.5 \text{ ft}^3$$

$$\text{2nd Volume} = (14 \text{ ft} \times 10 \text{ ft} \times 0.5 \text{ ft}) / 2 = 35 \text{ ft}^3 = 31.5 \text{ ft}^3 + 35 \text{ ft}^3$$

$$\text{Total} = 66.5 \text{ ft}^3$$

CONTINUATION SHEET

INTERIOR RAMP (1)

$$\text{Volume} = (L \times W \times H)/2 = (39 \text{ ft} \times 20 \text{ ft} \times 0.5 \text{ ft})/2$$

$$\text{Total} = 195.0 \text{ ft}^3$$

STEP-OFF PADS (3)

$$\text{Volume} = L \times W \times H$$

$$\text{1st Volume} = 53 \text{ in.} \times 71 \text{ in.} \times 6 \text{ in.} = 22,578 \text{ in.}^3$$

$$\text{2nd Volume} = 42 \text{ in.} \times 42 \text{ in.} \times 6 \text{ in.} = 10,584 \text{ in.}^3$$

$$\text{3rd Volume} = 49 \text{ in.} \times 45 \text{ in.} \times 6 \text{ in.} = 13,230 \text{ in.}^3$$

$$= 46,392 \text{ in.}^3 \times (5.787 \times 10^{-4} \text{ ft}^3 / \text{in.}^3)$$

$$\text{Total} = 26.8 \text{ ft}^3$$

RAMP CURBS (2 pair)

$$\text{Volume} = (L \times W \times H) \times 2$$

$$\text{1st pair} = (10.5 \text{ ft} \times 0.75 \text{ ft} \times 0.5 \text{ ft}) \times 2 = 7.9 \text{ ft}^3$$

$$\text{2nd pair} = (10 \text{ ft} \times 0.75 \text{ ft} \times 0.5 \text{ ft}) \times 2 = 7.5 \text{ ft}^3$$

$$\text{Total} = 15.4 \text{ ft}^3$$

INTERNAL WALL CURB

$$\text{Volume} = 7 \text{ in.} \times 6 \text{ in.} \times 65.5 \text{ ft} = 0.5833 \text{ ft} \times 0.5 \text{ ft} \times 65.5 \text{ ft}$$

$$\text{Total} = 19.1 \text{ ft}^3$$

$$\text{Total volume reduced by door structures} = 66.5 \text{ ft}^3 + 195.0 \text{ ft}^3 + 26.8 \text{ ft}^3 + 15.4 \text{ ft}^3 + 19.1 \text{ ft}^3 \\ = 323 \text{ ft}^3$$

Volume Reduced by Columns, DVF Area, and Fire Protection Room**COLUMNS (17 total, 15 @ 3 ft × 1 ft × 0.5 ft and 2 @ 3 ft × 3 ft × 0.5 ft)**

$$\text{Volume} = L \times W \times H \times \text{number of columns} = (3 \text{ ft} \times 1 \text{ ft} \times 0.5 \text{ ft}) \times 15 = 22.5 \text{ ft}^3$$

$$= (3 \text{ ft} \times 3 \text{ ft} \times 0.5 \text{ ft}) \times 2 = 9 \text{ ft}^3$$

$$\text{Total} = 32 \text{ ft}^3$$

DVF AREA

$$\text{Volume} = L \times W \times H \text{ (dimensions are conservative)} = 34 \text{ ft} \times 56 \text{ ft} \times 0.5 \text{ ft}$$

$$\text{Total} = 952 \text{ ft}^3$$

FIRE PROTECTION ROOM

$$\text{Volume} = L \times W \times H = 9 \text{ ft} \times 6 \text{ ft} \times 0.5 \text{ ft}; \text{Total} = 27 \text{ ft}^3$$

CONTINUATION SHEET

EQUIPMENT (scales measuring 6 ft × 6 ft)

$$\text{Volume} = 6 \text{ ft} \times 6 \text{ ft} \times 0.5 \text{ ft}; \text{ Total} = 18 \text{ ft}^3$$

OFFICE SPACE

$$\text{Volume} = L \times W \times H = 8 \text{ ft} \times 16 \text{ ft} \times 0.5 \text{ ft}; \text{ Total} = 64 \text{ ft}^3$$

$$\text{Total volume for miscellaneous structures} = 32 + 952 + 27 + 18 + 64 = 1,093 \text{ ft}^3$$

Total Facility Structural Displacement

$$\begin{aligned} \text{Structural displacement} &= \text{door structure displacement} + \text{miscellaneous structure displacement} \\ &= 323 \text{ ft}^3 + 1,093 \text{ ft}^3 \end{aligned}$$

$$\text{Total} = 1,416 \text{ ft}^3$$

C. Volume Displaced by Containers and Pallets in the MSA

To determine the volume displaced by containers stored in the MSA, the *calculation utilizes the* configuration depicted in Drawing 51-9912 (attached). The number of rows configured in the MSA include: one row, 56-ft long by 8-ft wide; one row, 16-ft long by 8-ft wide; and four rows, 24-ft long by 8-ft wide.

Individual Pallet and Container Displacement**PALLETS**

The metal pallets are each 4.83-ft by 8-ft. Each pallet consists of 12 slats, 4-in. wide by 4.83-ft long, supported by three 4-in. wide by 3.5-in. high by 8-ft long U-shaped beams (i.e., stringers). The slats and stringers are made of 10-gauge galvanized steel with a density of 495 lb/ft³. Each slat is lipped 0.5 in. along each side with a V-groove down the center. Each stringer is lipped 0.5 in. at the top to support the slats. Each stringer has four 2-in. high by 10-in. long holes, two in each side, with 0.5-in. extruded lips. Each pallet weighs approximately 322 lb.

$$\text{Volume displaced by one pallet} = 322 \text{ lb} / 495 \text{ lb/ft}^3 = 0.65 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

$$\text{Total} = 4.9 \text{ gal/pallet}$$

CONTAINERS

1. Boxes

Each box measures 4-ft by 4-ft by 8-ft. Since the pallets are 4.25-in. high, 1.75 in. (0.15 ft) of each box extends below the SCS curb.

$$\text{Volume} = L \times W \times H = 4 \text{ ft} \times 4 \text{ ft} \times 0.15 \text{ ft} = 2.4 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3; \text{ Total} = 35.9 \text{ gal}$$

$$\text{Total displacement per pallet with box} = \text{pallet displacement} + \text{box displacement}$$

$$= 4.9 \text{ gal} + 35.9 \text{ gal}; \text{ Total} = 41 \text{ gal}$$

CONTINUATION SHEET

2. Drums

Each drum measures 2 ft in diameter. Since the pallets are 4.25-in. high, 1.75 in. (0.15 ft) of each drum extends below the SCS curb.

$$\text{Drums per pallet} = 4.83 \text{ ft} / 2 \text{ ft dia./drum} \times 8 \text{ ft} / 2 \text{ ft dia./drum} = 2 \text{ drums wide} \times 4 \text{ drums long} = 8 \text{ drums / pallet}$$

$$\text{Volume} = \pi \times (1 \text{ ft})^2 \times 0.15 \text{ ft} = 0.47 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 \times 8 \text{ drums}$$

Total = 28.2 gal

Total displacement per pallet with drums = Pallet Displacement + Drum Displacement = 4.9 gal + 28 gal

Total = 33 gal

Calculations show that boxes provide the maximum displacement for given storage configurations. The *calculation uses* values determined for box/pallet displacement to demonstrate the worst-case scenario for waste storage volume.

Maximum Number of Boxes Stacked One High

Using the number and length of rows described above the total number of boxes is determined using the following calculation:

$$\text{Total boxes} = \text{Length of row} / (4 \text{ ft/box}) \times \text{number of rows}$$

$$1 \text{ row @ } 56\text{-ft long} = (56 \text{ ft} / 4 \text{ ft}) = 14 \text{ boxes}$$

$$1 \text{ row @ } 16\text{-ft long} = (16 \text{ ft} / 4 \text{ ft}) = 4 \text{ boxes}$$

$$4 \text{ rows @ } 24\text{-ft long} = (24 \text{ ft} / 4 \text{ ft}) \times 4 = 24 \text{ boxes} = 14 + 4 + 24$$

Total = 42 boxes stacked one high

Maximum Pallet/Container Displacement

For displacement calculation, assume there is one pallet per box.

$$\text{Maximum displacement} = \text{Total Displacement of Pallet with Box} \times \text{Total Number of Pallets}$$

$$= 41 \text{ gallons per pallet and box} \times 42 \text{ pallets and boxes}$$

Total = 1,722 gal

D. Available SCS Capacity in the MSA

$$\text{Available MSA SCS Capacity} = \text{Initial Capacity} - [\text{Door Structure Displacement} + \text{Displacement from Misc. Structures}] - \text{Maximum Pallet/Container Displacement} = [(6,521 \text{ ft}^3 - 1,416 \text{ ft}^3) \times 7.48 \text{ gal/ft}^3] - 1,722 \text{ gal} = 38,185 \text{ gal} - 1,722 \text{ gal}$$

Total = 36,463 gal

CONTINUATION SHEET

E. Free Liquid Volume in the MSA

The maximum liquid waste volume for mixed waste in the MSA is based on 26% of the total waste volume stored. The 26% represents the number of containers that contained some liquids when >17,000 containers were examined at the SWEPP.

Free Liquid Volume – Boxes

Using the facility configuration described above, the maximum stacking configuration for boxes is four high in the MSA.

$$42 \text{ pallets} \times 4 \text{ boxes/pallet} = 168 \text{ boxes}$$

$$\begin{aligned} \text{Volume} &= 128 \text{ ft}^3 / \text{box} \times 7.48 \text{ gal/ft}^3 \times 168 \text{ boxes} = 957.44 \text{ gal/box} \times 168 \text{ boxes} \\ &= 160,849.9 \text{ gal} \times 0.26 \end{aligned}$$

Total = 41,821 gal

Free Liquid Volume – Drums

The number of 55-gal drums that can be placed in the MSA is based on each drum being 2 ft in diameter, stacked four wide, and five high per row in the MSA.

$$1 \text{ row @ } 56 \text{ ft/row} = 56 \text{ ft/row} / 2 \text{ ft/drum} \times 1 \text{ row} \times 4 \text{ wide} \times 5 \text{ high} = 560 \text{ drums}$$

$$1 \text{ row @ } 16 \text{ ft/row} = 16 \text{ ft/row} / 2 \text{ ft/drum} \times 1 \text{ row} \times 4 \text{ wide} \times 5 \text{ high} = 160 \text{ drums}$$

$$4 \text{ rows @ } 24 \text{ ft/row} = 24 \text{ ft/row} / 2 \text{ ft/drum} \times 4 \text{ rows} \times 4 \text{ wide} \times 5 \text{ high} = 960 \text{ drums}$$

$$\text{Total Drums} = 560 \text{ drums} + 160 \text{ drums} + 960 \text{ drums} = 1,680 \text{ drums}$$

$$\text{Volume} = 1,680 \text{ drums} \times 55 \text{ gal/drum} = 92,400 \text{ gal} \times 0.26$$

Total = 24,024 gal

Calculations show that boxes provide the maximum free liquid content for the given storage configuration. The values determined for box free liquid content are used to demonstrate the worst-case scenario for maximum potential liquid waste volume.

F. MSA SCS Capacity Estimate

TOTAL FREE LIQUIDS STORED	10% OF TOTAL FREE LIQUIDS	AVAILABLE SECONDARY CONTAINMENT CAPACITY
41,821 gal	4,182 gal	36,463 gal

Demonstration Of Adequate Capacity

As shown the maximum MSA potential liquid storage capacity is 41,821 gal. The SCS must provide capacity for 10% of the maximum MSA potential storage capacity.

$$\text{Volume} = 41,821 \text{ gal} \times 0.10$$

Total = 4,182 gal

CONTINUATION SHEET

The required SCS capacity is 4,182 gal, which is less than 36,463 gal of available SCS capacity. Therefore, the Type I Module MSA *provides* adequate SCS capacity.

2. Type I Module PAAA/WCRA SCS Calculations**A. PAAA/WCRA Floor Area/Capacity**

The PAAA/WCRA consists of two rooms, separated by a wall. There is no elevated ramp or pad at the door separating these rooms; therefore, the SCS volume is considered the total volume provided in both rooms. The PAAA/WCRA measures 167-ft by 83.75-ft with a SCS curb height of 0.5 ft.

$$\text{PAAA/WCRA floor area} = 167.7 \text{ ft} \times 83.75 \text{ ft} = 14,044.9 \text{ ft}^2$$

$$\text{The initial capacity of the PAAA/WCRA without deductions} = 14,044.9 \text{ ft}^2 \times 0.5 \text{ ft}$$

$$\text{Total} = 7,022 \text{ ft}^3 \text{ (52,528 gal)}$$

B. Volume Displaced by PAAA/WCRA Building Structures

The following physical building structures are located within the PAAA/WCRA SCS: door ramps, step-off pads, and curbs; and columns, operating equipment, partition wall, office space, and gas generation testing system.

Volume Reduced by Door Ramps, Step-off Pads, and Curbs**RAMPS (2)**

$$\text{Volume} = (L \times W \times H) / 2$$

$$\text{1st volume} = (13 \text{ ft} \times 9.5 \text{ ft} \times 0.5 \text{ ft}) / 2 = 30.9 \text{ ft}^3$$

$$\text{2nd volume} = (14 \text{ ft} \times 10 \text{ ft} \times 0.5 \text{ ft}) / 2 = 35.0 \text{ ft}^3$$

$$\text{Total} = 66 \text{ ft}^3$$

STEP-OFF PADS (4)

$$\text{Volume} = L \times W \times H$$

$$\text{1st volume} = 42 \text{ in.} \times 42 \text{ in.} \times 6 \text{ in.} = 10,584 \text{ in.}^3$$

$$\text{2nd volume} = 69 \text{ in.} \times 42 \text{ in.} \times 6 \text{ in.} = 17,388 \text{ in.}^3$$

$$\text{3rd volume} = 67 \text{ in.} \times 41 \text{ in.} \times 6 \text{ in.} = 16,482 \text{ in.}^3$$

$$\text{4th volume} = 50 \text{ in.} \times 45 \text{ in.} \times 6 \text{ in.} = 13,500 \text{ in.}^3$$

$$\text{Total} = 57,954 \text{ in.}^3 \times (5.787 \times 10^{-4}) \text{ ft}^3 / \text{in.}^3 = 34 \text{ ft}^3$$

RAMP CURBS (2 pairs)

$$\text{Volume} = (L \times W \times H) \times 2$$

$$\text{1st pair} = (9.5 \text{ ft} \times 0.75 \text{ ft} \times 0.5 \text{ ft}) \times 2 = 7.1 \text{ ft}^3$$

CONTINUATION SHEET

$$2\text{nd pair} = (10 \text{ ft} \times 0.75 \text{ ft} \times 0.5 \text{ ft}) \times 2 = 7.5 \text{ ft}^3$$

$$\text{Total} = 7.1 \text{ ft}^3 + 7.5 \text{ ft}^3 = 15 \text{ ft}^3$$

INTERNAL WALL CURBS

$$\text{Volume} = 2.6 \text{ ft} \times 0.5 \text{ ft} \times 216.2 \text{ ft}$$

$$\text{Total} = 281 \text{ ft}^3$$

$$\text{Total volume reduced by door structures} = 66 \text{ ft}^3 + 34 \text{ ft}^3 + 15 \text{ ft}^3 + 281 \text{ ft}^3$$

$$\text{Total} = 396 \text{ ft}^3$$

Volume Reduced by PAAA/WCRA Columns, Equipment, and the Wall Partition

COLUMNS (15 total - 10 @ 3 ft × 1 ft × 0.5 ft and 5 @ 3 ft × 3 ft × 0.5 ft)

$$\begin{aligned} \text{Volume} &= L \times W \times H \times \text{number of columns} = (3 \text{ ft} \times 1 \text{ ft} \times 0.5 \text{ ft}) \times 10 = 15.0 \text{ ft}^3 \\ &= (3 \text{ ft} \times 3 \text{ ft} \times 0.5 \text{ ft}) \times 5 = 22.5 \text{ ft}^3 \end{aligned}$$

$$\text{Total} = 38 \text{ ft}^3$$

EQUIPMENT [1 piece (drum conveyor) measuring 7 ft × 12 ft]

$$\text{Volume} = (7 \text{ ft} \times 12 \text{ ft} \times 0.5 \text{ ft})$$

$$\text{Total} = 42 \text{ ft}^3$$

CENTER WALL (one wall 85-ft long with a 9-inch wide base)

$$\text{Volume} = 85 \text{ ft} \times 0.75 \text{ ft} \times 0.5 \text{ ft}$$

$$\text{Total} = 32 \text{ ft}^3$$

OFFICE SPACE

$$\text{Volume} = L \times W \times H = 10 \text{ ft} \times 8.7 \text{ ft} \times 0.5 \text{ ft}$$

$$\text{Total} = 44 \text{ ft}^3$$

$$\text{Total volume for miscellaneous structures} = 38 \text{ ft}^3 + 42 \text{ ft}^3 + 32 \text{ ft}^3 + 44 \text{ ft}^3$$

$$\text{Total} = 156 \text{ ft}^3$$

Volume Reduced by GGT System

CANISTERS (Total 40)

Canister Diameter: 26 in.; Base Diameter: 30 in.

Platform Dimensions: 34 in. x 34 in.

Secondary Containment Curb Height: 6 in.

CONTINUATION SHEET

(Although most of the canister platforms will be elevated off the floor, assume the footprint of canisters/platforms will consume the entire secondary containment to curb height of 6 in.)

$$\text{Platform of each canister} = 34 \text{ in.} \times 34 \text{ in.} \times 6 \text{ in.} = 6936 \text{ in.}^3 = 6936 \text{ in.}^3 \times (5.787 \times 10^{-4} \text{ ft}^3/\text{in.}^3) = 4 \text{ ft}^3$$

$$\text{Platform of 40 canisters} = 40 \text{ canisters} \times 4 \text{ ft}^3/\text{canister} = 160 \text{ ft}^3 = 160 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 1,197 gal

MAXIMUM OF TWO FLOOR CRANES

Each crane will be in a separate loading area. Each area will be approximately 12-ft by 12-ft.

Each Floor Crane: 25 in. \times 60 in.

Secondary Containment Curb Height: 6 in.

$$\text{Crane base volume} = 25 \text{ in.} \times 60 \text{ in.} \times 6 \text{ in.} = 9,000 \text{ in.}^3 = 9,000 \text{ in.}^3 \times (5.787 \times 10^{-4} \text{ ft}^3/\text{in.}^3) = 5 \text{ ft}^3$$

$$2 \text{ cranes base volume} = 2 \text{ cranes} \times 5 \text{ ft}^3/\text{crane} = 10 \text{ ft}^3 = 10 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 75 gal

MAXIMUM OF TWO ANALYTICAL CARTS

Cart Dimensions: 5 ft \times 2.5 ft (per cart)

Secondary Containment Curb Height: 6 in.

(Although most of the cart will be elevated off the floor (due to wheels), assume the footprint of cart will consume the entire secondary containment to curb height of 6 in.)

$$\text{Analytical cart base volume} = 5 \text{ ft} \times 2.5 \text{ ft} \times 0.5 \text{ ft} = 6 \text{ ft}^3$$

$$2 \text{ carts base volume} = 2 \text{ carts} \times 6 \text{ ft}^3/\text{cart} = 12 \text{ ft}^3 = 12 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 90 gal

VOC SCRUBBING CART

Although most of the cart will be elevated off the floor (due to support legs), assume the footprint of cart will consume the entire secondary containment to curb height of 6 in.

Cart Dimensions: 4 ft \times 2 ft; Secondary Containment Curb Height: 6 in.

$$\text{Scrubbing cart base volume} = 4 \text{ ft} \times 2 \text{ ft} \times .5 \text{ ft} = 4 \text{ ft}^3 = 4 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3$$

Total = 30 gal

FOUR LARGE GAS CYLINDERS

Cylinder Diameter: 1 ft; Secondary Containment Curb Height: 6 in.

CONTINUATION SHEET

Cylinder base volume = $\pi \times (0.5 \text{ ft})^2 \times 0.5 \text{ ft} = 0.4 \text{ ft}^3$

4 cylinders base volume = 4 cylinders $\times 0.4 \text{ ft}^3/\text{cylinder} = 2 \text{ ft}^3 = 2 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3$

Total = 15 gal

BATTERY CHARGER

Battery Charger Dimensions: 4 ft \times 2 ft; Secondary Containment Curb Height: 6 in.

Battery charger base volume = 4 ft \times 2 ft \times 0.5 ft = 4 ft³ = 4 ft³ \times 7.48 gal/ft³

Total = 30 gal

Summary of Secondary Containment Used by GGT System:

Item	Cubic Feet Secondary Containment Taken Up	Gallons Secondary Containment Taken Up
40 Canisters	160 ft ³	1,197 gal
Maximum of Two Floor Cranes	10 ft ³	75 gal
Maximum of Two Analytical Carts	12 ft ³	90 gal
VOC Scrubbing Cart	4 ft ³	30 gal
4 Large Gas Cylinders	2 ft ³	15 gal
Battery Charger	4 ft ³	30 gal
Total:	192 ft³	1,437 gal

Volume Reduced by Portable GGT System

PAD FOR ELECTRICAL TRANSFORMER

Pad Height: 6 in.

Pad Length: 24 in.

Pad Width: 12 in.

Volume of Pad = 6 in. \times 24 in. \times 12 in. = 1,728 in.³ = 1,728 in.³ \times (5.787 \times 10⁻⁴ ft³/in.³) = 1 ft³ \times 7.48 gal/ft³

Total = 7.5 gal

POWER SUPPLY

Power Supply Height: 6 in.

Power Supply Length: 12 in.

Power Supply Width: 12 in.

CONTINUATION SHEET

Power Supply Volume = 6 in. x 12 in. x 12.

$$= 864 \text{ in.}^3 = 864 \text{ in.}^3 \times (5.787 \times 10^{-4} \text{ ft}^3/\text{in.}^3) = 0.5 \text{ ft}^3$$

Total = 3.8 gal

Total Facility Structural Displacement

Structural Displacement = door structure displacement + misc. structure displacement + GGT System displacement + Portable GGT System displacement = $396 \text{ ft}^3 + 156 \text{ ft}^3 + 192 \text{ ft}^3 + 1.5 \text{ ft}^3$

Total = 745.5 ft³

C. Volume Displaced by Containers and Pallets in the PAAA/WCRA

To determine the volume displaced by containers stored in this area, the configuration depicted in Drawing 51-9912 (attached) was utilized. The number of 8-ft wide rows that are in the PAAA/WCRA is as follows: six 60-ft rows, two 24-ft rows, and three 36-ft rows.

Individual Pallet and Container Displacement**PALLETS**

The metal pallets are 4.83-ft by 8-ft. Each pallet consists of 12 slats, 4-in. wide by 4.83-ft long, supported by three 4-in. wide by 3.5-in. high by 8-ft long U-shaped beams (i.e., stringers). The slats and stringers are made of 10-gauge galvanized steel, with a density of $495 \text{ lb}/\text{ft}^3$. Each slat is lipped 0.5 in. along each side with a V-groove down the center. Each stringer is lipped 0.5 in. at the top to support the slats. Each stringer has four 2-in. high by 10-in. long holes, two in each side, with 0.5-in. extruded lips. Each pallet weighs approximately 322 lb.

$$\text{Volume displaced by one pallet} = 322 \text{ lb} / 495 \text{ lb}/\text{ft}^3 = 0.65 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3$$

Total = 5 gal/pallet

CONTAINERS**1. Boxes**

Each box measures 4-ft by 4-ft by 8-ft. Since the pallets are 4.25-in. high, 1.75 in. (0.15 ft) of each box extends below the SCS curb.

$$\text{Volume} = L \times W \times H = 4 \text{ ft} \times 4 \text{ ft} \times 0.15 \text{ ft} = 2.4 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3 = 17.95 \text{ gal}$$

Total displacement per pallet with box = pallet displacement + box displacement

$$= 5 \text{ gal} + 17.95 \text{ gal}$$

Total = 22.95 gal

2. Drums

CONTINUATION SHEET

Each drum measures 2 ft in diameter. Since the pallets are 4.25-in. high, 1.75 in. (0.15 ft) of each drum extends below the SCS curb.

$$\begin{aligned} \text{Drums / pallet} &= 4.83 \text{ ft} / 2 \text{ ft dia./drum} \times 8 \text{ ft} / 2 \text{ ft dia./drum} \\ &= 2 \text{ drums wide} \times 4 \text{ drums long} = 8 \text{ drums / pallet} \end{aligned}$$

$$\text{Volume} = \pi \times (1 \text{ ft})^2 \times 0.15 \text{ ft} = 0.47 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3 \times 8 \text{ drums}$$

Total = 28 gal

Total displacement per pallet with drums = pallet displacement + drum displacement within the SCS = 5 gal + 28 gal

Total = 33 gal

Calculations show that boxes provide the maximum displacement for the given storage configurations. The values determined for box/pallet displacement are used to demonstrate the worst-case scenario for waste storage volume.

Maximum Number of Boxes Stacked One High

Using the number and length of rows described above, the total number of boxes was determined using the following calculation:

$$\text{Total Pallets} = \text{length of row} / (4 \text{ ft/pallet}) \times \text{number of rows}$$

$$6 \text{ rows @ } 60 \text{ ft} = (60 \text{ ft} / 4) \times 6 = 90 \text{ boxes}$$

$$2 \text{ rows @ } 24 \text{ ft} = (24 \text{ ft} / 4) \times 2 = 12 \text{ boxes}$$

$$3 \text{ rows @ } 36 \text{ ft} = (36 \text{ ft} / 4) \times 3 = 27 \text{ boxes}$$

Total = 90 + 12 + 27 = 129 boxes (stacked one high)

Maximum Pallet/Container Displacement

Maximum displacement = total displacement of pallet with box \times total number of pallets = 41 gal per pallet and box \times 129 pallets

Total = 5,289 gal

D. Available SCS Capacity in the PAAA/WCRA

Available PAAA/WCRA Capacity = initial capacity

- [door structure displacement + the displacement from misc. structures + the displacement from GGT system + the displacement from the portable GGT system]
- maximum displacement of pallets and boxes

$$= [(7,022 \text{ ft}^3 - 745.5 \text{ ft}^3) \times 7.48 \text{ gal/ft}^3] - 5,289 \text{ gal} = 46,948 \text{ gal} - 5,289 \text{ gal}$$

Total = 41,659 gal

CONTINUATION SHEET

E. Free Liquid Volume in the PAAA/WCRA

The maximum liquid waste volume for mixed waste in the PAAA/WCRA is based on 26% of the total waste volume stored. The 26% represents the number of containers that contained some liquids when >17,000 containers were examined at the SWEPP.

Free Liquid Volume - Boxes

Using the facility configuration described above, the maximum stacking configuration for boxes is four high in the PAAA/WCRA.

$$= 129 \text{ pallets} \times 4 \text{ boxes/pallet} = 516 \text{ boxes}$$

$$\text{Volume} = 128 \text{ ft}^3 / \text{box} \times 7.48 \text{ gal/ft}^3 \times 516 \text{ boxes} = 494,039 \text{ gal} \times 0.26$$

$$\text{Total} = 128,450 \text{ gal}$$

Free Liquid Volume - Drums

The number of 55-gal drums that can be placed into the PAAA/WCRA is based on each drum being 2 ft in diameter, stacked four wide, and five high per row.

$$\text{Drums per pallet} = 2 \text{ wide} \times 4 \text{ long} \times 5 \text{ high} = 40 \text{ drums}$$

$$\text{Total drums} = (40 \text{ drums per pallet} \times 129 \text{ pallets}) = 5,160 \text{ drums}$$

$$\text{Volume} = 5,160 \text{ drums} \times 55 \text{ gal/drum} = 283,800 \text{ gal} \times 0.26; \text{ Total} = 73,788 \text{ gal}$$

Calculations show that boxes provide the maximum free liquid content for the given storage configuration. The values determined for box free liquid content are used to demonstrate the worst-case scenario for maximum potential liquid waste volume.

F. PAAA/WCRA SCS Capacity Estimate

TOTAL FREE LIQUIDS STORED	10% OF TOTAL FREE LIQUIDS	AVAILABLE SECONDARY CONTAINMENT CAPACITY
128,450 gal	12,845 gal	41,659 gal

Demonstration of Adequate Capacity

As shown the maximum PAAA/WCRA potential liquid storage capacity is 128,450 gal. The SCS must provide capacity for 10% of the free liquid stored.

$$\text{Volume} = 128,450 \times 0.10$$

$$\text{Total} = 12,845 \text{ gal}$$

The required SCS capacity is 12,845 gal, which is less than 41,659 gal of available SCS capacity. Therefore, the Type I Module PAAA/WCRA *provides* adequate SCS capacity.

CONTINUATION SHEET

3. Type I Module TLA SCS Calculations

Drums are stored as 14-drum TPA configurations, in Ten-Drum Overpacks (TDOPs) containing ten 55-gal drums, or in TRUPACT SWBs containing four 55-gal drums on spill pallets or pans or in TRUPACT casks.

Intuitively, since the lidded/sealed and leak tested TRUPACT casks hold the TPAs, or two TRUPACT SWBs, any/all releases from drums would be contained in the cask; therefore, SCS calculations are not provided for TPAs or boxes in TRUPACT casks.

Spill containment in the TLA will consist of a SCS capable of holding 10% of the total potential liquid in a 14-pack TPA or two TRUPACT SWBs, each of which holds four 55-gal drums.

A. Available SCS in the TLA

Containment will be manufactured units such as the following:

“Ultra Spill Deck” as manufactured by UltraTech International: Decks may be configured into a 104-in. by 104-in. unit (four each, 52-in. square units with bulkhead fittings to allow spilled liquid to flow from one module to the next; each module will hold 44 gal).

$$= 4 \times 44 \text{ gal}$$

$$\text{Total} = 176 \text{ gal}$$

Or

Ultra Confinement pans 96-in. in diameter with interior pallet to allow visual inspection; pans will contain approximately 85 gal of liquid.

$$\text{Total} = 85 \text{ gal}$$

B. Potential Free Liquid Volumes Stored on Spill Pallets or PansFree Liquid Volume in a TPA

$$\text{Volume} = 0.26 (55 \text{ gal/drum} \times 14 \text{ drums/TPA})$$

$$\text{Total} = 200 \text{ gal}$$

Free Liquid Volume in two TRUPACT SWBs

$$\text{Volume} = 0.26 (4 \times 55 \text{ gal}) \times 2$$

$$\text{Total} = 114 \text{ gal}$$

Free Liquid Volume in a TDOP

$$\text{Volume} = 0.26 (10 \times 55 \text{ gal})$$

$$\text{Total} = 143 \text{ gal}$$

CONTINUATION SHEET

C. TLA SCS Capacity Estimate

MAXIMUM FREE LIQUIDS STORED PER PALLET OR PAN	10% OF MAXIMUM	MINIMUM AVAILABLE SECONDARY CONTAINMENT CAPACITY
200 gal	20 gal	85 gal

Demonstration of Adequate Capacity

As shown, the maximum potential liquid stored per pallet or pan is 200 gal. The SCS (spill pallet or pan) must provide capacity for 10% of the free liquid stored.

$$\text{Volume} = 200 \text{ gal} \times 0.10$$

$$\text{Total} = 20 \text{ gal}$$

The required SCS capacity is 20 gal, which is less than the 85 gal of minimum available SCS capacity. Therefore, the Type I Module TLA for TPAs or SWBs *provides* adequate SCS capacity.

SECTION 5. SWEPP STORAGE AREA SCS CALCULATIONS

SWEPP storage area SCS calculations have been completed by determining floor area/capacity using Terra Model software. Terra Model mapping shows that the maximum depth within the storage area is approximately 3.9-in. Pallets are approximately 4 in. high. For calculation purposes, total immersion of pallets is assumed. Due to pallet height, no part of the containers can be immersed in the available SWEPP storage area impoundment volume. The pallet displacement value is calculated by addressing the example container storage configuration in the storage area using 55-gal drums, as depicted in Drawing 51-9906 (attached), to determine the maximum number of pallets required for storage. This section shows that for the desired permitted storage capacity of 108 m³, the SCS capacity is approximately 4.5 times greater than 10% of the available total free liquid associated with 108 m³ of waste in 55-gal drums.

1. Floor Area/Capacity

The SWEPP storage area is located at the south end of the High Bay. The building exterior walls form the outer boundaries of the storage area on the south, east, and west sides. Curbing and a forklift ramp near the center of the building floor area form the boundary on the north side.

The storage area extends 66 ft 8 in. (20.3 m) from the south wall into the SWEPP High Bay on the west side and 49 ft 8 in. (15.14 m) on the east side. The floor for the entire High Bay slopes approximately 0.5% toward the north. On the east side of the SWEPP storage area, the floor is sloped from the south side toward the north at approximately 0.4%. The floor on the west side of the storage area is sloped from the northwest corner to the east at approximately 0.6%.

To more accurately calculate the total volume of the SWEPP storage area, floor measurement data from facility drawings along with floor elevation data were entered into Terra Model software. The resulting topographic map of the storage area indicates the maximum possible depth is less than 4 in.

CONTINUATION SHEET

at a location on the north end of the storage west side. The software also provides the capability to determine the volume of the total area within the confines of the storage area.

The total initial estimated containment volume for the SWEPP storage area is 4,003 gal (15.15 m³).

2. Volume Displaced by Curbing

Curbing displacement takes place primarily on the east wall, and around the columns and fire water riser containment. The curbing on the east wall and columns is 6-in. wide. Depth varies from north to south in the SWEPP storage area. Calculations use the maximum depth of a particular item.

South wall curbing: The maximum depth at the south wall is 0.0 in. = 0.0 gal.

East wall curbing maximum depth is 0.1 ft = 17.83-ft long × 0.5-ft wide × 0.1-ft deep

$$= 0.9 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3; \text{ Total} = 7 \text{ gal}$$

Volume displaced by column curbing:

$$= 2 \text{ ft} \times 3.25 \text{ ft} \times 0.02 \text{ ft} = 0.13 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3; \text{ Total} = 1 \text{ gal}$$

$$= 3 \text{ ft} \times 3.25 \text{ ft} \times 0.27 \text{ ft} = 2.6 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3; \text{ Total} = 20 \text{ gal}$$

$$= 2.33 \text{ ft} \times 3.25 \text{ ft} \times 0.21 \text{ ft} = 1.6 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3; \text{ Total} = 12 \text{ gal}$$

$$= 2.33 \text{ ft} \times 2.5 \text{ ft} \times 0.28 \text{ ft} = 1.6 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3; \text{ Total} = 12 \text{ gal}$$

Total volume displaced by curbing

$$= 7 \text{ gal} + 1 \text{ gal} + 20 \text{ gal} + 12 \text{ gal} + 12 \text{ gal}$$

$$\text{Total} = 52 \text{ gal}$$

3. Volume Displaced by Metal Pallets

The metal pallets measure 4 ft square. Each pallet consists of six slats, 4-in. wide by 4-ft long, supported by three 4-in. wide by 3.5-in. high by 4-ft long U-shaped beams. The slats and stringers are made of 10-gauge galvanized steel. Each slat is lipped 0.5 in. along each side with a V-groove down the center. Each stringer is lipped 0.5 in. at the top to support the slats. Each stringer has four 2-in. high by 10-in. long holes, two in each side, with 0.5-in. extruded lips.

The pallets weigh approximately 136 lb each. Thus, the volume displaced by one pallet:

$$= 136 \text{ lb} / 495 \text{ lb/ft}^3 = 0.27 \text{ ft}^3 \times 7.48 \text{ gal/ft}^3; \text{ Total} = 2 \text{ gal/pallet}$$

The number of pallets required to store 108 m³ of waste in 55-gal drums is determined by addressing pallet requirements for the various storage configurations as depicted in Drawing 51-9906 in Appendix V. Associated pallet calculations follow.

The storage configuration depicted in Drawing 51-9906 (attached) has one row, 4 drums wide by 7 drums long; three rows, 4 drums wide by 10 drums long; and one row, 4 drums wide by 6 drums long.

4 drums wide:

CONTINUATION SHEET

Number of pallets wide = 4 drums wide × 2 ft/drum × 1 pallet/4-ft wide = **2 pallets wide**

Number of pallets long:

Row 6 drums long = 6 drums long × 2 ft/drum × 1 pallet/4-ft long = **3 pallets long**

Pallets / row = 2 pallets wide × 3 pallets long;

Total = 6 pallets

Row 7 drums long = 7 drums long × 2 ft/drum × 1 pallet/4-ft long
= 3.5 pallets, or **4 pallets long**

Pallets / row = 2 pallets wide × 4 pallets long

Total = 8 pallets

Row 10 drums long = 10 drums long × 2 ft/drum × 1 pallet/4-ft long = **5 pallets long**

Pallets / row = 2 pallets wide × 5 pallets long = 10 pallets × 3 rows

Total = 30 pallets

Total pallets for 55-gal drums = 6 + 8 + 30; Total = 44 pallets

Pallet displacement for 55-gal drums = 44 pallets × 2-gal/pallet; Total = 88 gal

4. Volume Displaced by Facility Equipment

A. Fork Lift Charging Station

A forklift charging station may be located within the SWEPP storage area. Assuming two forklifts are placed in the charging area, maximum displacement is:

Assume forklift tires, tines and drum-handling attachments are totally submerged.

Four tires per forklift = 15 in. × 8 in. × 4 in. × 4 / fork lift = 1,920 in.³ / 1,728 in.³/ft³
= 1.1 ft³ × 7.48 gal/ft³; **Total = 8 gal**

Two tines per forklift = 48 in. × 4 in. × 2 in. × 2 / fork lift = 768 in.³ / 1,728 in.³/ft³
= 0.44 ft³ × 7.48 gal/ft³; **Total = 3 gal**

One drum handler per forklift @ 300 lb = 300 lb / 495 lb/ft³ = 0.61 ft³ × 7.48 gal/ft³

Total = 5 gal

Total displacement for two forklifts = (8 gal + 3 gal + 5 gal) × 2; Total = 32 gal

B. Gamma Spectrometer

The maximum depth in the gamma spectrometer area due to floor slope is 3.5 in.

Gamma spec. plate support structure displacement = 4 ft × 6 ft × 3.5 in.

= 12,096 in.³ / 1,728 in.³/ft³ = 7.0 ft³ × 7.48 gal/ft³; **Total = 52 gal**

CONTINUATION SHEET

C. New (1999) Gamma Spectrometer

The maximum depth in the gamma spectrometer area due to floor slope is 3.5 in.

$$\begin{aligned} \text{Conveyor system} &= 37 \text{ ft} \times 3 \text{ ft} \times 3.5 \text{ in.} + 5 \text{ ft} \times 5 \text{ ft} \times 3.5 \text{ in.} = 68,544 \text{ in.}^3 / 1,728 \text{ in.}^3/\text{ft}^3 \\ &= 39.7 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3; \text{ Total} = \mathbf{297 \text{ gal}} \end{aligned}$$

$$\begin{aligned} \text{Detector/shield system} &= 6 \text{ ft} \times 6 \text{ ft} \times 3.5 \text{ in.} = 18,144 \text{ in.}^3 / 1,728 \text{ in.}^3/\text{ft}^3 \\ &= 10.5 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3; \text{ Total} = \mathbf{79 \text{ gal}} \end{aligned}$$

$$\begin{aligned} \text{Analytical support tables and rack} &= 5 \text{ ft} \times 10 \text{ ft} \times 3.5 \text{ in.} = 25,200 \text{ in.}^3 / 1,728 \text{ in.}^3/\text{ft}^3 \\ &= 14.6 \text{ ft}^3 \times 7.48 \text{ gal}/\text{ft}^3; \text{ Total} = \mathbf{109 \text{ gal}} \end{aligned}$$

$$\text{Total displacement for new gamma spectrometer} = 297 \text{ gal} + 79 \text{ gal} + 109 \text{ gal} = \mathbf{485 \text{ gal}}$$

D. Total Volume Displaced By Equipment

$$= 32 \text{ gal} + 52 \text{ gal} + 485 \text{ gal}$$

$$\text{Total} = \mathbf{569 \text{ gal}}$$

5. Available SCS Capacity

Capacity (55-gal drums) = Floor area/capacity – volume displaced by curbing – volume displaced by pallets - volume displaced by equipment = 4,003 gal - 52 gal - 88 gal – 569 gal

$$\text{Total} = \mathbf{3,294 \text{ gal}}$$

6. Free Liquid Volume in SWEPP Storage Area (55-gal Drums)

Number of 55-gal drums in SWEPP storage area = number of drums on pallets x number of drums high = 172 drums x 3 drums high

$$\text{Total} = \mathbf{516 \text{ drums}}$$

Estimated liquid volume (55-gal drums) = 516 drums x 55 gal/drum

$$\text{Total} = \mathbf{28,380 \text{ gal}}$$

7. SCS Capacity Estimate

Type of Container	Total Free Liquids Stored	10% of Total Free Liquids	Available Secondary Containment Capacity
55-gal Drums	28,380 gal	2,838 gal	3,294 gal

As shown, the maximum SWEPP Storage Area free liquid storage volume for the worst-case scenario is 28,380 gal. The SCS must provide capacity for 10% of the maximum liquid volume.

$$28,380 \text{ gal} \times 0.10 = \mathbf{2,838 \text{ gal}}$$



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CONTINUATION SHEET

The required SCS capacity for the maximum storage area configuration is 2,838 gal, which is less than the 3,294 gal of available SCS capacity; therefore, adequate SCS capacity is provided in the SWEPP Storage Area.



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EDF No.: 0271	Revision No.: 02	FMP No. (if any): NA
Title: Secondary Containment System Capacity Calculations – HMWA/RCRA		Building/System No.: WMF-676 / System 000

Summary:

Purpose/Scope:

This EDF, in conjunction with EDF-0272, is a revision to and supersedes EDF-0081, which was previously OPSCAL-ME-0033 and BNFL-03053-002. This revision isolates the HWMA/RCRA secondary containment requirements from the NFPA secondary containment requirements for the AMWTP Treatment Facility WMF-676. Changes at this revision shown in *bold/italics, show updated calculations for Area 1-10, Room 126B.*

Conclusion / Recommendations:

The new maximum waste box volume reflects a back-calculation using the maximum containment capacity of Area 2-04 (See Attachment 1), which is the smallest containment area that acts as a storage area for waste box containers. The containment capacity of secondary containment area 2-04 is 1,379 gallons and is the limiting containment volume for storing waste box containers in WMF-676. Future changes to allow waste box containers into the facility with an interior volume greater than 1,379 gallons will result in facility modifications to increase the containment capacity of containment area 2-04 and potentially containment area 2-03 to remain compliant with Reference 4.1.1 paragraph (b)(3). Design Engineering recommends implementing administrative or software engineering controls as required *prohibiting* the entrance of waste boxes possessing an interior volume in excess of 184.35 cubic feet into WMF-676. It is anticipated that waste boxes entering WMF-676 will contain no free liquids or relatively small amounts.

References: See Section 4 of Analysis

Originator: *Curry Gunnell* Signature: *[Signature]* Date: *7/5/11*

Technical Review: *Mark Hiatt* Signature: *[Signature]* Date: *7/5/11*

Additional Reviewers: (by title)

<i>Environmental</i>	<i>[Signature]</i>	<i>07/11/11</i>
Print Title	Signature	Date
Print Title	Signature	Date

Distribution List:

Approval:

Printed Name: *Ron Todd*
Printed Title: *Engineering Manager*
Signature: *[Signature]* Date: *7-12-11*



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EDF No.: 0271	Revision No.: 02	FMP No. (if any): NA
Title: Secondary Containment System Capacity Calculations – HMWA/RCRA		Building/System No.: WMF-676 / System 000
Scope: See Section 1 of Analysis		

Analysis:

1 PURPOSE

The purpose of this analysis is to determine and show the areas where secondary containment under Resource Conservation and Recovery Act (RCRA) and DOE Order 420.1 is required.

This updated analysis has been prepared to represent the Advanced Mixed Waste Treatment Facility (AMWTF or WMF-676) liquid spill containment configuration in its final condition before the startup of “hot” operations.

2 METHOD

2.1 The design method is as follows:

- 2.1.1 Identify rooms or areas for containment. The AMWTF is segregated into individual containment areas that include single or multiple rooms.
- 2.1.2 Determine gross room areas and overall containment areas. The areas are determined from the architectural general floor plan arrangements.
- 2.1.3 Determine net containment areas and total liquid spill containment volumes for each containment area.
 - RCRA requirements determine the required containment area volume to contain liquid waste spills in each containment area.
- 2.1.4 Determine curb heights to meet RCRA requirements.
- 2.1.5 Show containment boundaries on Exhibits 1, 2, and 3.

3 DESIGN INPUTS AND ASSUMPTIONS

- 3.1 Room areas and overall containment areas are based on the architectural general arrangement drawings (Section 4.2)
- 3.2 In receiving, process, and staging areas, the maximum number of containers of mixed waste was estimated (based on the architectural drawings) for containers stored in gloveboxes, on conveyors and fixed pedestals, and staged on the floors within these areas. Attachment 1 provides the allocation of containers of mixed waste to storage and staging locations, by room and containment area.

The total number of containers of mixed waste and the associated volume of potential liquid waste to contain is in accordance with the AMWTF HWMA/RCRA Treatment permit.

- 3.3 Curbs, as used in this document, are to show containment areas, not necessarily to imply that curbs are the only method of containment. Curbs, landing pads, stoops, ramps, sealants, and other means provide control of spilled liquids.

- 3.4 Nominal curb height is 4 inches throughout WMF-676. In a number of rooms and areas, other curb heights and/or containment methods exist to meet RCRA requirements for spill containment.
- 3.5 Overflow troughs exist in a number of rooms and areas to contain the design volume of fire protection sprinkler water within adjacent spill containment areas. These overflow troughs are located at a height above the calculated minimum RCRA curb heights, at least 2-inches above the floor. Thus, there exists no impact to the required RCRA curb heights because of installed overflow troughs used for containment of fire protection sprinkler water.
- 3.6 Based on examination of more than 17,000 waste containers, only 26% of the containers contained free liquids.
- 3.7 The architectural general arrangement drawings serve as the basis for gross floor area calculations for rooms and containment areas. The method for calculating net floor areas and overall containment volumes includes subtracting occupied areas from the gross floor areas. Detailed walk down measurements of curbs, anchor plates, and other fixed equipment, and estimating the numbers of containers staged on the floors serve as the basis for calculating occupied floor areas. Attachment 1 provides the results of these calculations.

4 REFERENCES

4.1 Codes and Standards

- 4.1.1 40 CFR 264.175, Containment
- 4.1.2 DOE Order 420.1, Facility Safety

4.2 Architectural Drawings

- 53-0201, Treatment Facility First Floor Plan General Arrangement
- 53-0207, Treatment Facility Second Floor Plan General Arrangement
- 53-0212, Treatment Facility Interstitial Utility Access General Arrangement

4.3 AMWTP HWMA/RCRA Treatment Permit

4.4 AMWTP EDF-0017, AMWTP Secondary Containment System Capacity Calculations Summary

4.5 TQ-MK-144, Maximum / Minimum Dimensions of Boxes Allowed into the AMWTF

4.6 BNFL-03053-002, Liquid Spill Containment Design Analysis

4.7 AMWTP EDF-0081, WMF-676 Secondary Containment System Capacity Calculations

4.8 AMWTP EDF-0272, WMF-676 Secondary Containment System Capacity Calculations – NFPA

5 COMPUTER SOFTWARE

This calculation did not perform computer modeling. This calculation used computer software spreadsheets (Microsoft® Excel) to organize data and to perform simple calculations such as the calculation of net areas, volumes, and curb heights for containment.

6 DESIGN ANALYSIS

This design analysis includes the design rationale and considerations for RCRA liquid spill containment, followed by a description of the specific areas where containment is required. Calculations performed to determine net containment areas and liquid volumes to contain form the primary basis for minimum curb heights and/or containment methods needed to meet RCRA requirements for liquid spill containment. The following is a summary of the steps taken to complete the liquid spill containment design analysis for the AMWTF.

First, the analysis developed containment areas throughout the plant (WMF-676). Containment areas consist of one or more adjacent rooms generally within the same building ventilation zone. Exhibits 1, 2, and 3 (Attachment 2) show these containment areas. Gross containment areas were calculated from the architectural general arrangement drawings, followed by walk downs and detailed calculations to determine net containment areas for both fire protection and RCRA spill containment.

Second, the analysis determined the volume of liquid to contain for RCRA for each of the containment areas. The required volume of RCRA liquid waste to contain within each individual containment area is 10% of the total volume of the mixed waste containers or the volume of the largest container within the area, whichever is greater.

Third, the analysis calculated the minimum curb height for RCRA for each of the containment areas, rounded up to the nearest 0.1 inch. In some areas, higher curbs are necessary to meet RCRA requirements for spill containment, as the nominal curb heights throughout WMF-676 are 4 inches. Attachment 1 specifies installed curb heights required to meet RCRA requirements.

Attachment 1 "Liquid Spill Containment Area Requirements" provides the detailed arrangement and organization of containment areas within WMF-676. In addition, it provides calculations for gross containment areas, occupied areas (e.g. curbs, anchor plates, other fixed equipment, containers staged on floors), net containment areas, volumes to contain for RCRA liquid wastes, and minimum curb heights for RCRA spill containment.

6.1 General Design Considerations

6.1.1 Regulatory Requirements

RCRA and DOE Order 420.1 establish the need for and the design requirements applicable to containment of hazardous materials (liquids only) in the AMWTF. RCRA requirements listed in 40 CFR 264.175 detail the requirement for the secondary containment system to contain 10% of the volume of containers or the volume of the largest container whichever is greater. The design requirements set forth in these documents regulate the design analysis for determining liquid spill containment curb heights.

6.2 Containment Curb Calculation

6.2.1 Containment Areas

Containment areas were developed for the AMWTF where liquid spill containment is required RCRA liquid wastes. Attachment 1 shows containment areas grouped into 18 containment areas on the first floor (26 rooms) and 13 containment areas (19 rooms) on the second floor and interstitial level. Of these 31 containment areas, only 18 are required to

contain RCRA liquid wastes. All 31 are required to contain fire protection sprinkler water (see Reference 4.8). The modification of curb heights, as necessary, satisfies containment needs.

6.2.2 Floor Space Occupied by Curbs, Equipment and Containers

In general, the architectural general arrangement drawings served as the basis for calculating the gross floor space of each containment area. Measuring the floor area occupied by curbs, anchor plates, and other fixed equipment, plus the area occupied by the estimated number of containers projected to be staged on each floor area determined the occupied floor space within each containment area.

The calculation used actual dimensions of curbs for each containment area, while using 50% of the floor area occupied by the ramps connected to curbs.

The calculation used a value of 0.1 ft² per anchor plate within occupied areas to account for the base plate and attached support leg for installed equipment. The calculation used larger values of occupied area for large anchor plates such as those required for support columns.

The calculation used architectural general arrangement drawings, field measurements, and visual estimates of major pieces of equipment within each containment area for other fixed equipment within occupied areas.

Floor areas occupied by the staging of containers of mixed waste (drums) were calculated for each containment area. Floor area occupied by each type of container was calculated as follows: (*boxes are staged on conveyors or pedestals and do not occupy floor space*)

55-gal drum 3.14 ft² (24-inch diameter)

85-gal drum 4.91 ft² (26-inch diameter)

100-gal drum 7.07ft² (34-inch diameter)

6.2.3 Net Containment Area

Subtracting the total occupied floor area from the gross floor area, for each containment area, results in its net containment area.

6.2.4 Maximum Waste Box Size

The maximum dimensions a waste box can possess and still physically enter WMF-676 are 56-inches wide by 96-inches long by 76-½ -inches high (Reference 4.6) providing a volume of 1,780 gallons. Calculations to determine the allowable liquid capacity of a waste box utilized the maximum volume capacity of the smallest containment area, Containment Area 2-04. The allowable volume is then the net containment area multiplied by the height of the containment curb of area 2-04. $(295 \text{ ft}^2)(0.5833 \text{ ft}) = 184.35 \text{ ft}^3$ or 1,379 gallons. Thus, only waste boxes with an interior volume less than or equal to 1,379 gallons may enter WMF-676.

6.2.5 Minimum Curb Heights

Minimum curb heights required for containing RCRA liquid wastes were calculated as follows:

Converting the volume of RCRA liquid wastes to contain to cubic feet, dividing the result by

the net containment area, and multiplying by 12 in/ft to obtain the minimum RCRA curb heights for each containment area. Note that not all containment areas required curbs for RCRA spill containment due to the absence of liquid wastes in those areas. See Reference 4.8 for fire protection curb heights in those areas. In two areas, higher curbs are necessary to meet RCRA requirements, as the nominal curb heights throughout WMF-676 are only 4 inches. These include: Room 217C (V.G. Door Airlock), which has a 7.5-inch curb installed to meet both fire protection and RCRA requirements for spill containment; And Room 226 (Box Conveyor Area), which has a 7-inch curb installed to meet both fire protection and RCRA requirements for spill containment.

7 CONCLUSIONS

Attachment 1 lists the calculated minimum required design curb heights to meet RCRA requirements. These curb heights are based on:

- Containment area configuration prior to “hot” operations
- Net containment area (ft²)
- Calculated volumes to contain
- RCRA spill containment requirements

Attachment 2 shows the containment areas represented as Exhibits 1, 2, and 3.

The nominal curb height of 4 inches is adequate for containment of RCRA liquid wastes in all areas except the following:

- Room 009, Box Elevator, 16.8-inch curb required, 12-inch curb installed. This area is classified as an “in process storage area” and can only store boxes with a volume less than 131.9 cubic feet.
- Room 217C, V.G. Door Airlock, 4.6-inch curb required, 7.5-inch curb installed.

8 ATTACHMENTS

Item	Description
------	-------------

- | | |
|----|---------------------------------------------|
| 1. | Liquid Spill Containment Area Requirements. |
| 2. | Exhibits 1, 2, and 3 |
| 3. | References 4.1.1 and 4.5 |

Summary: See Section 7 of Analysis

Attachments (if any): See Section 8 of Analysis



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ATTACHMENT 1 Liquid Spill Containment Area Requirements

Area Number	Room Number	Room Description	Zone	Gross Containment Area (sq.ft.)	Curbs (sq. ft.)	Anchor Plates (sq. ft.)	Other Fixed Equipment (sq. ft.)	Drums and Boxes on Floor (sq. ft.)	Total Occupied Area (sq. ft.)	Net Containment Area for RCRA (sq. ft.)	Volume from Liquid Wastes (gallons)	Calculated minimum RCRA Curb Height (inches)	Notes <i>(Unless otherwise specified, containment curb heights are 4-inches high)</i>
First Floor													
1-01	134	Waste Receiving and Storage	Clean	1108.3	80.8	4.9	0.0	0.0	85.7	1022.6	1379	2.2	4 boxes and 20 drums (55-gal) on conveyors Installed overflow trough is 2-inches high designed to flow into Room 131 (Area 1-07) an approved RCRA containment area.
1-02	009	Box Elevator	Clean	136.7	0.0	0.8	4.0	0.0	4.8	131.9	1379	16.77	1 box staged in elevator Installed curb height is 12 inches Reference 4.4 designates this Area as "in process" thus removing the requirement to contain the volume of the waste box.
1-05	146	Drum Storage Area "A"	Z1	814.3	41.0	6.4	9.0	127.7	184.1	630.2	455.0		24 drums (4 85-gal & 20 100-gal) on conveyors, 26 drums (85-gal) staged on floor, total waste volume 4550-gal
	145	Corridor	Z1	164.4	164.4	0.0	0.0	0.0	164.4	0.0	0.0		
		Total		978.7	205.4	6.4	9.0	127.7	348.5	630.2	455.0	1.2	Installed overflow troughs in this area are 2-inches high.
1-06	146A	Waste Drum Venturi/Filter	Z2	923.3	14.7	5.5	10.0	72.1	102.3	821.0	199.0		16 drums (55-gal) on conveyors and 6 drums (100-gal) and 6 drums (85-gal) staged on floor, total volume 1990-gal
	146B	Drum Storage Area "B"	Z2	305.8	13.4	3.4	1.0	42.5	60.3	245.5	120.0		6 drums (100-gal) on conveyors and 6 drums (100-gal) staged on floor, total volume 1200-gal



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ATTACHMENT 1 Liquid Spill Containment Area Requirements

Area Number	Room Number	Room Description	Zone	Gross Containment Area (sq.ft.)	Curbs (sq. ft.)	Anchor Plates (sq. ft.)	Other Fixed Equipment (sq. ft.)	Drums and Boxes on Floor (sq. ft.)	Total Occupied Area (sq. ft.)	Net Containment Area for RCRA (sq. ft.)	Volume from Liquid Wastes (gallons)	Calculated minimum RCRA Curb Height (inches)	Notes <i>(Unless otherwise specified, containment curb heights are 4-inches high)</i>
First Floor (continued)													
1-07	141B	Supercompaction	Z2	1644.4	0.0	10.0	155.0	127.3	292.3	1352.1	260.5		11 drums (55-gal) in glovebox, 2 drums (100-gal) on conveyors, 18 drums (100-gal) staged on floor, total volume 2,605-gal
	141	Vestibule	Z1/Z2	110.0	18.3	0.0	0.0	0.0	18.3	91.7	0.0		
		Total		2983.5	46.4	18.9	166.0	241.9	473.2	2510.3	579.5	0.4	Installed overflow trough in this area is 2-inches high.
1-07	131	Transfer Conveyor	Z1	1536.2	238.6	5.4	16.0	314.2	574.2	962.0	803.0	1.4	46 drums (55-gal) on conveyors, 100 drums (55-gal) staged on floor, total volume 8030-gal. Maximum 6000-gal of fire sprinkler water to contain for areas greater than 1500 sq.ft.
1-08	127B	Vestibule/Airlock	Z1/Z2	91.6	0.0	1.2	0.0	0.0	1.2	90.4	55.0	1.0	Installed overflow troughs in this area are 2-inches high.
1-09	127A	Drum Venturi Airlock	Z2	400.0	67.5	1.6	18.0	0.0	87.1	312.9	55.0	0.3	4 drums (55-gal) on conveyors
1-10	126B	Drum Assay Area	Z2	223.2	22.3	4.5		0.0	38.8	184.4	55.0	0.5	5 drums (55-gal) in GB, 1 drum (55-gal) on conveyor
													1 drum (55-gal) in GB, 2 drums(55-gal) docked to GB. RCRA containment is required only in the vicinity of the Drum Import/Export GB. This is reflected in the Gross Containment Area used for this Area

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ATTACHMENT 1 Liquid Spill Containment Area Requirements

Area Number	Room Number	Room Description	Zone	Gross Containment Area (sq.ft.)	Curbs (sq. ft.)	Anchor Plates (sq. ft.)	Other Fixed Equipment (sq. ft.)	Drums and Boxes on Floor (sq. ft.)	Total Occupied Area (sq. ft.)	Net Containment Area for RCRA (sq. ft.)	Volume from Liquid Wastes (gallons)	Calculated minimum RCRA Curb Height (inches)	Notes <i>(Unless otherwise specified, containment curb heights are 4-inches high)</i>
First Floor (continued)													
1-11	126C	Drum Assay Conveyors	Z3	740.6	14.7	6.0	28.0	0.0	48.7	691.9	165.0		30 drums (55-gal) on conveyors or pedestals, total volume 1650-gal.
	125B	North Box Line/Drum Conveyor Area	Z3	1085.0	14.7	10.0	12.0	0.0	36.7	1048.3	154.0		28 drums (55-gal) on conveyors or pedestals, total volume 1540-gal
	124B	South Box Line/Drum Conveyor Area	Z3	1085.0	14.7	10.0	12.0	0.0	36.7	1048.3	154.0		28 drums (55-gal) on conveyors or pedestals, total volume 1540-gal
		Total		2910.6	44.1	26.0	52.0	0.0	122.1	2788.5	473.0	0.3	
1-12	147	Central Conveyor System Feed Area	Z3	2698.7	35.0	10.0	35.0	201.0	281.0	2417.7	825.0	0.6	86 drums (55-gal) on conveyors or pedestals, 64 drums (55-gal) staged on floor, total volume 8250-gal
	147D	Maintenance Area	Z3										(included in 147 above)
1-15	143	Drum Storage Area "C"	Clean	1415.3	84.5	9.0	21.0	0.0	114.5	1300.8	320.0	0.4	20 drums (85-gal) and 15 drums (100-gal) on conveyors, total volume 3200-gal Installed overflow trough in this area is 2-inches high.
Second Floor and Interstitial Level													
2-02	236	SCW Treatment	Z2	2960.2	95.1	10.0	230.0	68.8	403.9	2556.3	204.0	0.2	10 drums (85-gal) in glovebox, 14 drums (85-gal) staged on floor, total volume 2040-gal.
2-03	226	Box Conveyor Area	Z1	400.0	19.7	2.0	8.0	0.0	29.7	370.3	1379	6.0	2 boxes on conveyors Installed curb height is 7-inches

ATTACHMENT 1
Liquid Spill Containment Area Requirements

Area Number	Room Number	Room Description	Zone	Gross Containment Area (sq.ft.)	Curbs (sq. ft.)	Anchor Plates (sq. ft.)	Other Fixed Equipment (sq. ft.)	Drums and Boxes on Floor (sq. ft.)	Total Occupied Area (sq. ft.)	Net Containment Area for RCRA (sq. ft.)	Volume from Liquid Wastes (gallons)	Calculated minimum RCRA Curb Height (inches)	Notes <i>(Unless otherwise specified, containment curb heights are 4-inches high)</i>
Second Floor and Interstitial Level (continued)													
2-04	217C	V.G. Door Airlock	Z2	239.6	0.0	1.0	10.0	0.0	11.0	228.6	1379		1 box on conveyor
	217B	Switchchange	Z2	98.2	31.8	0.0	0.0	0.0	31.8	66.4	0.0		
		Total		337.8	31.8	1.0	10.0	0.0	42.8	295.0	1379	7.5	Installed curb height is 7.5-inches
2-05	232B	Operations Area	Z3	1042.3	15.9	0.0	0.0	188.5	204.4	837.9	330.0		60 drums (55-gal) staged on floor, total volume 3300-gal
	232H	LLW Export Corridor	Z3	164.7	0.0	0.0	0.0	0.0	0.0	164.7	0.0		
		Total		1207.0	15.9	0.0	0.0	188.5	204.4	1002.6	330.0	0.6	Installed curb height is 7-inches
2-06	229B	North Box Line	Z3	1562.7	15.9	10.0	295.0	0.0	320.9	1241.8	1379		6 boxes on conveyors or pedestals, sort troughs not excluded from containment area
	220B	Switchchange	Z2/Z3	138.7	14.7	0.0	0.0	0.0	14.7	124.0	0.0		
	220C	V.G. Door Airlock	Z2/Z3	304.9	0.0	3.0	25.0	0.0	28.0	276.9	0.0		
		Total		2006.3	30.6	13.0	320.0	0.0	363.6	1642.7	1379	1.4	
2-07	228B	South Box Line	Z3	1357.0	31.9	10.0	407.0	0.0	448.9	908.1	1379	2.5	4 boxes on conveyors or pedestals, sort troughs not excluded from containment area
2-08	224B	Hot Maintenance	Z3	1012.1	22.9	0.0	10.0	0.0	32.9	979.2	0.0		48 drums (55-gal) staged on floor, total volume 2640-gal
	225A	Box Size Reduction Area	Z3	936.0	14.7	2.3	95.0	0.0	112.0	824.0	1379		1 box on conveyor
		Total		1948.1	37.6	2.3	105.0	0.0	144.9	1803.2	1379	1.3	



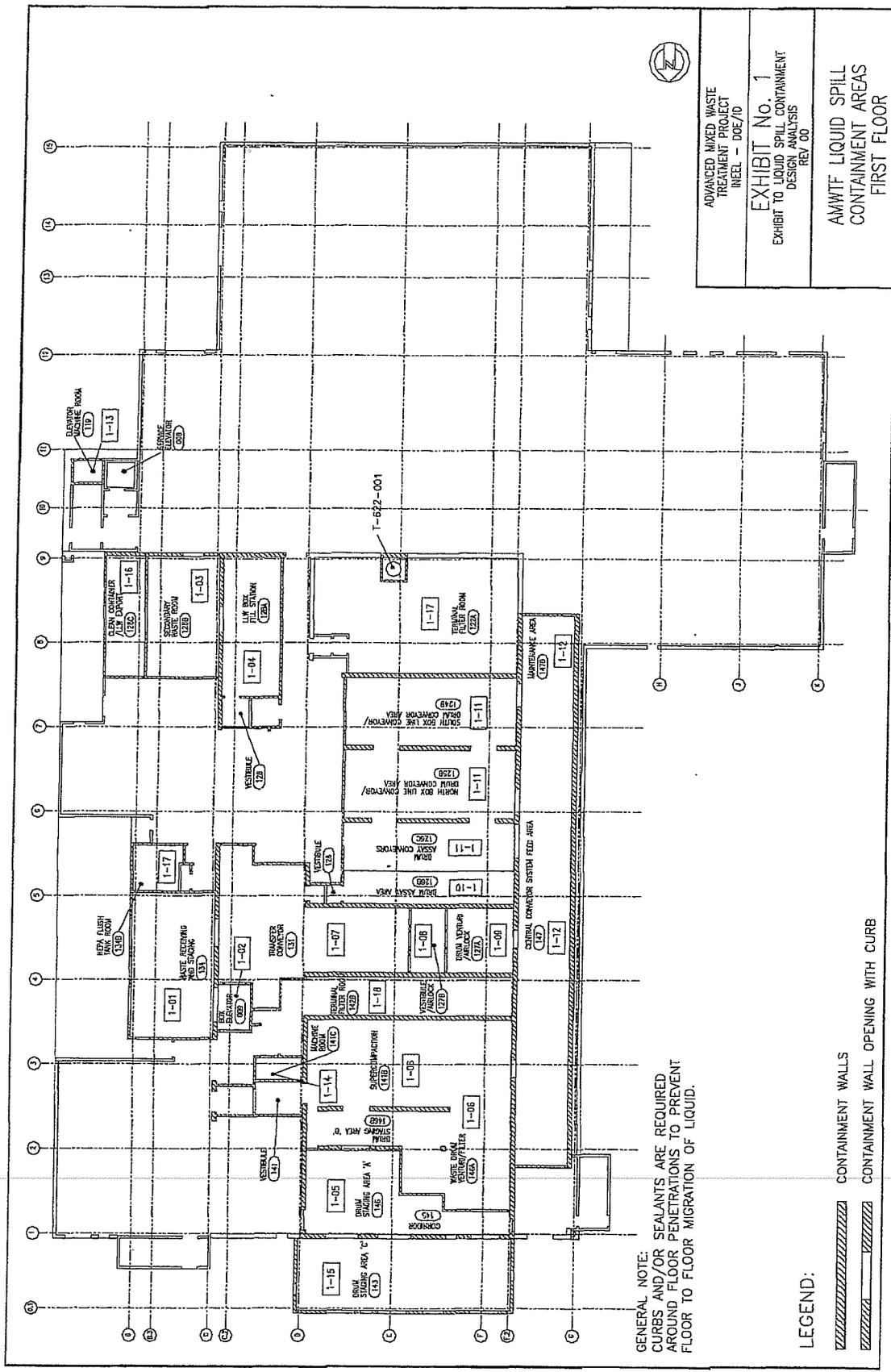
Advanced Mixed Waste Treatment Project

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ATTACHMENT 2



GENERAL NOTE:
CURBS AND/OR SEALANTS ARE REQUIRED
AROUND FLOOR PENETRATIONS TO PREVENT
FLOOR TO FLOOR MIGRATION OF LIQUID.

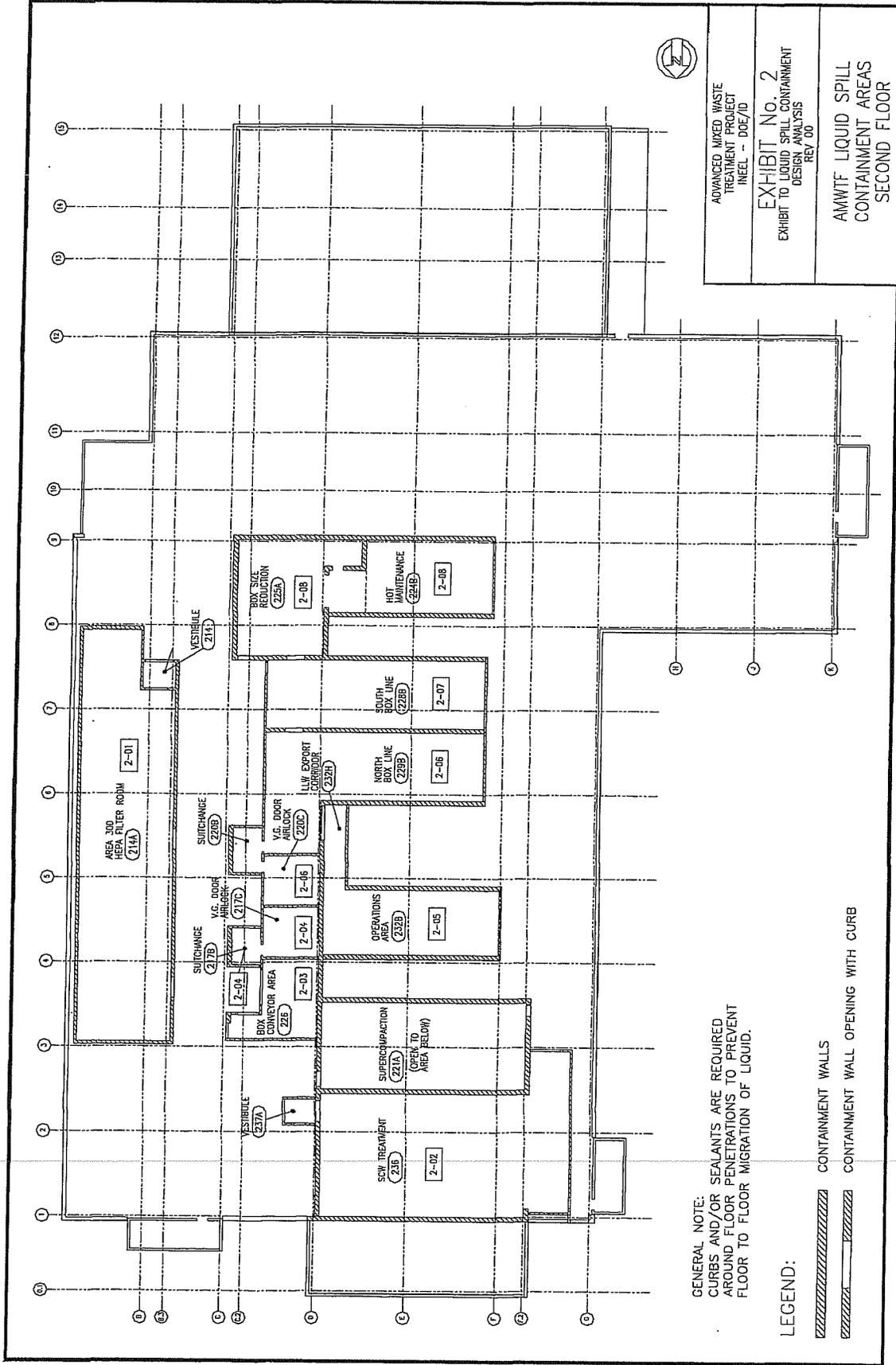
LEGEND:

- CONTAINMENT WALLS
- CONTAINMENT WALL OPENING WITH CURB

 ADVANCED MIXED WASTE TREATMENT PROJECT INEEL - DOE/ID
EXHIBIT No. 1 EXHIBIT TO LIQUID SPILL CONTAINMENT DESIGN ANALYSIS REV 00
AMWTF LIQUID SPILL CONTAINMENT AREAS FIRST FLOOR

CADD FILE: NSK-549_00_EXHIBIT-1.DWG
 EDF-0271, Revision 02

ATTACHMENT 2



GENERAL NOTE:
CURBS AND/OR SEALANTS ARE REQUIRED
AROUND FLOOR PENETRATIONS TO PREVENT
FLOOR TO FLOOR MIGRATION OF LIQUID.

LEGEND:

- CONTAINMENT WALLS
- CONTAINMENT WALL OPENING WITH CURB

ADVANCED MIXED WASTE TREATMENT PROJECT INTEL - DOE/ID
EXHIBIT No. 2 EXHIBIT TO LIQUID SPILL CONTAINMENT DESIGN ANALYSIS REV. 00
AMWTF LIQUID SPILL CONTAINMENT AREAS SECOND FLOOR

ATTACHMENT 3

Reference 4.1.1

[Code of Federal Regulations]
[Title 40, Volume 25]
[Revised as of July 1, 2005]
From the U.S. Government Printing Office via GPO Access
[CITE: 40CFR264.175]

[Page 357]

TITLE 40--PROTECTION OF ENVIRONMENT
CHAPTER I--ENVIRONMENTAL PROTECTION AGENCY (CONTINUED)

PART 264_ STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT,
STORAGE, AND DISPOSAL FACILITIES--Table of Contents

Subpart I Use and Management of Containers
Sec. 264.175 Containment.

(a) Container storage areas must have a containment system that is designed and operated in accordance with paragraph (b) of this section, except as otherwise provided by paragraph (c) of this section.

(b) A containment system must be designed and operated as follows:

(1) A base must underly the containers which is free of cracks or gaps and is sufficiently impervious to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed;

(2) The base must be sloped or the containment system must be otherwise designed and operated to drain and remove liquids resulting from leaks, spills, or precipitation, unless the containers are elevated or are otherwise protected from contact with accumulated liquids;

(3) The containment system must have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container, whichever is greater. Containers that do not contain free liquids need not be considered in this determination;

(4) Run-on into the containment system must be prevented unless the collection system has sufficient excess capacity in addition to that required in paragraph (b)(3) of this section to contain any run-on which might enter the system; and

(5) Spilled or leaked waste and accumulated precipitation must be removed from the sump or collection area in as timely a manner as is necessary to prevent overflow of the collection system.

[Comment: If the collected material is a hazardous waste under part 261 of this Chapter, it must be managed as a hazardous waste in accordance with all applicable requirements of parts 262 through 266 of this chapter. If the collected material is discharged through a point source to waters of the United States, it is subject to the requirements of section 402 of the Clean Water Act, as amended.]

(c) Storage areas that store containers holding only wastes that do not contain free liquids need not have a containment system defined by paragraph (b) of this section, except as provided by paragraph (d) of this section or provided that:

(1) The storage area is sloped or is otherwise designed and operated to drain and remove liquid resulting from precipitation, or

(2) The containers are elevated or are otherwise protected from contact with accumulated liquid.

(d) Storage areas that store containers holding the wastes listed below that do not contain free liquids must have a containment system defined by paragraph (b) of this section:

(1) FO20, FO21, FO22, FO23, FO26, and FO27.

(2) [Reserved]

[46 FR 55112, Nov. 6, 1981, as amended at 50 FR 2003, Jan. 14, 1985]

ATTACHMENT 3

Reference 4.5



TECHNICAL QUERY

TQ Number: MK-144

To: (Recipient) John Isherwood / <u>P. Leatherbarrow</u>		Organization: BNFL
From: (Requestor) Todd Gooding		Organization: MK
Subject/Document: Maximum/minimum box size requirements for AMWTF		
Section 1 Information Requested: What are the maximum and minimum dimensions of boxes allowed into the AMWTF? The PDC Rev. 05 5.3.4.1 states that the maximum box size is "58.5 inches by 76.4 inches by 96 inches (+/- 2 inches)." A maximum width of 58.5 inches plus 2 inches for tolerance provides a design width of 60.5 inches. Currently, the wall openings for the VG doors are 62 inches wide. Construction tolerances for the location of wall are +/- 0.5 inches. A worst case scenario could lead to a box to wall opening clearance of only 0.5 inches ((61.5 inches - 60.5 inches)/2). HR has expressed great concern at locating a 10,000-pound box within this tolerance. Rumors exist about the maximum box dimensions changing such that the width of wall openings for the VG doors is not a concern. If the PDC is correct, then the VG door opening width must be increased to provide additional clearance to allow a box to pass through the wall opening without risk. The PDC Rev. 04 does not indicate a minimum box size yet there are box dimensions shown in Table S.1-2 of 24 inches by 24 inches by 18 inches. Current box line design does not accommodate a box this small.		
Name: Todd Gooding	Signature: <u>Todd Gooding</u>	Date: <u>5/19/01</u>

Section 2. Reply: THE MAXIMUM AND MINIMUM BOX ENVELOPE SIZES ARE AS FOLLOWS: MAX - 56 in x 76.5 x 96 (W x H x L). MIN - 48 in x 24 x 68 ALL BOXES OUTSIDE OF THESE ENVELOPE SIZES WILL REQUIRE REPACKING TO CONFORM.		
Name: <u>P. LEATHERBARROW.</u>	Signature: <u>P. Leatherbarrow</u>	Date: <u>05/10/01.</u>



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CS

Implementing Document: MP-CD&M-11.6

EDF No.: 0272	Revision No.: 02	FMP No. (if any): NA
Title: Secondary Containment System Capacity Calculations – HMWA/RCRA		Building/System No.: WMF-676 / System 000

Summary:

Purpose/Scope:

This EDF, in conjunction with EDF-0271, is a revision to and supersedes EDF-0081, which was previously OPSCAL-ME-0033 and BNFL-03053-002. This revision isolates the NFPA secondary containment requirements from the HWMA/RCRA secondary containment requirements for the AMWTP Treatment Facility WMF-676. Changes at this revision, shown in *bold/italics*, show updated calculations for Area 1-10, Room 126B.

Conclusion / Recommendations:

Refer to Section 7 of Analysis

References: See Section 4 of Analysis

Originator: *Curry Cunnell* *[Signature]* *7/5/11*
Signature Date:

Technical Review: *Mark Hiatt* *[Signature]* *7/5/11*
Signature Date:

Additional Reviewers: (by title)		
Print Title	Signature	Date
	<i>NA</i>	
Print Title	Signature	Date

Distribution List:

Approval:

Printed Name: *Ron Todd*

Printed Title: *Engineering Manager*

R. Todd *7-12-11*
Signature Date

EDF No.: 0272	Revision No.: 02	FMP No. (if any): NA
Title: Secondary Containment System Capacity Calculations – HMWA/RCRA		Building/System No.: WMF-676 / System 000
Scope: See Section 1 of Analysis		

Analysis:

1 PURPOSE

The purpose of this analysis is to determine and show the areas where secondary containment under Uniform Fire Code (UFC), National Fire Protection Association (NFPA), and DOE Order 420.1 is required.

This updated analysis has been prepared to represent the Advanced Mixed Waste Treatment Facility (AMWTF or WMF-676) liquid spill containment configuration in its final condition before the startup of “hot” operations.

2 METHOD

2.1 The design method is as follows:

- 2.1.1 Identify rooms or areas for containment. The AMWTF is segregated into individual containment areas that include single or multiple rooms.
- 2.1.2 Determine gross room areas and overall containment areas. The areas are determined from the architectural general floor plan arrangements.
- 2.1.3 Determine net containment areas and total liquid spill containment volumes for each containment area.
 - NFPA 13, NFPA 15, and UFC requirements determine the required containment area volume to contain fire protection sprinkler water.
- 2.1.4 Show containment boundaries on Exhibits 1, 2, and 3.

3 DESIGN INPUTS AND ASSUMPTIONS

- 3.1 Room areas and overall containment areas are based on the architectural general arrangement drawings (Section 4.2)
- 3.2 Fire sprinkler occupancy classification is Ordinary Hazard Group 2 in accordance with the Uniform Fire Code. As such, design sprinkler densities are assumed at 0.2 gpm/ft² up to a maximum floor area of 1500 ft³. For the purposes of calculating containment volumes, assume fire sprinkler water flows at the design density for a period of 20 minutes.
- 3.3 Curbs, as used in this document, are to show containment areas, not necessarily to imply that curbs are the only method of containment. Curbs, landing pads, stoops, ramps, troughs, grates, sealants, and other means will provide control of spilled liquids and fire protection sprinkler water.
- 3.4 Nominal curb height is 4 inches throughout WMF-676. In a number of rooms and areas, other curb heights and/or containment methods *exist* to meet fire protection sprinkler water containment requirements.

- 3.5 Overflow troughs exist in a number of rooms and areas to contain the design volume of fire protection sprinkler water within adjacent spill containment areas. These overflow troughs are located at a height above the calculated minimum RCRA curb heights, at least 2-inches above the floor. Thus, there exists no impact to the required RCRA curb heights because of installed overflow troughs used for containment of fire protection sprinkler water.
- 3.6 Nominal trough dimensions are 2 inches in depth and 8 inches in width, with the bottom of the trough located 2 inches above the floor. Nominal flow for each overflow trough is 70 gallons per minute.
- 3.7 For the purposes of calculating fire protection containment volumes, assume that free liquids from the single largest container of mixed waste are negligible with respect to the volume of fire protection sprinkler water. Therefore, the volume of fire protection sprinkler water to contain does not include the volume of potential liquid wastes that may be spilled concurrently with the discharge of fire protection sprinkler water.
- 3.8 The architectural general arrangement drawings serve as the basis for gross floor area calculations for rooms and containment areas. The method for calculating net floor areas and overall containment volumes includes subtracting occupied areas from the gross floor areas. Detailed walk down measurements of curbs, anchor plates, and other fixed equipment, and estimating the numbers of containers staged on the floors serve as the basis for calculating occupied floor areas. Attachment 1 provides the results of these calculations.

4 REFERENCES

4.1 Codes and Standards

- 4.1.1 NFPA 13: Installation of Sprinkler Systems
- 4.1.2 NFPA 15: Standard for Water Spray Fixed Systems for Fire Protection
- 4.1.3 Uniform Fire Code
- 4.1.4 DOE Order 420.1, Facility Safety

4.2 Architectural Drawings

- 53-0201, Treatment Facility First Floor Plan General Arrangement
- 53-0207, Treatment Facility Second Floor Plan General Arrangement
- 53-0212, Treatment Facility Interstitial Utility Access General Arrangement

- 4.3 RPT-ESH-012, AMWTP Fire Hazards Analysis, July 2004
- 4.4 AMWTP HWMA/RCRA Treatment Permit
- 4.5 AMWTP EDF-0017, AMWTP Secondary Containment System Capacity Calculations Summary
- 4.6 BNFL-03053-002, Liquid Spill Containment Design Analysis
- 4.7 AMWTP EDF-0081, WMF-676 Secondary Containment System Capacity Calculations
- 4.8 AMWTP EDF-0271, WMF-676 Secondary Containment System Capacity Calculations – HWMA/RCRA

5 COMPUTER SOFTWARE

This calculation did not perform computer modeling. This calculation used computer software spreadsheets (Microsoft® Excel) to organize data and to perform simple calculations such as the calculation of net areas, volumes, and curb heights for containment.

6 DESIGN ANALYSIS

This design analysis includes the design rationale, considerations and requirements for containment of fire protection sprinkler water, followed by a description of the specific areas where containment is required. Calculations performed to determine net containment areas and liquid volumes to contain form the primary basis for minimum curb heights and/or containment methods needed to meet fire protection requirements for liquid spill containment. The following is a summary of the steps taken to complete the liquid spill containment design analysis for the AMWTF.

First, the analysis developed containment areas throughout the plant (WMF-676). Containment areas consist of one or more adjacent rooms generally within the same building ventilation zone. Exhibits 1, 2, and 3 (Attachment 2) show these containment areas. Gross containment areas were calculated from the architectural general arrangement drawings, followed by walk downs and detailed calculations to determine net containment areas for both fire protection and RCRA spill containment.

Second, the analysis determined the volume of liquid to contain for fire protection for each of the containment areas. The volume of the fire protection sprinkler water to contain was calculated at the UFC design flow and density (0.2 gpm/ft² for 20 minutes or 4 gal/ft²) up to a maximum of 1500 ft² (6000 gal) for each individual containment area.

Third, the analysis calculated the minimum curb height for fire protection for each of the containment areas, rounded up to the nearest 0.1 inch. In a number of areas, higher curbs and/or overflow troughs are necessary to meet fire protection requirements for spill containment, as the nominal curb heights throughout WMF-676 are 4 inches. Attachment 1 specifies installed curb heights and overflow troughs required to meet both fire protection and RCRA requirements.

Attachment 1 "Liquid Spill Containment Area Requirements" provides the detailed arrangement and organization of containment areas within WMF-676. In addition, it provides calculations for gross containment areas, occupied areas (e.g. curbs, anchor plates, other fixed equipment, containers staged on floors), net containment areas, volumes to contain for fire protection sprinkler water, and minimum curb heights for fire protection sprinkler water containment.

6.1 General Design Considerations

6.1.1 Regulatory Requirements

UFC, NFPA, and DOE Order 420.1 establish the need for and the design requirements applicable to containment of fire protection sprinkler water and hazardous materials (liquids only) in the AMWTF. Containment curbs and walls will contain fire protection sprinkler water from areas with potential surface contamination from radioactive. UFC requires indoor storage of radioactive materials in accordance with 8003.1. UFC requires secondary containment of hazardous materials liquids and fire protection sprinkler water. The secondary containment system (SCS) shall contain a spill from the single largest container, plus the volume of fire protection sprinkler water from the minimum design area for a period of 20 minutes. Where

process data indicated that the free liquid in any single container is minor, this analysis considers the volume negligible and is not included in the spill containment calculations. The design requirements set forth in these documents regulate the design analysis for determining liquid spill containment curb heights.

6.2 Containment Curb Calculation

6.2.1 Containment Areas

Containment areas were developed for the AMWTF where liquid spill containment is required for fire protection sprinkler water and RCRA liquid wastes. Attachment 1 shows containment areas grouped into 18 containment areas on the first floor (26 rooms) and 13 containment areas (19 rooms) on the second floor and interstitial level. All 31 are required to contain fire protection sprinkler water, with 17 required to contain RCRA liquid wastes (see Reference 4.8). The modification of curb heights and installation of overflow troughs, as necessary, satisfies containment needs.

6.2.2 Floor Space Occupied by Curbs, Equipment and Containers

In general, the architectural general arrangement drawings served as the basis for calculating the gross floor space of each containment area. The occupied floor space within each containment area was determined by measuring the floor area occupied by curbs, anchor plates, and other fixed equipment, plus the area occupied by the estimated number of containers projected to be staged on each floor area.

The calculation does not consider transient items (containers staged on the floors) in the occupied floor area for fire protection curbing calculations. Therefore, occupied floor area for fire protection sprinkler water is greater than that for the RCRA liquid wastes by the area occupied by transient items (containers staged on floors).

The calculation used actual dimensions of curbs for each containment area, while using 50% of the floor area occupied by the ramps connected to curbs.

The calculation used a value of 0.1 ft² per anchor plate within occupied areas to account for the base plate and attached support leg for installed equipment. The calculation used larger values of occupied area for large anchor plates such as those required for support columns.

The calculation used architectural general arrangement drawings, field measurements, and visual estimates of major pieces of equipment within each containment area for other fixed equipment within occupied areas.

6.2.3 Net Containment Area

Subtracting the total occupied floor area from the gross floor area, for each containment area, results in its net containment area.

6.2.4 Volume of Liquid to Contain

The calculation uses the UFC design flow and density to determine the volume of fire protection sprinkler water to contain. These design values are 0.2 gpm/ft² for 20 minutes or 4 gal/ft² up to a maximum of 1500 ft² (6000 gal) for each individual containment area.

6.2.5 Minimum Curb Heights

Minimum fire protection (NFPA) curb heights required for containing the fire protection sprinkler water were calculated as follows:

The calculation converted the volume of fire protection sprinkler water to contain to cubic feet, then divided by the adjusted net containment area, and multiplied by 12 in/ft. Note that not all containment areas provide curb heights that will alone satisfy the fire protection containment requirements. In these areas, higher curbs and/or overflow troughs are necessary to meet fire protection requirements, as the nominal curb heights throughout WMF-676 are only 4 inches. Attachment 1 specifies installed curb heights and overflow troughs required to meet fire protection requirements.

7 CONCLUSIONS

Attachment 1 lists the calculated minimum required design curb heights to meet fire protection sprinkler water containment requirements. These curb heights are based on:

- Containment area configuration prior to "hot" operations
- Net containment area (ft²)
- Calculated volumes to contain
- Fire sprinkler design flow and density

Attachment 2 shows the containment areas represented as Exhibits 1, 2, and 3.

The nominal curb height of 4 inches is adequate for containment of fire protection sprinkler water in all areas except the following:

- Room 128B, Secondary Waste Room, 7.2-inch curb required, 4-inch curb installed, excess fire sprinkler water designed to overflow into Room 128C and Room 129 via installed overflow troughs.
- Room 128A, LLW Box Fill Station, 6.5-inch curb required, 6.5-inch curb installed.
- Room 146/145, Drum Staging Area "A"/Corridor, 8.3-inch curb required, 4-inch curb installed, excess fire sprinkler water designed to overflow into Room 143 and Room 141B via installed overflow troughs.
- Room 131, Transfer Conveyor, 7.6-inch curb required, 4-inch curb installed, excess fire sprinkler water designed to overflow into Room 134 and Room 142B via installed overflow troughs.
- Room 127B, Vestibule/Airlock, 6.5-inch curb required, 4-inch curb installed, excess fire sprinkler water is contained by overflow into Room 127A and Room 131.
- Room 127A, Drum Venturi/Airlock, 8.2-inch curb required, 4-inch curb installed, excess fire sprinkler water is contained by overflow into Room 127B and Room 131.
- Room 126B, Drum Assay Area, 7.8-inch curb required, 4-inch curb installed, excess fire sprinkler water is contained by overflow into Room 131.
- Room 119, Elevator Machine Room, 6.5-inch curb required, 8.0-inch curb installed.
- Room 141C, Machine Room, 6.4-inch curb required, 8.0-inch curb installed.

- Room 143, Drum Staging Area "C", 7.0-inch curb required, 4-inch curb installed, excess fire sprinkler water designed to overflow into Room 146 and Room 141B via installed overflow troughs.
- Room 128C, Clean Container/LLW Export, 7.4-inch curb required, 4-inch curb installed, excess fire sprinkler water designed to overflow into Room 128B via installed overflow troughs.
- Room 122A, Terminal Filter Room, 4.7-inch curb required, 5.0-inch curb installed.
- Room 142B, Terminal Filter Room, 6.7-inch curb required, 4-inch curb installed, excess fire sprinkler water designed to overflow into Room 131 via installed overflow troughs.
- Room 226, Box Conveyor Area, 6.8-inch curb required, 7.0-inch curb installed.
- Room 217C/217B, V.G. Door Airlock/Suit change, 7.3-inch curb required, 7.5-inch curb installed.
- Room 232B/232H, Operations Area/LLW Export Corridor, 6.5-inch curb required, 7.0-inch curb installed.
- Room 229B/220B/220C, North Box Line/Suit change/V.G. Door Airlock, 5.9-inch curb required, 4.0-inch curb installed, excess fire sprinkler water designed to overflow into Room 228B and Room 225A via installed overflow troughs.
- Room 228B, South Box Line, 9.6-inch curb required, 4.0-inch curb installed, excess fire sprinkler water designed to overflow into Room 225A and Room 229B via installed overflow troughs.
- Room 224B/225A, Hot Maintenance/Box Size Reduction Area, 5.4-inch curb required, 4.0-inch curb installed, excess fire sprinkler water designed to overflow into Room 228B and Room 229B via installed overflow troughs.
- Room 224C/224A, Hydraulic Room/Vestibule, 7.0-inch curb required, 7.0-inch curb installed.
- Room 200B, Elevator Machine Room, 6.5-inch curb required, 8.0-inch curb installed.
- Room 212C, Filter Maintenance Area, 6.5-inch curb required, 7.0-inch curb installed.
- Room 212F, Filter Maintenance Area, 6.5-inch curb required, 7.0-inch curb installed.
- Room 212H, Filter Maintenance Area, 6.5-inch curb required, 7.0-inch curb installed.

8 ATTACHMENTS

Item Description

1. Liquid Spill Containment Area Requirements; Attachment 1, pages 11 – 17
2. Exhibits 1, 2, and 3; Attachment 2, pages 18 – 20

Summary: See Section 7 of Analysis

Attachments (if any): See Section 8 of Analysis

ATTACHMENT 1
Liquid Spill Containment Area Requirements

Area Number	Room Number	Room Description	Zone	Gross Containment Area (sq.ft.)	Curbs (sq.ft.)	Anchor Plates (sq.ft.)	Other Fixed Equipment (sq.ft.)	Total Occupied Area (sq.ft.)	Net Containment Area for NFPA (sq.ft.)	Volume of Liquid from Sprinklers (gallons)	Calculated minimum NFPA Curb Height (inches)	Notes
First Floor												
1-01	134	Waste Receiving and Storage	Clean	1108.3	80.8	4.9	0.0	85.7	1022.6	4433.2	4.0	Excess fire sprinkler water designed to overflow to Room 131 via installed troughs 1 box staged in elevator
1-02	009	Box Elevator	Clean	136.7	0.0	0.8	4.0	4.8	131.9	546.8	6.7	Installed curb height is 12 inches for NFPA and RCRA Reference 4.4 designates this Area as "in process" thus removing the requirement to contain the volume of the waste box.
1-03	128B	Secondary Waste Room	Z1	818.9	77.5	1.4	8.0	126.2	732.0	3275.6	4.0	Containment for NFPA requirements only, no liquid wastes allowed per administrative control
1-04	128A	LLW Box Fill Station	Z2	725.3	0.0	5.0	4.0	48.3	716.3	2901.2		Excess fire sprinkler water designed to overflow to Room 128C and Room 129 via installed troughs
	128	Vestibule	Z1/Z2	57.8	0.0	0.0	0.0	0.0	57.8	231.2		
		Total		783.1	0.0	5.0	4.0	48.3	774.1	3132.4	6.5	Containment for NFPA requirements only, no liquid wastes allowed per administrative control
1-05	146	Drum Storage Area "A"	Z1	814.3	41.0	6.4	9.0	184.1	757.9	3257.2		Installed curb height is 6.5 inches for NFPA
	145	Corridor	Z1	164.4	164.4	0.0	0.0	164.4	0.0	657.6		
		Total		978.7	205.4	6.4	9.0	348.5	757.9	3914.8	4.0	Excess fire sprinkler water designed to overflow to Room 143 and Room 141B via installed troughs

ATTACHMENT 1
Liquid Spill Containment Area Requirements

Area Number	Room Number	Room Description	Zone	Gross Containment Area (sq.ft.)	Curbs (sq.ft.)	Anchor Plates (sq.ft.)	Other Fixed Equipment (sq.ft.)	Total Occupied Area (sq.ft.)	Net Containment Area For NFPA (sq.ft.)	Volume of Liquid from Sprinklers (gallons)	Calculated minimum NFPA Curb Height (inches)	Notes
First Floor (continued)												
1-06	146A	Waste Drum Venturi/Filter	Z2	923.3	14.7	5.5	10.0	102.3	893.1	3693.2		
	146B	Drum Storage Area "B"	Z2	305.8	13.4	3.4	1.0	60.3	288.0	1223.2		
	141B	Supercompaction	Z2	1644.4	0.0	10.0	155.0	292.3	1479.4	6577.6		
	141	Vestibule	Z1/Z2	110.0	18.3	0.0	0.0	18.3	91.7	440.0		
		Total		2983.5	46.4	18.9	166.0	473.2	2752.2	6000.0	3.5	Maximum 6000-gal of fire sprinkler water to contain for areas greater than 1500 sq.ft.
1-07	131	Transfer Conveyor	Z1	1536.2	238.6	5.4	16.0	574.2	1276.2	6000.0	4.0	Maximum 6000-gal of fire sprinkler water to contain for areas greater than 1500 sq.ft. Excess fire sprinkler water designed to overflow to Room 134 and Room 142B via installed troughs
1-08	127B	Vestibule/Airlock	Z1/Z2	91.6	0.0	1.2	0.0	1.2	90.4	366.4	4.0	Installed curb height is 4 inches for NFPA. Excess fire sprinkler water is contained by overflow to Rooms 127A and 131
1-09	127A	Drum Venturi Airlock	Z2	400.0	67.5	1.6	18.0	87.1	312.9	1600.0	4.0	Installed curb height is 4 inches for NFPA. Excess fire sprinkler water is contained by overflow to Rooms 127B and 131
1-10	126B	Drum Assay Area	Z2	558.5	22.3	6.4	68.0	96.7	461.8	2234.0	4.0	Installed curb height is 4 inches for NFPA. Excess fire sprinkler water is contained by overflow to Room 131.

ATTACHMENT 1
Liquid Spill Containment Area Requirements

Area Number	Room Number	Room Description	Zone	Gross Containment Area (sq.ft.)	Curbs (sq. ft.)	Anchor Plates (sq. ft.)	Other Fixed Equipment (sq. ft.)	Total Occupied Area (sq. ft.)	Net Containment Area for NFPA (sq. ft.)	Volume of Liquid from Sprinklers (gallons)	Calculated minimum NFPA Curb Height (inches)	Notes
First Floor (continued)												
1-11	126C	Drum Assay Conveyors	Z3	740.6	14.7	6.0	28.0	48.7	691.9	2962.4		
	125B	North Box Line/Drum Conveyor Area	Z3	1085.0	14.7	10.0	12.0	36.7	1048.3	4340.0		
	124B	South Box Line/Drum Conveyor Area	Z3	1085.0	14.7	10.0	12.0	36.7	1048.3	4340.0		
		Total		2910.6	44.1	26.0	52.0	122.1	2788.5	6000.0	3.5	Maximum 6000-gal of fire sprinkler water to contain for areas greater than 1500 sq.ft.
1-12	147	Central Conveyor System Feed Area	Z3	2698.7	35.0	10.0	35.0	281.0	2618.7	6000.0	3.7	
	147D	Maintenance Area (included in 147 above)	Z3									
1-13	119	Elevator Machine Room	Clean	55.6	0.0	0.4	0.0	0.4	55.2	222.4	6.5	Containment for NFPA requirements only, non-RCRA area
1-14	141C	Machine Room	Z1	91.1	0.0	0.4	0.0	0.4	90.7	364.4	6.4	Installed curb height is 8 inches for NFPA Containment for NFPA requirements only, non-RCRA area
1-15	143	Drum Storage Area "C"	Clean	1415.3	84.5	9.0	21.0	114.5	1300.8	5661.2	4.0	Installed curb height is 8 inches for NFPA Excess fire sprinkler water designed to overflow to Room 146 and Room 141B via installed troughs
1-16	128C	Clean Container/LLW Export	Clean	440.0	52.1	1.3	0.0	53.4	386.6	1760.0	4.0	Containment for NFPA requirements only, no liquid wastes allowed per administrative control Excess fire sprinkler water designed to overflow to Room 128B via installed trough

ATTACHMENT 1 Liquid Spill Containment Area Requirements

Area Number	Room Number	Room Description	Zone	Gross Containment Area (sq.ft.)	Curbs (sq. ft.)	Anchor Plates (sq. ft.)	Other Fixed Equipment (sq. ft.)	Total Occupied Area (sq. ft.)	Net Containment Area for NFPA (sq. ft.)	Volume of Liquid from Sprinklers (gallons)	Calculated minimum NFPA Curb Height (inches)	Notes
First Floor (continued)												
1-17	122A	Terminal Filter Room	Z2	2128.9	63.0	5.0	10.0	266.4	2050.9	6000.0	4.7	Maximum 6000-gal of fire sprinkler water to contain for areas greater than 1500 sq. ft.
1-18	142B	Terminal Filter Room	Z2	836.0	26.6	1.4	2.0	92.8	806.0	3344.0	4.0	Installed curb height is 5 inches for NFPA Containment for NFPA requirements only, no liquid wastes allowed per administrative control Excess fire sprinkler water is designed to overflow to Room 131 via installed troughs
Second Floor and Interstitial Level												
2-01	214A	300 Area HEPA Filter Room	Z2	3338.2	147.9	10.0	20.0	240.7	3160.3	6000.0	3.0	Containment for NFPA requirements only, no liquid wastes allowed per administrative control. Maximum 6000-gal of fire sprinkler water to contain for areas greater than 1500 sq.ft.
2-02	236	SCW Treatment	Z2	2960.2	95.1	10.0	230.0	403.9	2625.1	6000.0	3.7	Maximum 6000-gal of fire sprinkler water to contain for areas greater than 1500 sq.ft.
2-03	226	Box Conveyor Area	Z1	400.0	19.7	2.0	8.0	29.7	370.3	1600.0	6.9	Installed curb height is 7 inches for NFPA and RCRA
2-04	217C	V.G. Door Airlock	Z2	239.6	0.0	1.0	10.0	11.0	228.6	958.4		
	217B	Suitchange	Z2	98.2	31.8	0.0	0.0	31.8	66.4	392.8		
		Total		337.8	31.8	1.0	10.0	42.8	295.0	1351.2	7.3	Installed curb height is 7.5 inches for NFPA and RCRA
2-05	232B	Operations Area	Z3	1042.3	15.9	0.0	0.0	204.4	1026.4	4169.2		

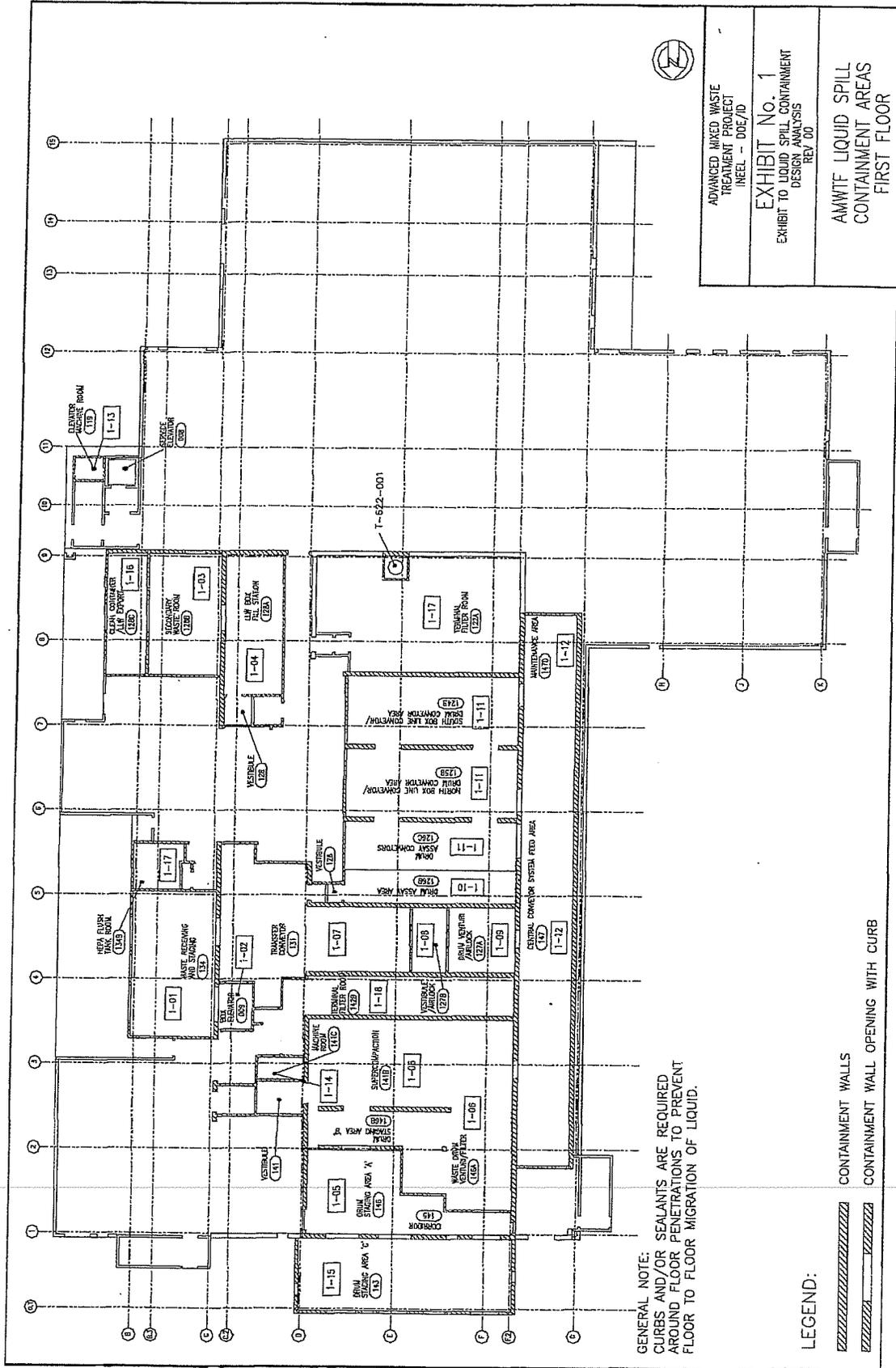
ATTACHMENT 1
Liquid Spill Containment Area Requirements

Area Number	Room Number	Room Description	Zone	Gross Containment Area (sq.ft.)	Curbs (sq. ft.)	Anchor Plates (sq. ft.)	Other Fixed Equipment (sq. ft.)	Total Occupied Area (sq. ft.)	Net Containment Area for NFPA (sq. ft.)	Volume of Liquid from Sprinklers (gallons)	Calculated minimum NFPA Curb Height (inches)	Notes
Second Floor and Interstitial Level (continued)												
	232H	LLW Export Corridor	Z3	164.7	0.0	0.0	0.0	0.0	164.7	658.8		
		Total		1207.0	15.9	0.0	0.0	204.4	1191.1	4828.0	6.5	Installed curb height is 7 inches for NFPA and RCRA
2-06	229B	North Box Line	Z3	1562.7	15.9	10.0	295.0	320.9	1241.8	6250.8		Waste sort troughs not excluded from containment area
	220B	Suitchange	Z2/Z3	138.7	14.7	0.0	0.0	14.7	124.0	554.8		
	220C	V.G. Door Airlock	Z2/Z3	304.9	0.0	3.0	25.0	28.0	276.9	1219.6		
		Total		2006.3	30.6	13.0	320.0	363.6	1642.7	6000.0	4.0	Maximum 6000-gal of fire sprinkler water to contain for areas greater than 1500 sq.ft.
2-07	228B	South Box Line	Z3	1357.0	31.9	10.0	407.0	448.9	908.1	5428.0	4.0	Excess fire sprinkler water designed to overflow to Room 228B and 225A via installed troughs Waste sort troughs not excluded from containment area
2-08	224B	Hot Maintenance	Z3	1012.1	22.9	0.0	10.0	32.9	979.2	4048.4		
	225A	Box Size Reduction Area	Z3	936.0	14.7	2.3	95.0	112.0	824.0	3744.0		
		Total		1948.1	37.6	2.3	105.0	144.9	1803.2	6000.0	4.0	Maximum 6000-gal of fire sprinkler water to contain for areas greater than 1500 sq.ft. Excess fire sprinkler water designed to overflow to Room 228B and 229B via installed troughs

ATTACHMENT 1
Liquid Spill Containment Area Requirements

Area Number	Room Number	Room Description	Zone	Gross Containment Area (sq.ft.)	Curbs (sq. ft.)	Anchor Plates (sq. ft.)	Other Fixed Equipment (sq. ft.)	Total Occupied Area (sq. ft.)	Net Containment Area for NFPA (sq. ft.)	Volume of Liquid from Sprinklers (gallons)	Calculated minimum NFPA Curb Height (inches)	Notes
Second Floor and Interstitial Level (continued)												
2-09	224C	Hydraulic Room	Z2	1279.9	0.0	1.0	100.0	132.4	1178.9	5119.6		
	224A	Vestibule	Z1/Z2	30.0	0.0	0.0	0.0	0.0	30.0	120.0		
		Total		1309.9	0.0	1.0	100.0	132.4	1208.9	5239.6	7.0	Containment for NFPA requirements only, non-RCRA area
2-10	200B	Elevator Machine Room	Clean	76.0	0.0	0.4	0.0	0.4	75.6	304.0	6.5	Installed curb height is 7 inches for NFPA Containment for NFPA requirements only, non-RCRA area
2-11	212C	Filter Maintenance Area	Z2	490.8	0.0	1.0	8.0	34.2	481.8	1963.2	6.5	Installed curb height is 8 inches for NFPA Containment for NFPA requirements only, no liquid wastes allowed per administrative control.
2-12	212F	Filter Maintenance Area	Z2	1164.5	0.0	6.4	4.0	60.7	1154.1	4658.0	6.5	Installed curb height is 7 inches for NFPA Containment for NFPA requirements only, no liquid wastes allowed per administrative control.
2-13	212H	Filter Maintenance Area	Z2	494.9	0.0	2.8	2.0	30.0	490.1	1979.6	6.5	Installed curb height is 7 inches for NFPA Containment for NFPA requirements only, no liquid wastes allowed per administrative control.

ATTACHMENT 2



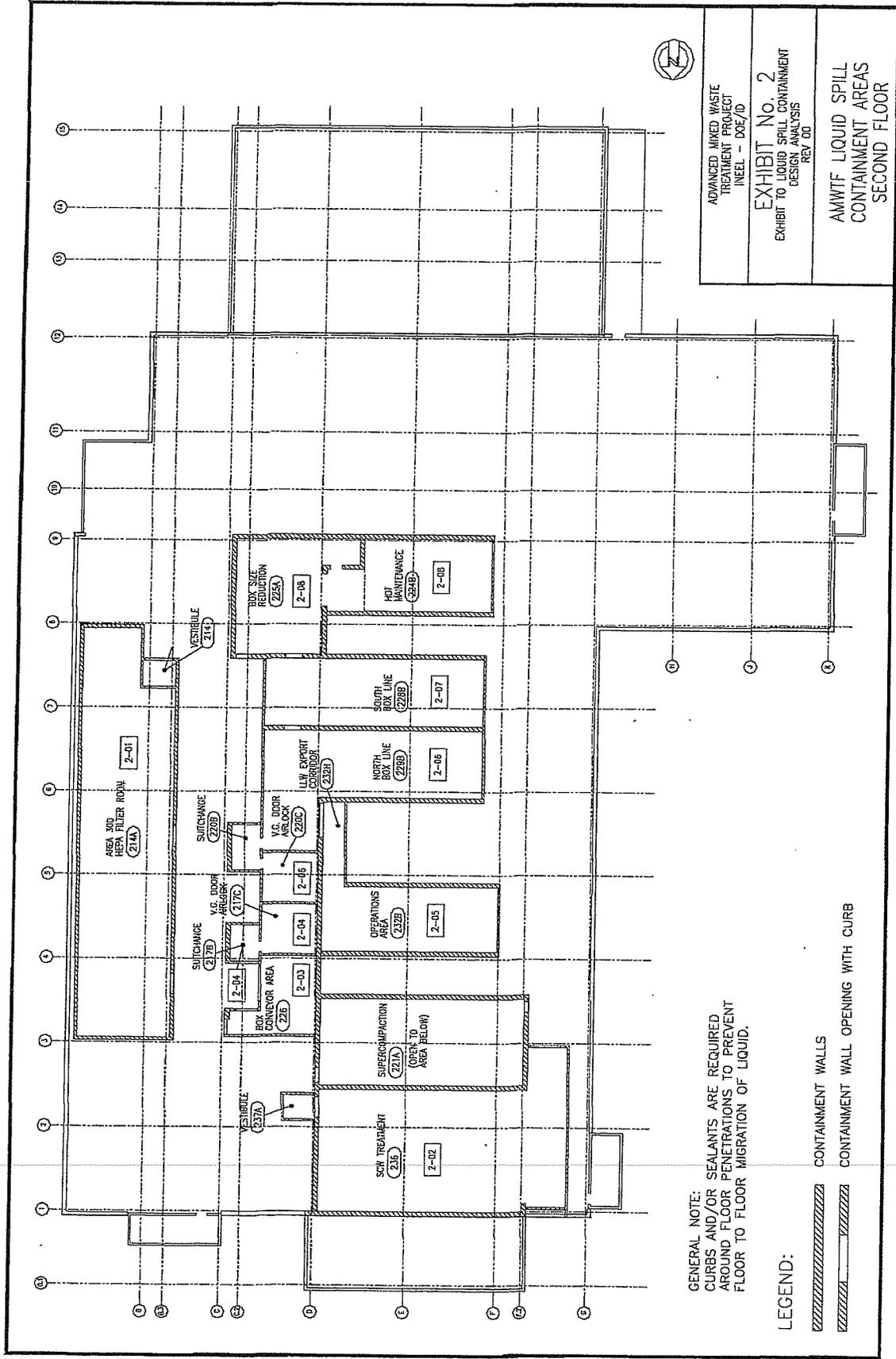
GENERAL NOTE:
CURBS AND/OR SEALANTS ARE REQUIRED
AROUND FLOOR PENETRATIONS TO PREVENT
FLOOR TO FLOOR MIGRATION OF LIQUID.

LEGEND:

- ████████████████████ CONTAINMENT WALLS
- ████████████████████ CONTAINMENT WALL OPENING WITH CURB

ADVANCED MIXED WASTE TREATMENT PROJECT INTEL - DOE/JD
EXHIBIT No. 1 EXHIBIT TO LIQUID SPILL CONTAINMENT DESIGN ANALYSIS REV 00
AMWTF LIQUID SPILL CONTAINMENT AREAS FIRST FLOOR

ATTACHMENT 2



GENERAL NOTE:
CURBS AND/OR SEALANTS ARE REQUIRED
AROUND FLOOR PENETRATIONS TO PREVENT
FLOOR TO FLOOR MIGRATION OF LIQUID.

LEGEND:

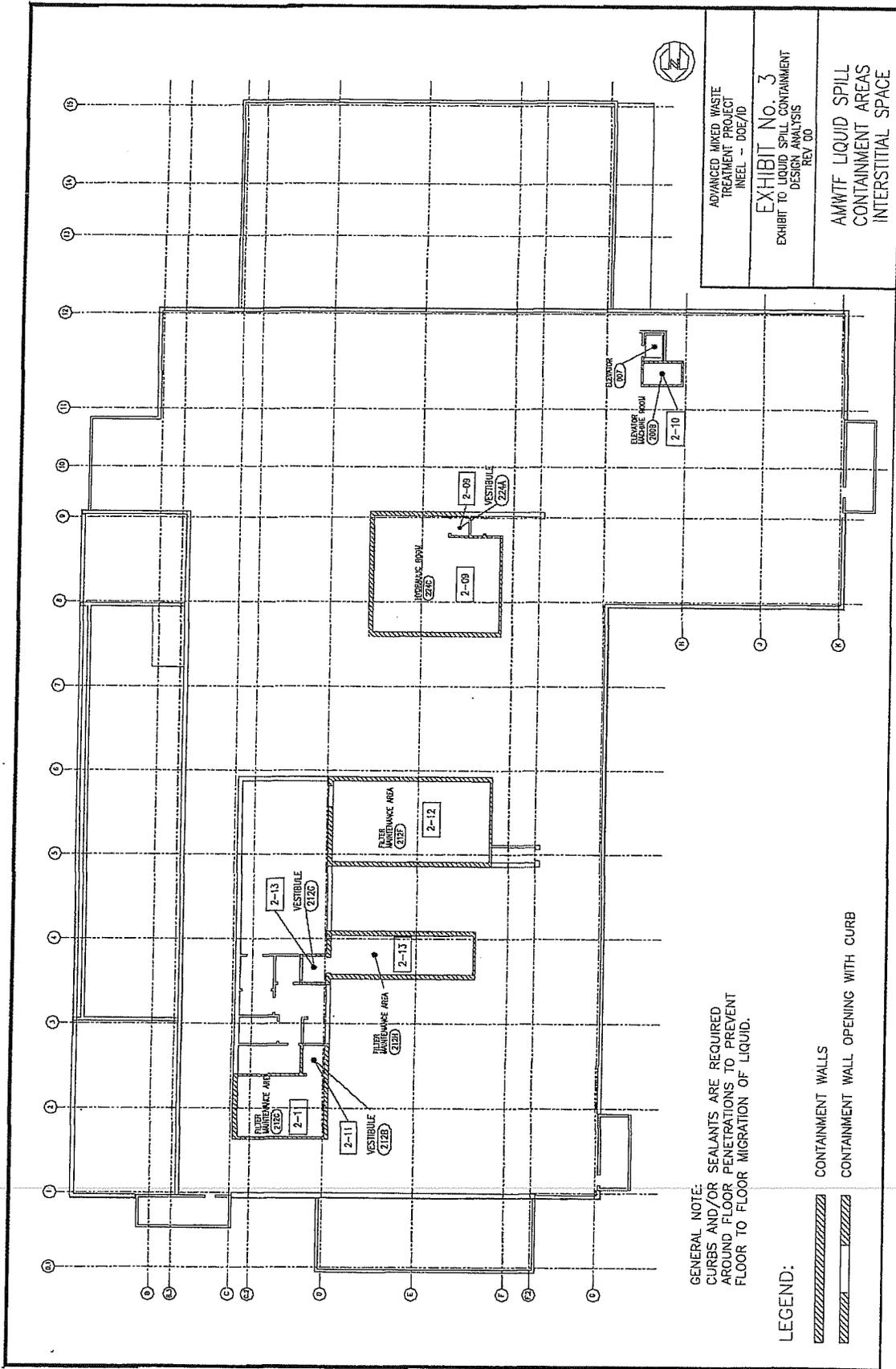
-  CONTAINMENT WALLS
-  CONTAINMENT WALL OPENING WITH CURB

ADVANCED MIXED WASTE
TREATMENT PROJECT
INEEL - DOE/ID

EXHIBIT No. 2
EXHIBIT TO LIQUID SPILL CONTAINMENT
DESIGN ANALYSIS
REV 00

AMWTF LIQUID SPILL
CONTAINMENT AREAS
SECOND FLOOR

ATTACHMENT 2

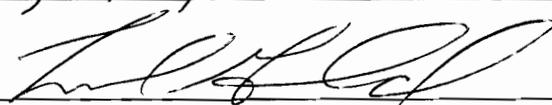


GENERAL NOTE:
CURBS AND/OR SEALANTS ARE REQUIRED
AROUND FLOOR PENETRATIONS TO PREVENT
FLOOR TO FLOOR MIGRATION OF LIQUID.

LEGEND:

-  CONTAINMENT WALLS
-  CONTAINMENT WALL OPENING WITH CURB

ADVANCED MIXED WASTE TREATMENT PROJECT MEEL - DOE/ID
EXHIBIT No. 3 EXHIBIT TO LIQUID SPILL CONTAINMENT DESIGN ANALYSIS REV 00
AMWTF LIQUID SPILL CONTAINMENT AREAS INTERSTITIAL SPACE

EDF No.: 0277	Revision Number: 1
Title: Maximum Waste Storage Capacity for WMF-636 Pad 2 and AMWTP Outside Storage Area.	Building/System No.: WMF-636
<p>Summary: Maximum waste volumes were calculated for Pad 2 permitting purposes. The maximum volumes were calculated for high density volumes using two different scenarios which were, 1) using high density 55 gallon drum configuration, and 2) using high density 4' x 4' x 8' box configurations. In addition, an outside storage area on the northwest side of the WMF-636 was evaluated for, 1) loaded TRUPACT II Trailer storage and, 2) normal density 4' x 4' x 8' Box storage, 3) normal density drums.</p> <p>The WMF-636, Pad 2 maximum waste volumes are as follows: High Density 55 Gallon Drum storage volume = 2,893,000 gallons capacity High Density 4' x 4' x 8' Box storage volume = 6,350,140 gallons capacity</p> <p>WMF-636, Outdoor Storage Area waste volumes are as follows: Maximum Loaded TRUPACT II Trailer storage volume = 6 each Normal Density 4' x 4' x 8' Box storage volume = 404,995 gallons capacity Normal Density 55 Gallon Drums = 130,900 gallons capacity</p>	
References:	
Originator: Ted Sluder 	Date: 7/1/08
Technical Review: Michael Main 	Date: 7-1-08
Additional Reviewers: (by title)	
<i>Print Title:</i>	
	Signature Date
<i>Print Title:</i>	
	Signature Date
Distribution List:	
Approval:	
Printed Name: <u>Lincoln Griswold</u>	
Printed Title: <u>Eng Mgr</u>	
	7/1/08
Signature	Date

DISCUSSION:

The maximum waste storage volumes were calculated for two different areas associated with the AMWTP. Those areas are WMF-636 Pad 2, which is the east wing of the WMF-636 proper, and an asphalted container storage area located on the northwest corner of the WMF-636 building. The assumptions and calculations for the waste volumes for the two different areas are as follows:

TSA-RE, WMF-636, Pad 2

Assumptions:

- A 20 feet wide aisle for operations extends from the south overhead door to the north side of the building.
- A 20 feet wide aisle for operations extends from the east overhead door to the north/south aisle.
- A 10 feet wide corridor extends from the north south corridor along the north wall to Pad 1.
- All stacks both drum and boxes are separated by a 3 feet wide aisle, and all stacks are kept a minimum of 3 feet from structural items including walls, columns, and partitions.
- All soil areas in Pad 2 have been asphalted. Maximum waste volumes include these areas.
- Volume calculations assumptions include:
 1. Box volumes include the entire volume of the box.
 2. Drum volumes are based on the standard 55 gallon drum volumes.
 3. High density drum stacks are 4 wide by 5 high by the full depth of the row. All drums are stacked on six pack retainers. All stacks are separated by a minimum 3 feet wide aisles
 4. High density box stacks are 4 boxes wide by 4 boxes high. Standard boxes are 4' x 4' x 8'. All stacks are separated by a minimum of 3 feet wide aisles.

AMWTP Outside Storage Area

Assumptions:

- The area is encompassed on the north and west sides by the north access road, and maintains a 50 feet corridor between the main structure to the east and the airlock structure to the south, leaving area nominally 81.1 feet in the north /south and 88.5 feet in the east/west.
- This area can be used to store either loaded TRUPACT Trailers or standard 4'x 4' x 8' boxes in stacks 2 boxes wide by 3 boxes high, or 55 gallon drums stacked 2 wide and three high.
- A TRUPACT trailer requires a 8 feet wide space and a four feet aisle is maintained between each of the trailers.

CALCULATIONS

PAGE 1 of 2

HIGH DENSITY DRUM CAPACITY - TSA-RE, PAD 2

→ EAST SIDE OF N/S ISLE

$$35 \text{ ROWS} \times 4 \text{ DRUMS}^{(\text{WIDE})} \times 5 \text{ DRUMS}^{(\text{HIGH})} \times 34 \text{ DRUMS}^{\text{Deep}}$$

$$\text{WASTE VOLUME} = 55 \frac{\text{gal}}{\text{drum}} \times 35 \times 4 \times 5 \times 34$$

$$= 1,309,000 \text{ gallons capacity}$$

→ WEST SIDE OF N/S ISLE

$$36 \text{ ROWS} \times 4 \text{ DRUMS}^{(\text{WIDE})} \times 5 \text{ DRUMS}^{(\text{HIGH})} \times 40 \text{ drums deep}$$

$$\text{WASTE VOLUME} = 55 \frac{\text{gal}}{\text{drum}} \times 36 \times 4 \times 5 \times 40$$

$$= 1,584,000 \text{ gallons capacity}$$

MAXIMUM WASTE VOLUME FOR HIGH DENSITY DRUMS

ON PAD 2 = 2,893,000 GALLONS CAPACITY.

HIGH DENSITY BOX CAPACITY - TSA-RE, PAD 2

→ EAST SIDE OF N/S ISLE

$$(3.5 \text{ Row} + 7.5 \text{ Rows}) \times 4 \text{ Box Wide} \times 4 \text{ Box High} \times 17 \text{ Box deep}$$

$$\text{WASTE VOLUME} = 11 \text{ rows} \times 4 \times 4 \times 17 \times 957.5 \text{ gal/box}$$

$$= \underline{2,864,840} \text{ gallons}$$

→ WEST SIDE OF N/S ISLE

$$11.375 \text{ Row} \times 4 \text{ Box Wide} \times 4 \text{ Box High} \times 20 \text{ Box deep}$$

$$\text{WASTE VOLUME} = 11.375 \times 4 \times 4 \times 20 \times 957.5 \text{ gal/box}$$

$$= \underline{3,485,300} \text{ gallons}$$

MAXIMUM WASTE VOLUME FOR 4'x4'x8' BOXES IN HIGH DENSITY CONFIGURATION ON PAD 2

$$2,864,840 + 3,485,300 = \underline{6,350,140} \text{ GALLONS}$$

CALCULATIONS

PAGE 2 of 2

NORMAL DENSITY BOX CAPACITY - TSA-RE
OUTSIDE STORAGE PAD.

ROW	1	-	19	boxes	deep
	2	-	18	"	"
	3	-	16.5	"	"
	4	-	13	"	"
	5	-	8	"	"

ROWS ARE STACKED 2 BOXES WIDE AND
THREE BOXES HIGH

- BOXES ARE 4' x 4' x 8'
- 7.48 gallons / ft³

TOTAL BOX STORAGE VOLUME =

$$(19 + 18 + 16.5 + 13 + 8) \times 2 \times 3 \times (4' \times 4' \times 8') (7.48) =$$

$$\underline{104,997 \text{ gallons}}$$

NORMAL DENSITY DRUM CAPACITY - TSR-RE
OUTSIDE STORAGE PAD

NORMAL DENSITY - 2 WIDE : 3 HIGH

AVERAGE ROW LENGTH - 61 ft

$$61 \text{ ft} \times \frac{6 \text{ drums}}{\text{row } 2 \text{ ft}} \times 13 \text{ ROWS} = 2,380 \text{ drums}$$

$$2,380 \text{ drums} \times \frac{55 \text{ gallons}}{\text{drum}} = 130,900 \text{ gallons}$$

APPENDIX XII

ASPHALT STRUCTURAL STABILITY FOR DENSE PACK LOADING ON PAD 2

EDF-0338, Revision 05: Evaluation of the Asphalt Floor System for Dense Pack Loading

EDF No.: EDF-0338	Revision No.: 05	FMP No. (if any):
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Title: Evaluation of the Asphalt Floor System for Dense Pack Loading	Building/System No.: WMF636
-----------------------------------------------------------------------------	------------------------------------

Revision 05 Summary: Revision 05 only applies to containers stored in a Dense Pack configuration as described in this EDF. All reference to the typical soil bearing pressure of 2000 PSF has been removed, since it created confusion. A ultimate soil bearing pressure of 1540 PSF (assuming GW and GP soils and 4 inch wide interfacing runners) with a factor of safety of 2 yields a allowable soil bearing capacity of 770 PSF for Dense Pack Loading. Also, all references to enhanced runner widths for metal pallets have been removed since this concept was never used.

Summary:

The purpose of the EDF is to outline maximum Dense Pack Loading and support parameters for the WMF636, Pad 2 asphalt floor system.

The asphalt floor system will be able to safely support the following high density configurations:

- 55 gallon drums stacked four wide and five high; drums will be placed on 4' x 8' four-bar (or greater) pallets or an equivalent pallet. Care will be taken to ensure loading is distributed to asphalt floor system by adding a 3/4" plywood sheet to further distribute the loads, if needed.
- Waste boxes stacked 4 boxes wide by 4 boxes high; boxes will have adequate runners and/or a sheet of 3/4" plywood placed under the boxes to uniformly distribute the stack loads onto the asphalt floor system.
- Puck drums and overpacks stacked 4 drums wide by 4 drums high; puck drums will be placed on 64"x 64" wood pallets which will uniformly distribute the load to the asphalt floor system.

The drums will be stored on standard metal pallets and/or special design wood pallets, the boxes will be stored on the box skids and added skids (cribbing), and plywood base interfaces, as required for the loading conditions. The loading conditions in this area will be administratively controlled via AMWTP operating procedures to ensure the sub base bearing loading does not exceed 770 pounds per square foot (PSF) for Dense Pack Loading. The following chart summarizes the typical asphalt interface loading scenarios.

Containers (drums and boxes) stored in a configuration not greater than 3 high are not subject to the restrictions in this EDF due to the stability of the waste stack. However, good operating practices should follow the chart below as a guide for allowable foundation loading.

WMF-636 Pad 2 Foundation Dense Pack Loading Information

Pallet/Box Type	Runner Length	Base Description	Maximum Foundation Loading per Pallet or Box Stack lbs (@770PSF)
4 bar metal pallet	96 inches	4 runners, each 4 inches wide	8,213
		with 3/4" plywood base	22,805
5 bar metal pallet	96 inches	5 runners, each 4 inches wide	10,266
		with 3/4" plywood base	31,102
11 bar wood pallet	48 inches	See EDF-0948	36,730
64" x 64" wood pallet	64 inches	3/4" plywood base	18,240
3 skid box (Bull Run)	44 inches	3 runners, each 4 inches wide	2,950
		with 3/4" plywood base	5,061



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Implementing Document: MP-CD&M-11.6

EDF No.: EDF-0338		Revision No.: 05		FMP No. (if any):	
Title: Evaluation of the Asphalt Floor System for Dense Pack Loading			Building/System No.: WMF636		
		5 runners, 3- 4" and 2- 3.5" wide		4,673	
		with 3/4" plywood base		12,150	
5 skid box (FRP)	46 inches	5 runners, each 3.5 inches wide		4,305	
		with 3/4" plywood base		10,825	

- References:**
1. Lockheed Martin Drawing 175774, RWMC Building 6363 TSA Retrieval Enclosure Interior Drainage Plan, Rev 3.
 2. Civil Engineering reference Manual, Fifth Edition, Michael R. Lindeburg, P.E.
 3. Plywood Design Specification, APA, the Engineered Wood Association, 1997.
 4. Fundamentals of Geotechnical Analysis, Dunn, Anderson, Kiefer, 1980

Originator: *TED SLUDER* / *Ted E. Sluder* *3/17/2016*
Signature Date:

Technical Review: *Ryan Searle* / *Ryan Searle* *3/17/2016*
Signature Date:

Additional Reviewers: (by title)		
<i>Environmental Compliance/Permitting</i>	<i>[Signature]</i>	<i>3/17/2016</i>
Print Title	Signature	Date
Print Title	Signature	Date
Print Title	Signature	Date

Distribution List:

Approval:

Printed Name: *Quin Blackburn*

Printed Title: *Engineering Lead*

Quin Blackburn *3/17/2016*
Signature Date



Engineering Design File Record Sheet

Form-1590
Rev. 4
Effective: 01/20/11

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Implementing Document: MP-CD&M-11.6

EDF No.: EDF-0338	Revision No.: 05	FMP No. (if any):
Title: Evaluation of the Asphalt Floor System for Dense Pack Loading		Building/System No.: WMF636

Scope:

Purpose/Scope:

The purpose of this EDF is to document the following items;

- WMF636, Pad 2 Dense Pack Foundation Loading requirements for drums and boxes
- Allowable and Ultimate soil bearing pressure for WMF-636 Pad 2 for the AMWTP HWMA/RCRA Permit
- Ultimate foundation bearing capacity for WMF-636 Pad 2 asphalt floor system, as an administrative control for AMWTP procedures
- Define acceptable methods to adequately distribute loads to the foundation, using runners (skids), pallets, sheeting, or other engineering approved methods.

Analysis:

Definitions:

Asphalt is a sticky, black and viscous liquid or semi-solid that is present in most crude petroleum. The primary use of asphalt is in road construction where it is used as the glue or binder for the aggregate particles. The road surfacing material is usually called 'asphalt concrete' in North America or simply 'asphalt' elsewhere.

Granular Base is the processed sands and gravels placed below the asphalt surfacing. Normal processing would include crushing, grading and compacting materials. This layer acts as a foundation and drainage layer for the asphalt surfacing.

Subgrade is the soil (normally in situ) prepared to support a structure of a pavement system. It is the foundation for the pavement structure. Preparation normally includes moisture conditioning and compaction.

Dense pack configuration shall mean the storage of mixed waste containers as follows: 4 drums wide by 5 drums high by "n" drums long (allowing for appropriate aisle spacing), or 4 boxes wide by 4 boxes high by "n" boxes long (allowing for appropriate aisle spacing).

Dense Pack Loading Guidelines (see WMF636 Pad 2 Foundation Dense Pack Loading Table below)

Boxes: Waste boxes may have added runners and a sheet of ¾" plywood placed under the boxes to uniformly distribute the stack loads onto the asphalt floor system.

Drums: 55 gallon drums stacked four wide and five high on metal or wood pallets, normally 4 feet by 8 feet. Care will be taken to ensure loading is distributed to asphalt layer when using metal pallets, by adding a ¾" plywood sheet to further distribute the loads or reducing the stack height as necessary.

Drums: 85 gallons will be stacked on 64"x 64" wood pallets, or 5 bar metal pallets with a ¾" plywood base (as required) to enhance the weight distribution to the asphalt floor system.

Puck Drums: Puck drums will be placed on 64"x 64" wood pallets to distribute the load uniformly to the asphalt layer

Pad 2 Description and History

The asphalt floor system for Pad 2 in the east wing of WMF-636 consists of 4 inches of asphalt underlain by 4 to 6 inches of granular base course material, which is underlain by in situ subgrade materials.

There is a reinforced cement concrete pad in the south east quadrant of Pad 2, having nominal dimensions of 32 feet by 38 feet. This pad is insignificant in size compare to the overall pad, but the asphalt in the immediate area has irregular slopes due to differential pad elevations. High density stacking in this area should not be done due to irregular slopes.

While asphalt itself has limited long term load bearing capacity due to its ability to flow, the Pad 2 foundation has some positive features which help mitigate using asphalt, as opposed to a steel reinforced concrete pad, for the top bearing surface. These positive features include:

- The entire pad is covered by a roof system which has been in place for the last 20 years, and this roof system was completely repaired in 2015 to minimize potential leaks. This prevents rain from saturating the subsurface in situ soil materials.

EDF No.: EDF-0338	Revision No.: 05	FMP No. (if any):
Title: Evaluation of the Asphalt Floor System for Dense Pack Loading		Building/System No.: WMF636

- The static water table is approximately 650 feet below grade and there are no perched water tables in the area.
- Competent blue basalt lithology is less than 10 feet below the floor system grade and in many places is less than a foot. This minimizes the depth of the weaker stratum soils, thus minimizing the potential for differential settlement or shear failure.
- The in situ materials (above the basalt bedrock and below the top soil) are non cohesive sands, silts, and gravels which are capable of bearing loads in the 1540 lb/ft² (does not include a factor of safety) range if kept dry.
- Pad 2 was pre-loaded with waste for an extensive period of time (~40 years), creating a loading condition equivalent to the high density loading, and no failed areas due to settlement have been observed on the pad. Some localized asphalt areas failed due to high moisture content from roof leaks. These areas were removed and the saturated soils were removed and replaced with competent granular base material overlain by asphalt to match the original pad concept.

Yielding and some minor settlement will occur in the asphalt material. However, due to the shallow profile (four inch depth) and the homogeneous nature of the asphalt, settlement will be relatively minor and uniform. The subgrade should not experience significant yielding or settlement due to the pre-loading conditions, the material bearing capacities, and distribution of the load at the subgrade elevation. The granular base will provide a good foundation for the asphalt layer, and will have a ultimate bearing capacity (nominal) 1540lbs/ft² for 4 inch wide runners (see attached calculations).

Soil Bearing and Foundation Loading Limit Calculations

The calculation method to determine adequate Dense Pack Loading for PAD 2 treats the asphalt and base materials as granular gravels distributing the load to the in situ soils and bedrock. For each Dense Pack loading conditions on this pad, using pallets or boxes having 4 inch wide runners, an ultimate soil bearing capacity of 1540 PSF is calculated using the Terzaghi-Meyerhoff equation 10.1 (reference 2) and further reduced using a factor of safety of 2 to an allowable 770 PSF. This soil bearing pressure with the applied factor of safety will be used as a general foundation loading limit for Dense Pack Loading. Should Dense Pack Loading conditions outside of the examples in this EDF be encountered, those conditions can be evaluated using the boundary conditions established in this EDF. Based on the type of containers and the cumulative weights, adequate foundation support (plywood, lumber, or other, as determined by the engineer) will be provided under the waste stacks in contact with the asphalt pad to ensure the soil bearing pressure does not exceed the allowable limit of 770 PSF.

The following table summarizes the allowable soil bearing capacities for Dense Pack Loading on the Pad 2 foundation, for the typical pallet/box types, assuming a 770 PSF allowable bearing capacity.

WMF-636 Pad 2 Foundation Dense Pack Loading Information

Pallet/Box Type	Runner Length	Base Description	Maximum Foundation Loading per Pallet or Box Stack lbs(@770PSF)
4 bar metal pallet	96 inches	4 runners, each 4 inches wide	8,213
		with 3/4" plywood base	22,805
5 bar metal pallet	96 inches	5 runners, each 4 inches wide	10,266
		with 3/4" plywood base	31,102
11 bar wood pallet	48 inches	See EDF-0948	36,730
64" x 64" wood pallet	64 inches	3/4" plywood base	18,240



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Page 5 of 5

Implementing Document: MP-CD&M-11.6

EDF No.: EDF-0338		Revision No.: 05		FMP No. (if any):	
Title: Evaluation of the Asphalt Floor System for Dense Pack Loading			Building/System No.: WMF636		
3 skid box (Bull Run)	44 inches	3 runners, each 4 inches wide	2,950		
		with 3/4" plywood base	5,061		
		5 runners, 3- 4"and 2- 3.5" wide	4,673		
		with 3/4" plywood base	12,150		
5 skid box (FRP)	46 inches	5 runners, each 3.5 inches wide	4,305		
		with 3/4" plywood base	10,825		

Summary:

High Density stacking of containerized materials can be achieved on the WMF-636 Pad 2 asphalt safely, if the loading is controlled to prevent subgrade materials from failing. The chart contained in this EDF describes the foundation/stack interface conditions that will typically be encountered. Most foundation interfaces will consist of 4 inch wide runners supplemented by 3/4" thick plywood sheeting and the associated allowable loading for these conditions.

For containers stored in a Dense Pack configuration, an allowable loading of 770 PSF will apply, to protect the ultimate soil bearing capacity of 1540 PSF.

Attachments (If any):

1. Pad 2 Soil Loading Calculations
2. Plywood Design Specification, APA 1997
3. 4 Bar Metal Pallet Capacity Calculations
4. 5 Bar Metal Pallet Capacity Calculations
5. 11 Bar Wood Pallet Data
6. 64" x 64" Wood Pallet Calculations
7. 3 Skid Box Calculations
8. 5 Skid Box Calculations
9. 4 Bar Metal Pallet Drawing
10. 5 Bar Metal Pallet Calculations
11. Wooden Storage Pallet – TSA-RE Specifications
12. 64" x64" Wood Pallet & 11 Bar Wood Pallet Drawing
13. 3 Skid Box Drawing
14. 5 Skid Box Drawing

PAD 2 SOIL LOADING

EXISTING PARAMETERS:

- 4" of ASPHALT - NEGLECT AND TREAT AS SOIL
- 4"-6" OF CRUSHED AGGREGATE - GP
- SUBGRADE SOILS ARE GW
- ϕ FOR GP & GW $\approx 38^\circ$
- COHESION (C) = 0
- $P = 120$ PCF (NOMINAL)
- $P_q =$ SURCHARGE = 0
- $P_g =$ GROSS BEARING CAPACITY
- $P_a =$ ALLOWABLE BEARING CAPACITY $P_a = \frac{P_g}{SF}$
- $B =$ FOOTING WIDTH (FT) - LONG CONTINUOUS FOOTING
- $N_\gamma = 77$; $D_f =$ DEPTH OF FOOTING = 0

SUPPORT MECHANISMS EVALUATED:

- FULLY DISTRIBUTED LOAD
- 4 BAR - 4'x8' PALLET
- 5 SKID BOX
- 64"x64" PALLET
- FULLY DISTRIBUTED LOAD

GROSS BEARING CAPACITY - TERZAGHI - MEYERHOFF

$$P_g = \frac{1}{2} P B N_\gamma + c N_c + (P'_2 + P'_2/D_f) N_q$$

EVALUATE RUNNER WIDTHS

$$\rightarrow B = 4''$$

$$P_g = \frac{1}{2} P B N_\gamma = \frac{1}{2} (120) (4/12) (77)$$

$$P_g = 1,540 \quad 1/2 SF = \text{FACTOR OF SAFETY (FS)} = 2$$

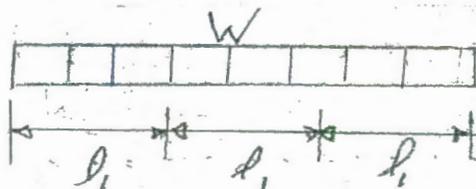
$$P_a = P_g / 2 = \frac{1,540}{2} = 770 \text{ psf}$$

770 psf

PLYWOOD DESIGN SPECIFICATION, APA 1997

UNIFORM LOADS BASED ON BENDING STRESS
FOR 3 OR GREATER SPANS

$$w_b = \frac{120 F_b K_S}{l_1^2}$$



WHERE :

w_b = UNIFORM LOAD BASED ON
BENDING STRESS (psf)

F_b = ALLOWABLE BENDING STRESS (psi)

K_S = EFFECTIVE SECTION MODULUS ($\text{IN.}^3/\text{ft}$)

l_1 = SPAN CENTER TO CENTER OF SUPPORTS
(IN.)

4 Bar Metal Pallet

$$F_b = 1650 \text{ PSI} \quad K_s = .496 \quad P_A = 770 \text{ lb/ft}^2$$

4 bar metal pallet (without Plywood base)

$$(4 \text{ skids}) (8 \text{ ft}) \left(\frac{4}{12} \text{ ft}\right) (770 \text{ lb/ft}^2) = 8,213 \text{ lb}$$

4 bar metal Pallet with $\frac{3}{4}$ " PLYWOOD BASE

$$\begin{aligned} \text{CAPACITY} &= \text{SKID CAPACITY} + \text{PLYWOOD CAPACITY} \\ &= (8,213) + (w_b \times \text{SURFACE AREA}) \end{aligned}$$

$$w_b = \frac{(120)(F_b)(K_s)}{l,^2} = \text{lb/ft}^2$$

$$= \frac{(120)(1650)(.496)}{(14.67)^2} = 456 \text{ lb/ft}^2$$

$$\begin{aligned} \text{CAPACITY} &= 8,213 + ((456 \text{ lb/ft}^2)(32 \text{ ft}^2)) \\ &= 22,805 \text{ lb} \end{aligned}$$

5 BAR Metal Pallet (58" x 96" w 4" SKIDS)

$$F_b = 1650 \text{ psi} \quad K_s = 0.496 \quad P_A = 770 \text{ lb/ft}^2$$

5 BAR METAL PALLET with out Plywood BASE

$$(5 \text{ SKID})(8 \text{ ft})(4 \frac{1}{2} \text{ ft})(770 \text{ lb/ft}^2) = 10,266 \text{ lbs}$$

5 Bar Metal PALLET with PLYWOOD BASE

$$\begin{aligned} \text{CAPACITY} &= \text{SKID CAPACITY} + \text{PLYWOOD CAPACITY} \\ &= (10,266 \text{ lb}) + W_b (\text{SURFACE AREA } \text{ft}^2) \end{aligned}$$

$$\begin{aligned} W_b &= \frac{(120)(F_b)(K_s)}{L^2} \\ &= \frac{(120)(1650 \text{ psi})(.496)}{(13.5)^2} \\ &= 538 \text{ lb/ft}^2 \end{aligned}$$

$$\begin{aligned} \text{CAPACITY} &= 10,266 \text{ lb} + ((538 \text{ lb/ft}^2)(38.66 \text{ ft}^2)) \\ &= 31,102 \text{ lbs} \end{aligned}$$

11 Bar Wood PALLET

Per EDF 0948

CAPACITY 36,730 lb

64" x 64" WOOD PALLET

$$F_b = 1650 \text{ psi} \quad K_S = 0.496$$

$$P_A = 673.75 \frac{\text{lb}}{\text{ft}^2} \quad (\text{EDF-0948})$$

$$l_1 = 15.1''$$

SKID CAPACITY (ON ASPHALT PAD)

$$(5 \text{ SKIDS}) \left(\frac{3.5}{12} \text{ ft} \right) \left(\frac{64}{12} \text{ ft} \right) (770 \frac{\text{lb}}{\text{ft}^2}) = 5,988 \text{ lb}$$

CAPACITY = SKID CAPACITY + PLYWOOD CAPACITY

$$w_b = \frac{120 (F_b) (K_S)}{l_1^2}$$

$$w_b = \frac{(120)(1650 \text{ psi})(.496)}{15.1''^2} = 430.7 \text{ lbs}$$

$$\begin{aligned} \text{CAPACITY} &= 5988 \text{ lb} + (430.7 \text{ lb}) \left(\frac{64 \times 64}{144} \right) \\ &= 18,239 \text{ lb} \end{aligned}$$

3 SKID BOX (BULL RUN BR-90)

SKID CAPACITY ON ASPHALT PAD: =

$$(3 \text{ SKIDS}) \left(\frac{4}{12} \text{ ft}\right) \left(\frac{46}{12} \text{ ft}\right) (770 \text{ lb/ft}^2)$$

$$= 2,951 \text{ lb}$$

→ 3 SKID CAPACITY WITH $\frac{3}{4}$ " PLYWOOD INTERFACE

(SKID CAPACITY) + (PLYWOOD CAPACITY)

$$(2,951 \text{ lb}) + (w_b (\text{SURFACE AREA}))$$

$$w_b = \frac{120 (1650 \text{ psi}) (.496)}{32^2} = 95 \text{ lb/ft}^2$$

$$(2,951 \text{ lb}) + (95 \text{ lb/ft}^2) \left(\frac{(72)(44)}{144} \text{ ft}^2\right)$$

$$= (2,951 \text{ lb}) + (2,110 \text{ lb})$$

$$\rightarrow = 5,061 \text{ lb f}$$

3 SKID BOX w/ INTERMEDIATE CRIBBING:

= SKID CAPACITY ON ASPHALT PAD:

$$= \left((3 \text{ SKIDS}) \left(\frac{4}{12} \text{ ft}\right) + (2 \text{ SKIDS}) \left(\frac{3.5}{12} \text{ ft}\right)\right) \left(\frac{46}{12} \text{ ft}\right) (770 \text{ lb/ft}^2)$$

$$= 4,673 \text{ lb}$$

3 SKID BOX w/ INTERMEDIATE CRIBBING & $\frac{3}{4}$ " PLYWOOD INTERFACE

= (SKID CAPACITY) + (PLYWOOD CAPACITY)

$$= (4,673 \text{ lb}) + (w_b (\text{PLYWOOD SURFACE AREA}))$$

$$w_b = \frac{120 (1650 \text{ psi}) (.496)}{17^2} = 340 \text{ lb/ft}^2$$

$$= (4,673 \text{ lb}) + (340 \text{ lb/ft}^2) \left(\frac{(72)(44)}{144} \text{ ft}^2\right) =$$

$$= \underline{\underline{12,150 \text{ lb}}}$$

5 SKID BOX FRP (84" x 48" x 48")

SKID CAPACITY ON ASPHALT:

$$= (5 \text{ SKIDS}) \left(\frac{3.5}{12} \text{ ft} \right) \left(\frac{46}{12} \text{ ft} \right) \left(770 \frac{\text{lb}}{\text{ft}^2} \right)$$

$$= 4,305 \text{ lb}$$

5 SKID BOX WITH A $\frac{3}{4}$ " PLYWOOD INTERFACE:

$$= (\text{SKID CAPACITY}) + (\text{PLYWOOD CAPACITY})$$

$$= (4,305 \text{ lb}) + (w_b (\text{PLYWOOD SURFACE AREA}))$$

$$w_b = \frac{120 (1650) (.496)}{(20.1)^2}$$

$$= 243 \frac{\text{lb}}{\text{ft}^2}$$

$$= (4,305 \text{ lb}) + \left(\left(243 \frac{\text{lb}}{\text{ft}^2} \right) \left(\frac{(84)(46)}{144} \text{ ft}^2 \right) \right)$$

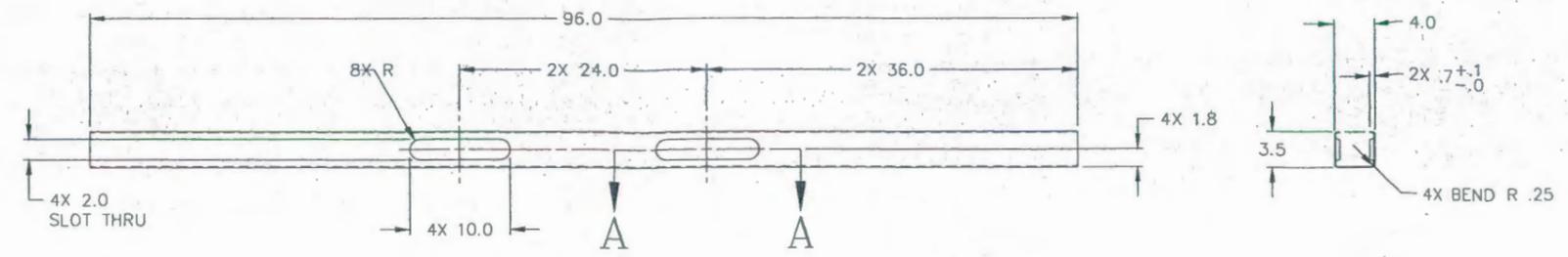
$$= 10,825 \text{ lb}$$

EDF-0338

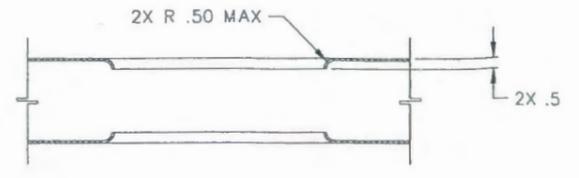
ATTACHMENT 9

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
C	SEE C DCN	3/7/94	M. WHITAKER

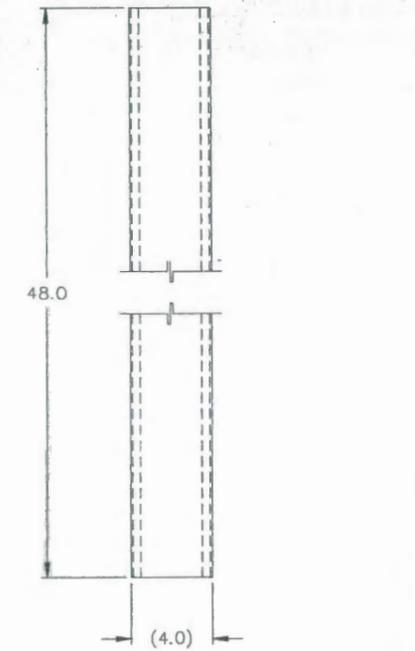
- NOTES:
1. REMOVE ALL BURRS AND SHARP EDGES.
 2. WELD PER AWS D1.3 USING ITEM 5, WELD FILLER METAL, WITH VISUAL INSPECTION PER AWS D1.3.
 3. MARK PER STD-7006-2A WITH 446370-1 ASSEMBLY.
 4. COAT ALL WELDS USING ITEM 4, GALVANIZING METAL COATING.



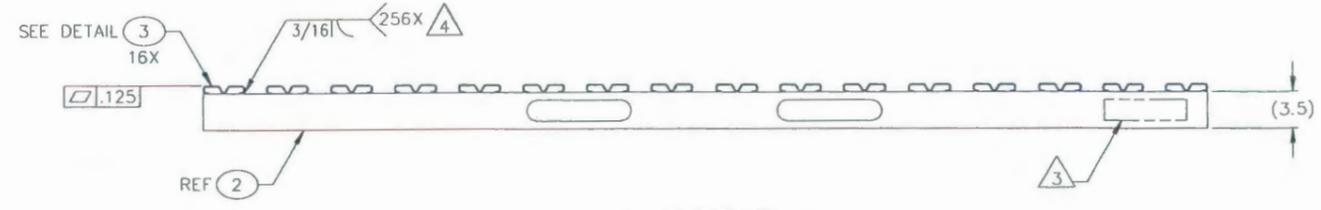
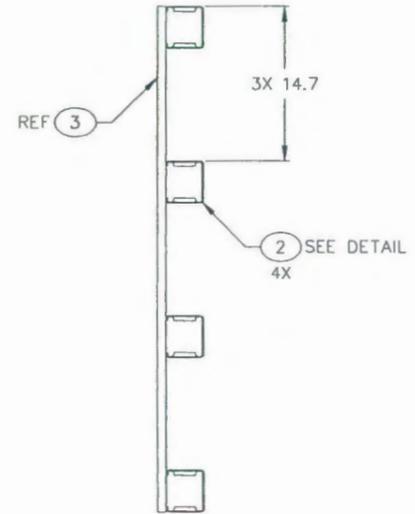
DETAIL 2
SCALE: 1/8



SECTION A-A
SCALE: 1/4



DETAIL 3
SCALE: 1/4



-1 ASSEMBLY
SCALE: 1/8

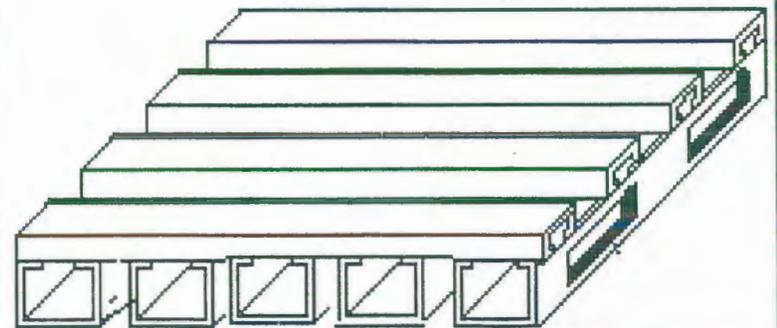
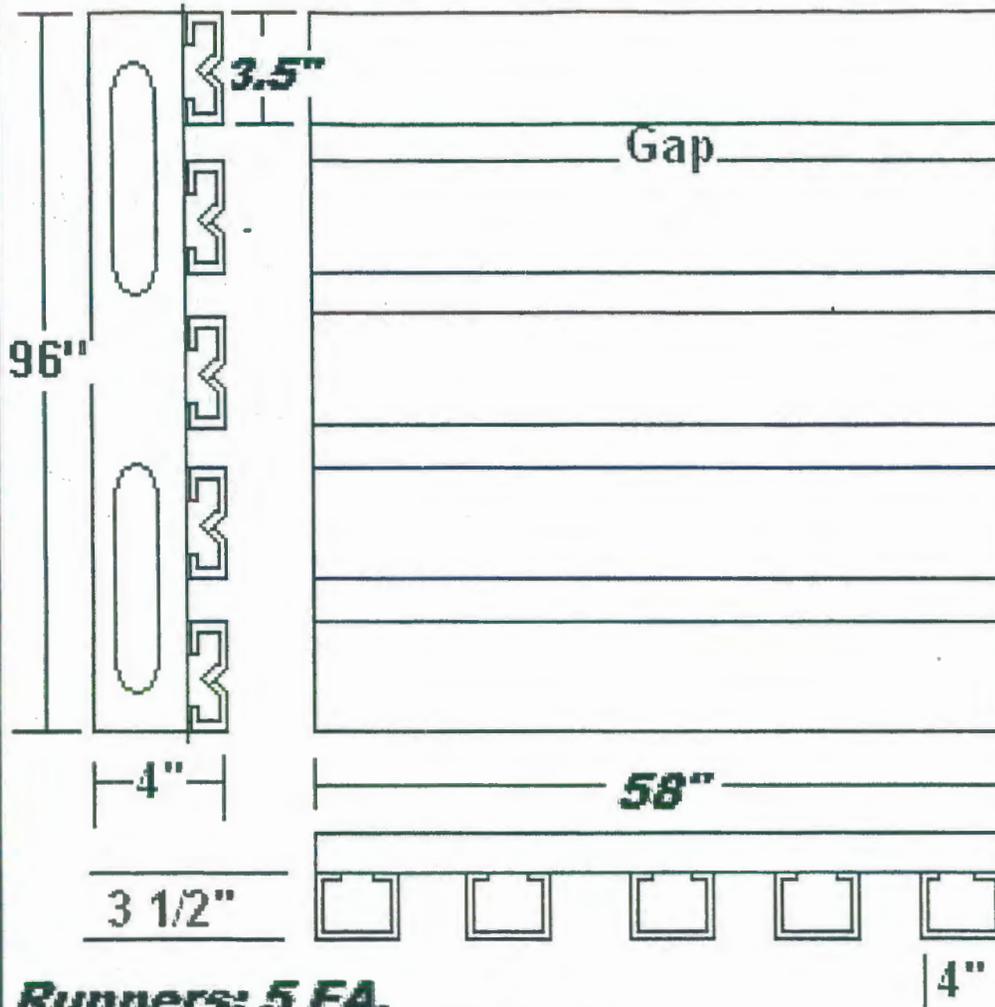
QTY. REQD.	QUAL. LEVEL	PART OR IDENTIFYING NO.	DESCRIPTION/MATERIAL/SPECIFICATION	ITEM/ FND.
AR	B		WELD FILLER METAL ER70S-X AWS A 5.18	5
AR	B	7725T3	GALVANIZING METAL COATING McMASTER-CARR CATALOG #99	4
16	B	-3	SLAT SHEET, 12 GA (.108 THICK) GALVANIZED CS ASTM A 446 GRADE B, COATING DESIGNATION, G90	3
4	B	-2	STRINGER	2
	B	-1	ASSEMBLY	1

DIMENSIONING AND SYMBOLS ARE AMERICAN NATIONAL STANDARD UNLESS OTHERWISE SPECIFIED SURFACE ROUGHNESS 125 DIMENSIONS AND TOLERANCES ARE IN INCHES TOLERANCES: X ± .1 DECIMALS: .XX ± .03 FRACTIONS: ± 1/8 ANGULAR: ± 7 DO NOT SCALE DRAWING		NEXT ASSY/REF DWG: FINAL PROJECT NO.: 15291-02 QUALITY: W.C. BARE DATE: 11/23/93 DESIGN: R.J. CARPENEDO DATE: 11/23/93 CHECKED: L.D. WILLIS DATE: 11/23/93 DRAWN: B.F. RHODES DATE: NOV '93 RELEASE: L.D. WILLIS DATE: 11/23/93	WASTE CHARACTERIZATION AND STORAGE FACILITY PALLET (48" x 96") INDEX CODE NUMBER: 446370 SHEET 1 OF 1
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------

Control No **0719-1611**

Notes

- Do not duplicate without the written permission of International Metal Pallet.
- Coat all welds with Rust Retardent
- Fab. from ASTM A653 Commercial Grade. **16 GA. Galvanized**
- All Dimensions & weights are apox.
- *Static wt. is deemed acceptable unless given written notice.*
- *4-way holes are 1/7/8" x 10" with 1/2" extruded lip.*



Runners: 5 EA.

Top Slat: 16 EA.

Bottom Slats: 0

Pallet WT: 201 LB. Static= 73,080 LB

International Metal Pallet
www.metalpallet.com
 800-846-0709
 Drawing No.
B-9658-1616-4

EDF-0338

ATTACHMENT 10

WOOD STORAGE PALLETS - TSA-RE

SPECIFICATIONS

WOOD PALLETS WILL BE CONSTRUCTED TO THE FOLLOWING MINIMUM REQUIREMENTS:

- PLYWOOD SHALL BE $\frac{3}{4}$ " THICK CDX GRADE
- 4X4 LUMBER SHALL BE KILN DRIED FIR
- ALL WOOD SURFACES SHALL BE PAINTED OR IMPREGNATE WITH AN APPROVED FIRE RETARDANT COATING. THE COATING SYSTEM SHALL SEAL 100% OF ALL EXPOSED SURFACES.
- THE PLYWOOD SHALL BE JOINED TO THE 4X4 FIR RUNNERS USING BOTH SCREWS AND ADHESIVES.
 - SCREWS SHALL BE $2\frac{1}{2}$ " GALVANIZED HEAVY DUTY SCREWS. THE SCREWS SHALL ENGAGE EACH RUNNER ON 8 INCH CENTERS, WITH A MINIMUM OF 3 IN A FIELD.
 - CONSTRUCTION ADHESIVE SHALL BE A COMMERCIAL GRADE ADHESIVE MADE FOR JOINING WOOD SURFACES.

ASSUMPTIONS:

LOADING - MAXIMUM LOADING CONDITION IS FOR HIGH DENSITY STACKING, I. R.

- 55 GALLON DRUMS, 5 HIGH, 1000 lb/DRUM
- 4X4X8 WOOD BOXES - 4 HIGH, 10,000 lb/BOX

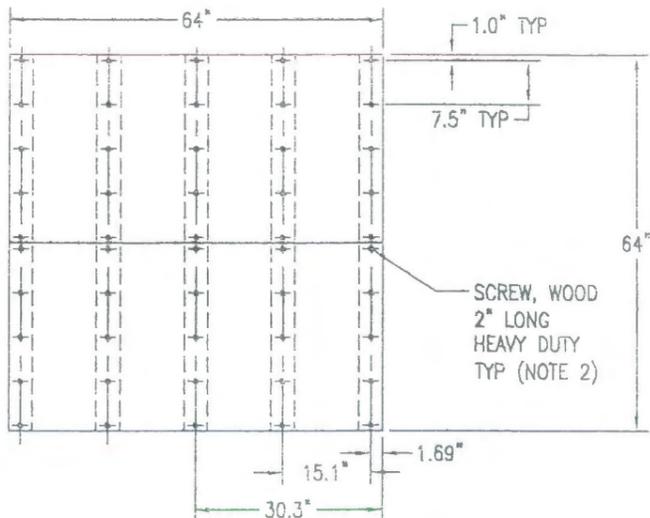
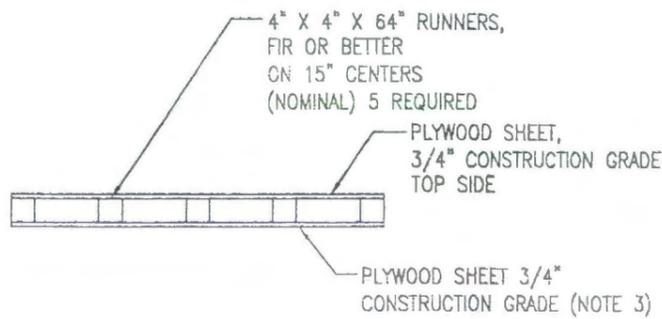
PALLETS ARE CONSTRUCTED OF DOUGLAS FIR OR STRONGER WOOD PRODUCTS

ECCENTRIC LOADING OF PALLETS WILL NOT OCCUR DUE TO DESIGN CONFIGURATION

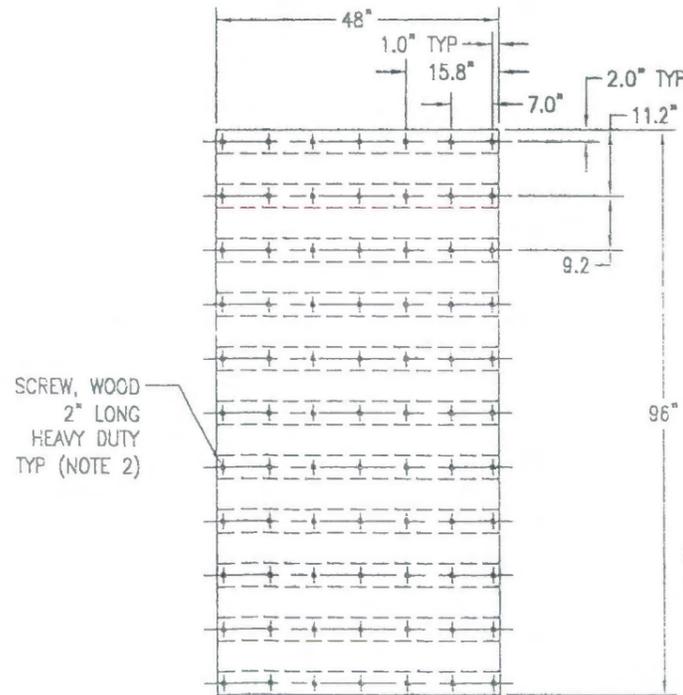
NOTES:

1. MULTIPLE SEAMS MAY BE USED ON EACH FACE OF THE 64"x64" PALLETS. SEAMS PARALLEL TO RUNNERS MUST TERMINATE ON THE CENTER OF A RUNNER. ALL OTHER SEAMS MUST BE PERPENDICULAR TO THE RUNNERS.
2. NAILS MAY BE USED INSTEAD OF SCREWS. NAILS WILL BE 10d OR LARGER COMMONS W/ COATING.
3. FOR 64"x64" PALLETS THE BOTTOM SHEET MAY BE EITHER 1/2" OR 3/4" PLYWOOD, BUT ANY SINGLE PALLET SHALL NOT HAVE BOTH ON THE BOTTOM SIDE. 1/2" PLYWOOD WILL BE FROM DRUM SPACER EXCESS MATERIAL.
4. ALL WOOD SURFACES SHALL BE COATED WITH OR CONSTRUCTED OF AN APPROVED FIRE RETARDANT SYSTEM MEETING OR EXCEEDING A CLASS A RATING. THE SYSTEM SHALL SEAL 100% OF ALL SURFACES.
5. ON THE 64"x64" PALLETS STENCIL "FIRE RETARDANT PALLET" AND "THIS SIDE UP" ON THE 1/2" DECKING. THE LETTERS SHOULD BE BLACK AND 3" TALL.
6. ON THE 48"x96" PALLETS STENCIL "FIRE RETARDANT PALLET". THE LETTERS SHOULD BE BLACK AND 3" TALL.

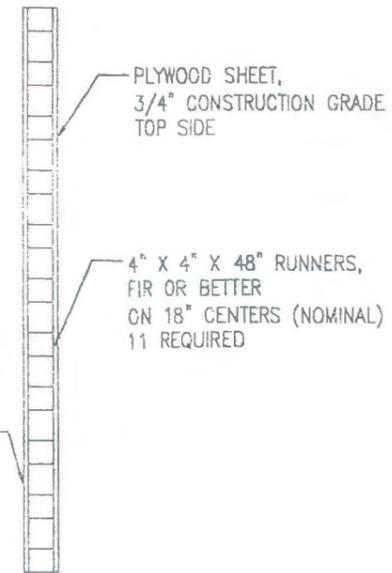
REVISIONS					
REV	DATE	DESCRIPTION	PREP	CHECK	APP
00	9/25/08	MODIFY FASTENERS, # OF SEAMS, ADD NOTES, ADD ANOTHER PALLET DWG. PER FMP-0874, SEE OPSDCN-ME-0862.	KAB	TS	RDB
01	11/3/08	ADD 5 MORE RUNNERS TO 48"x96" PALLET. SEE OPSDCN-ME-0831.	KAB	TS	RDB
02	11/12/08	ADD NOTES 5 & 6 FOR FIRE RETARDANT INFO. SEE OPSDCN-ME-0885.	KAB	TS	RDB



64" x 64" WOOD PALLET



48" x 96" WOOD PALLET

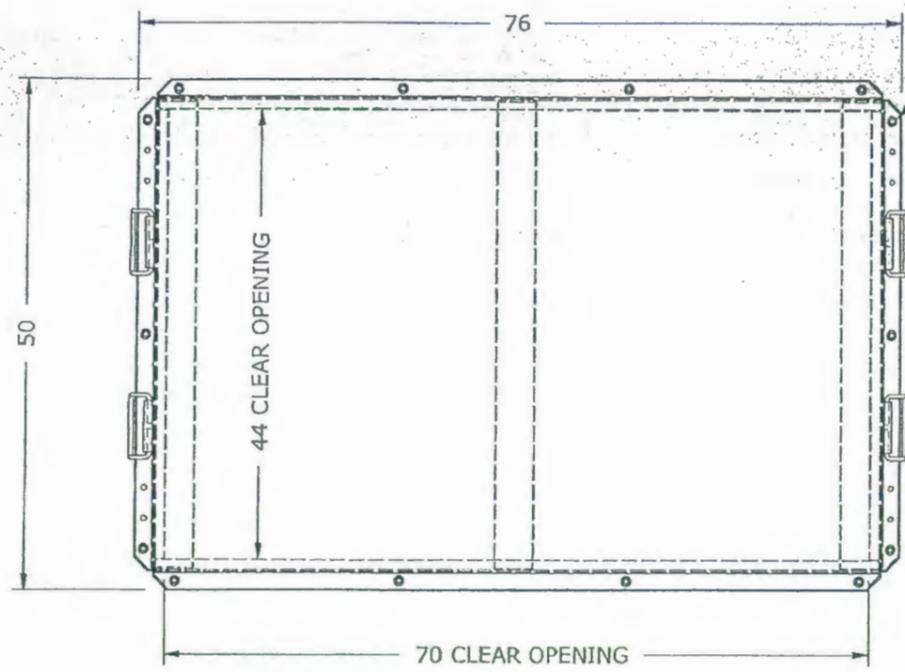


NEXT ASSY/REF DWG				DRAWING NO.	
APPROVALS				DATE	
DRAWN		KELLI BAKKE		9/24/08	
CHECKED		TED SLUDER		9/24/08	
APPROVED		R.D BROWN		9/25/08	
APPROVED FOR FABRICATION		R.D BROWN		9/25/08	
QUALITY LEVEL NG		SCALE 1:20		SYSTEM 040 SHEET 1 OF 1	
CAGE CODE		INDEX CODE NUMBER		DRAWING NO.	
C 01MF3		05E N/A 047 09C		53-10663 02	

AMWTP
WOOD PALLETS

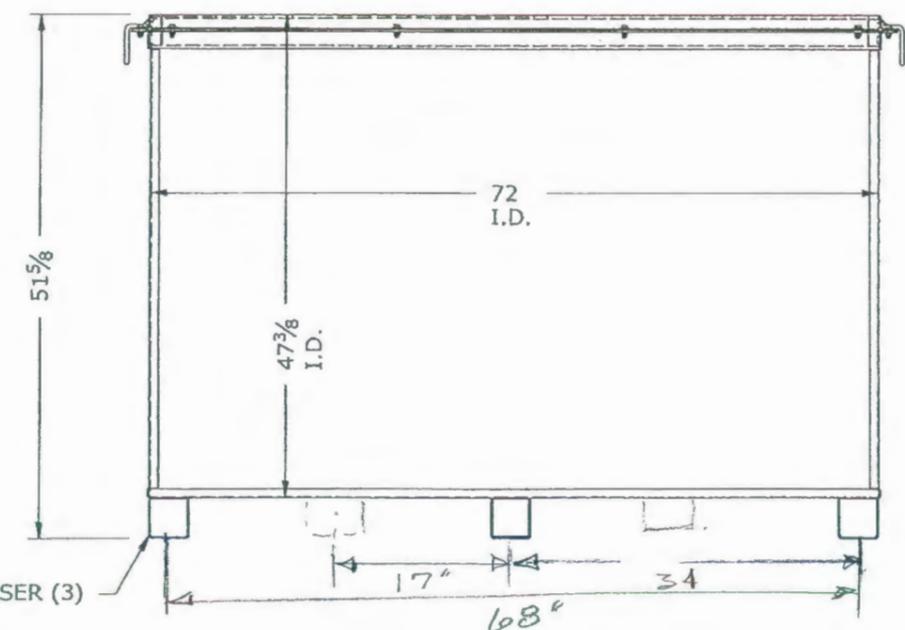
Set Drawing No.

BD-1001-A

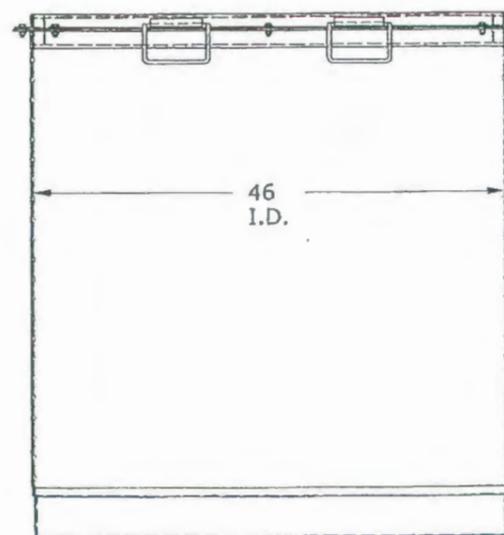


3/8" BOLT, HEX FLANGE NUT & WASHER
TYP. (14) PLACES

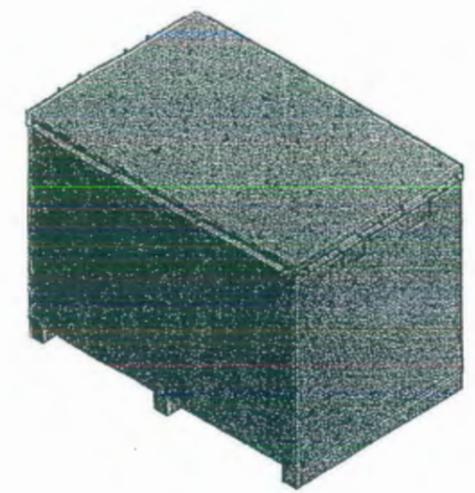
REMOVABLE
LID LIFT HANDLE
(4) PLACES



RISER (3)



DESCRIPTION	NOMINAL SIZE		
	WIDTH	LENGTH	HEIGHT
INTERNAL DIMENSIONS	46	72	47 3/8
EXTERNAL DIMENSIONS	50	76	51 5/8
CLEAR OPENING	44	70	
PAYLOAD CAPACITY	10,000 lbs		
VOLUME CAPACITY	90 CUBIC FT		
CLEAR OPENING VOLUME	84.5 CUBIC FT		
TARE WEIGHT	703 lbs		
DISPOSAL VOLUME	113 CUBIC FT		
MATERIAL OF CONSTRUCTION	STEEL		
EXTERIOR SURFACE	PAINTED		



**ORIGINAL
CONTROLLED**



SOB I.D.
PO. I.D.
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REV	ECR #	DESCRIPTION	DATE	APPROVED
1	13-005	CHANGED BOLTING FLANGE	4/11/2013	DDP

Copy

DRAWING/DETAILING
DATE 16 APR 2013
REVIEWED BY D. A. Polu 16 APR 2013
APPROVED Mark LaCombe 15/APP/13

TITLE		C0090-IP1-BCP-LR4	
DESCRIPTION		STANDARD BOX WITH RISERS	
ENG.	DRAWN BY	DATE	SCALE
	DDP	8/14/2012	SCALE
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED		CUSTOMER	
XX	± .060	BD-1001-A	
XXX	± .030		
XX	± 1/8"		
ANGLES ± 1°		PART DWG. NO.	SHEET 1 OF 5

8976-CC

PARTS/MATERIAL LIST			REV	DATE	DESCRIPTION	BY	LEAD	DEPT	PROJ
MANUFACTURER / DRAWING NO.	DESCRIPTION / MATERIAL	QL	00	12/27/00	FINAL DESIGN ISSUE	AZE	GC	AZ	548
	ASSEMBLY WITH TOP ATTACHED	M							
	ASSEMBLY WITH OUT TOP ATTACHED	M							
	TOP	M							
	SIDE	M							
	END	M							
	BOTTOM	M							
	SKID	M							

FIBERGLASS
FIL ON LID

NOTES CONTINUED	NOTES
<p>5. FASTEN 2x4 EGGS A PANE USING 16 PONY CEMENT-COATED NAILS IN PATTERN SHOWN.</p> <p>6. ALL DIMENSIONS ARE IN INCHES. TOLERANCE = ±1/4 UNLESS OTHERWISE STATED.</p> <p>7. FIBERGLASS COATING:</p> <p>7A. RESIN SHALL BE A FLAME-RESISTANT POLYESTER SUITABLE FOR SPRAY-UP APPLICATION.</p> <p>7B. THE FIBERGLASS REINFORCEMENT SHALL BE NON-CONTINUOUS ROWING WITH A RED TRACER. FRAMING LENGTH SHALL BE 0.5 TO 2.0 INCHES.</p> <p>7C. THE FIBERGLASS LAMINATE SHALL BE 0.25-INCH MINIMUM THICKNESS THROUGHOUT, INCLUDING EXTERIOR EDGES, EXCEPT 10 PERCENT OF THE FLAT SURFACES MAY BE 0.84-INCH MINIMUM THICKNESS. CORNERS AND BOTTOM SHALL NOT BE LESS THAN 0.125 INCH THICK.</p> <p>8. SPRAY TOP OF SKID WITH A LIGHT COAT OF RESIN AND DISTRIBUTE ABOUT ONE QUART OF FINE GRAVEL AND WET RESIN TO PROVIDE A NON-SLIP SURFACE.</p>	<p>1. MATERIAL:</p> <p>2A. FIBERGLASS - EXTERIOR TYPE (UNSATURATED RESIN) OR BETTER 3/4 INCH BOTTOM FILLER PANEL SHALL BE 1/4 INCH THICK AND 70% PER FABRICATOR'S OFFICE.</p> <p>2B. FRAMING MEMBERS - 2x4 S4S CONSTRUCTION GRADE SEASONED, SELECT TO BE FREE OF BARK AND LOOSE ANGLE.</p> <p>2. PANEL EDGES SHALL BE STRAIGHT AND SQUARE FOR FIT TO WITH ADJACENT PANELS. FRAMING MEMBERS SHOWN FLUSH SHALL BE FLUSH TO 1/4 INCH MAXIMUM BELOW EDGE. PANEL-TO-FRAMING MEMBER GAPS SHALL NOT EXCEED 1/4 INCH. WHEN NECESSARY, ADDITIONAL NAILS NOT TO EXCEED 16 PONY SIZE MAY BE USED TO REDUCE GAPS. PROTRUDING NAILS SHALL BE CHAMFERED FLUSH ON BELOW SURFACE.</p> <p>3. ALL JOINTS SHALL BE GLUED AND Nailed AS FOLLOWS:</p> <p>3A. APPLY CONTINUOUS PATCH OF WHITE WATER RESISTANT RESIN ALONG EACH JOINT. GLUE SHALL COVER AT LEAST 50 PERCENT OF JOINT INTERFERENCE.</p> <p>3B. APPLY 8 PONY CEMENT-COATED NAILS OR 2 INCH PLASTIC COATED STAPLES IN PATTERN SHOWN, EXCEPT THERE SHALL BE AT LEAST 3 FASTENERS THROUGH EACH FILLER BLOCK. DRIVE HEADS FLUSH TO 1/8 INCH MAXIMUM BELOW SURFACE. STAPLES SHALL CROSS DRAWN OF FIRST PLY AT NOT LESS THAN A 45 ANGLE. THERE SHALL BE NO PROTRUDING NAILS OR STAPLES FROM EXTERIOR OF BOX.</p> <p>4. THE ACCEPTANCE OF EACH LOT OF PANELS WILL BE BASED ON A VISUAL INSPECTION OF LUMBER GRADE, WORKMANSHIP, CONSTRUCTION AND A FUNCTIONAL OR DIMENSIONAL INSPECTION PER PANEL SIZE.</p>

REFERENCE DRAWINGS	
DRAWING NO.	DRAWING TITLE
ED-6768	AMWTP INTERNAL FLUS- PANEL FRP TEST BOX ASSEMBLY SH 1 OF 2

ADVANCED MIXED WASTE TREATMENT PROJECT
NEEL - DOE/ID

AMWTP INTERNAL FLUS- PANEL FRP TEST BOX ASSEMBLY SH 1 OF 2

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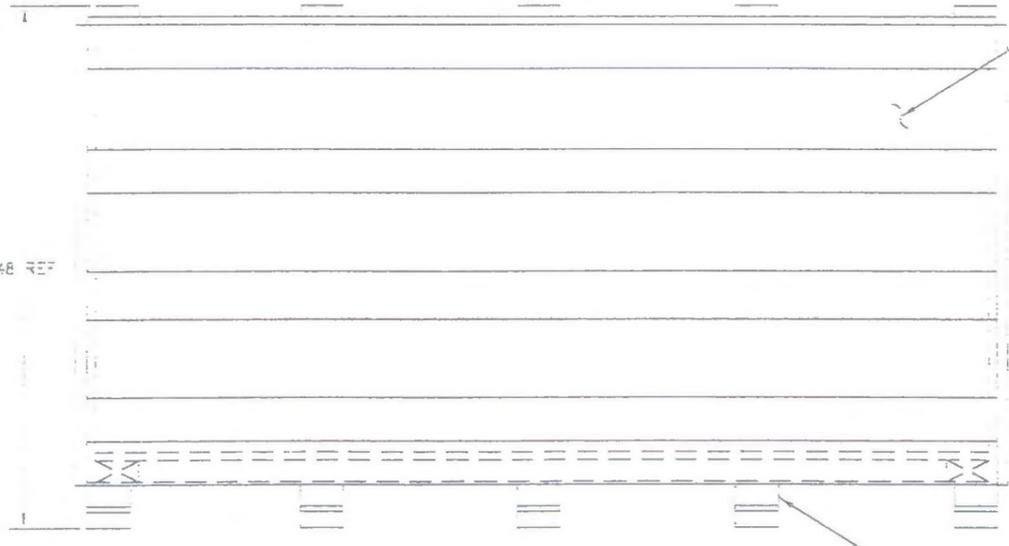
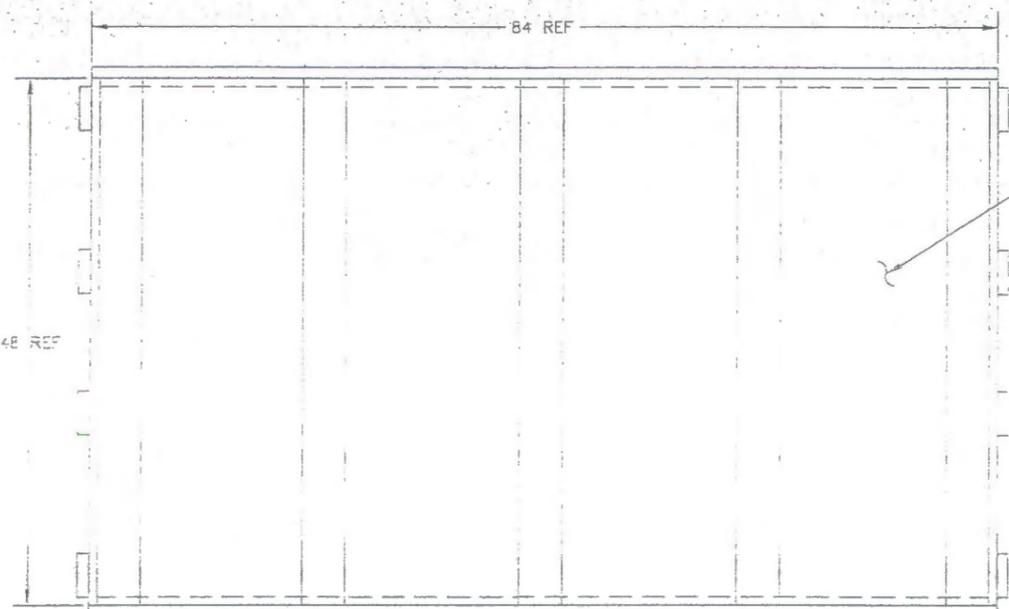
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DESIGNED: SANDBERG	12/27/00	WSS:	206.06.06
CHECKED: GREEN	12/27/00	SYSTEM: N/A	QUALITY LEVEL: NC
VERIFIED: N/A		DRAWING NUMBER	REV
APPROVED: S. A. SHARPE	12/28/00	89-8768	CC
CAD: FUSHP@BNFL.COM			



ASSEMBLY
SCALE: 1/2" = 1'-0" ①

ASSEMBLY
SCALE: 1/2" = 1'-0" ②

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APPENDIX XIII

WMF-676 VENTILATION SYSTEMS REMEDY SCHEDULE

WMF-676 VENTILATION SYSTEMS REMEDY SCHEDULE

System Description	Plant Item Number	Plant and Equipment Description	Redundancy	Failure/ Main. Mode	Response	Maintenance Requirement/ Consequence
730 System Zone 2 Supply	AHU-730-200 - AHU-730-201	2 x 100% supply air handling units	1 x 100% unit run 1 x 100% unit standby	1 unit fails	Alarm to control room Auto change to standby unit Initiate interlocks with associated extract systems	Plant can operate in this mode without impact on containment indefinitely
730 System Zone 2 Supply	AHU-730-200 AHU-730-201	2 x 100% supply air handling units	1 x 100% unit run 1 x 100% unit standby	2 units fail	Initiate interlocks with associated extract systems	Operators leave Zone 2 and Zone 3 areas and await confirmation that Zone 2 supply system is operational
750 System Zone 3 Extract	EF-750-202A EF-750-202B	2 x 100% extract fans	1 x 100% fan run 1 x 100% fan standby	1 fan fails	Alarm to control room Auto change to standby unit Initiate interlocks with associated extract systems	Plant can operate indefinitely in this mode without impact to containment
				2 fans fail	Initiate interlocks with associated supply systems	Operators leave Zone 2 and Zone 3 areas and await confirmation that Zone 2 extract system is operational
760 System Glovebox Extract	EF-760-204A EF-760-204B	2 x 100% extract fans	1 x 100% fan run 1 x 100% fan standby	1 fan fails	Alarm to control room Auto change to standby unit Initiate interlocks with associated supply and extract systems	Plant can operate indefinitely in this mode without impact to containment
				2 fans fail	Initiate interlocks with associated supply and extract systems	Operators cease glovebox operation and await confirmation that glovebox extract system is operational
750 System Zone 3 Extract HEPA Filters Second Stage	AFU-750-208 AFU-750-209 AFU-750-210	3 x 50% second stage HEPA filter banks	3 x 50% filter banks operate at downrated capacity for normal operation	Isolate 1 filter bank on line with Zone 3 extract system running	N/A	Total system duty can be handled by remaining 2 filter banks during filter change

WMF-676 VENTILATION SYSTEMS REMEDY SCHEDULE

System Description	Plant Item Number	Plant and Equipment Description	Redundancy	Failure/ Main. Mode	Response	Maintenance Requirement/ Consequence
750 System Zone 3 Extract HEPA Filters Third Stage	AFU-750-213 AFU-750-214 AFU-750-215	3 x 50% third stage HEPA filter banks	3 x 50% filter banks operate at downrated capacity for normal operation	Isolate 1 filter bank on line with Zone 3 extract system running	N/A	Total system duty can be handled by remaining 2 filter banks during filter change
760 System Glovebox Extract HEPA Filters Second Stage	AFU-760-204 AFU-760-205	2 x 100% second stage HEPA filter banks	2 x 100% filter banks operate at downrated capacity for normal operation	Isolate 1 filter bank on line with glovebox extract system running	N/A	Total system duty can be handled by remaining filter bank during filter change
760 System Glovebox Extract HEPA Filters Third Stage	AFU-760-206 AFU-760-207	2 x 100% third stage HEPA filter banks	2 x 100% filter banks operate at downrated capacity for normal operation	Isolate 1 filter bank on line with glovebox extract system running	N/A	Total system duty can be handled by remaining filter bank during filter change
All Glovebox Extract Systems	All	Glovebox	N/A	Glovebox breach (glove tear)	Vortex amplifier system on glovebox extract ensures minimum velocity of 200 fpm through open glove port	Operator withdraws hands from gloves Monitor operator Fit new glove Reset control system

APPENDIX XIV

**TECHNICAL SPECIFICATIONS FOR WMF-676 HWMA/RCRA SECONDARY CONTAINMENT
COATING SYSTEMS**

1. Introduction

1.1 Purpose

This document outlines the technical and quality assurance requirements for the preparation and application of coatings used to provide secondary containment for the Advanced Mixed Waste Treatment Facility (AMWTF), commonly know as Waste Management Facility-676 (WMF-676). All coatings used as part of the secondary containment system meet the requirements of the Idaho Administrative Procedures Act (IDAPA) 58.01.05.008 [Title 40 of the Code of Federal Regulations (CFR) 264.175].

1.2 Coating System Requirements

The coatings used as part of the secondary containment system are generally comprised of a spall/hole repair material, a primer for use over bare concrete, and a self-leveling solids epoxy capable of achieving a final dry film thickness of 50 to 145 mils. All coatings used on the base of the secondary containment system, typically a concrete floor, provide the containment “system,” and meet the requirements of IDAPA 58.01.05.008 (40 CFR 264.175). The secondary containment system includes provisions for heavy abrasion areas (e.g., aggregate filled) and heavily cracked areas (e.g., embedded membrane).

2. Acceptable Systems

Acceptable coating systems for providing secondary containment are listed in the following sections. The following coating systems (See Table 1) have been selected based upon engineering design, HWMA/RCRA requirements, safety concerns, maintenance issues, etc. The coatings specified in Table 1 have been evaluated for the specific use of the coating, and have been designed to allow for specific use. For example, an aggregate material may be added to a coating in a high traffic area to provide a non-slip surface. All materials added to a specific coating, as shown in Table 1, do not reduce the ability of the system to meet the requirements listed under IDAPA 58.01.05.008 (40 CFR 264.175).

Table 1 – Acceptable Coating Systems

COATING MANUFACTURER	COATING^a	PRODUCT NAME^b
Ameron International	Primer Primer (Metal) Primer and Sealer Primer and Sealer Epoxy Filler Epoxy Filler Self-leveling Epoxy Surface Waterborne Acrylic Topcoat 100% Solids Epoxy Multi-Purpose Epoxy High-Solids Epoxy Coating High-Solids Epoxy Coating High-Solids Epoxy Coating Polyurethane Topcoat Polyurethane Coating Synthetic Resin Coating	Prime A Pell 200 ^c B55 Series ^d Amercoat 68HS NuKlad 105A NuKlad 114A Amerlock 400BF NuKlad 120A Amercoat 220 Amercoat 351 Amercoat 385 Amerlock 400 Amerlock 400NT ^e Amerlock 2 Amercoat 450HS Amershield Amercoat 1000
Carboline	Primer/Sealer Scratch/Build Patch Elastomeric Sealer Semi-Leveling Coating Aggregate Membrane	Semstone 110 or 5401 ^f Semstone 140, 145, 145SL, or 245 Semstone 501 or 510 Semstone 805 or 806 Semstone 870 Silica Aggregate ^g Semstone Scrim Cloth/Semstone 100 Fabric ^g
General Polymers	Primer Patch Scratch/Build Grout Topcoat Elastomeric Sealer Aggregate Membrane	3579 TPM #115 or TPM #711 ^h 3561, 3561P, or Epoflex 3552 3744 3744P or Cor-Seal PS 7200 Epo-flex 3555 5115 Aggregate and Trafficote Filler with 50 mesh dry Silica Sand ^g Fiberglass Scrim FS38-.4 ^g
Keeler & Long	Primer Filler Scratch/Build Elastomeric Sealer Aggregate Membrane	Kolor-Poxy 5129 Fast Set Grout ^g Kolor-Poxy 5500 or 7700 RLP 2378 KL Quartz ^g KL Fabric ^g

- Coatings are applied to a dry film thickness as specified by the manufacturer. Coating application will be done in accordance with manufacturer specifications.
- Manufacturer Product Specification Sheets are provided at the end of this Appendix.
- This product is manufactured by Chemprobe Coating Systems.
- This product is manufactured by the Sherwin-Williams Company.
- Manufacturer Product Specification Sheet for Amerlock 400NT is the same as for Amerlock 400.

- f. Semstone 5401 is the same product as Semstone 1340. The coatings come from two product lines and are given two different coating names. However, the products are the same in physical and chemical properties and have the same chemical resistance. See Manufacturer Product Specification Sheet 1340 at the end of the Appendix for information on both Semstone 5401 and 1340.
- g. This material is an inert material that may be added to a specific coating in a given area. For example, sand aggregate could be added to an epoxy topcoat in order to provide a non-slip walking surface. All inert materials added do not reduce the chemical resistance of a coating.
- h. TPM #711 is a cement based repair mortar and will be coated with a coating system that meets the requirements of IDAPA 58.01.05.008 (40 CFR 264.175).

3. Application

General

All surface preparation and coating application will conform to the applicable standards of the Society of Protective Coatings and the manufacturer's specifications. All work will be performed by trained/skilled personnel in a manner comparable with the best standards of practice.

Surface Preparation – Concrete

The following cleaning activities will be performed on all concrete surfaces to be coated.

- A. Concrete surfaces shall be prepared in accordance with the requirements of SSPC-SP-13, "Surface Preparation of Concrete" and will be free of all contamination, from release agents, curing compounds, and any existing coatings.
- B. All oily or greasy surface contaminants, dirt, loose material, and dust shall be removed by cleaning in accordance with the American Society of Testing and Materials (ASTM) requirements. Specific attention shall be given to the removal of wax-based floor sweeping compounds.
- C. All surface defects such as fins, protrusions, bulges or mortar spatter shall be removed by grinding, scraping, or equivalent method.
- D. All flooring surfaces shall be prepared by vacuum assisted abrasive blasting or low emission open abrasive blasting in accordance with ASTM requirements. Power tool cleaning may be used around edges or in hard to reach areas.
- E. The prepared surface will have a uniform roughened appearance similar to that of coarse sandpaper.
- F. Abrasives will not be used that will erode the substrate beyond what is necessary to impart a specified texture.
- G. Abrasives used in blast cleaning operations will be new, washed, graded, non-hazardous, non-radioactive, and free of contaminants, which would interfere with the adhesion of coatings.
- H. As a final step in the preparation process, the prepared surface will be vacuumed to remove any loose particles or dust. Once clean, the surfaces will be off-limits to personnel in order to avoid contamination of the surfaces.

Surface Preparation – Steel Appurtenances

The following cleaning activities will be performed on all steel surfaces to be coated.

- A. Solvent Cleaning
 1. Prior to using any of the methods of surface preparation specified herein, remove heavy deposits of grease and oil from the bare substrate using a scraper, squeegee, or equivalent method.

2. Remove all oil and grease residues in accordance with the standards of the Society of Protective Coatings requirements.
3. Only use solvents or detergents that will not damage the substrate.
4. Use clean cloths for final cleaning.

Note: It may be necessary to supplement the above stated methods with mechanical cleaning such as scraping, wire brushing, or equivalent method to dislodge surface contaminants.

B. Surface Roughening

Remove gloss from the existing coating and thoroughly roughen the surface to assure proper adhesion of the newly applied material. Use one or more of the methods identified below:

1. Hand and Power Sanding – Use hand and power tools to sand, and uniformly and densely roughen the entire surface. When preparing coatings, use vacuum shrouding around tools, as required, to reduce worker exposures to potentially toxic materials.
2. Brush-Off Blast Cleaning – Prepare the entire surface to a Brush-Off degree of cleanliness in accordance with the Society of Protective Coatings requirements. Various control measures may be used to minimize the extent of damage caused to the coating system. Control measures include, but are not limited to, reducing blasting pressures using a fine abrasive, and increasing the blasting distance.

Coating Application

- A. Protective coverings will be used to protect fixtures, equipment, and other surfaces not to be coated.
- B. Coatings will only be applied to concrete when it is dry and fully cured. Moisture content tests will be conducted in accordance with ASTM requirements.
- C. Steel surfaces will only be coated after all surface preparation requirements have been completed.
- D. When coating wide floors, manpower and techniques will be adjusted so that seams are not noticeable.
- E. Mixing and Thinning
 1. All coating components will be mixed in exact proportions specified by the manufacturer. This is particularly important when mixing in aggregate for a slurry coat application. Care will be given to ensure all material is removed from containers during mixing and metering operations.
 2. All coatings will be thoroughly mixed until all components are thoroughly combined and are of a smooth consistency. Coatings will not be applied beyond pot-life limits specified by the manufacturer.

3. Filler aggregate will be uniformly mixed in accordance with manufacturer's specifications.
4. The type of thinner used for coatings will be in accordance with manufacturer's specifications. The amount of thinner added will not exceed the limits established in the specifications.

F. Spall/Hole/Defect Repair

1. Spalls, holes, and depressions evident on the floor surface will be flush filled after cleaning with the specified repair material. The repair area will be struck flush immediately after patching in order to avoid lumps that will disrupt the uniformity of the subsequent coats.

G. Primer Application

1. The primer will be applied in accordance with the manufacturer's specifications. Under no circumstances may the primer be allowed to puddle on the floor. Roll out excess material where necessary.

H. Application of Scratch Coat

1. The scratch coat will be applied in accordance with the manufacturer's instructions. Under no circumstances may the primer be allowed to puddle on the floor. Roll out excess material where necessary.
2. During the application, extreme care shall be taken to remove all ridges and material as the material cures extremely hard. Protrusions might require power grinding to remove.

I. Application of Self-Leveling Epoxy Coat

1. Plan the work so that the material can be poured and spread as a continuous, monolithic layer. "Cut-in" around disruptions in the continuum of the floor, such as at equipment bases and columns, first.
2. Terminations should be made at locations where the interface seam will be the least noticeable, such as at equipment bases and columns, first.
3. Termination seams will be made in accordance with the manufacturer's specifications.
4. Air can become entrapped during mixing and application. Any large bubbles that become evident soon after placing the material probably are a result of air incorporated during the mixing process. Smaller air bubbles are also invariably present. These bubbles will take more time to rise to the surface. Methods will be employed to minimize these air bubbles.

J. Special Requirements for Build/Scratch Coat Application to High Abrasion Floors

The Build/Scratch Coat will be applied as a broadcast or aggregate slurry film, unless stipulated otherwise by the manufacturer.

K. Special Requirements for Build/Scratch Coat Application to Heavily Cracked Floors

Apply designated Build/Scratch Coat reinforced with fiberglass scrim cloth and fortified with aggregate. Install the mesh into the Scratch Coat prior to completing the Build Coat application with aggregate, as specified by the manufacturer.

L. Application of Flexible Sealant

The Flexible Sealant will be applied in accordance with the manufacturer's specifications to properly prepared surfaces.

Number of Coats and Required Dry Film Thickness

After completion of surface preparation, as specified, all surfaces will receive a floor coating system as determined by the manufacturer's specifications.

Cure

- A. The manufacturer's recommended minimum/maximum recoat windows will be followed throughout the coating application process.
- B. The completed floor coating will be allowed to cure for at least 24 hours before being subjected to foot traffic and 48 hours before being subjected to wheeled vehicles.

Repairs

- A. For discrete localized repairs, prepare the area with a rotary disk grinder or by other comparable power tool methods as required to (1) expose fresh concrete and remove any foot traffic glaze and (2) feather the perimeter and scuff up the surrounding intact floor coating over a band of about 1 – 3 inches wide.
- B. Power tools will be outfitted with vacuum recovery systems to minimize dusting unless more comprehensive measures, such as enclosing the work area and ducting the contained air to a filter, are used.
- C. For small "dings," abrading may be accomplished by manual sanding.
- D. For major reworks the complete system should be removed and a new system applied.
- E. As a final step in the preparation process, always vacuum the prepared surface to pick up any loose particles or dust. Any areas wet during the preparation process must be allowed to dry (as determined visually).
- F. The repair/refurbishing is made by first applying the Primer and then making any patch repairs to flush-out the concrete. Primer recoat window will be followed.

- G. One Build Coat will be applied after the patch has cured in accordance with the manufacturer's specifications.

Clean-Up

Upon completion of the work, all materials, equipment, and containers shall be removed from the site. Coating or paint spots upon adjacent surfaces will be removed and the entire jobsite cleaned. All damage to surfaces resulting from the work of this section shall be cleaned, repaired, or refinished to the specification stated in Section 3.0 of this document.

4. References

A. American Society for Testing and Materials (ASTM)

1. ASTM D 4258, "Standard Practice for Surface Cleaning Concrete for Coating."
2. ASTM D 4259, "Standard Practice for Abrading Concrete."
3. ASTM E337, "Standard Test Method for Measuring Humidity with a Psychrometer."
4. ASTM D4138, "Standard Test Method for Measurement of Dry Paint Thickness of Protective Coating Systems by Destructive Means."
5. ASTM D4285, "Standard Test Method for Indicating Oil or Water in Compressed Air."
6. ASTM D4414, "Standard Practice for Measurement of Wet Film Thickness by Notch Gages."
7. ASTM D4227, "Standard Practice for the Qualification of Coating Applicators for Application of Coatings to Concrete Surfaces."
8. ASTM D4263, "Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method."
9. ASTM F1869-98, "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride."

B. Standards of the Society of Protective Coatings

1. SSPC-QP 1, "Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Industrial Structures)."
2. SSPC-QP 8, "Standard Procedure for Evaluating the Qualifications of Contracting Firms that Install Polymer Coatings and Surfacing on Concrete and Other Cementitious Substrates."
3. SSPC-SP 1, "Solvent Cleaning."
4. SSPC-SP 7, "Brush Off Blast Cleaning."

5. SSPC-SP 12, "Surface Preparation and Cleaning of Steel and Other Hard Materials by High and Ultrahigh Pressure Water Jetting Prior to Recoating."
6. SSPC-SP 13, "Surface Preparation of Concrete."
7. SSPC Publication No. 91-12, "Coating and Lining Inspection Manual."

PRIME A PELL® 200

1. PRODUCT NAME

PRIME A PELL 200; a clear penetrating water repellent for above grade vertical, brick and block masonry, concrete, glass fiber reinforced concrete (GFRC), and stucco.

2. MANUFACTURER

Chemprobe Coating Systems, LP.
2805 Industrial Lane
Garland, TX 75041
Phone: (800) 760-6776
Phone: (972) 271-5551
Fax: (972) 271-5553

3. PRODUCT DESCRIPTION

Basic use: PRIME A PELL 200 is a clear, filmless, penetrating water repellents for virtually all concrete and masonry above grade vertical walls and structures. The treatment does not alter the color or texture of the surface nor affect the vapor transmission qualities of the substrate. When this product is applied, the solution penetrates the substrate and reacts to create a powerful barrier against water penetration. This barrier is not sensitive to ultraviolet and weather deterioration like some other water repellents.

Resists:

- Water Intrusion
- Stain Damage
- Freeze Thaw Spalling
- Efflorescence
- Fungi and Mildew
- Rust Damage

Advantages:

- One coat application.
- Compatible with caulking and sealing compounds.
- Long Lasting Repellency.

PRIME A PELL 200 is acceptable to the United States Department of Agriculture as a coating for application to structural surfaces or surfaces where there is a possibility of incidental food contact.

Limitations: PRIME A PELL 200 is not formulated for use on horizontal or below grade surfaces. This product is not intended to seal visible cracks or as a substitute for re-pointing defective mortar joints. The substrate should not be acid washed after application. The acid will not penetrate and may cause surface discoloration. PRIME A PELL 200 must penetrate into and react with the substrate for effective repellency, therefore, it may not be as effective on painted surfaces. If both color and water repellency are desired, use Chemprobe's CONFORMAL Stain. PRIME A PELL 200 is one of the few products that will not discolor limestone, but it does not repel water from all grades of limestone. Use PRIME A PELL NS on non-siliceous substrates. Please be aware that a water repellent may not be able to completely seal wind driven rain from all types of masonry systems and that a minimum of two coats may be required for ade-

quate performance. A test application must be done to determine performance and substrate compatibility. Use PRIME A PELL Plus or PRIME A PELL H₂O where low VOC materials are required.

Composition and Materials:

PRIME A PELL 200 is a patented product containing defused quartz carbide and modified oligomeric siloxane in a mixture of hydrocarbon solvents.

4. TECHNICAL DATA

PRIME A PELL 200 has been successfully tested under the Federal Testing Standards 141 and meets or exceeds applicable requirements of Federal Specification SS-W-110C (GSA-FSS). The Atlas Twin Arc Weatherometer is used to determine the deterioration of materials under severe accelerated climatic conditions.

Various concrete and masonry surfaces treated with PRIME A PELL 200 were subjected to this test and the results substantiate the stated guarantee.

Refer to Table I for technical characteristics, and Table II for Test Results.

Table I: Technical Characteristics

Characteristic	PRIME A PELL 200
Active Ingredient	Oligomeric Alkylalkoxy Siloxane
Weight per Gallon	6.7 lb/gal (803 g/l)
Solubility in Water	None
Solids Content	7%
Appearance	Cloudy / Clear Liquid
Flash Point	102°F (39° C)
Storage	Not above 120° F (49° C)
VOC (volatile organic content)	6.2 lb/gal (725 g/l)
Clean Up With....	Mineral Spirits / Lacquer Thinner

Table II Test Results for PRIME A PELL 200

Test Performed	Results
ASTM E514 Water Permeance of Masonry	99.1%
ASTM C67 Water Repellency Test	97.1%
ASTM E96 Moisture Vapor Transmission	97.7%
ASTM G53 Weathering & UV Stability (2500 hrs)	No Loss of Repellency

5. INSTALLATION

Preparatory Work. The surface to be treated must be sound, dry and free of cracks, dirt, oils, paint or other contaminants which may effect the penetration of PRIME A PELL 200. Fill all cracks, voids, and tuck point mortar joints if necessary. New mortar must be allowed to cure a minimum of twenty one (21) days before treatment. Surface and air temperature must be above 40°F (5° C).

Precautions: Read the Material Safety Data Sheet prior to use. Use only in well ventilated or open areas. Keep away from open flame or extreme heat Avoid breathing vapors, repeated contact with the skin and contact with eyes. The use of an approved organic vapor respirator and eye protection during application is recommended. Overspray should be removed immediately with paint thinner or mineral spirits. Shield and protect from overspray: plants and shrubs, glass, painted surfaces, wood frames and any other items subject to over-spray which are not to be treated.

Avoid contact with asphalt materials such as roof shingles, and driveways.

Application: This product should be used as supplied by the manufacturer. Do not dilute or thin. Use a low pressure rotary or gear pump sprayer with a fan tip to apply PRIME A PELL 200. A commercial grade pump up spray tank with solvent resistant hose is also acceptable. High pressure paint spray equipment is not acceptable for the application of water repellents. Best results are obtained by delivering a soft stream of product saturating the wall and allowing a slight rundown (less than three inches). Clean equipment after use with paint thinner, mineral spirits, or other suitable solvent. Coverage rates are dependent upon substrate porosity. Table III contains approximate coverage rates for various substrates. A test application should be performed to determine the exact coverage rate required. Refer to Chemprobe's PRIME A PELL 200 application instructions for more complete details.

6. AVAILABILITY AND COST

Availability: PRIME A PELL 200 is available in 1, 5, and 55 gallon containers from distributors throughout the United States. Contact Chemprobe for the distributor nearest you. Samples will be provided upon request

Cost: Material cost is dependent on container size and geographical location. Prices are available from your local distributor or our sales office in Garland Texas.

7. WARRANTY

Chemprobe will provide a warranty application, prior to product installation, upon request. Chemprobe stands behind the performance claims of its products when used in accordance with their design intentions and application instructions. Coverage rates are critical for long life expectancy. Rates must be within the noted ranges on Table III for a warranty to be valid.

Chemprobe under all warranties, expressed or implied, shall be limited to the replacement of product or refund of purchase price.

CHEMPROBE'S WRITTEN WARRANTY IS IN LIEU OF ANY WARRANTY, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS.

Any warranty claim must be accompanied by a copy of the Chemprobe Warranty with a Warranty number.

8. MAINTENANCE

None required. Reapply after PRIME A PELL 200 no longer repels water.

Life expectancy is dependent upon substrate condition and quality of application.

9. TECHNICAL SERVICES

Complete Technical assistance and information is available from select Chemprobe distributors or our Technical Department in Garland Texas.

Phone: (800) 760-6776

Phone: (972) 271-5551

Fax: (972) 271-5553.

Table III Approximate Coverage Rates PRIME A PELL 200

Substrate	Sqft. /Gallon	Meter ² /liter
Concrete Block (Light Weight)	65 -85	1.6-2.1
Concrete Block	75-125	1.8-3.1
Stucco	100-125	2.5-3.1
Brick (porous)	125-150	3.1-3.7
Brick(Fired)	200-250	4.9-6.1
Concrete Panels	200-300	4.9-7.4

** Coverage rates are approximate. A test application should be done to determine exact coverage rates.

address 2805 Industrial Lane Garland, Texas 75041	toll free # 800-760-6776	local # 972-271-5551	fax # 972-271-5553	internet www.chemprobe.com info@chemprobe.com
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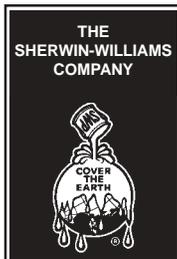


*Industrial
and
Marine
Coatings*

DIRECT-TO-METAL ENAMEL

B55 SERIES

PRODUCT INFORMATION		Revised 1/02
<p>INDUSTRIAL & MARINE COATINGS</p> <p>PRODUCT DESCRIPTION</p> <p>DIRECT-TO-METAL ENAMEL is a high-build alkyd coating with rust-inhibitive properties for application directly to bare steel.</p> <ul style="list-style-type: none"> • Good gloss and color retention • Corrosion resistance and finish coat protection in one coat • Outstanding long term flexibility • Suitable for use in USDA inspected facilities 	<p>RECOMMENDED USES</p> <p>For use over prepared steel in industrial environments.</p> <ul style="list-style-type: none"> • Interior / exterior • New construction • Railings • Machinery • Structural steel • Steel doors • Steel decking • Primer / finish • Repaints • Storage tanks • Bar joists • Piping • Fire escapes • Conveyors 	
<p>PRODUCT CHARACTERISTICS</p> <p>Finish: Semi-Gloss</p> <p>Color: Wide range of colors available</p> <p>Volume Solids: 41% ± 2%, may vary by color</p> <p>Weight Solids: 59% ± 2%, may vary by color</p> <p>VOC (calculated): 450 g/L; 3.75 lb/gal Pure White</p> <p>Recommended Spreading Rate per coat:</p> <p>Wet mils: 7.0 - 13.0 Dry mils: 3.0 - 5.0 Coverage: 131 - 188 sq ft/gal approximate</p> <p>NOTE: Brush or roll application may require multiple coats to achieve maximum film thickness and uniformity of appearance.</p> <p>Drying Schedule 10.0 mils wet @ 50% RH: @ 77°F</p> <p>To touch: 1½ hours Tack free: 6 hours To recoat: 18 hours</p> <p>Drying time is temperature, humidity and film thickness dependent.</p> <p>Shelf Life: 36 months, unopened, at 77°F</p> <p>Flash Point: 101°F, PMCC</p> <p>Reducer: Not recommended</p> <p>Clean Up: VM&P Naphtha, R1K3</p>	<p>PERFORMANCE CHARACTERISTICS</p> <p>System Tested: (unless otherwise indicated) Substrate: Steel Surface Preparation: SSPC-SP6 Finish: 2 cts. Direct-to-Metal Enamel @ 3.0 mils dft/ct</p> <p>Abrasion Resistance: Method: ASTM D4060, CS17 wheel, 1000 cycles, 1 kg load Result: 200 mg loss</p> <p>Adhesion: Method: ASTM D4541 Result: 300 psi</p> <p>Direct Impact Resistance: Method: ASTM G14 Result: >30 in. lbs.</p> <p>Dry Heat Resistance: Method: ASTM D2485 Result: 200°F (discolors)</p> <p>Flexibility: Method: ASTM D522, 180° bend, 1/4" mandrel Result: Passes</p> <p>Moisture Condensation Resistance: Method: ASTM D4585, 100°F, 500 hours Result: Passes</p> <p>Pencil Hardness: Method: ASTM D3363 Result: 3B</p> <p>Salt Fog Resistance: Method: ASTM B117, 500 hours Result: Passes</p> <p>Exterior Durability: Method: 1 year, 45° South Result: Very good</p> <p>Thermal Shock: Method: ASTM D2246, 5 cycles Result: Passes</p> <p>Provides performance comparable to products formulated to federal specifications: MIL-E-15090, TT-E-485F</p>	



*Industrial
and
Marine
Coatings*

DIRECT-TO-METAL ENAMEL

B55 SERIES

INDUSTRIAL
& MARINE
COATINGS

PRODUCT INFORMATION

RECOMMENDED SYSTEMS

Steel, Light Service:

1 ct. Direct-To-Metal Enamel @ 3.0 - 5.0 mils dft

Steel, Moderate Service:

2 cts. Direct-To-Metal Enamel @ 3.0 - 5.0 mils dft/ct

The systems listed above are representative of the product's use. Other systems may be appropriate.

SURFACE PREPARATION

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

Refer to product Application Bulletin for detailed surface preparation information.

Minimum recommended surface preparation:
Iron & Steel: SSPC-SP2

TINTING

Tint with Blend-A-Color Toner at 75% strength. Five minutes minimum mixing on a mechanical shaker is required for complete mixing of color.

APPLICATION CONDITIONS

Temperature: 40°F minimum, 120°F maximum
(air, surface, and material)
At least 5°F above dew point
Relative humidity: 85% maximum

Refer to product Application Bulletin for detailed application information.

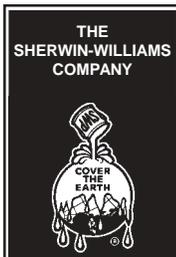
ORDERING INFORMATION

Packaging: 1 and 5 gallon containers
Weight per gallon: 9.2 ± 0.2 lb, may vary with color

SAFETY PRECAUTIONS

Refer to the MSDS sheet before use.

Published technical data and instructions are subject to change without notice. Contact your Sherwin-Williams representative for additional technical data and instructions.



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DIRECT-TO-METAL ENAMEL

B55 SERIES

**INDUSTRIAL
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COATINGS**

APPLICATION BULLETIN

Revised 1/02

SURFACE PREPARATION

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

Iron & Steel

Minimum surface preparation is Hand Tool Clean per SSPC-SP2. Remove all oil and grease from surface by Solvent Cleaning per SSPC-SP1. For better performance, use Commercial Blast Cleaning per SSPC-SP6, blast clean all surfaces using a sharp, angular abrasive for optimum surface profile (2 mils). Coat any bare steel within 8 hours or before flash rusting occurs.

Previously Painted Surfaces

If in sound condition, clean the surface of all foreign material. Smooth, hard or glossy coatings and surfaces should be dulled by abrading the surface. Apply a test area, allowing paint to dry one week before testing adhesion. If adhesion is poor, or if this product attacks the previous finish, removal of the previous coating may be necessary. If paint is peeling or badly weathered, clean surface to sound substrate and treat as a new surface as above.

APPLICATION CONDITIONS

Temperature: 40°F minimum, 120°F maximum
(air, surface, and material)
At least 5°F above dew point

Relative humidity: 85% maximum

APPLICATION EQUIPMENT

The following is a guide. Changes in pressures and tip sizes may be needed for proper spray characteristics. Always purge spray equipment before use with listed reducer. Any reduction must be compatible with the existing environmental and application conditions.

Reducer Not recommended

Clean Up VM&P Naphtha, R1K3

Airless Spray

Pressure 2000 psi
Hose 3/8" ID
Tip019"

Conventional Spray

Gun Binks 95
Fluid Nozzle 63B
Air Nozzle 63PB
Atomization Pressure .. 50 psi
Fluid Pressure 20-25 psi

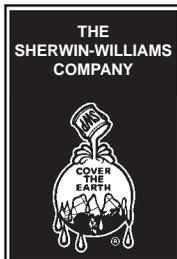
Brush

Brush Natural Bristle

Roller

Cover 3/8" woven with phenolic core

If specific application equipment is listed above, equivalent equipment may be substituted.



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DIRECT-TO-METAL ENAMEL

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APPLICATION BULLETIN

APPLICATION PROCEDURES

Surface preparation must be completed as indicated.

Mixing Instructions: Mix paint thoroughly by boxing and stirring before use.

Apply paint at the recommended film thickness and spreading rate as indicated below:

Recommended Spreading Rate per coat:

Wet mils:	7.0 - 13.0
Dry mils:	3.0 - 5.0
Coverage:	131 - 188 sq ft/gal approximate

NOTE: Brush or roll application may require multiple coats to achieve maximum film thickness and uniformity of appearance.

Drying Schedule @ 10.0 mils wet @ 50% RH:

@ 77°F

To touch:	1½ hours
Tack free:	6 hours
To recoat:	18 hours

Drying time is temperature, humidity and film thickness dependent.

Application of coating above maximum or below minimum recommended spreading rate may adversely affect coating performance.

PERFORMANCE TIPS

Stripe coat all crevices, welds, and sharp angles to prevent early failure in these areas.

When using spray application, use a 50% overlap with each pass of the gun to avoid holidays, bare areas, and pinholes. If necessary, cross spray at a right angle.

Spreading rates are calculated on volume solids and do not include an application loss factor due to surface profile, roughness or porosity of the surface, skill and technique of the applicator, method of application, various surface irregularities, material lost during mixing, spillage, overthinning, climatic conditions, and excessive film build.

No reduction of material is recommended as it can affect film build, appearance, and adhesion.

In order to avoid blockage of spray equipment, clean equipment before use or before periods of extended downtime with VM&P Naphtha, R1K3.

Refer to Product Information sheet for additional performance characteristics and properties.

CLEAN UP INSTRUCTIONS

Clean spills and spatters immediately with VM&P Naphtha, R1K3. Clean tools immediately after use with VM&P Naphtha, R1K3. Follow manufacturer's safety recommendations when using any solvent.

SAFETY PRECAUTIONS

Refer to the MSDS sheet before use.

Published technical data and instructions are subject to change without notice. Contact your Sherwin-Williams representative for additional technical data and instructions.



AMERON
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Performance Coatings & Finishes

Amercoat[®] 68HS



Zinc rich epoxy primer

68 Series

Product Data/ Application Instruction

- High zinc content in dry film.
- Outstanding resistance to severe weathering
- Excellent adhesion to inorganic zincs
- Easily applied by airless or conventional spray
- Fast dry times allow for rapid topcoating
- Amercoat 861 Accelerator can be used for low temperature curing.

Typical Uses

Amercoat 68HS is a shop primer for bare steel on new construction or major repair projects. Amercoat 68HS can also be used as a field maintenance primer over bare steel or steel coated with organic or inorganic zinc primers and epoxy topcoats such as, Amercoat 385, Amerlock[®] 400 or Amershield[™]. Amercoat 68HS may be used to repair itself or inorganic zinc primers.

Typical Properties

Adhesion, Elcometer D4541 1000 psi

Qualifications

AASHTO – Standard Specification for Highway Bridges Table 10.32.3C Allowable Load for Slip Critical Connections Class B

AISC – Specification for Structural Joints Using ASTM A325 or A490 Bolts RCSC Specification for Structural Joints Table 3 Class B

Physical Data

Finish	Flat	
Color	Reddish gray	
Components	3	
Mixing ratio	1- or 5-gal unit package	
Curing mechanism	Solvent release and chemical reaction between components	
Volume solids (ASTM D2697 modified)	70% ± 3%	
Coats	1	
Typical dry film thickness	3 mils (75 microns)	
Theoretical coverage	ft ² /gal	m ² /L
1 mil (25 microns)	1123	27.5
3 mils (75 microns)	374	9.2
VOC	lb/gal	g/L
mixed	2.4	288
mixed/thinned (1/2 pt/gal)	2.8	335
Temperature resistance, dry continuous (maximum)	°F	°C
	400	204
Flash point (SETA)	°F	°C
cure	110	43
resin	82	28
mixed	82	28
Amercoat 65	78	25
Amercoat 12	2	-17
Thinner	Amercoat 65	
Cleaner	Amercoat 12	

Typical Systems

1st Coat	2nd Coat	3rd Coat
Amercoat 68 Series	Amercoat 385 or Amercoat 370	Amercoat 450 Series
Amercoat 68 Series	PSX 700	
Amercoat 68 Series	Amershield	
Amercoat 68 Series	Amerlock Series	Amercoat 450 Series

Surface Preparation

Coating performance, in general, is proportional to the degree of surface preparation. Surface must be clean, dry and free of all contaminants.

Steel – Without pits or depressions: blast SSPC-SP6.

Rusted and pitted: blast SSPC-SP10.

Blast to achieve a 1- to 2-mil (25- to 50-micron) profile as indicated by a Keane-Tator Surface Profile Comparator. Testex Tape or similar device.

For touch-up or repair, power tool clean SSPC-SP3 or SP11 is acceptable.

Apply Amercoat 68HS as soon as possible to prevent blasted surface from rusting. Keep moisture, oil, grease or other organic matter off surface before coating. Spot blast to remove any contamination; solvent-wiping is not satisfactory.

Repair inorganic zinc surfaces – must be clean, dry, free of all contaminants and loose paint. Blast damaged areas to SSPC-SP10 or mechanically clean to SSPC-SP3 or SP11.

Epoxy or urethane surfaces – abrasive or brush blast damaged areas down to bare metal. Remove all contaminants before applying coating.

Environmental Conditions

Resin and cure material must be a minimum of 50°F before mixing. For satisfactory cure, air and surface temperatures must be above 50°F (10°C). Use Amercoat 861 Accelerator when air and surface temperatures are below 50°F (10°C)

Temperature	°F	°C
air	32 to 120	0 to 49
surface	32 to 140	0 to 60
material (minimum)	50	10

Surface temperatures must be minimum 5°F (3°C) above the dew point to prevent condensation.

Application Data

Applied over	Steel		
Surface preparation	SSPC-SP 6 or 10		
Method	Airless or conventional spray		
Mixing ratio (by volume)	1- or 5-gal unit package		
Pot life (hours)	°F/°C		
	90/32	70/21	50/10
nonaccelerated	8	16	24
accelerated (¼ pt 861/5 gal)	5	9	16

Environmental conditions

Temperature	°F	°C
air	32 to 120	0 to 49
surface	32 to 140	0 to 60
material (minimum)	40	4

Surface temperatures must be minimum 5°F (3°C) above the dew point to prevent condensation.

Drying time (ASTM D1640) (hours)	°F/°C			
	90/32	70/21	50/10	32/0
nonaccelerated				
touch	¼	½	1	NR
through	4	8	36	NR
topcoat (minimum)	1	2	6	NR
topcoat (maximum months)	6	6	6	NR
accelerated (¼ pt 861/5 gal)				
touch	–	⅓	½	2
through	1½	4	16	96
topcoat (minimum)	¾	1½	4	24
topcoat (maximum months)	6	6	6	6

NR = Not Recommended

Application Equipment

The following is a guide; suitable equipment from other manufacturers may be used. Changes in pressure, hose and tip size may be needed for proper spray characteristics.

Conventional spray – Industrial equipment such as DeVilbiss MBC or JGA, or Binks #18 or 62 spray gun. A moisture and oil trap in the main air supply, mechanical pot agitator, separate regulators for air and fluid pressure are recommended.

Airless spray – Standard equipment such as Graco Bulldog Hydra-Spray or larger with a 0.017-inch tip with preorifice or fine finish tip.

Power mixer – Jiffy Mixer powered by an air or explosion-proof electric motor.

Application Procedure

1. Flush all equipment with thinner or Amercoat 12 before use.
2. Stir each component separately, then mix cure into resin and mix until uniform. Slowly stir in zinc dust and mix until uniformly blended. Maintain slow agitation during application to ensure the material remains uniformly blended.

Pot life (hours)	°F/°C		
	90/32	70/21	50/10
nonaccelerated	8	16	24
accelerated (¼ pt 861/5 gal)	5	9	16

3. Thinning may be required; thin with up to ½ pint Amercoat 65 per gallon of Amercoat 68HS.
4. Apply to wet coat in even, parallel passes; overlap each pass 50 percent to avoid holidays, bare areas and pinholes. If required, cross spray at right angles to first pass.
5. Check dry film thickness using nondestructive dry film thickness gauge such as Mikrotest or Elcometer. If less than the specified thickness, apply additional material. Typical dry film thickness is 3 mils in one coat, however dry film thickness up to 5 mils in one coat is acceptable. Do not exceed 6 mils in one coat as excess dry film thickness may result in increased mechanical damage during handling or shipping.
6. Touch up random pinholes, holidays and small damaged or bare areas by brush when film dry to touch. Larger areas should be resprayed.

Drying time (ASTM D1640) (hours)	°F/°C			
	90/32	70/21	50/10	32/0
nonaccelerated	¼	½	1	NR
touch	4	8	36	NR
topcoat (minimum)	1	2	6	NR
topcoat (maximum months)	6	6	6	NR
accelerated (¼ pt 861/5 gal)				
touch	–	½	½	2
through	1½	4	16	96
topcoat (minimum)	¾	1½	4	24
topcoat (maximum months)	6	6	6	6

NR=Not Recommended

7. Clean equipment with thinner or Amercoat 12 immediately after use.

Shipping Data

Packaging units	1 gal	5 gal
cure	1-qt can	1-gal can
resin	1-gal can	5-gal can
powder	1-gal can	EnviroPac
Shipping weight (approx)	lb	kg
1-gal unit		
cure	2	0.9
resin	5.4	2.5
powder	20.2	9.2
5-gal unit		
cure	8.4	3.8
resin	26.6	12
powder	98.5	44.7

Shelf life when stored indoors at 40 to 100°F (4 to 38°C)
cure, resin, powder 1 year from shipment date

Numerical values are subject to normal manufacturing tolerances, color and testing variances. Allow for application losses and surface irregularities. See application instructions for complete information and safety precautions.

This mixed product is photochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.

Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of each component. Safety precautions must be strictly followed during storing, handling and use.

CAUTION - Improper use and handling of this product can be hazardous to health.

Do not use this product without first taking all appropriate safety measures to prevent property damage and injuries. These measures may include, without limitation: implementation of proper ventilation, use of proper lamps, wearing of proper protective clothing and masks, tenting and proper separation of application areas. Consult your supervisor. Proper ventilation and protective measures must be provided during application and drying to keep spray mists and vapor concentrations within safe limits and to protect against toxic hazards. Necessary safety equipment must be used and ventilation requirements carefully observed, especially in confined or enclosed spaces, such as tank interiors and buildings.

This product is to be used by those knowledgeable about proper application methods. Ameron makes no recommendation about the types of safety measures that may need to be adopted because these depend on application environment and space, of which Ameron is unaware and over which it has no control.

If you do not fully understand these warnings and instructions or if you cannot strictly comply with them, do not use the product.

Note: Consult Code of Federal Regulations Title 29, Labor, parts 1910 and 1915 concerning occupational safety and health standards and regulations, as well as any other applicable federal, state and local regulations on safe practices in coating operations.

This product is for industrial use only. Not for residential use.

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

Ameron makes no other warranties concerning the product. No other warranties, whether express, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Ameron be liable for consequential or incidental damages.

Any recommendation or suggestion relating to the use of the products made by Ameron, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.

Limitation of Liability

Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. **In no event shall Ameron be liable for consequential or incidental damages.**



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AMERON
INTERNATIONAL

Performance Coatings & Finishes

Nu-Klad® 105A

Epoxy primer and sealer

Product Data

- Primer for concrete surfaces

Nu-Klad 105A primer/sealer is recommended for concrete surfaces prior to application of Nu-Klad 100A, 110A, 120A and Amercoat® 3228 epoxy surfacers. Nu-Klad 105A is also recommended as a primer for Nu-Klad 470A elastomeric polyurethane, Amerlock® 400 and Amershield™.

As a primer/sealer, Nu-Klad 105A is applied to concrete slabs or to formed concrete surfaces which have been water cured and properly prepared.

As a concrete curing compound, Nu-Klad 105A is applied to concrete slabs immediately after pouring and finishing. Nu-Klad 105A is applied to formed concrete surfaces as soon as the forms are removed, three days after initial pour.

Typical Uses

- Chemical processing plants
 - Power
 - Sewage and waste treatments
- Finishing operations
 - Mining
 - Metal
- Mills
 - Pulp and paper
 - Steel
 - Textile

Typical Systems Using Nu-Klad 105A

Nu-Klad 105A as a Primer

Concrete must cure a minimum of 14 days prior to the application of Nu-Klad 105A as a primer/sealer.

First Coat	Second Coat	Third Coat
Nu-Klad 105A	Nu-Klad 100A, 110A, 120A, 470A or Amercoat 3228	Amerlock 400, Amershield or none

When epoxy surfacers are applied outdoors, over Nu-Klad 105A as a primer/sealer the maximum recoat window is relatively short. If the maximum time is exceeded the Nu-Klad 105A surface will have to be roughened prior to topcoating.

Nu-Klad 105A as a Concrete Curing Compound

Nu-Klad 105A is applied to concrete slabs immediately after pouring and finishing, or to formed concrete surfaces as soon as the forms are removed (three days after initial pour). Concrete must cure a minimum of 14 days (total) prior to topcoating with epoxy surfacers.

First Coat	Second Coat	Third Coat
Nu-Klad 105A	Nu-Klad 100A, 110A, 120A, 470A or Amercoat 3228	Amerlock 400, Amershield or none

When epoxy surfacers are applied outdoors, over Nu-Klad 105A as a concrete curing compound, the maximum recoat time will **ALWAYS** be exceeded and the Nu-Klad 105A surface will have to be roughened.

Physical Data

Color*

Amber, Beige BR-2, Buff Brown BR-3, Deep Blue BL-2, Medium Gray GR-2, Haze Green GN-5, Ivory YE-2, Light Blue BL-4, Oxide Red BR-1, Pearl Gray GR-3, Bright Red RD-1

Components	2	
Curing mechanism	Chemical reaction between components	
Coats	1	
Theoretical coverage per unit	ft ² /gal	m ² /L
	250 to 400	6.1 to 9.8

Will vary, dependent upon density or porosity of concrete and method of application.

Volume solids (calculated)	100%	
Temperature resistance	Wet	
	°F	°C
continuous	160	71
VOC mixed	0.0 lbs/gal	0.0 g/l
Flash point (SETA)	°F	°C
cure	215	102
resin	183	84
mixed	210	99
Amercoat 12	2	-17
Amercoat 928	175	115

Application Data

Applied over	Concrete		
Surface preparation	ASTM D4260, ASTM D4259		
Method	Airless spray, brush, roller, squeegee		
	°F/°C		
Working time (hours)	90/32 3/4	70/21 1	50/10 1 1/2
Environmental conditions	°F		
Temperature	°C		
air	50 to 100	10 to 38	
surface	50 to 120	10 to 49	
material (minimum)	50	10	

Drying time (ASTM D1640) (hours)	°F/°C		
	90/32	70/21	50/10
touch	13	17	24
through	20	24	36

Epoxy surfacing topcoat time over 105A

	90/32	70/21	50/10
minimum (hours)	3	4	6
maximum** (days)			
inside	15	21	30
outside	3	5	7

Amerlock/Amershield topcoat times

	90/32	70/21	50/10
minimum (hours)	13	17	24
maximum*** (months)	3	3	3

*Nu-Klad 105A is subject to color change upon aging.

**Roughen surface if maximum topcoat time is exceeded. Nu-Klad 105A which is thick and glossy must be roughened.

***Roughen surface if maximum topcoat time is exceeded

Equipment cleaner Amercoat 12 or 928

Application Data Summary

See Application Instructions for complete information on surface preparation, environmental conditions, application procedures and equipment. To obtain maximum performance, apply as recommended. Adhere to all safety precautions during storage, handling, application and drying periods.

Surface Preparation

Coating performance is, in general, proportional to the degree of surface preparation. All surfaces must be clean, dry and free of all contaminants.

Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of each component. Safety precautions must be strictly followed during storage, handling and use.

This product is for professional use only. Not for residential use.

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

Ameron makes no other warranties concerning the product. No other warranties, whether express, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Ameron be liable for consequential or incidental damages.

Any recommendation or suggestion relating to the use of the products made by Ameron, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.

Shipping Data

Packaging	1-gal unit	
cure	1.5 lbs in 1-qt can	
resin	7.9 lbs in 1-gal can	
Shipping weight (approx)	lb	kg
1-gal unit		
cure	1.8	0.8
resin	8.7	4

Shelf life when stored indoors in unopened, tightly sealed containers at 40 to 100°F (4 to 38°C)

resin and cure 1 year from shipment date

The mixed product is nonphotochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.

Numerical values are subject to normal manufacturing tolerances, colors and testing variances. Allow for application losses and surface irregularities.

Limitation of Liability

Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. **In no event shall Ameron be liable for consequential or incidental damages.**



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AMERON
INTERNATIONAL

Performance Coatings & Finishes

Nu-Klad[®] 114A

Epoxy filler compound

Product Data

• Filler for steel, formed concrete or concrete block
Nu-Klad 114A is a 100% solids epoxy filler compound to fill holes, voids and surface discontinuities in steel, formed concrete or concrete block up to one inch across as measured in their largest dimension. A single application will fill or seal most air bubbles and holes. On concrete block surfaces, Nu-Klad 114A provides a smooth surface in a single application for applying coatings or Nu-Klad 100A spray-on epoxy surfacer.

Nu-Klad 114A may be used to fill pits, voids, or seams in steel or concrete water tanks. For potable water tanks, topcoat with an ANSI/NSF Standard 61 - approved potable water tank lining such as Amerlock 2 or 400.

Typical Uses

Steel and concrete surfaces in :

- Nuclear facilities
- Plants – fossil fuel, sewage and waste treatment, food and beverage, chemical processing
- Mills – pulp and paper, textile, steel
- Mining and metal finishing operations
- Water tanks

Typical Properties – after 7 days @ 70°F (21°C)

Mechanical

Density (ASTM D71 modified)	88.6 lbs/ft ³
Tensile strength (ASTM D412)	3000 psi
Compressive strength (ASTM C579)	12549 psi
Modulus of elasticity (ASTM C580)	9.4 x 10 ⁵ psi

Application Data Summary

See Application Instructions for complete information on surface preparation, environmental conditions, application procedures and equipment. To obtain maximum performance, apply as recommended. Adhere to all safety precautions during storage, handling, application and drying periods.

Surface Preparation

Coating performance is, in general, proportional to the degree of surface preparation. Prior to coating, all surfaces must be clean, dry and free of all contaminants, including salt deposits.

Qualifications

ANSI/NSF Standard 61 - for use in drinking water

- Maximum Surface Area / Volume - 0.033 in²/L or maximum 1% of a 4000 gallon tank or larger
- Maximum Use Temperature - 23°C



Physical Data

Color	Off-white	
Components	2	
Curing mechanism	Chemical reaction between components	
Volume solids	100%	
Theoretical coverage	ft ² /unit	
1 mil (25 microns)		
3 lb unit	406	
20 lb unit	2709	
VOC	lb/gal	g/L
mixed	0.0	0.0
Flash point (SETA)	°F	°C
114A cure	>200	93
114A resin	>200	93
Amercoat 12	2	-17
Amercoat 928	175	79

Application Data

Applied over	Prepared or primed steel, concrete, masonry block		
Surface preparation	Abrasive blast		
steel	ASTM D4258, 4259 or 4260		
concrete	ASTM D4261		
masonry			
Primer	Nu-Klad 105A		
Method	Squeegee, roller, trowel, spatula		
Mixing ratio (by volume)	1.84 parts resin to 1 part cure		
	°F/°C		
	90/32	70/21	50/10
Working time (hours)	1	2 ^{1/2}	4
Initial setting	9	18	36
Curing time before topcoating			
minimum	9	18	36
maximum			
with 114A	36	72	144
with 100A	72	168	336
with Amercoat 90HS	6 months		
<i>If maximum recoat time exceeded, roughen surfaces.</i>			
Environmental conditions			
Temperature	°F		°C
material and surface	50 to 120	10 to 27	
Equipment cleaner	Amercoat 12 or 928		

Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of each component. Safety precautions must be strictly followed during storage, handling and use.

This product is for professional use only. Not for residential use.

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

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Shipping Data

Packaging units	3 lb	20 lb
cure	1-pt can	1/2-gal can
resin	1-qt can	2 1/2-gal can
Shipping weight (approx)	3 lb	20 lb
cure	.79	5.28
resin	2.21	14.72

Shelf life when stored indoors at 40 to 100°F (4 to 38°C)
1 year from shipment date

Numerical values are subject to normal manufacturing tolerances and testing variances. Allow for application losses and surface irregularities.

This mixed product is nonphotochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.

Limitation of Liability

Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. **In no event shall Ameron be liable for consequential or incidental damages.**



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AMERON
INTERNATIONAL

Performance Coatings & Finishes

Amerlock[®] 400BF

Epoxy masonry block filler

Product Data/ Application Instructions

- Block filler for use on prepared interior or exterior masonry block

Application Data

Adhere to all application instructions, precautions, conditions and limitations to obtain maximum performance. For conditions outside the requirements or limitations described, contact your Ameron representative.

Surface Preparation

Surface must be clean and free of all contaminants. Refer to ASTM D4258 for cleaning.

Application Equipment

The following is a guide; suitable equipment from other manufacturers may be used. Changes in pressure and tip size may be needed for proper spray characteristics.

Airless spray – Standard equipment such as Graco Bulldog Hydra-Spray or larger, with a 0.021 to 0.029-inch fluid tip.

Brush or roller – For touchup or texturing coating.

Power mixer – Jiffy Mixer with an explosion-proof motor.

Application Procedures

1. Flush all equipment with thinner or Amercoat 12 before use.
2. Stir resin using an explosion-proof power mixer to disperse pigments.
3. Add cure to resin. Mix thoroughly until uniformly blended to a workable consistency.
4. Do not mix more material than can be used within the expected pot life.
5. For optimum application material should be from 50 to 90°F (10 to 32°C). Above 110°F (43°C) sagging may occur.
6. Thin only for workability; thin no more than 1/2 pint of Amercoat 65 per gallon of Amerlock 400BF. A small amount of thinner greatly reduces viscosity; running or sagging may occur.
7. Apply in even, parallel passes; overlap 50 percent to avoid holidays, bare areas and pinholes. If required, cross spray at right angles.
8. Ventilate confined spaces with clean air between curing application coats and while curing final coat.
9. Repair any damaged areas by brushout or spray.
10. Clean equipment with thinner of Amercoat 12 immediately after use.

Physical Data

Color	Off-white	
Components	2	
Curing mechanism	Solvent release and chemical reaction between components	
Volume solids (calculated)	75% ± 3%	
Dry film thickness per coat	10-20 mils (250-500 microns)	
Coats	1	
Theoretical coverage	ft ² /gal	m ² /L
1 mil (25 microns)	1203	29.5
10 mils (250 microns)	120.3	2.9
VOC	lb/gal	g/L
mixed	1.8	216
mixed/thinned 1/2 pt	2.1	252
Temperature resistance, Dry	°F	°C
continuous	200	93
intermittent	350	177
Flash point (SETA)	°F	°C
cure and resin	80	27
Amercoat 65	78	25
Amercoat 12	2	-17

Application Data

Applied over	Concrete; concrete cinder, or masonry block		
Surface preparation	Dry, clean, well prepared surface		
Method	Airless spray, brush (touch-up), roller (back-up)		
Mixing ratio (by volume)	1 part resin to 1 part cure		
Pot life (hours)	°F/°C		
	90/32	70/21	50/10
Amerlock 400BF	1 1/2	2 1/2	4
Environmental conditions			
Temperature	°F °C		
air and surface	20 to 122	-7 to 50	
material	50 to 90	10 to 32	
Surface temperatures must be at least 5°F (3°C) above dew point to prevent condensation. At freezing temperatures, surface must be free of ice.			
Drying time (ASTM D1640) (hours)	°F/°C		
	90/32	70/21	50/10
touch 10 mils	1	3	--
20 mils	1 1/2	4	--
through 10 mils	5	9	--
20 mils	6	11	--
Thinner	Amercoat 65		
Equipment cleaner	Amercoat 12		

Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of each component. Safety precautions must be strictly followed during storage, handling and use.

CAUTION – Improper use and handling of this product can be hazardous to health and cause fire or explosion.

Do not use this product without first taking all appropriate safety measures to prevent property damage and injuries. These measures may include, without limitation: implementation of proper ventilation, use of proper lamps, wearing of proper protective clothing and masks, tenting and proper separation of application areas. Consult your supervisor. Proper ventilation and protective measures must be provided during application and drying to keep spray mists and vapor concentrations within safe limits and to protect against toxic hazards. Necessary safety equipment must be used and ventilation requirements carefully observed, especially in confined or enclosed spaces, such as tank interiors and buildings.

This product is to be used by those knowledgeable about proper application methods. Ameron makes no recommendation about the types of safety measures that may need to be adopted because these depend on application environment and space, of which Ameron is unaware and over which it has no control.

If you do not fully understand these warnings and instructions or if you cannot strictly comply with them, do not use the product.

Note: Consult Code of Federal Regulations Title 29, Labor, parts 1910 and 1915 concerning occupational safety and health standards and regulations, as well as any other applicable federal, state and local regulations on safe practices in coating operations.

This product is for industrial use only. Not for residential use.

Shipping Data

Packaging units	2 and 5 gal	
cure	1 gal in 1-gal can	
	2.5 gal in 3 gal can	
resin	1 gal in 1-gal can	
	2.5 gal in 5-gal can	
Shipping weight (approx)	lb	kg
2-gal unit		
cure	14.7	6.7
resin	14.2	6.4
5-gal unit		
cure	37.4	17.0
resin	36.4	16.5

Shelf life when stored indoors at 40 to 100°F (4 to 38°C)
1 year from shipment date

Numerical values are subject to normal manufacturing tolerances, color and testing variances. Allow for application losses and surface irregularities.

Improper use and handling of this product can be hazardous to health and cause fire or explosion.

This mixed product is photochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.

Warranty

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Limitation of Liability

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AMERON
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Performance Coatings & Finishes

Nu-Klad® 120A

Self-leveling epoxy surfacer

Product Data

- Zero VOC, solventless
- Easy to apply
- Wide range of uses
- Smooth, cleanable floor
- Excellent adhesion
- Provides long-lasting protection to concrete
- Can be used indoors or outdoors
- Good durability and appearance
- Topcoatable
- Suitable for new concrete or refurbishment

Nu-Klad 120A is a spreadable self-leveling epoxy surfacer for concrete floor protection where a smooth cleanable floor surface is required.

Nu-Klad 120A may be applied over a broad temperature range at varying thickness. Always mix packaged amounts of resin, cure and powder. DO NOT vary mix ratio.

Amercoat® 883 Decorative vinyl chips may be used with Nu-Klad 120A and topcoated with Amershield.

Typical Uses

- Food and beverage processing facilities
- Electronic equipment plants
- Industrial and commercial warehouses
- Laboratory floors
- Pharmaceutical plants
- Power plants
- Waste water and sewage treatment plants

Recommended Systems

Service	Primer	Nu-Klad 120A	Final Coat
Decorative	105A	40 mils	Amershield™
Mild	105A	40-60	
Moderate	105A	60-100	
Severe	105A	100-175	

Note: An optional final coat of Amerlock® 400 or Amershield may be used for mild service.

Typical Properties after 11 days @ 70°F (21°C)

Mechanical

Tensile strength (ASTM C307)	2,110 psi
Compressive strength (ASTM C579)	8,250 psi
Flexural strength (ASTM C580)	3,930 psi
Modulus of elasticity (ASTM C580)	8.03 psi x 10 ⁵

Physical Data

Color*	Medium gray, pearl gray, white	
Components	3 – resin, cure and powder	
Curing mechanism	Chemical reaction between components	
DFT per coat	mils	microns
	40 to 175	1000 to 4375
Coats	1 or 2**	
Theoretical coverage (ft ² /unit)		
Thickness (mils)		
40	88	
60 (≈ ¹ / ₁₆ in)	58	
80	44	
100	35	
120 (≈ ¹ / ₈ in)	29	
130	27	
160	22	
175	20	
VOC	0.0 lb/gal	0.0 g/L
Flash point (SETA)	°F	°C
cure	240	116
resin	230	110
Amercoat 12	2	-17
Amercoat 928 (TCC)	175	79

Application Data

Applied over	Prepared and primed concrete**	
Surface preparation	ASTM D4260 or 4259	
Primer	Nu-Klad 105A	
Method	Pour and spread - roll or gauge rake	
Mixing ratio	As packaged. Mix full units only.	
Environmental conditions		
Temperature	°F	°C
air	40 to 100	4 to 38
surface	40 to 120	4 to 49
material (minimum)	50 to 100	10 to 38

**Nu-Klad 120A is subject to color change upon aging. There may be minor variations in color from batch to batch.*

***A primer is optional for two-coat application of Nu-Klad 120A. Over very rough abrasive-blasted concrete a skim coat of Nu-Klad 120A may assist in achieving a smooth surface.*

Formerly Amercoat 3292

Application Data Summary

See Application Instructions for complete information on surface preparation, environmental conditions, application procedures and equipment. To obtain maximum performance, apply as recommended. Adhere to all safety precautions during storage, handling, application and drying periods.

Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of each component. Safety precautions must be strictly followed during storage, handling and use.

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Warranty

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			°F/°C
Working time (hours)	90/32	70/21	50/10
normal	¹ / ₂	³ / ₄	1 ¹ / ₂
Drying time (hours)			°F/°C
(ASTM D1640)	90/32	70/21	50/10
touch	2	3	16
through (walk-on)	6	16	28
Time before service (days)	1	2	4
Minimum topcoat time (hours)	90/32	70/21	50/10
with Amerlock 400 or Amershield	6	16	28
Maximum recoat time (days)***			
120A over 120A	2	3	5
120A over 105A	7	14	28
Amershield over 120A	3	5	10
Amerlock 400 over 120A	15	30	45

***Roughen surface if maximum recoat time is exceeded.

Equipment cleaner Amercoat 12 or 928

Shipping Data

Packaging		
cure	3.6 lb in 1-gal can	
resin	7.9 lb in 5-gal can	
powder	21.4 lb in EnviroPac™	
Shipping weight (approx)	lb	kg
cure	4.4	2
resin	11.4	5.2
powder unit	22.7	10.3

Shelf life when stored indoors at 40 to 100°F (4 to 38°C) in unopened, tightly sealed containers.

resin, cure and powder 1 year from shipment date

Numerical values are subject to normal manufacturing tolerances, colors and testing variances. Allow for application losses and surface irregularities.

This mixed product is nonphotochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.

Limitation of Liability

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AMERON
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Performance Coatings & Finishes

Amercoat[®] 220

Waterborne acrylic topcoat

Product Data

- Self-priming
- VOC-compliant
- Single-package convenience
- Semigloss or satin
- Brush, roll or spray
- Dries fast, minimum downtime
- Interior for OEM
- Excellent gloss retention and weathering
- Superior impact resistance and flexibility
- Washable, scrub-resistant
- Durable, chemical-resistant
- Stain resistant
- Quick, easy clean up
- Wide color range

Amercoat 220 is a high-performance waterborne acrylic enamel that may be applied direct* to metal on most exterior and interior surfaces. Also ideal for concrete and masonry, it may be used over tightly adhering old paint and rust as well as primed surfaces. Amercoat 220 provides a beautiful, flexible, cleanable gloss finish that resists cracking, peeling and impact damage. Amercoat 220 significantly out-performs conventional acrylic coatings. It retains color and gloss like a polyurethane, far better than traditional alkyds.

Amercoat 220 requires minimal surface preparation, usually only metal etching or power tool cleaning to remove loose rust. Easy to apply and clean up, Amercoat 220 is a versatile topcoat for a wide variety of new construction and maintenance application. Contact your Ameron representative for conditions outside the requirements or limitations described.

***Important – Amercoat 220 deep or dark colors made from neutral or clear tint base should always be used with a prime coat when going over metallic surfaces such as steel and aluminum.**

Typical Uses

- Walls
- Food processing plants
- Institutional maintenance and new construction
 - Schools
 - Hospitals
 - Laboratories
 - Storage areas
- Industrial maintenance and new construction
 - Tank exteriors
 - Structural steel
- Marine applications
 - Vessel topsides and interiors
 - Offshore platform topsides and interiors

Not recommended for continuous immersion

Physical Data

Finish	Semigloss	
Color	See color chart	
	<i>Uniform appearance will require two coats of white or pastel colors over dark substrates. Use only light-colored primer or intermediate coat when one finish coat of white or pastel Amercoat 220 is specified.</i>	
	<i>Gloss varies with color.</i>	
	<i>Yellow, red and orange colors will fade faster than other colors due to the replacement of lead-based pigments with lead-free pigments in these colors.</i>	
Components	1	
Curing mechanism	Drying	
Volume solids (calculated)	35% ± 3%	
Dry film thickness per coat	2 mils (50 microns)	
direct-to-metal	2-5 mils (50-125 microns)	
	<i>Coating thickness depends on severity of exposure and surface roughness.</i>	
Coats	1 to 2	
Theoretical coverage	ft ² /gal	m ² /L
1 mil (25 microns)	561	13.8
2 mils (50 microns)	280	6.9
VOC	1.5 lb/gal	180 g/L
Flash point (SETA)	°F	°C
Amercoat 220	>212	>100

Qualifications

- NFPA – Class A
- USDA – Incidental Food Contact

Application Data

Applied over	Prepared or primed steel and concrete, previously painted surfaces, wood, aluminum, galvanizing, dry wall		
Primer	148, 151, 385, 400, 5105, Dimetcote [®] 21-5 or D9HS		
	<i>When applying over Dimetcote 21-5, Amercoat 856 Additive must be used.</i>		
Surface preparation	See primer application instructions		
Method	Conventional or airless spray, brush, roller		
Environmental conditions			
Temperature	°F	°C	
air	40 to 110	4 to 43	
surface	40 to 120	4 to 49	
Relative humidity	°F		
(maximum)	40	50 to 100	>100
	60%	85%	95%
Surface temperatures must be at least 5°F (3°C) above dew point to prevent condensation.			

Formerly Amerguard[™] 220

Typical Properties

Performance**

Abrasion (ASTM D4060) CS-17, 1000 cycles, 1 kg	weight loss 110 mg
Impact (ASTM G14)	160 in/lbs
Adhesion (Elcometer) (ASTM D4541)	500 psi
Flexibility (ASTM D522)	>35%
Moisture vapor transmission (ASTM D1653) Specific permeability	1.04
Temperature resistant (dry) Continuous Intermittent	°F/°C 200/93 250/121
Weatherability (QUV & Florida Exposure) Chalk resistant Gloss retention	1 yr/Excellent 1 yr/Excellent
Salt Spray (ASTM B117) 1000 hrs; 1 coat Face corrosion	None (ASTM D1654)
Humidity/Condensation (ASTM D4585) 100 hrs; 1 coat Face corrosion	None (ASTM D1654)

****Note: Values are for factory manufactured material. Tint based colors will have reduced water resistance.**

Compatibility

Coated surfaces: may be applied over most existing coatings, including alkyds, epoxies, vinyls, polyurethanes, acrylic. To insure good adhesion, conduct a compatibility test over clean, intact area or roughen the surface with light abrasive blasting or sanding.

Suitable primers:

Amercoat 148	Waterborne Acrylic
Amercoat 351	100% solids multi-purpose epoxy
Amercoat 385	Epoxy
Amerlock 400	Epoxy
Amercoat 5105	Alkyd
Dimetcote 21-5	Waterbased Inorganic Zinc Silicate
Dimetcote 21-9	Inorganic Zinc Primer

Application Data Summary

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Drying time (ASTM D1640) @ 2 mils DFT	°F/°C		
	90/32	70/21	50/10
touch (minutes)	15	20	60
through (hours)	1	3	13
Recoat time (hours)			
minimum	1	3	13
maximum	None, see surface preparation for aged coatings.		

Cracking may occur at temperatures below 50°F during initial drying.

Thinner	Water
Equipment cleaner	Water

Shipping Data

Packaging	1 gal	5 gal
Shipping weight (approx)	lb	kg
1-gal can	11	5
5-gal can	53	24

Shelf life when stored indoors at 40 to 100°F (4 to 38°C)
18 months from manufacture date

Protect from freezing.

Numerical values are subject to normal manufacturing tolerances, color and testing variances. Allow for application losses and surface irregularities. See application instructions for complete information and safety precautions.

This product is nonphotochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.

Surface Preparation

Coating performance is, in general, proportional to the degree of surface preparation. All surfaces must be clean, dry and free of all contaminants, including salt deposits before applying coating.

Safety Precautions

Read material safety data sheet before use. Safety precautions must be strictly followed during storage, handling and use.

This product is for industrial use only. Not for residential use.

Warranty

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AMERON
INTERNATIONAL

Performance Coatings & Finishes

Amercoat[®] 351

100% solids multi-purpose epoxy

Product Data/ Application Instructions

- Solventless
- High-build
- Hot water resistant
- Chemical resistant
- Abrasion resistant
- Excellent barrier properties
- Standard airless application
- Easily cleaned

Typical Uses

- Chemical tank lining
- Water tank lining
- Pipe lining and coating
- Abrasion resistant coating
- Concrete protection

Amercoat 351 is a solventless, high performance coating that can be applied with standard airless equipment. It is suitable for use as a tank lining for a variety of fuel and clean products for non-reactive chemicals, caustic, salt water, ballast and dry bulk materials.

The abrasion resistance of Amercoat 351 allows it to be used as a lining for slurries, or as a coating for concrete in high wear services.

Amercoat 880 glass flake additive may be added to Amercoat 351 to increase film build, further reinforce mechanical properties and lower moisture permeability. For increased film build in one coat, Amercoat 884 can be added.

Amercoat 351 is an excellent barrier coat, providing long-term resistance to corrosion even under aggressive conditions. It is suitable for immersion in both salt and deionized waters up to 120°F (49°C).

Typical Properties

Abrasion (ASTM D4060) 1 kg/1000 cycles / cs-17 wheel	41 mg wt. loss
Adhesion, elcometer (ASTM D4541)	1200 psi
Salt spray - 12 mils/5000 hrs. face corrosion (ASTM B117) face blistering (ASTM B117)	None None
Humidity condensation (ASTM D4585) face corrosion blistering	2000 + hrs None None
Moisture Vapor Transmission (ASTM F1249)	6.07g/m ²
Steam cleanable	Yes

Physical Data

Finish	Semigloss	
Color*	Gray	
<i>*Note: When exposed to sunlight, color change will occur.</i>		
Components	2	
Curing mechanism	Chemical reaction between components	
Volume solids (calculated)	100%	
Dry film thickness per coat with 880 with 884 1 gal	8-12 mils (200-300 microns) 12-25 mils 20-55 mils	
Theoretical coverage	ft ² /gal	m ² /L
1 mil (25 microns)	1604	39.4
8 mils (200 microns)	201	4.9
VOC mixed	lb/gal	g/L
	0.0	0.0
Temperature resistance	Wet	Dry
	°F °C	°F °C
continuous	120 49	200 93
intermittent	140 60	250 121
Flash point (SETA)	°F	°C
351 cure	>212	>100
351 resin	>212	>100
Amercoat 928	175	47

Qualifications

USDA - Incidental Food Contact

Application Data

Applied over	Primed or prepared steel, concrete	
Surface preparation steel concrete	SSPC-SP10 ASTM D4259 or 4260	
Primer	Amercoat 370	
Method	Airless spray	
Mixing ratio (by volume)	3 parts resin to 1 part cure	
351	2 x 1-gal can 880	
351 - 4 gal mixed	1 x ½-gal can 884	
351 - 4 gal mixed	1 x 1-gal can 884	
Pot life (hours)	°F/°C	
	90/32	70/21 50/10
	½	1 1½
Environmental conditions		
Temperature	°F	°C
air and surface	40 to 90	4 to 32
material	50 to 90	10 to 32
Surface temperatures must be at least 5°F (3°C) above dew point to prevent condensation.		

Chemical Resistance

The following is a representative list of chemicals to which Amercoat 351 may be exposed as a lining. Contact your Ameron representative for recommendations concerning specific requirements.

Alum	Gasoline, unleaded
10% Ammonium hydroxide	Kerosene
Aromatic 100	
n-Butyl acetate	Mineral oil
Carbon Tetrachloride	Nonyl phenol
Castor oil	Oxygenated salt water
50% Caustic (to 160°F, 71°C)	Palm oil (to 160°F, 71°C)
Crude oil (to 120°F, 49°C)	Salt water (to 120°F, 49°C)
Diesel fuel	20% Sodium carbonate
Diethylene glycol	Triton X-100
Ethanol (to 120°F, 49°C)	Water (to 120°F, 49°C)
Formaldehyde	Xylene

Systems Using Amercoat 351

1st Coat	2nd Coat
Amercoat 351	
Amercoat 351	Amercoat 351
Amercoat 351	Amercoat 450HS

Surface Preparation

Coating performance is, in general, proportional to the degree of surface preparation. Prior to coating, the surface must be clean, dry, undamaged and free of all contaminants, including salt deposits. Round off all rough welds and remove all weld spatter.

Steel – Abrasive blast SSPC-SP10. Blast to achieve an anchor profile of 1 to 2 mils (25-50. microns) anchor profile as indicated by a Keane-Tator Surface Profile Comparator, Testex Tape or similar device. Remove abrasive residue or dust from surface. Apply Amercoat 351 as soon as possible to keep steel from rusting. If a holding primer is required, Amercoat 83HS may be used.

Note: Apply Amercoat 351 as soon as possible after surface preparation to prevent recontamination. Do not leave blasted steel uncoated overnight. In case of contamination, remove contaminants. Spot blast if needed.

Concrete—Clean concrete surface. Abrasive blast (ASTM D4259) or acid etch (ASTM D4260) to remove all previous coatings, chalk and surface glaze or laitance. Fill small holes or voids in cast concrete wall or overhead surfaces with Nu-Klad 114A filler compound before applying Amercoat 351. Apply Amercoat 351 within 7 days after application of Nu-Klad 114A.

Adhere to all application instructions, precautions, conditions and limitations to obtain the maximum performance. For conditions outside the requirements or limitations described, contact your Ameron representative.

Drying time (ASTM D1640) (hours)	°F/°C		
	90/32	70/21	50/10
touch	8	10	16
through	12	18	60
Recoat time**			
minimum	8	12	36
maximum (days)	5	14	20

****Roughen surface if maximum recoat time is exceeded.**

Time before service @ 8 mils (days)	°F/°C		
	90/32	70/21	50/10
immersion***	4	7	14

*****Cure at 50°F minimum.**

Equipment cleaner Amercoat 928

Shipping Data

Packaging	1- and 4-gal can
cure	0.25 gal in 1-gal can
	1.0 gal in 1-gal can
resin	0.75 gal in 1-gal can
	3.0 gal in 5-gal can

Shipping weight (approx)	lb	kg
1-gal unit		
cure	2.5	1.1
resin	9.3	4.2
4-gal unit		
cure	9.0	4.1
resin	40.0	18.1

Shelf life when stored indoors at 40 to 100°F (4 to 38°C)
cure and resin 1 year from shipment date

Numerical values are subject to normal manufacturing tolerances, color and testing variances. Allow for application losses and surface irregularities.

The mixed product is nonphotochemically reactive as defined by South Coast Air Quality Management District's Rule 102 or equivalent regulations.

Low Temperature Limitations

After application the substrate and coating temperature must be at 40°F or above to avoid creating film defects from exposure to temperatures below 40°F.

Cure time required before exposure to temperatures below 40°F are as follows:

70°F	60°F	50°F	40°F
3 hrs	7 hrs	16 hrs	48 hrs

High Temperature Limitation

After application at surface temperatures of 40°F to 90°F the Amercoat 351 must cure as follows before being exposed to temperatures above 90°F to avoid sagging:

90°F	70°F	60°F	50°F	40°F
4 hrs	6 hrs	8 hrs	10 hrs	24 hrs

When surface temperatures are above 90°F use Amercoat 884 additive to maintain film build. Without the Amercoat 884 additive sagging may occur above 4 mils DFT at a substrate temperature of 140°F.

Application Equipment

The following is a guide; suitable equipment from other manufacturers may be used. Changes in pressure and tip size may be needed to achieve the proper spray characteristics.

Airless spray—Standard equipment with a ratio of 45:1, such as Graco King. Pump should be equipped with $\frac{3}{8}$ inch internal diameter high pressure spray hose for lengths of less than 50 feet. For length greater than 50 feet, spray hose should be $\frac{1}{2}$ inch internal diameter.

When Amercoat 880 is added, the tip size should be 0.035-inch or larger. Tip size when Amercoat 884 is added should be 0.027 to 0.035.

Power mixer—Jiffy Mixer

Brush or Roller—Additional coats may be required to attain proper thickness.

Application Procedure

Amercoat 351 is packaged in the correct proportions of resin and cure which must be mixed together before use.

1. Flush equipment with Amercoat 928 cleaner.
2. Stir both resin and cure to an even consistency. Add cure to resin mixing until a uniform consistency is achieved.
Do not use thinners. Never mix more than can be sprayed within pot life time.

Pot life (hours)	°F/°C		
	90/32	70/21	50/10
	$\frac{1}{2}$	1	$1\frac{1}{2}$

3. Apply a wet coat in even, parallel passes. Overlap each pass 50 percent to avoid bare areas, pinholes or holidays. Cross spray at right angles if necessary.
4. Material temperature must be between 50 and 90°F. Higher temperatures shorten the pot life. Lower temperatures affect sprayability.
5. Ventilate with clean air during application. Maintain air temperature to prevent condensation on coating surface.
6. Check film thickness using a wet film thickness gauge. If films less than 8 mils (200 microns) apply additional material. Maximum dry film thickness when using Amercoat 880 is 25 mils per coat.

Note: To increase film build with one application Amercoat 884 can be added – 1 gal can for a 4-gal unit of Amercoat 351 will increase dry film thickness to between 20-55 mils. See Amercoat 884 Product Data Sheet for specific information.

7. For immersion service, check for bare areas, pinholes and holidays with a non-destructive wet sponge holiday detector such as Tinker-Rasor Model M1 or Model AP/W. Apply additional Amercoat 351 to areas requiring touch-up within maximum recoat time.

Time before service @ 8 mils (days)	°F/°C		
	90/32	70/21	50/10
immersion**	4	7	14

**Cure at 50°F minimum.

8. Clean equipment with Amercoat 928 immediately after use.

Repair

Spot abrasive blast to remove all rust, loose paint and other contaminants from damaged areas abraded to bare steel.

Clean and roughen coating surface if recoat time is exceeded. Apply Amercoat 351 as soon as possible after surface is cleaned to prevent contaminants on the surface.

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

Ameron makes no other warranties concerning the product. No other warranties, whether express, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Ameron be liable for consequential or incidental damages.

Any recommendation or suggestion relating to the use of the products made by Ameron, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.

Limitation of Liability

Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. **In no event shall Ameron be liable for consequential or incidental damages.**

Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of each component. Safety precautions must be strictly followed during storage, handling and use.

CAUTION – Improper use and handling of this product can be hazardous to health.

Do not use this product without first taking all appropriate safety measures to prevent property damage and injuries. These measures may include, without limitation: implementation of proper ventilation, use of proper lamps, wearing of proper protective clothing and masks, tenting and proper separation of application areas. Consult your supervisor. Proper ventilation and protective measures must be provided during application and drying to keep vapor concentrations within safe limits and to protect against toxic hazards. Necessary safety equipment must be used and ventilation requirements carefully observed, especially in confined or enclosed spaces, such as tank interiors and buildings.

This product is to be used by those knowledgeable about proper application methods. Ameron makes no recommendation about the types of safety measures that may need to be adopted because these depend on application environment and space, of which Ameron is unaware and over which it has no control.

If you do not fully understand these warnings and instructions or if you cannot strictly comply with them, do not use the product.

Note: Consult Code of Federal Regulations Title 29, Labor, parts 1910 and 1915 concerning occupational safety and health standards and regulations, as well as any other applicable federal, state and local regulations on safe practices in coating operations.

This product is for industrial use only. Not for residential use.



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Performance Coatings & Finishes

Amercoat[®] 385



Multi-purpose epoxy

Product Data/ Application Instructions

- Multi-purpose high build epoxy
- High solids high build epoxy intermediate
- Primer for durable systems with wide range of topcoats, including polyurethanes and acrylics
- Ballast water tanklining
- High build anti-corrosive coating for ship hulls
- Excellent shop primer for corrosive service
- Suitable for immersion service
- Outstanding chemical and weather resistance
- Excellent adhesion to inorganic zinc silicate
- Easy application
- Contains no lead or chromate pigments
- Low VOC
- Wide film build range
- Compatible with a variety of substrates and surface preparations

Amercoat 385 is a high-performance epoxy coating forming a tough, abrasion-resistant, durable film. It adheres strongly to bare steel, coated steel and inorganic zinc silicate primed surfaces on new construction, repair and field maintenance projects. Amercoat 385 will also adhere to intact painted surfaces and tight rust and may be used to repair itself or inorganic zinc silicate primers.

Amercoat 385 provides an excellent barrier to corrosion; its inhibitive pigment version (385PA) affords corrosion inhibition at damaged areas. It has good protection to chemical resistance, making it suitable for use in aggressive environments. Amercoat 385 is user-friendly and can be applied by a variety of methods to produce a smooth, fast-drying film. It is suitable for immersion in both salt and fresh water at temperatures up to 140°F, continuous and can be used as a tank lining for alkaline and salt solutions, petroleum fuels, sewage waste and certain chemicals.

Amercoat 385 may also be applied over aluminum, stainless steel, galvanizing, concrete and previously coated surfaces in addition to steel.

Amercoat 880 glassflake may be added to increase film build and lower moisture vapor permeability. For additional information see Amercoat 880 Product Data Sheet or contact your Ameron representative.

Typical Uses

- Decks, hulls and superstructures of ships, barges and work boats.
- Piers, offshore platforms and related structures.
- Tank exteriors in oil refineries, paper mills, chemical processing facilities and waste water treatment plants.
- Tank lining.
- Industrial structural steel, machinery and piping.

Physical Data

Finish	Flat	
Color	Ameron standard colors See color card	
Amercoat 385	Oxide red, buff	
Amercoat 385PA Inhibitive pigment		
Components	2	
385 or 385PA		
Curing mechanism	Solvent release and chemical reaction between components	
Volume solids (ASTM D2697 modified)	66% ± 3%	
385 or 385PA		
Dry film thickness per coat	4 to 6 mils (100 to 150 microns) 6 to 14 mils (150 to 350 microns)	
385 or 385PA with 880 glassflake		
Coats	1 or 2	
Theoretical coverage	ft ² /gal	m ² /L
385 or 385PA		
1 mil (25 microns)	1059	26.0
4 mils (100 microns)	265	6.5
<i>385 with 880 at 6 mils (150 microns) will be 185 ft² per gallon.</i>		
VOC	lb/gal	g/L
(EPA method 24)		
385 mixed	2.3	276
385 mixed/thinned	2.6	311
Temperature	Wet	Dry
	°F °C	°F °C
continuous	140 60	200 93
intermittent	175 79	250 121
Flash point (SETA)	°F	°C
385 cure	118	48
385 resin	128	53
Amercoat 861	300	149
Amercoat 65	78	25
Amercoat 101	145	63
Amercoat 12	2	-17

Qualifications

Military Sealift Command	Underwater hulls, topside and salt water ballast tank service.
NAVSEA	Chapter 631 for aluminum hull use
USDA	Incidental Food Contact
MIL-P-23236B Type IV Class 2 Grade B	Dedicated Sea Water Ballast only.

Typical Properties

Physical

Abrasion (ASTM D4060) 108 mg weight loss
1 kg load/1000 cycles
CS-17 wheel

Adhesion, Elcometer (ASTM D4541) >1000 psi

Performance

Salt spray – 1 coat @ 6 mils 5000 hours exposure
face corrosion (ASTM B117) None
face blistering (ASTM B117) None

Humidity (condensation) (ASTM D4585)
3000 hours exposure
face corrosion None

Steam cleanable Yes

Chemical resistance – Condition after 1 year immersion
caustic 30%, 50% up to 140°F Excellent
fuel (MSC recipe) Excellent
salt water Excellent
DI water up to 140°F Excellent

Amercoat 385 Chemical Resistance Guide

Environment	Splash and Spillage	Fumes and Weather
Acidic	F	G
Alkaline	E	E
Solvents	E	E
Salt solutions		
Acidic	G	VG
Neutral	E	E
Alkaline	E	E
Water	E	E

F-Fair G-Good E-Excellent VG-Very Good

This chart shows typical resistance of Amercoat 385. Contact your Ameron representative for your specific requirements.

Systems Using Amercoat 385

1st Coat	2nd Coat	3rd Coat
Amercoat 385 or 385PA	–	–
Amercoat 385 or 385PA	Amershield™	–
Amercoat 385 or 385PA	450 Series	–
Dimetcote® 9 Series	385	Amershield, 450 Series
Amercoat 68 Series	385	Amershield, 450 Series
Amercoat 385	385	279, 275E, 277E, ABC 3, ABC 4

Confirm compliance with VOC regulations before using coating systems. For immersion service, apply 2 coats at a minimum of 8 mils total DFT.

Over Dimetcote, and Amercoat 68 Series primers, a mist coat/full coat and thinning with Amercoat 101 may be required to prevent application bubbling.

Use Amercoat 385PA primer when inhibitive pigmented primer is specified as the first coat.

Use Amercoat 385PA oxide red when MIO pigment is specified.

Application Data

Applied over substrates Steel, concrete, masonry block, aluminum, galvanizing, coated surfaces
Primer/s See Systems Table
Method Airless, conventional spray, brush or roller

Mixing ratio (by volume)
385 or 385PA 1 part resin to 1 part cure
385 with 880 glassflake 1-gal 880 per mixed 2-gal 385
5 gal 880 per mixed 10-gal 385

Pot life (hours)

°F/°C

	90/32	70/21	50/10
385 or 385PA	1½	3	5
385 with 880 glassflake	1½	2½	4

Environmental conditions

Temperature °F °C
air and surface 32 to 120 0 to 49

Surface temperatures must be at least 5°F (3°C) above dew point to prevent condensation.

Drying time (ASTM D1640) @ 6 mils, DFT (hours)

°F/°C

	90/32	70/21	50/10	32/0
touch	1	2	3	6
through	10	16	24	168
with 880 glassflake	12	18	26	192

Topcoat or recoat time

minimum 6 8 10 72

Addition of 861 Accelerator does not change dry-to-touch or dry-through times but does accelerate cure for service.

Topcoat or recoat time

(days) (maximum) 90/32 °F/°C 70/21 50/10

Product	90/32	70/21	50/10
450 Series or Amershield™	14	30	42
385 or 385PA non-immersion	No maximum – Clean surface required		
immersion	6 months – high pressure water wash and roughen surface if exceeded		
ABC® 3, or ABC 4, Amercoat 275E, 277E, 279	Apply while 385 is soft to thumb pressure		

Failure to apply antifoulings while coating is still soft to thumb pressure may result in poor adhesion and eventual delamination.

Time before service @ 8 mils (hours) °F/°C

385 or 385PA immersion	90/32	70/21	50/10	32/0
ambient	24	48	72	240
hot	72	168	336	NR
non-immersion	12	24	36	168

Thinners (up to ½ pt)

above 70°F (21°C) Amercoat 101
below 70°F (21°C) Amercoat 65

In confined areas thin with Amercoat 101

Equipment cleaner Thinner or Amercoat 12

Adhere to all application instructions, precautions, conditions and limitations to obtain the maximum performance. When used over recommended primers, refer to Application Instructions for the specific primer being used for surface preparation data and application and drying procedures. For conditions outside the requirements or limitations described, contact your Ameron representative.

Surface Preparation

Coating performance is proportional to the degree of surface preparation. Refer to specifications for the specific primer being used. Prior to coating, primed surface must be clean, dry, undamaged and free of all contaminants including salt deposits. Round off all rough welds and remove all weld spatter.

Steel – Remove all loose rust, dirt, grease or other contaminants by one of the following depending on the degree of cleanliness required: SSPC-SP2, 3, 6 or 7. SP12 (WJ-2L) is also acceptable. For more severe service and immersion, clean to SSPC-SP10. The choice of surface preparation will depend on the system selected and end-use service conditions.

Blast to achieve a dense, angular anchor profile of 1-2 mils (25-50 microns) as indicated by a Keane-Tator Surface Profile Comparator or Testex Tape. Increase coating thickness if profile greater than 3 mils.

Galvanizing – Remove oil or soap film with neutral detergent or emulsion cleaner; then use zinc treatment such as Galvaprep® or equivalent or blast lightly with fine abrasive.

Aluminum – Remove oil, grease or soap film with neutral detergent or emulsion cleaner; treat with Alodine® 1200, Alumiprep® or equivalent or blast lightly with fine abrasive.

Concrete/masonry – Surface must be cured, clean, dry, free of contamination and disintegrated or chalky materials. Clean concrete surface; abrasive blast (ASTM D4259) or acid etch (ASTM D4260). Fill concrete voids with Nu-Klad® 965 or 114A to achieve a smooth surface. Clean masonry surface by ASTM D4261. Fill masonry block with Amerlock® 400BF Block Filler.

Aged coatings – All surfaces must be clean, dry, tightly bonded and free of all loose paint, corrosion products or chalky residue. Clean by low pressure water cleaning (1000 psi, min.), SSPC-SP1, 2, 3 or 7. Amercoat 385 is compatible over most types of properly applied and tightly adhering coatings. However, a test patch is recommended to confirm compatibility.

Repair – Prepare damaged areas to original surface preparation specifications, feathering edges of intact coating. Thoroughly remove dust or abrasive residue before touch up.

Application Equipment

Airless spray – Standard equipment such as Graco Bulldog or larger with a 0.15- to 0.021- in. (0.38 to 0.53 mm) fluid tip.

Conventional spray – Industrial equipment such as DeVilbiss MBC or JGA spray gun with 78 or 765 air cap and “E” fluid tip, or Binks No. 18 or 62 gun with a 66 x 63PB nozzle set up. Separate air and fluid pressure regulators, and a moisture and oil trap in the main air supply line are recommended.

Power mixer – Jiffy Mixer powered by an air or an explosion-proof electric motor.

Brush – Natural bristle. Maintain wet edge.

Roller – Use industrial roller. Level any air bubbles with bristle brush.

Application Procedure

Amercoat 385 or 385PA consists of two components which must be mixed together before use. It is packaged in the proper portions in 2- or 10-gallon units.

1. Flush equipment with thinner or Amercoat 12 before use.
2. Stir each component thoroughly, then combine resin and cure and mix until uniform. When using Amercoat 880 glassflake, add material to mixed unit of Amercoat 385 following 880. Instructions for use.
3. Thin only if necessary for workability, add Amercoat 101 up to ½ pint (approximately 6%) per gallon of Amercoat 385. Use Amercoat 65 when faster drying is desired. Use Amercoat 101 when applying in confined spaces. Use only Ameron recommended thinners.
4. Do not mix more material than will be used within pot life. Pot life is shortened by higher temperatures.
5. For conventional spray, use adequate air pressure and volume to ensure proper atomization.
6. Apply a wet coat in even, parallel passes; overlap each pass 50 percent. If required, cross-spray at right angles to avoid holidays, bare areas and pinholes.
Note: When applying directly over inorganic zincs or zinc-rich primers, a mist coat/full coat technique may be required to minimize bubbling. This will depend on the age of the primer, surface roughness, and environmental conditions during application and curing.
7. When applying antifouling coatings, apply first antifouling coat while Amercoat 385 is still soft to thumb pressure. Failure to apply antifouling while Amercoat 385 is still soft may result in poor adhesion between coatings and eventual delamination of the antifouling.
8. Normal recommended dry film thickness per coat is 4 to 6 mils for 385 and 6 to 14 mils for 385 with 880. However, if greater thickness is applied in local areas because of overlapping, no runs or sags will normally occur at a dry film thickness up to 10 mils for 385 and 16 mils for 385 with 880. Total dry film thickness in two coats must not exceed 16 mils for 385 and 32 mils for 385 with 880.
9. A wet film thickness of 6 mils (150 microns) normally provides 4 mils (100 microns) of dry film.
10. When using brush or roller application method, additional coats may be required to achieve proper film thickness.
11. When a pinhole-free film is required, check film continuity of material with a nondestructive holiday detector such as Tinker and Razor Model M-1. Apply additional Amercoat 385 to areas requiring touch up.
12. Clean all equipment with thinner or Amercoat 12 immediately after use.

Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of each component. Safety precautions must be strictly followed during storage, handling and use.

CAUTION - Improper use and handling of this product can be hazardous to health and cause fire or explosion.

Do not use this product without first taking all appropriate safety measures to prevent property damage and injuries. These measures may include, without limitation: implementation of proper ventilation, use of proper lamps, wearing of proper protective clothing and masks, tenting and proper separation of application areas.

Consult your supervisor. Proper ventilation and protective measures must be provided during application and drying to keep spray mists and vapor concentrations within safe limits and to protect against toxic hazards. Necessary safety equipment must be used and ventilation requirements carefully observed, especially in confined or enclosed spaces, such as tank interiors and buildings.

This product is to be used by those knowledgeable about proper application methods. Ameron makes no recommendation about the types of safety measures that may need to be adopted because these depend on application environment and space, of which Ameron is unaware and over which it has no control.

If you do not fully understand these warnings and instructions or if you cannot strictly comply with them, do not use the product.

Note: Consult Code of Federal Regulations Title 29, Labor, parts 1910 and 1915 concerning occupational safety and health standards and regulations, as well as any other applicable federal, state and local regulations on safe practices in coating operations.

This product is for industrial use only. Not for residential use.

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoices amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar buyer from recovery under this Warranty.

Ameron makes no other warranties concerning the product. No other warranties, whether express, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Ameron be liable for consequential or incidental damages.

Any recommendation or suggestion relating to the use of the products made by Ameron, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.

Limitation of Liability

Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. **In no event shall Ameron be liable for consequential or incidental damages.**

Shipping Data

Packaging		
385 or 385PA		2- and 10-gal units

Shipping weight (approx.)	lb	kg
385 or 385PA 2-gal unit		
cure 1 gal in 1-gal can	12	5.6
resin 1 gal in 1-gal can	13	6.0
385 or 385PA 5-gal unit		
cure 5 gal in 5-gal can	61	27.7
resin 5 gal in 5-gal can	60	27.3

Shelf life when stored indoors at 40 to 100°F (4 to 38°C)
cure, resin and paste 1 year from shipment date

Numerical values are subject to normal manufacturing tolerances, color and testing variances. Allow for application losses and surface irregularities. See application instructions for complete information and safety precautions.

The mixed product is photochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.



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Performance Coatings & Finishes

Amerlock[®] 400



High-solids epoxy coating

Amerlock Series

Product Data/ Application Instructions

- Low VOC
- High-performance general maintenance coating for new or old steel
- Cures through wide temperature range
- Self-priming topcoat over most existing coatings
- Can be overcoated with wide range of topcoats
- Compatible with prepared damp surfaces
- Compatible with adherent rust remaining on prepared surfaces
- 5 mils or more in a single coat
- Resists high humidity and moisture
- Temperature resistance to 450°F on insulated or uninsulated surfaces when mixed with Amercoat 880 glass flake additive

Amerlock's low solvent level meets VOC requirements, reduces the chances for film pinholing and solvent entrapment at the substrate-coating interface, often a major cause of coating failure with conventional epoxies and lower solids systems.

Amerlock 400 is available in a variety of colors, including aluminum, and therefore does not require a topcoat. For extended weatherability or special uses, a topcoat may be desired.

Typical Uses

Amerlock 400 is used in those areas where blasting is impractical or impossible. As a maintenance coating, Amerlock 400 protects steel structures in industrial facilities, bridges, tank exteriors, marine weathering, offshore, oil tanks, piping, roofs, water towers and other exposures. Amerlock 400 has good chemical resistance to splash/spillage, fumes and immersion in neutral, fresh and salt water (see resistance table). Contact your Ameron representative for specific information.

Typical Properties

Physical

Abrasion resistance (ASTM D4060)	
1 kg load/1000 cycles CS-17 wheel	weight loss 102 mg
Impact resistance (ASTM D2794)	
Direct	24 in · lb
Reverse	6 in · lb
Moisture vapor transmission (ASTM D1653)	
	6.28g/m ² /24hrs.
Adhesion (ASTM D4541)	
	900 psi

Performance

Salt spray (ASTM B117) 3000 hours	
Face blistering	None
Humidity (ASTM D2247) 750 hours	
Face corrosion, blistering	None
Immersion (NACE TM-01-69) fresh water 1 year	
blistering	None



Physical Data

Finish	Semigloss
Color	Standard, Rapid Response, custom colors and aluminum

White and light colors may show yellowing on aging. Use of Amercoat 861 with white or light colors will slightly discolor.

Yellow, red and orange colors will fade faster than other colors due to the replacement of lead-based pigments with lead-free pigments in these colors

Components	2
Curing mechanism	Solvent release and chemical reaction between components

Volume solids (ASTM D2697 modified)	
400	83% ± 3%
400AL	88% ± 3%
Dry film thickness (per coat)	4-8 mils (100-200 microns)

Coats	1 or 2	
Theoretical coverage	ft ² /gal	m ² /L
1 mil (25 microns)		
400	1331	32.6
400AL	1412	34.7
5 mils (125 microns)		
400	266	6.5
400AL	282	6.9

VOC	lb/gal	g/L
400 mixed*	1.5	180
mixed/thinned (½ pt/gal)**	1.8	220
400AL mixed**	1.0	120
mixed/thinned (1 ½ pt/gal)**	2.0	240

*EPA method 24

** Calculated

Temperature resistance,	wet		dry	
400	°F	°C	°F	°C
continuous	100	38	200	93
intermittent	100	38	350	177
with 880 (1 gal can/2 gal mix)				
continuous	100	38	425	218
intermittent	100	38	450	232

Some discoloration and darkening will occur at temperatures greater than 200°F, this will not affect film integrity or coating performance

Flash point (SETA)	°F	°C
2/400 resin	131	55
400 cure	85	29
400AL resin	110	43
400AL cure	116	47
Amercoat [®] 8	20	-7
Amercoat 65	78	25
Amercoat 12	2	-17

** Amerlock 400 resin and Amerlock 2 resin are identical, and are packaged under a common label as Amerlock 2/400 resin. Amerlock 400 cure and Amerlock 2 cure are different, and are labeled individually.*

Qualifications

USDA – Incidental food contact

NFPA – Class A

NSF Standard 61 – For use in drinking water. See current NSF listing at www.nsf.org for restrictions and approved colors.

Chemical Resistance Guide

Environment	Immersion		Splash and Spillage		Fumes and Weather	
	400	400AL	400	400AL	400	400AL
Acidic	*	*	F	F	G	G
Alkaline	*	*	E	G	E	E
Solvents	*	*	G	G	E	E
Salt water	E	E	E	E	E	E
Water	E	E	E	E	E	E

F-Fair G-Good E-Excellent

*Contact your Ameron representative.

This table is only a guide to show typical resistances of Amerlock 400 and 400AL. For specific recommendations, contact your Ameron representative for your particular corrosion protection needs.

Systems using Amerlock 400 or 400AL

1 st coat	2 nd Coat***	3 rd coat***
400	None	None
400	450HS	None
Amershield™ 400**	None 400	None
Dimetcote® 9, 9FT or 9HS	400	None
Dimetcote 9, 9FT or 9HS	400	450HS

**Water immersion.

***For color contrast when 2 coats of 400AL are used, 400AL red can be used as first coat.

Recoat/Topcoat time

	°F/°C		
minimum (hours)	90/32	70/21	50/10
400	8	16	30
400 with 1 pt 861	4	7	16
400AL	3	12	48
400AL with ½ pt 861	3	5	12

Recoat/Topcoat time @ 70°F (21°C)

System	Maximum time
400/400	3 months
400 with 861/400	1 month
400/Amershield or 450HS	1 month
400/5405	1 day
400 with 861/Amershield or 450HS	2 weeks

Note: If maximum time is exceeded, roughen surface. For topcoats (finish coats) not listed, see Product Data sheet for specific topcoat time limitations.

Surface Preparation

Coating performance is, in general, proportional to the degree of surface preparation. Abrasive blasting is usually the most effective and economical method. When this is impossible or impractical, Amerlock 400 can be applied over mechanically cleaned surfaces. All surfaces must be clean, dry and free of all contaminants, including salt deposits.

Amerlock 400 may be used over most types of properly prepared and tightly adhering coatings. A test patch is recommended for use over existing coatings.

Steel – Remove all loose rust, dirt, moisture, grease or other contaminants from surface. Power-tool clean SSPC-SP3 or hand-tool clean SSPC-SP2. For more severe environments, dry abrasive blast SSPC-SP7. Water blasting is also acceptable. For immersion service – dry abrasive blast SSPC-SP10. For high-heat service on uninsulated substrates, abrasive blast per SSPC-SP6. For insulated substrates, abrasive blast per SSPC-SP10. In both cases, a 2-3 mil profile must be obtained.

Aluminum – Remove oil, grease or soap film with neutral detergent or emulsion cleaner, treat with Alodine® 1200, Alumiprep® or equivalent or blast lightly with fine abrasive.

Galvanizing – Remove oil or soap film with detergent or emulsion cleaner, then use zinc treatment such as Galvaprep® or equivalent or blast lightly with fine abrasive.

Concrete – Acid etching (ASTM D4260) or abrasive blast (ASTM D4259) new concrete cured a minimum of 14 days.

Application Data

Applied over	Steel, concrete, aluminum, galvanizing
Surface preparation	
Steel	SSPC-SP2, 3, 6, 7, 10 or 11
Concrete	ASTM D4259 or 4260
Aluminum	Alodine®, Alumiprep® or light abrasive blast
Galvanizing	Galvaprep® or light abrasive blast
Method	Airless or conventional spray. Brush or roller may require additional coats.
Mixing ratio (by volume)	1 part resin to 1 part cure

Pot life (hours)	°F/°C				
861 Accelerator	Amerlock	90/32	70/21	50/10	32/0
Amount	/mixed 5 gal				
None	400	1½	2½	4	7
	400AL	3½	5½	10	15
½ pt	400	1	1½	2½	4
	400AL	1	1½	2½	4
1 pt	400	½	1	1½	2

Pot life is the period of time after mixing that a five-gallon unit of material is sprayable when thinned as recommended. Mixture may appear fluid beyond this time, but spraying and film build characteristics may be impaired.

Environmental conditions

Product	Air and Surface Temperature
Amerlock 400 or 400 AL	40° to 122°F (4° to 50°C)
Amerlock with 861	20° to 122°F (-6° to 50°C)
Surface temperatures must be at least 5°F (3°C) above dew point to prevent condensation. At freezing temperatures, surface must be free of ice.	

Do not use Amerlock 400AL on water damp surfaces.

Drying time (ASTM D1640) (hours)

		touch					
		°F/°C					
861	Amerlock						
Amt	/mixed 5 gal	120/49	90/32	70/21	50/10	32/0	20/-6
None	400	1½	4½	9	28	96	NR
	400AL	1	4	12	36	96	NR
½ pt	400	1½	3	5	24	72	120
	400AL	1	1½	2½	5	10	24
1 pt	400	1	2	4	15	48	96

Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of each component. Safety precautions must be strictly followed during storage, handling and use.

CAUTION - Improper use and handling of this product can be hazardous to health and cause fire or explosion.

Do not use this product without first taking all appropriate safety measures to prevent property damage and injuries. These measures may include, without limitation: implementation of proper ventilation, use of proper lamps, wearing of proper protective clothing and masks, tenting and proper separation of application areas. Consult your supervisor. Proper ventilation and protective measures must be provided during application and drying to keep solvent vapor concentrations within safe limits and to protect against toxic hazards. Necessary safety equipment must be used and ventilation requirements carefully observed, especially in confined or enclosed spaces, such as tank interiors and buildings.

This product is to be used by those knowledgeable about proper application methods. Ameron makes no recommendation about the types of safety measures that may need to be adopted because these depend on application and space, of which Ameron is unaware and over which it has no control.

If you do not fully understand the warnings and instructions or if you cannot strictly comply with them, do not use the product.

Note: Consult Code of Federal Regulations Title 29, Labor, parts 1910 and 1915 concerning occupational safety and health standards and regulations, as well as any other applicable federal, state and local regulations on safe practices in coating operations.

This product is for industrial use only. Not for residential use.

Limitation of Liability

Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. **In no event shall Ameron be liable for consequential or incidental damages.**

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

Ameron makes no other warranties concerning the product. No other warranties, whether expressed, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Ameron be liable for consequential or incidental damages.

Any recommendation or suggestion relating to use of the products made by Ameron, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.



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AMERON
INTERNATIONAL

Performance Coatings & Finishes

AMERLOCK[®]

The Next Generation of Amerlock 400



Fast drying surface tolerant VOC compliant epoxy

Amerlock Series

Product Data/ Application Instructions

- Fast dry, dry to touch in 2 hours at 70°F (21°C)
- Recoat in 3 hours at 70°F (21°C)
- Low temperature cure down to 0°F (-18°C)
- Exceptional corrosion protection in industrial and marine corrosive environments
- Surface tolerant, excellent adhesion to tight rust and prepared damp surfaces
- Self priming topcoat over most existing coatings
- Can be overcoated with a wide range of topcoats
- Meets all existing VOC regulations including SCAQMD Rule 1113 requirements for 2002

Amerlock 2's low solvent level meets VOC requirements, reduces the chances for film pinholing and solvent entrapment at the substrate-coating interface, often a major cause of coating failure with conventional epoxies and lower solids systems.

Amerlock 2 is available in a variety of colors, and therefore does not require a topcoat. For extended weatherability or special uses, a topcoat may be desired.

Typical Uses

Amerlock 2 is designed for use in a variety of areas, even those where surface preparation is impossible. As a maintenance coating, Amerlock 2 protects steel structures in industrial facilities, bridges, tank exteriors, marine weathering, offshore, oil tanks, piping, roofs, water towers and other exposures. Amerlock 2 has good chemical resistance to splash/spillage, fumes and immersion in neutral, fresh and salt water (see resistance table). Contact your Ameron representative for specific information.

Qualifications (Amerlock 2)

1. USDA – Incidental food contact
2. NSF Standard 61 - For use in drinking water.
See current NSF listing at www.nsf.org for restrictions and approved colors.
3. FDA 21 CFR 175.300 extraction test for direct food contact



Physical Data

Finish	Semigloss		
Color	Standard, Rapid Response, custom colors and aluminum		
Components	2		
Curing mechanism	Solvent release and chemical reaction between components		
Volume solids (ASTM D2697 modified)			
Amerlock 2	83% ± 3%		
Amerlock 2AL	85% ± 3%		
Dry film thickness (per coat)	4-8 mils (100-200 microns)		
Coats	1 or 2		
Theoretical coverage	ft ² /gal	m ² /L	
1mil (25 microns)			
Amerlock 2	1331	32.6	
Amerlock 2AL	1363	33.1	
5 mils (125 microns)			
Amerlock 2	266	6.5	
Amerlock 2AL	273	6.7	
VOC	lb/gal	g/L	
Amerlock 2 mixed*	1.5	180	
mixed/thinned (½ pt/gal)*	1.8	216	
Amerlock 2AL mixed**	1.0	123	
mixed/thinned (½ pt/gal)**	2.0	234	
* EPA method 24			
** Calculated			
Temperature resistance,	wet		dry
	°F	°C	°F °C
continuous	100	38	200 93
intermittent	100	38	350 177
Flash point (SETA)	°F		°C
Amerlock 2/400 resin*	131		55
Amerlock 2 cure	114		29
Amerlock 2AL resin	110		43
Amerlock 2AL cure	122		50
Amercoat [®] 8	20		-7
Amercoat 65	78		25
Amercoat 12	2		-17

* Amerlock 2 resin and Amerlock 400 resin are identical, and are packaged under a common label as Amerlock 2/400 resin. Amerlock 2 cure and Amerlock 400 cure are different, and are labeled individually.

Typical Properties (Amerlock 2)

Physical

Abrasion resistance (ASTM D4060)	
1 kg load/1000 cycles	weight loss
CS-17 wheel	102 mg
Impact resistance (ASTM D2794)	
Direct	24 in · lb
Reverse	6 in · lb
Moisture vapor transmission (ASTM F1249)	
	4.0 gm/m ² /day
Adhesion (ASTM D4541)	
	1200 psi

Performance

Salt spray (ASTM B117) 3500 hours		
Face corrosion/blistering		None
Humidity (ASTM D2247) 1500 hours		
Face corrosion/blistering		None
Prohesion (ASTM G85-A5) 3000 hours		
Face corrosion/blistering		None

Chemical Resistance Guide

Environment	Immersion	Splash and Spillage	Fumes and Weather
	2 2AL	2 2AL	2 2AL
Acidic	* *	F F	G G
Alkaline	* *	E E	E E
Solvents	* *	G G	E E
Salt water	E *	E E	E E
Water	E *	E E	E E
F-Fair	G-Good	E-Excellent	

*Contact your Ameron representative.

This table is only a guide to show typical resistances of Amerlock 2 and Amerlock 2AL. For specific recommendations, contact your Ameron representative for your particular corrosion protection needs.

Systems using Amerlock 2 or Amerlock 2AL

1 st coat	2 nd Coat	3 rd coat
Amerlock 2	None	None
Amerlock 2	Amerlock 2	None
Amerlock 2	450HS	None
Amerlock 2	Amershield	None
Amerlock 2	PSX 1001	None
Dimetcote® 9, 9FT or 9HS	Amerlock 2	None
Dimetcote 9, 9FT or 9HS	Amerlock 2	450HS

Note: For color contrast when two coats of Amerlock 2 Aluminum are used, Amerlock 2 Aluminum Red can be used as the first coat.

Surface Preparation

Coating performance is, in general, proportional to the degree of surface preparation. Abrasive blasting is usually the most effective and economical method. When this is impossible or impractical, Amerlock 2 can be applied over mechanically cleaned surfaces. All surfaces must be clean, dry and free of all contaminants, including salt deposits.

Amerlock 2 may be used over most types of properly prepared and tightly adhering coatings. A test patch is recommended for use over existing coatings.

Steel – Remove all loose rust, dirt, moisture, grease or other contaminants from surface. Power-tool clean SSPC-SP3 or hand-tool clean SSPC-SP2. For more severe environments, dry abrasive blast SSPC-SP7. Water jetting is also acceptable. For immersion service – dry abrasive blast SSPC-SP10.

Aluminum – Remove oil, grease or soap film with neutral detergent or emulsion cleaner, treat with Alodine® 1200, Alumiprep® or equivalent or blast lightly with fine abrasive.

Galvanizing – Remove oil or soap film with detergent or emulsion cleaner, then use zinc treatment such as Galvaprep® or equivalent or blast lightly with fine abrasive.

Concrete – Acid etching (ASTM D4260) or abrasive blast (ASTM D4259) new concrete cured a minimum of 14 days.

Application Data

Applied over	Steel, concrete, aluminum, galvanizing
Surface preparation	
Steel	SSPC-SP2, 3, 6, 7, 10 or 11
Concrete	ASTM D4259 or 4260
Aluminum	Alodine®, Alumiprep® or light abrasive blast
Galvanizing	Galvaprep® or light abrasive blast
Method	Airless or conventional spray. Brush or roller may require additional coats.
Mixing ratio (by volume)	1 part resin to 1 part cure
Environmental conditions	Air and surface temperature 20° to 120°F (-6° to 49°C)

Surface temperatures must be at least 5°F (3°C) above dew point to prevent condensation. At freezing temperatures, surface must be free of ice.

Drying time (ASTM D1640) (hours)

	touch °F/°C					
	120/49	90/32	70/21	50/10	32/0	20/-6
Amerlock 2	0.5	1	2	8	24	48
Amerlock 2AL	0.5	2	3.5	11	30	—
	through					
Amerlock 2	1	2	4.5	13	38	96
Amerlock 2AL	1.5	3.5	7	17	48	—
Thinner	Amercoat 8 or 65					
Equipment cleaner	Thinner or Amercoat 12					

	°F/°C		
	90/32	70/21	50/10
Recoat/Topcoat time minimum (hours)	1	3	6

Recoat/Topcoat time @ 70°F (21°C)

System	Maximum time
Amerlock 2/Amerlock 2	1 month
Amerlock 2/Amershield or 450HS	1 week
Amerlock 2/Amercoat 5405	1 day
Amerlock 2AL/Amerlock 2AL	2 weeks

Note: If maximum time is exceeded, roughen surface. For topcoats (finish coats) not listed, see Product Data sheet for specific topcoat time limitations.

	°F/°C			
	90/32	70/21	50/10	32/0
Amerlock 2				
unthinned	0.75	1	2	4
½ pint thinner	1	1.5	2.5	5
Amerlock 2AL				
unthinned	0.5	0.75	1.5	—
½ pint thinner	1	1.25	2	—

Pot life is the period of time after mixing that a five-gallon unit of material is sprayable when thinned as recommended. Mixture may appear fluid beyond this time, but spraying and film build characteristics may be impaired.

Application Equipment

The following is a guide; suitable equipment from other manufacturers may be used. Changes in pressure, hose and tip size may be needed for proper spray characteristics.

Airless spray – Standard equipment having a 45:1 or higher pump ratio, with a 0.017- to 0.021-inch fluid tip.

Conventional spray – Industrial equipment, such as DeVilbiss MBC or JGA or Binks 18 or 62 spray gun. A moisture and oil trap in the main air supply line, a pressure material pot with mechanical agitator and separate regulators of air and fluid pressure are recommended.

Power mixer – Jiffy Mixer powered by an air or explosion-proof electric motor.

Brush or roller – Additional coats may be required to attain proper thickness.

Application Procedure

1. Flush all equipment with thinner or Amercoat® 12 before use.
2. Stir resin and cure using an explosion-proof power mixer to disperse pigments.
3. Add cure to resin. Mix thoroughly until uniformly blended to a workable consistency.
4. Do not mix more material than can be used within the expected pot life.
5. For optimum application, material should be from 50° to 90°F (10° to 32°C). Above 122°F (50°C), sagging may occur.
6. Use only Ameron recommended thinners. Above 70°F (29°C) use Amercoat 8, at lower temperatures use Amercoat 65. A small amount of thinner greatly reduces viscosity; excessive thinning will cause running or sagging. Thin cautiously as follows:

	Amerlock 2	Amerlock 2AL
Airless – up to	½ pt/gal	1pt/gal
Conventional – up to	½ pt/gal	1pt/gal

Below 50°F additional thinning may be needed and multiple coats required to achieve specified thickness.

7. To minimize orange peel appearance, adjust conventional spray equipment to obtain adequate atomization at lowest air pressure.
8. Apply a wet coat in even, parallel passes with 50 percent overlap to avoid holidays, bare areas and pinholes. If required, cross spray at right angles.
9. When applying Amerlock 2 directly over inorganic zincs or zinc rich primers, a mist coat/full coat technique may be required to minimize bubbling. This will depend on the age of the Dimetcote®, surface roughness and conditions during curing.
10. Ventilate confined areas with clean air during application and while curing the final coat. Prevent moisture condensation on the surface between coats.
11. Repair damaged areas by brush or spray.
12. Clean equipment with thinner or Amercoat 12 immediately after use.

Note: Do not apply Amerlock 2AL on water-damp surfaces.

Shipping Data

Packaging unit	2 gal	5 gal
cure	1-gal can	2.5-gal can
resin	1-gal can	2.5-gal can
Shipping weight (approx)	lbs	kg
2-gal unit		
Amerlock 2 cure	12.8	5.8
Amerlock 2/400 resin	13.7	6.2
Amerlock 2AL resin	11.0	5.0
Amerlock 2AL cure	13.3	15.9
5-gal unit		
Amerlock 2 cure	33.0	15.0
Amerlock 2/400 resin	35.0	15.9
Amerlock 2AL resin	28.3	12.8
Amerlock 2AL cure	34.5	15.6

Shelf life when stored indoors at 40° to 100°F (4° to 38°C) resin and cure 1 year from shipment date.

Numerical values are subject to normal manufacturing tolerances, color and testing variances. Allow for application losses and surface irregularities.

This mixed product is photochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.

Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of each component. Safety precautions must be strictly followed during storage, handling and use.

CAUTION – Improper use and handling of this product can be hazardous to health and cause fire or explosion.

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This product is to be used by those knowledgeable about proper application methods. Ameron makes no recommendation about the types of safety measures that may need to be adopted because these depend on application and space, of which Ameron is unaware and over which it has no control.

If you do not fully understand the warnings and instructions or if you cannot strictly comply with them, do not use the product.

Note: Consult Code of Federal Regulations Title 29, Labor, parts 1910 and 1915 concerning occupational safety and health standards and regulations, as well as any other applicable federal, state and local regulations on safe practices in coating operations.

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Limitation of Liability

Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. **In no event shall Ameron be liable for consequential or incidental damages.**

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

Ameron makes no other warranties concerning the product. No other warranties, whether expressed, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Ameron be liable for consequential or incidental damages.

Any recommendation or suggestion relating to use of the products made by Ameron, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.



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Performance Coatings & Finishes

Amercoat[®] 450HS



Gloss aliphatic polyurethane topcoat

450 Series

Product Data/ Application Instructions

- Gloss topcoat
- Outstanding weather resistance with excellent color and gloss retention
- VOC compliant
- Resistant to broad range of corrosive atmospheres
- Resists soil pickup – cleans easily
- Cures through wide temperature range
- Hard, flexible and abrasion resistant

Typical Uses

Amercoat 450HS Series can be used as a finish coat where attractive appearance and a wide range of corrosive resistance is required.

- Chemical plants
- Pulp and paper mills
- Off shore platforms
- Petroleum refineries and containers.

Typical Properties

Chemical resistance guide

When applied over suitable primer or intermediate coat:

Environment	Splash and Spillage	Fumes and Weather
Acidic	VG	E
Alkaline	VG	E
Solvents	G	E
Salt solutions		
Acidic	E	E
Neutral	E	E
Alkaline	E	E
Water	E	E
G-Good	VG-Very Good	E-Excellent

This table is only a guide. For specific recommendations, contact your Ameron representative for your particular corrosion protection needs. Amercoat 450HS is not recommended for immersion service.

Physical Data

Finish	Gloss	
Color*	See color card	
Components	2	
Mixing ratio (by volume)	4 parts resin to 1 part cure	
Curing mechanism	Solvent release and chemical reaction between components	
Volume Solids	66% ± 3%	
VOC (EPA Method 24)	lb/gal	g/L
unthinned	2.4	288
thinned (10% by volume)	2.8	340
Dry film thickness (per coat)	2-3 mils (50-75 microns)	
Coats	1 or 2	
Theoretical coverage	ft ² /gal	m ² /L
1 mil	1059	26
2 mils	530	13
Temperature resistance	°F/°C	
continuous	wet	dry
intermittent	NR	200/93
	NR	250/121
Flash Point	°F	°C
cure	92	33
resin	97	36
mixed	98	37
Amercoat 923	102	39
Amercoat 101	140	60
Amercoat 12	2	-17
Thinners	Amercoat 65, Amercoat 101	
Cleaner	Amercoat 12	

**Certain colors (especially yellow, red and orange) may require additional coats to achieve adequate hiding, particularly when applied over dark or contrasting primer color. Color variance with rapid response tinted colors may be greater than with standard production batches. If color is critical, change batches at natural breaks in structure or intermix batches for consistency.*

Yellow, red and orange colors will fade faster than other colors due to the replacement of lead-based pigments with lead-free pigments in these colors.

Typical Systems

1st Coat	2nd Coat	3rd Coat
Dimetcote or Amercoat 68 Series	Amercoat 385	Amercoat 450 Series
Amercoat 235, Amercoat 236, Amercoat 370 or Amercoat 385	Amercoat 450 Series	—
Amerlock Series	Amercoat 450 Series	—

Surface Preparation

Coating performance, in general, is proportional to the degree of surface preparation. Refer to application instructions for specific primers and intermediate coats being used for application and curing procedures. All previous coats must be clean and dry. Adhere to all minimum and maximum topcoat times for specific primers and intermediate coats. Aged epoxy coatings must be roughened before applying 450HS.

Application Data

Substrates	Prepared and primed steel, concrete, aluminum, galvanizing, or aged coatings.			
Surface preparation: Steel Concrete Aluminum Galvanizing Aged coatings	Refer to Product Data Sheet/ Application Instructions of specific primer or intermediate coat being used.			
Method	Airless or conventional spray, roller, brush (touch-up only)			
Mixing ratio (by volume)	4 parts resin to 1 part cure			
Environmental conditions air and surface temp	°F 20 to 120	°C -7 to 49		
Pot life (hours)	F°/C°			
	90/32	70/21	50/10	
450HS	2	4	6	
450HS with 866M*	¾	1½	3	
Dry times	F°/C°			
	90/32	70/21	50/10	32/0
touch (minutes)	10	30	90	NR
with 866M*	7	25	75	240
through (hours)	4	8	24	NR
with 866M*	1¾	2½	8	36
Recoat times	F°/C°			
	90/32	70/21	50/10	32/0
minimum (hours)	2	4	12	NR
with 866M*	1	1½	4	16
maximum (days)	7	30	60	NR
with 866M*	2	7	15	30
*Accelerated at ½-pint 866M per 5 gallons mixed.				
Thinner	Amercoat 65 or 101			
Equipment cleaner	Amercoat 12			

Application Equipment

The following is a guide; suitable equipment from other manufacturers may be used. Changes in pressure and tip size may be needed for proper spray characteristics.

Airless spray—Standard equipment such as Graco, DeVilbiss, Binks, Speeflo, or others having a 28:1 or higher pump ratio and a fluid tip with 0.013- to 0.015-inch (0.33- to 0.38-mm) orifice.

Conventional spray—Industrial equipment such as DeVilbiss MBC or Binks BBR spray gun. Separate air and fluid pressure regulators, mechanical pot agitator and a moisture and oil trap in main air supply line are recommended.

Brush or roller - Natural bristle brush or solvent-resistant roller with ¼-inch to ⅜-inch nap. For best appearance when rolling, level any air bubbles with bristle brush.

Application Procedure

Amercoat 450HS is packaged in two components in the proper proportions which must be mixed together before use:

1. Flush equipment with thinner or Amercoat 12 before use.
2. Stir each component thoroughly, then add cure to resin and mix until uniformly blended to a workable consistency. Do not mix more material than will be used within 4 hours at 65-80°F (18-27°C). Pot life is shortened by higher temperatures and use of Amercoat 866M. See pot life data. Use up to ½ pint of Amercoat 866M Accelerator per 5 gallons mixed.
3. Thin only if necessary for workability.
4. When applying by conventional spray, use adequate air pressure and volume to ensure proper atomization.
5. Apply a wet coat in even parallel passes, overlap 50 percent to avoid holidays, bare areas and pinholes. If required, cross spray at right angles.
6. Application of 3 mils (75 microns) wet film thickness will normally provide 2 mils (50 microns) dry film.
7. Clean all equipment with thinner or Amercoat 12 immediately after use.
8. Keep containers tightly closed since repeated exposure to moisture will cause gelation. Moisture contaminated material is also subject to gassing on storage. Handle bulged containers with caution; lids may eject forcibly.

Shipping Data

Packaging units	1 gal	5-gal
cure	0.2 gal in 1-qt can	1 gal in 1-gal can
resin	0.8 gal in 1-gal can	4 gal in 5-gal can
Shipping weight (approx)	lb	kg
1-gal unit		
cure	2	0.9
resin	10.2	4.6
5-gal unit		
cure	9	4.1
resin	49	22
Shelf life when stored indoors at 40 to 100°F (4 to 38°C)	resin and cure 1 year from shipment date	

Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of each component. Safety precautions must be strictly followed during storage, handling and use.

CAUTION – Improper use and handling of this product can be hazardous to health and cause fire or explosion.

Do not use this product without first taking all appropriate safety measures to prevent property damage and injuries. These measures may include, without limitation: implementation of proper ventilation, use of proper lamps, wearing of proper protective clothing and masks, tenting and proper separation of application areas. Consult your supervisor. Proper ventilation and protective measures must be provided during application and drying to keep spray mists and vapor concentrations within safe limits and to protect against toxic hazards. Necessary safety equipment must be used and ventilation requirements carefully observed, especially in confined or enclosed spaces, such as tank interiors and buildings.

This product is to be used by those knowledgeable about proper application methods. Ameron makes no recommendation about the types of safety measures that may need to be adopted because these depend on application environment and space, of which Ameron is unaware and over which it has no control.

If you do not fully understand these warnings and instructions or if you cannot strictly comply with them, do not use the product.

Note: Consult Code of Federal Regulations Title 29, Labor, parts 1910 and 1915 concerning occupational safety and health standards and regulations, as well as any other applicable federal, state and local regulations on safe practices in coating operations.

This product is for industrial use only. Not for residential use.

Limitation of Liability

Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. In no event shall **Ameron be liable for consequential or incidental damages.**

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

Ameron makes no other warranties concerning the product. No other warranties, whether express, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Ameron be liable for consequential or incidental damages.

Any recommendation or suggestion relating to the use of the products made by Ameron, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.



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Typical Properties

Physical

Impact resistance (ASTM D2794) @ 5 mils		
direct	140 in · lbs	15.8 N · m
reverse	50 in · lbs	5.6 N · m

Taber abrasion	
1 kg load/1000 cycles	weight loss
CS-17 wheel	60.2 mg

Elongation (ASTM D522) >32%

Graffiti cleaning with Amerase with gloss retention 100 cycles

Chemical Resistance Guide

Environment	Splash and Spillage	Fumes and Weather
Acidic	E	E
Alkaline	E	E
Salt solutions		
Acidic	E	E
Neutral	E	E
Alkaline	E	E
Seawater	E	E
Fresh water	E	E
Solvents	G	E
Petroleum products	E	E
F-Fair G-Good E-Excellent NR-Not Recommended		

This table is only a guide to show typical resistance of Amershield. Contact your Ameron representative for your particular corrosion protection needs.

Typical Systems

Substrate	Primer	Finish Coat
Steel	none, 400*, 68HS	Amershield
Galvanizing	none, 400*, 68HS	Amershield
Aluminum	none, 400*	Amershield
Concrete	400*	Amershield
Masonry	none, 400*	Amershield

*Other Ameron epoxy primers are also acceptable.

Refer to specific primer's product data sheets and application instructions for detailed application and surface preparation information.

Apply test patch to intact coating to confirm compatibility and adhesion.

When Amerlock 400 is used as a primer for Amershield the maximum topcoat time is one month; Amerlock 2 – 7 days, 400 with 861 Accelerator – 14 days. Clean and roughen surface if topcoat time is exceeded.

On Amercoat 68HS use a mist coat/full coat application procedure to prevent application bubbling.

Environmental Conditions

Temperature air or surface	°F	°C
Amershield	40 to 120	4 to 49
Amershield with 866M	32 to 120	0 to 49

Surface temperature must be at least 5°F (3°C) above dew point to prevent condensation.

Low Temperature Application

At low temperatures or when a fast cure is required Amercoat 866M accelerator can be added to mixed Amershield resin and cure (see Amercoat 866M literature). **DO NOT** apply Amershield with 866M when surface temperature is over 120°F.

Application Data

Applied over	Prepared or primed steel, aluminum, galvanizing, masonry and primed concrete
Surface preparation	
steel	SSPC-SP 6 or 10
aluminum	Alodine®, Alumiprep® or light abrasive blast
galvanizing	Galvaprep® or light abrasive blast
concrete	See specific primer
masonry	ASTM D4261
previously coated surface	SSPC-SP1, 3 or 7

Appearance will vary depending on substrate and application method.

Mixing ratio (by volume) 1 part cure to 4 parts resin

Pot life (hours)	°F/°C			
	90/32	70/21	50/10	32/0
Amershield	1½	2½	5	-
Amershield with 866M	½	1	2	4

Using ½ pt Amercoat 866M per mixed 5 gallon Amershield

Environmental Conditions

Temperature-Air or surface	°F	°C
Amershield	40 to 120	4 to 49
Amershield with 866M	32 to 120	0 to 49

Surface temperatures must be at least 5°F (3°C) above dew point to prevent condensation.

Drying time (ASTM D1640) (hours)	°F/°C			
	90/32	70/21	50/10	32/0
touch	1	2½	4	-
with 866M	½	¾	1	2½
through	5	10	72	-
with 866M	2	3	6	10

Recoat time (hours)	°F/°C				
	90/32	80/26	70/21	50/10	32/0
minimum	4	5½	8	48	-
with 866M	1½	1¾	2	4	8
maximum	12	24	168	168	-
with 866M	6	8	12	24	48

Roughen surface or use Amerase™ if maximum recoat time is exceeded.

Thinner Amercoat 65

Equipment cleaner Thinner or Amercoat 12

Adhere to all application instructions, precautions, conditions and limitations to obtain the maximum performance. For conditions outside the requirements or limitations described, contact your Ameron representative.

Surface Preparation

Coating performance is, in general, proportional to the degree of surface preparation. All surfaces must be clean, dry and free of oil, grease, dirt, salt deposits or other contamination.

1. To provide a smooth appearance to the Amershield coating Amercoat® 851, flow control additive may be used. See Amercoat 851 Product Data Sheet for more information.
2. For faster drying at low temperatures, Amercoat 866M can be used with all Amershield products.

Steel – Mill scale and rust must be removed. Abrasive blast hot-rolled steel to SSPC-SP6 and rusted and pitted steel to SSPC-SP10. Clean cold-rolled steel to SSPC-SP1 using vapor degreasing or solvent emulsion to remove all oil, grease and contamination. Solvent wipe is not satisfactory. Contact Ameron for compatible phosphate surface treatments.

Aluminum – Remove oil, grease or soap film with neutral detergent or emulsion cleaner; treat with Alodine® 1200 or Alumiprep® or blast lightly with fine abrasive.

Galvanizing – Remove oil or soap film with neutral detergent or emulsion cleaner; treat with Galvaprep® Amchem Products or blast lightly with fine abrasive.

Amercoat 68HS – Wash off water soluble contaminants; remove oil, grease, etc., with a neutral detergent or emulsion cleaner. Solvent wipe is not satisfactory.

Concrete – Clean concrete and masonry surfaces, abrasive blast (ASTM D4259) or acid etch (ASTM D4260). Fill concrete voids with Nu-Klad® 114A or 965. Fill masonry block with Amerlock® 400BF block filler.

Coated surface – Clean by low pressure water cleaning (1000 psi or greater) water blast, abrasive blast (SSPC-SP7), solvent emulsion cleaning (SSPC-SP1) or power tool cleaning (SSPC-SP3). Surface must be clean, dry and free of oil, grease, dirt or other contamination. Apply test patch to confirm compatibility and adhesion.

Application Equipment

Power mixer – Jiffy mixer powered by an air or explosion-proof electric motor.

Airless and electrostatic spray – Standard equipment Graco, DeVilbiss, Nordson-Bede, Speeflo or others having a 28:1 or higher pump ratio and a fluid tip with a 0.015- to 0.021-inch (0.38- to 0.53-mm) orifice.

Conventional, air-assisted airless and electrostatic spray – Devilbiss, Binks or Graco production spray equipment with moisture and oil trap in the main air supply line.

Brush – Natural bristle. Maintain a wet edge.

Roller – Solvent resistant. Level any air bubbles with a bristle brush.

When brush or roller applied, multiple coats may be needed to achieve dry film thickness.

Application Procedures

1. Flush equipment with thinner or Amercoat 12.
2. Stir resin thoroughly, add cure and mix until uniform. Do not mix more material than will be used within pot life time. Mixing ratio is 4 parts resin to 1 part cure by volume.

Pot life (hours)	°F/°C			
	90/32	70/21	50/10	32/0
Amershield	1½	2½	5	-
Amershield with 866M	½	1	2	4

3. If thinning is necessary, add up to 1 pint Amercoat 65 per gallon of Amershield .

4. When applying by spray, adjust pressures for equipment configuration and environmental conditions to ensure proper atomization.

5. Apply a wet coat in even, parallel passes; overlap each pass 50 percent.

Drying time (ASTM D1640) (hours)	°F/°C			
	90/32	70/21	50/10	32/0
touch	1	2½	4	-
with 866M	½	¾	1	2½
through	5	10	72	-
with 866M	2	3	6	10

Using ½ pt Amercoat 866M per 5 gal Amershield

Recoat time (hours)	°F/°C				
	90/32	80/26	70/21	50/10	32/0
minimum	4	5½	8	48	-
with 866M	1½	1¾	2	4	8
maximum	12	24	168	168	-
with 866M	6	8	12	24	48

Roughen surface or use Amerase™ if maximum recoat time is exceeded.

Note: When applying directly over organic zinc at full thickness, bubbling may occur. A mist coat/full coat technique may be required to prevent application bubbling.

6. For colors, application of 8-mil wet film thickness (thinned) will normally provide 5-mil dry film thickness, Clear coat at 5-mils WFT will normally provide 3-mil DFT.

7. Clean all equipment with thinner or Amercoat 12 immediately after use.

Note: Moisture sensitive – Keep cure container tightly closed. Repeated moisture exposure will cause gellation and gassing; handle bulged containers with caution, lids may eject forcibly.

Repair

Spot blast or power tool clean bare substrate to the requirements shown under surface preparation. Feather edges of intact coating. Remove dust, dirt and contamination before recoating.

Shipping Data

Packaging units	1 gal	5 gal
cure	0.20 gal in 1-qt can	1 gal in 1-gal can
resin	0.80 gal in 1-gal can	4 gal in 5-gal can
Shipping weight (approx)	lb	kg
1-gal unit		
cure	2.2	1.0
resin	11.0	5.0
5-gal unit		
cure	10.4	4.7
resin	55.0	25.0
Shelf life when stored indoors at 40 to 100°F (4 to 38°C)		
resin	1 year from shipment date	
cure	1 year from manufacturer date	

Numerical values are subject to normal manufacturing tolerances, colors and testing variances. Appearance will vary depending on substrate and application method. Allow for application losses and surface irregularities. See application instructions for complete information and safety precautions.

This mixed product is nonphotochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.

Safety Precautions

Read each component's material safety data sheet before use. Mixed material has hazards of both components. Safety precautions must be strictly followed during storage, handling and use.

Limitation of Liability

Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. **In no event shall Ameron be liable for consequential or incidental damages.**

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

Ameron makes no other warranties concerning the product. No other warranties, whether express, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Ameron be liable for consequential or incidental damages.

Any recommendation or suggestion relating to the use of products made by Ameron, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.



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AMERON
INTERNATIONAL

Performance Coatings & Finishes

Amercoat® 1000

Single pack synthetic resin coating

Product Data/ Application Instructions

- One component primer
- Low VOC

Typical Uses

Amercoat 1000 is a primer used with PSX 1001 to give a high-performance maintenance system with ease of one pack application.

Surface Preparation

Coating performance is, in general, proportional to the degree of surface preparation. Prior to coating, all surfaces must be clean, dry, undamaged and free of all contaminants, including salt deposits.

Steel – New steel surfaces to a minimum SSPC-SP6. Blast to achieve a 1 mil (25 micron) profile as indicated by a Keane-Tator Surface Profile Comparator, Testex Tape or a similar device.

Aged coatings - All surfaces must be clean, dry, tightly bonded and free of all loose paint, corrosion products or chalky residue. Clean by pressure water blast (1000 psi or greater), SSPC-SP1, 2,3, or 7. Amercoat 1000 is compatible over most types of properly applied and tight-adhering coatings. However, a test patch is recommended to confirm compatibility.

Repair - Prepare damaged areas to original surface preparation specifications, feathering edges of intact coating. Thoroughly remove dust or abrasive residue before touch up.

Application Equipment

The following is a guide; suitable equipment from other manufacturers may be used. Changes in pressure, hose and tip size may be needed for proper spray characteristics.

Conventional spray – Industrial equipment such as DeVilbiss MBC or JGA spray gun. Separate regulators for air and fluid pressure, mechanical pot agitator and a moisture and oil trap in the main air supply line are recommended.

Airless spray – Standard equipment such as Graco, DeVilbiss, Nordson, Spee-Flo or others having 28:1 or higher pump ratio and fluid tip with a 0.015- to 0.019-inch (0.38mm to 0.53mm) orifice.

Brush – Natural bristle. Maintain a wet edge.

Roller – Industrial solvent-type. Level any air bubbles with a bristle brush.

Power mixer – Jiffy mixer powered by an air or explosion-proof electric motor.

Physical Data

Finish	Flat	
Color	Oxide red, buff, off-white, and pearl gray	
Components	1	
Curing mechanism	Solvent release and air oxidation	
Volume solids (calculated)	60% ± 3%	
Dry film thickness per coat	4 - 5 mils (100 - 125 microns)	
Coats	1-2	
Theoretical coverage	ft ² /gal	m ² /L
1 mil (25 microns)	962.4	23.6
5 mils (125 microns)	192.4	4.8
VOC (EPA Method 24)	lb/gal	g/L
mixed	2.6	312
mixed, thinned (1/2pt/gal)	2.7	324
Flash point (SETA)	°F	°C
Amercoat 1000	82	28
Amercoat 65	78	26
Amercoat 12	2	-17

Application Data

Applied over	Prepared steel		
Surface preparation	SSPC-SP3, 6 or 8		
Method	Airless or conventional spray, brush or roller		
Environmental conditions			
Temperature	°F	°C	
air and surface	45 to 100	7 to 38	
Surface temperatures must be at least 5°F (3°C) above dew point to prevent condensation.			
Drying time at 8 mils WFT	°F/°C		
	90/32	70/21	50/10
touch (minutes)	15	25	45
through (minutes)	75	90	130
Minimum			
recoat/topcoat (hours)	2	2	4
Maximum			
recoat/topcoat (hours)	None		
Thinner	Amercoat 65		
Equipment cleaner	Amercoat 12		

Formerly Amercoat 3346

Application Procedure

1. Flush all equipment with thinner or Amercoat 12.
2. Stir to uniform consistency. Strain through cheesecloth or equivalent to remove skin particles or other contamination.
3. If thinning is necessary for workability, add up to $\frac{1}{2}$ pt of Amercoat 65 thinner per 1 gal of Amercoat 1000.
4. Apply a wet coat in even, parallel passes; overlap each pass 50 percent to avoid bare areas, pinholes or holidays. Excessive wet film thickness will cause sags and runs.
5. Store unused materials in tightly closed containers. Partially filled containers may show surface skinning after storage. Strain before use to remove skin.
6. Clean application equipment with thinner or Amercoat 12.

Safety Precautions

Read product's material safety data sheet before use

CAUTION – Improper use and handling of this product can be hazardous to health and cause fire or explosion.

Do not use this product without first taking all appropriate safety measures to prevent property damage and injuries. These measures may include, without limitation: implementation of proper ventilation, use of proper lamps, wearing of proper protective clothing and masks, tenting and proper separation of application areas. Consult your supervisor. Proper ventilation and protective measures must be provided during application and drying to keep spray mists and vapor concentrations within safe limits and to protect against toxic hazards. Necessary safety equipment must be used and ventilation requirements carefully observed, especially in confined or enclosed spaces, such as tank interiors and buildings.

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If you do not fully understand these warnings and instructions or if you cannot strictly comply with them, do not use the product.

Note: Consult Code of Federal Regulations Title 29, Labor, parts 1910 and 1915 concerning occupational safety and health standards and regulations, as well as any other applicable federal, state and local regulations on safe practices in coating operations.

This product is for industrial use only. Not for residential use.

Shipping Data

Packaging	1 gal	5 gal
Shipping weight (approx)	lb	kg
1-gal can	13.5	6
5-gal can	67	30.5

Shelf life when stored indoors at 40 to 100°F (4 to 38°C)
1 year from date of shipment.

Numerical values are subject to normal manufacturing tolerances, colors and testing variances. Allow for application losses and surface irregularities.

This product is photochemically reactive as defined by the South Coast Air Quality Management District's Rule 102 or equivalent regulations.

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such nonconformance as required herein shall bar Buyer from recovery under this Warranty.

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PRODUCT DESCRIPTION

SEMSTONE 110/110EP Damp-Proof Primer is a two part epoxy that exhibits superior adhesion to concrete and steel. SEMSTONE 110/110EP Damp Proof Primer is used in conjunction with many of Carboline's coatings.

PACKAGING

SEMSTONE 110/110EP Damp-Proof Primer is packaged in 1.5 gallon units.

A unit of Semstone 110 consists of:

- 1 1 gallon can of Part A
- 1 1 gallon can of Part B (short-filled)

A unit of Semstone 110EP consists of:

- 1 1 gallon can of Part A
- 1 1 gallon can of Part B (short-filled)
- 1 bag of Part C

COVERAGE

A 1.5 gallon unit of Semstone 110 or 110 EP will cover approximately 250 sq. ft./23.2 sq. m

TYPICAL PROPERTIES

MIXING RATIO

2 parts Part A to 1 part Part B by volume.

COLOR

110: Amber
110EP: Buff

POT LIFE

After mixing, SEMSTONE 110/110EP has a working time of approximately 60 minutes @ 75°F/24°C.

CURING

Listed below are a few curing schedules that may be used for time and work planning.

MINIMUM APPLICATION TEMPERATURE	DRY TO TOUCH	MAXIMUM RECOAT
50°F/10°C	24 to 30 Hrs	4 Days
65°F/18°C	10 to 12 Hrs	3 Days
80°F/27°C	6 to 10 Hrs	48 Hrs
95°F/35°C	5 to 8 Hrs	24 Hrs

*SEMSTONE 110/110EP may be topped while still wet. Check specific topcoat data sheet or consult Carboline's Technical Service Department for specific instructions.

STORAGE CONDITIONS

Store all components of SEMSTONE 110/110EP between 50°F/10°C and 90°F/32°C in a dry area, out of direct sunlight. PLEASE HANDLE AND STORE PROPERLY. The shelf life is 1 year in the original, unopened container.

SURFACE PREPARATION

Proper preparation is critical to ensure an adequate bond. The substrate must be free of all wax, grease, oils, fats, soil, loose or foreign materials, and laitance. Laitance and unbonded cement particles must be removed by mechanical methods, i.e., abrasive blasting or scarifying. Other contaminants may be removed by scrubbing with a heavy duty industrial detergent and rinsing with clean water. The surface must show open pores throughout and have a sand paper texture. For recommendations or additional information regarding substrate preparation, please contact Carboline's Technical Service Department.

PRIMER APPLICATION

1. Mix Part A resin with Part B hardener until uniform in color and consistency.
2. Apply to prepared surface using flat floor squeegee, paint roller, or brush. Apply in one even coat to thoroughly wet and seal surface. Do not allow to puddle.

Note: To avoid potential outgassing problems, Carboline recommends applying Semstone 110 while ambient temperature is descending. As common with all epoxies and novolacs, under certain conditions such as low temperature and high humidity, this product may develop an oily film on its surface known as "blush". This blush should be removed by a soap and water wash prior to any re-coating.

EPOXY PUTTY APPLICATION

1. Mix Part A resin with Part B hardener until uniform in color and consistency.
2. Add Part C to form a putty consistency and mix thoroughly.
3. Apply to primed surface, working into voids to displace air, using a trowel, squeegee or broad knife.

CURING

The surface of SEMSTONE 110/110EP will be tack-free in 6-8 hours at 70°F/21°C.

SEMSTONE® 110/110 EP

RECOMMENDATIONS

- Apply only on clean, sound, and properly prepared substrate.
- Substrate temperature should be greater than 5°F/3°C above dew point.
- Application and curing times are dependent upon ambient and substrate conditions. Consult Carboline if conditions are not within recommended guidelines.

NOTES

- Material Safety Data Sheets on SEMSTONE 110/110EP are available on request.
- Specific information regarding chemical resistance of SEMSTONE 110/110EP is available through Carboline Technical Service.
- A staff of technical service engineers is available to assist in product application, or answer questions related to Carboline products. Requests for technical literature or service can be made through local sales representatives and offices, or corporate offices located throughout the world.

SAFETY

READ THIS NOTICE!

SAFETY & MISCELLANEOUS EQUIPMENT

Toluene or Xylene solvents are recommended for clean up of SEMSTONE 110/110EP part A or B material spills. Use these materials only in strict accordance with manufacturers' recommended safety procedures. Dispose of waste materials in accordance with Government Regulations.

For the applicator, the use of a supplied air respirator system is required when handling the product.

The selection of proper protective clothing and equipment will significantly reduce risk to injury. Body covering apparel, safety goggles and impermeable gloves are highly recommended.

In case of contact, flush area with water for 15 minutes and seek medical attention. Wash skin with soap and water.

Use only with adequate ventilation.



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Selection & Specification Data

Generic Type	Polyamido-Amine Epoxy
Description	Penetrating primer/sealer for use on concrete substrates and Carboline Pyrocrete Fireproofing products. It performs extremely well in sealing cementitious surfaces and is designed to receive a variety of different generic types of finish coats. Some recommended uses of 1340 include the use as a curing compound or form release agent. When applied to "green" concrete it will retard the escape of moisture during the cure period. It is also excellent for use as a form release coating on plywood or steel forms. Meets the requirements of ASTM C309 when applied at 5.0-10.0 mils (125-250 microns) wet.
Features	<ul style="list-style-type: none"> ▪ Exceptional wetting characteristics ▪ Low stress, highly flexible film ▪ Very high solids ▪ Low odor ▪ User-friendly brush & roller application ▪ VOC compliant to current AIM regulations ▪ Nuclear Service Level 1
Color	Clear Amber (0910)
Finish	Gloss
Primers	Self-priming. May be applied over most generic types of coatings.
Topcoats	Acrylics, Epoxies, Polyurethanes
Dry Film Thickness	1.0 - 2.0 mils (25 - 50 microns) DFT for most applications but can be applied up to 4.0 mils (100 microns) for sealing rough surfaces or shot-blasted concrete. When used as a curing and/or form release agent, it may be applied up to 10.0 mils (250 microns) wet.
Solids Content	By Volume: 98% ± 2%
Theoretical Coverage Rate	1572 mil ft ² (38.5 m ² /l at 25 microns) Allow for loss in mixing and application. Porous and irregular substrates like concrete/fireproofing coverage rates and should be taken into account.
VOC Values	As supplied: 0.2 lbs/gal (24 g/l) EPA Method 24: 0.8 lbs/gal (95 g/l) Thinned: 25 oz/gal w/ #76: 1.8 lbs./gal (214 g/l) These are nominal values.
Dry Temp. Resistance	Continuous: 175°F (79°C) Non-Continuous: 200°F (93°C)
Limitations	<ul style="list-style-type: none"> ▪ Epoxies lose gloss, discolor and eventually chalk in sunlight exposure. ▪ Do not use for immersion service.

Substrates & Surface Preparation

Concrete	Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating.
As a Curing Membrane	Carboguard 1340 has been tested in accordance with ASTM C 309-98a Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete and passes the requirements set forth in the standard. While 1340 may be applied to green concrete, generally additional coats or other coatings should not be applied until the concrete has cured 28 days at 75°F (24°C) and 50% R.H. or equivalent. Prior to topcoating we recommend that a test patch be applied to insure proper adhesion.
General	Concrete must be cured 28 days at 75°F (24°C) and 50% relative humidity or equivalent. Prepare surfaces in accordance with ASTM D4258 Surface Cleaning of Concrete and ASTM D4259 Abrading Concrete. Voids in concrete may require surfacing. Application prior to surfacing assures tight adhesion between concrete and surfacers or membranes. Compatibility with other coatings, surfacers and polyurethane membranes eliminates need for form release oils or curing oils.
Pyrocrete Fireproofing Products	Contact Carboline Technical Service or your Carboline sales representative for specific applications and requirements.
Previously Painted Surfaces	Lightly sand or abrade to roughen and degloss the surface. Existing paint must attain a minimum 3B rating in accordance with ASTM D3359 "X-Scribe" adhesion test.

Carboguard® 1340

Application Equipment

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

General Guidelines:

Spray Application (General) Contact Carboline Technical Service for spray equipment and technique.

Brush & Roller (General) Avoid excessive re-brushing or re-rolling. Apply only enough material to wet the surface uniformly. Any puddles formed must be brushed out.

Brush Use a medium bristle brush.

Roller Use a medium or long-nap synthetic roller cover with phenolic core.

Mixing & Thinning

Mixing Power mix separately, then combine and power mix. DO NOT MIX PARTIAL KITS.

Ratio 1:1 Ratio (A to B)

Thinning Normally not required but may be thinned up to 25 oz/gal (20%) with Thinner #76. Use of thinners other than those supplied or recommended by Carboline may adversely affect product performance and void product warranty, whether expressed or implied.

Pot Life 45 minutes at 75°F (24°C). Pot life will be less at higher temperatures.

Cleanup & Safety

Cleanup Use Thinner #2 or Acetone. In case of spillage, absorb and dispose of in accordance with local applicable regulations.

Safety Read and follow all caution statements on this product data sheet and on the MSDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.

Ventilation When used in enclosed areas and product is thinned, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to insure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved respirator.

Caution This product exotherms at the end of its pot life. Any unused quantities will become extremely hot. The material begins to thicken at the end of its pot life, which is an indication of exotherm. Immediately spread out on an appropriate surface or add sand or other suitable heat sink to the unused material to reduce the severity of exotherm. Take appropriate precautions against breathing fumes. This product when thinned contains flammable solvents. Keep away from sparks and open flames. All electrical equipment and installations should be made and grounded in accordance with the National Electric Code. In areas where explosion hazards exist, workmen should be required to use non-ferrous tools and wear conductive and non-sparking shoes.

Application Conditions

Condition	Material	Surface	Ambient	Humidity
Normal	60°-80°F (16°-27°C)	60°-80°F (16°-27°C)	60°-80°F (16°-27°C)	0-80%
Minimum	60°F (16°C)	50°F (10°C)	50°F (10°C)	0%
Maximum	90°F (32°C)	130°F (54°C)	100°F (38°C)	90%

This product simply requires the substrate temperature to be above the dew point. Condensation due to substrate temperatures below the dew point can cause flash rusting on prepared steel. Special application techniques may be required above or below normal application conditions.

Curing Schedule

Surface Temp. & 50% Relative Humidity	Dry to Topcoat or Handle	Maximum Recoat Time w/ Water Borne	Maximum Recoat Time w/ Solvent Borne	Final Cure
50°F (10°C)	24 Hours			9 Days
75°F (24°C)	12 Hours	14 Days	30 Days	6 Days
90°F (32°C)	6 Hours			3 Days

These times are based on a 1.0-2.0 mil (25-50 micron) dry film thickness. Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times and could result in solvent entrapment and premature failure. Excessive humidity or condensation on the surface during curing can interfere with the cure, can cause discoloration and may result in a surface haze. Any haze or blush must be removed by water washing before recoating. During high humidity conditions, it is recommended that the application be done while temperatures are increasing. If the maximum recoat time is exceeded, the surface must be abraded by sweep blasting or sanding before the application of additional coats.

Curing Schedule for Curing/Form Release Agent

Surface Temp. & 50% Relative Humidity	Dry to Topcoat or Handle	Final Cure
75°F (24°C)	5 Hours	6 Days

These times are based on 5.0-10.0 (125-250 microns) mils dry film thickness.

Packaging, Handling & Storage

Shipping Weight (Approximate) 0.5 Gallon Kit 6 lbs (3 kg) 2 Gallon Kit 22 lbs (10 kg)

Flash Point (Setaflash) Part A: >205°F (96°C)
Part B: >205°F (96°C)

Storage Temperature & Humidity 40° - 110°F (4°-43°C) Store indoors.
0-90% Relative Humidity

Shelf Life Part A & B: Min. 36 months at 75°F (24°C)

***Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.**



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PRODUCT DESCRIPTION

Semstone 140 is a 100% solids, high performance, epoxy lining system designed for concrete. Semstone 140 is a semi-leveling coating which may be applied as an aggregate filled and/or reinforced coating system. Semstone 140 is specially formulated to withstand some of industry's most aggressive chemicals.

USES, APPLICATIONS

- Process Slabs
- Tank Farm Floors
- Chemical Loading and Unloading Areas
- Spill Containment Areas

PRODUCT ADVANTAGES

Semstone 140 is a two-component system that possesses the following characteristics:

- Excellent resistance to chemical attack
- Excellent abrasion and impact resistance
- Exceptional thermal shock resistance
- Superior bonding qualities
- High cohesive strength
- Low permeability
- Low odor

CHEMICAL RESISTANCE

Semstone 140 is formulated to resist a variety of chemical solutions. Please consult Carboline Technical Service Department for specific recommendations.

PACKAGING

Semstone 140 is available in 1-gallon and 5-gallon units.

A 1 gallon unit consists of:

- 1 1 gallon can of Part A (resin)
- 1 1 quart can of Part B (hardener)

A 5 gallon unit consists of:

- 1 5 gallon pail of Part A (resin)
- 1 1 gallon can of Part B (hardener)

PHYSICAL CHARACTERISTICS

Compressive Strength	14,000 psi (ASTM C-579: AFC)
Tensile Strength	Neat: 6,300 psi (ASTM D-638) Reinforced: 8,600 psi
Flexural Strength	Neat: 9,500 psi (ASTM D-790) Reinforced: 15,800 psi (ASTM C-580) Aggregate Filled: 6,100 psi
Flexural Modulus of Elasticity	Neat: 4.7×10^5 psi (ASTM D-790) Reinforced: 7.7×10^5 psi (ASTM C-580) Aggregate Filled: 11.0×10^5 psi
Hardness	Neat: 75 (ASTM D-2240, Shore D)
Bond Strength	> 400 psi (ASTM D-4541) (100% concrete failure)
Water Vapor Transmission (ASTM E-96).....	0.0120 grams/hr./ft ²
Permeability	0.0042 perm. -in. (ASTM E-96)
Weight per Mixed Gallon	10.0 lbs.
Pot Life @ 75°F	45 to 60 min*
Cure Times @ 75°F	Dry to Touch: 12 hrs Firm: 24 hrs Chemical Service: 36 hrs
Flammability	Non-flammable

* Significantly less at elevated temperatures

COVERAGE

Semstone 140 will cover 1,604 mils sq. ft./gal. For estimating purposes, one gallon of Semstone 140 will cover 64 sq. ft./5.96 sq. m at a thickness of 25 mils/0.63 mm. Application thickness may vary from 30-150 mils/0.75-3.8 mm, depending on expected service conditions (i.e., chemical exposure, temperature, traffic load and other mechanical abuse, immersion service vs. splash-spill, etc.). Consult Carboline's Technical Service Department for specific thickness recommendations. In addition, coverage rates will be effected by the condition of the surface being coated (degraded vs. smooth, steel vs. concrete, etc.).

SEMSTONE® 140

STORAGE CONDITIONS

Store all components between 50-75°F/10-24°C in a dry area. Keep out of direct sunlight. Avoid excessive heat and do not freeze. The shelf life is one year in the original, unopened container.

Twenty-four hours before application, all materials (components A and B, aggregate, etc.) should be stored at 70-85°F/21-29°C to facilitate handling.

SUBSTRATE PREPARATION

General

Proper preparation is critical to ensure an adequate bond. The substrate must be dry and free of all wax, grease, oils, fats, soil, loose or foreign materials and laitance. Laitance and unbonded cement particles must be removed by mechanical methods, i.e., abrasive blasting or scarifying. Other contaminants may be removed by scrubbing with a heavy-duty industrial detergent and rinsing with clean water. For recommendations or additional information regarding substrate preparation, please contact Carboline's Technical Service Department.

Concrete

Concrete should be properly cured for 28 days and have the following characteristics:

- Substrate tensile strength of at least 300 psi.
- pH in the range of 7 to 11.

The surface must show open pores throughout and have a sandpaper texture.

Steel

Equipment base plates, etc. to be coated along with the concrete should be abrasive blasted to a near white metal finish, SSPC-10 or NACE-2, with a 1 to 2 mils anchor profile.

Masking

Mask surfaces that are not to be coated. This material is difficult to remove once applied.

APPLICATION GUIDELINES

Before mixing and applying any material, make sure environmental conditions are satisfactory for application. For optimal working conditions, substrate temperature must be between 60°F/15°C and 80°F/27°C. Measure the surface temperature with a surface thermometer. Cold areas must be heated until the slab temperature is above 50°F/10°C. This will allow the material to achieve a proper cure. Also, a cold sub-

strate will make the material stiff and difficult to apply. Warm areas or areas in direct sunlight must be shaded or arrangements made to work during evenings or at night. A warm substrate (60°F/15°C to 80°F/27°C) will aid in the material's workability; however, a hot substrate (80°F/27°C to 100°F/37°C) or a substrate directly in the sun will shorten the material's working time and can cause other phenomenon such as pinholing and bubbling. Substrate temperature should be greater than 5°F/3°C above dew point.

If the temperature is expected to drop below 50°F/10°C use Semstone 140CT.

APPLICATION

Priming

Apply Semstone 110 Primer in accordance with the product data sheet. Allow the primer to cure prior to the application of Semstone 140.

Note: For substrates with out-gassing concerns use Carboguard 1340. Primer should be applied while the substrate temperature is decreasing.

Broadcast Application (AFC – Broadcast)

Pre-mix Part A (resin) for 30 seconds using a Jiffy Mixer. Pour Part B (hardener) into the Part A pail and mix thoroughly for 2 minutes.

Apply a base coat at the specified thickness using a squeegee or a notched trowel. For a 60 mil/1.5 mm system apply a 25 mil/0.63 mm base coat and for a 125 mil/3.1 mm system apply a 50 mil/1.3 mm base coat. Immediately after applying the base coat, begin broadcasting the aggregate until a dry appearance is achieved.

Note: The use of a 20/40 mesh aggregate is highly recommended. One gallon of 20/40 mesh silica weighs 13-14 lbs.

After the base coat has cured, remove the loose aggregate. Apply a 10-15 mil/0.25-0.38 mm topcoat using a squeegee or roller.

Material Coverages

Below is a list of coverages for the Broadcast application depending upon desired thickness and texture.

MATERIAL	Nominal 60 mils/1.5 mm	Nominal 75 mils/1.9 mm	Nominal 125 mils/3.1 mm
Semstone 110 Primer	200-250 sq.ft./gal.	200-250 sq.ft./gal.	200-250 sq.ft./gal.
Semstone 140 Base Coat	64 sq.ft./gal.	45 sq.ft./gal.	32 sq.ft./gal.
Aggregate	1.5 lbs./sq.ft.	1.5 lbs./sq.ft.	2 lbs./sq.ft.
Semstone 140 Topcoat			
15 mils	100 sq.ft./gal.	100 sq.ft./gal.	100 sq.ft./gal.

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Blended Application (AFC – Blended)

Pre-mix Part A (resin) for 30 seconds using a Jiffy Mixer. Pour Part B (hardener) into Part A and thoroughly mix for 2 minutes. After mixing Part A and Part B, split the mix into two 5 gallon buckets. While continuing to mix with a Jiffy Mixer, slowly add the aggregate.

Note: A 2:1 sand to liquid weight ratio will produce a trowel-like consistency. A 3:1 sand to liquid weight ratio will produce a grout-like consistency.

Note: The use of a 20/40 mesh silica aggregate is highly recommended. One gallon of 20/40 mesh silica weighs 13-14 lbs.

Apply the mixture at the desired thickness using a notched trowel.

Note: For vertical surfaces add Semstone Thixotrope Part C (pre-measured mixes) or Cab-O-Sil (TS 720) to the blended mix at a 1:2 Cab-O-Sil to liquid volume ratio.

After the surface has cured, the surface must be washed with soap and water prior to re-coating.

Note: Surface must be sanded prior to re-coating after an initial cure of 24 hours.

Material Coverages

Below is a list of coverages for the Blended application.

MATERIAL	Nominal 125 mils/3.1 mm
Semstone 110 Primer	200-250 sq.ft./gal.
Semstone 140 Mortar 125 mils	20 sq.ft./gal.

Reinforced (AFRC – Broadcast)

A fiberglass scrim cloth may be added to the 125 mil broadcast system. For the 125 mil broadcast system apply the fiberglass scrim cloth into the base coat prior to applying the aggregate.

Reinforced (AFRC – Blended)

A fiberglass scrim cloth may be added to the 125 blended system. For the 125 mil blended system apply a 25-35 mil/0.63-0.88 mm base coat and lay the fiberglass scrim cloth into the base coat.

Note: For a vertical surface, the base coat should be mixed with Cab-O-Sil (TS 720) at a 1:1 volume ratio.

Allow the base coat to become tacky and then apply Semstone 140 mortar at 90-100 mils/2.25-2.50 mm.

Note: Application of base coat, fiberglass scrim cloth, and mortar should be completed in the same day.

RECOMMENDATIONS

- Apply only on clean, sound, dry and properly prepared substrates.
- Minimum ambient and surface temperatures are 50°F/10°C at the time of application.
- Maximum surface temperatures should not exceed 90°F/32°C during the time of application.
- Substrate temperature should be greater than 5°F/3°C above dew point.
- Application and curing times are dependent upon ambient and surface conditions. Consult Carboline's Technical Service Department if conditions are not within the recommended guidelines.

PRECAUTIONS

- MEK, Toluene or Xylene solvents are recommended for clean up of Semstone 140 material spills. Use these materials only in strict accordance with manufacturer's recommended safety procedures. Dispose of waste materials in accordance with government regulations.
- The use of a NIOSH/MSHA approved respirator using a #TC-23C-738 organic vapor or a #TC-23C-740 organic vapor acid gas cartridge is mandatory.
- The selection of proper protective clothing and equipment will significantly reduce risk to injury. Body covering apparel, safety goggles and impermeable gloves are highly recommended.
- In case of contact, flush the area with water for 15 minutes and seek medical attention. Wash skin with soap and water.
- Use only with adequate ventilation.

NOTES

- Material Safety Data Sheets on Semstone 140 are available on request.
- Specific information regarding chemical resistance of Semstone 140 is available in the Semstone Chemical Resistance Guide.
- A staff of technical service engineers is available to assist with product application or to answer questions related to Carboline products.
- Requests for technical literature or service can be made through local sales representatives and offices, or corporate offices located worldwide.

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SEMSTONE® 140



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PRODUCT DESCRIPTION

Semstone 145 is a 100% solids, high performance, novolac epoxy lining system designed for concrete. Semstone 145 is a semi-leveling coating which may be applied as an aggregate filled and/or reinforced coating system. Semstone 145 is specially formulated to withstand some of industry's most aggressive chemicals, including 98% sulfuric acid, as well as many organic chemicals and solvents.

USES, APPLICATIONS

- Process Slabs
- Tank Farm Floors
- Chemical Loading and Unloading Areas
- Spill Containment Areas

PRODUCT ADVANTAGES

Semstone 145 is a two-component system that possesses the following characteristics:

- Excellent resistance to chemical attack
- Excellent abrasion and impact resistance
- Exceptional thermal shock resistance
- Superior bonding qualities
- High cohesive strength
- Low permeability
- Low odor

CHEMICAL RESISTANCE

Semstone 145 is formulated to resist a variety of chemical solutions. Please consult Carboline Technical Service Department for specific recommendations.

PACKAGING

Semstone 145 is available in 1 gallon and 5 gallon units.

- A 1 gallon unit consists of:
- 1 1 gallon can of Part A (resin)
 - 1 1 quart can of Part B (hardener)

- A 5 gallon unit consists of:
- 1 5 gallon pail of Part A (resin)
 - 1 1 gallon can of Part B (hardener)

PHYSICAL CHARACTERISTICS

Compressive Strength	16,000 psi (ASTM C-579: AFC)
Tensile Strength	Neat: 7,000 psi (ASTM D-638) Reinforced: 8,500 psi
Flexural Strength	Neat: 9,000 psi (ASTM D-790) Reinforced: 13,000 psi
	(ASTM C-580) Aggregate Filled: 6,200 psi
Flexural Modulus of Elasticity	Neat: 5.4 x 10 ⁵ psi (ASTM D-790) Reinforced: 7.5 x 10 ⁵ psi
	(ASTM C-580) Aggregate Filled: 12.6 x 10 ⁵ psi
Hardness	Neat: 75 (ASTM D-2240, Shore D)
Bond Strength	> 400 psi (ASTM D-4541) (100% concrete failure)
Water Vapor	0.0120 grams/hr./ft ²
Transmission	(ASTM E-96)
Permeability	0.0042 perm. -in. (ASTM E-96)
Weight per Mixed Gallon	10.4 lbs.
Pot Life @ 75°F	45 to 60 min*
Cure Times @ 75°F	Dry to Touch: 12 hrs Firm: 24 hrs Chemical Service: 36 hrs
Flammability	Non-flammable

*Significantly less at elevated temperatures

COVERAGE

Semstone 145 will cover 1,604 mils sq. ft./gal. For estimating purposes, one gallon of Semstone 145 will cover 64 sq. ft./5.96 sq. m at a thickness of 25 mils/0.63 mm. Application thickness may vary from 30-150 mils/0.75-3.8 mm, depending on expected service conditions (i.e., chemical exposure, temperature, traffic load and other mechanical abuse, immersion service vs. splash-spill, etc.). Consult Carboline's Technical Service Department for specific thickness recommendations. In addition, coverage rates will be effected by the condition of the surface being coated (degraded vs. smooth, steel vs. concrete, etc.).

SEMSTONE® 145

STORAGE CONDITIONS

Store all components between 50-75°F/10-24°C in a dry area. Keep out of direct sunlight. Avoid excessive heat and do not freeze. The shelf life is one year in the original, unopened container.

Twenty-four hours before application, all materials (components A and B, aggregate, etc.) should be stored at a 70-85°F/21-29°C to facilitate handling.

SUBSTRATE PREPARATION

General

Proper preparation is critical to ensure an adequate bond. The substrate must be dry and free of all wax, grease, oils, fats, soil, loose or foreign materials and laitance. Laitance and unbonded cement particles must be removed by mechanical methods, i.e., abrasive blasting or scarifying. Other contaminants may be removed by scrubbing with a heavy-duty industrial detergent and rinsing with clean water. For recommendations or additional information regarding substrate preparation, please contact Carboline's Technical Service Department.

Concrete

Concrete should be properly cured for 28 days and have the following characteristics:

- Substrate tensile strength of at least 300 psi.
- pH range of 7 to 11.

The surface must show open pores throughout and have a sandpaper texture.

Steel

Equipment base plates, etc. to be coated along with the concrete should be abrasive blasted to a near white metal finish, SSPC-10 or NACE-2, with a 1 to 2 mils anchor profile.

Masking

Mask surfaces that should not be coated. This material is difficult to remove once applied.

APPLICATION GUIDELINES

Before mixing and applying any material, make sure environmental conditions are satisfactory for application. For optimal working conditions, substrate temperature must be between 60°F/15°C and 80°F/27°C. Measure the surface temperature with a surface thermometer. Cold areas must be heated until the slab temperature is above 50°F/10°C. This will allow the material to achieve a proper cure. Also, a cold substrate will make the material stiff and difficult to apply.

Warm areas or areas in direct sunlight must be shaded or arrangements made to work during evenings or at night. A warm substrate (60°F/15°C to 80°F/27°C) will aid in the material's workability; however, a hot substrate (80°F/27°C to 100°F/37°C) or a substrate directly in the sun will shorten the material's working time and can cause other phenomenon such as pinholing and bubbling. Substrate temperature should be greater than 5°F/3°C above dew point.

If the temperature is expected to drop below 50°F/10°C use Semstone 145CT.

APPLICATION

Priming

Apply Semstone 110 Primer in accordance with the product data sheet. Allow the primer to cure prior to application of Semstone 145.

Note: For substrates with out-gassing concerns use Carboguard 1340. Primer should be applied while the substrate temperature is decreasing.

Broadcast Application (AFC – Broadcast)

Pre-mix Part A (resin) for 30 seconds using a Jiffy Mixer. Pour Part B (hardener) into the Part A pail and mix thoroughly for 2 minutes.

Apply a base coat at the specified thickness using a squeegee or a notched trowel. For a 60 mil/1.5 mm system apply a 25 mil/0.63 mm base coat and for a 125 mil/3.1 mm system apply a 50 mil/1.3 mm base coat. Immediately after applying the base coat, begin broadcasting the aggregate until a dry appearance is achieved.

Note: The use of a 20/40 mesh aggregate is highly recommended. One gallon of 20/40 mesh silica weighs 13-14 lbs.

After the base coat has cured, remove the loose aggregate. Apply a 10-15 mil/0.25-0.38 mm topcoat using a squeegee or roller.

Material Coverages

Below is a list of coverages for the Broadcast application depending upon desired thickness and texture.

MATERIAL	Nominal	Nominal	Nominal
	60 mils/1.5 mm	75 mils/1.9 mm	125 mils/3.1 mm
Semstone 110 Primer	200-250 sq.ft./gal.	200-250 sq.ft./gal.	200-250 sq.ft./gal.
Semstone 145 Base Coat	64 sq.ft./gal.	45 sq.ft./gal.	32 sq.ft./gal.
Aggregate	1.5 lbs./sq. ft.	1.5 lbs./sq. ft.	2 lbs./sq. ft.
Semstone 145 Topcoat			
15 mils	100 sq. ft./gal.	100 sq. ft./gal.	100 sq. ft./gal.
30 mils	53 sq. ft./gal.	53 sq. ft./gal.	53 sq. ft./gal.

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Blended Application (AFC – Blended)

Pre-mix Part A (resin) for 30 seconds using a Jiffy Mixer. Pour Part B (hardener) into Part A and thoroughly mix for 2 minutes. After mixing Part A and Part B, split the mix into two 5 gallon buckets. While continuing to mix with a Jiffy Mixer, slowly add the aggregate.

Note: A 2:1 sand to liquid weight ratio will produce a trowel-like consistency. A 3:1 sand to liquid weight ratio will produce a grout-like consistency.

Note: The use of a 20/40 mesh silica aggregate is highly recommended. One gallon of 20/40 mesh silica weighs 13-14 lbs.

Apply the mixture at the desired thickness using a notched trowel.

Note: For vertical surfaces add Semstone Thixotrope Part C (pre-measured mixes) or Cab-O-Sil (TS 720) to the blended mix at a 1:2 Cab-O-Sil to liquid volume ratio.

After the surface has cured, the surface must be washed with soap and water prior to re-coating.

Note: Surface must be sanded prior to re-coating after an initial cure of 24 hours.

Material Coverages

Below is a list of coverages for the Blended application.

MATERIAL	Nominal 125 mils/3.1 mm
Semstone 110 Primer	200-250 sq.ft./gal.
Semstone 145 Mortar 125 mils	20 sq.ft./gal.

Reinforced (AFRC – Broadcast)

A fiberglass scrim cloth may be added to the 125 mil broadcast system. For the 125 mil broadcast system apply the fiberglass scrim cloth into the base coat prior to applying the aggregate.

Reinforced (AFRC – Blended)

A fiberglass scrim cloth may be added to the 125 mil blended system. For the 125 mil blended system apply a 25-35 mil/0.63-0.88 mm base coat and lay the fiberglass scrim cloth into the base coat.

Note: For a vertical surface, the base coat should be mixed with Cab-O-Sil (TS 720) at a 1:1 volume ratio.

Allow the base coat to become tacky and then apply Semstone 145 mortar at 90-100 mils/2.25-2.50 mm.

Note: Application of base coat, engineering fabric, and mortar should be completed in the same day.

RECOMMENDATIONS

- Apply only on clean, sound, dry and properly prepared substrates.
- Minimum ambient and surface temperatures are 50°F/10°C at the time of application.
- Maximum surface temperatures should not exceed 90°F/32°C during the time of application.
- Substrate temperature should be greater than 5°F/3°C above dew point.
- Application and curing times are dependent upon ambient and surface conditions. Consult Carboline's Technical Service Department if conditions are not within the recommended guidelines.

PRECAUTIONS

- MEK, Toluene or Xylene solvents are recommended for clean up of Semstone 145 material spills. Use these materials only in strict accordance with manufacturer's recommended safety procedures. Dispose of waste materials in accordance with government regulations.
- The use of a NIOSH/MSHA approved respirator using a #TC-23C-738 organic vapor or a #TC-23C-740 organic vapor acid gas cartridge is mandatory.
- The selection of proper protective clothing and equipment will significantly reduce risk to injury. Body covering apparel, safety goggles and impermeable gloves are highly recommended.
- In case of contact, flush the area with water for 15 minutes and seek medical attention. Wash skin with soap and water.
- Use only with adequate ventilation.

NOTES

- Material Safety Data Sheets on Semstone 145 are available on request.
- Specific information regarding chemical resistance of Semstone 145 is available in the Semstone Chemical Resistance Guide.
- A staff of technical service engineers is available to assist with product application or to answer questions related to Carboline products.
- Requests for technical literature or service can be made through local sales representatives and offices, or corporate offices located worldwide.

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SEMSTONE® 145



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PRODUCT DESCRIPTION

Semstone 145SL is a 100% solids, high performance, novolac epoxy coating designed for concrete. Semstone 145SL is a self-leveling coating which may be applied as a neat, aggregate filled and/or reinforced coating system. Semstone 145SL is specially formulated to withstand some of industry's most aggressive chemicals, including 98% sulfuric acid as well as many organic chemicals and solvents.

USES, APPLICATIONS

- Process Areas
- Tank Farm Floors
- Production Areas
- Spill Containment Areas
- Light Manufacturing

PRODUCT ADVANTAGES

Semstone 145SL is a two-component system that possesses the following characteristics:

- Excellent resistance to chemical attack
- Excellent abrasion and impact resistance
- Exceptional thermal shock resistance
- Superior bonding qualities
- High cohesive strength
- Low permeability
- Low odor

CHEMICAL RESISTANCE

Semstone 145SL is formulated to resist a variety of chemical solutions. Please consult Carboline Technical Service Department for specific recommendations.

PACKAGING

Semstone 145SL is available in 1 gallon and 5 gallon units.

A 1 gallon unit consists of:

- 1 1 gallon can of Part A (resin)
- 1 1 quart can of Part B (hardener)

A 5 gallon unit consists of:

- 1 5 gallon pail of Part A (resin)
- 1 1 gallon can of Part B (hardener)

PHYSICAL CHARACTERISTICS

Compressive Strength	13,500 psi (ASTM C-579: AFC)
Tensile Strength	Neat: 5,500 psi (ASTM D-638) Reinforced: 7,800 psi
Flexural Strength	Neat: 7,200 psi (ASTM D-790) Reinforced: 13,000 psi (ASTM C-580) Aggregate Filled: 7,200 psi
Flexural Modulus of Elasticity	Neat: 3.5 x 10 ⁵ psi (ASTM D-790) Reinforced: 6.1 x 10 ⁵ psi (ASTM C-580) Aggregate Filled: 9.7 x 10 ⁵ psi
Hardness	Neat: 70 (ASTM D-2240, Shore D)
Bond Strength	> 400 psi (ASTM D-4541) (100% concrete failure)
Water Vapor Transmission	0.0120 gm/hr./ft. ² (ASTM E-96)
Permeability	0.0042 perm. -in. (ASTM E-96)
Weight per Mixed Gallon	10.0 lbs
Pot Life @ 75°F	45 to 60 min.*
Cure Times @ 75°F	Dry to Touch: 12 hrs Firm: 24 hrs Chemical Service: 36 hrs
Flammability	Non-flammable

* Significantly less at elevated temperatures

COVERAGE

Semstone 145SL will cover 1,604 mils sq. ft./gal. For estimating purposes, one gallon of Semstone 145SL will cover 64 sq. ft./5.96 sq. m at a thickness of 25 mils/0.63 mm. Application thickness may vary from 30-150 mils/0.75-3.8 mm, depending on expected service conditions (i.e., chemical exposure, temperature, traffic load and other mechanical abuse, immersion service vs. splash-spill, etc.). Consult Carboline's Technical Service Department for specific thickness recommendations. In addition, coverage rates will be effected by the condition of the surface being coated (degraded vs. smooth, steel vs. concrete, etc.).

SEMSTONE® 145 SL

STORAGE CONDITIONS

Store all components between 50-75°F/10-24°C in a dry area. Keep out of direct sunlight. Avoid excessive heat and do not freeze. The shelf life is one year in the original, unopened container.

Twenty-four hours before application, all materials (components A and B, aggregate, etc.) should be stored at a 70-85°F/21-29°C to facilitate handling.

SUBSTRATE PREPARATION

General

Proper preparation is critical to ensure an adequate bond. The substrate must be dry and free of all wax, grease, oils, fats, soil, loose or foreign materials and laitance. Laitance and unbonded cement particles must be removed by mechanical methods, i.e., abrasive blasting or scarifying. Other contaminants may be removed by scrubbing with a heavy-duty industrial detergent and rinsing with clean water. For recommendations or additional information regarding substrate preparation, please contact Carboline's Technical Service Department.

Concrete

Concrete should be properly cured for 28 days and have the following characteristics:

- Substrate tensile strength of at least 300 psi.
- pH in the range of 7 to 11.

The surface must show open pores throughout and have a sandpaper texture.

Steel

Equipment base plates, etc. to be coated along with the concrete should be abrasive blasted to a near white metal finish (SSPC-10 or NACE-2) with a 1 to 2 mils anchor profile.

Masking

Mask surfaces that are not to be coated. This material is difficult to remove once applied.

APPLICATION GUIDELINES

Before mixing and applying any material, make sure environmental conditions are satisfactory for application. For optimal working conditions, substrate temperature must be between 60-80°F/15-27°C. Measure the surface temperature with a surface thermometer. Cold areas must be heated until the slab temperature is above 50°F/10°C. This will allow the material to achieve a proper cure. Also, a cold substrate will make the material stiff and difficult to apply. Warm areas or areas in direct sunlight must be shaded or arrangements made to work during evenings or at night. A warm substrate (60-80°F/

15-27°C) will aid in the material's workability; however, a hot substrate (80-100°F/27-37°C) or a substrate directly in the sun will shorten the material's working time and can cause other phenomenon such as pinholing and bubbling. Substrate temperature should be greater than 5°F/3°C above dew point.

If the temperature is expected to drop below 50°F/10°C use Semstone 145CT.

APPLICATION

Priming

▪ Neat Applications

Semstone 110 Primer and Semstone 610 Primer must be used prior to the application of Semstone 145SL. Apply Semstone 110 Primer at a rate of 250-300 sq. ft./23.3-27.9 sq. m per gallon. While the Semstone 110 Primer is wet, apply Semstone 610 Primer. Allow the Semstone 610 Primer to cure prior to the application of Semstone 145SL. (Apply Semstone 110 Primer and Semstone 610 Primer in accordance with the Semstone 610 Product Data sheet.)

▪ Broadcast/Blended Applications

Apply Semstone 110 Primer in accordance with the Product Data sheet. Allow the primer to cure prior to application of Semstone 145SL.

Note: For substrates with out-gassing concerns use Carboguard 1340. Primer should be applied while the substrate temperature is decreasing.

Neat Application

A neat application is typically for thicknesses below 30 mils.

Pre-mix Part A (resin) for 30 seconds using a Jiffy Mixer. Pour Part B (hardener) into the Part A pail and mix thoroughly for 2 minutes.

Apply Semstone 145SL at the desired thickness using a notched squeegee. Backroll the Semstone 145SL with a spiked roller; this will assist in air release from the coating.

For thicknesses above 30 mils one of the following systems may be used as a more economical solution.

Below is a list of coverages for the Neat application depending upon desired thickness.

MATERIAL	Nominal 20 mils/0.5 mm	Nominal 75 mils/1.9 mm
Semstone 110 Primer	250-300 sq.ft./gal.	250-300 sq.ft./gal.
Semstone 145 SL	80 sq.ft./gal.	53 sq.ft./gal.

Broadcast Application (AFC – Broadcast)

Pre-mix Part A (resin) for 30 seconds using a Jiffy

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Mixer. Pour Part B (hardener) into the Part A pail and mix thoroughly for 2 minutes.

Apply a base coat at the specified thickness using a squeegee or a notched trowel. For a 60 mil/1.5 mm system apply a 25 mil/0.63 mm base coat and for a 125 mil/3.1 mm system apply a 50 mil/1.3 mm base coat. Immediately after applying the base coat begin broadcasting the aggregate until a dry appearance is achieved.

Note: The use of a 20/40 mesh aggregate is highly recommended. One gallon of 20/40 mesh silica weighs 13-14 lbs.

After the base coat has cured, remove the loose aggregate. Apply a 15-20 mil/0.38-0.5 mm topcoat using a squeegee or roller.

Material Coverages

Below is a list of coverages for the Broadcast application depending upon desired thickness and texture.

MATERIAL	Nominal 60 mils/1.5 mm	Nominal 75 mils/1.9 mm	Nominal 125 mils/3.1 mm
Semstone 110 Primer	200-250 sq.ft./gal.	200-250 sq.ft./gal.	200-250 sq.ft./gal.
Semstone 145 SL Base Coat Aggregate	64 sq.ft./gal. 1.5 lbs./sq. ft.	45 sq.ft./gal. 1.5 lbs./sq. ft.	32 sq.ft./gal. 2 lbs./sq. ft.
Semstone 145 SL Topcoat 15 mils	100 sq. ft./gal.	100 sq. ft./gal.	100 sq. ft./gal.

Blended Application (AFC-Blended)

Pre-mix Part A (resin) for 30 seconds using a Jiffy Mixer. Pour Part B (hardener) into the Part A and thoroughly mix for 2 minutes. After mixing Part A and Part B, split the mix into two 5 gallon buckets. While continuing to mix with a Jiffy Mixer slowly add the aggregate.

Note: A 2:1 sand to liquid weight ratio will produce a trowel-like consistency. A 3:1 sand to liquid weight ratio will produce a grout-like consistency.

Note: The use of a 20/40 mesh silica aggregate is highly recommended. One gallon of 20/40 mesh silica weighs 13-14 lbs.

For vertical applications contact Carboline's Technical Service Department.

Apply the mixture at the desired thickness using a notched trowel.

Note: The surface must be sanded prior to re-coating after an initial cure of 24 hours.

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Material Coverages

Below is a list of coverages for the Blended application.

MATERIAL	Nominal 125 mils/3.1 mm
Semstone 110 Primer	200-250 sq.ft./gal.
Semstone 145 SL Mortar 125 mils	20 sq.ft./gal.

Reinforced (AFRC – Broadcast)

A fiberglass scrim cloth may be added to the 125 mil broadcast system. For the 125 mil broadcast system apply fiberglass scrim cloth into the base coat prior to applying the aggregate.

Reinforced (AFRC – Blended)

A fiberglass scrim cloth may be added to the 125 mil blended system. For the 125 mil blended system apply a 25-35 mil/0.63-0.88 mm base coat and lay the fiberglass scrim cloth into the base coat.

Allow the base coat to become tacky and then apply Semstone 145SL mortar at 90-100 mils/2.25-2.5 mm.

Note: Application of base coat, fiberglass scrim cloth, and mortar should be completed in the same day.

For vertical applications contact Carboline's Technical Service Department.

RECOMMENDATIONS

- Apply only on clean, sound, dry and properly prepared substrates.
- Minimum ambient and surface temperatures are 50°F/10°C at the time of application.
- Maximum surface temperatures should not exceed 90°F/32°C during the time of application.
- Substrate temperature should be greater than 5°F/3°C above dew point.
- Application and curing times are dependent upon ambient and surface conditions. Consult Carboline's Technical Service Department if conditions are not within the recommended guidelines.

PRECAUTIONS

- MEK, Toluene or Xylene solvents are recommended for clean up of Semstone 145SL material spills. Use these materials only in strict accordance with the manufacturer's recommended safety procedures. Dispose of waste materials in accordance with government regulations.
- The use of a NIOSH/MSHA approved respirator using a #TC-23C-738 organic vapor or a #TC-23C-740 organic vapor acid gas cartridge is mandatory.

SEMSTONE® 145 SL

- The selection of proper protective clothing and equipment will significantly reduce risk to injury. Body covering apparel, safety goggles and impermeable gloves are highly recommended.
- In case of contact, flush the area with water for 15 minutes and seek medical attention. Wash skin with soap and water.
- Use only with adequate ventilation.

NOTES

- Material Safety Data Sheets on Semstone 145SL are available upon request.
- Specific information regarding the chemical resistance of Semstone 145SL is available in the Semstone Chemical Resistance Guide
- A staff of technical service engineers is available to assist in product application or to answer questions related to Carboline products.
- Requests for technical literature or service can be made through local sales representatives and offices, or corporate offices located worldwide.



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PRODUCT DESCRIPTION

Semstone 245 is a 100% solids, high performance, novolac epoxy lining system designed for concrete. Semstone 245 is a semi-leveling coating, it may be applied as an aggregate filled and/or reinforced coating system. Semstone 245 is specially formulated to withstand some of the industry's most aggressive chemicals, specifically chlorinated solvents.

USES, APPLICATIONS

- Process Slabs
- Tank Farm Floors
- Chemical Loading and Unloading Areas
- Spill Containment Areas

PRODUCT ADVANTAGES

Semstone 245 is a two-component system that possesses the following characteristics:

- Excellent resistance to chemical attack
- Excellent abrasion and impact resistance
- Exceptional thermal shock resistance
- Superior bonding qualities
- High cohesive strength
- Low permeability
- Low odor

CHEMICAL RESISTANCE

Semstone 245 is formulated to resist a variety of chemical solutions. Please consult Carboline Technical Service Department for specific recommendations.

PACKAGING

Semstone 245 is available in 1 gallon and 3 gallon units.

A 1 gallon unit consists of:

- 1 1 gallon can of Part A (resin)
- 1 quart can of Part B (hardener)

A 3 gallon unit consists of:

- 1 5 gallon pail of Part A (resin)
- 1 1 gallon can of Part B (hardener)

PHYSICAL CHARACTERISTICS

Compressive Strength	18,000 psi (ASTM C-579: AFC)
Tensile Strength	Reinforced: 8,000 psi (ASTM D-638)
Flexural Strength	Neat: 11,000 psi (ASTM D-790) Reinforced: 14,000 psi (ASTM C-580) Aggregate Filled: 6,000 psi
Flexural Modulus of Elasticity	Neat: 8.1×10^5 psi (ASTM D-790) Reinforced: 9.4×10^5 psi (ASTM C-580) Aggregate Filled: 14.9×10^5 psi
Hardness	Neat: 80 (ASTM D-2240, Shore D)
Bond Strength	> 400 psi (ASTM D-4541) (100% concrete failure)
Water Vapor Transmission (ASTM E-96).....	0.0120 grams/hr./ft ²
Permeability	0.0042 perm. -in. (ASTM E-96)
Weight per Mixed Gallon	10.6 lbs.
Pot Life @ 75°F	45 to 60 min*
Cure Times @ 75°F	Dry to Touch: 12 hrs Firm: 24 hrs Chemical Service: 36 hrs
Flammability	Non-flammable

* Significantly less at elevated temperatures

COVERAGE

Semstone 245 will cover 1,604 mils sq. ft./gal. For estimating purposes, one gallon of Semstone 245 will cover 64 sq. ft./5.96 sq. m at a thickness of 25 mil/0.63 mm. Application thickness may vary from 30-150 mils/0.75-3.8 mm depending upon expected service conditions (i.e., chemical exposure, temperature, traffic load and other mechanical abuse, immersion service vs. splash-spill, etc.). Consult Carboline's Technical Service Department for specific thickness recommendations. In addition, coverage rates will be effected by the condition of the surface being coated (degraded vs. smooth, steel vs. concrete, etc.).

SEMSTONE® 245

STORAGE CONDITIONS

Store all components between 50-70°F/10-21°C in a dry area. Keep out of direct sunlight. Avoid excessive heat and do not freeze. The shelf life is one year in the original, unopened container.

Twenty-four hours before application, all materials (components A and B, aggregate, etc.) should be stored at a 65-75°F/18-24°C to facilitate handling.

SUBSTRATE PREPARATION

General

Proper preparation is critical to ensure an adequate bond. The substrate must be dry and free of all wax, grease, oils, fats, soil, loose or foreign materials and laitance. Laitance and unbonded cement particles must be removed by mechanical methods, i.e., abrasive blasting or scarifying. Other contaminants may be removed by scrubbing with a heavy-duty industrial detergent and rinsing with clean water. For recommendations or additional information regarding substrate preparation, please contact Carboline's Technical Service Department.

Concrete

Concrete should be properly cured for 28 days and have the following characteristics:

- Substrate tensile strength of at least 300 psi.
- pH in the range of 7 to 11.

The surface must show open pores throughout and have a sandpaper texture.

Steel

Equipment base plates, etc. to be coated along with the concrete should be abrasive blasted to a near white metal finish, SSPC-10 or NACE-2, with a 1 to 2 mils anchor profile.

Masking

Mask surfaces that are not to be coated. This material is difficult to remove once applied.

APPLICATION GUIDELINES

Before mixing and applying any material, make sure environmental conditions are satisfactory for application. For optimal working conditions, substrate temperature must be between 50°F/10°C and 70°F/21°C. Measure the surface temperature with a surface thermometer. Cold areas must be heated until the slab temperature is above 35°F/2°C. This will allow the material to achieve a proper cure. Also, a cold substrate will make the material stiff and difficult to apply.

Warm areas or areas in direct sunlight must be shaded or arrangements made to work during evenings or at night. A warm substrate (50°F/10°C to 70°F/21°C) will aid in the material's workability; however, a hot substrate (70°F/21°C to 100°F/37°C) or a substrate directly in the sun will shorten the material's working time and can cause other phenomenon such as pinholing and bubbling. Substrate temperature should be greater than 5°F/3°C above dew point.

APPLICATION

Priming

Apply Semstone 110 Primer in accordance with the product data sheet. Allow the primer to cure prior to application of Semstone 245.

Note: For substrates with out-gassing concerns use Carboguard 1340. Primer should be applied while the substrate temperature is decreasing.

Broadcast Application (AFC – Broadcast)

Pre-mix Part A (resin) for 30 seconds using a Jiffy Mixer. Pour Part B (hardener) into the Part A pail and mix thoroughly for 2 minutes.

Apply a base coat at the specified thickness using a squeegee or a notched trowel. For a 60 mil/1.5 mm system apply a 25 mil/0.63 mm base coat and for a 125 mil/3.1 mm system apply a 50 mil/1.3 mm base coat. Immediately after applying the base coat begin broadcasting the aggregate until a dry appearance is achieved.

Note: The use of a 20/40 mesh aggregate is highly recommended. One gallon of 20/40 mesh silica weighs 13-14 lbs.

After the base coat has cured, remove the loose aggregate. Apply a 10-15 mil/0.25-0.38 mm topcoat using a squeegee or roller.

Material Coverages

Below is a list of coverages for the Broadcast application depending upon desired thickness and texture.

MATERIAL	Nominal	Nominal	Nominal
	60 mils/1.5 mm	75 mils/1.9 mm	125 mils/3.1 mm
Semstone 110 Primer	200-250 sq. ft./gal.	200-250 sq. ft./gal.	200-250 sq. ft./gal.
Semstone 245 Base Coat	64 sq.ft./gal.	45 sq.ft./gal.	32 sq.ft./gal.
Aggregate	1.5 lbs./sq. ft.	1.5 lbs./sq. ft.	2 lbs./sq. ft.
Semstone 245 Topcoat			
15 mil	100 sq. ft./gal.	100 sq. ft./gal.	100 sq. ft./gal.
30 mil	53 sq. ft./gal.	53 sq. ft./gal.	53 sq. ft./gal.

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Blended Application (AFC – Blended)

Pre-mix Part A (resin) for 30 seconds using a Jiffy Mixer. Pour Part B (hardener) into Part A and thoroughly mix for 2 minutes. After mixing Part A and Part B, split the mix into two 5 gallon buckets. While continuing to mix with a Jiffy Mixer, slowly add the aggregate.

Note: A 2:1 sand to liquid weight ratio will produce a trowel-like consistency. A 3:1 sand to liquid weight ratio will produce a grout-like consistency.

Note: The use of a 20/40 mesh silica aggregate is highly recommended. One gallon of 20/40 mesh silica weighs 13-14 lbs.

Apply the mixture at the desired thickness using a notched trowel.

Note: For vertical surfaces add Semstone Thixotrope Part C (pre-measured mixes) or Cab-O-Sil (TS 720) to the blended mix at a 1:2 Cab-O-Sil to liquid volume ratio.

After the surface has cured, the surface must be washed with soap and water prior to re-coating.

Note: Surface must be sanded prior to re-coating after an initial cure of 24 hours.

Material Coverages

Below is a list of coverages for the Blended application.

MATERIAL	Nominal 125 mils/3.1 mm
Semstone 110 Primer	200-250 sq.ft./gal.
Semstone 245 Mortar 125 mils	20 sq.ft./gal.

Reinforced (AFRC – Broadcast)

A fiberglass scrim cloth may be added to the 125 mil broadcast system. For the 125 mil broadcast system apply the fiberglass scrim cloth into the base coat prior to applying the aggregate.

Reinforced (AFRC – Blended)

A fiberglass scrim cloth may be added to the 125 mil blended system. For the 125 mil blended system apply a 25-35 mil/0.63-0.88 mm base coat and lay the fiberglass scrim cloth into the base coat.

Note: For a vertical surface, the base coat should be mixed with Cab-O-Sil (TS 720) at a 1:1 volume ratio.

Allow the base coat to become tacky and then apply Semstone 245 mortar at 90-100 mils/2.25-2.50 mm.

Note: Application of base coat, engineering fabric, and mortar should be completed in the same day.

RECOMMENDATIONS

- Apply only on clean, sound, dry and properly prepared substrates.
- Minimum ambient and surface temperatures are 35°F/2°C at the time of application.
- Maximum surface temperatures should not exceed 90°F/32°C during the time of application.
- Substrate temperature should be greater than 5°F/3°C above dew point.
- Application and curing times are dependent upon ambient and surface conditions. Consult Carboline's Technical Service Department if conditions are not within the recommended guidelines.

PRECAUTIONS

- MEK, Toluene or Xylene solvents are recommended for clean up of Semstone 245 material spills. Use these materials only in strict accordance with manufacturer's recommended safety procedures. Dispose of waste materials in accordance with government regulations.
- The use of a NIOSH/MSHA approved respirator using a #TC-23C-738 organic vapor or a #TC-23C-740 organic vapor acid gas cartridge is mandatory.
- The selection of proper protective clothing and equipment will significantly reduce risk to injury. Body covering apparel, safety goggles and impermeable gloves are highly recommended.
- In case of contact, flush the area with water for 15 minutes and seek medical attention. Wash skin with soap and water.
- Use only with adequate ventilation.

NOTES

- Material Safety Data Sheets on Semstone 245 are available on request.
- Specific information regarding chemical resistance of Semstone 245 is available in the Semstone Chemical Resistance Guide.
- A staff of technical service engineers is available to assist in product application or to answer questions related to Carboline products.
- Requests for technical literature or service can be made through local sales representatives and offices, or corporate offices located worldwide.

August 2003 replaces May 2003

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SEMSTONE® 245



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Selection & Specification Data

Generic Type	Two component solvent free epoxy
Description	Epoxy patching and surfacing compound that exhibits excellent bond strength and chemical resistance to a variety of acids, alkalis, salt solutions and oils. It is used to fill voids and bugholes in precast or poured-in-place concrete and other masonry surfaces. Repairs damaged concrete, fills narrow cracks, and can be used as a coving material for floor-wall transitions or lap joint areas. May also be used to repair weld seams and pits in metal.
Features	<ul style="list-style-type: none"> ▪ Solvent free ▪ Excellent film strength, abrasion, and impact resistance ▪ Rapid hardening for quick service ▪ Easy to mix ratios ▪ Excellent film build and working properties
Color	Light gray
Primers	Normally self-priming to steel, concrete or masonry surfaces. May be applied over other epoxies.
Topcoats	Epoxies, Polyurethanes
Dry Film Thickness	As required to fill the void or resurface the substrate. May be applied up to 1/8 inch (125 mils) per application on a vertical surface.
Solids Content	By Volume: 100%
Theoretical Coverage Rate	12.8 ft. ² /gal at 125 mils (1/8 inch) Allow for loss in mixing and application. Thicknesses less than or greater than this will alter the coverage rate. Please consult Technical Service for additional information.
VOC Values	As supplied: 0.00 lbs./gal
Dry Temp. Resistance	Continuous: 250°F (121°C) Non-Continuous: 300°F (149°C) Discoloration may be observed above 200°F (93°C).
Limitations	Epoxies lose gloss, discolor and eventually chalk in sunlight exposure.

Substrates & Surface Preparation

General	Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating.
Steel	<u>Cleanliness:</u> SSPC-SP10 <u>Surface Profile:</u> 1.5-3.0 mils (38-75 microns)
Galvanized Steel	SSPC-SP1 and prime with specific Carboline primers as recommended by your Carboline Sales Representative.
Concrete	Concrete must be cured 28 days at 75°F (24°C) and 50% relative humidity or equivalent. Prepare surfaces in accordance with ASTM D4258 Surface Cleaning of Concrete and ASTM D4259 Abrading Concrete.
CMU	Mortar joints should be thoroughly cured for a minimum of 15 days at 75°F (24°C) and 50% relative humidity or equivalent.

Performance Data

Test Method	System	Results
ASTM D4541 Bond Strength (Elcometer)	501 over concrete	>400 psi concrete failure
ASTM C579 Compressive Strength	501	5000 psi
ASTM C307 Tensile Strength	501	1300 psi
ASTM C580 Flexural Strength	501	2200 psi
ASTM D2240 Hardness Shore D Durometer	501	60

Test reports and additional data available upon written request.

Carboguard® 501

Application Equipment

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

General Guidelines:

Hand Tools This is a high solids thixotropic coating that is applied through the use of one or more of the following: steel finishing trowel, taping knife, spatula, or rigid squeegee. Use the surrounding area as a leveling guide for finishing.

Mixing & Thinning

Mixing Power mix separately and then combine and power mix for at least two minutes or until a uniform gray color is achieved. Recommend using a heavy-duty, slow speed drill and a jiffy mixer. When mixing partial kits it is critical to apportion equal volumes of the two components to ensure proper cure and film properties. Any unused material must be resealed immediately.

Ratio 1:1 Ratio (A to B)

Pot Life 15-30 min at 75°F(24°C) depending on volume mixed. Pot life ends when coating becomes too viscous to use. Pot life times will be less at higher temperatures or larger mixed masses.

Cleanup & Safety

Cleanup Use scouring pads and water or Thinner #2. In case of spillage, absorb and dispose of in accordance with local applicable regulations.

Safety Read and follow all caution statements on this product data sheet and on the MSDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.

Ventilation When used in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to insure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved respirator.

Caution All electrical equipment and installations should be made and grounded in accordance with the National Electric Code. In areas where explosion hazards exist, workmen should be required to use non-ferrous tools and wear conductive and non-sparking shoes.

Application Conditions

Condition	Material	Surface	Ambient	Humidity
Normal	60°-85°F (16°-29°C)	60°-85°F (16°-29°C)	60°-90°F (16°-32°C)	0-80%
Minimum	55°F (13°C)	55°F (13°C)	55°F (13°C)	0%
Maximum	90°F (32°C)	125°F (52°C)	110°F (43°C)	80%

This product simply requires the substrate temperature to be above the dew point. Condensation due to substrate temperatures below the dew point can cause flash rusting on prepared steel and interfere with proper adhesion to the substrate. Special application techniques may be required above or below normal application conditions. It may be sanded 8 to 16 hours after application, depending on ambient conditions.

Curing Schedule

Surface Temp. & 50% Relative Humidity	Set Time to Topcoat with Other Finishes	Ultimate Physical Properties
75°F (24°C)	6-8 Hours	7 days

Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times. Excessive humidity or condensation on the surface during curing can interfere with the cure, can cause discoloration and may result in a surface haze. Any haze or blush must be removed by water washing before recoating. During high humidity conditions, it is recommended that the application be done while temperatures are increasing. **Maximum recoat/topcoat times are 30 days for epoxies and 90 days for polyurethanes at 75°F (24°C).** If the maximum recoat times have been exceeded, the surface must be abraded by sweep blasting or sanding prior to the application of additional coats.

Packaging, Handling & Storage

Shipping Weight (Approximate) 3.6 gallon kit
50 lbs (23 kg)

Flash Point (Setaflash) Part A >267°F (131°C)
Part B >485°F (251°C)

Storage Conditions 60°-85°F (16°-30°C) Store indoors.
Do not freeze.

Shelf Life Min. 36 months

***Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.**



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An **RPM** Company

January 2001 replaces September 2000

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Selection & Specification Data

Generic Type A water-based epoxy repair mortar which is cement and aggregate filled.

Description An economical epoxy patching and surfacing compound that exhibits excellent bond strength to concrete and other masonry surfaces. It is ideally suited for patching spalled concrete and masonry wall surfacing to accept subsequent topcoats. Carboguard 510 repairs damaged concrete, fills large cracks, and can be used as a coving and sloping material for floor-wall transitions.

Features

- Water based, low odor
- Excellent film strength, abrasion, and impact resistance
- Is castable, making it suitable for restoring pump foundations
- Easily topcoated to provide additional chemical resistance or appearance
- Also used as a primer without aggregate

Color Gray

Primers Normally self-priming to concrete or masonry surfaces.

Topcoats Epoxies, Epoxy-Novolacs, Polyurethanes

Dry Film Thickness As required to fill the void or resurface the substrate. May be applied up to 2 inches per application. Feather-edging is not recommended.

Theoretical Coverage Rate Primer only: 120 ft² per gallon
3-gallon unit with aggregate blend: 1.68 ft³

VOC Values As supplied: 0.00lbs/gallon
Water based product

Limitations

- Minimum surface and ambient temperature is 50°F (10°C).
- Not for use under vinyl ester or polyester materials.

Substrates & Surface Preparation

General Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating.

Concrete Concrete must be cured 28 days at 75°F (24°C) and 50% relative humidity or equivalent. Prepare surfaces in accordance with ASTM D4258 Surface Cleaning of Concrete and ASTM D4259 Abrading Concrete.

CMU Mortar joints should be thoroughly cured for a minimum of 15 days at 75°F (24°C) and 50% relative humidity or equivalent.

Performance Data

Test Method	Results
Dynamometer Adhesion to concrete	350 psi
ASTM C-109 Compressive Strength	5840 psi
ASTM C-190 Tensile Strength	865 psi
ASTM C-348 Flexural Strength	1840 psi
Abrasion Resistance Tabor Abrader (CS-17 Wheel)	0.09 mg.

Test reports and additional data available upon written request.

Carboguard® 510

Application Equipment

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

General Guidelines:

General Carboguard 510 may be applied using conventional concrete placement and finishing tools. Mixing should be done by a horizontal blade mortar mixer.

Mixing & Thinning & Application

Mixing Power mix Parts A and B separately, then combine and use as a primer at a spreading rate of 120 ft² per gallon.

Within 4 hours of priming, combine the following mixture, for use as a surfacing build up material. Premix sand and cement for best results before adding to A+B mixture.

Ratio 1:2

½ Cubic foot kit (for voids, bugholes)

Part A .38 gal. (3.4 lbs.)

Part B .77 gal. (6.2 lbs.)

Sand #40-80 angular mesh 39 lbs.

Portland Cement (Type 1) 11 pounds

3 Gallon Kit* (for filling up to 1" thick)

Part A 1 gallon (8.8 lbs.)

Part B 2 gallon (16. Lbs.)

Sand #30-50 angular mesh* 150 lbs.

Portland Cement (Type 1)* 42 lbs.

3 Gallon Kit* (for filling over 1" thick)

Part A 1 gallon (8.8 lbs.)

Part B 2 gallon (16. lbs.)

Sand #30-50 angular mesh* 50 lbs.

Portland Cement (Type 1)* 42 lbs.

Pea Gravel ¼"* 100. Lbs.

Volume Yield: 1.66 cubic feet

* Sand, cement and pea gravel for 3 and 15 gallon kits are not supplied by Carboline and should be bought locally.

Note: In thicknesses over 2", up to 15% additional pea gravel can be added to further extend volume by 5%. Components listed are for 3 gallon kit. Scale up appropriately for 15 gallon kit.

Apply to the surface using rubber float or other suitable spreading tool.

Pot Life 60 minutes at 75°F (24°C)

Application Conditions

Condition	Material	Surface	Ambient	Humidity
Normal	70°-80°F (21°-26°C)	70°-80°F (21°-26°C)	70°-80°F (21°-26°C)	0-80%
Minimum	50°F (10°C)	50°F (10°C)	50°F (10°C)	0%
Maximum	90°F (32°C)	125°F (52°C)	110°F (43°C)	80%

This product simply requires the substrate temperature to be above the dew point. Special application techniques may be required above or below normal application conditions. Note: When conditions such as excessive wind and high ambient temperatures exist, cover the area with polyethylene sheeting.

December 2002 replaces June 2001

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Curing Schedule

Surface Temp. & 50% Relative Humidity	Set Time to Topcoat	Light Traffic	Heavy Traffic	Final Cure
75°F (24°C)	12 Hours	24 hours	48 hours	28 days

These times are based on ½" thickness at 70°F (21°C). Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times. Excessive humidity or condensation on the surface during curing can interfere with the cure, can cause discoloration and may result in a surface haze. Any haze or blush must be removed by water washing before recoating. During high humidity conditions, it is recommended that the application be done while temperatures are increasing.

When using Carboguard 510 as an underlayment for epoxy, epoxy-novolac, or polyurethane coatings, it will be necessary to allow the Carboguard 510 to cure a minimum of 24 hours for every 2 inches of thickness. The maximum recoat time without surface preparation is 7 days at 85°F. Always take precautions to prohibit the surface from becoming contaminated prior to application of topcoating; it will be necessary to detergent wash and abrasive blast or sand the surface if it has been contaminated.

Cleanup & Safety

Cleanup Use scouring pads and water. In case of spillage, absorb and dispose of in accordance with local applicable regulations.

Safety Read and follow all caution statements on this product data sheet and on the MSDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.

Ventilation When used as a tank lining or in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to insure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved respirator.

Packaging, Handling & Storage

Shipping Weight (Approximate)	<u>½ cu. Ft. Kit</u>	<u>3 Gallon kit*</u>	<u>15 gallon kit*</u>
	62 lbs (28 kg)	27 lbs. (12 kg)	135 lbs. (61kg)

* Liquid components A & B only.

Flash Point (Setflash)
Part A 485°F (251°C)
Part B Water-based, Not applicable.
Part C Not applicable.

Storage Conditions 65° - 85°F (18°-30°C) Store indoors.
Do not freeze

Shelf Life Part A & B: Min. 24 months at 75°F (24°C)

***Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.**



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An **RPM** Company

PRODUCT DESCRIPTION

SEMSTONE 805 is a Flexible Epoxy Polymer Coating & Lining providing a chemical, water and/or abrasion resistant barrier for steel and concrete. SEMSTONE 805 is one of Carboline's most versatile coating systems. Developed as a self-leveling, flexible chemical resistant coating and lining, this two-component system can also be used as a high build coating and lining system with the addition of a third component.

SEMSTONE 805 is a 100% solids, low odor, two component system consisting of Part A and Part B components. It may be applied as a neat system (unfilled), reinforced system, aggregate filled system to extend coverage, or as an aggregate filled reinforced system. A bagged Part C thixotropic agent is added for high build applications. It is most often used with reinforcing fabric (#100) over expansion joints.

TYPICAL USES AND APPLICATIONS

SEMSTONE 805 offers users a variety of application options for the protection of steel and concrete. It can be used as a chemically resistant seal for expansion joints and other points of movement, and as a reinforced coating system for severely cracked concrete surfaces. With the addition of Part C non-silica thixotropic agent, SEMSTONE 805 can be applied as a high build coating and lining system or as a trowel/caulk grade or putty material.

Consult Carboline's Technical Service Department for specific chemical resistance information.

HANDLING CHARACTERISTICS

SEMSTONE 805 may be applied using an airless spray unit in accordance with manufacturer's specifications, notched trowel, squeegee, brush or roller. It can be applied as a trowel/caulk grade or putty material with the addition of Part C thixotropic agent.

Depending on expected service conditions application thickness may vary. Consult Carboline Technical Sales Representative for specific thickness recommendations.

When applying as a high build system or to vertical surfaces, the addition of Part C is required.

PHYSICAL CHARACTERISTICS

Color	Gray
Solids by Volume	100%
Weight per Mixed Gallon	10.1 lbs
Pot Life@75°F	30-to-45 min
Primer	SEMSTONE 110 Damp Proof,SEMSTONE 110-P/S
Hardness	55
(ASTM D-2240 Shore A: neat)	
Abrasion Resistance	120 (mg lost)
(ASTM D-1044: neat)	
(CS17 wheels - 1000 cycle, 1000 gram) AFC.....	
Tensile Strength	1050 psi
(ASTM D-638: neat)	
Tensile Elongation	100%
(ASTM D-638: neat)	
Bond Strength	Concrete Failure in Concrete
(ASTM D-4541: (psi))	

PACKAGING

SEMSTONE 805 is packaged in 1-gallon and 2-gallon units.

Each unit consists of a pre-measured Part A component and a pre-measured Part B component. A bagged Part C thixotropic agent is available for work on vertical surfaces.

STORAGE

Keep SEMSTONE 805 products tightly sealed in their original containers until ready for use. Store at 50-to-80°F, out of direct sunlight. Properly stored, SEMSTONE 805 has a minimum shelf life of one year. Refer to the batch number on the label for date of manufacture.

PRECAUTIONS

FOR INDUSTRIAL USE ONLY.

When using SEMSTONE 805 products, be aware of these safety precautions:

- Avoid contact with eyes and skin.
- Do not ingest or inhale.
- Always wear chemical goggles, rubber gloves, and appropriate work clothing.
- Wear fresh air hood and make provisions for forced ventilation when working in confined areas.
- Wear fresh air hood or an organic mist respirator when spraying in an open area.

SEMSTONE® 805

*Flexible Epoxy
Polymer Coating & Lining*

- Prolonged or repeated exposure to this material may cause skin irritation or allergic reaction.
- Refer to material safety data sheets (MSDS) regarding individual components.

NOTES

- Material Safety Data Sheets on SEMSTONE 805 are available on request.
- A staff of technical service engineers is available to assist in product application, or answer questions related to Carboline products.
- Requests for technical literature or service can be made through local sales representatives and offices, or corporate offices located throughout the world.



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PRODUCT DESCRIPTION AND USES

SEMSTONE 806 is a 100% solids, low odor, rubberized epoxy. It is used as a chemically resistant coating for concrete. When reinforced with our flexible reinforcing fabrics it provides a system which will bridge working cracks as well as expansion joints. SEMSTONE 806 reinforced with #100 fabric can bridge crack expansion joint movement up to 1/2" without cracking.

SEMSTONE 806, as packaged, is a self-leveling material. However, it maybe used as a high build coating system by the addition of a third component, Part C, which is a non-silica thixotrope (when using reinforcing fabric, Part C is not required). The product may be applied by airless spray, notched trowel, squeegee, brush or roller. To make a trowel/caulk grade or putty, add Part C.

SEMSTONE 806 provides an abrasion, chemical and water resistant coating that exhibits good flexibility allowing it to accommodate crack movement. Concrete slabs with severe cracking problems, as well as all construction and expansion joints, may be treated using SEMSTONE 806 with #100 Fabric is ideal for use as a secondary containment coating.

COLOR
 Gray

PACKAGING
 SEMSTONE 806 is available in 1-gallon and 5-gallon units. Each unit consists of premeasured Part A and Part B components. Bagged Part C thixotropic agent may be ordered separately.

COVERAGE
 Coverage will be effected by the condition of the surface being coated (degraded vs. smooth, steel vs. concrete, etc.) and the ability of the applicators to maintain a consistent thickness. To figure THEORETICAL coverage per gallon, divide desired mil thickness into 1604. The result will be the number of square feet per gallon. The thickness of the coating system will vary depending on which fabric is used. The following is the thickness and THEORETICAL coverage rates for fabric reinforced systems once they have been saturated with SEMSTONE 806:

PHYSICAL CHARACTERISTICS

Color.....Gray
Solids by Volume.....100%
Weight per Mixed Gallon.....9.9 lbs
Pot Life@75°F.....30-to-40 min
Primer.....Optional
Hardness.....55
 (ASTM D-2240 Shore A: neat)
Abrasion Resistance26 (mg loss)
 (ASTM D-1044: neat)
 (CS17 wheels - 1000 cycle, 1000 gram load)
Tensile Strength.....1500-2000 psi
 (ASTM D-638: neat)
 reinforced with fabric:.....3000-3500 psi
Tensile Elongation.....75%
 (ASTM D-638: neat)
 reinforced with fabric: 60%
Bond Strength.....
Concrete: cohesive failure in concrete
 (ASTM D-4541)
 2" overlap joint strength reinforced with fabric:
exceeds tensile strength of system (>3500 psi)

FABRIC THICKNESS*	THEORETICAL COVERAGE
#100 50-to-60 mils	26-to-32 square feet/gallon

*Thicknesses listed represent finish thicknesses after saturation of fabric. Over-saturation of the fabrics will increase finish thicknesses and decrease coverage rates.

STORAGE TEMPERATURE
 Keep SEMSTONE 806 components tightly sealed in their original containers until ready for use. Store at 50-to-85°F, out of direct sunlight. The optimum temperature for material workability is 75-to-85°F. Properly stored, SEMSTONE 806 has a minimum shelf life of one year.

Refer to batch number on label for date of manufacture.

SURFACE PREPARATION
General
 Surfaces must be dry and free of dirt, dust, oil, grease, chemicals and other contaminants immediately prior to each application of SEMSTONE 806.

SEMSTONE® 806

Rubberized Epoxy Polymer Coating

Concrete

1. Immediately prior to application of coating, concrete substrate must be:
 - Adequately cured (generally, at least 28-days; check with Carboline if concrete has cured less than 28-days).
 - Structurally sound.
 - Free of all dirt, dust, debris, oil, grease, fats, chemical contamination, salts, solvents, surface hardeners, incompatible curing compounds and form release agents, laitance and efflorescence.
 - Concrete surfaces must be dry and must have:
 - Surface tensile strength of at least 300 psi.
 - pH in the range of 7-to-11.
 - All fins, projections and splatter removed.
 - All defects repaired using patching as described herein.
 - Failed or otherwise incompatible old coatings removed.
 - A surface texture similar to medium sandpaper (40-to-60 grit).

Refer to Carboline's separate document "Surface Preparation - Concrete" for further instruction in the preparation of concrete surfaces.

2. Locate all expansion joints, control joints, floor drains, equipment base plates, and mid-floor termination points. Handle them according to Carboline SEMSTONE Construction Details.
3. Degraded concrete should be restored using Carboguard 510 Concrete Repair Mortar.

Previously Applied Coatings

1. Ensure coating and bond integrity.
2. Soap and water wash the surface of the cured coating.
3. Roughen the surface by sanding or abrasive blasting.
4. Remove dust and debris.

Incidental Steel

Equipment base plates, etc. to be coated along with the concrete should be abrasive blasted to a commercial finish with a low 1-to-2 mil anchor profile. (Ref. SSPC-SP-6)

APPLICATION TEMPERATURE

The temperature of the surface to be coated, and the ambient air temperature should be at least 50°F during installation and curing.

24-hours before application, all materials (components A, B, and C, etc.) should be stored at 75-to-85°F to facilitate handling.

MASKING

Mask surfaces that are not to be coated. SEMSTONE 806 is difficult to remove, once applied.

APPLICATION EQUIPMENT

SEMSTONE 806 may be applied using a spray rig, notched trowel, brush or roller

When spraying SEMSTONE 806:

A single component airless rig can be used to spray SEMSTONE 806.

See Equipment Specifications 397-251, Graco King.

Always use spray equipment in accordance with manufacturer's instructions.

MIXING

The Part A component must be individually agitated immediately prior to use.

Part A - Blend each Part A component to a uniform consistency in its individual container, using a Jiffy type mixer.

Part B - No need to agitate.

Pour the entire contents of Part A into a clean container. Add Part B and mix thoroughly for two minutes using a Jiffy type mixer.

If using Part C for vertical surface application, add the pre-measured bag of Part C slowly to the mixed resins and hardeners and blend until the Part C has been evenly dispersed. The amount of Part C may be adjusted to meet job requirements. When using SEMSTONE 806 in conjunction with reinforcing fabric it is not necessary to add Part C.

The pot life of the mixture will be approximately 30-to-45 minutes at 75°F; significantly less time at elevated temperatures.

The longer the material is in the bucket after mixing, the shorter its pot life will be. Use it immediately.

Instructions For Unreinforced Coating Applications

Apply the SEMSTONE 806 using your preferred application tools.

If work is interrupted, or at the end of the day, terminate the coating in a straight line.

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Instructions For Reinforced Coating Applications

Apply SEMSTONE 806 to the prepared surface, primed or unprimed at a thickness of 40-to-50 mils on horizontal surfaces and 10-to-15 mils on vertical surfaces.

Immediately embed a layer of Reinforcing Fabric into the wet base-coat. Use a short napped felt roller to work any trapped air out from under the fabric and cause the fabric to lay flat.

Apply additional SEMSTONE 806 to the surface of the fabric until the fabric is saturated with SEMSTONE 806. When the fabric is completely saturated it will have a "sheen" finish to it and appear wet. The heavier fabrics will require more material to saturate than the lighter weight fabrics. It is very important that the applicator check the fabric frequently to look for dull, dry looking areas or spots as this is an indication that the fabric is not completely saturated, in which case more material will need to be applied before the system cures.

If work is interrupted, or at the end of the day, terminate the coating in a straight line.

Clean tie-in surfaces by soap and water washing before abrading.

Next day tie-in and spot repair is very easy. Simply abrade the surface using a wire brush and proceed with the application.

CLEAN UP

Remove all masking tape from items masked for protection during installation.

Before it gels, SEMSTONE 806 may be cleaned from tools and equipment using hot, soapy water. After SEMSTONE 806 gels, xylene or MEK will be required. Chlorinated solvents may be used if flammable solvents are not allowed.

SAFETY PRECAUTIONS

FOR INDUSTRIAL USE ONLY.

Avoid contact with eyes and skin; do not ingest or inhale.

When working with SEMSTONE 806, always wear chemical goggles, rubber gloves, and appropriate work clothing.

When spraying in a confined area, also wear a fresh air hood and make provisions for forced ventilation.

When spraying in an open area, an organic mist respirator can replace the fresh air hood.

Prolonged or repeated exposure to SEMSTONE 806 may cause skin irritation or allergic reactions.

Refer to material safety data sheets regarding individual components.

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SAFETY

READ THIS NOTICE **SAFETY AND MISCELLANEOUS EQUIPMENT**

It is recommended that the operator provide himself with clean coveralls and rubber soled shoes and observe good personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.

When working in confined areas adequate ventilation must be provided. Respirators or fresh air supplied hoods may be required.

FIRE AND EXPLOSION HAZARDS: PRODUCT CONTAINS LESS THAN 1% VOLATILE COMPONENTS. HOWEVER, VAPORS ARE HEAVIER THAN AIR AND COULD TRAVEL LONG DISTANCES, IGNITE, AND FLASHBACK. ELIMINATE ALL IGNITION SOURCES. Keep away from heat, sparks and open flame and use necessary safety equipment such as air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and breathing of vapor or spray mist. When working in tanks, rooms and other enclosed spaces, adequate ventilation must be provided. Refer to PLASITE Bulletin PA-3. Keep out of the reach of children.

CAUTION - Read and follow all caution statements on this product data sheet, material safety data sheet and container label for this product.

This bulletin provides standard information on the coating and application procedure. Since varying conditions may not be covered, consult your local sales representative or Carboline's Technical Service Department for further information.

SEMSTONE® 806
Rubberized Epoxy Polymer Coating



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314/644-1000 314/644-4617 (fax) www.carboline.com

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PRODUCT DESCRIPTION

Semstone 870 is a high performance, vinyl ester lining system designed for concrete. Semstone 870 is a semi-leveling coating which may be applied as an aggregate filled and/or reinforced coating system. Semstone 870 is specially formulated to withstand some of industry's most aggressive chemicals, including a broad range of organic chemicals. A cooler temperature version (870 CT) is available on special order.

USES, APPLICATIONS

- Process Slabs
- Tank Farm Floors
- Chemical Loading and Unloading Areas
- Spill Containment Areas

PRODUCT ADVANTAGES

Semstone 870 is a two-component system that possesses the following characteristics:

- Excellent resistance to chemical attack
- Excellent abrasion and impact resistance
- Exceptional thermal shock resistance
- Superior bonding qualities
- High cohesive strength
- Low permeability
- Low odor

CHEMICAL RESISTANCE

Semstone 870 is formulated to resist a variety of chemical solutions. Please consult Carboline Technical Service Department for specific recommendations.

PACKAGING

Semstone 870 is available in 1 gallon and 5 gallon units.

A 1 gallon unit consists of:

- 1 1 gallon can of Part A (resin)
- 1 6 oz. jar of Part B (catalyst)

A 5 gallon unit consists of:

- 1 5 gallon pail of Part A (resin)
- 1 1 quart container of Part B (catalyst)

PHYSICAL CHARACTERISTICS

Compressive Strength	17,500 psi (ASTM C-579: AFC)
Tensile Strength	Neat: 5,300 psi (ASTM D-638) Reinforced: 10,000 psi
Flexural Strength	Neat: 8,200 psi (ASTM D-790) Reinforced: 22,000 psi
	Aggregate Filled: 5,800 psi
Flexural Modulus of Elasticity	Neat: 10.9 x 10 ⁵ psi (ASTM D-790) Reinforced: 15.6 x 10 ⁵ psi
	Aggregate Filled: 15.3 x 10 ⁵ psi
Hardness	Neat: 80 (ASTM D-2240, Shore D)
Bond Strength	> 400 psi (ASTM D-4541) (100% concrete failure)
Water Vapor Transmission	/0.0120 grams/hr./ft ² (ASTM E-96)
Permeability	0.0042 perm. -in. (ASTM E-96)
Weight per Mixed Gallon	10.4 lbs.
Pot Life @ 75°F	45 to 60 min*
Cure Times @ 75°F (870)	Dry to Touch: 12 hrs Firm: 24 hrs Chemical Service: 48 hrs
Cure Times @ 60°F (870 CT)	Dry to Touch: 12 hrs Firm: 24 hrs Chemical Service: 48 hrs
Flammability	Non-flammable

* Significantly less at elevated temperatures

COVERAGE

Semstone 870 will cover 1,363 mils sq. ft./gal. For estimating purposes, one gallon of Semstone 870 will cover 54 sq. ft./5.02 sq. m at a thickness of 25 mils/0.63 mm. Application thickness may vary from 30-150 mils/0.75-3.8 mm depending on expected service conditions (i.e., chemical exposure, temperature, traffic load and other mechanical abuse, immersion service vs. splash-spill, etc.). Consult Carboline's Technical Service Department for specific thickness recommendations. In addition, coverage rates will be effected by the condition of the surface being coated (degraded vs. smooth, steel vs. concrete, etc.).

SEMSTONE® 870 & 870 CT

STORAGE CONDITIONS

Store all components between 50-65°F/10-18°C in a dry area. Keep out of direct sunlight. Avoid excessive heat and do not freeze. The shelf life is 3 months in the original, unopened container.

Twenty-four hours before application, all materials (components A and B, aggregate, etc.) should be stored at a 60-75°F/18-21°C to facilitate handling.

SUBSTRATE PREPARATION

General

Proper preparation is critical to ensure an adequate bond. The substrate must be dry and free of all wax, grease, oils, fats, soil, loose or foreign materials and laitance. Laitance and unbonded cement particles must be removed by mechanical methods, i.e., abrasive blasting or scarifying. Other contaminants may be removed by scrubbing with a heavy-duty industrial detergent and rinsing with clean water. For recommendations or additional information regarding substrate preparation, please contact Carboline's Technical Service Department.

Concrete

Concrete should be properly cured for 28 days and have the following characteristics:

- Substrate tensile strength of at least 300 psi.
- pH in the range of 7 to 11.

The surface must show open pores throughout and have a sandpaper texture.

Steel

Equipment base plates, etc. to be coated along with the concrete should be abrasive blasted to a near white metal finish, SSPC-10 or NACE-2, with a 1 to 2 mils anchor profile.

Masking

Mask surfaces that are not to be coated. This material is difficult to remove once applied.

APPLICATION GUIDELINES

Before mixing and applying any material, make sure environmental conditions are satisfactory for application. For optimal working conditions, substrate temperature must be between 70°F/21°C and 80°F/27°C. Measure the surface temperature with a surface thermometer. Cold areas must be heated until the slab temperature is above 65°F/18°C. This will allow the material to achieve a proper cure. Also, a cold substrate will make the material stiff and difficult to apply. Warm areas or areas in direct sunlight must be shaded or arrangements made

to work during evenings or at night. A warm substrate (70°F/21°C to 80°F/27°C) will aid in the material's workability; however, a hot substrate (80°F/27°C to 90°F/32°C) or a substrate directly in the sun will shorten the material's working time and can cause other phenomenon such as pinholing and bubbling. Substrate temperature should be greater than 5°F/3°C above dew point.

If the temperature is expected to drop below 65°F/18°C use Semstone 870CT.

APPLICATION

Priming

Apply Semstone 800 Series Primer in accordance with the product data sheet. Allow the primer to cure prior to application of Semstone 870.

Broadcast Application (AFC – Broadcast)

Pre-mix Part A (resin) for 30 seconds using a Jiffy Mixer. Pour Part B (catalyst) into the Part A pail and mix thoroughly for 2 minutes.

Apply a base coat at the specified thickness using a squeegee or a notched trowel. For a 60 mil/1.5 mm system apply a 25 mil/0.63 mm base coat and for a 125 mil/3.1 mm system apply a 50 mil/1.3 mm base coat. Immediately after applying the base coat begin broadcasting the aggregate until a dry appearance is achieved.

Note: The use of a 20/40 mesh aggregate is highly recommended. One gallon of 20/40 mesh silica weighs 13-14 lbs.

After the base coat has cured, remove the loose aggregate. Apply a 10-15 mil/0.25-0.38 mm topcoat using a squeegee or roller.

Material Coverages

Below is a list of coverages for the Broadcast application depending upon desired thickness and texture.

MATERIAL	Nominal 60 mils/1.5 mm	Nominal 75 mils/1.9 mm	Nominal 125 mils/3.1 mm
Semstone 800 Series Primer	300 sq. ft./carton	300 sq. ft./carton	300 sq. ft./carton
Semstone 870 Base Coat	64 sq.ft./gal.	45 sq.ft./gal.	32 sq.ft./gal.
Aggregate	1.5 lbs./sq. ft.	1.5 lbs./sq. ft.	2 lbs./sq. ft.
Semstone 870 Topcoat 15 mil	100 sq. ft./gal.	100 sq. ft./gal.	100 sq. ft./gal.

Blended Application (AFC – Blended)

Pre-mix Part A (resin) for 30 seconds using a Jiffy Mixer. Pour Part B (catalyst) into Part A and thoroughly mix for 2 minutes. After mixing Part A and Part B, split the mix into two 5-gallon buckets. While continuing to mix with a Jiffy Mixer slowly add the aggregate.

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SEMSTONE® 870 & 870 CT

Note: A 2:1 sand to liquid weight ratio will produce a trowel-like consistency. A 3:1 sand to liquid weight ratio will produce a grout-like consistency.

Note: The use of a 20/40 mesh silica aggregate is highly recommended. One gallon of 20/40 mesh silica weighs 13-14 lbs.

Apply the mixture at the desired thickness using a notched trowel.

Note: For vertical surfaces add Semstone Thixotrope Part C (pre-measured mixes) or Cab-O-Sil (TS 720) to the blended mix at a 1:2 Cab-O-Sil to liquid volume ratio.

If desired, the surface may be recoated after it has finally cured.

Note: After an initial cure of 48 hours, the surface must be sanded and solvent wiped prior to recoating.

Material Coverages

Below is a list of coverages for the Blended application.

MATERIAL	Nominal 125 mils/3.1 mm
Semstone 800 Series Primer	300 sq.ft./carton
Semstone 870 Mortar 125 mils	20 sq.ft./gal.

Reinforced (AFRC – Broadcast)

A fiberglass scrim cloth may be added to the 125 mil broadcast system. For the 125 mil broadcast system apply the fiberglass scrim cloth into the base coat prior to applying the aggregate.

Reinforced (AFRC – Blended)

A fiberglass scrim cloth may be added to the 125 mil blended system. For the 125 mil blended system apply a 25-35 mil/0.63-0.88 mm base coat and lay the fiberglass scrim cloth into the base coat.

Note: For a vertical surface, the base coat should be mixed with Cab-O-Sil (TS 720) at a 1:1 volume ratio.

Allow the base coat to become tacky and then apply Semstone 870 mortar at 90-100 mils/2.25-2.50 mm.

Note: Application of base coat, the fiberglass scrim cloth, and mortar should be completed in the same day.

RECOMMENDATIONS

- Apply only on clean, sound, dry and properly prepared substrates.

- Minimum ambient and surface temperatures are 65°F/18°C at the time of application.
- Maximum surface temperatures should not exceed 90°F/32°C during the time of application.
- Substrate temperature should be greater than 5°F/3°C above dew point.
- Application and curing times are dependent upon ambient and surface conditions. Consult Carboline's Technical Service Department if conditions are not within the recommended guidelines.

PRECAUTIONS

- MEK, Toluene or Xylene solvents are recommended for clean up of Semstone 870 material spills. Use these materials only in strict accordance with manufacturer's recommended safety procedures. Dispose of waste materials in accordance with government regulations.
- The use of a NIOSH/MSHA approved respirator using a #TC-23C-738 organic vapor or a #TC-23C-740 organic vapor acid gas cartridge is mandatory.
- The selection of proper protective clothing and equipment will significantly reduce risk to injury. Body covering apparel, safety goggles and impermeable gloves are highly recommended.
- In case of contact, flush the area with water for 15 minutes and seek medical attention. Wash skin with soap and water.
- Use only with adequate ventilation.

NOTES

- Material Safety Data Sheets on Semstone 870 are available on request.
- A staff of technical service engineers is available to assist with product application or to answer questions related to Carboline products.
- Requests for technical literature or service can be made through local sales representatives and offices, or corporate offices located worldwide.

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SEMSTONE® 870 & 870 CT



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TECHNICAL DATA SHEET

3579, 3579P STANDARD PRIMER / BINDER

PRODUCT DESCRIPTION

General Polymers 3579, 3579P STANDARD PRIMER / BINDER is a 100% solids, clear or pigmented epoxy primer. 3579, 3579P STANDARD PRIMER / BINDER is available in clear, red, white and gray, has good blush resistance and is low in viscosity to promote good penetration of the concrete substrate and excellent wetting of mortar aggregate.

ADVANTAGES

- Good blush resistance at room temperature
- Low modulus of elasticity, stress relieving
- 100% solids, zero VOC
- Low odor emission permitting installation during normal working hours
- Penetrates and reinforces substrates
- Available with an antimicrobial agent

TYPICAL USES

The 3579, 3579P STANDARD PRIMER / BINDER is zero VOC (volatile organic content) epoxy primer for coatings, slurries, mortar overlays, and patches. It can be also used as a binder resin. For slurries, mortar and patching systems.

TYPICAL PHYSICAL PROPERTIES @ 73F

Mix Ratio A:B		2:1
Color		Clear, White, Red and Gray
Solids, by volume		100%
VOC (Volatile Organic Content)		- 0 -
Viscosity, mixed Pigmented		150-400 cps
Clear		250-600 cps
Pot Life, 150 grams mass	@ 73F	25-30 minutes
Cure Time	Dry to Touch	3-5 hours
	Recoat	8-12 hours
	Full Cure	7 days
Tensile Strength		3,000 psi
ASTM D 638		
Flexural Strength		6,000 psi
ASTM D 790		
Compressive Strength		9,000 psi
ASTM D 695		
Hardness, Shore D		75/65
ASTM D 2240		
Adhesion		350 psi
ACI 503R	(100% concrete failure)	
Flammability		Self-extinguishing over concrete

LIMITATIONS

- Slab on grade requires vapor/moisture barrier.
- Surface must be clean and dry.
- Cool damp conditions may cause surface blushing.
- Substrate must be structurally sound and free of bond inhibiting contaminants.
- During installation and initial cure cycle substrate and ambient air temperature must be at a minimum of 45F. Substrate temperature must be least 5F above the dew point (for lower temperature installation contact Technical Service Department).
- When required, adequate ventilation shall be provided and proper clothing and respirators worn.
- Strictly adhere to published coverage rates.

SURFACE PREPARATION

Proper inspection and preparation of the substrate to receive resinous material is critical. Read and follow the "Instructions for Concrete Surface Preparation" (Form G-1) for complete details.

APPLICATION

- MATERIAL DELIVERY AND STORAGE

Store materials in accordance with the instructions, with seals and labels intact and legible. Maintain temperature within required range.

- INSTALLATION

We understand that you want the system installed right the first time. Therefore, an exclusive group of local specialty contractors has been selected for their experience, expertise, stability and, most importantly, their commitment to quality and owner satisfaction.

Materials are to be installed per the Installation Instructions. Refer to and follow MSDS Safety Recommendations.

NOTE: Epoxy materials may tend to blush at the surface especially in humid environments. After surface is primed and before installation of each subsequent coat, surface must be examined for blush (a whitish greasy film and/or low gloss). The blush must be completely removed prior to recoating using warm detergent water or through solvent wipe.

CHEMICAL RESISTANCE

For comprehensive chemical resistance information, consult the Chemical Resistant Guide and contact Technical Service Department.

WARRANTY

The sale of General Polymers Brand products is governed by the Standard Terms and Conditions of Sale. Sherwin-Williams has no knowledge or control concerning buyer's use for the product nor over the quality of the concrete or substrate to which they are applied. Sherwin-Williams assumes no responsibility for any loss or damage resulting from the handling or use of the products by the buyers. Sherwin-Williams makes the following **LIMITED WARRANTY** that its products have been supplied free from manufacturing defects, and will conform to Sherwin-Williams manufacturing standards. Technical data furnished is true and accurate to the best of our knowledge; however, no guarantee of accuracy is given or implied. This Limited Warranty shall not apply in the case of improper installation, improper substrate construction, damage beyond the scope and protection of the products, exposure of the products to solvents and/or higher concentrations of acids than that for which the products are designed and loss of bond due to hydrostatic pressure, vapor pressure, capillary action or moisture from within, under or adjacent to the concrete surface.

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SYSTEM BULLETIN

TPM® #115 Standard Troweled Mortar (S1-S5)

Product Description

General Polymers TPM #115 STANDARD TROWELED MORTAR (S1-S5) Systems are 1/8" - 1/4" high build protective resurfacing systems utilizing an epoxy and silica aggregate mortar, high build grout and seal coats. Different seal coat options are available for specific needs. TPM #115-S1 for semigloss finish. TPM #115-S2 for a high gloss finish. TPM #115-S3 for moderate chemical resistance and TPM #115-S4-S5 for harsh chemical resistance.

Advantages

- 100% solids available in TPM #115-S3, S4 and S5
- -0- VOC for low odor during installation (S3-S5)
- Protects substrates from conditions of thermal shock, and heavy impact and wear
- Resists degradation from many chemicals, acids and alkalis
- Wide range of colors available
- Available with an antimicrobial agent

Uses

- Traffic aisles and manufacturing
- Pulp and paper plants
- Waste water treatment facilities
- Pharmaceuticals
- Drum storage areas
- Petroleum refineries
- Food and beverage facilities

System Specification

TPM #115 STANDARD TROWELED MORTAR (S1-S5) Systems as manufactured by General Polymers shall consist of 3579 Penetrating Primer as primer, 3562P Trowel Mortar Binder Resin as the binder resin, 5115 Mortar Blend Aggregate, 3744GP High Performance CR Epoxy Grout as the grout coat. Different seal coat options are as follows:

TPM #115-S1	3543(NS) Polyamide Coating Semi-Gloss
TPM #115-S2	4608P Polyurethane Enamel
TPM #115-S3	3506 Stipple Epoxy Floor Coating
TPM #115-S4	3744P High Performance CR Epoxy
TPM#115-S5	4685P POLY-COTE 100% Solids Urethane

General Polymers®

A Division of The Sherwin-Williams Company

Typical Physical Properties @1/4"

Color	17 Standard Colors Computerized custom color matching available upon request
Solids, by volume Available in TPM #115-S3, S4 and S5 only	100%
VOC (Volatile Organic Content) Available in TPM #115-S3, S4 and S5 only	-0-
Hardness @ 24 hours, Shore D ASTM D 2240	80-65
Compressive Strength ASTM C 579	11,000 psi
Tensile Strength ASTM C 307 ASTM D 638	1,700 psi 6,000 psi
Flexural Strength ASTM C 580	3,700 psi
Adhesion ACI 503R	350 psi 100% concrete failure
Abrasion Resistance ASTM D 4060, CS-17 Wheel	70-90 mgs lost
Impact Resistance MIL-D-3134, Sec.4.7.3	Withstands 16 ft lbs without cracking, delamination or chipping

Installation

The following information is to be used as a guideline for the installation of the TPM #115 STANDARD TROWELED MORTAR (S1-S5) Systems. Contact General Polymers Technical Service Department for assistance prior to application.

Surface Preparation - General

General Polymers systems can be applied to a variety of substrates, if the substrate is properly prepared. Preparation of surfaces other than concrete will depend on the type of substrate, such as wood, concrete block, quarry tile, etc. Should there be any questions regarding a specific substrate or condition, please contact General Polymers Technical Service Department prior to starting the project.

Refer to Surface Preparation (Form G-1).

Surface Preparation - Concrete

Concrete surfaces shall be abrasive blasted to remove all surface contaminants and laitance. The prepared concrete shall have a minimum surface profile equal to 40-60 grit sandpaper.

After initial preparation has occurred, inspect the concrete for bug holes, voids, fins and other imperfections. Protrusions shall be ground smooth while voids shall be filled with a General Polymers system filler. For recommendations, consult General Polymers Technical Service Department.

Temperature

Throughout the application process, substrate temperature should be 50°F - 90°F. Substrate temperature must be at least 5°F above the dew point. Applications on concrete substrates should occur while temperature is falling to lessen offgassing. The material should not be applied in direct sunlight, if possible.

Application Information

Material	Mix Ratio	Theoretical Coverage Per Coat Concrete	Packaging
3579	2:1	250 sq. ft. / gal	3 or 15 gals
3562P	4:1	33 sq. ft. / 1¼ gal @ 1/4" 50 sq. ft. / 1¼ gal @ 3/16" 72 sq. ft. / 1¼ gal @ 1/8"	1.25 - 250 gals
5115		70 lbs / 1¼ gal	50 lbs
Grout Coat:			
3744GP	2:1	100 sq. ft. / gal	3 or 15 gals
Seal Coat:			
S1 3543(NS)	1:1	250 sq. ft. / gal	2 or 10 gals
S2 4608P	2:1	330 sq. ft. / gal	3 or 15 gals
S3 3506	2:1	200 sq. ft. / gal	5 or 25 gals
S4 3744P	2:1	200 sq. ft. / gal	3 or 15 gals
S5 4685P	1:1	330 sq. ft. / gal	2 or 10 gals

Materials shall be applied by hand or power trowel in compliance with manufacturer's recommended installation procedure. * Additional 5115 aggregate may be added to 1.25 gallon of mixed epoxy to facilitate power troweling (10 lbs. recommended - 35 lbs. maximum).

Primer

Mixing and Application

1. Premix 3579 A (resin) and 3579 B (hardener) separately, using a low speed drill and Jiffy mixer. Mix for three minutes and until uniform, exercising caution not to introduce air into the material.
2. Add 2 parts 3579 A (resin) to 1 part 3579 B (hardener) by volume. Mix with low speed drill and Jiffy mixer for three minutes and until uniform. To insure proper system cure and performance, strictly follow mix ratio recommendations.
3. 3579 may be applied via spray, roller or brush. Apply 5-8 mils, evenly, with no puddles. Coverage will vary depending upon porosity of the substrate and surface texture.
4. Wait until primer is tacky (minimum 1 hour), before applying the mortar. If primer is not going to be topped within open time, broadcast silica sand into resin lightly but uniformly and allow to cure overnight.

Mortar

Mixing and Application

1. Premix 3562P A (resin) and 3562P B (hardener) separately, using a low speed drill and Jiffy mixer. Mix for three minutes and until uniform, exercising caution not to whip air into the material.
2. Add 4 parts 3562P A (4 quarts resin) to 1 part 3562P B (1 quart hardener) by volume. Mix with low speed drill and Jiffy mixer for three minutes and until uniform. Place mixed 3562P into mortar mixer. Slowly add 70 pounds of 5115 aggregate. Mix until aggregate is thoroughly "wet out". Immediately dump mortar onto substrate and screed to desired thickness.
3. Compact and smooth the mortar using a hand or power trowel. Allow to cure (Cure times vary depending on environmental conditions) before applying grout coat.

Grout Coat

Mixing and Application

1. Premix 3744GPA (resin) and 3744GPB (hardener) separately, using a low speed drill and Jiffy mixer. Mix for three minutes and until uniform, exercising caution not to whip air into the material.
2. Add 2 parts 3744GPA (resin) to 1 part 3744GPB (hardener) by volume. Mix with low speed drill and Jiffy mixer for three minutes and until uniform.
3. Apply 3744GP using a spring steel trowel or red rubber squeegee and back roll at a spread rate of 100 sq. ft. per gallon, taking care not to pull the grout from the voids in the floor. Allow to cure (Cure times vary depending on environmental conditions) before applying seal coat.

Seal Coat (S1)

Mixing and Application

1. Premix 3543A (resin) and 3543B (hardener) separately, using a low speed drill and Jiffy mixer. Mix for three minutes and until uniform, exercising caution not to whip air into the material.
2. Add 1 part 3543A (resin) to 1 part 3543B (hardener) by volume. Mix with low speed drill and Jiffy mixer for three minutes and until uniform.
3. Apply 3543 using a short nap roller at a spread rate of 250 sq. ft. per gallon. Allow to cure 24 hours minimum before opening to traffic.

Seal Coat (S2)

Mixing and Application

1. Premix 4608PA (resin) using a low speed drill and Jiffy mixer. Mix for three minutes and until uniform, exercising caution not to whip air into the materials.
2. Add 2 parts 4608PA (resin) to 1 part 4608PB (hardener) by volume. Mix with low speed drill and Jiffy mixer for three minutes and until uniform.
3. Apply 4608P using a short nap roller at a spread rate of 330 sq. ft. per gallon. Allow to cure 24 hours minimum before opening to traffic.

Seal Coat (S3)

Mixing and Application

1. Premix 3506A (resin) and 3506B (hardener) separately, using a low speed drill and Jiffy mixer. Mix for three minutes and until uniform, exercising caution not to whip air into the material.
2. Add 2 parts 3506A (resin) to 1 part 3506B (hardener) by volume. Mix with low speed drill and Jiffy mixer for three minutes and until uniform.
3. Apply 3506 using a short nap roller at a spread rate of 200 sq. ft. per gallon. Allow to cure 24 hours minimum before opening to traffic.

Seal Coat (S4)

Mixing and Application

1. Premix 3744PA (resin) and 3744PB (hardener) separately, using a low speed drill and Jiffy mixer. Mix for three minutes and until uniform, exercising caution not to whip air into the material.
2. Add 2 parts 3744PA (resin) to 1 part 3744PB (hardener) by volume. Mix with low speed drill and Jiffy mixer for three minutes and until uniform.
3. Apply 3744P using a short nap roller at a spread rate of 200 sq. ft. per gallon. Allow to cure 24 hours minimum before opening to traffic.

Note: Epoxy materials will appear to be cure and "dry to touch" prior to full chemical cross linking. Allow 3744P to cure for 7-14 days prior to exposure to water or other chemicals for best performance.

Seal Coat (S5)

Mixing and Application

1. Premix 4685PA (resin) using a low speed drill and Jiffy mixer. Mix for three minutes and until uniform, exercising caution not to whip air into the materials.
2. Add 1 part 4685PA (resin) to 1 part 4685PB (hardener) by volume. Mix with low speed drill and Jiffy mixer for three minutes and until uniform.
3. Apply 4685P using a short nap roller at a spread rate of 330 sq. ft. per gallon. Allow to cure 24 hours minimum before opening to traffic.

Application Equipment

Brush / Roller

Use 1/4" phenolic core rollers and professional quality, medium stiff natural bristle brushes.

Trowel

Use steel finishing trowel or epoxy mortar power trowel such as manufactured by Superior.

Cleanup

Clean up mixing and application equipment immediately after use. Use toluene or xylene. Observe all fire and health precautions when handling or storing solvents.

Safety

MSDS (Material Safety Data Sheets) must be read and understood by personnel responsible for supervision and installation of the General Polymers Materials. In particular, PPI (Personal Protection Index) data should be consulted to help insure safe handling. All applicable federal, state, local, and particular plant safety guidelines must be followed during the handling and installation and cure of these materials.

Safe and proper disposal of excess materials shall be done in accordance with applicable federal, state, and local codes.

Material Storage

Store materials in a temperature controlled environment (50°F - 90°F) and out of direct sunlight.

Keep resins, hardeners, and solvents separated from each other and away from sources of ignition. One year shelf life is expected for products stored between 50°F - 90°F.

Maintenance

Occasional inspection of the installed material and spot repairs can prolong system life. For specific information, contact General Polymers Technical Service Department.

Shipping

- Destinations east of the Rocky Mountains are shipped F.O.B. Cincinnati, Ohio.
- Destinations west of the Rocky Mountains are shipped F.O.B. Sylmar, California.

For specific information relating to international shipments, contact your local General Polymers Representative.

Warranty

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GENERAL POLYMERS' LIABILITY SHALL NOT EXCEED REPLACEMENT OF OR RETURN OF THE PURCHASE PRICE FOR THE PRODUCTS WHICH IT MAY SELL WHICH MAY PROVE TO BE DEFECTIVE UNDER NORMAL USE AND SERVICE WITHIN ONE YEAR FROM DATE OF SALE AND WHICH UPON EXAMINATION BY GENERAL POLYMERS SHALL DISCLOSE, TO GENERAL POLYMERS' SATISFACTION, TO BE DEFECTIVE. IN NO EVENT SHALL GENERAL POLYMERS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, BUYERS LOSS OF MATERIAL OR PROFITS, INCREASED EXPENSE OF OPERATION, BODILY INJURY, LOSS OF USE OF PROPERTY, OR DOWNTIME. GENERAL POLYMERS MAKES NO IMPLIED WARRANTIES OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE. THE BUYER HEREBY EXPRESSLY WAIVES ANY CLAIM TO ADDITIONAL DAMAGES.

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GPS TPM115 S1-S5/14
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SYSTEM BULLETIN



TPM® #711 High Early Strength Repair Mortar

Product Description

General Polymers TPM #711 HIGH EARLY STRENGTH REPAIR MORTAR is a single component, rapid setting, high early strength repair mortar that requires only the addition of water to produce a fast, permanent repair for concrete.

Advantages

- Rapid, high early strength
- Reaches 2000 psi in 1 hour
- Fiber reinforced
- Modified with silica fume for reduced permeability
- Shrink resistant
- Resistant to deicing chemicals
- Wear resistant
- Freeze / thaw resistant
- Easy installation
- Excellent bond to concrete substrate
- Able to be extended with peagravel

Uses

- Manufacturing, storage and shipping areas
- Bridge decks and nosings
- Bridge high-rise railing grouting
- Distribution center and warehouse floors
- Parking garages, decks, ramps and lots
- Airport runways and runway light installations
- Highways and roadways
- Auto racetracks
- Commercial freezers

System Specification

TPM #711 HIGH EARLY STRENGTH REPAIR MORTAR consists of TPM #711 aggregate and potable water.

Typical Physical Properties

Color	Concrete Gray	
Working Time @ 72°F	15 minutes	
Initial Set Time @ 72°F	25 minutes	
Final Set Time @ 72°F	35 minutes	
Compressive Strength @ 72°F (22°C)		
ASTM C 109		
	(psi)	(MPa)
1 hour	2000	13.8
3 hours	4000	27.6
1 day	6000	41.4
3 day	7500	51.7
7 day	8000	55.2
28 Day Cure	9650	66.6
Length change		
ASTM C 157 with ASTM C 928 modifications		
	Air Cured	Water Cured
7 days	-0.0520%	0.0005%
28 days	-0.0620%	0.0140%
Shear Bond Strength		
@ 7 days 90°F		
ASTM C 882		
	(psi)	(MPa)
	2,600	17.9
Average Scaling Resistance		
Deicing Chemicals .00375#/ft ² loss @ 25 cycles		

ASTM C = Mortar System

Installation

General Polymers materials shall only be installed by approved contractors. The following information is to be used as a guideline for the installation of the TPM #711 HIGH EARLY STRENGTH REPAIR MORTAR System. Contact the Technical Service Department for assistance prior to application.

Surface Preparation - General

General Polymers systems can be applied to a variety of substrates, if the substrate is properly prepared. Preparation of surfaces other than concrete will depend on the type of substrate, such as wood, concrete block, quarry tile, etc. Should there be any questions regarding a specific substrate or condition, please contact the Technical Service Department prior to starting the project. Refer to Surface Preparation (Form G-1).

Application Information

Standard Mix - 1/2" - 2" - Thick Applications

Material	Mix Ratio	Theoretical Coverage Per Coat	Packaging
TPM #711Mortar	50 pound bag plus 2.5 quarts potable water	12.5 sq. ft @ 1/2"	50 lb polyethylene lined bags

For Repairs Greater Than 2"

Material	Mix Ratio	Theoretical Coverage Per Coat	Packaging
TPM #711 Mortar	50 pound bag plus 2.5 quarts potable water	4 sq. ft @ 2"	50 lb polyethylene lined bags
Aggregate	Plus 25 pounds 3/8" clean, washed and dried pea gravel		

Surface Preparation - Concrete

Concrete surfaces shall be abrasive blasted to remove all surface contaminants and laitance. The prepared concrete shall have a surface profile equal to CSP3-5. Refer to Form G-1.

After initial preparation has occurred, inspect the concrete for bug holes, voids, fins and other imperfections. Protrusions shall be ground smooth while voids shall be filled with a system compatible filler. For recommendations, consult the Technical Service Department.

Temperature

Throughout the application process, substrate temperature should be 40°F - 90°F. Substrate temperature must be at least 5°F above the dew point. Applications on concrete substrate should occur while temperature is falling to lessen off-gassing. The material should not be applied in direct sunlight, if possible.

Mixing

Mix only an amount that can be placed and finished in 15 minutes. Place recommended amount of clean water into mortar mixer. Add **TPM #711**. Mix for 1-2 minutes. For applications over 1" add clean 3/8" pea gravel at the rate of 25 lbs per 50 lb bag.

Placing

Place mortar onto clean damp concrete. Work material aggressively onto repair surface and around sides with a stiff bristle brush to assure good bond. Level and screed material to proper height. Saturate area with water for 24 hours prior to applying mortar. During application, surface should be damp, but free of any standing water.

No bonding agent is necessary with TPM #711. Immediately upon completion of mixing, place material in repair area. Work from one side of site only - not toward middle from opposite directions.

Finishing

Level and screed material to proper height. Float edges with wooden or magnesium floats. Occasionally clean all tools of built up material. DO NOT retemper.

Curing

Apply wet burlap, wet rags, etc. to finished repair area and cover with polyethylene, or apply a membrane curing compound approved by General Polymers. In emergency repair situations when proper curing is not possible, cover TPM #711 with polyethylene until final set and area is reopened to traffic.

Precautions

- DO NOT featheredge or use for patches less than 1/2" deep.
- In hot weather, protect TPM #711 from water evaporation by covering with polyethylene sheets, use cool mixing water, and protect applied material from direct sunlight.
- In cold weather, follow ACI suggestions and protect TPM #711 by covering with polyethylene sheets, use warm water and heat repair area surface prior to application if below 40°F.
- Do not add admixtures (accelerators or water reducers) or antifreeze to TPM #711.

Cleanup

Clean up mixing and application equipment immediately after use. Use warm water. Observe all fire and health precautions when handling or storing solvents.

Safety

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Safe and proper disposal of excess materials shall be done in accordance with applicable federal, state, and local codes.

Material Storage

Store materials in a temperature controlled dry environment (50°F to 90°F).

Keep resins, hardeners, and solvents separated from each other and away from sources of ignition. One year shelf life is expected for products stored between 50°F to 90°F.

Maintenance

Occasional inspection of the installed material and spot repair can prolong system life. For specific information, contact the Technical Service Department.

Shipping

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TECHNICAL DATA SHEET

3561, 3561P EPOXY RESIN GLAZE

PRODUCT DESCRIPTION

General Polymers 3561, 3561P EPOXY RESIN GLAZE are 100% solids, two component epoxy resin systems used for general purpose decorative aggregate and heavy duty industrial flooring systems. 3561, 3561P EPOXY RESIN GLAZE possess good chemical resistance, with excellent compressive strength and abrasion resistance.

ADVANTAGES

- USDA approved
- Good chemical resistance
- - 0 - VOC (Volatile Organic Content)
- High compressive and tensile strength
- Abrasion resistant
- Available with an antimicrobial agent

TYPICAL USES

3561 EPOXY RESIN GLAZE is used as a clear binder resin for decorative aggregate systems. 3561P EPOXY RESIN GLAZE is used as a binder resin in clear and solid color systems including slurry and trowel applied flooring systems. Typical installations include surfacing floors in chemical processing plants, industrial aisles, docks, ramps, kitchens, utility rooms, restrooms, locker rooms, breweries, photographic labs and water and waste and sewage plants. 3561, 3561P EPOXY RESIN GLAZE can also be used for other surfaces requiring seamless decorative or solid colored heavy duty protective surfacing.

TYPICAL PHYSICAL PROPERTIES

Mix Ratio A:B		4:1
Color		Clear, White, Gray, Red, Black
Solids, by volume		100%
VOC (Volatile Organic Content)		- 0 -
Pot Life, 1 gallon mass		
ASTM D 2471		
Regular Cure	@ 50F	40 minutes
	@ 73F	16 minutes
	@ 90F	8 minutes
Fast Cure	@ 50F	30 minutes
	@ 73F	12 minutes
	@ 90F	6 minutes
Cure Time		
Regular Cure	Dry to Touch	12 hours
	Recoat	16 hours min.
	Light Traffic	24hours min.
	Full Cure	7 days
Fast Cure	Dry to Touch	2-3 hours
	Recoat	3-4 hours min.
	Light Traffic	8-12 hours min.
	Full Cure	7 days
Abrasion Resistance		100 mgs lost
ASTM D 4060, CS-17 Wheel, 1,000 Cycles		
Hardness, Shore D		75/65
ASTM D 2240		
Compressive Strength		10,000 psi
ASTM D 685		
Flexural Strength		12,000 psi
ASTM D 790		

TYPICAL PHYSICAL PROPERTIES

(cont'd.)

Tensile Strength ASTM D 638	6,000 psi
Tensile Elongation ASTM D 638	2 - 4% min.
Resistance to Elevated Temperatures MIL-D-3134J	No slip or flow at required temperature of 158F
Adhesion ACI 503R	350 psi (100% concrete failure)
Flammability	Self-extinguishing over concrete

LIMITATIONS

- Slab on grade requires vapor/moisture barrier.
- Substrate must be structurally sound, dry and free of bond inhibiting contaminants.
- During installation and initial cure cycle substrate and ambient air temperature must be at a minimum of 50F. Substrate temperature must be least 5F above the dew point (for lower temperature installation contact General Polymers).
- Strictly adhere to published coverage rates.

SURFACE PREPARATION

Proper inspection and preparation of the substrate to receive resinous material is critical. Read and follow the "Instructions for Concrete Surface Preparation" (Form G-1) for complete details.

APPLICATION

- MATERIAL DELIVERY AND STORAGE

Store materials in accordance with the instructions, with seals and labels intact and legible. Maintain temperature within required range.

- INSTALLATION

We understand that you want the system installed right the first time. Therefore, an exclusive group of local specialty contractors has been selected for their experience, expertise, stability and, most importantly, their commitment to quality and owner satisfaction.

Materials are to be installed per the Installation Instructions. Refer to and follow MSDS Safety Recommendations.

NOTE: Epoxy materials may tend to blush at the surface especially in humid environments. After surface is primed and before installation of each subsequent coat, surface must be examined for blush (a whitish greasy film and/or low gloss). The blush must be completely removed prior to recoating using warm detergent water or through solvent wipe.

CHEMICAL RESISTANCE

For comprehensive chemical resistance information, contact the Technical Services Department.

SKID INHIBITION and EASE OF CLEANING

Skid inhibition and ease of cleaning properties can be adjusted to meet your specific needs. Aggressive skid inhibition makes cleaning more difficult.

MAINTENANCE

Caution: Some cleaners will affect the color or texture of your polymer floor surfaces. To determine how your cleaner will perform, we recommend that you first test each cleaner, in a small area, utilizing your cleaning technique. This precaution will demonstrate the effect of your cleaner and technique, if no deleterious effects are observed, continue with the procedure. If deleterious effects do occur, modify the cleaning material and/or procedure.

WARRANTY

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TECHNICAL DATA SHEET

3552
EPO-FLEX® FLEXIBLE
EPOXY MEMBRANE

PRODUCT DESCRIPTION

General Polymers 3552 EPO-FLEX FLEXIBLE EPOXY MEMBRANE is a 100% solids, flexible epoxy material which combines the toughness, adhesion and durability of epoxies with a degree of flexibility common to polyurethanes. Flexibility is achieved without the use of plasticizers or other additives which can separate or migrate out of the epoxy complex as the material ages or is degraded due to environmental conditions. 3552 EPO-FLEX FLEXIBLE EPOXY MEMBRANE may be used with fiberglass mesh in surfaces for larger cracks and joints.

ADVANTAGES

- Optional reinforcement
- Bridges hairline cracks, aids in suppression of reflective cracking of trowel applied flooring due to substrate movement associated with thermal movement.
- Flexible, yet tough
- - 0 - VOC (Volatile Organic Content) allowing for installation in occupied facilities
- State of the art chemistry assures long-term flexibility
- Remains flexible at low temperatures
- Waterproofing

TYPICAL USES

3552 EPO-FLEX FLEXIBLE EPOXY MEMBRANE is recommended for use as a flexible membrane under General Polymers trowel and fluid-applied flooring systems where substrate cracking is anticipated and/or evident or as a waterproofing membrane as required.

TYPICAL USES (cont)

Installations under aesthetic and functional overlays include: mechanical equipment rooms, kitchens, animal research, wet production, secondary containment and other areas requiring protection from substrate through-system cracking.

TYPICAL PHYSICAL PROPERTIES @ 73F

Mix Ratio A:B	1:1
Color	Gray
Solids, by volume	100%
VOC (Volatile Organic Content)	- 0 -
Coverage	@ 40 mils 40 sq. ft.
Cure Time	Dry to Touch 16 - 24 hours Recoat 24 hours min.
Adhesion	350 psi
ACI 503R	(100% concrete failure)
Hardness, Shore D	23
ASTM D 2240	
Tensile Strength	1,200 psi
ASTM D 412	
Elongation @ Break	145%
ASTM D 412	
Thermal Cycling	No Cracking
ASTM C 884	
(24 hours, -21C to 25C)	
Flammability	Self-extinguishing over concrete

LIMITATIONS

- Slab on grade requires vapor/moisture barrier.
- Substrate must be structurally sound, dry and free of bond inhibiting contaminants.
- During installation and initial cure cycle substrate and ambient air temperature must be at a minimum of 60F. Substrate temperature must be least 5F above the dew point (for lower temperature installation contact General Polymers).
- When required, adequate ventilation shall be provided and proper clothing and respirators worn.
- Extinguish all sources of ignition during the entire installation cycle.
- Strictly adhere to published coverage rates.

SURFACE PREPARATION

Proper inspection and preparation of the substrate to receive resinous material is critical. Read and follow the "Instructions for Surface Preparation" (Form G1) for complete details.

APPLICATION

• MATERIAL DELIVERY AND STORAGE

Store materials in accordance with instructions, with seals and labels intact and legible. Maintain temperature within required range.

• INSTALLATION

We understand that you want the system installed right the first time. Therefore, an exclusive group of local specialty contractors has been selected for their experience, expertise, stability and, most importantly, their commitment to quality and owner satisfaction.

Materials are to be installed per Installation Instructions. Refer to and follow MSDS Safety Recommendations.

NOTE: Epoxy materials may tend to blush at the surface especially in humid environments. After surface is primed and before installation of each subsequent coat, surface must be examined for blush (a whitish greasy film and/or low gloss). The blush must be completely removed prior to recoating using warm detergent water or through solvent wipe.

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TECHNICAL DATA SHEET

3744, 3744P, 3744PF HIGH PERFORMANCE CR EPOXY

PRODUCT DESCRIPTION

General Polymers 3744, 3744P, 3744PF HIGH PERFORMANCE CR EPOXY is a 100% solids, two component epoxy coating and binder resin. 3744, 3744P, 3744PF HIGH PERFORMANCE CR EPOXY may be used directly over approved primed substrates or as a gloss seal coat over decorative, slurry and mortar systems. Its outstanding broad spectrum chemical resistance provides protection in aggressive environments. Available in clear, pigmented or pigmented fast cure.

ADVANTAGES

- Stain Resistant
- Chemical Resistant
- -0- VOC (Volatile Organic Content)
- Available with an antimicrobial agent

TYPICAL USES

3744, 3744P, 3744PF HIGH PERFORMANCE CR EPOXY should be used in areas where maintenance of a high performance, aesthetically appealing and chemical resistant epoxy system is required. 3744, 3744P, 3744PF HIGH PERFORMANCE CR EPOXY is 100% solids, and has no offensive solvent odor during installation.

TYPICAL PHYSICAL PROPERTIES @ 73F

Mix Ratio A:B	2:1	
Color	Clear, Standard Colors Computer color matching available upon request	
Solids, by volume	100%	
VOC (Volatile Organic Content)	- 0 -	
Cure Time @ 6 mils		
Standard Cure	Dry to Touch	4-6 hours
	Recoat	12-16 hours min.
	Light Traffic	24 hours min
	Full Cure	7 days
Fast Cure	Dry to Touch	3-4 hours
	Recoat	6-8 hours
	Light Traffic	10-12 hours
	Full Cure	7 days
Flexural Strength	12,400 psi	
ASTM D 790		
Tensile Strength	6,000 psi	
ASTM D 638		
Abrasion Resistance	100 mgs lost	
ASTM D 4060, CS-17 Wheel, 1,000 Cycles		
Resistance to	No slip or flow at required	
Elevated Temperatures	temperature of 158F	
MIL-D-3134J		
Hardness, Shore D	75	
ASTM D 2240		

TYPICAL PHYSICAL PROPERTIES @ 73F

Adhesion ACI 503R	350 psi (100% concrete failure)
Flammability	Self-extinguishing over concrete
Gloss 60 Gloss Meter @ 73F, 50% RH	85 millage pts.
Impact Resistance MIL-D-3134J	Direct, inch pound greater than 160, passes Reverse, inch pound greater than 80, passes

LIMITATIONS

- Slab on grade requires vapor/moisture barrier.
- Substrate must be structurally sound, dry and free of bond inhibiting contaminants.
- During installation and initial cure cycle substrate and ambient air temperature must be at a minimum of 50F. Substrate temperature must be least 5F above the dew point (for lower temperature installation contact the Technical Service Department).
- Maximum dry surface temperature not to exceed 160F.
- Strictly adhere to published coverage rates.

SURFACE PREPARATION

Proper inspection and preparation of the substrate to receive resinous material is critical. Read and follow the "Instructions for Concrete Surface Preparation" (Form G-1) for complete details.

APPLICATION

• MATERIAL DELIVERY AND STORAGE

Store materials in accordance with the instructions, with seals and labels intact and legible. Maintain temperature within required range.

• INSTALLATION

We understand that you want the system installed right the first time. Therefore, an exclusive group of local specialty contractors have been selected for their experience, expertise, stability and, most importantly, their commitment to quality and owner satisfaction.

Materials are to be installed per the Installation Instructions. Refer to and follow MSDS Safety Recommendations.

NOTE: Epoxy materials may tend to blush at the surface especially in humid environments. After the surface is primed and before installation of each subsequent coat, surface must be examined for blush (a whitish greasy film and/or low gloss). The blush must be completely removed prior to recoating using warm detergent water or through solvent wipe.

Epoxy materials will appear to be cured and dry to touch prior to full chemical cross linking. Allow 3744, 3744P, 3744PF to cure for 2-3 days prior to exposure to water or other chemicals for best performance.

CHEMICAL RESISTANCE

For comprehensive chemical resistance information, consult the Chemical Resistant Guide and contact the Technical Service Department.

SKID INHIBITION and EASE OF CLEANING

Skid inhibition and ease of cleaning properties can be adjusted to meet your specific needs. Aggressive skid inhibition makes cleaning more difficult.

MAINTENANCE

Caution: Some cleaners will affect the color or texture of your polymer floor surfaces. To determine how your cleaner will perform, we recommend that you first test each cleaner, in a small area, utilizing your cleaning technique. This precaution will demonstrate the effect of your cleaner and technique. If no deleterious effects are observed, continue with the procedure. If deleterious effects do occur, modify the cleaning material and/or procedure.

WARRANTY

The sale of General Polymers Brand products is governed by the Standard Terms and Conditions of Sale. Sherwin-Williams has no knowledge or control concerning buyer's use for the product nor over the quality of the concrete or substrate to which they are applied. Sherwin-Williams assumes no responsibility for any loss or damage resulting from the handling or use of the products by the buyers. Sherwin-Williams makes the following **LIMITED WARRANTY** that its products have been supplied free from manufacturing defects, and will conform to Sherwin-Williams manufacturing standards. Technical data furnished is true and accurate to the best of our knowledge; however, no guarantee of accuracy is given or implied. This Limited Warranty shall not apply in the case of improper installation, improper substrate construction, damage beyond the scope and protection of the products, exposure of the products to solvents and/or higher concentrations of acids than that for which the products are designed and loss of bond due to hydrostatic pressure, vapor pressure, capillary action or moisture from within, under or adjacent to the concrete surface.

SHERWIN-WILLIAMS' LIABILITY SHALL NOT EXCEED REPLACEMENT OF OR RETURN OF THE PURCHASE PRICE FOR THE PRODUCTS WHICH IT MAY SELL WHICH MAY PROVE TO BE DEFECTIVE UNDER NORMAL USE AND SERVICE WITHIN ONE YEAR FROM DATE OF SALE AND WHICH UPON EXAMINATION BY SHERWIN-WILLIAMS SHALL DISCLOSE, TO SHERWIN-WILLIAMS' SATISFACTION, TO BE DEFECTIVE. IN NO EVENT SHALL SHERWIN-WILLIAMS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, BUYERS LOSS OF MATERIAL OR PROFITS, INCREASED EXPENSE OF OPERATION, BODILY INJURY, LOSS OF USE OF PROPERTY, OR DOWNTIME. SHERWIN-WILLIAMS MAKES NO IMPLIED WARRANTIES OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE. THE BUYER HEREBY EXPRESSLY WAIVES ANY CLAIM TO ADDITIONAL DAMAGES.

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Cincinnati, OH
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General Polymers

Corrosion Control

Technical Data Sheet

COR-SEAL PS Polysulfide Sealant/Caulk

PRODUCT DESCRIPTION

COR-SEAL PS is a 100% solids, elastomeric, polysulfide sealant for caulking joints where chemical resistance is required. **COR-SEAL PS** maintains excellent bond between many substrates and/or materials.

FEATURES/BENEFITS

- Provides outstanding chemical resistance and UV stability
- Is 100% solids
- Resists thermal shock and cycling
- Does not require priming in most cases
- Maintains effective bond between materials of similar or dissimilar porosities, surface textures, and/or expansion coefficients

TYPICAL USES

COR-SEAL PS has been formulated to provide sealant protection in secondary containment projects. It is recommended as a sealant for expansion joints, control joints, and cracks greater than 1/4" in width. It is certified to NSF Standard 61, Section 6 for Joining and Sealing Materials and meets all aspects of ASTM C 920 specifications for Non-sag, Class 25 sealants.

PACKAGING

<u>Product #</u>	<u>Premeasured Kits</u>
1605	1.5 gallons

TYPICAL PHYSICAL PROPERTIES

Mix Ratio A:B	Premeasured @ 17:1	Hardness, Shore D	25-30
Color	Gray	ASTM D 2240	
Solids, by volume	100%	Tensile Strength	150-200 psi
VOC (Volatile Organic Content)	- 0 -	ASTM D 638	
Viscosity, mixed	1,000,000 cps	% Elongation	500-550 %
		ASTM D638	
Pot life @ 73°F, 1 gallon mass		100% modulus	50 psi
ASTM D 2471	@ 50° F	3 hrs	
	@ 73° F	1 - 1 1/4 hrs	
	@ 90° F	30 - 45 mins	
Cure time, 73°F, 50% RH		200% modulus	80 psi
Dry to Touch		% Joint Movement	± 25
Full Cure		Flammability	Self-extinguishing on concrete
		ASTM D 635	

LIMITATIONS

COR-SEAL PS is not recommended for:

- Glass glazing
- Joints less than 1/4" in width or depth
- Contaminated joints
- Certain architectural paints and finishes without prior testing

SURFACE PREPARATION

Proper inspection and preparation of the substrate to receive **COR-SEAL PS** is critical. Read and follow General Polymers "Guideline Instructions for Concrete Surface Preparation" (Form G-1, current version) for complete details and/or contact General Polymers Technical Service Department.

APPLICATION

• MATERIAL DELIVERY AND STORAGE

Store **COR-SEAL PS** in a temperature controlled environment, 50°F (10°C) to 80°F (26°C), and out of direct sunlight. Keep resins, hardeners, and solvents separated from each other and away from sources of ignition. Shelf life is one year in original, unopened containers stored at temperatures lower than 80°F (26°C).

• INSTALLATION

General Polymers understands that you want the system installed right the first time. Therefore, an exclusive group of local specialty contractors has been selected by General Polymers for their experience, expertise, stability, and most importantly, commitment to quality and owner satisfaction. Materials are to be installed per General Polymers Installation Instructions.

CHEMICAL RESISTANCE

For chemical resistance information, refer to General Polymers Corrosion Control Chemical Resistance Guide. Consult General Polymers Technical Service Department for specific details.

MAINTENANCE

Occasional inspection and spot repair of the installed sealant can prolong the system life. When installed properly, **COR-SEAL PS** should require little or no maintenance. However, if the sealant is damaged and the bond is intact, cut out the damaged area and re-caulk. If the bond has been affected, remove the sealant, clean and prepare the joint. For specific information, contact General Polymers Technical Service Department.

WARRANTY

THE SALE AND PURCHASE OF THE COMPANY'S PRODUCTS ARE GOVERNED BY THE COMPANY'S TERMS AND CONDITIONS OF SALE. SINCE THE COMPANY HAS NO CONTROL OVER APPLICATION OF THE PRODUCTS, QUALITY OF THE CONCRETE OR SUBSTRATE TO WHICH THEY ARE APPLIED OR OTHER FACTORS OF IMPORTANCE, THE COMPANY MAKES THE FOLLOWING LIMITED WARRANTY: ONCE THE BUYER HAS ACCEPTED AND MET THE TERMS AND CONDITIONS OF SALE AND INSPECTED AND TESTED THE PRODUCTS PRIOR TO INSTALLATION, THE COMPANY SHALL WARRANT THAT ITS PRODUCTS WILL BE FREE FROM MANUFACTURING DEFECTS AND WILL CONFORM TO THE WRITTEN TECHNICAL DATA AND PERFORMANCE PROPERTIES SET FORTH THEREIN. UPON PROOF BY THE BUYER OF NONCONFORMANCE OR THAT SUCH GOODS WERE DEFECTIVELY MANUFACTURED, THE COMPANY WILL REPLACE ANY PRODUCT THAT DOES NOT CONFORM TO THE WRITTEN TECHNICAL DATA AND PERFORMANCE PROPERTIES OR WILL REFUND THE PURCHASE PRICE OF THE PRODUCTS, IF DISCOVERY AND A PROPER CLAIM IS MADE WITHIN ONE YEAR OF DELIVERY OF THE PRODUCTS. NO REPRESENTATIVE, AGENT, DISTRIBUTOR OR APPROVED CONTRACTOR OF THE COMPANY IS AUTHORIZED TO CHANGE OR MODIFY THE TECHNICAL DATA AND PERFORMANCE PROPERTIES OR THIS LIMITED WARRANTY IN ANY WAY, OR ADD PROVISIONS TO THE STANDARD TERMS AND CONDITIONS OF SALE.

THE COMPANY'S PRODUCTS ARE SOLD SUBJECT TO THE EXPRESS LIMITED WARRANTIES CONTAINED HEREIN. THE LIABILITY OF THE COMPANY WHETHER BASED ON ITS WARRANTY, CONTRACT OR OTHERWISE, SHALL IN NO CASE EXCEED THE PURCHASE PRICE FOR THE PRODUCTS AND DOES NOT INCLUDE INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHICH RESULT FROM THE USE OR MISUSE OF THE PRODUCTS SOLD HEREUNDER. EXCEPT AS PROVIDED HEREIN, THE COMPANY MAKES NO WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCTS, INCLUDING WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. BUYER HEREBY EXPRESSLY WAIVES ANY CLAIM TO ADDITIONAL DAMAGES.

THE COMPANY'S LIMITED WARRANTY SHALL NOT APPLY IN THE CASE OF IMPROPER INSTALLATION OR CONSTRUCTION, DAMAGE DUE TO GOUGING OR OTHER DAMAGE BEYOND THE SCOPE AND PROTECTION OF THE INSTALLED SYSTEM, INCLUDING, IMPACT, ABRASION, THERMAL SHOCK AND EXPOSURE TO CONCENTRATIONS OF CHEMICALS HIGHER THAN THAT FOR WHICH THE MATERIALS WERE DESIGNED. THE COMPANY'S LIMITED WARRANTY DOES NOT APPLY TO AREAS WHICH HAVE FAILED FOR ANY CAUSE NOT RELATED TO THE PRODUCTS OR TO LOSS OF BOND DUE TO HYDROSTATIC PRESSURE, VAPOR PRESSURE, CAPILLARY ACTION OR MOISTURE FROM WITHIN, UNDER OR ADJACENT TO THE CONCRETE SURFACE, OR STRUCTURAL FAILURES. THE COMPANY IS NOT A LICENSED ARCHITECT, STRUCTURAL ENGINEER, OR DESIGN PROFESSIONAL, (AND DOES NOT CARRY ERRORS AND OMISSIONS INSURANCE FOR DESIGN CLAIMS) AND RENDERS NO OPINION REGARDING THE STRUCTURAL INTEGRITY OR SUITABILITY OF THE PROJECT, OR ANY DESIGN DEFICIENCIES IN ANY ARCHITECT, STRUCTURAL ENGINEER OR DESIGNERS PLANS, AND SPECIFICALLY DISCLAIMS ANY RESPONSIBILITY THEREFORE.

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Cor-Seal PS / 5
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TECHNICAL DATA SHEET**General Polymers®**

High Performance Flooring

3555 EPO-FLEX® HD EPOXY COATING

PRODUCT DESCRIPTION

General Polymers 3555 EPO-FLEX HD EPOXY COATING is a 100% solids, chemical resistant, elastomeric epoxy which combines the toughness, adhesion, and durability of epoxies with the flexibility common to polyurethane elastomers. Flexibility is achieved without the use of plasticizers or other additives which migrate from a material as it ages. EPO-FLEX HD EPOXY COATING is self-leveling and may be used with fiberglass reinforcing to enhance system properties.

ADVANTAGES

- Tough, abrasion resistant
- Bridges cracks in concrete structures up to 65 mils
- Retains long-term flexibility due to unique chemistry
- May be installed in occupied facilities (Zero VOC)
- Thermal shock resistance
- Remains flexible at low temperatures

TYPICAL USES

EPO-FLEX HD EPOXY COATING is recommended for use as a flexible coating and as a component of EPO-FLEX Industrial Floor and EPO-FLEX MER (Mechanical Room Flooring Systems).

TYPICAL PHYSICAL PROPERTIES @ 73F

Mix Ratio A:B	1:1
Color	Gray
Solids, by volume	100%
VOC (Volatile Organic Content)	- 0 -
Coverage	@ 20-40 mils 40-80 sq. ft.
Cure Time @ 6 mils	Dry to Touch 5 hours
	Recoat 6-24 hours min.
	Full Cure 48 hours
Adhesion	350 psi
ACI 503R	(100% concrete failure)
Hardness, Shore D	50/40
ASTM D 2240	
Tensile Strength	1,700 psi
ASTM D 412	
Elongation	80%
ASTM D 412	
Thermal Cycling	No Cracking
ASTM C 884	
(24 hours, -21C to 25C)	
Flammability	Self-extinguishing over concrete

LIMITATIONS

- Slab on grade requires vapor/moisture barrier.
- Substrate must be structurally sound, dry and free of bond inhibiting contaminants.
- During installation and initial cure cycle substrate and ambient air temperature must be at a minimum of 60F. Substrate temperature must be at least 5F above the dew point (for lower temperature installation contact the Technical Service Department).
- When required, adequate ventilation shall be provided and proper clothing and respirators worn.
- Extinguish all sources of ignition during the entire installation cycle.
- Strictly adhere to published coverage rates.

SURFACE PREPARATION

Proper inspection and preparation of the substrate to receive resinous material is critical. Read and follow the "Instructions for Surface Preparation" (Form G-1) for complete details.

APPLICATION

• MATERIAL DELIVERY AND STORAGE

Store materials in accordance with the instructions, with seals and labels intact and legible. Maintain temperature within required range.

• INSTALLATION

We understand that you want the system installed right the first time. Therefore, an exclusive group of local specialty contractors has been selected for their experience, expertise, stability and, most importantly, their commitment to quality and owner satisfaction.

Materials are to be installed per the Installation Instructions. Refer to and follow MSDS Safety Recommendations.

NOTE: Epoxy materials may tend to blush at the surface especially in humid environments. After surface is primed and before installation of each subsequent coat, surface must be examined for blush (a whitish greasy film and/or low gloss). The blush must be completely removed prior to recoating using warm detergent water or through solvent wipe.

WARRANTY

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SHERWIN-WILLIAMS LIABILITY SHALL NOT EXCEED REPLACEMENT OF OR RETURN OF THE PURCHASE PRICE FOR THE PRODUCTS WHICH IT MAY SELL WHICH MAY PROVE TO BE DEFECTIVE UNDER NORMAL USE AND SERVICE WITHIN ONE YEAR FROM DATE OF SALE AND WHICH UPON EXAMINATION BY SHERWIN-WILLIAMS SHALL DISCLOSE, TO SHERWIN-WILLIAMS' SATISFACTION, TO BE DEFECTIVE. IN NO EVENT SHALL SHERWIN-WILLIAMS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, BUYERS LOSS OF MATERIAL OR PROFITS, INCREASED EXPENSE OF OPERATION, BODILY INJURY, LOSS OF USE OF PROPERTY, OR DOWNTIME. SHERWIN-WILLIAMS MAKES NO IMPLIED WARRANTIES OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE. THE BUYER HEREBY EXPRESSLY WAIVES ANY CLAIM TO ADDITIONAL DAMAGES.

This Limited Warranty supersedes any other warranty or other representation, whether written or oral, hereto made between parties.

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Keeler & Long/PPG
856 Echo Lake Road
Watertown, CT 06795
1-800-238-8596



Kolor-Poxy™
Primer/Sealer
KL5129/KL5129B

Product Information

Product Code: KL5129/KL5129B
Product: Epoxy-Amidoamine
Suggested Use: Sealer for use on concrete floors or walls.
Not Recommended: Patching holes or cracks.
Compatible Topcoats: Hydro-Poxy™ Primers, and Enamels, Kolormastic™, Kolor-Poxy™ Primers and Enamels, Kolor-Poxy™ Self-Leveling Floor Coating, Kolor-Poxy™ Self-Priming Surfacing Enamel, Kolor-Sil™ Enamels, Poly-Silicone Enamels, Vinyl Latex.

Product Description

Color: Clear amber
Gloss 60°: Not applicable
Weight/Gallon: 8.7 +/- 0.5 lbs./gal. (mixed)
In Service Heat Limitations: 200°F (93°C) maximum, dry heat
Flash Point: 200°F (93°C)
Package: KL5129 - five gallon pail filled at 2.4 gallons (9.08 liters) or one gallon pail filled at 0.60 gallon (2.27 liters).
KL5129B - two gallon pail filled at 1.6 gallons (6.06 liters) or half gallon pail filled at 0.40 gallon (1.51 liters)
Percent Solids by Volume: 95.0 +/- 3.0% (mixed, calculated)
Percent Solids by Weight: 95.0 +/- 3.0% (mixed, applied and air dried)
VOC, Air Dried (g/l): 52 (mixed)
VOC, EPA 24 (g/l): 143 (mixed)

Drying Schedule

Air Dry @ 77°F (25°C) ASTM D5895
Dry to Touch: 12 hours
Dry to Handle: 12 hours
Dry to Recoat: 12-24 hours

Application Data

Substrate: Concrete floors or walls
Substrate Preparation: Track blast or acid etch and rinse well to neutralize. Use a rotary wire brush, grinder or brush blast for walls. A profile equivalent to 80 grit sandpaper is required.
Basecoat: Not applicable
Application Method: Airless Spray: Equipment capable of maintaining a minimum of 1500-2500 psi at the tip without surge. 0.013" (0.33 mm) to 0.017" (0.43 mm) orifice.
May be applied by brush or roller application.
Refer to Application Guide APG-6 for additional information.
Parts Base by Volume: 3 parts KL5129
Parts Catalyst by Volume: 2 parts KL5129B
Thinner Code & Percent: Not recommended
Digestion Time: None required
Pot Life: 45 minutes at 77°F (25°C)
Wet Film Per Coat (mils): 2.1-4.2 mils
Dry Film Per Coat (mils): 2.0-4.0 mils
Coverage Sq. Ft./Ga. @ 1 mil: 1524
Clean Up Solvent: KL3700
Mixing Instructions: Add KL5129B to KL5129. Thoroughly drain curing agent from its container to insure proper mix ratio. Agitate thoroughly. Scrape sides. No digestion is required.

The statement and methods presented in this bulletin are based upon the best available data and practices known to PPG/Keeler & Long at the present time. They are not representations or warranties of performance, results or comprehensiveness of such data. Since PPG/Keeler & Long is constantly improving its coatings and paint formulas, future technical data may vary somewhat from what was available when this bulletin was printed. Contact your PPG/Keeler & Long Sales Representative for the most up-to-date information.



 PPG High Performance Coatings

Keeler & Long/PPG
856 Echo Lake Road
Watertown, CT 06795
1-800-238-8596

Kolor-Poxy™
Primer/Sealer
KL5129/KL5129B

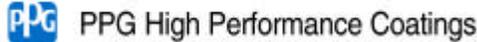
Additional Information: Apply only when air, product and surface temperatures are between 50°F (10°C) and 85°F (29°C) and surface temperature is at least 5°F (3°C) above the dew point.

Read all label and Material Safety Data Sheet (MSDS) information prior to use. MSDS are available by calling 1-800-238-8596.

The statement and methods presented in this bulletin are based upon the best available data and practices known to PPG/Keeler & Long at the present time. They are not representations or warranties of performance, results or comprehensiveness of such data. Since PPG/Keeler & Long is constantly improving its coatings and paint formulas, future technical data may vary somewhat from what was available when this bulletin was printed. Contact your PPG/Keeler & Long Sales Representative for the most up-to-date information.



Keeler & Long/PPG
856 Echo Lake Road
Watertown, CT 06795
1-800-238-8596



Kolor-Poxy™ Self Leveling Floor Coating KL5500/KL5500B

Product Information

Product Code: KL5500/KL5500B
Product: Epoxy-Amine
Suggested Use: A self leveling coating for use on interior floors, steel decking or embeds where a smooth, high gloss durable surface is required.
Not Recommended: Exterior service. Consult Technical Services for recommendation where splash and spillage of strong acids is present.

Product Description

Color: Various
Gloss 60°: 85 minimum
Weight/Gallon: 11.7 +/- 0.5 lbs./gal. (mixed) *
In Service Heat Limitations: 200°F (93°C) maximum, dry heat
Flash Point: 150°F (66°C)
Package: KL5500 - five gallon pail filled at 2.72 gallons (10.3 liters).
KL5500B - two gallon pail filled at 1.28 gallons (4.84 liters).
Percent Solids by Volume: 100.0 +/- 3.0% (mixed, calculated)
Percent Solids by Weight: 100.0 +/- 3.0% (mixed, applied and air dried)
VOC, Air Dried (g/l): 0 (mixed)
VOC, EPA 24 (g/l): 85 (mixed)

Drying Schedule

Air Dry @ 77°F (25°C) ASTM D5895
Dry to Touch: 5 hours
Dry to Recoat: 12 hours
Light Traffic: 24 hours
Heavy Traffic: 72 hours

Application Data

Substrate: Concrete floors , steel decking, embeds
Substrate Preparation: Sealed, dry, clean and free of contamination.
Basecoat: Kolor-Poxy™ Clear Sealer, Kolor-Poxy™ Primer/Sealer, Kolor-Poxy™ Primers and Enamels.
Application Method: Apply using a squeegee or notched steel trowel to desired film thickness. After 5-10 minutes, roll with a porcupine roller in a crosshatch manner to release entrapped air and assist in leveling. Refer to Application Guide APG-6 for additional information.
Parts Base by Volume: 2.125 parts KL5500
Parts Catalyst by Volume: 1 part KL5500B
Thinner Code & Percent: Not recommended.
Digestion Time: Not required.
Pot Life: 20 minutes at 77°F (25°C)
Wet Film Per Coat (mils): 34.0-122.0 mils
Dry Film Per Coat (mils): 34.0-122.0 mils
Coverage Sq. Ft./Ga. @ 1 mil: 1604
Clean Up Solvent: KL3700
Mixing Instructions: Mechanically agitate KL5500 before blending. Add KL5500B to KL5500. Mechanically agitate for 2 minutes. Pour mixed coating into a clean pail, scrape sides of the original pail and agitate for an additional 30 seconds. No digestion is required.

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 PPG High Performance Coatings

Keeler & Long/PPG
856 Echo Lake Road
Watertown, CT 06795
1-800-238-8596

Kolor-Poxy™ Self Leveling Floor Coating KL5500/KL5500B

Additional Information: Apply only when air, product and surface temperatures are between 65°F (18°C) and 85°F (29°C) and surface temperature is at least 5°F (3°C) above the dew point. Consult Technical Service if temperature is out of the recommended application range.

Store materials at temperatures between 50°F (10°C) and 85°F (29°C).

Read all label and Material Safety Data Sheet (MSDS) information prior to use. MSDS are available by calling 1-800-238-8596.

*Values are calculated for KL5500 White mixed with KL5500B. Values may vary with color.

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RLP 2378 +

THIOLKOL

Chemical Resistant Elastomeric Liner

Product Specifications & Technical Data

Description

RLP 2378 + is a highly elastomeric two-component polysulfide based coating that is rugged and flexible. It can be applied to concrete and steel as a coating or spray applied over a geotextile fabric for use as a liner over earthen substrates. When cured, RLP 2378 + creates a seamless, custom fitting, impermeable membrane to act as secondary containment for water, oil, fuels or other chemical solutions.

Benefits

- 100 % Solids-Contains no VOC's
- Resistant to broad range of fuels and chemicals
- Maintains elasticity at very low temperatures
- Resistant to U.V. degradation
- Excellent crack bridging capabilities

Recommended Uses

The RLP 2378 + is an excellent concrete coating in both primary and secondary containment applications needing an impermeable membrane. When applied over fabric it is used in applications where secondary containment is needed around above-ground storage tanks located within an earthen dike system. It can also be used with fabric over contaminated or deteriorated concrete where direct adhesion of a coating is not possible.

Precautions

Always use protective clothing, gloves and goggles consistent with OSHA regulations during use. Avoid eye and skin contact. Do not ingest or inhale. Refer to Material Safety Data Sheet for detailed safety precautions.

Standard Colors

Gray, Black

Typical Properties

Tensile Strength (ASTM D-638)	300 psi
Elongation (ASTM D-638)	250%
Hardness (ASTM D-2240)	60-65
Conical Mandrel Bend (ASTMD-522)	@ -20 °F
Pot Life	30 mins
Cure Time @ 77° F	Foot Traffic 16 hours
Full Service	7 days

The data shown above reflects typical results based on laboratory testing under controlled conditions. Reasonable variations from the data shown above may result.

Packaging/Coverage

4.5 Gallon Unit

Typical Application:

Primer: 300EX @ 5-7 mils
Basecoat: RLP 2378 + @ 20 mils
Topcoat: RLP 2378 + @ 20 mils

Coverage:

80 square feet per gallon @ 20 mils

Limitations

RLP 2378 + is not designed for vehicular traffic.

Do not apply in temperatures less than 50°F or greater than 95°F. (material cures slower at cooler temperatures and working time will be substantially reduced at higher temperatures). Both components should be stored in a dry place at temperatures between 65 and 80°F. Do not apply to slabs on grade unless a heavy unruptured vapor barrier has been installed under the slab. Confirm product performance in specific chemical environment prior to use. Substrate temperature must be at least 5°F above the dew point.

Surface Preparation

Concrete

Apply only to clean, dry and sound concrete substrates that are free of all coatings, sealers, curing compounds, oils, greases or any other contaminants.

New concrete should be cured a minimum of 28 days. Concrete that has been contaminated with chemicals or other foreign matter must be neutralized or removed. Remove any laitance or weak surface layers. Concrete should have a minimum surface tensile strength of at least 300 PSI., as verified by an elcometer test. Surface profile shall be CSP-3 to CSP-5 meeting ICRI (International Concrete Repair Institute) standard guideline #03732 for coating concrete, producing a profile equal to 60-grit sandpaper or coarser. Prepare surface by mechanical means to achieve this desired profile. Moisture vapor transmission should be 3 lbs. or less as confirmed through a calcium chloride test or other quantitative testing methods. All surface irregularities, cracks, expansion joints and control joints should be properly addressed prior to application. Outgassing may occur due to the porosity of some concrete surfaces. To reduce the effect of outgassing, the primer and coating should be applied when the temperature of the concrete substrate is dropping. This usually occurs in the evening, however, the concrete substrate temperature should be measured with a surface thermometer for verification. Double priming will greatly reduce the effects of outgassing by additionally filling the pores in the concrete. Refer to PolySpec Surface Preparation Guidelines for more details.

Installation Procedures

1. For concrete surfaces or steel, apply PolySpec 300EX Primer by roller. *See data sheet for application details.*
2. Component A Resin should be premixed prior to using due to possible pigment settling that may occur during transportation and storage.
3. (For batch mixing) Pour Component B Hardener into Component A Resin pail. Mix well using a mechanical jiffy type-mixer operated at low speed until a consistent color is attained. Scrape container sides to ensure a proper blend.
4. The recommended method of applying the RLP 2378 + coating is with plural component airless spray equipment. Equipment must be capable of heating both components of RLP 2378 + to 90-100°F to improve atomization properties. Application by squeegee, roller and brush are also suitable methods.

5. Minimum recoat time is 2 hours and maximum recoat time in 72 hours at normal temperatures. If coating exceeds this time period, contact PolySpec for assistance.

6. For best results, clean tools and equipment with PolySpec All Purpose Cleaner, a non-flammable and non-evaporating cleaner. Always wear gloves when using this product.

Refer to RLP 2378 + detailed application guidelines for information on fabric liner applications, spray equipment and application details.

Warranty Information

PolySpec, L.P. warrants its products to be free from defects in material and workmanship. PolySpec's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at PolySpec's option, to either replacement of products not conforming to this warranty or credit to Buyer's account in the invoiced amount of the nonconforming products. Any claim under this Warranty must be made by Buyer to PolySpec in writing within five days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify PolySpec of such nonconformance as required herein shall bar Buyer from recovery under this warranty.

PolySpec makes no other warranties concerning this product. No other warranties, either expressed or implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall PolySpec be liable for consequential or incidental damages.

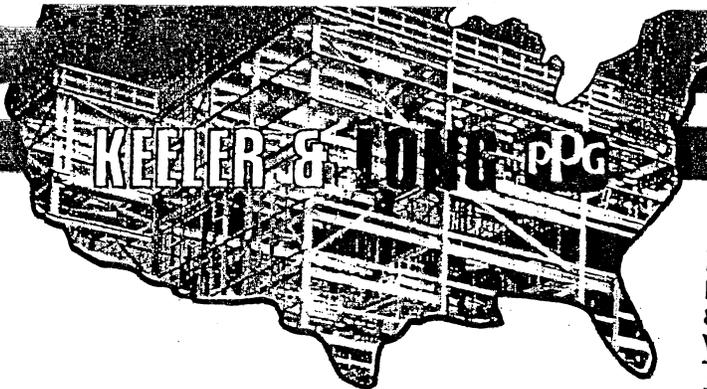
Any recommendation or suggestion relating to the use of the products made by PolySpec, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for the Buyer to satisfy itself of the suitability of the products for its own particular use, and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results. PolySpec cannot guarantee that color will conform to sample, if provided.

Rev. 06/03

Doc. 0712 THIOKOL® RLP 2378 + Chemical Resistant Elastomeric Liner

*Thiokol is a registered trademark of Toray Thiokol Co., Ltd.

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HEADQUARTERS:
 P. O. Box 460
 856 Echo Lake Road
 Watertown, CT 06795
 Tel (860) 274-6701
 Fax (860) 274-5857

KOLOR-QUARTZ SEAMLESS FLOOR COATING No. 7700

GENERIC TYPE: EPOXY/AMINE

PRODUCT DESCRIPTION: A two component, high solids epoxy, formulated to develop a seamless floor coating that will provide a protective, easy-to-clean surface. Available in smooth and non-skid finishes.

RECOMMENDED USES: For areas where an aesthetically pleasing, durable floor coating is desired, such as kitchens, restrooms, shower rooms, cleanrooms, traffic areas, showrooms.

NOT RECOMMENDED FOR: Splash and spillage of strong acids*; immersion service.

COMPATIBLE UNDERCOATS: Kolor-Poxy Primer/Sealer
 Kolor-Poxy Primers
 Kolor-Poxy Clear Sealer
 Kolor-Poxy Self-Leveling Floor Coating*

* Must be applied within a 15-30 hour recoat window or abraded prior to application of Kolor-Quartz.

PRODUCT CHARACTERISTICS:

Solids by Volume:	98% ± 1%
Solids by Weight:	97% ± 1%
Recommended	
Dry Film Thickness:	8.0 - 20.0 mils
Theoretical Coverage:	100 Sq. Ft./Gallon @ 16.0 mils DFT
Finish:	Non-Skid Gloss
Available Colors:	White, Black, Red, Blue, Green, Gray (Other colors/combinations available)
Drying Time @ 72°F	
To Touch:	6 Hours
To Recoat:	15-20 Hours
VOC Content:	0.3 Pounds/Gallon 34 Grams/Liter

* For specific recommendation, please call Keeler & Long Technical Department

December, 1994

TECHNICAL BULLETIN

TECHNICAL DATA

PHYSICAL DATA:	Weight per gallon:	8.9 ± 0.2 (pounds)
	Flash Point (Pensky-Martens):	>110°F
	Shelf Life:	2 Years
	Pot Life @ 72°F:	15-20 Minutes
	Temperature Resistance:	200°F
	Viscosity @ 77°F:	85 ± 5
	Gloss (60° meter):	
	Non-Skid	<10
	Storage Temperature:	50 - 85°F
	Mixing Ratio (Approx. by Volume):	1.69:1

APPLICATION DATA:	Application Procedure Guide:	APG-6
	Wet Film Thickness Range:	8.0 - 20.0 mils
	Dry Film Thickness Range:	8.0 - 20.0 mils
	Temperature Range:	65 - 85°F*
	Relative Humidity:	85% Maximum
	Substrate Temperature:	Dew Point + 5°F
	Minimum Surface Preparation:	Sealed; Clean, Dry, No Contaminants
	Induction Time @ 72°F:	None
	Recommended Solvent	No. 3700

*If applied at temperatures out of the specified range, consult Keeler & Long Technical Department.

Application Method

Mix parts A&B with a paint stirrer until streak free. Improper mixing will result in an uncured product. Pour entire contents into a clean container.

Use a notched squeegee or fine-nap or mohair roller to roll out the coating. Spread at a rate of 75-200 sq. ft. per gallon.

Let coating self-level for 2 - 3 minutes then "seed" or "broadcast" desired aggregate into the wet coating. Continue until the surface is saturated and no shiny areas are visible.

Roll out using a napless or foam roller. Do not use pressure on the roller. This step is to insure the aggregate is "bedded down" uniformly.

Allow to cure for 15-20 hours. Sweep off any loose aggregate and apply a glaze coat of No. 7700 (Clear) to the surface. Thinning may be required depending on temperature (up to 1 pint/gallon). Additional coats may be required to achieve desired appearance.

KEELER & LONG PPG

P. O. Box 460, 856 Echo Lake Road
Watertown, CT 06795
Tel: (860) 274-6701 Fax: (860) 274-5857



This information is presented as accurate and correct, in good faith, to assist the user in specification and application. No warranty is expressed or implied. No liability is assumed. Product specifications are subject to change without notice. Data listed above is for white or base color of the product. Data for other colors may differ. INDUSTRIAL AFFILIATE

APPENDIX XV**BOX LINE DRAWINGS and Exhibits**

Item Number	Description	Drawing Number	Revision Number	PE Certification Date	Revision Approval Date
1	Second Floor – NE Quadrant General Arrangement	53-0208	07	06/28/06	06/29/06
2	Second Floor – SE Quadrant General Arrangement	53-0209	09	04/14/11	04/13/11
3	Carbon Dioxide Discharge Pipe Network Isometric	BNF6599-3	02	None	10/31/2013
4	Brokk Fire Suppression Nozzle Assembly	XV-1	00	Not Applicable	Not Applicable

Appendix XV
AMWTP Box Line Drawings
(Items 1 - 2)

These large, fold-out drawing are not available in electronic form; however, hard copies can be requested from the Idaho Department of Environmental Quality

APPENDIX XVI**BOX LINE MECHANICAL DATA SHEETS**

MDS Number	Description
DP340201	Box Line Portable Sump Pump
DQ340201	Box Line Overhead Power Manipulator
DQ340202	Master Slave Manipulator
DQ340240	Box Tipping Carriage w/Integral Clamping Frame
DQ340206	Box Line Waste Handling Crane
DQ340225	Floor Mounted Hydraulic Manipulator
DQ340220	Guillotine
DQ330221	Filter Crushing Machine
DZ340335	Waste Pre-Compaction Mechanism
DZ340203	Waste Export Table
DZ340322	Waste Size Reduction Area
DZ340324	Waste Export Table (West)
DZ320227	Variable Geometry Doors
DM-320-200	Box Opening Gantry System
W-345-011	Drum Lidding Equipment

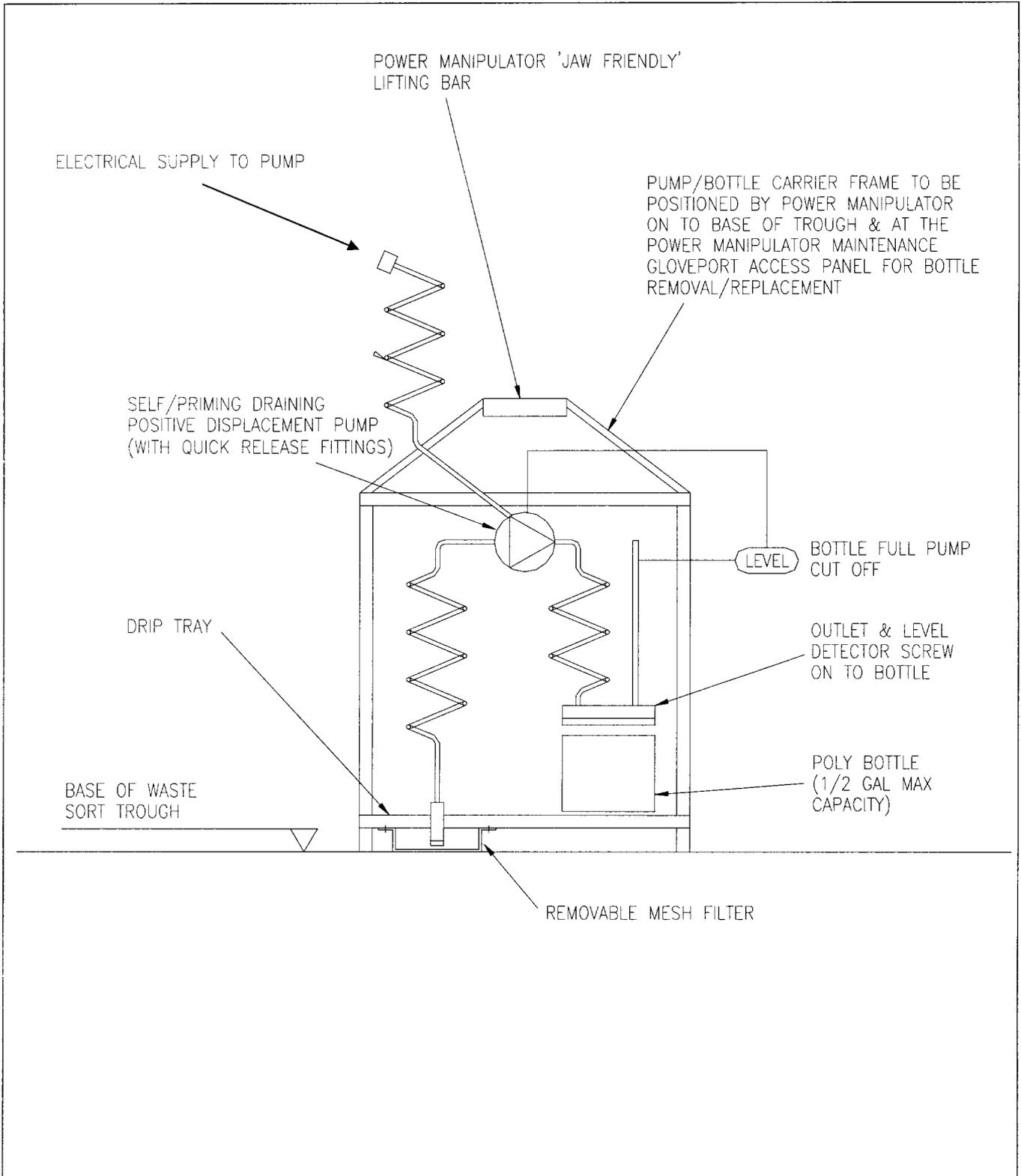


Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DP340201
Project No.:	K0105C	Area:	North & South Box Lines	No. Installed:	4 (1+3 spares) in each Box Line.
PI No.:	P-340-201 & P-330-201	Category:	UBC PC 2	% Duty:	On Demand
Description:	Box Line Portable Sump Pump	System No.:	330 & 340		
Function:	To remove liquids from the waste sort troughs in North & South Box Line Cells				
SUMMARY DATA		UNITS			
Maximum Duty		hp	1/3		
Design Life		year	15		
Failure on Demand		-	0.13%		
Design Capacity (Operating Cycles)		per 24 hour	20 (max.)		
Cycle Time (To fill one bottle)		second	90		
Minimum Design Pressure		in. wg	-0.8 (in cell depression)		
Maximum Design Pressure		in. wg	0		
Minimum Design Temperature		°F	60		
Maximum Design Temperature		°F	95		
Length		in.	24" (approx)		
Width		in.	18" (approx)		
Height		in.	38" (approx)		
Maximum Design Capacity		US gal/min	.35 against 13' head		
Estimated Weight		lb	150		
Materials and Construction	Stainless steel with polypropylene pipe work and fittings where appropriate.				
Maintenance	The equipment will be a low cost commercial pump unit and will be disposed of as secondary waste and replaced on breakdown. It will be fitted with quick release couplings and electrical plug and sockets to allow easy 'hands on' replacement through gloveports or by maintenance personnel in PPE.				
<p>Description: The pumps, each with an empty bottle, will be picked up by the power manipulator and placed on the floor of the trough to suck up any free liquids. The pump will be operated remotely by a pushbutton. The pump will be stopped automatically on detection of the bottle being full of liquid. When the trough is empty or the bottle full, the unit will be transferred by the power manipulator to the power manipulator maintenance gloveport access panel, where the bottle will be disconnected from the unit, lidded and a new bottle fitted. The bottle will be sent to the SCW facility for analysis/processing via a drum from the SCW export station. Pumps will either be disposable or reusable. Should pumps be reused, color-coding of the pump will signify compatible waste streams.</p>					
Inputs:	Alpha contaminated liquids, generally water-based, specific gravity 0.95 to 1.05				
Outputs:	As above				
Interfaces:	Pipework & fittings, power manipulator				
Operating Environment:	Zone 3 – Pump/Pipework to suit alpha contaminated liquids				
Services:	Electricity (Power & Control)				

10/27/3	02	<i>M. Gray</i>	<i>Richard Beh</i>	<i>P. Keattala</i>	Update for permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Evans	For permit
11/10/00	00	K Parkinson	E. Calvert	D. Evans	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Box Line Portable Sump Pump	Site: Idaho Falls	Data Sheet No.: DP340201
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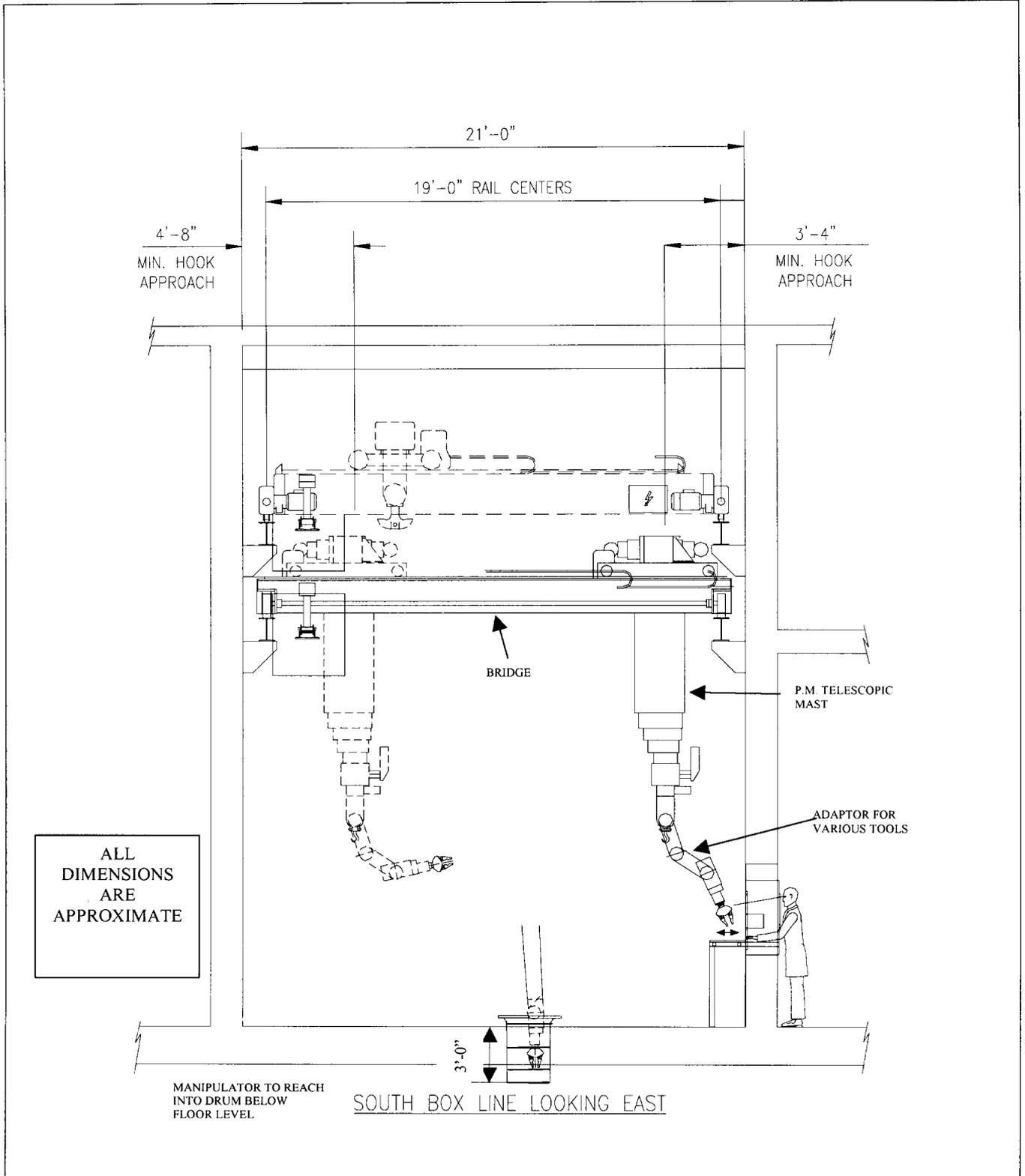




Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DQ340201
Project No.:	K0105C	Area:	North & South Box Line	No. Installed:	2
PI No.:	Q-340-201 & Q-330-201	Category:	UBC PC 2	% Duty:	On Demand
Description:	Box Line Overhead Power Manipulator	System No.:	340		
Function:	To assist in solid waste sorting operations, cell equipment maintenance, clean-up operations				
SUMMARY DATA		UNITS			
Maximum Duty		hp	8		
Design Life		year	15		
Failure on Demand		-	0.2%		
Design Capacity (Operating Cycles)		lifts/day	20 At or near maximum load capacity.		
Minimum Design Pressure		in. wg	-0.8 (in cell depression)		
Maximum Design Pressure		in. wg	0		
Minimum Design Temperature		°F	66		
Maximum Design Temperature		°F	95		
Long Travel Speed		ft/min	0 to 25		
Cross Travel Speed		ft/min	0 to 25		
Lift Speed		ft/min	0 to 13		
Mast Rotation Speed		RPM	0 to 1		
Maximum Vertical Lifting Capacity (Auxiliary Hook)		lb	4000 (Safe Working load)		
Degrees of Freedom		-	6 + Grip		
Manipulator Reach		in.	65		
Estimated Weight		lb	10,000		
Materials and Construction	Stainless steel and painted carbon steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement. The equipment shall be fitted with a retrieval system allowing the manipulator to be returned to the maintenance area above the in-cell sub-change room. Items will be replaced/maintained with the assistance of a maintenance hoist, in-cell cranes and a maintenance platform.				
Description:	<p>The manipulator will be an electro-mechanical type, used to sort and handle mixed contaminated waste, assist with maintenance of other in-cell equipment and assist with in-cell clean-up operations. The manipulator shall be attached to a telescopic mast, suspended from a hoist and trolley unit mounted on a travelling bridge. A manipulator jaw shall be provided for remote attachment and used to manipulate waste. 30, 55, & 83 gallon drum grabs, petal grab, lid lever tool, nibbler & a powered nut runner will be provided for remote attachment to mast after arm has been removed. A soft jaw module will also be provided. A hook shall be located on the base of the mast. All joints shall be sealed against the ingress of fluid or dust. The Power Manipulator duties include:</p> <p>1) Removal of box lids, 2) Obtaining grab samples, 3) Cleaning the cell, 4) Assistance in maintenance activities, 5) General waste transfers, and 6) Used at Off Line Box Processing Station.</p>				
Inputs:	None				
Outputs:	None				
Interfaces:	All equipment within the cell				
Operating Environment:	Zone 3, dry, alpha contaminated and dusty				
Services:	Electricity (Power & Control), pneumatic supply (80 psig ± 5%)				
10/27/03	02	M. Gray	E. Calvert	P. Kuttner	For permit
01/12/01	01	M. Green	E. Calvert	D. Evans	Update for permit CCR
11/10/00	00	K. Parkinson	E. Calvert	D. Evans	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

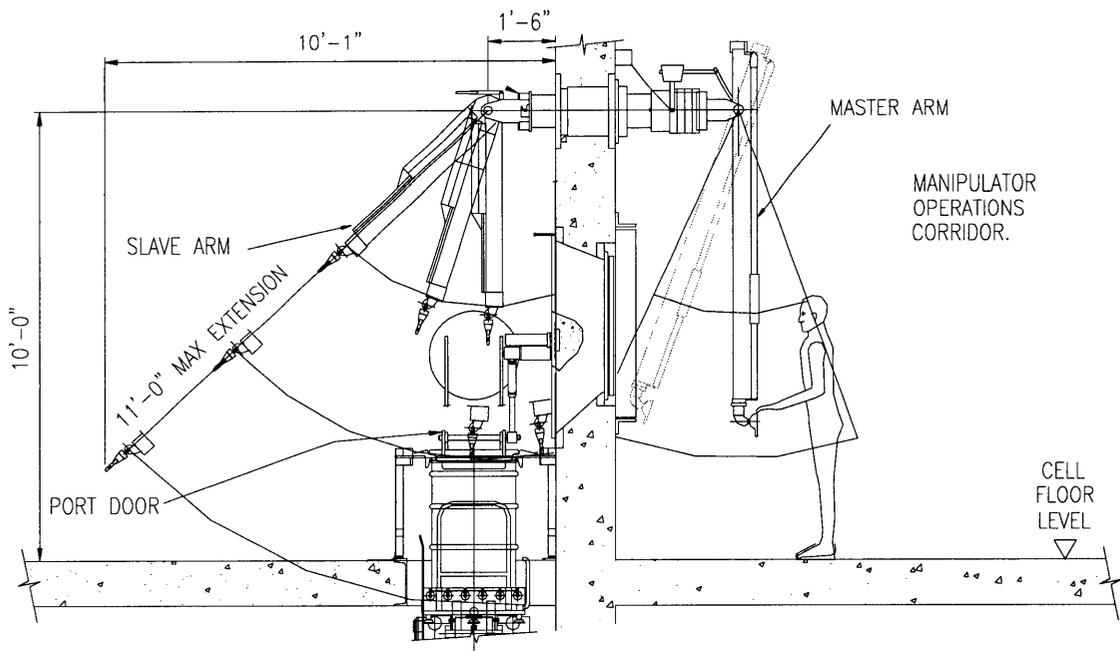
Description: Box Line Power Manipulator	Site: Idaho Falls	Data Sheet No.: DQ340201
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Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DQ340202
Project No.:	K0105C	Area:	North & South Box Lines	No. Installed:	Up to 6
PI No.:	Q-330-202 (1 off) and Q-340-202 (5 off)	Category:	UBC PC 2	% Duty:	On Demand
Description:	Master Slave Manipulator		System No.:	330 & 340	
Function:	To assist in North & South Box Line solid waste sorting operations.				
SUMMARY DATA		UNITS			
Maximum Duty		hp	1/3		
Design Life		year	15 minimum		
Failure on Demand		-	0.5%		
Manipulator Operating Time		hours per day	7.5 (max)		
Minimum Design Pressure		in. wg	-0.8 (in cell depression)		
Maximum Design Pressure		in. wg	0		
Minimum Design Temperature		°F	66		
Maximum Design Temperature		°F	95		
Design Capacity (Lifting)		lb	45 (max)		
Dimensions		ft & in.	See sheet 2.		
Degrees of Freedom		-	6 +Grip		
Estimated Weight		lb	150		
Materials and Construction	Stainless steel, Aluminium & Carbon Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement. A crane or power manipulator will be provided to aid removal and transfer to a trolley. Major maintenance of the 'in-cell' part of the MSM will be carried out in a remote Hot Maintenance Workshop.				
<p>Description:</p> <p>The MSMs are to be commercial units consisting of a master arm, slave arm and a standard length through wall tube assembly, installed in a wall liner and suitably sealed for an alpha environment. They will be used to carry out production and selected maintenance tasks, which, but for the hazardous nature of the waste would normally be carried out 'hands on.' The manipulator will also be used in conjunction with other waste handling equipment in waste sorting operations. Duties will include sorting and placing waste into containers, handling general purpose cutting and area 'clean up' tools, etc. The MSMs are to have a remote slave arm removal feature to allow the slave arm to be disconnected using a crane or power manipulator. The MSM shall be manually operated from an adjacent control station outside of the cavern with the operator viewing through windows and CCTV cameras. All motions shall be achieved mechanically; only the telescopic arm will be electrically operated.</p> <p>Slave arms will be transferred within the Zone 3 area to the Hot Maintenance Cell for repair. Repaired and tested units will be returned in the opposite direction.</p>					
Inputs:	Waste items				
Outputs:	Waste items				
Interfaces:	Export ports, troughs and cutting and 'clean up' tools				
Operating Environment:	Zone 3, dry, alpha contaminated				
Services:	Electricity (Power & Control)				

5/17/04	04	T. Kelly			For CCR
10/27/03	03	M. Gray	Richard Beck	P. Leatherbarrow	Update For permit - CCR
07/12/01	02	J. Hembree	P. Buckley	G. Daniel	For permit
01/12/01	01	M. Green	E. Calvert	D. Evans	For permit
11/10/00	00	K. Parkinson	E. Calvert	D. Evans	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Master Slave Manipulator	Site: Idaho Falls	Data Sheet No.: DQ340202
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TYPICAL SECTIONAL THROUGH CELL WALL

(ALL DIMENSIONS APPROXIMATE)

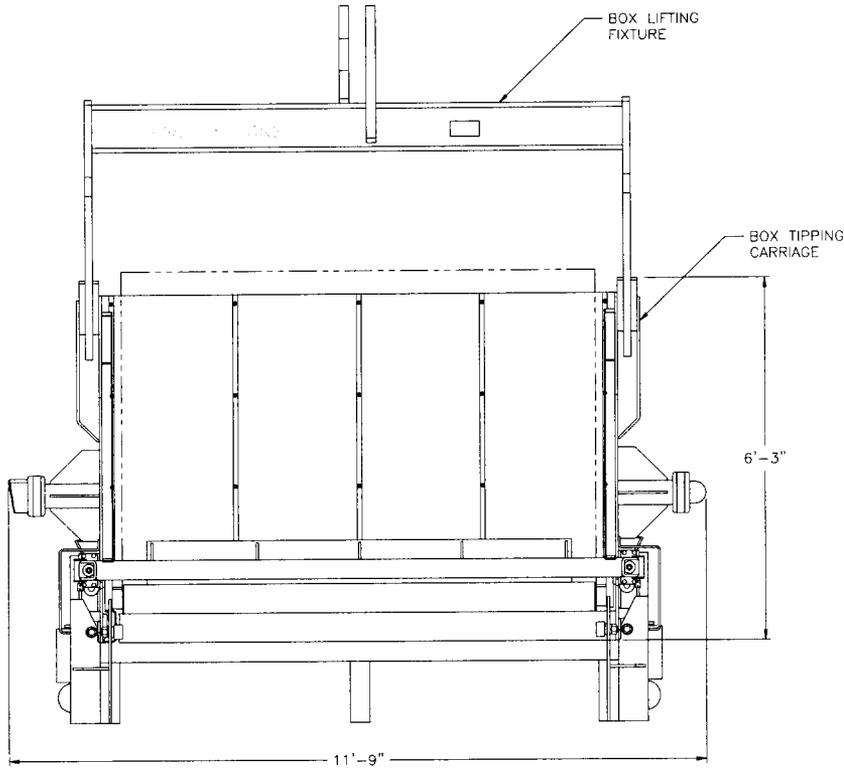


Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DQ340240
Project No.:	K0105C	Area:	North & South Box Lines	No. Installed:	2 of each P.I.
PI No.:	Q-340-240 & Q-330-240	Category:	UBC PC 2	% Duty:	On Demand
Description:	Box Tipping Carriage W/ Integral clamping frame	System No.:	330 & 340		
Function:	To clamp a de-lidded box in the Tipping Carriage & using Waste Handling Crane, lift, transfer & tip, assisted by Tipping Yokes, the waste into the designated Waste Sort Trough.				
SUMMARY DATA		UNITS			
Maximum duty	hp	10 HP Power pack for tipping yokes, 1 HP for clamping frame			
Design Life	year	15			
Failure on Demand	-	0.07%			
Design Capacity (Operating Cycles)	per 24 hour	6 (max)			
Clamp Open/Close Cycle Time	second	120			
Minimum Design Pressure	in. wg	-0.8 (in cell depression)			
Maximum Design Pressure	in. wg	0			
Minimum Design Temperature	°F	66			
Maximum Design Temperature	°F	95			
Dimensions	ft & in.	See Sheet 2			
Estimated Weight	lb	5800 (Actual)			
Materials and Construction	Stainless steel and painted carbon steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement.				
<p>Description:</p> <p>Tipping carriages are located, in each of the Box Line cells. With a de-lidded box in position within the Tipping Carriage, the actuators power a clamp beam, securing the box within the carriage. The Waste Handling Crane (e.g.; Q-340-206) using its Ramshorn Hook and a lifting fixture will lift the Tipping Carriage and travel to the motorized tipping yokes. By rotating the Tipping Carriage, the carriage & de-lidded box are tipped such that the contents of the box are transferred into the Waste Sort Trough. The empty box & Carriage is raised clear and returned to the Box transfer conveyor. The two actuators reverse the clamp beam thus freeing the empty box for return to the Box Conveyor. The Tipping Carriage will be remotely operated from control stations outside the cavern by an operator viewing directly through windows or alternatively via a CCTV camera.</p>					
Inputs:	Boxes full with waste (maximum size 96" long x 58.5" wide x 76.5" high)				
Outputs:	Empty boxes				
Interfaces:	Box transfer conveyor, lifting fixture, tipping yokes, Waste Handling Crane				
Operating Environment:	Zone 3, dry, alpha contaminated				
Services:	Electricity (Power & Control)				

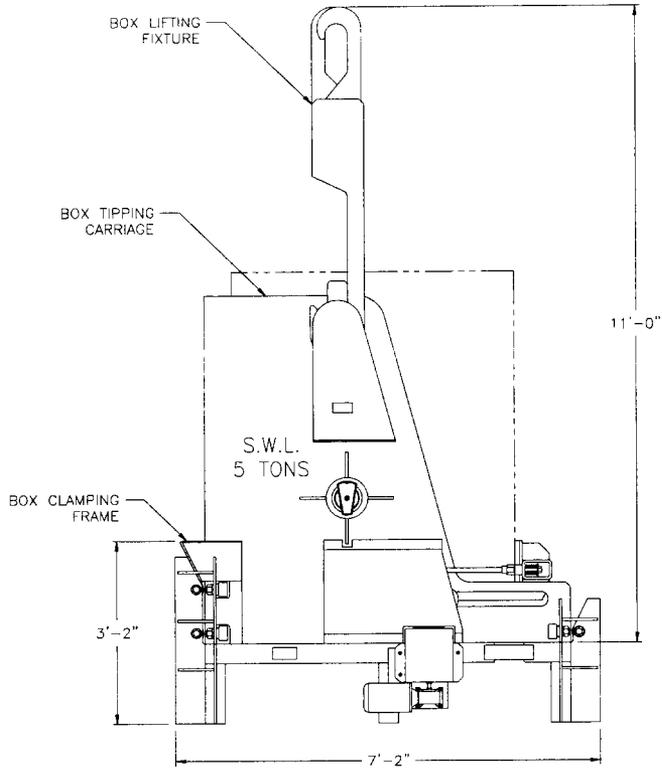
10/27/03	03	<i>M. Gray</i>	<i>Robert Park</i>	<i>P. Heatter</i>	Update for permit - CCR
07/12/01	02	J. Hembree	P. Buckley	G. Daniel	For permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Evans	For permit - CCR
11/10/00	00	K. Parkinson	E. Calvert	D. Evans	For permit - CCR
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Box Clamping Frame / Tipping Carriage	Site: Idaho Falls	Data Sheet No.: DQ340240
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TIPPING CARRIAGE AT
BOX CLAMPING STATION
(VIEW LOOKING WEST)

Description: Box Clamping Frame / Tipping Carriage	Site: Idaho Falls	Data Sheet No.: DQ340240
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TIPPING CARRIAGE AT
BOX CLAMPING STATION
(VIEW LOOKING SOUTH)



Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DQ340206
Project No.:	K0105C	Area:	North & South Box Line	No. Installed:	1
PI No.:	Q-340-206 & Q-330-206	Category:	UBC PC 2	% Duty:	On Demand
Description:	Box Line Waste Handling Crane	System No.:	330/340		

Function: To handle waste boxes (within a box transport carriage), non-standard boxes and maintenance work

SUMMARY DATA	UNITS	
Maximum Duty	hp	9
Design Life	year	15
Failure on Demand	-	0.2%
Mean Time Between Failures	hour	2000
Minimum Design Pressure	in. wg	-0.8 (in cell depression)
Maximum Design Pressure	in. wg	0
Minimum Design Temperature	°F	66
Maximum Design Temperature	°F	95
Design Capacity (Hoist SWL)	ton	7.5
Type Of Main Girder (Bridge)	-	Double
Bridge Span	-	See sheets 2 and 3
Longitudinal Travel Length	ft & in.	78' - 4"
Cross Travel Length	ft & in.	14' - 2 1/2"
Maximum Raised Hook Height	ft & in.	' - 11 5/8" to Ramshorn hook
Degrees of Freedom	-	4 with hook rotate feature
Speed - Hoist	ft/min.	5/14, 2-speed
Speed - Cross Travel	ft/min.	35/75, 2-speed
Speed - Long Travel	ft/min.	17/50, 2-speed
Estimated Weight	lb	6500

Materials and Construction Painted carbon steel

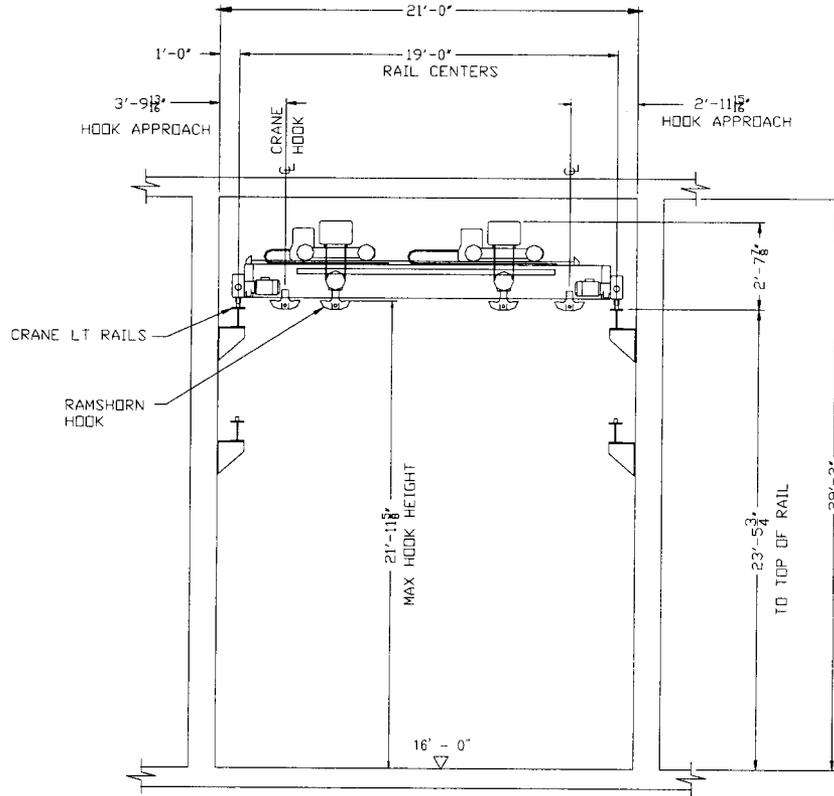
Maintenance Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement. The crane will be maintained with items replaced 'hands on' by maintenance personnel in PPE off a platform above the roof of the sub change room.

Description:
 The Waste Handling Crane, using its Ramshorn hook and lifting fixture, will lift the Tipping Carriage from the transfer conveyor and travel to the Tipping Yokes. The crane will also be used to assist in the maintenance function, it can be controlled from within the cell and its Ramshorn hook, fitted with 'D' shackle & slings will assist in lifting operations. The crane shall be electric top running double girder bridge type with an overhead cross travel trolley unit. The trolley unit shall be fitted with a single hoist, equipped with a power rotating Ramshorn type hook, which is used to lift the waste box and tipping carriage. The hoist will be operated remotely from one of a number of control stations for process operations. Cable carriers shall be provided for long and cross travel power/control cable deployment. An infrared control is to be provided for in-cell maintenance operations.

Inputs:	Waste boxes/Tipping Carriage
Outputs:	Waste boxes/Tipping Carriage
Interfaces:	Power Manipulator, MSM's and various grabs, waste boxes, tipping carriage, lifting fixture
Operating Environment:	Zone 3, dry, alpha contaminated
Services:	Electricity (Power & Control)

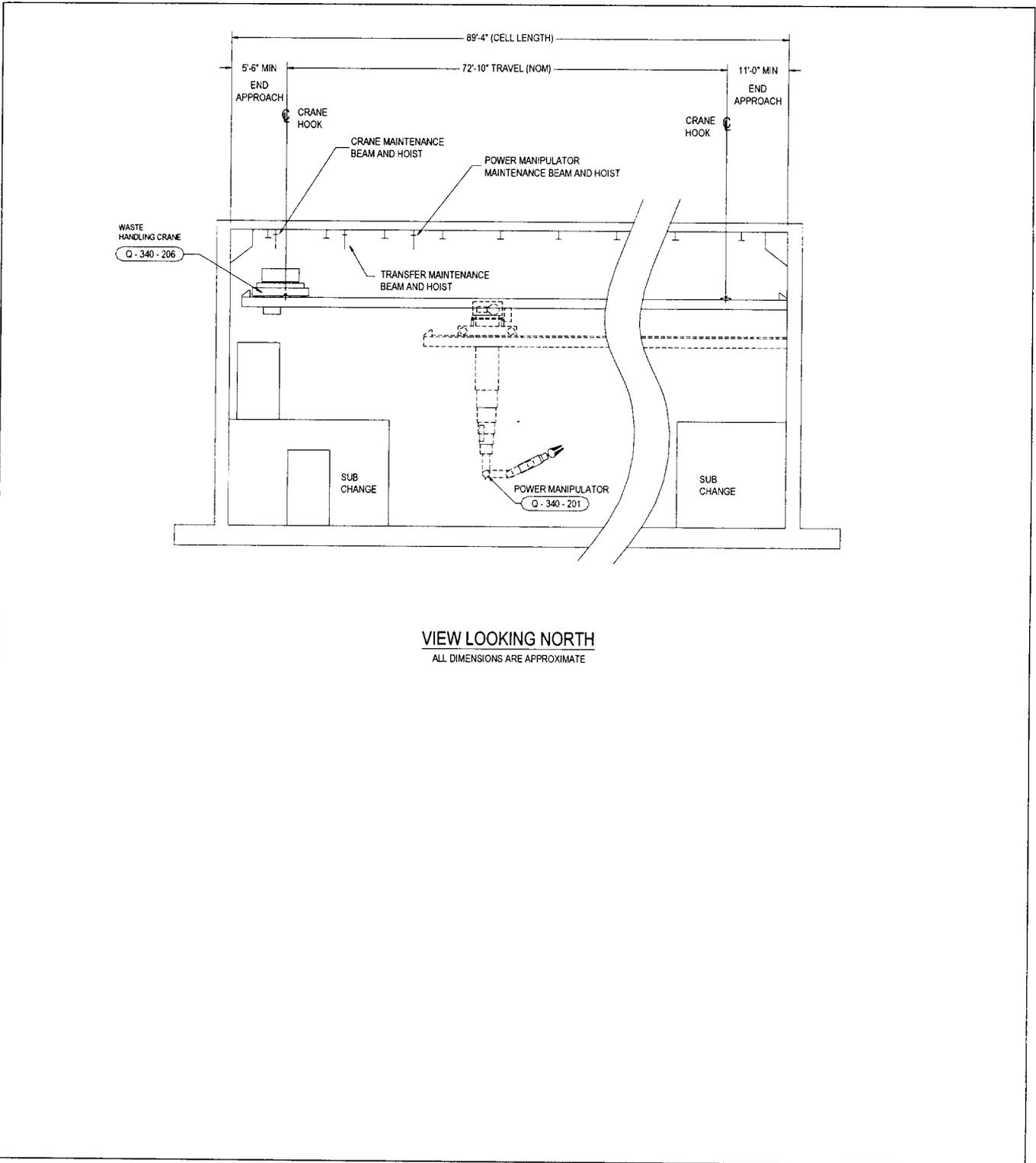
10/22/03	02	<i>M. Gray</i>	<i>E. Calvert</i>	<i>D. Evans</i>	For permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Evans	For permit
11/10/00	00	K. Parkinson	E. Calvert	D. Evans	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Box Line Waste Handling Crane	Site: Idaho Falls	Data Sheet No.: DQ340206
--------------------------------------------	-------------------	--------------------------



VIEW LOOKING EAST
ALL DIMENSIONS ARE APPROXIMATE

Description: Box Line Waste Handling Crane	Site: Idaho Falls	Data Sheet No.: DQ340206
--------------------------------------------	-------------------	--------------------------



VIEW LOOKING NORTH
ALL DIMENSIONS ARE APPROXIMATE



Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DQ340225
Project No.:	K0105C	Area:	North & South Box Lines	No. Installed:	1 in South 2 in North
PI No.:	Q-340-225 & Q-330-225/A and B	Category:	UBC PC 2	% Duty:	On Demand
Description:	Floor Mounted Hydraulic Manipulator	System No.:	330 & 340		

Function: To assist in North & South Box Line solid waste sorting and size reduction operations.

SUMMARY DATA	UNITS	
Maximum Duty	hp	40
Design Life	year	15
Failure on Demand	-	0.2%
Maximum Design Capacity	box/day	3 (Approx. 300 cubic feet)
Manipulator Operating Time	hours per day	9 (max) Note: the manipulator is on 'standby' continuously. 'Standby' is with the hydraulic pumps running for immediate operation.
Minimum Design Pressure	in. wg	-0.8 (in cell depression)
Maximum Design Pressure	in. wg	0
Minimum Design Temperature	°F	66
Maximum Design Temperature	°F	95
Design Capacity (Lifting)	lb	8360
Degrees of Freedom	-	6 + Grip
Maximum Arm Reach	ft & in.	20' - 0"
Estimated Weight	lb	6360
Materials and Construction	Painted carbon steel	
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement.	

Description:

The manipulators will be used to sort and size-reduce waste tipped into the sorting troughs in the North and South Box Line Waste Processing cells. Each manipulator will consist of a 3-part arm, a turntable/gear ring and slewing system. The arm is designed for heavy-duty handling and size reduction work. Cylinders exposed to extreme loads are to be provided with slide bearings. The power pack will be located remotely.

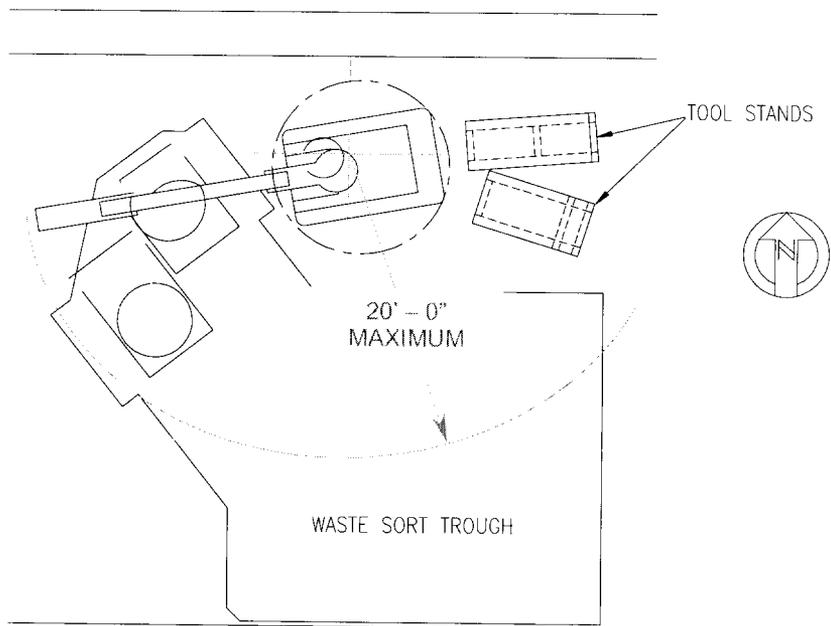
Each manipulator will be operated from an elevated control desk outside the cavern with direct viewing through a window and supplemented with CCTV cameras. The unit will be provided with remotely interchangeable tools and a storage rack. Tools deployed will include heavy-duty croppers, actuated hammers, etc. Commercial equipment to be used where available and fit for purpose.

The Floor Mounted Hydraulic Manipulator incorporates a 'quick hitch system' (a hydraulic device for gripping tools), which enables the tools to be quickly replaced remotely. Tool stands support the tools to allow the 'quick hitch system' to be used.

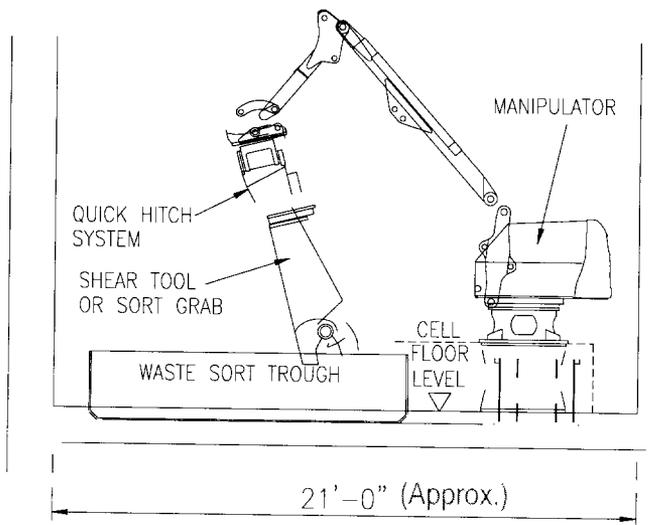
Inputs:	Waste tipped from box
Outputs:	Size reduced waste
Interfaces:	Boxes, waste sort troughs, waste, tools/tool stands
Operating Environment:	Zone 3, dry, alpha contaminated
Services:	Electricity (Power & Control)

10/17/03	02	<i>M. Gray</i>	<i>E. Calvert</i>	<i>D. Evans</i>	For permit - CCR
01/12/01	01	M Green	E. Calvert	D. Evans	For permit
11/10/00	00	K. Parkinson	E. Calvert	D. Evans	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Floor Mounted Hydraulic Manipulator	Site: Idaho Falls	Data Sheet No.: DQ340225
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PLAN VIEW



VIEW LOOKING WEST

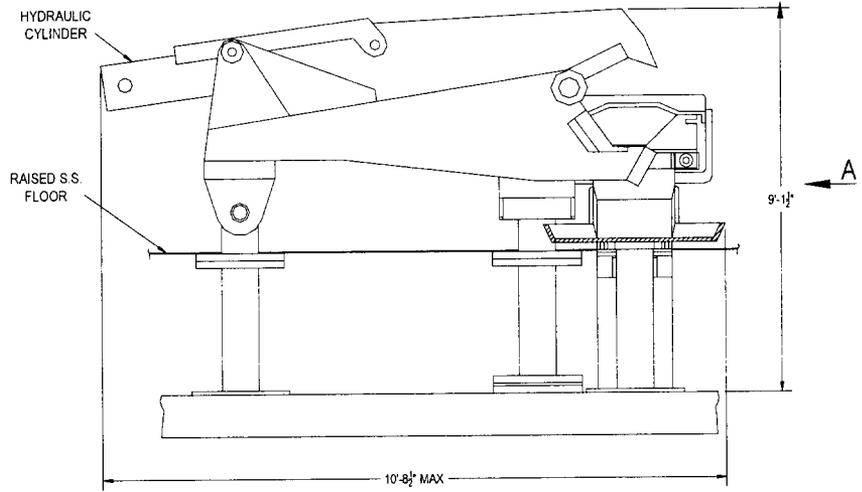


Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DQ340220
Project No.:	K0105C	Area:	South Box Line Cell	No. Installed:	1
PI No.:	Q-340-220	Category:	UBC PC 2	% Duty:	On Demand
Description:	Guillotine	System No.:	340		
Function:	To automatically size reduce long slender items to manageable lengths for transfer by MSMs into local waste export stations.				
SUMMARY DATA		UNITS			
Maximum Duty		hp	40		
Design Life		year	15		
Failure on Demand		-	0.03%		
Design Capacity (Operating Cycles)		per 24 hour	2000 (max)		
Guillotine Open/Close Cycle Time		second	10		
Minimum Design Pressure		in. wg	-0.8 (in cell depression)		
Maximum Design Pressure		in. wg	0		
Minimum Design Temperature		°F	66		
Maximum Design Temperature		°F	95		
Dimensions		-	See sheet 2		
Estimated Weight		lb	8000		
Materials and Construction	Painted carbon steel frame, stainless steel clad table				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement.				
<p>Description:</p> <p>The Guillotine is located in the South Cell within the reach of the Floor Mounted Hydraulic Manipulator (PI No Q-340-225) the overhead power manipulator (PI No. Q-340-201) & the MSMs (P.I. No. Q-340-202) which will place guillotined waste into the awaiting export drums. It will be comprised of a commercially available hydraulically powered High Force Shear Unit mounted perpendicular to a Feed Table & waste disposal chute. The Floor Mounted Manipulator will transfer the long items from the sort trough (P.I. No. Z-340-322) into the Guillotine Feed Table. With the Guillotine jaws open, the Feed Table will inch the items along utilizing an electrically driven stainless steel pushing frame to allow a pre-determined crop length. Cropped waste will fall/slide via the waste disposal chute onto a Waste Export Table (East) (P.I. No. Z-340-203) & subsequently be transferred via the power manipulator or the MSMs into 55 gal waste export drums docked below the Waste Export Table. The Guillotine will be remotely operated from control stations outside the cavern by an operator viewing directly through windows or alternatively via a CCTV camera.</p>					
Inputs:	Long slender items, e.g., tubes, bar, angle iron, cable tray/trunking, beams & columns (maximum size 10" x 5" x 8' - 0" long)				
Outputs:	Items above sized reduced to enable them to fit into a 55 gal waste export drum				
Interfaces:	MSM, floor mounted hydraulic manipulator & Overhead Power Manipulator				
Operating Environment:	Zone 3, dry, alpha contaminated				
Services:	Hydraulics for power & electricity (Power & Control)				

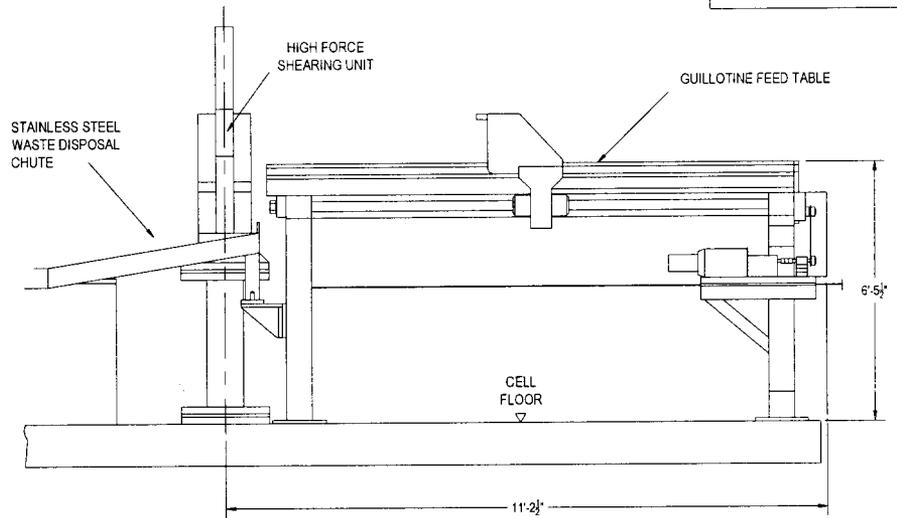
10/23/03	02	<i>M. Gray</i>	<i>Rudow Red</i>	<i>P. Headwater</i>	For permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Evans	For permit - CCR
11/10/00	00	K. Parkinson	E. Calvert	D. Evans	For permit - CCR
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Guillotine	Site: Idaho Falls	Data Sheet No.: DQ340220
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GUILLOTINE (SIDE ELEVATION)

ALL DIMENSIONS
ARE APPROXIMATE



GUILLOTINE (VIEW ON ARROW 'A')

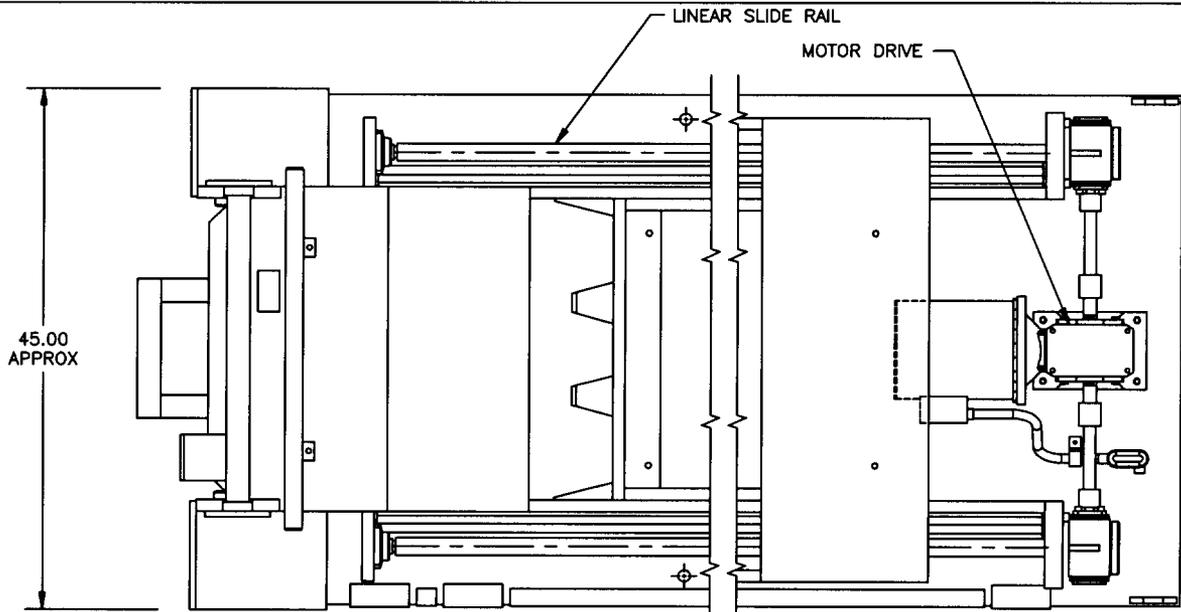


Mechanical Data Sheet

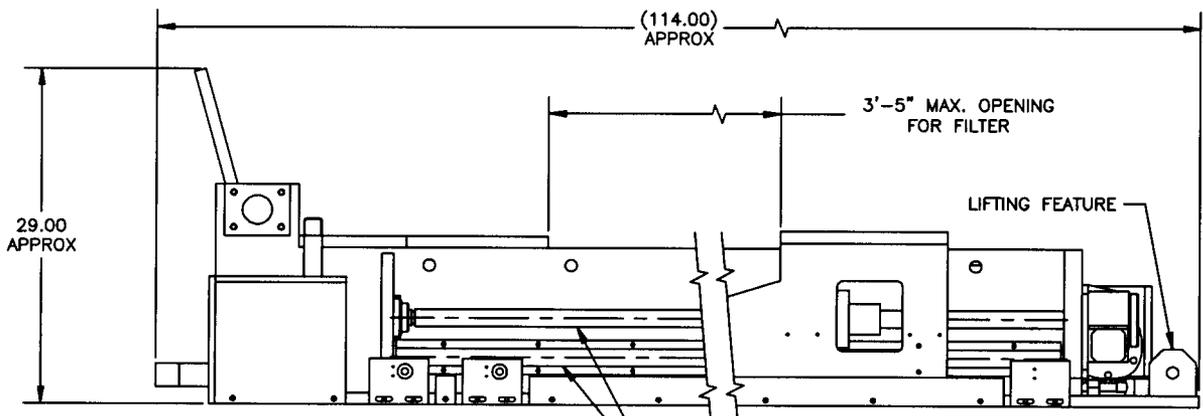
Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DQ330221
Project No.:	K0105C	Area:	North Box Line Cell	No. Installed:	1
PI No.:	Q-330-221	Category:	UBC PC 2	% Duty:	On Demand
Description:	Filter Crushing Machine		System No.:	330	
Function:	To achieve initial size reduction of HEPA (air) filters (max. size 24" x 24" x 12"), which would not otherwise fit straight into a 55 gal waste export drum.				
SUMMARY DATA		UNITS			
Maximum Duty	hp		1		
Design Life	year		15		
Failure on Demand	-		0.27%		
Design Capacity (Operating Cycles)	per 24 hour		30 Filters (max.)		
Jaw Open/Close Cycle Time	second		90		
Minimum Design Pressure	in. wg		-0.8 (in cell depression)		
Maximum Design Pressure	in. wg		0		
Minimum Design Temperature	°F		66		
Maximum Design Temperature	°F		95		
Dimensions	ft & in.		See Sheet 2		
Estimated Weight	lb		3300		
Materials and Construction	Stainless Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement.				
<p>Description:</p> <p>The filter crusher may be located in the North Box Line Cell within the reach of the Overhead Power Manipulator. The Overhead Power Manipulator will transfer the filters from one of the sort troughs into the crusher. The crushing operation will be achieved by Actuators pulling a movable jaw towards a fixed jaw with the filter situated in a cavity between them. 'Jaw Open' and 'Jaw Closed' proximity switches are to be provided. The filter crusher automatically deposits the filter into the Waste Sort Troughs.</p> <p>The Filter Crusher will be remotely operated from control stations outside the cavern by an operator viewing directly through windows or alternatively via a CCTV camera.</p> <p>The filter crusher will be used to 'break the back' of used HEPA filter cartridges in either one or two planes. It will provide the minimum size reduction necessary to allow filters to be placed into 55 gallon drums. Minimum size reduction is necessary so as not to re-suspend the filtered particulate. The filter crusher unit is removable to allow space underneath to be cleaned.</p>					
Inputs:	Mainly 24" x 24" x 12" HEPA filters and other smaller sizes that will not fit into 55 gal export drums				
Outputs:	Size reduced filters /waste suitable for transfer to 55 gallon drum				
Interfaces:	Waste sort troughs and floor mounted hydraulic manipulator & Overhead Power Manipulator				
Operating Environment:	Zone 3, dry, alpha contaminated and dusty				
Services:	Electricity (Power & Control)				

10/27/03	02	<i>M. Gray</i>	<i>E. Calvert</i>	<i>D. Evans</i>	For permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Evans	For permit
11/10/00	00	K. Parkinson	E. Calvert	D. Evans	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Filter Crushing Machine	Site: Idaho Falls	Data Sheet No.: DQ330221
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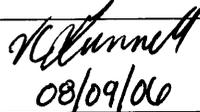
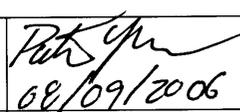


PLAN VIEW

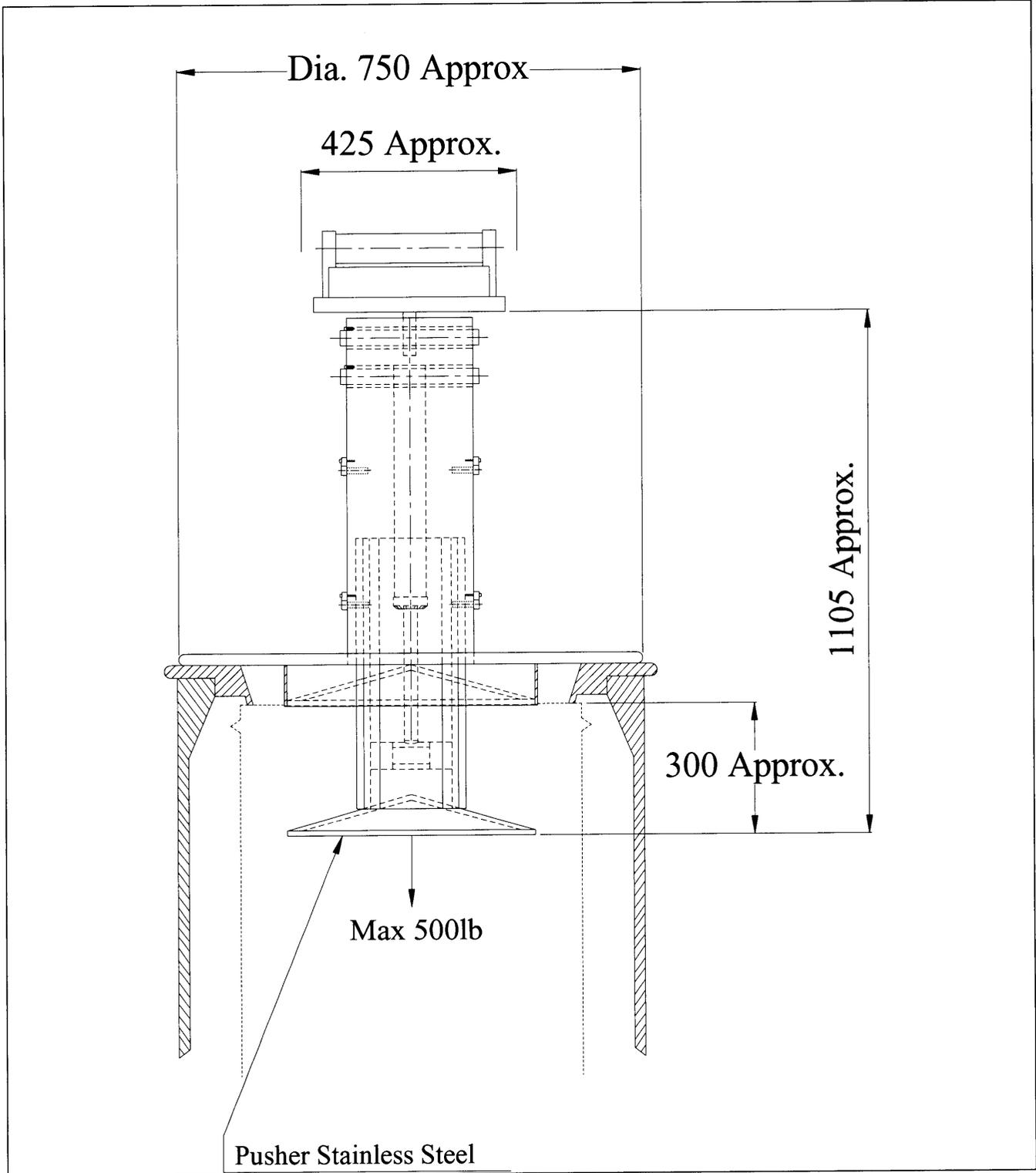


SIDE VIEW

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ340335
Project No.:	K0105C	Area:	North & South Box Lines	No. Installed:	2 (1/Box Line)
PI No.:	Z-340-335 & Z-330-335	Category:	UBC PC 2	% Duty:	On Demand
Description:	Waste Pre-Compaction Mechanism	System No.:	330 & 340		
Function:	To compress waste in a 55 gallon drum when the door fails to close due to protuberant waste.				
SUMMARY DATA		UNITS			
Maximum Duty		hp	N/A		
Design Life		year	15		
Failure on Demand		-	0.2%		
Operating Cycle (To raise & lower)		second	20		
Total Operating Time		minutes per 24 hour	10 (max)		
Design Capacity (Operating Cycles)		per 24 hour	30 (max)		
Minimum Design Pressure		in. wg	-0.8 (in cell depression)		
Maximum Design Pressure		in. wg	0		
Minimum Design Temperature		°F	60		
Maximum Design Temperature		°F	95		
Dimensions		inch	20 diameter (approx.)		
Materials and Construction	Painted Carbon Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement.				
<p>Description:</p> <p>The Drum Compaction Tool will be available for use at each port door within the North and South Box Lines. It will be picked up by the Floor Mounted Hydraulic Manipulator, transported to a port door and used to compress any soft waste preventing a port door from closing. The maximum downward force exerted shall be 500 lb. The base of the drum compaction tool may be used to move the waste inwards when compressing to minimize the risk of piercing the side of the drum. The tool may occasionally be used to increase packing efficiency of soft waste in the drum.</p>					
Inputs:	55 gallon drums with loose waste				
Outputs:	55 gallon full drums with pre-compacted waste				
Interfaces:	Floor Mounted Hydraulic Manipulator, Waste Export Ports, 55 Drums				
Operating Environment:	Zone 3, dry, alpha contaminated				
Services:	Supplied from Floor Mounted Hydraulic Manipulators (Q-330-225A & B and Q-340-225)				

08/09/06	04		 08/09/06	 08/09/2006	Incorporated hardcopy redline from rev. 03. Added AMWTP Logo.
7/10/06	03	P. Townsend	P.A. Young	Gary Buss	Clarification of Design Intent
10/27/03	02	M. Gray	P. Leatherbarrow	P. Leatherbarrow	For permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Evans	For permit - CCR
11/17/00	00	S. Mason	E. Calvert	D. Evans	For permit - CCR
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Waste Pre-Compaction Mechanism	Site: Idaho Falls	Data Sheet No.: DZ340335
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Mechanical Data Sheet

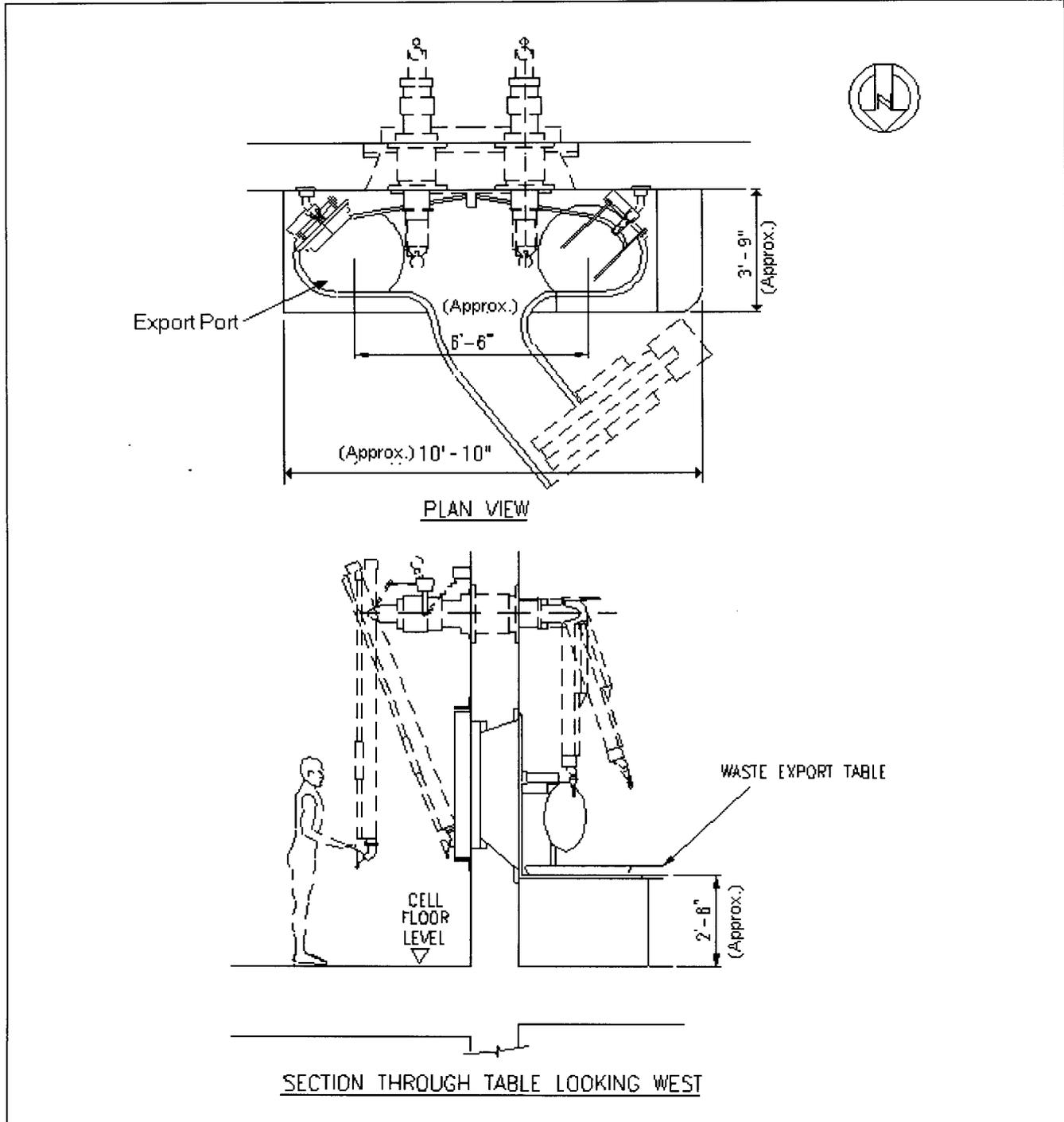
Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ340203
Project No.:	K0105C	Area:	South Box Line	No. Installed:	1
PI No.:	Z-340-203	Category:	UBC PC 2	% Duty:	On Demand
Description:	Waste Export Table	System No.:	340		
Function:	The table retains waste during loading of waste, size reduced by the guillotine, into waste export drums docked below.				
SUMMARY DATA		UNITS			
Maximum Duty		hp	N/A		
Design Life		year	15		
Failure on Demand		-	0.2%		
Operating Cycle (Door open/close)		second	10-15		
Design Capacity-Port Door (Operating Cycles)		per 24 hour	40 (max.)		
Minimum Design Pressure		in. wg	-0.8 (in cell depression)		
Maximum Design Pressure		in. wg	0		
Minimum Design Temperature		°F	60		
Maximum Design Temperature		°F	95		
Waste Export Table Dimensions		ft & in.	See Sheet 2		
Estimated Weight		lb	2340		
Materials and Construction	Stainless Steel				
Maintenance	<p>Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement.</p> <p>The table will be capable of being cleaned using brushing /vacuum cleaning techniques with MSMs / Power Manipulator tools. The port door will be designed for 'hands on' maintenance by personnel in PPE.</p>				
Description:	<p>The Waste Export Table is located in the South Box Line Cell, to interface with the Guillotine (P.I. No Q-340-220) and the cell floor aperture and to be within the reach of both Master-Slave and Overhead Power Manipulators. 55 gal. drums, raised to docked positions by elevators from the cell below, accept waste transferred using the manipulators. The Waste Export Table contains two Waste Export Port Doors. The Waste Export Table will be viewed directly, through a window, by an operator positioned outside of the cell.</p>				
Inputs:	Size Reduced Waste cropped by Guillotine				
Outputs:	Special case waste and waste destined for supercompaction				
Interfaces:	55 gal drums, Guillotine, MSMs & Overhead Power Manipulator				
Operating Environment:	Zone 3, dry, alpha contaminated and dusty				
Services:	Electricity (Power & Control)				

10/27/03	02	<i>M. Gray</i>	<i>P. Keathley</i>	<i>P. Keathley</i>	For permit – CCR
01/12/01	01	M. Green	E. Calvert	D. Evans	For permit – CCR
11/13/00	00	S. Mason	E. Calvert	D. Evans	For permit – CCR
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Waste Export Table

Site: Idaho Falls

Data Sheet No.: DZ340203





Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ340322
Project No.:	K0105C	Area:	North & South Box Lines	No. Installed:	2 in North Cell 1 in South Cell
PI No.:	Z-340-322 & Z-330-322A	Category:	UBC PC 2	% Duty:	On Demand
Description:	Waste Size Reduction Area		System No.:	330 & 340	
Function:	The Waste Sort Troughs retain waste during tipping, sorting & size reduction within the Box Line processing cells.				

SUMMARY DATA	UNITS	
Maximum Duty	hp	N/A
Design Life	year	15
Failure on Demand	-	N/A
Maximum Capacity	boxes per day	3
Minimum Design Pressure	in. wg	-0.8 (in cell depression)
Maximum Design Pressure	in. wg	0
Minimum Design Temperature	°F	69
Maximum Design Temperature	°F	95
Waste Sort Trough Dimensions	ft & in.	See Sheet 2
Estimated Weight	lb	7300 (Maximum load = 13,200)
Materials and Construction	Stainless steel	
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. In Zone 3 areas, maintenance personnel will be wearing full PPE and breathing sets which may hinder movement. The area will be cleaned routinely by vacuum cleaning and/or brush employed by either the power manipulator or during manned entry into the cavern.	

Description:

Two Waste Sort Troughs are located in the North Box Line Cell & one in the South Box Line Cell, with each trough served by its own Floor Mounted Manipulator. They will be constructed entirely from Stainless Steel. Each trough contains two Waste Export Station Ports, through which sorted/size reduced waste is posted into 55 gal export drums. In order to assist in cleaning & in-cell floor inspections by direct viewing as well as providing better maintenance access to all in-cell equipment & space for routing or services, the structure will include the provision for a raised/suspended floor around the sort trough areas.

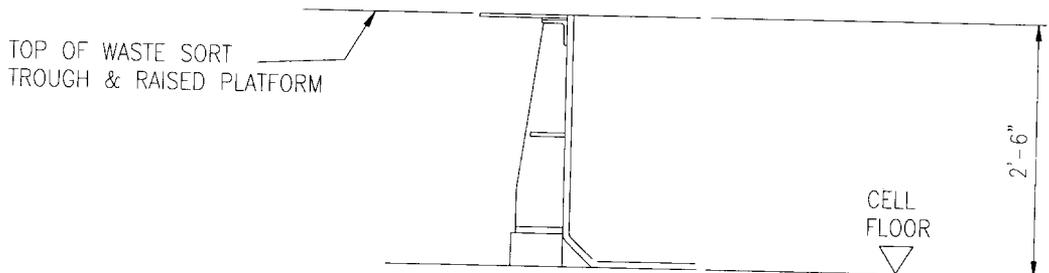
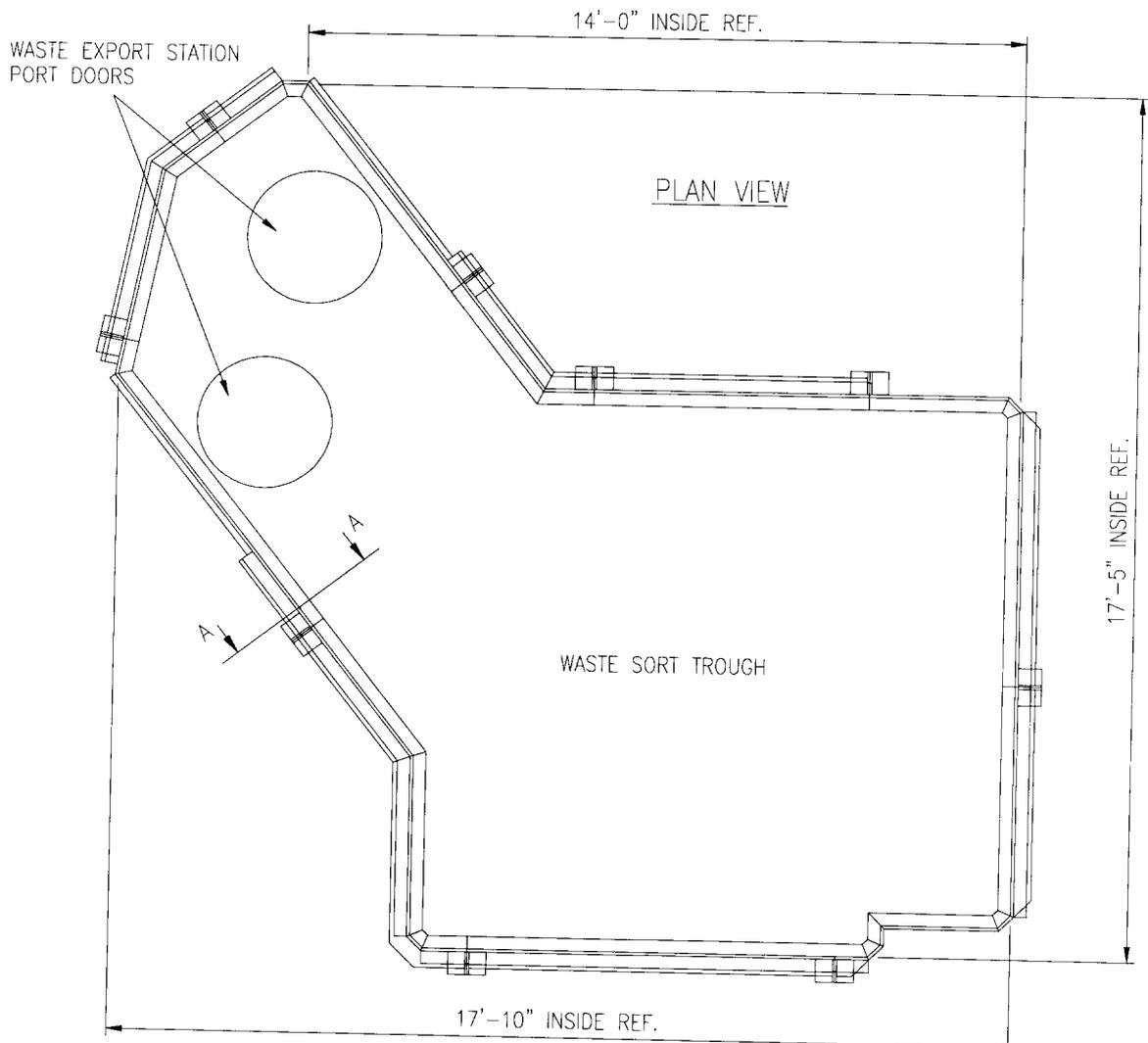
The Sort Trough operations will be remotely operated from control stations outside the cavern by an operator viewing directly through windows or alternatively via a CCTV camera.

Waste troughs will contain the entire contents of a waste box and leave room for sorting and size reduction prior to waste being placed in the drum located below the trough. The troughs are a sealed, fabricated construction and have a raised chamfered spigot under the port doors. Troughs will contain in excess of the volume of a 55 gal drum, should free liquids be accidentally transferred.

Inputs:	Waste tipped from box secured in Tipping Carriage
Outputs:	Size reduced waste suitable for export in a 55 gal drum
Interfaces:	55 gal drums, Tipping Frame/Waste Handling Crane, Floor Mounted Hydraulic Manipulator & Overhead Power Manipulator
Operating Environment:	Zone 3, dry, alpha contaminated and dusty
Services:	N/A

10/27/03	02	<i>M. Gray</i>	<i>P. Keeth</i>	<i>P. Keeth</i>	For permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Evans	For permit
11/13/00	00	S. Mason	E. Calvert	D. Evans	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Waste Size Reduction Area	Site: Idaho Falls	Data Sheet No.: DZ340322
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ALL DIMENSIONS
ARE APPROXIMATE

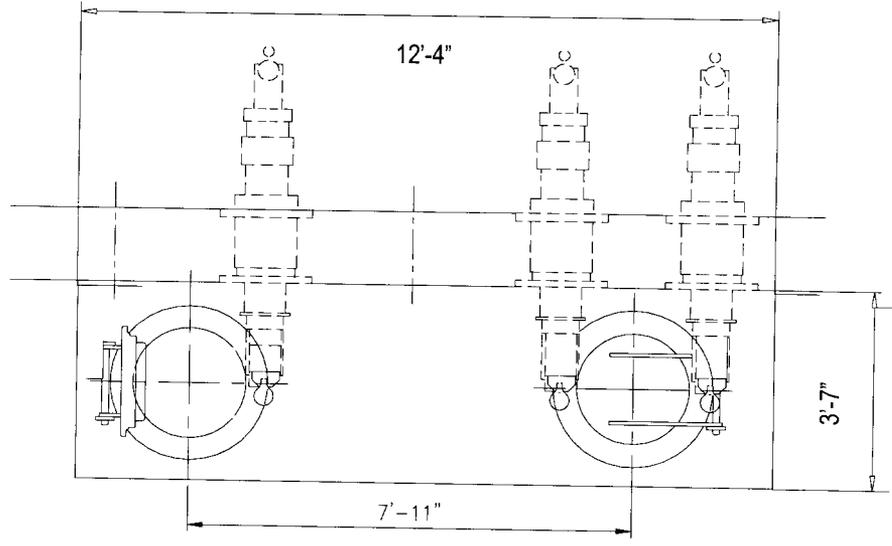


Mechanical Data Sheet

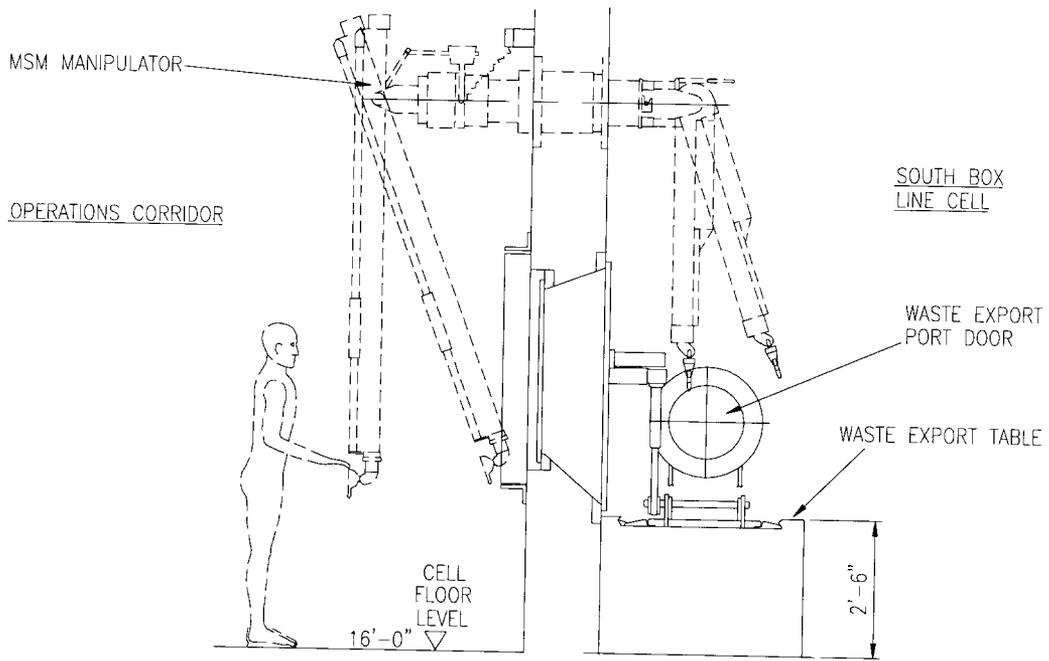
Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ340324
Project No.:	K0105C	Area:	South Box Line	No. Installed:	1
PI No.:	Z-340-324	Category:	UBC PC 2	% Duty:	On Demand
Description:	Waste Export Table (West)		System No.:	340	
Function:	The table will retain waste for sorting/loading into waste export drums docked below at the Off-Line Box Processing Station.				
SUMMARY DATA		UNITS			
Maximum Duty		hp	N/A		
Design Life		year	15		
Failure on Demand		-	0.2%		
Operating Cycle (Door open/close)		second	10-15		
Design Capacity (Operating Cycles)		per 24 hour	40 (max.)		
Minimum Design Pressure		in. wg	-0.8 (in cell depression)		
Maximum Design Pressure		in. wg	0		
Minimum Design Temperature		°F	60		
Maximum Design Temperature		°F	95		
Waste Export Table Dimensions		ft & in.	See Sheet 2		
Estimated Weight		lb	3800		
Materials and Construction	Stainless Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement. Maximum module/item weight 22lb.				
<p>Description:</p> <p>The Waste Export Table is located in the South Box Line Cell, to interface with the cell floor aperture aligned with the Off-Line Box Processing Station and to be within the reach of the master-slave manipulators and the overhead power manipulator. 55 gal drums raised to docked positions by elevators from the cell below accept waste transferred using the manipulators. The Waste Export Table contains two Waste Export Port Doors. The port doors will contain a course seal to prevent the egress of dust & debris. The ports are arranged in pairs to ensure that as one drum is being changed the second drum is available for filling. The ports will have a guide system for drum location. The Waste Export Table will be constructed from a sealed stainless steel fabrication to aid decontamination. The Waste Export Table will be viewed directly through a window, by an operator positioned outside of the cell.</p>					
Inputs:	Small boxed waste, or size reduced waste				
Outputs:	Waste in a 55gal drum				
Interfaces:	55 gal drums, box of waste at Off-Line Box Processing Station, MSMs, Wall mounted Hydraulic Manipulator & Overhead Power Manipulator				
Operating Environment:	Zone 3, dry, alpha contaminated and dusty				
Services:	Electricity (Power & Control)				

10/27/03	03	<i>pp</i> M. Gray	<i>lutan</i> P. Buckley	<i>P. Keitt</i> G. Daniel	For permit - CCR
07/12/01	02	J. Hembree	P. Buckley	G. Daniel	For permit
01/12/01	01	M. Green	E. Calvert	D. Evans	For permit
11/13/00	00	S. Mason	E. Calvert	D. Evans	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Waste Export Table (West)	Site: Idaho Falls	Data Sheet No.: DZ340324
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PLAN VIEW



SECTION THROUGH TABLE

ALL
DIMENSIONS
ARE
APPROXIMATE

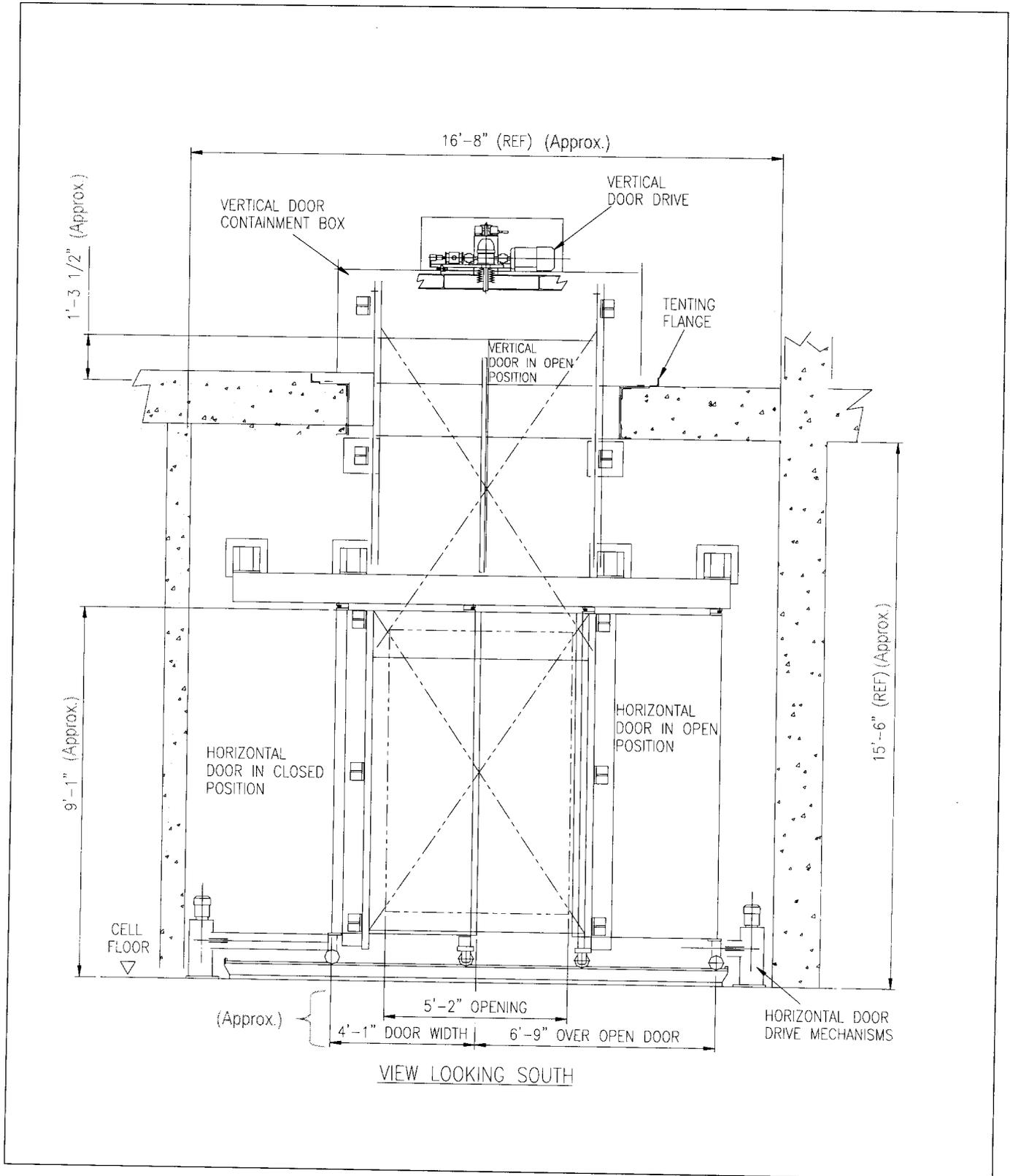


Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ320227
Project No.:	K0105C	Area:	Room 226, 217C, 220C	No. Installed:	1 pair per PI No.
PI No.:	Z-320-227, 228 & 229	Category:	UBC PC 2	% Duty:	On Demand
Description:	Variable Geometry Doors	System No.:	320		
Function:	To provide airlocks & means of segregation/isolation between zones & Box Import area.				
SUMMARY DATA		UNITS			
Maximum Duty		hp	3.5		
Design Life		year	15		
Failure on Demand		-	0.5%		
Design Capacity (Operating Cycles)		per 24 hour	10 (max)		
Cycle Time		minute	8		
Minimum Design Pressure		in. wg	-.8"(Max)		
Maximum Design Pressure		in. wg	0		
Minimum Design Temperature		°F	60		
Maximum Design Temperature		°F	95		
Horizontal Door Size:	Width	ft & in.	4' - 1"		
	Height	ft & in.	9' - 1"		
Vertical Door Size:	Width	ft & in.	6' - 1"		
	Height	ft & in.	9' - 1"		
Estimated Weight		lb	1100		
Materials and Construction	Stainless steel or painted carbon steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. In Zone 3 areas, maintenance personnel will be wearing full PPE and breathing sets which may hinder movement. Maximum module/item weight 22lb. Maintenance of upper door mechanisms will be from a floor above the airlock rooms.				
Description: The Variable Geometry Doors consist of a pair of horizontal doors and a vertical door which will open to a controlled aperture slightly wider and higher than the box envelope size. This will maintain containment of the zone 3 cells by controlling the velocity of the incoming air past the box when the doors are open, thereby preventing back diffusion of contamination.					
The operation of all doors will be interlocked to maintain ventilation containment.					
Inputs:	4'-10 1/2" wide x 6'-4 1/2" high x 8'-0" long (Maximum Effective Transfer Size)				
Outputs:	4'-10 1/2" wide x 6'-4 1/2" high x 8'-0" long (Maximum Effective Transfer Size)				
Interfaces:	Box transfer conveyor, Waste boxes, Building structure				
Operating Environment:	Zones 1, 2 & 3 - dry and alpha contaminated				
Services:	Electricity (Power & Control)				

10/27/03	02	M. Gray	<i>Robert Bell</i>	<i>P. Keitt</i>	For permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Evans	For permit
11/14/00	00	K. Parkinson	E. Calvert	D. Evans	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Variable Geometry Doors	Site: Idaho Falls	Data Sheet No.: DZ320227
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Quality Level: NO

Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
00	Issued for permit use	K. Parkinson 11/10/00	E. Calvert 11/10/00	N/A	D. Evans
01	Issued for permit use	M. Green 01/12/01	E. Calvert 01/12/01	N/A	D. Evans
02	Issued for permit use only - CCR. Revised to reflect modified equipment. Ownership of MDS transferred from BEL to BNFL, Inc as of this rev.	S. Anderton 01/18/01	D. Lord 01/18/01	N/A	P. Cavarial 01/18/01
03		T. Gooding 10/27/03	Richard Beck 10/27/03	N/A	P. Leatherbarrow 11/18/03
04	Clarify original design intent as reflected in as-built configuration	P. Townsend	P.A. Young	N/A	Gary Buss 07/10/06
05	Incorporated hardcopy redline from rev. 04. Added AMWTP logo.		 08/09/06	 08/09/2006	

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Engineering and Environmental Laboratory (INEEL)
System Number:	320
Plant Item Number:	M-320-200
Equipment Name:	Box Opening Gantry System
Associated Drawing(s):	53-3298
Function:	To deploy, manipulate and control the opening tools for wooden and metal boxes.

SUMMARY DATA	UNITS	
Maximum Duty	hp	13.5
Design Life	year	15
Failure on Demand	-	Awaiting vendor information
Cycle Time	minute	TBD during testing
Minimum Design Pressure	in. wg	-0.8 (in cell depression)
Maximum Design Pressure	in. wg	0
Minimum Design Temperature	°F	66
Maximum Design Temperature	°F	95
Maximum Design Capacity	boxes Per 24 Hour	10 (1 Box at a time)
Dimensions	ft. & in.	See Sheets 2 & 3
Estimated Weight	lb	2500
Materials and Construction	Painted Carbon Steel / Aluminium	
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for safe and rapid access for maintenance and removable/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement and visibility.	

Description:
 The Box Opening Gantry System shall be a commercially available gantry system comprising of bridge, trolley, telescopic mast and wrist assemblies. The bridge, trolley and mast travel envelope shall enable the opening of all the box variations. The wrist assembly shall have pitch and yaw rotation for tool positioning. The wrist assembly shall be designed for remote tool change. The wrist assembly shall incorporate intelligent tooling and cutting force feedback.
 The Gantry System shall integrate with the dust/swarf collection system.



Mechanical Data Sheet

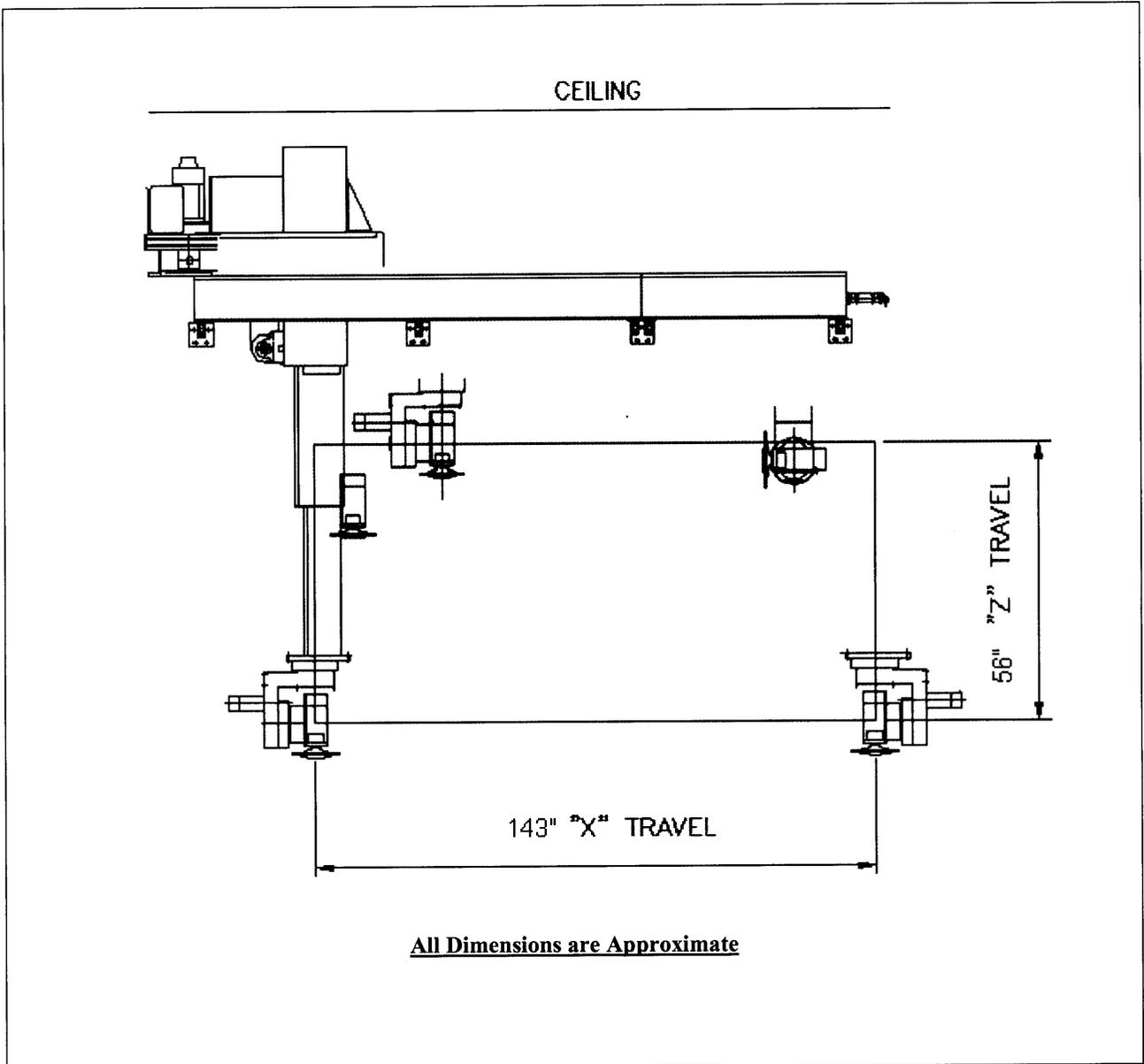
No. DM-320-200

Sheet 2 of 4

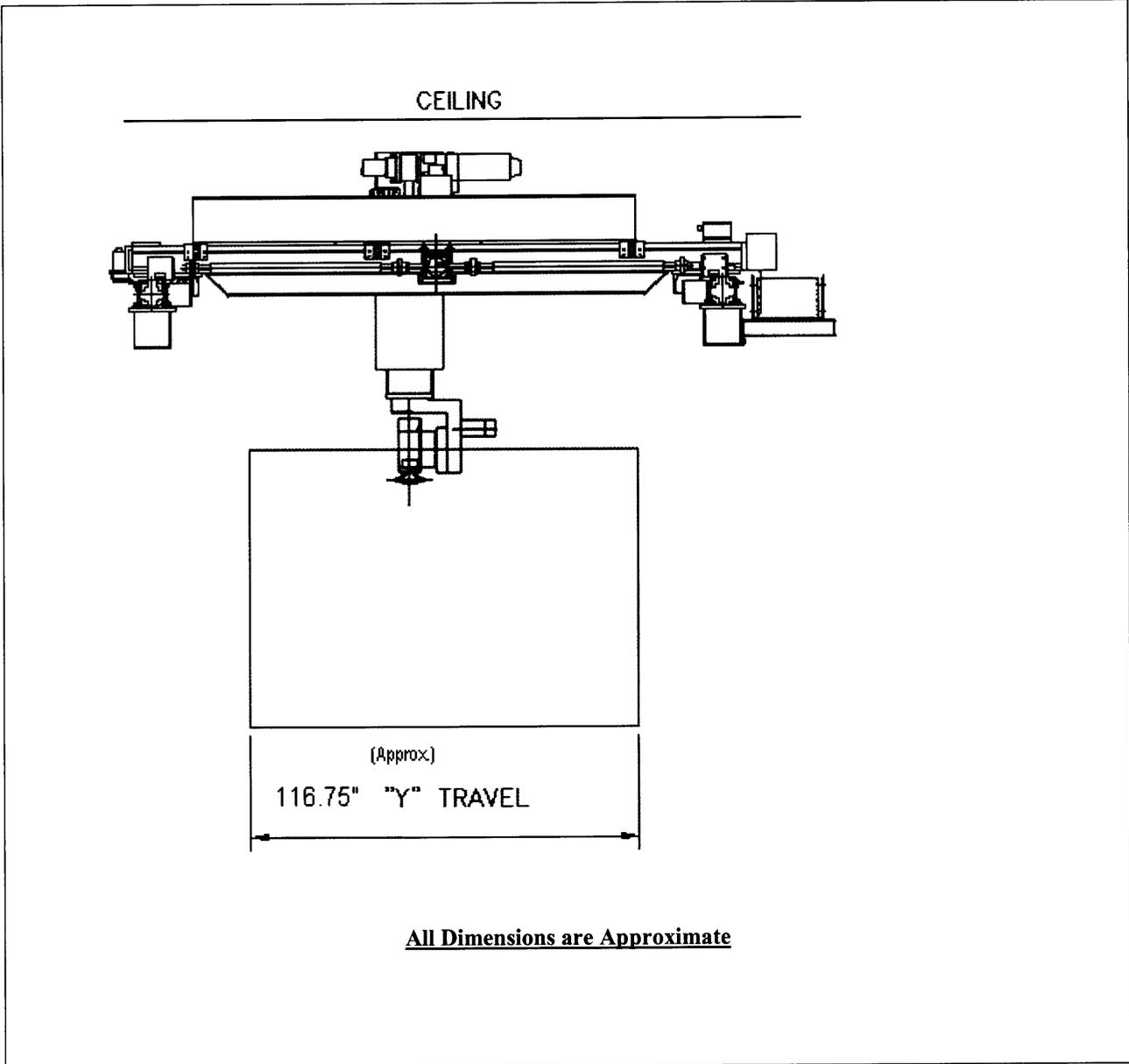
Description:	Box Opening Gantry System	Site:	INEEL	Data Sheet No.:	DM320200
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Inputs:	Intact boxes
Outputs:	Boxes, lid cut and retained.
Interfaces:	Box lid cutting tools, vacuum system and conveyor.
Operating Environment:	Zone 3, dry, contaminated and dusty
Services:	Electricity (Power & Control)

Description: Box Opening Gantry System	Site: INEEL	Data Sheet No.: DM320200
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Description: Box Opening Gantry System	Site: INEEL	Data Sheet No.: DM320200
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QUALITY LEVEL: NO

Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
0	Final Design Issue	Greg W. 06/08/01	Dan Horn 06/08/01	N/A	Dan Horn 06/08/01
1	Issued For Permit - CCR	T. Gooding 07/27/03 <i>11/18/03</i>	<i>Richard Beck</i> 11/11/03	N/A.	<i>P. Reutter</i> 11/18/03

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Engineering and Environmental Laboratory (INEEL)
System Number:	345
Plant Item Number:	W-345-011
Equipment Name:	Drum Lidding Equipment
Associated Drawings:	C&D Robotics Dwg. 410544
Associated Documents:	W-335-012

Description

Equipment roll seals (scaNs) 55 gallon drum lids to drums.

Summary Data

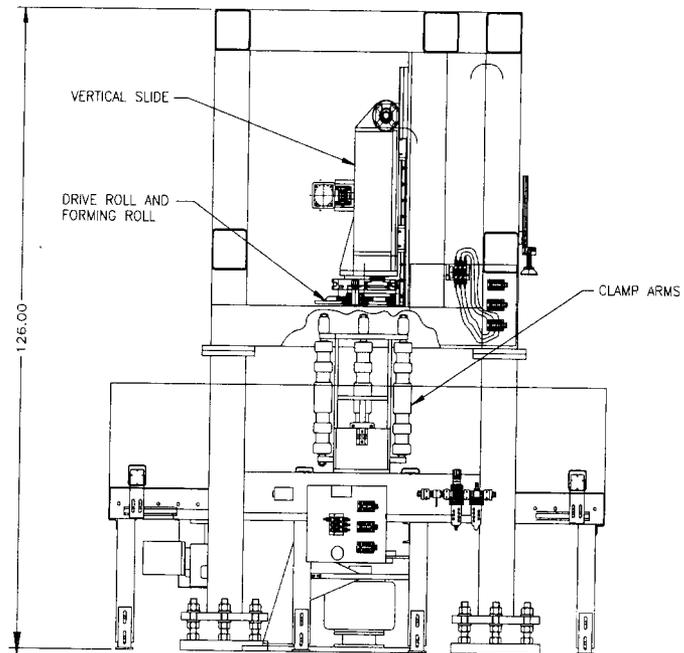
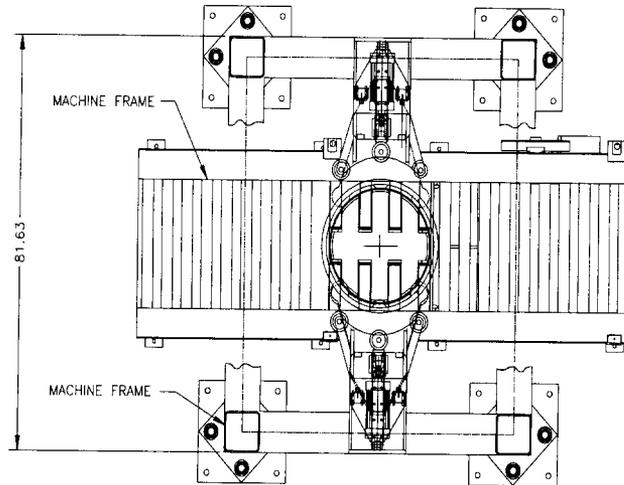
SUMMARY DATA		UNITS	
Annual Duty		days	365
Daily Duty:		hours	24
Design Capacity		hours	Min. 60 drums/24 hrs requirement
Minimum Design Pressure		in. wg	N/A
Maximum Design Pressure		in. wg	N/A
Minimum Design Temperature		°F	66
Maximum Design Temperature		°F	95
Dimensions	Length	ft-in.	93 ½" (approx.)
	Width	ft-in.	81 ¼" (approx.)
	Height	ft-in.	126" (approx.)
Estimated Weight		lb	As designed
Materials and Construction	Carbon steel supports and general construction, tool steel rollers		
Maintenance	The equipment will be accessed directly and be of modular construction, modules to be easily removable with a minimum number of fittings to allow disassembly.		
Inputs:	55-gallon tight-head drum filled with waste without lid seamed on and a 55-gallon tight-head drum lid delivered by conveyor		
Outputs:	Full, lidded 55-gallon tight-head drums		
Interfaces:	Conveyor control, Conveyor Chain Driven live roller		
Operating Environment:	Remote dry 66-81°F filter air ventilation – Zone 3		
Services:	480 volt electrical (power and control)		

Special Requirements

1.	System design is to be maintenance friendly and support quick turn around--the use of quick disconnects on electrical leads, bolted connections of high wear parts, etc.
2.	The design is to be modularized with individual components (which require maintenance) not to exceed 25 pounds to facilitate lifting and removal. Components in excess of 25 lbs require lifting points.
3.	The system will function in a fully automatic mode. Drums will be received on a transfer conveyor, secured in place and a lid is to be rolled on without the use of lubricants.
4.	Will need to integrate with conveyor for delivery of drums.
5.	Deleted
6.	Design is to include a lid check mechanism that verifies lid is in place before leaving the lidding station.
7.	Clear, safe access for suited maintenance required.

Description: Drum Lidding Equipment Site: INEEL Data Sheet No.: W-345-011

ALL DIMENSIONS ARE APPROXIMATE



APPENDIX XVII**MATERIAL TRANSFER SYSTEM MECHANICAL DATA SHEETS**

MDS Number	Description
DW370006	Waste Drum Handling Robots
DZ310200	Venturi Glovebox
DZ340299	Drum Import/Export Port Door
Z-390-200	Import/Export Glovebox



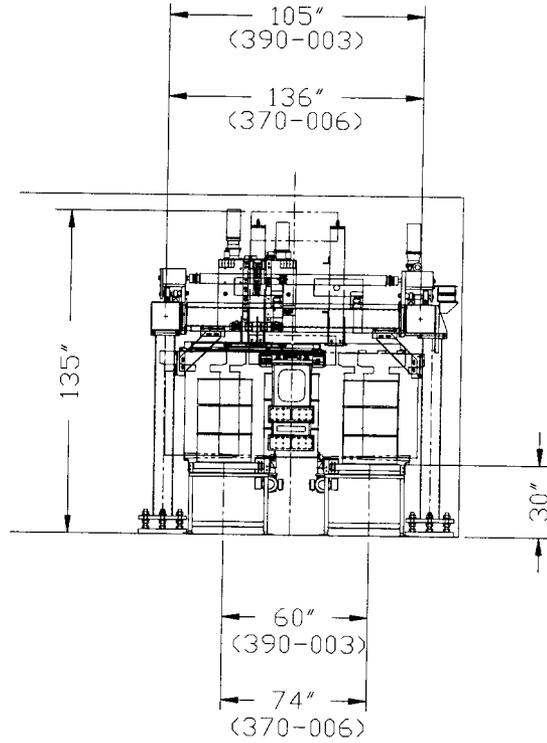
Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DW370006
Project No.:	K0105C	Area:	Room 147, 126C, 124B, 125B	No. Installed:	4
PI No.:	W-370-006, W-390-003, W-335-010, W-345-006	Category:	UBC PC 2	% Duty:	On Demand
Description:	Waste Drum Handling Robots	System No.:	370, 390, 335, 345		
Function:	To transfer waste drums between drum staging positions and conveyor sections supporting process equipment and other drum handling equipment.				
SUMMARY DATA		UNITS			
Maximum Duty		hp		4	
Design Life		year		15	
Failure on Demand		-		0.2%	
Design Capacity (Operating Cycles)		lifts/hr		60 A at or near maximum load capacity	
Minimum Design Pressure		in wg		-0.8 (in cell depression)	
Maximum Design Pressure		in wg		0	
Minimum Design Temperature		°F		66	
Maximum Design Temperature		°F		95	
Long Travel Speed		ft/min		300	
Cross Travel Speed		ft/min		150	
Lift Speed		ft/min		10	
Maximum Vertical Lifting Capacity		lb		1000	
Degrees of Freedom		-		6 + Grip	
Estimated Weight		lb		1000	
Materials and Construction	Painted welded carbon steel, aluminium				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement. The equipment can be pushed to the maintenance area. Items will be replaced/maintained with the assistance of a maintenance hoist, fixed hoist points and a temporary maintenance platform.				
Description:	The robots will be an electro-mechanical type, used to transfer 55-gallon drums between drum staging positions and conveyor sections supporting process equipment and other drum handling equipment in each of the systems. Each robot will be attached to a mast, suspended from a hoist and trolley unit mounted on a travelling bridge. The drum grab on the end of each robot will provide lateral base support for drums during transport.				
Inputs:	55-gallon drums				
Outputs:	55-gallon drums				
Interfaces:	All equipment within the cell				
Operating Environment:	Zone 3, dry, alpha contaminated and dusty				
Services:	Electricity (Power & Control), pneumatic supply (80 psig ± 5%)				

		<i>T. Gooding</i>	<i>Richard Red</i>	<i>R. Keaton</i>	For permit
10/27/03	0	T. Gooding			For permit - CCR
02/22/01	0A	K. Clark	C. Widdle	J.A.	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Waste Drum Handling Robots	Site: Idaho Falls	Data Sheet No.: DW370006
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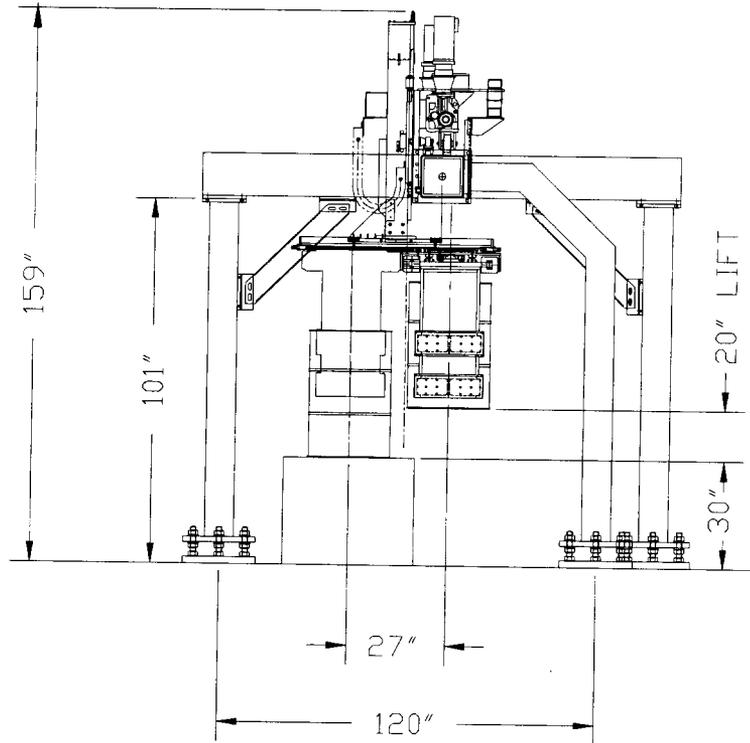
W-370-006, W-390-003,



ALL DIMENSIONS ARE APPROXIMATE

Description: Waste Drum Handling Robots	Site: Idaho Falls	Data Sheet No.: DW370006
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W-335-010, W-345-006



ALL DIMENSIONS ARE APPROXIMATE



Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ310200
Project No.:	K0105C	Area:	Drum Venturi	No. Installed:	One of each P.I.
PI No.:	Z-310-200 & Z-423-200	Category:	UBC PC 2	% Duty:	On Demand
Description:	Venturi Glovebox	System No.:	310 & 423		
Function:	To provide a sealed negative pressurized environment.				

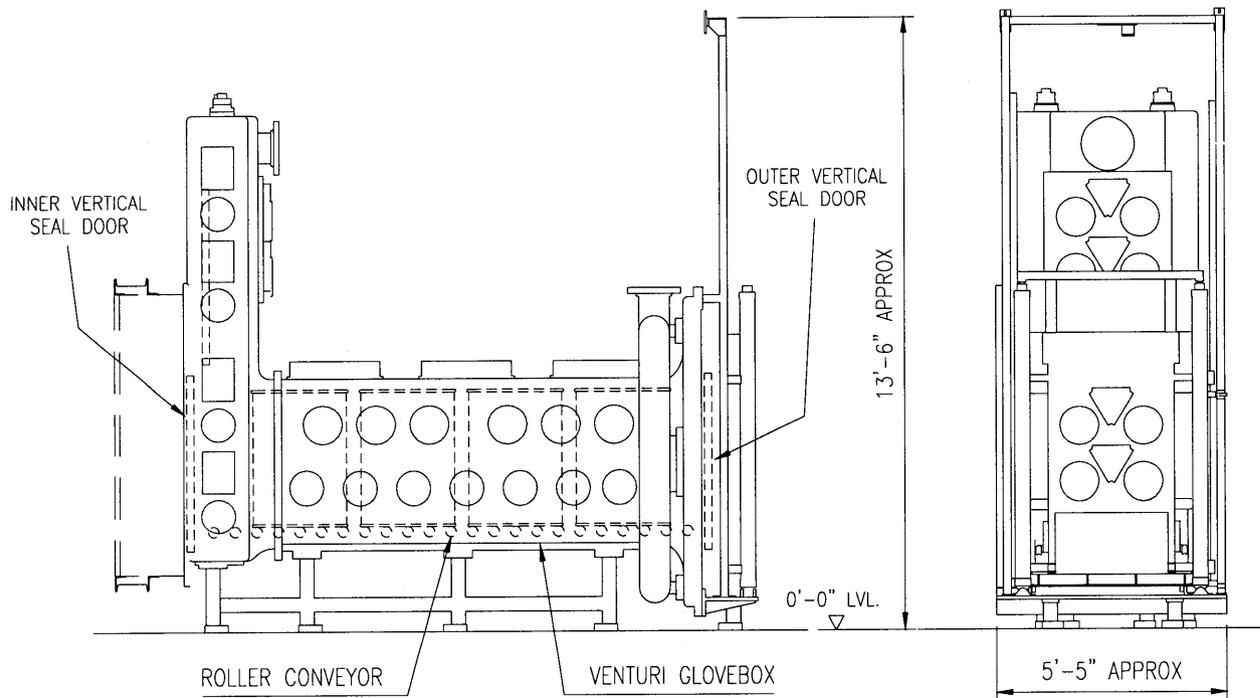
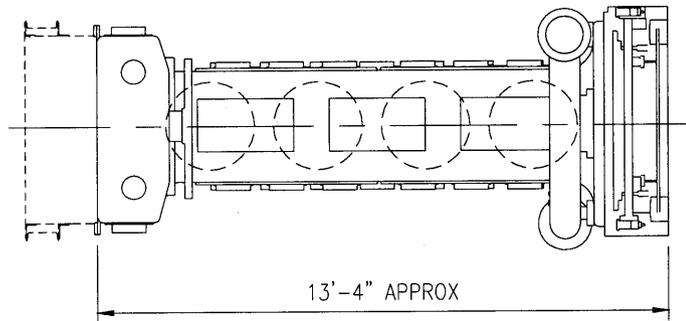
SUMMARY DATA	UNITS	
Maximum Duty	hp	1
Design Life	Year	15
Failure on Demand	-	0.5%
Design Capacity	Drums per 24 hour	480
Linear Speed	ft/min.	40 (max.)
Cycle Time (Transfer of one drum)	second	90
Minimum Design Pressure	in. wg	-4 (Glovebox test depression)
Maximum Design Pressure	in. wg	+4 (Test pressure)
Minimum Design Temperature	°F	66
Maximum Design Temperature	°F	95
Length	ft & in.	13'- 4" Approx.
Width	ft & in.	5'- 5" Approx.
Height	ft & in.	13'- 6" Approx.
Estimated Weight	lb	6600
Materials and Construction	Stainless Steel	
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance of some inner door components within Zone 3 will be by maintenance personnel wearing full PPE and breathing sets, which may hinder movement. The remaining components in potential Zone 3 are maintained through Gloveports. Equipment within Zone 2 will be by direct access.	

Description:
 The Venturi Airlock Glovebox conveyor will transfer lidded drums from a Zone 2 area into a Zone 3 environment. The glovebox operates on a venturi principle to maintain a safe environment for personnel. This is achieved by profiling the internal geometry of the glovebox shell, which will be designed to convey both drum sizes. For the venturi to operate effectively, 3-4 drums must always be present in the airlock section.
 Drums will be moved through the glovebox on a roller type conveyor; the rollers being maintainable via gloveports. The conveying system will be of stainless steel construction with integral drive rollers.
 The glovebox will have flanged end faces to mate with inner and outer vertical seal doors. The glovebox containment will be of stainless steel construction with viewing windows and gloveports.
 The glovebox will also require a dedicated ducted plenum and extract vent, complete with filtration system.

Inputs:	Lidded waste drums and unlidded clean drums
Outputs:	Lidded waste drums and unlidded clean drums
Interfaces (Z-310-200):	Zone 3 containment adjacent to north end of Central Conveyor System
Interfaces (Z-423-200):	East side of Zone 3 Conveyor System, approximately mid-way
Operating Environment:	Zone 2/3, dry, alpha contaminated
Services:	Electricity (Power & Control), pneumatics (80 psig ± 5%)

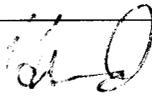
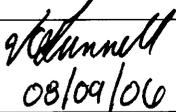
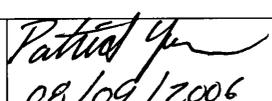
04/23/07	03	J. Godak	Mark H. [Signature]	P. Leatherbarrow	For permit
10/27/03	02	T. Gooding	R. Beck	P. Leatherbarrow	For permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Yew	For permit
11/27/00	00	K. Parkinson	E. Calvert	D. Yew	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Venturi Glovebox	Site: Idaho Falls	Data Sheet No.: DZ310200
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VENTURI AIRLOCK GLOVEBOX

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ340299
Project No.:	K0105C	Area:	South Box Line	No. Installed:	1
PI No.:	Z-340-299	Category:	UBC PC 2	% Duty:	On Demand
Description:	Drum Import/Export Port Door	System No.:	340		
Function:	To import/export 55 gal drums into & out of the South Box Line Cell & to prevent spilt loose waste from exiting through this port				
SUMMARY DATA		UNITS			
Maximum Duty		hp		1	
Design Life		year		15	
Failure on Demand		-		0.2%	
Maximum Capacity		drums per 24 hour		50	
Operating Cycle (Door open/close)		second		10-15	
Total Operating Time		minutes per 24 hour		5 (max.)	
Design Capacity (Operating Cycles)		per 24 hour		12 (max.)	
Minimum Design Pressure		in. wg		-0.8 (in cell depression)	
Maximum Design Pressure		in. wg		0	
Minimum Design Temperature		°F		66	
Maximum Design Temperature		°F		95	
Estimated Weight		lb		1000	
Materials and Construction	Stainless steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance personnel will be wearing full PPE and breathing sets which may hinder movement. Maximum module/item weight 22 lb.				
Description:	<p>The port door is located in the floor of the South Box Line Cell. This allows either the docking or transfer of a 55 gal drum from the Material Transfer Cell below into the South Box Line Cell & vice versa. During import, the drum will have been placed under the port door by the material transfer system, or in the case of export, the drum elevator will be in the raised position. The port door has four main components:</p> <ol style="list-style-type: none"> 1) <u>Equipment Mounting Plate</u>: This controls the drum position, resists the forces exerted by the drum elevator and prevents uncontrolled movement of loose waste and leakage of free liquids. 2) <u>Port Door</u>: This is to be a robust construction to resist accidental damage from the Overhead Power Manipulator/Waste Handling Crane c/w Drum Grab Attachment, during drum loading. It prevents uncontrolled discharge of waste. 3) <u>Guide Ring</u>: In the 'closed' position, the hinged guide ring will be located in the port opening. The ring will allow a 55 gal drum to be docked and located against it without damage. In the 'open' position, the ring will be removed from the port opening to allow a 55 gal drum to be imported or exported through it. 4) <u>Door /Guide Ring Actuators</u>: These provide the power to raise and lower both the door fabrication and guide ring. Proximity switches will indicate the open and closed positions. The port door and guide ring will be remotely operated from control stations outside the cell by an operator viewing directly through windows or alternatively via a CCTV camera 				
Inputs:	55 gal drums				
Outputs:	55 gal drums				
Interfaces:	55 gal drums, Overhead Power Manipulator &/or Waste Handling Crane c/w Drum Grab Attachment				
Operating Environment:	Zone 3, dry, alpha contaminated				
Services:	Electricity (Power & Control)				

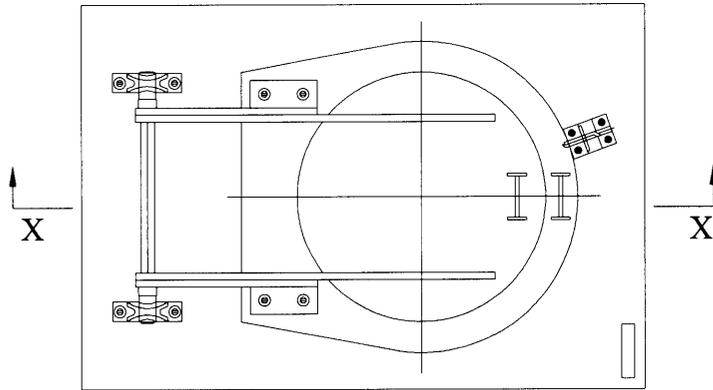
08/09/06	06		 08/09/06	 08/09/2006	Incorporated hardcopy redline from rev. 05. Added AMWTP Logo.
07/10/06	05	P. Townsend	P.A. Young	Gary Buss	Clarify original design intent as reflected in as-built configuration.



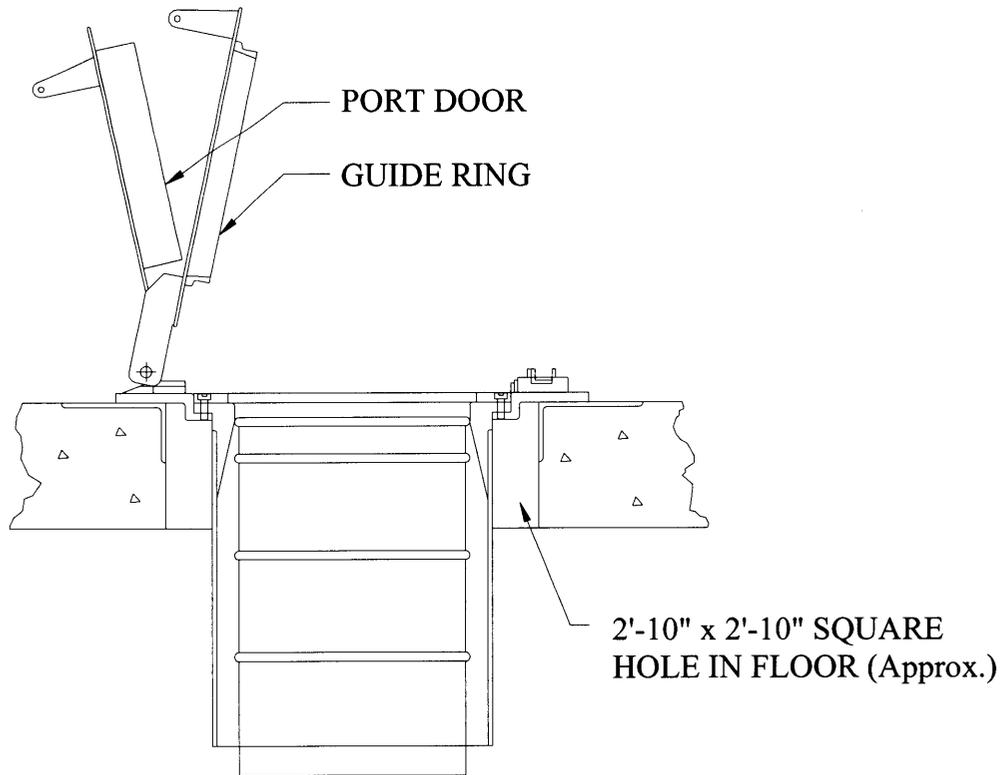
Mechanical Data Sheet

Description:		Drum Import/Export Port Door		Site:	INL	Data Sheet No.:	DZ340299
10/27/03	04	M. Gray	Richard Beck	P. Leatherbarrow		For permit - CCR	
08/30/01	03	R. Sorenson	P. Leatherbarrow	J. Isherwood		For permit	
07/12/01	02	J. Hembree	P. Buckley	G. Daniel		For permit	
01/12/01	01	M. Geen	E. Calvert	D. Evans		For permit	
Date	Issue	By	Checked	Approved		Purpose of Issue	

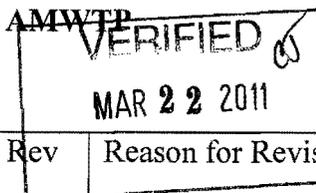
Description:	Drum Import/Export Port Door	Site:	INL	Data Sheet No.:	DZ340299
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PLAN



**SECTION ON 'X-X' SHOWING 55 GAL
DRUM DOCKED & BOTH LIDS OPEN**



Mechanical Data Sheet

NO. Z-390-200

QUALITY LEVEL: NO

Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
0	For Permit use only	Aaron Ricks 3/21/11	<i>R. Todd</i> 3-22-11	N/A	<i>A. Ricks</i> 3/22/11

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Laboratory (INL)
System Number:	390
Plant Item Number:	Z-390-200
Equipment Name:	Import/Export Glovebox
Associated Drawings:	53-10852 WMF-676 Drum Import Export Glovebox 53-0201 First Floor Plan General Arrangement
Associated Documents:	EDF-0477

Description

The glovebox is equipped for receipt of drums and has the capabilities to remove liners, transfer drums in and out of the glovebox, transfer liners, visual examination (VE), and bag out operations. The glovebox will contain: hoist, conveyor, lifting tools. Room 126B will support the glove box with the following: drum haulers, scissor lifts, bar code readers, DMS workstation, weight scale, drum turntable, VE CCTV Camera, hand tools, step stools, and an elevated floor. This room will be used to close drums after the bag out process and survey drums before transportation to other parts of the facility.

The glovebox is designed for maximum visibility, maintainability and operational efficiency.

Summary Data

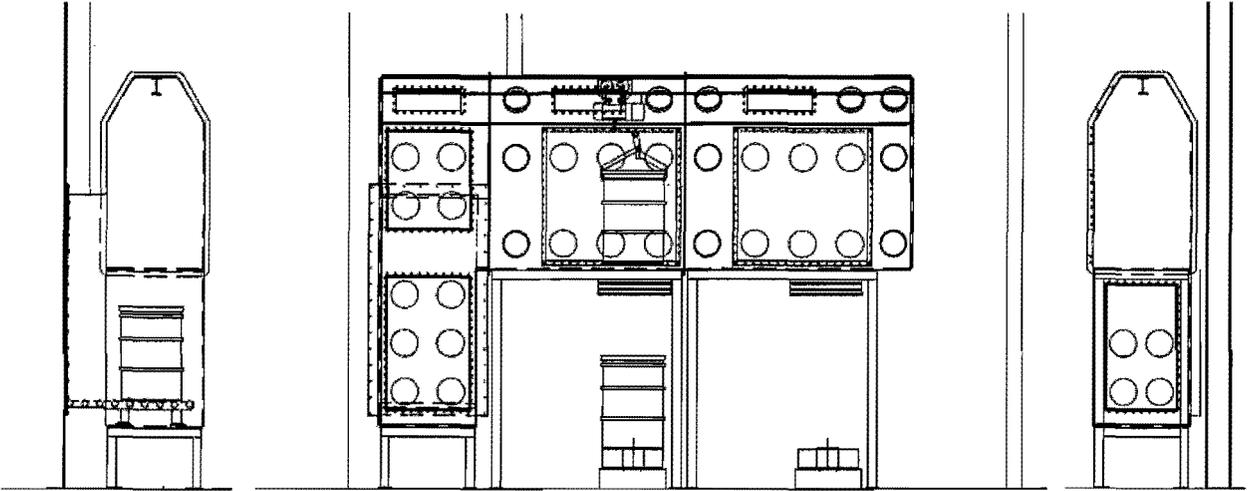
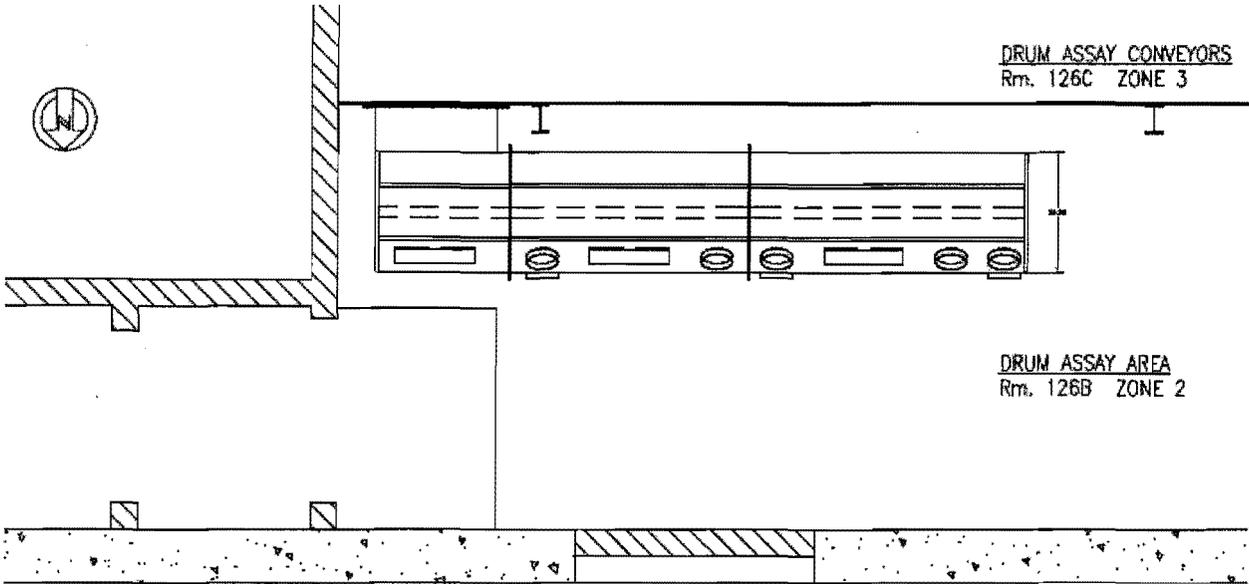
SUMMARY DATA		UNITS	
Annual Duty:		days	365
Daily Duty:		hours	24 (On Demand)
Design Capacity:		per day	20 drums
Nominal Operating Pressure:		in. wg	-1 relative to zone 3
Nominal Operating Temperature:		°F	66 - 81
Dimensions:	Length:	ft-in.	16'-4" (approximately)
	Width:	ft-in.	3'-0" (approximately)
	Height:	ft-in.	13'-4" (approximately)

AMWTP

Mechanical Data Sheet

NO. Z-390-200

Estimated Weight:	lb	TBD
Materials and Construction:	Stainless steel skin wall, ceiling, and door panels w/ safety glass windows.	
Maintenance:	The glovebox is stationary with minimal maintenance requirements.	
Inputs:	55-gallon metal waste drums and 55-gallon calibration drums within 83/85-gallon metal overpack drums via the scissor lifts.	
Outputs:	High density polyethylene liners via 55-gallon drum and scissor lift. 55-gallon drums into 83/85-gallon overpacks.	
Interfaces:	System 390 conveyor. Facility concrete floor room 126B stainless steel wall/flange.	
Operating Environment:	Zone 2	
Services:	Electrical power (120V, 230V, 480V, 3Ø), ICS control, DMS data, video, and instrument air.	



-1 GLOVEBOX INSTALLATION
SCALE 3/4" = 1'-0"

APPENDIX XVIII**SPECIAL CASE WASTE AND DRUM REPACK SYSTEM DRAWINGS/EXHIBITS**

Item Number	Description	Exhibit or Drawing Number	Revision Number	PE Certification Date	Revision Approval Date
1	SCW Transfer Glovebox - Position A Process Flow Diagram	XVIII-1	00	Not Applicable	Not Applicable
2	SCW Treatment Glovebox - Position B (Liquids) Process Flow Diagram	XVIII-2	00	Not Applicable	Not Applicable
3	SCW Treatment Glovebox - Position B (ABS) Process Flow Diagram	XVIII-3	00	Not Applicable	Not Applicable
4	SCW Treatment Glovebox - Position B (Misc.) Sheet 1 Process Flow Diagram	XVIII-4	00	Not Applicable	Not Applicable
5	SCW Treatment Glovebox - Position B (Misc.) Sheet 2 Process Flow Diagram	XVIII-5	00	Not Applicable	Not Applicable
6	SCW Sampling Glovebox - Position C (Solids) Process Flow Diagram	XVIII-6	01	Not Applicable	Not Applicable
7	SCW Sampling Glovebox - Position C Process Flow Diagram (Liquids)	XVIII-7	00	Not Applicable	Not Applicable
8	SCW Container-in-Container Glovebox - Position D Process Flow Diagram	XVIII-8	01	Not Applicable	Not Applicable
9	SCW Waste Collection Area - Position F Process Flow Diagram	XVIII-9	00	Not Applicable	Not Applicable
10	Special Case Waste and Drum Repack System Area General Arrangement	53-9744	07	06/28/06	06/29/06
11	Drum Repack System Block Flow Diagram	XVIII-10	00	Not Applicable	Not Applicable

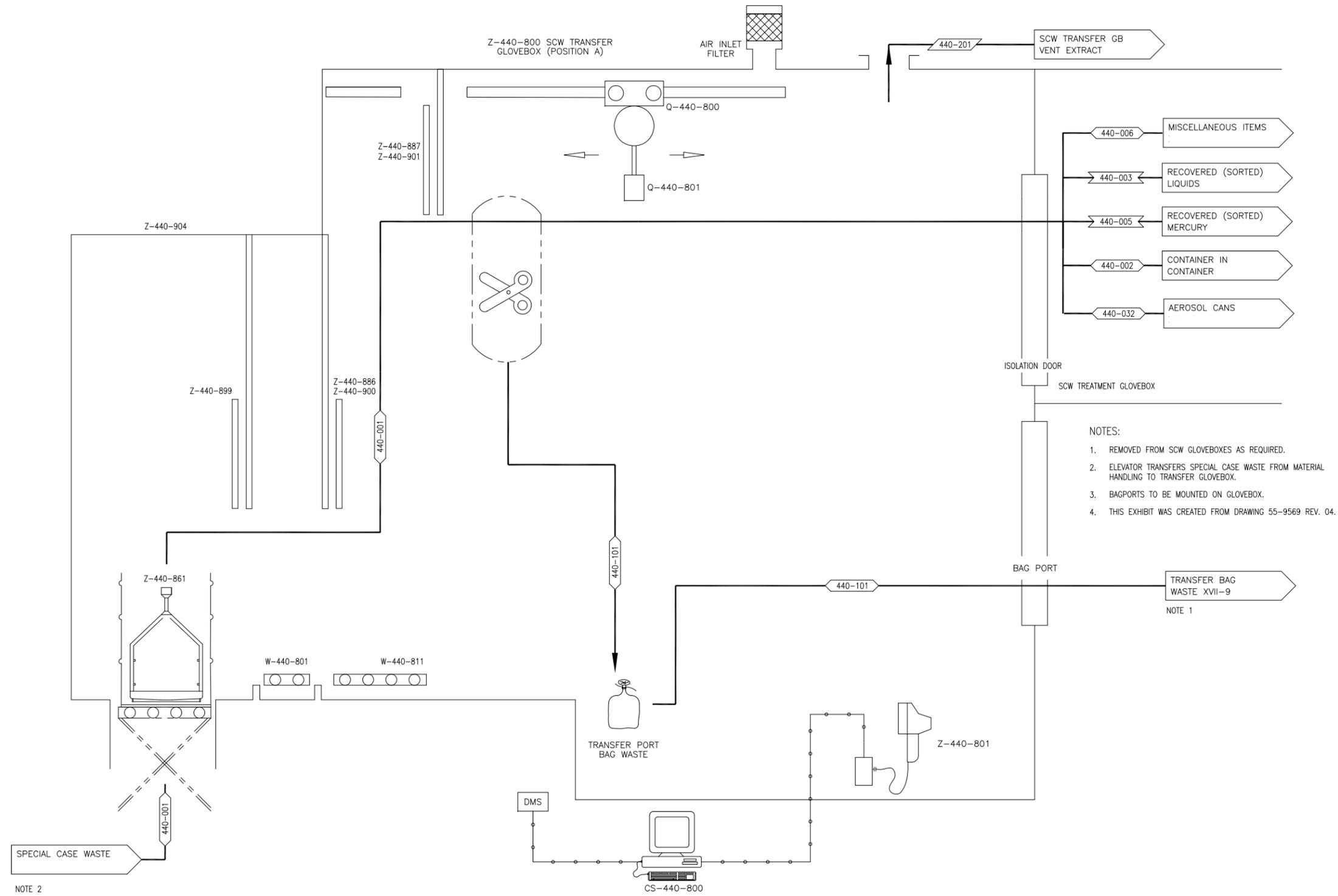
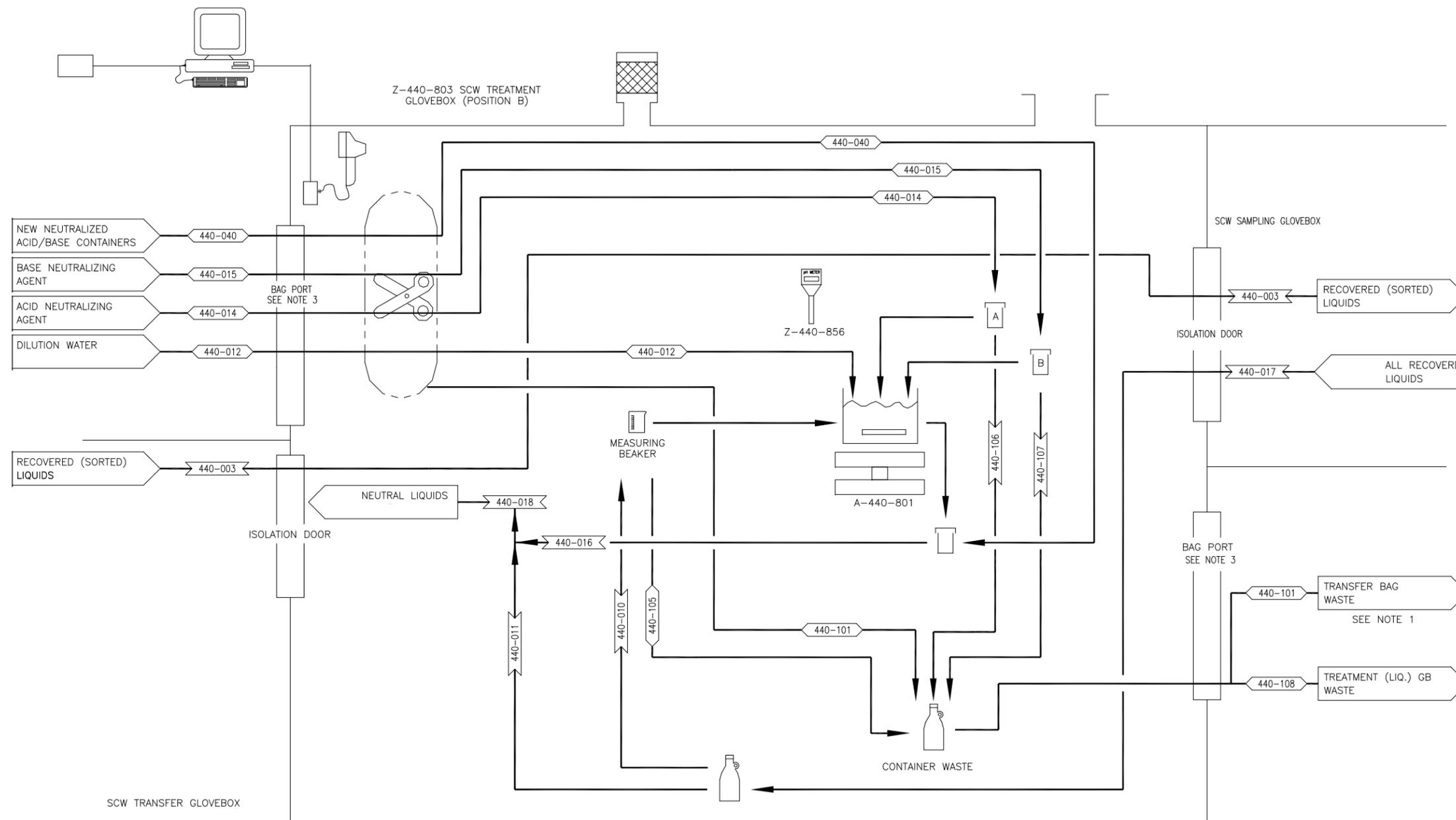


Exhibit XVIII-1 SCW Transfer Glovebox – Position A Process Flow Diagram



- NOTES:
1. REMOVED FROM SCW GLOVEBOXES AS REQUIRED
 2. DMS AND VENTILATION DETAILS PROVIDED ON XVIII-3 & XVIII-4
 3. ONE BAG PORT TO BE MOUNTED ON GLOVEBOX.
 4. THIS EXHIBIT WAS CREATED FROM DRAWING 55-9570 REV 04.

Exhibit XVIII-2 SCW Treatment Glovebox – Position B (Liquids) Process Flow Diagram

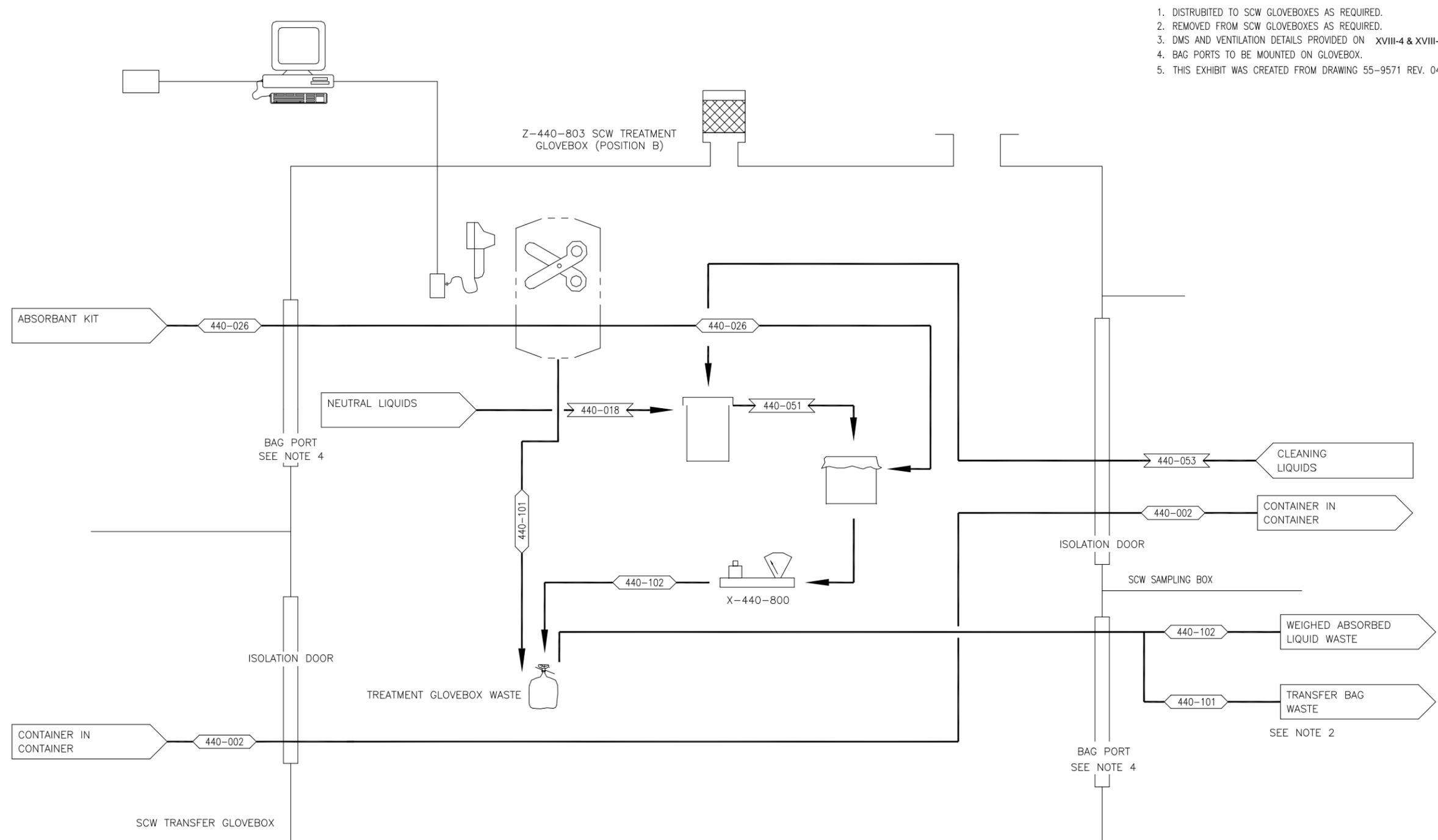


Exhibit XVIII-3 SCW Treatment Glovebox – Position B (ABS) Process Flow Diagram

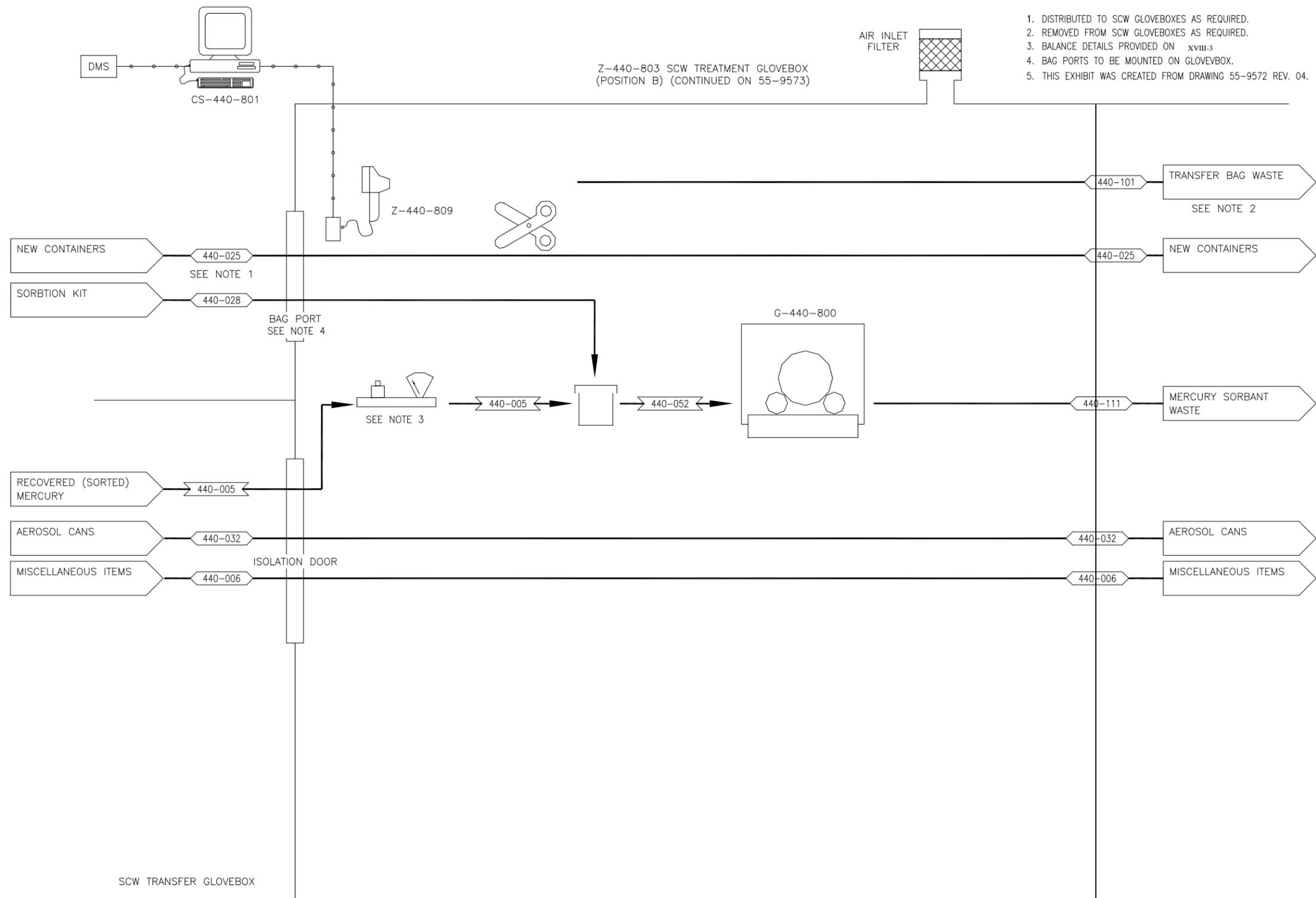


Exhibit XVIII-4 SCW Treatment Glovebox – Position B (Misc.) Sheet 1 Process Flow Diagram

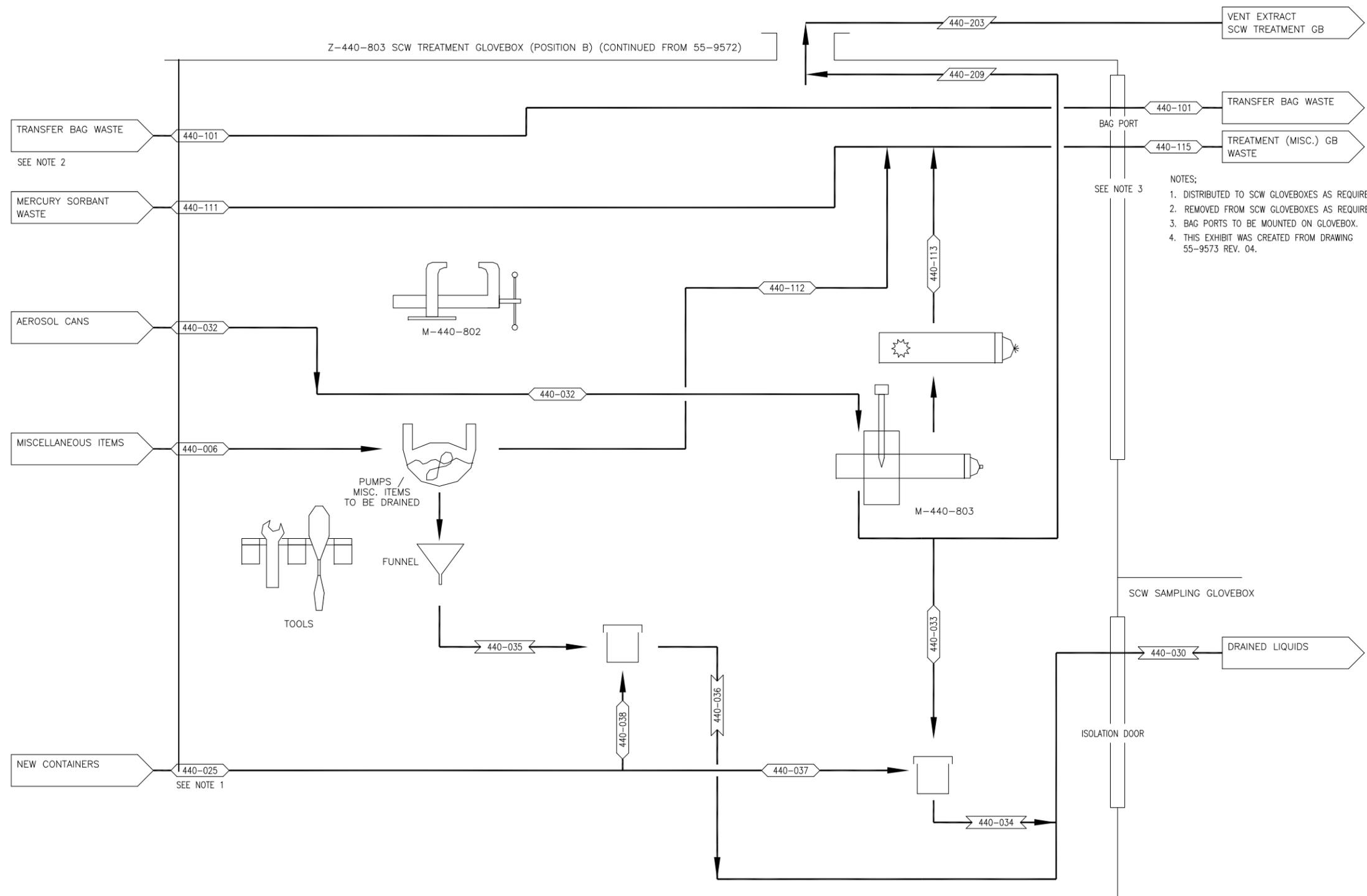
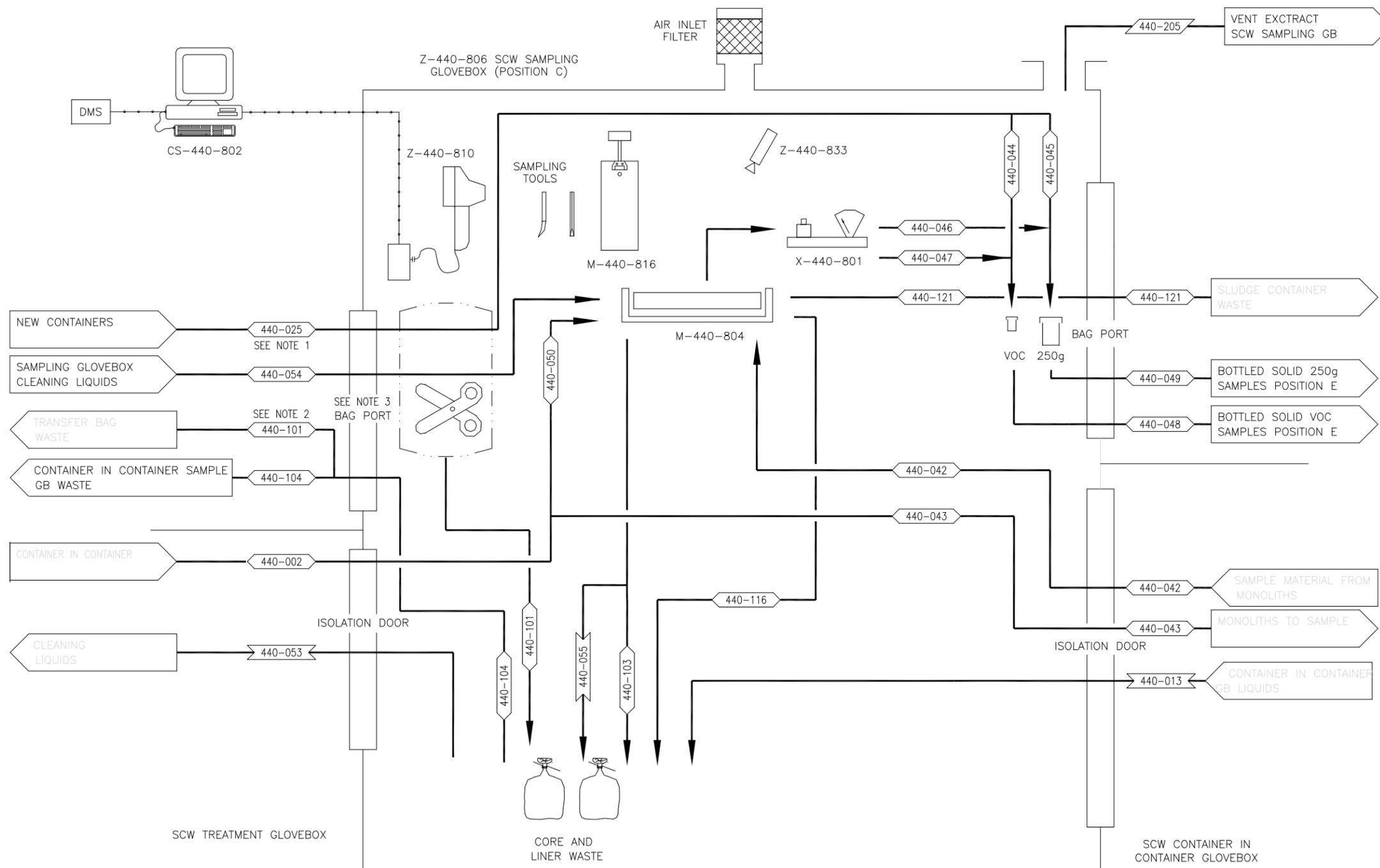


Exhibit XVIII-5 SCW Treatment Glovebox – Position B (Misc.) Sheet 2 Process Flow Diagram



1. DISTRIBUTED TO SCW GLOVEBOXES AS REQUIRED.
2. REMOVED FROM SCW GLOVEBOXES AS REQUIRED.
3. ONE BAG PORT TO BE MOUNTED ON GLOVEBOX.
4. THIS EXHIBIT WAS MADE FROM 55-9517 REV. 06.

Exhibit XVIII-6 SCW Sampling Glovebox – Position C (Solids) Process Flow Diagram

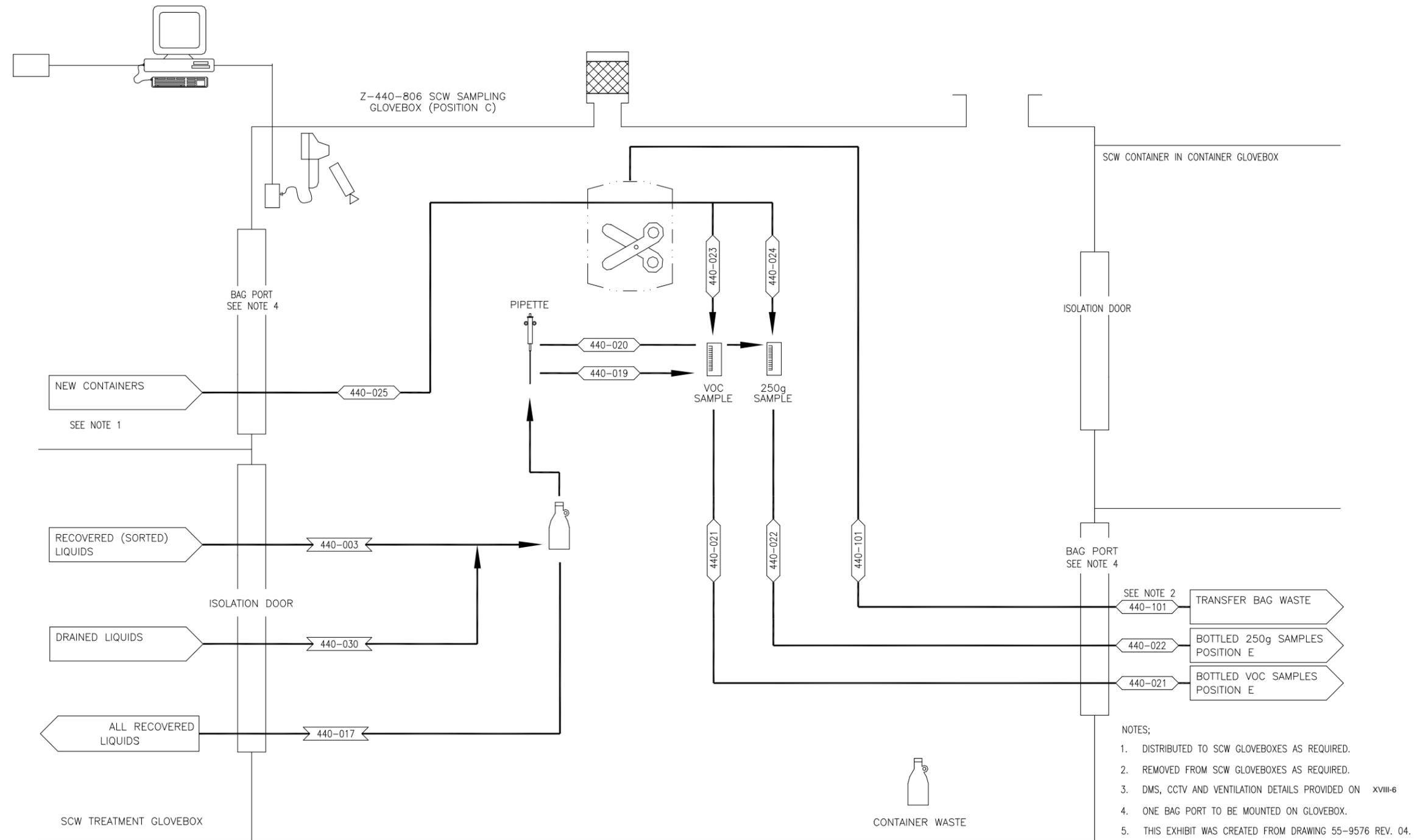


Exhibit XVIII-7 SCW Sampling Glovebox – Position C Process Flow Diagram (Liquids)

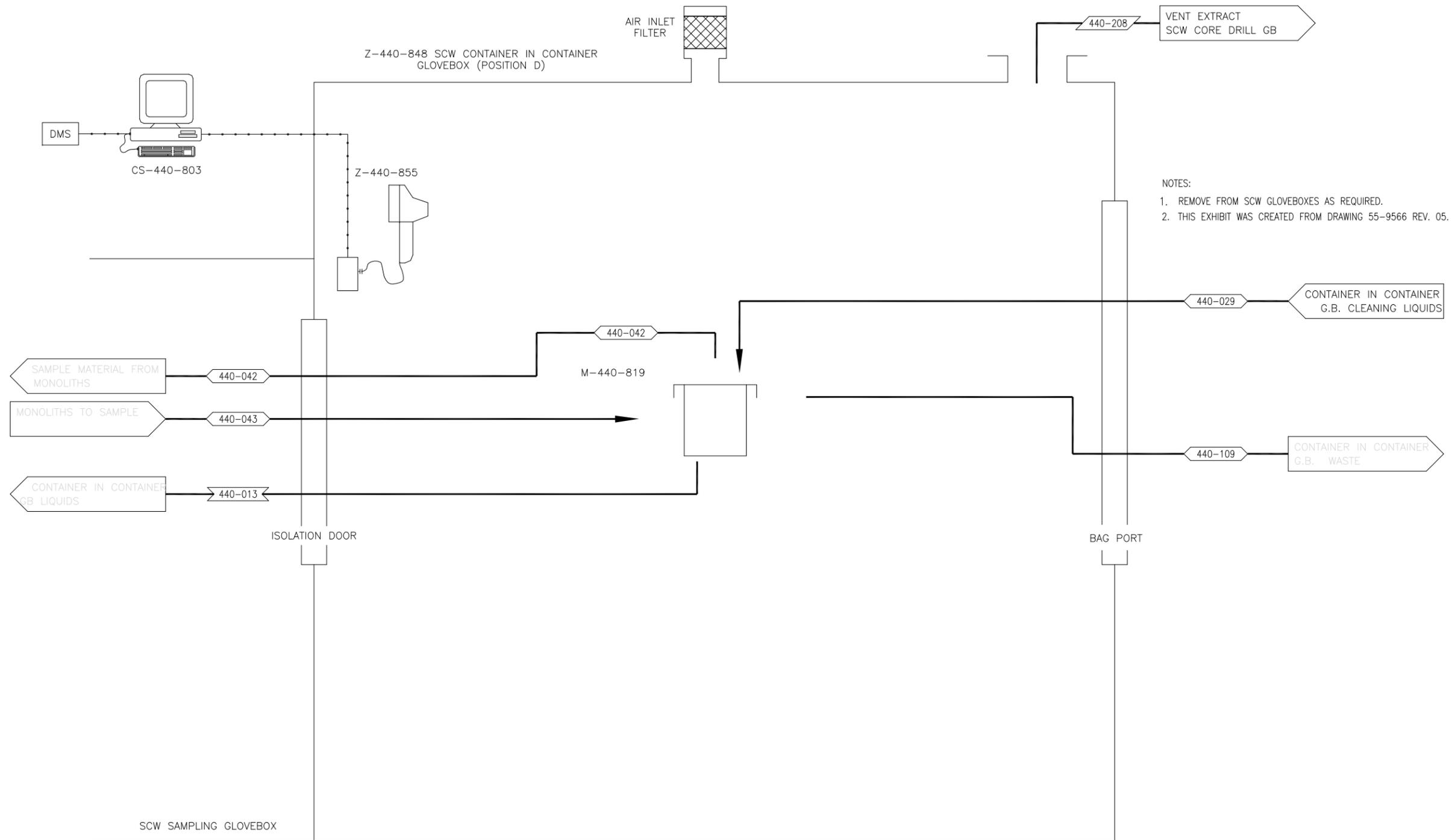


Exhibit XVIII-8 SCW Container-in-Container Glovebox – Position D Process Flow Diagram

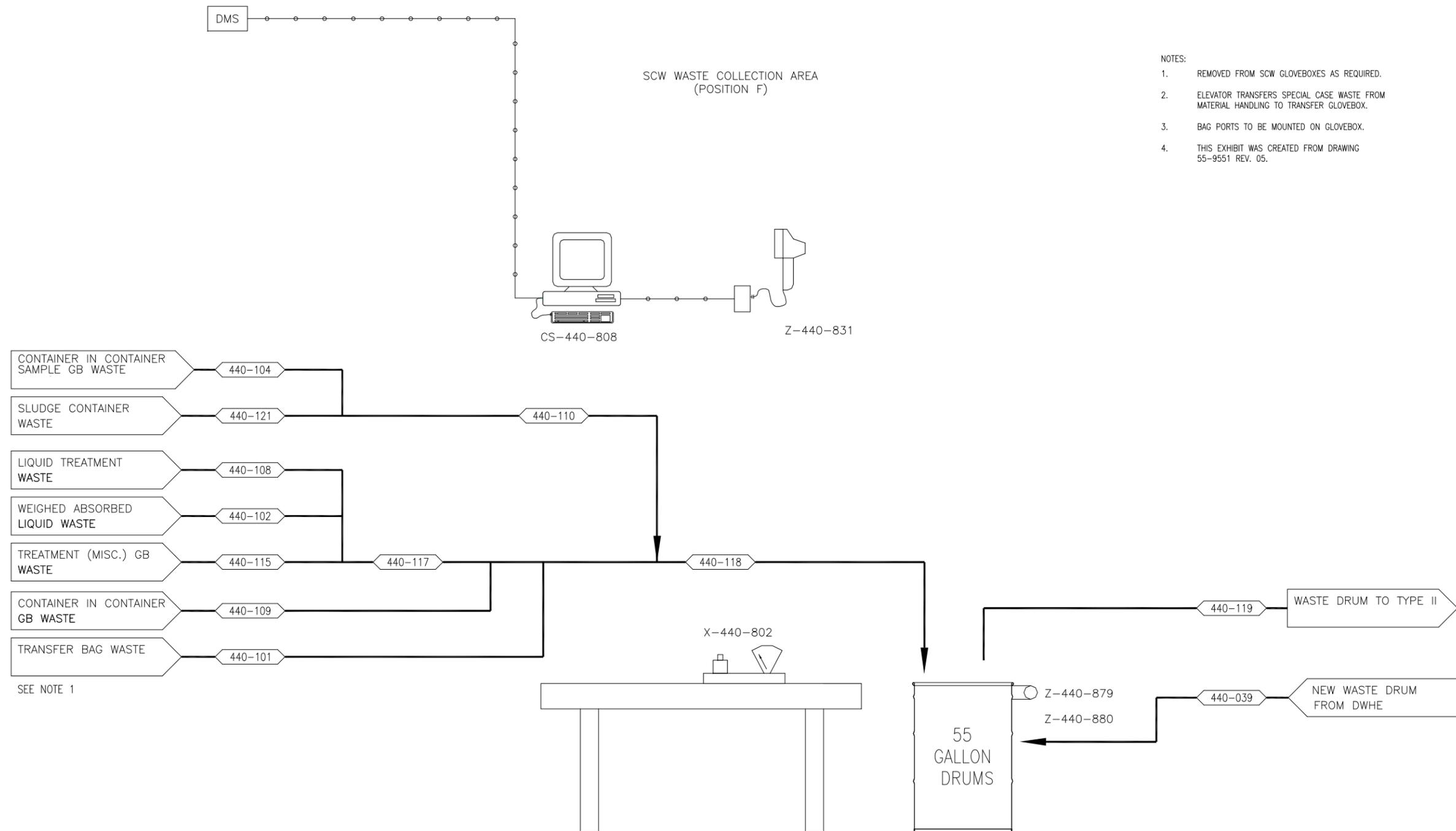
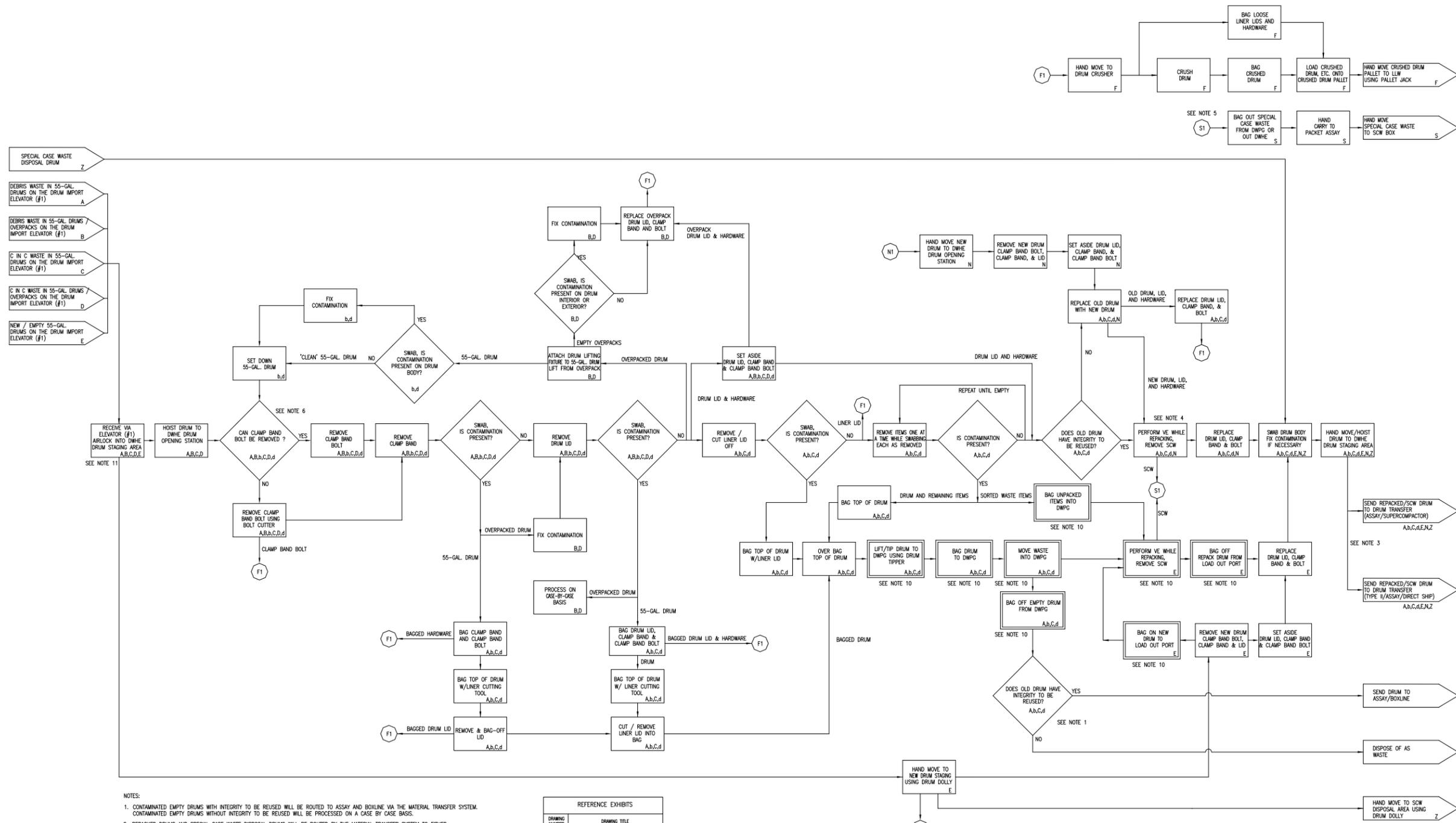


Exhibit XVIII-9 SCW Waste Collection Area – Position F Process Flow Diagram

Exhibit XVIII-10
Special Case Waste and Drum Repack System
Area General Arrangement

Drawing 53-9744

This large, fold-out drawing is not available in electronic form; however, a hard copy can be requested from the Idaho Department of Environmental Quality



- NOTES:
- CONTAMINATED EMPTY DRUMS WITH INTEGRITY TO BE REUSED WILL BE ROUTED TO ASSAY AND BOXLINE VIA THE MATERIAL TRANSFER SYSTEM. CONTAMINATED EMPTY DRUMS WITHOUT INTEGRITY TO BE REUSED WILL BE PROCESSED ON A CASE BY CASE BASIS.
 - REPACKED DRUMS AND SPECIAL CASE WASTE DISPOSAL DRUMS WILL BE ROUTED BY THE MATERIAL TRANSFER SYSTEM TO EITHER ASSAY/SUPERCOMPACTOR OR TYPE II/ASSAY/DIRECT SHIP AS APPROPRIATE.
 - CONTAINER IN CONTAINER VISUAL EXAMINATIONS (VE) ARE PERFORMED IN THE DRUMMED WASTE PACKAGING GLOVEBOX AND IN SCW. ITEMS SENT TO VE IN SCW ARE THEN RETURNED TO DRS.
 - SPECIAL CASE WASTE INCLUDES PROHIBITED ITEMS AND MISMATCHED IDC ITEMS FOR THE PURPOSES OF THIS DRAWING.
 - A 55-GALLON DRUM WHICH WAS RECEIVED AS AN OVERPACK (B, D) IS TRACKED BY b, d AFTER OVERPACK IS REMOVED.
 - PROCESS BOXES SHOWN IN DOUBLE LINE DENOTE DRUMMED WASTE PACKAGING GLOVEBOX (DWPG) RELATED OPERATIONS.
 - THIS EXHIBIT WAS CREATED FROM DRAWING 55-9568 REV. 03.

REFERENCE EXHIBITS	
DRAWING NUMBER	DRAWING TITLE
55-9544	SPECIAL CASE WASTE AND DRUM REPACK SYSTEM AREA GENERAL ARRANGEMENT

Exhibit XVIII-11 Drum Repack System Block Flow Diagram

APPENDIX XIX**TREATMENT (SPECIAL CASE WASTE) MECHANICAL DATA SHEETS**

MDS Number	Description
Z-440-800	SCW Transfer Glovebox
Z-440-803	SCW Treatment Glovebox
Z-440-806	SCW Sampling Glovebox
Z-440-848	SCW Container-In-Container Glovebox
M-440-803	Aerosol Can Puncturer



Mechanical Data Sheet

No. Z-440-800

QUALITY LEVEL: NO

Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
0	Final design issue – issued for permit use	D. Horn (sig. On file) 01/18/01	T. Coleman (sig. on file) 01/18/01	N/A	K. Bentley (sig. On file) 01/18/01
1	Final design issue – incorporated permit review comments for permit use only	D. Horn (sig. on file) 02/23/01	T. Coleman (sig. On file) 02/23/01	N/A	K. Bentley (sig. On file) 02/23/01
2	Final Design issue – 100% Design	L. Shiau 06/18/01	D. Horn 06/18/01	N/A	D. Horn 06/18/01
3	Updated for permit - CCR	<i>S. Schultheis</i> 27 Oct. 2003	<i>Richard Beck</i> 27 Oct 2003	N/A.	<i>S. Schultheis</i> 2/1/03

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Engineering and Environmental Laboratory (INEEL)
System Number:	440
Plant Item Number:	Z-440-800
Equipment Name:	SCW Transfer Glovebox
Associated Drawing(s):	55-9569 Special Case Waste Transfer Glovebox – Position A Process Flow Diagram 53-9744 Special Case Waste and Drum Repack System Area General Arrangement 53-9782 Special Case Waste and Drum Repack System Elevation Sht 2 of 3
Associated Document(s):	BNFL-5232-P-013 Process Description for Special Case Waste Glovebox

Description

The glovebox is designed to maintain containment by confining any contamination to the Zone 3 ventilated areas of the building. The glovebox incorporates a receipt/sort/export area. If required the glovebox can provide minimal process lead/lag capability for containers subject to sampling. The glovebox contains a transfer roller conveyor, bag transfer port, bar code reader, 2 airlock doors and a basket hoist/trolley.

Summary Data

SUMMARY DATA	UNITS	
Annual Duty	day	330
Daily Duty	hour	24 (On demand)
Average Throughput	Per day	1 gallon container of waste
Cycle Time (Transfer of drum contents)	minutes	20 (from time of receipt of SCW drum to the discharge of the SCW drum)
Minimum Design Pressure	in. wg	-2



Mechanical Data Sheet

No. Z-440-800

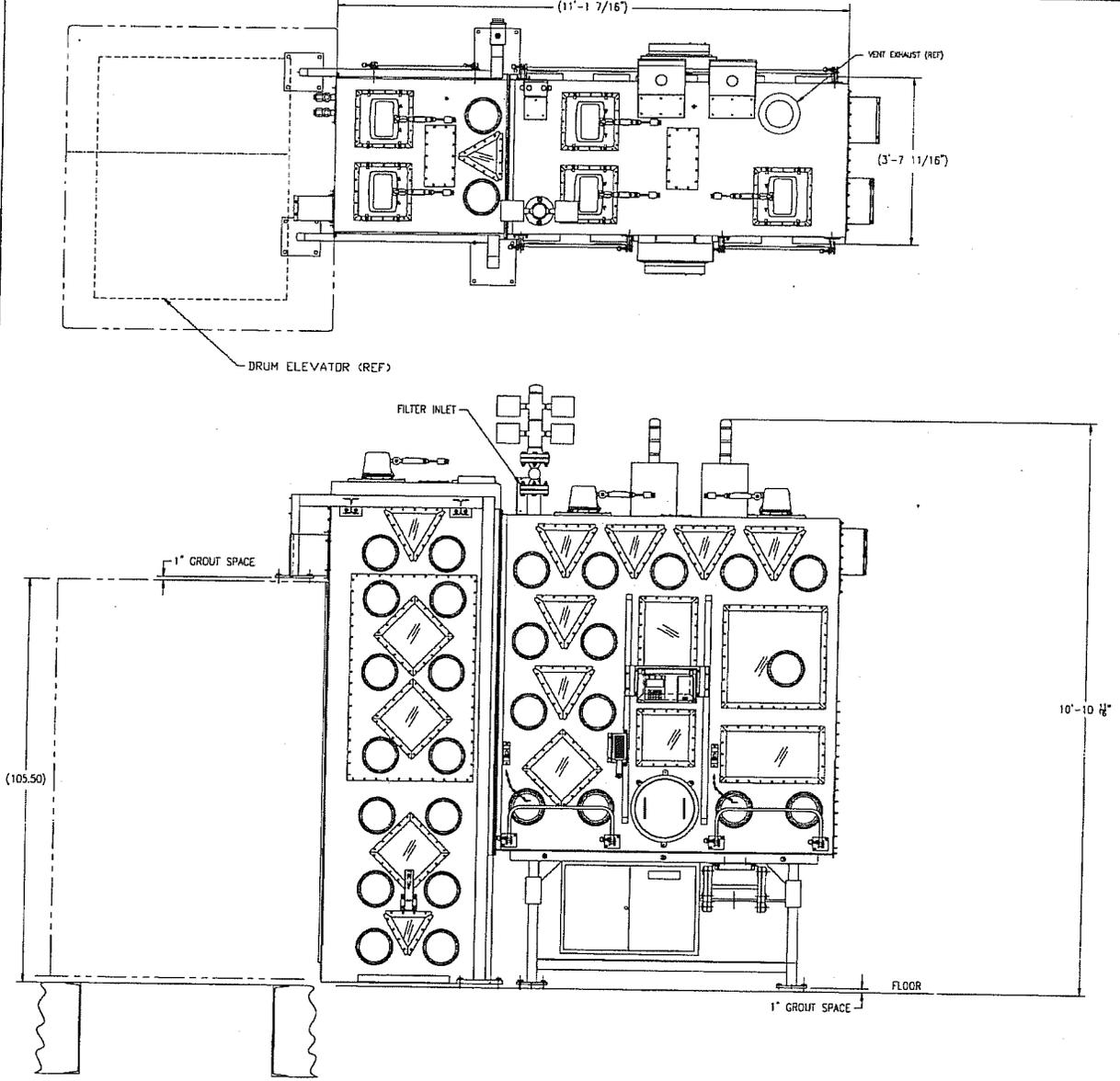
Maximum Design Pressure	in. wg	+2
Normal Operating Temp. Range	°F	66 – 81

Dimensions:	Length	ft & in.	11'-1 11/16" Approx.
	Width	ft & in.	3'-7 11/16" Approx.
	Height	ft & in.	10'-10 1/8" Approx.
Estimated Weight	lb	4,000 (includes equipment)	
Materials and Construction	Stainless Steel		
Maintenance	The equipment is of modular construction, modules to be easily removable with minimum number of fittings to allow dismantling within the containment by glovebox operators via gloveports. Equipment located externally to the glovebox is by direct access.		
Inputs:	By drum elevator conveyor: transfer basket transfer drum containing special case waste By bag port: wipes and drum line originated SCW		
Outputs:	By drum elevator conveyor: transfer basket transfer drum By bag port: wipes, bag waste By isolation door: special case waste containers		
Interfaces:	Drum Elevator, SCW Treatment Glovebox (Z-440-803), HVAC		
Operating Environment:	Zone 3 – Contamination Area (Glovebox Internal) Zone 2 – Operating Area (Glovebox External)		
Services:	Instrument Air, Electricity (Power & Control), Ventilation		

Special Requirements

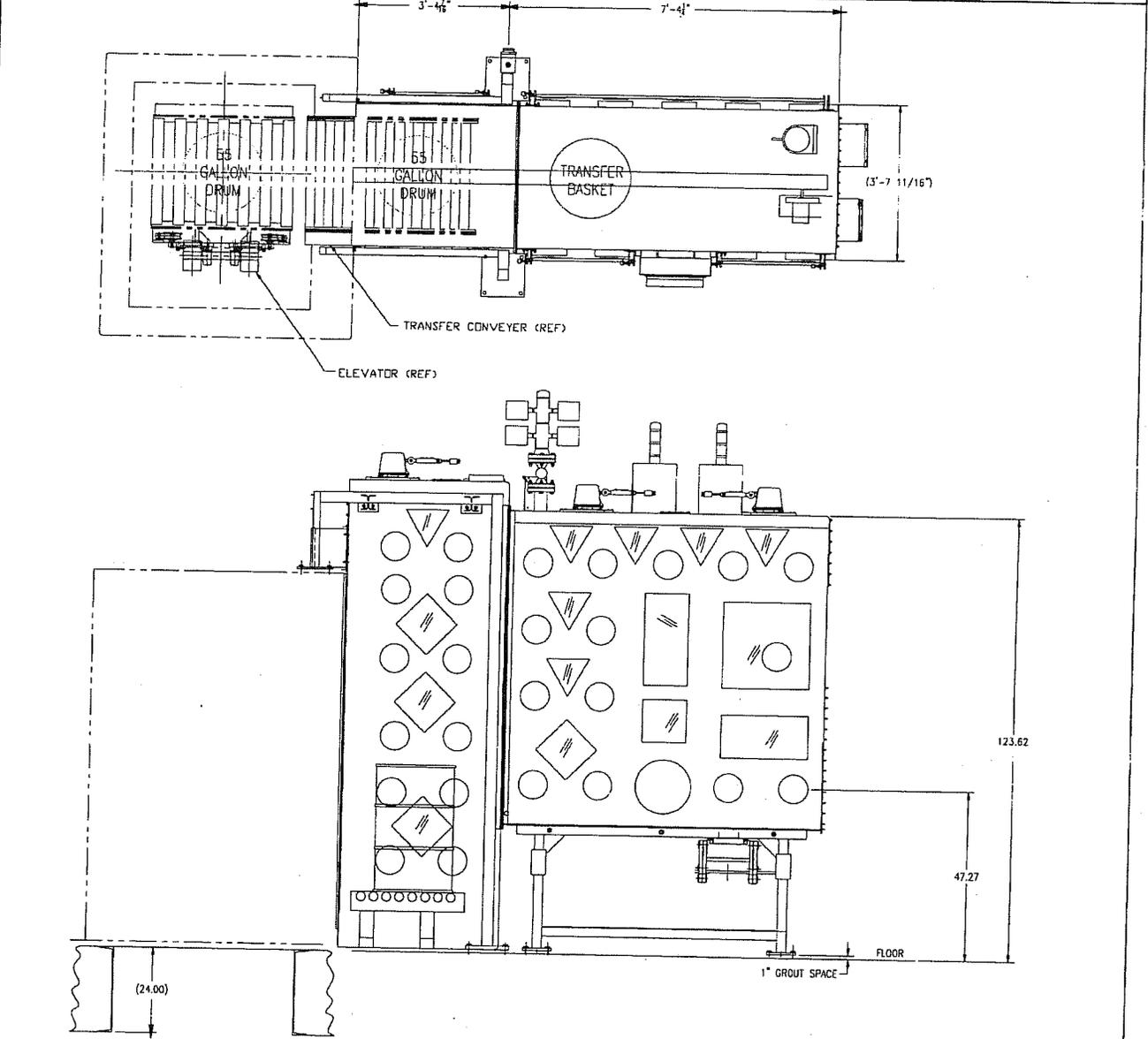
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Description: Transfer Glovebox Site: INEEL Data Sheet No.: Z-440-800



ALL DIMENSIONS ARE APPROXIMATE

Description: Transfer Glovebox Site: INEEL Data Sheet No.: Z-440-800



ALL DIMENSIONS ARE APPROXIMATE



Mechanical Data Sheet

No. Z-440-803

QUALITY LEVEL: NO

Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
0	Final design issue – issued for permit use	D. Horn (sig. On file) 01/18/01	T. Coleman (sig. On file) 01/18/01	N/A	K. Bentley (sig. On file) 01/18/01
1	Final design issue – incorporated permit review comments, for permit use only	D. Horn (sig. Of file) 02/23/01	T. Coleman (sig. on file) 02/23/01	N/A	K. Bentley (sig. On file) 02/23/01
2	Final design issue - %100 design	L. Schiau 06/18/01	D. Horn 06/18/01	N/A	D. Horn 06/18/01
3	Updated for permit - CCR	S Schultheis 27 Oct. 2003 <i>pt. Rechecked</i>	<i>Richard Leh</i>	N/A.	<i>J. Kauter</i> 12/1/03

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Engineering and Environmental Laboratory (INEEL)
System Number:	440
Plant Item Number:	Z-440-803
Equipment Name:	SCW Treatment Glovebox
Associated Drawing(s):	55-9570 Special Case Waste Treatment Glovebox – Position B (Liquids) Process Flow Diagram 55-9571 Special Case Waste Treatment Glovebox – Position B (Abs.) Process Flow Diagram 55-9572 Special Case Waste Treatment Glovebox – Position B (Misc.) Sht 1 Process Flow Diagram 55-9573 Special Case Waste Treatment Glovebox – Position B (Misc.) Sht 2 Process Flow Diagram 53-9744 Special Case Waste and Drum Repack System Area General Arrangement 53-9782 Special Case Waste and Drum Repack System Elevation Sht 2 of 3
Associated Document(s):	BNFL-5232-P-013 Process Description for Special Case Waste Glovebox

Description

The glovebox is designed to maintain containment by confining any contamination to the Zone 3 ventilated areas of the building. The glovebox is used for draining liquids from aerosol cans and miscellaneous items, the treatment of liquids, absorption of liquids, and the absorption of mercury. The glovebox contains a jar mill, a balance, a vice, an aerosol can puncturing device, hand tools, a stirring plate, bar code reader and a bag transfer port.

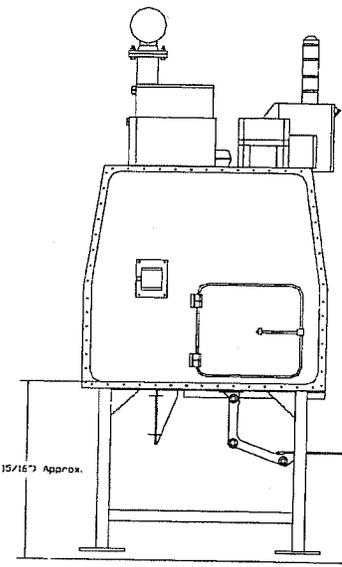
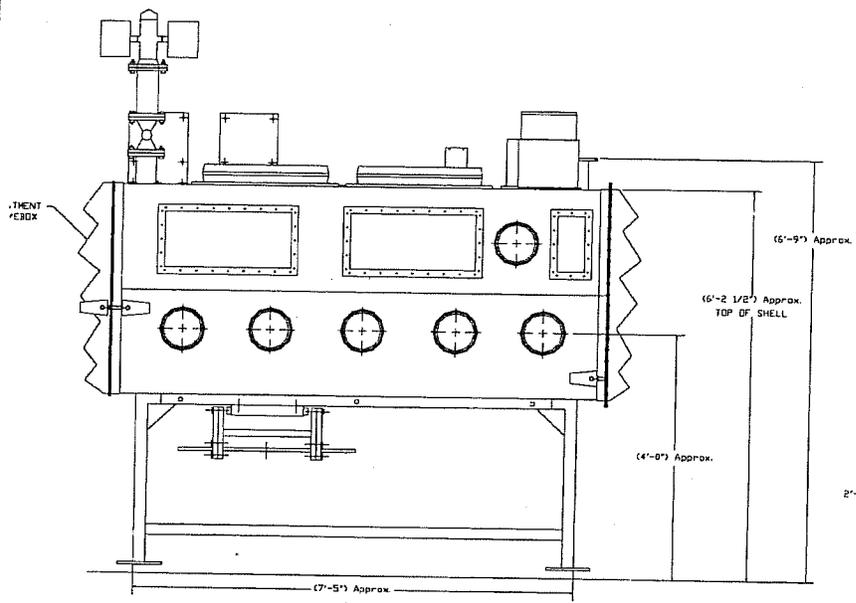
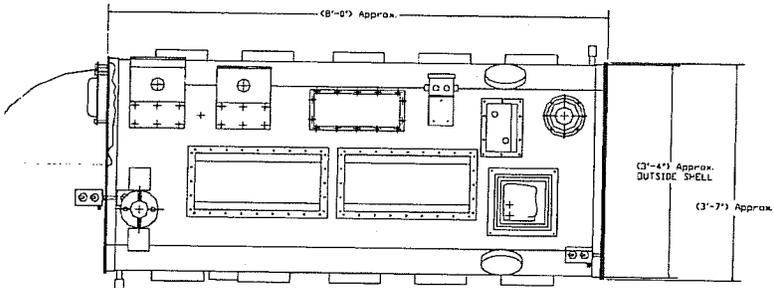
Summary Data

SUMMARY DATA		UNITS	
Annual Duty		day	330
Daily Duty		Hour	24 (On demand)
Average Throughput		Per day	1 gallon container of waste
Cycle Time		Second	Variable (depends on waste stream)
Minimum Design Pressure		in. wg	-2
Maximum Design Pressure		in. wg	+2
Normal Operating Temperature Range		°F	66 - 81
Design Temperature		°F	200
Dimensions:	Length	ft & in.	8'-0" Approx.
	Width	ft & in.	3'-7" Approx.
	Height	ft & in.	6'-9" Approx.
Estimated Weight		lb	1,700 (includes equipment)
Materials and Construction	Stainless Steel		
Maintenance	The equipment is small lab equipment that can be easily removed with minimum number of fittings to allow dismantling within the containment by glovebox operators via gloveports. Equipment located externally to the glovebox is by direct access.		
Inputs:	By isolation door (from transfer and sampling gloveboxes): special case waste containers By bag port: new containers, absorption kits, mercury absorption kits, neutralization kits, dilution water		
Outputs:	By isolation door (to sampling glovebox): container in a container waste, recovered liquids waste By bag port: empty liquid containers, depressurized aerosol cans, drained miscellaneous items, absorbed liquid waste, absorbed mercury waste		
Interfaces:	SCW Sampling Glovebox (Z-440-806), SCW Transfer Glovebox (Z-440-800), HVAC		
Operating Environment:	Zone 3 – Contamination Area (Glovebox Internal) Zone 2 – Operating Area (Glovebox External)		
Services:	Electricity (Power & Control), Ventilation		

Special Requirements

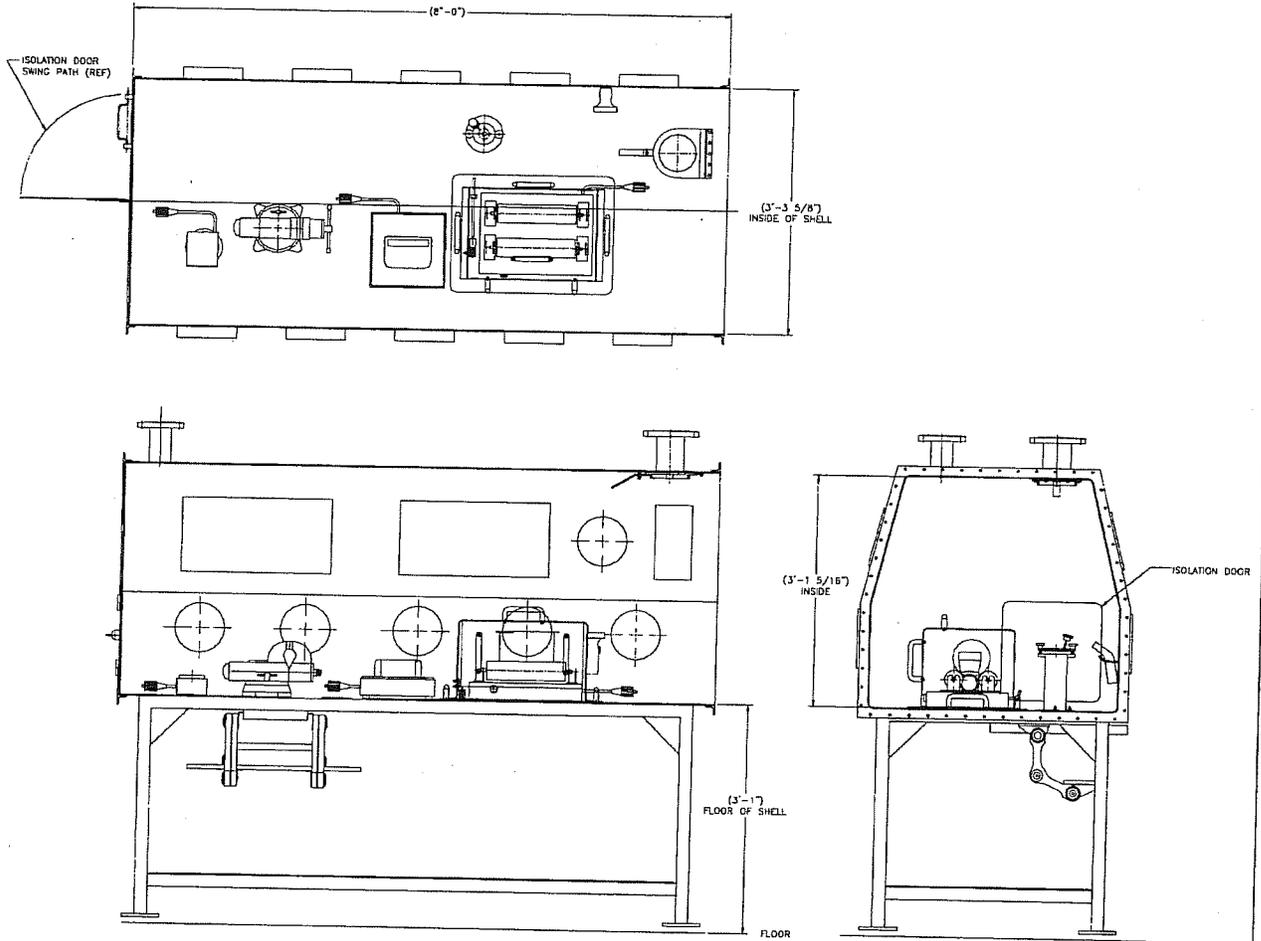
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Description: Treatment Glovebox	Site: INEEL	Data Sheet No.: Z-440-803
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ALL DIMENSIONS ARE APPROXIMATE

Description: Treatment Glovebox Site: INEEL Data Sheet No.: Z-440-803



ALL DIMENSIONS ARE APPROXIMATE



Mechanical Data Sheet

No. Z-440-806

QUALITY LEVEL: NO

Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
0	Final design issue – issued for permit use	D. Horn (sig. On file) 01/18/01	T. Coleman (sig. On file) 01/18/01	N/A	K. Bentley (Sig. On file) 01/18/01
1	Final design issue – incorporated permit review comments, for permit use only	D. Horn (sig. On file) 02/23/01	T. Coleman (sig. On file) 02/23/01	N/A	K. Bentley (Sig. On file) 02/23/01
2	Final design issue – 100% design	L. Schiau 06/18/01	D. Horn 06/18/01	N/A	D. Horn 06/18/01
3	Issue for permit - CCR	S. Schulthies 10/27/03 <i>[Signature]</i>	<i>Rubov Red</i> 10/27/03	N/A	<i>P. Bentley</i> 12/1/03

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Engineering and Environmental Laboratory (INEEL)
System Number:	440
Plant Item Number:	Z-440-806
Equipment Name:	SCW Sampling Glovebox
Associated Drawing(s):	55-9517 Special Case Waste Sampling Glovebox – Position C (Liquids) Process Flow Diagram 55-9576 Special Case Waste Sampling Glovebox – Position C (Solids) Process Flow Diagram 53-9744 Special Case Waste and Drum Repack System Area General Arrangement 53-9782 Special Case Waste and Drum Repack System Elevation Sht 2 of 3
Associated Document(s):	BNFL-5232-P-013 Process Description for Special Case Waste Glovebox

Description

The glovebox is designed to maintain containment by confining any contamination to the Zone 3 ventilated areas of the building. The glovebox is used for the sampling of liquids and solids. The glovebox contains: bar code reader, a can opener, a liquid tray, a pipette, a balance, hand tools (if required), VE CCTV Camera and a bag port.

Summary Data

SUMMARY DATA	UNITS	
Annual Duty	day	330
Daily Duty	Hour	24 (On demand)
Average Throughput	Per day	1 gallon container of waste
Cycle Time	Second	Variable (depends on waste stream)

Minimum Design Pressure	in. wg	-2
Maximum Design Pressure	in. wg	+2
Normal Operating Temperature Range	°F	66 - 81
Dimensions:	Length	ft & in. 8'-0" Approx.
	Width	ft & in. 3'-7" Approx.
	Height	ft & in. 6'-9" Approx.
Estimated Weight	lb	1,700 (includes equipment)
Materials and Construction	Stainless Steel	
Maintenance	The equipment is small lab equipment that can be easily removed with minimum number of fittings to allow dismantling within the containment by glovebox operators via gloveports. Equipment located externally to the glovebox is by direct access.	
Inputs:	By isolation door (from treatment glovebox): container in a container and recovered liquids (including aerosol container and miscellaneous item contents) By isolation door (from container in container glovebox): sample material, used cleaning fluid By bag port: new containers, wipes	
Outputs:	By isolation door (to treatment glovebox): recovered liquids (including aerosol container, miscellaneous item contents, used cleaning fluid) By isolation door (to container in container glovebox): monolithic container in a container waste By bag port: filled sample containers, container in a container sludge waste, bag transfer waste	
Interfaces:	SCW Treatment Glovebox (Z-440-803), SCW Container in Container Glovebox (Z-440-848), HVAC	
Operating Environment:	Zone 3 – Contamination Area (Glovebox Internal) Zone 2 – Operating Area (Glovebox External)	
Services:	Electricity (Power & Control), Ventilation	

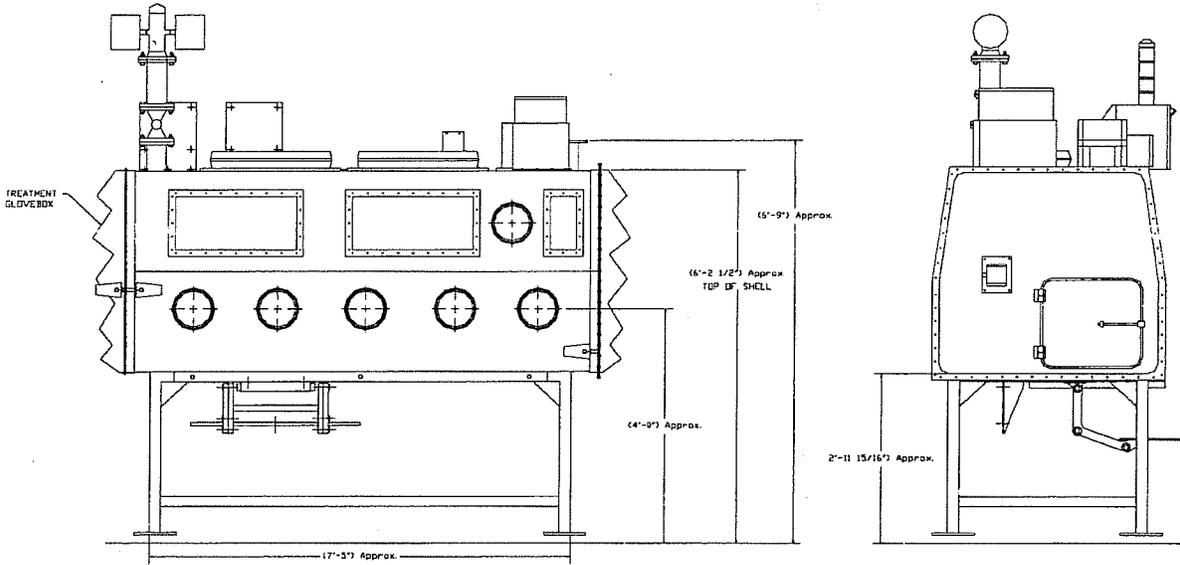
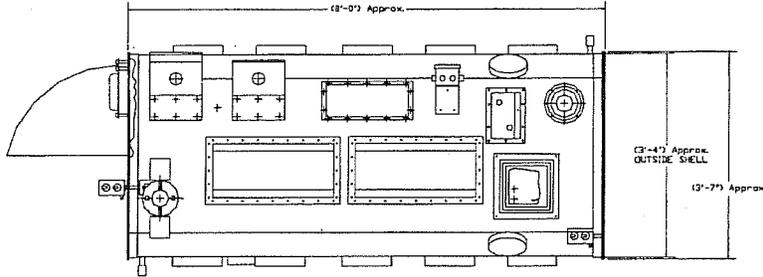
Special Requirements

None	

Description: Sampling Glovebox

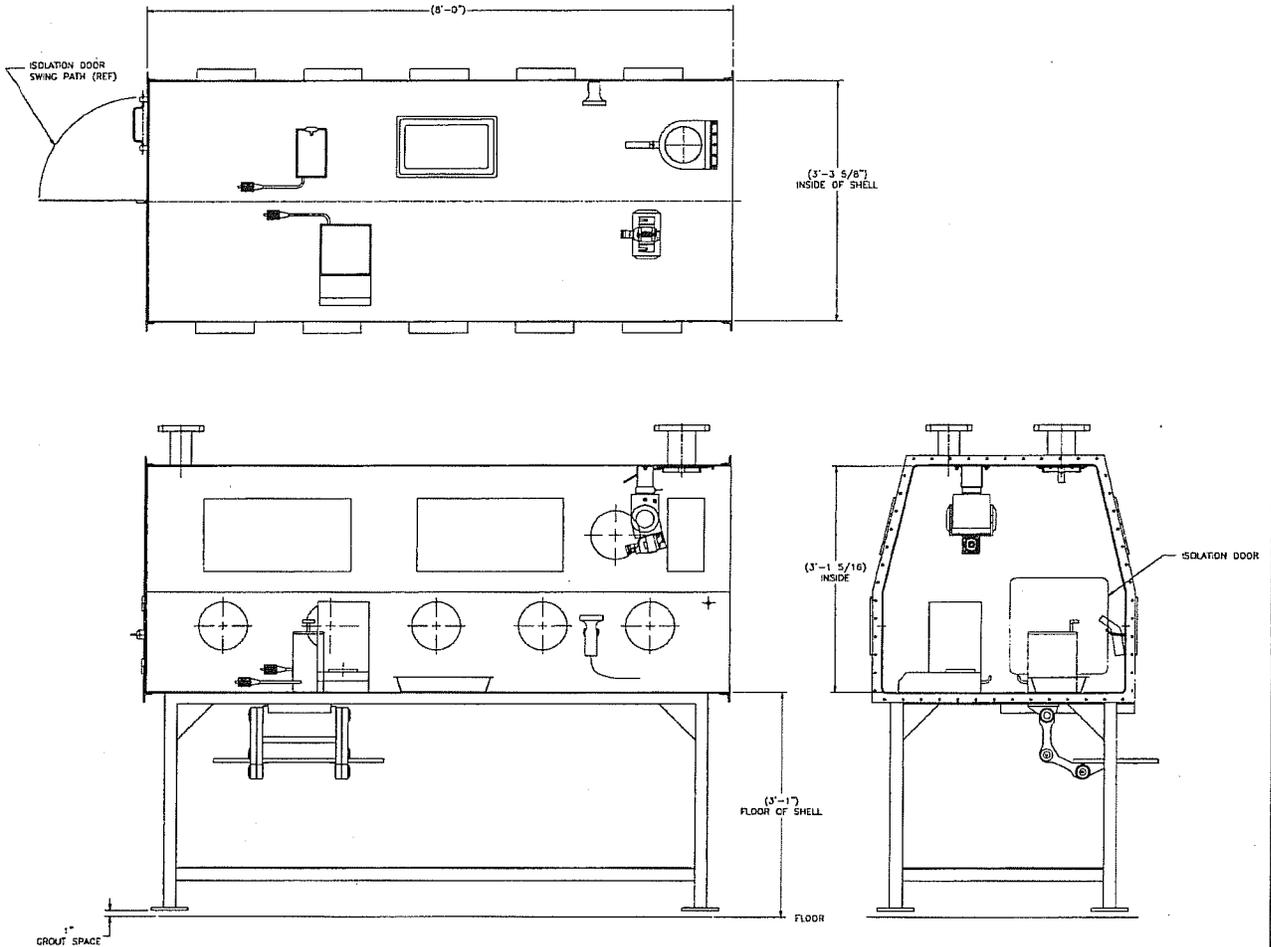
Site: INEEL

Data Sheet No.: Z-440-806



ALL DIMENSIONS ARE APPROXIMATE

Description: Sampling Glovebox	Site: INEEL	Data Sheet No.: Z-440-806
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ALL DIMENSIONS ARE APPROXIMATE



Mechanical Data Sheet

No. Z-440-848

QUALITY LEVEL: NO

Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
0	Final design issue – issued for permit use	D. Horn (sig. On file) 01/18/01	T. Coleman (sig. On file) 01/18/01	N/A	K. Bentley (sig. On file) 01/18/01
1	Final design issue – incorporated permit review comments, for permit use only	D. Horn (sig. On file) 02/23/01	T. Coleman (sig. On file) 02/23/01	N/A	K. Bentley (sig. On file) 02/23/01
2	Final design issue - 100% design	L. Schiau 06/18/01	D. Horn 06/18/01	N/A	D. Horn 06/18/01
3	Issue for permit - CCR	S. Schulthies 10/27/03 <i>S. Schulthies</i>	<i>Rudowick</i> 10/27/03	N/A.	<i>S. Schulthies</i> 12/1/03

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Engineering and Environmental Laboratory (INEEL)
System Number:	440
Plant Item Number:	Z-440-848
Equipment Name:	SCW Container in Container Glovebox
Associated Drawing(s):	55-9566 Special Case Waste Container in Container Glovebox – Position D Process Flow Diagram 53-9744 Special Case Waste and Drum Repack System Area General Arrangement 53-9782 Special Case Waste and Drum Repack System Elevation Sht 2 of 3
Associated Document(s):	BNFL-5232-P-013 Process Description for Special Case Waste Glovebox

Description

The glovebox is designed to maintain containment by confining any contamination to the Zone 3 ventilated areas of the building. The glovebox is used for the sampling of monolithic container in a container waste. The glovebox contains a bar code reader and a bag transfer port.

Summary Data

SUMMARY DATA	UNITS	
Annual Duty	day	330
Daily Duty	hour	24 (On demand)
Average Throughput	Per day	1 gallon container of waste
Cycle Time (Coring operation)	Second	Variable (depends on waste stream)
Minimum Design Pressure	in. wg	-2
Maximum Design Pressure	in. wg	+2



Mechanical Data Sheet

No. Z-440-848

Normal Operating Temperature Range	°F	66 - 81
Dimensions:	Length	ft & in. 8'-0" Approx.
	Width	ft & in. 3'-7" Approx.
	Height	ft & in. 6'-9" Approx.
Estimated Weight	lb	1,700 (includes equipment)
Materials and Construction	Stainless Steel	
Maintenance:	The equipment is of modular construction, modules to be easily removable with minimum number of fittings to allow dismantling within the containment by glovebox operators via gloveports. Equipment located externally to the glovebox is by direct access.	
Inputs:	By isolation door: Container in a container waste to be sampled By bag port: Wipes and cleaning fluid	
Outputs:	By isolation door: Sample material, used cleaning fluid By bag port: Wipes and Container in a Container waste	
Interfaces:	SCW Sampling Glovebox (Z-440-806), HVAC	
Operating Environment:	Zone 3 – Contamination Area (Glovebox Internal) Zone 2 – Operating Area (Glovebox External)	
Services:	Electricity (Power & Control), Ventilation	

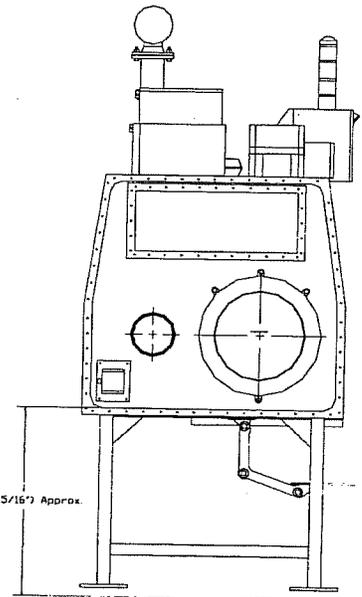
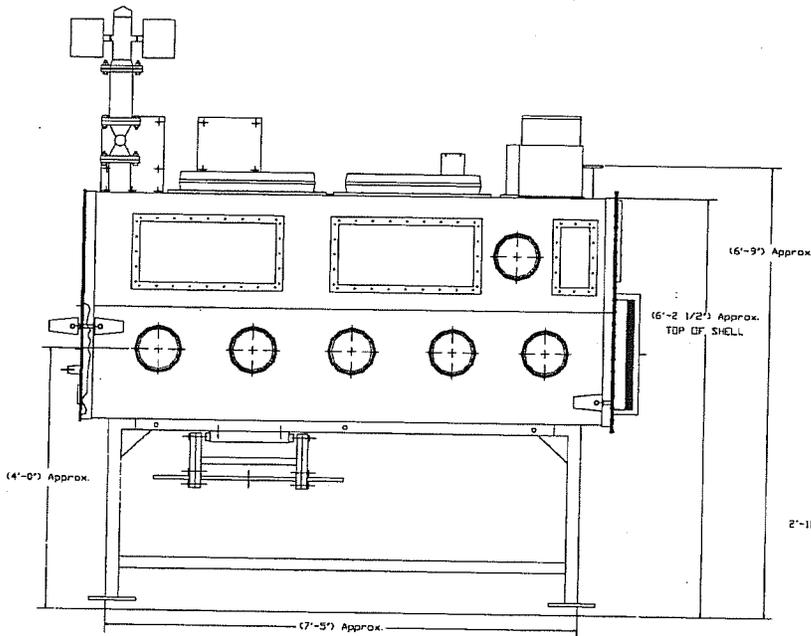
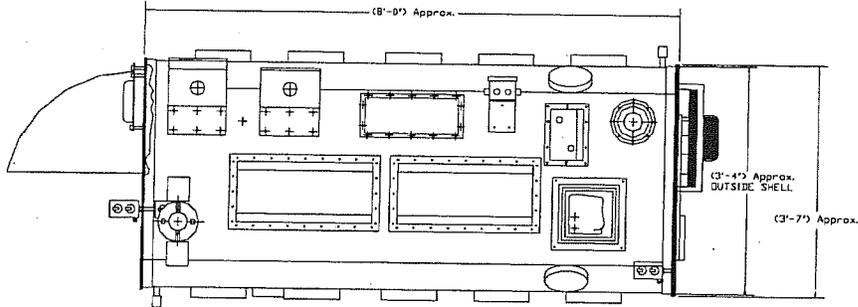
Special Requirements

None	

Description: Container in
Container Glovebox

Site: INEEL

Data Sheet No.: Z-440-848

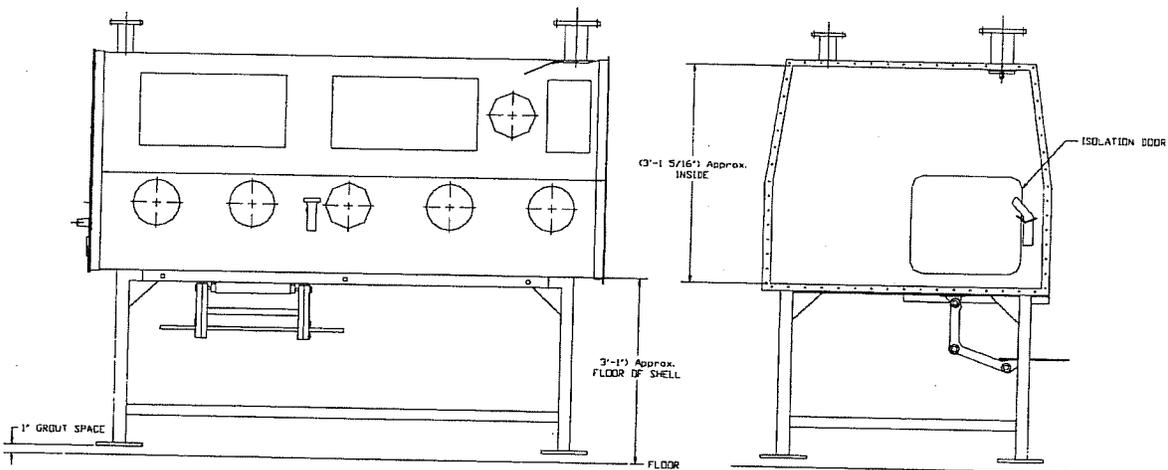
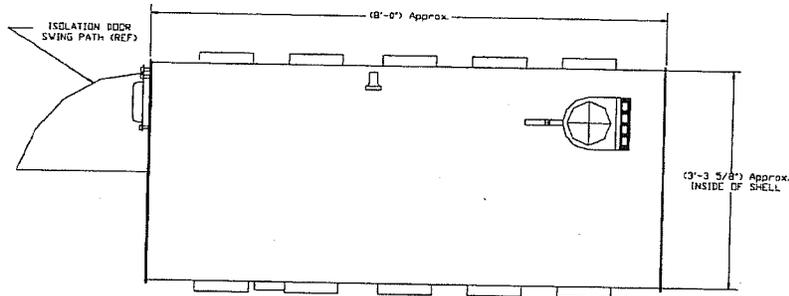


ALL DIMENSIONS ARE APPROXIMATE

Description: Container in
Container Glovebox

Site: INEEL

Data Sheet No.: Z-440-848





Mechanical Data Sheet

No. M-440-803

QUALITY LEVEL: NO					
Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
0	Final Design Issue - 100% Design	D. Horn 11/15/01 <i>D. Horn</i>	M. Zubin 11/15/01 <i>M. Zubin</i>	N/A -	D. Horn 11/15/01 <i>D. Horn</i>

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Engineering and Environmental Laboratory (INEEL)
System Number:	440
Plant Item Number:	M-440-803
Equipment Name:	Aerosol Can Puncturer
Associated Drawing(s):	55-9573 Special Case Waste Treatment Glovebox – Position B Sht 2 (Misc.) Process Flow Diagram 53-9894 SCW Aerosol Can Puncturing Device Assembly
Associated Document(s):	BNFL-5232-P-013 Process Description for Special Case Waste Glovebox

Description

Device for puncturing aerosol cans containing known non-hazardous gas. Unit contains aerosol can during puncturing operations and is secured to the Treatment Glovebox floor.

Summary Data

SUMMARY DATA	UNITS	
Annual Duty	day	330
Daily Duty	Hour	24 (On demand)
Average Throughput	Per wk	1 aerosol can (1 liter size)
Cycle Time	Minute	15 Approx.
Minimum Design Pressure	In wg	N/A
Maximum Design Pressure	In wg	N/A
Normal Operating Temperature Range	°F	66 – 81
Dimensions:	Diameter	Ft & in 6" Approx.
	Height	Ft & in 11" Approx.
Estimated Weight	lb.	15 Approx.
Materials and Construction	Stainless Steel.	
Maintenance	The equipment is small lab equipment that can be easily removed with minimum number of fittings to allow dismantling within the containment by glovebox operators via gloveports.	
Inputs :	Filled aerosol can is placed inside bag. Bag and can are placed device and secured with a bolt-on cap.	



Mechanical Data Sheet

No. M-440-803

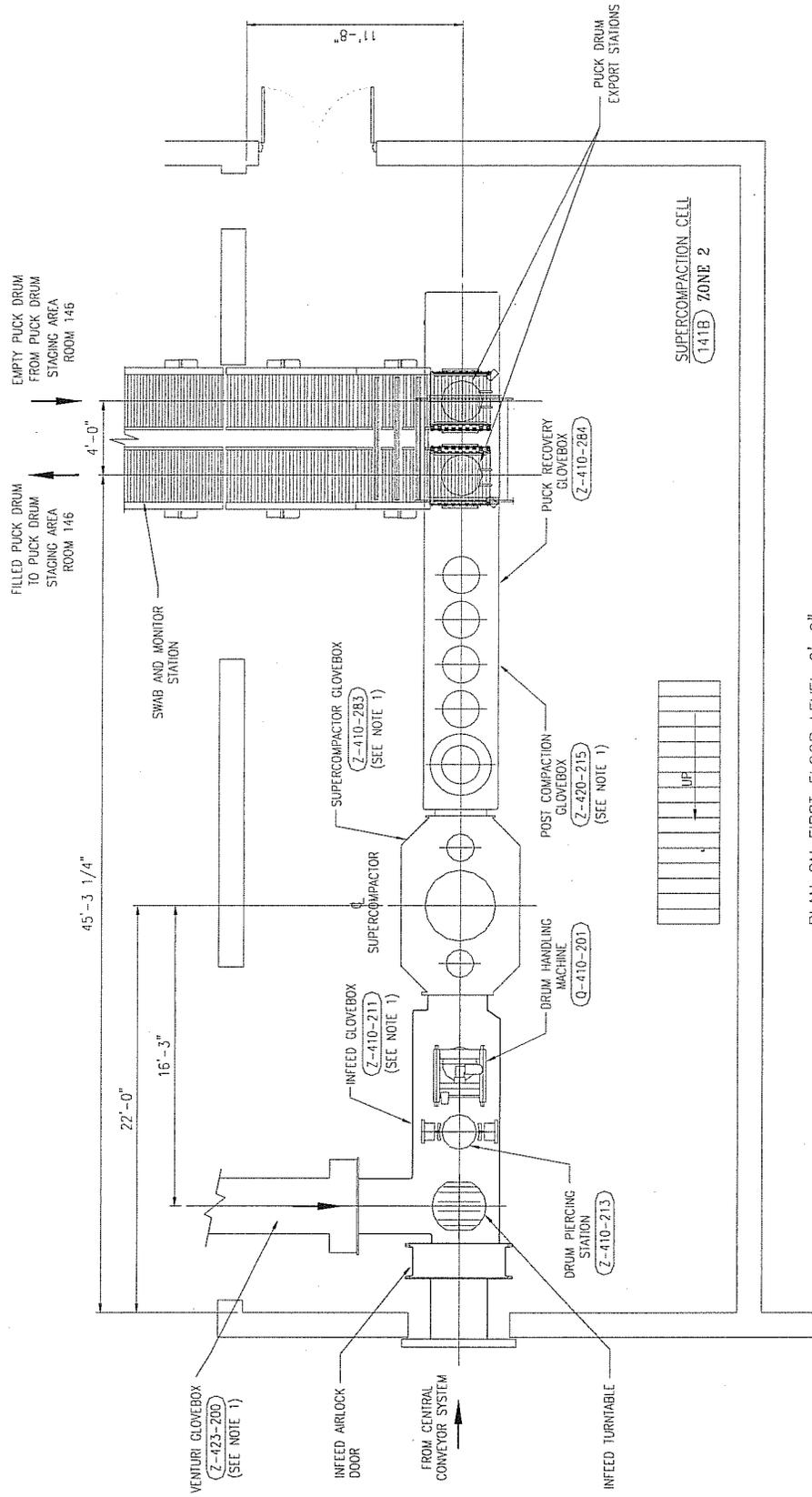
Outputs:	Bag, can and can contents are removed from the unit after bolt-on cap is removed.
Interfaces :	SCW Treatment Glovebox (Z-440-803)
Operating Environment:	Zone 3 - Contamination Area
Services	N/A

Special Requirements

None	

APPENDIX XX**TREATMENT (SUPERCOMPACTION) EXHIBITS**

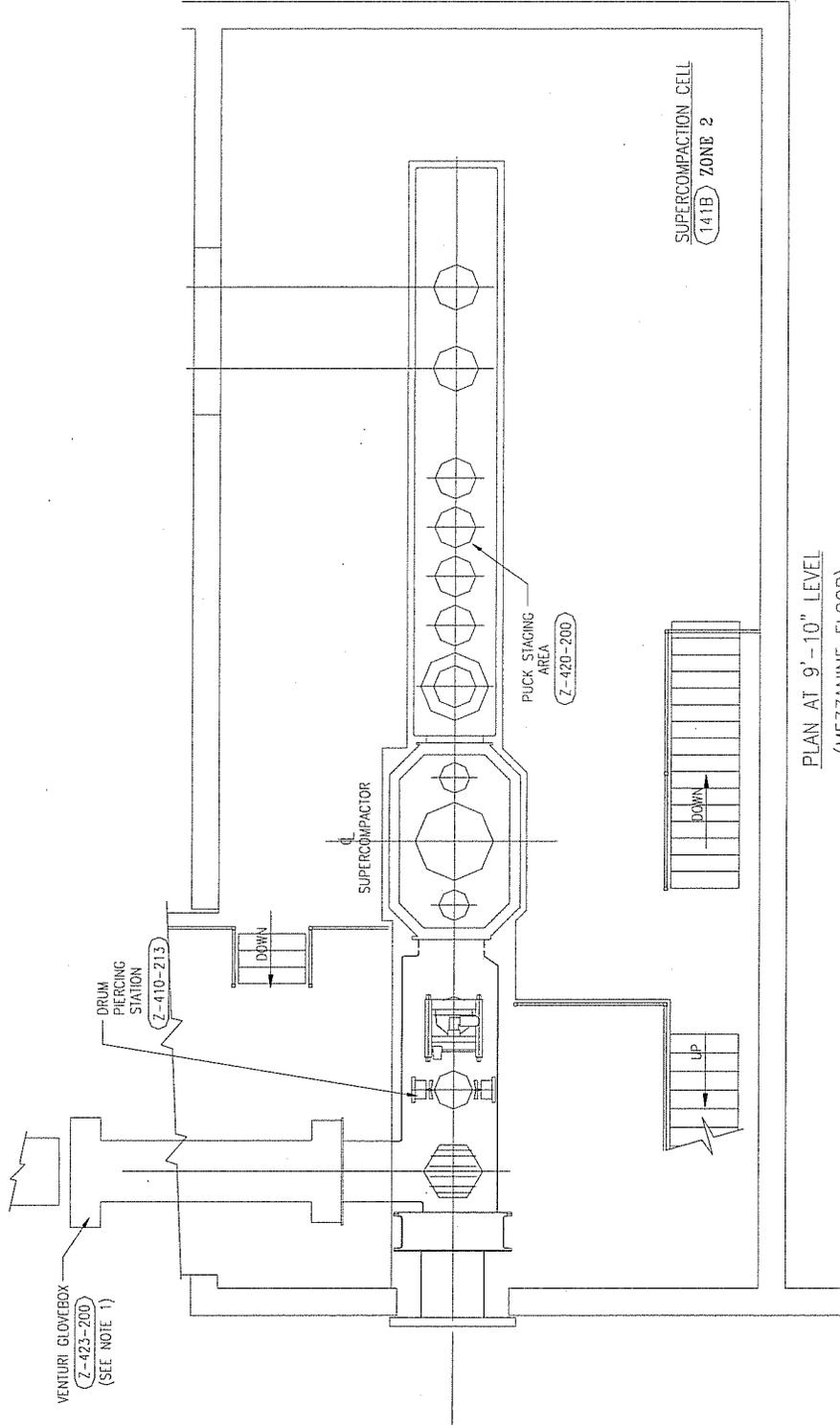
Item Number	Description	Exhibit or Drawing Number	Revision Number	PE Certification Date	Revision Approval Date
1	Treatment Building Supercompaction Cell Layout First Floor Level	XX-1A	02	Not Applicable	Not Applicable
2	Treatment Building Supercompaction Cell Layout Mezzanine Level	XX-1B	02	Not Applicable	Not Applicable
3	Treatment Building Supercompaction Cell Layout Second Floor Level	XX-1C	02	Not Applicable	Not Applicable



PLAN ON FIRST FLOOR LEVEL 0'-0"

Note: This exhibit was created from drawing 53-3301 Rev 06.

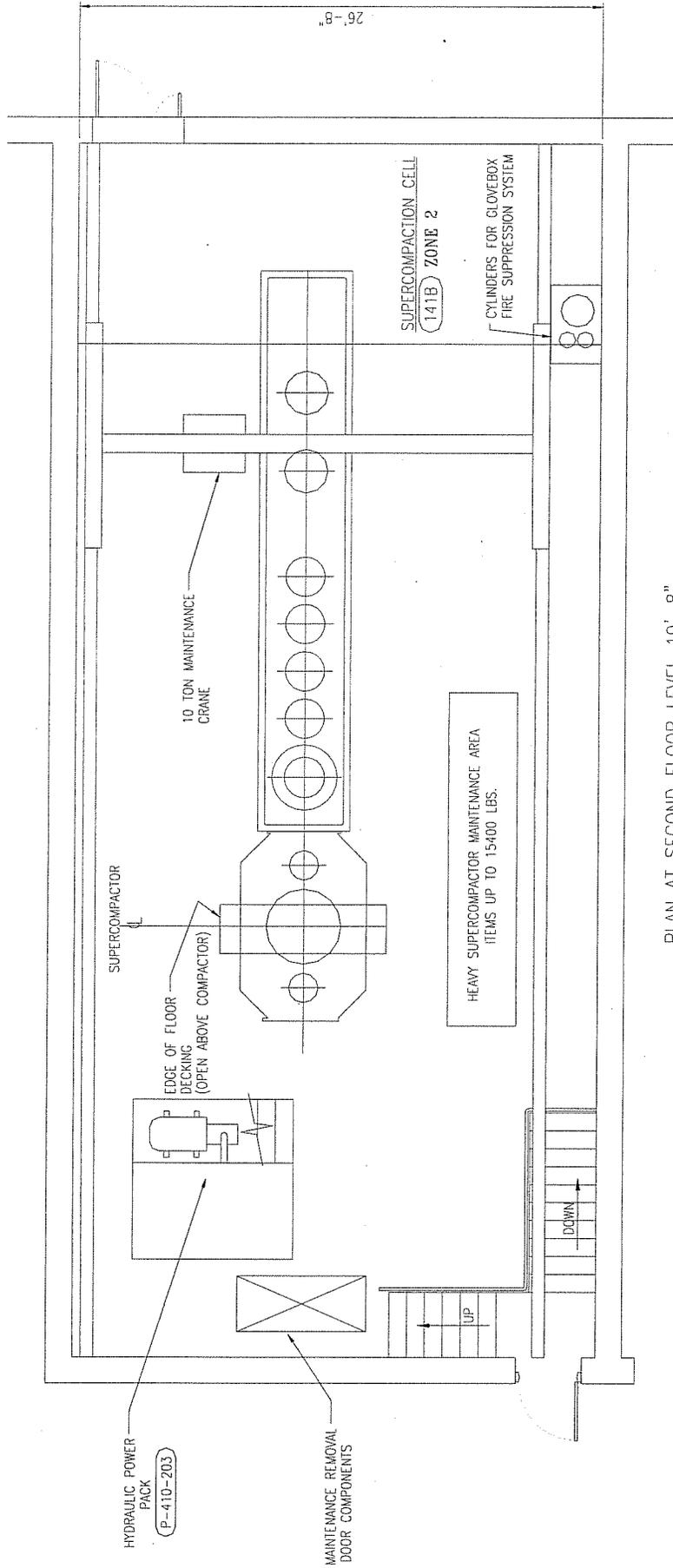
Exhibit XX-1A Treatment Building Supercompaction Cell Layout First Floor Level 0'-0"



PLAN AT 9'-10" LEVEL
(MEZZANINE FLOOR)

Note: This exhibit was created from drawing 53-3301 Rev 06.

Exhibit XX-1B Treatment Building Supercompaction Cell Layout Mezzanine Level 9'-10"



Note: This exhibit was created from drawing 53-3301 Rev 06.

Exhibit XX-1C Treatment Building Supercompaction Cell Layout Second Floor Level 19'-8"

APPENDIX XXI**TREATMENT (SUPERCOMPACTION) MECHANICAL DATA SHEETS**

MDS Number	Description
DZ410200	Supercompactor
DZ410211	Supercompactor Infeed Glovebox
DZ410213	Drum Piercing Station
DZ410283	Supercompactor Glovebox
DZ410284	Puck Recovery Glovebox
DZ420200	Puck Staging Area
DZ420215	Post Compaction Glovebox
DQ410201	Drum Handling Machine
DQ420200	Puck Handler & Gripper
DM420207	Puck Drum Bagless Transfer Mechanism
DW410204	Supercompaction Trolley

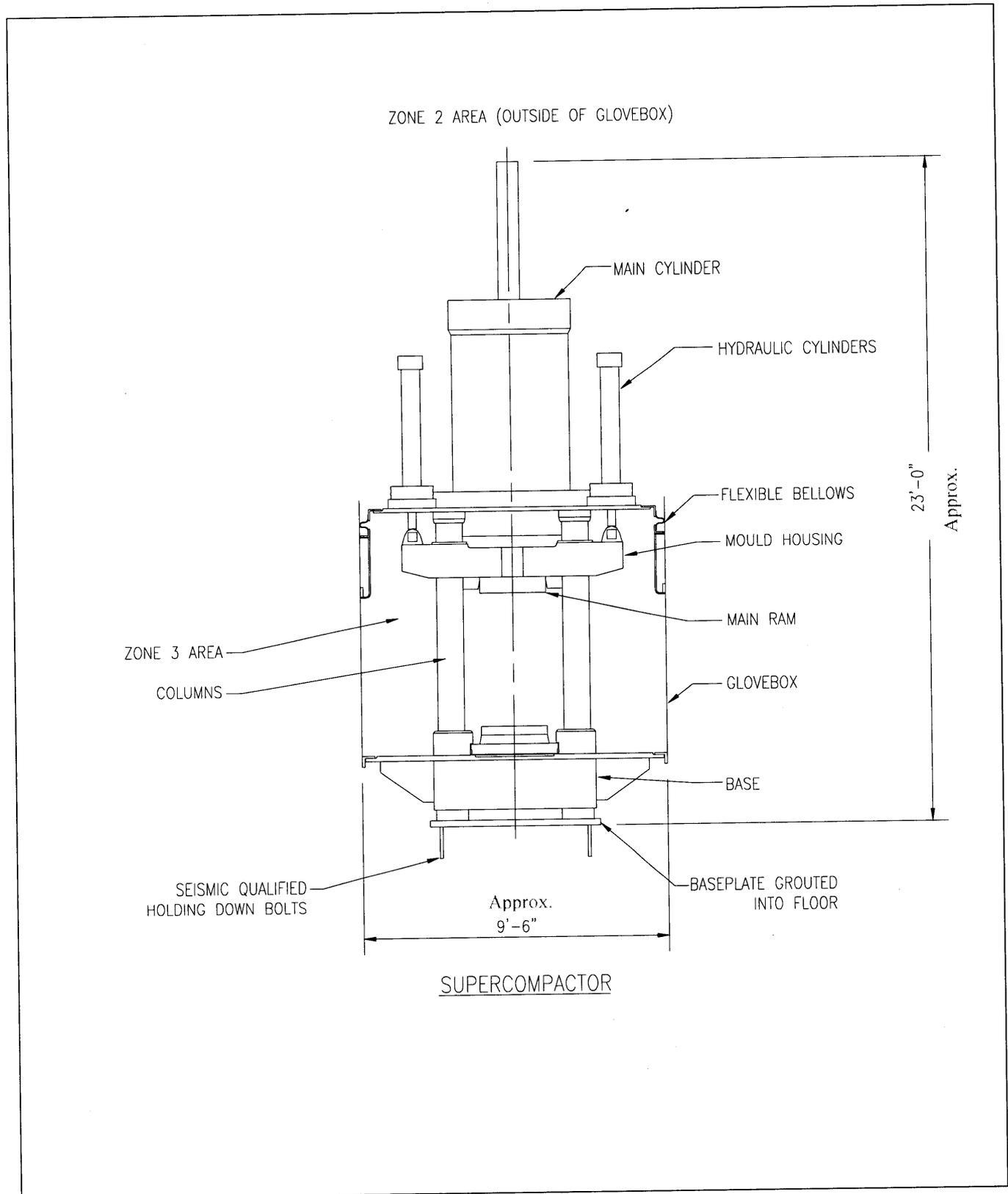


Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ410200
Project No.:	K0105C	Area:	Supercompaction Cell	No. Installed:	1
PI No.:	Z-410-200	Category:	UBC PC 2	% Duty:	On Demand
Description:	Supercompactor	System No.:	410		
Function:	The machine will crush/size reduce lidded drums filled with waste material.				
SUMMARY DATA		UNITS			
Maximum Duty		hp		See Data Sheet DP410203	
Design Life		year		15	
Failure on Demand		-		0.5%	
Cycle Time (Compaction Cycle)		minute		5 (max)	
Compaction Force		ton		2240 (min)	
Design Capacity		drums per 24 hour		160 (max)	
Minimum Design Pressure		in. wg		-4 (Glovebox test depression)	
Maximum Design Pressure		in. wg		+4 (Test pressure)	
Minimum Design Temperature		°F		50	
Maximum Design Temperature		°F		104	
Length		Ft & in.		9'-6"	
Width		Ft & in.		6'-11"	
Height		Ft & in.		23'-0"	
Estimated Weight		lb		123000	
Materials and Construction	Mainly Carbon Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance of components will be done through gloveports.				
<p>Description:</p> <p>The supercompactor will consist of a 4 Column Hydraulic Press, a bolster and press plates. The bolster will lower to surround a lidded waste drum, positioned on a lower press plate that is fastened to the compaction trolley. The main ram with upper press plate will lower into the bolster and compact the drum.</p> <p>Max size of drum: Diameter 2ft-1in.; Height 3ft-3in.</p> <p>Puck size: Min. 1 in. approx. Max. 3ft-3in.</p> <p>Hydraulic Fluid: approved fire safe hydraulic oil</p>					
Inputs:	Lidded drums (1000 lb max approx.) for compaction				
Outputs:	Compacts (pucks)				
Interfaces:	Drum trolley, Infeed glovebox, Puck handler, Post Compaction Glovebox and Hydraulic Powerpack				
Operating Environment:	Zone 3 for items between glovebox flanges, alpha contaminated				
Services:	Hydraulics, Electricity (Power & Control), Cooling Water				

04/23/07	03	J. Godak	<i>Mark Hutt</i>	<i>Robert Yew</i>	For permit
10/27/03	02	S. Schultheis	R. Beck	P. Leatherbarrow	For permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Yew	For permit
11/22/00	00	S. Mason	E. Calvert	D. Yew	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Supercompactor	Site: Idaho Falls	Data Sheet No.: DZ410200
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Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ410211
Project No.:	K0105C	Area:	Supercompaction Cell	No. Installed:	1
PI No.:	Z-410-211	Category:	UBC PC 2	% Duty:	On Demand
Description:	Supercompactor Infeed Glovebox	System No.:	410		

Function: To provide a Zone 3 containment to prevent the release of radioactivity and toxic substances whilst the process is carried out.

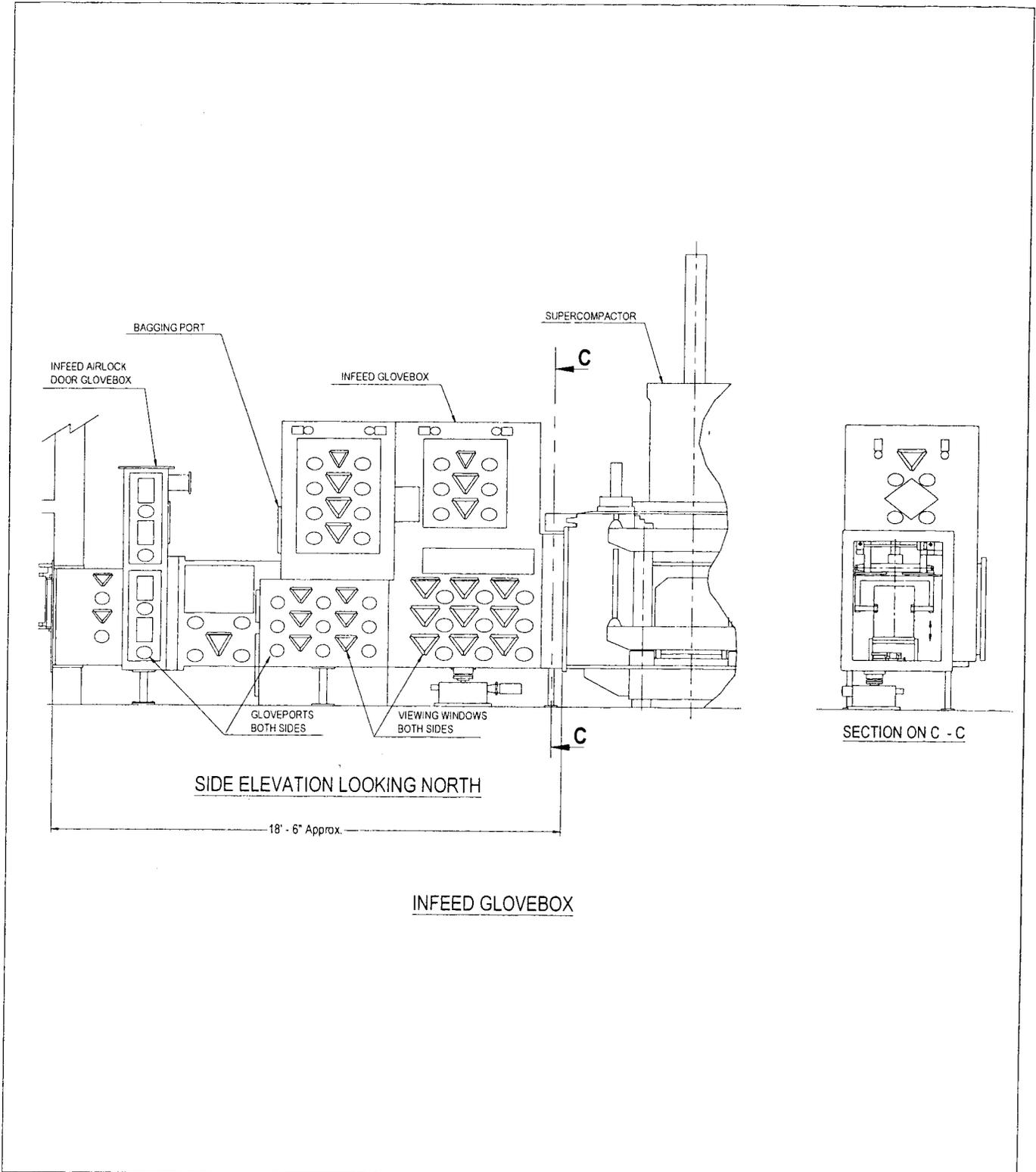
SUMMARY DATA	UNITS	
Maximum Duty	hp	N/A
Design Life	year	15
Failure on Demand	-	N/A
Design Capacity	drums per 24 hour	160 (max)
Minimum Design Pressure	in. wg	-4 (Glovebox test depression)
Maximum Design Pressure	in. wg	+4 (Test pressure)
Minimum Design Temperature	°F	50
Maximum Design Temperature	°F	104
Infeed Glovebox Dimensions	ft & in.	See sheet 2
Estimated Weight	lb	21000
Materials and Construction	Stainless Steel	
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance of components will be done through glove ports.	

Description:
High integrity sealed glovebox, which will contain infeed conveyor, infeed turntable, drum elevator door, drum handler, compaction trolley, drum piercing station.

Inputs:	Lidded drums to Supercompactor
Outputs:	Lidded drums to Supercompactor
Interfaces:	Central Conveying System, Supercompactor, North Venturi Glovebox, Infeed Airlock Door Glovbox, Drum Piercing Glovebox
Operating Environment:	Zone 3, alpha contaminated
Services:	Electricity (power and control), pneumatic supply (80 psig ± 5%)

5/17/04	05	T. Kelly			For CCR
10/27/03	04	S. Schulthies	Richard Beck	Phil Leatherbarrow	Issue for permit - CCR
06/01/01	03	M. Ogden	K. Shaw	D. Yew	For permit
02/08/01	02	L. Markiewka	K. Shaw	D. Yew	For permit
01/12/01	01	M. Green	E. Calvert	D. Yew	For permit
11/22/00	00	S. Mason	E. Calvert	D. Yew	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

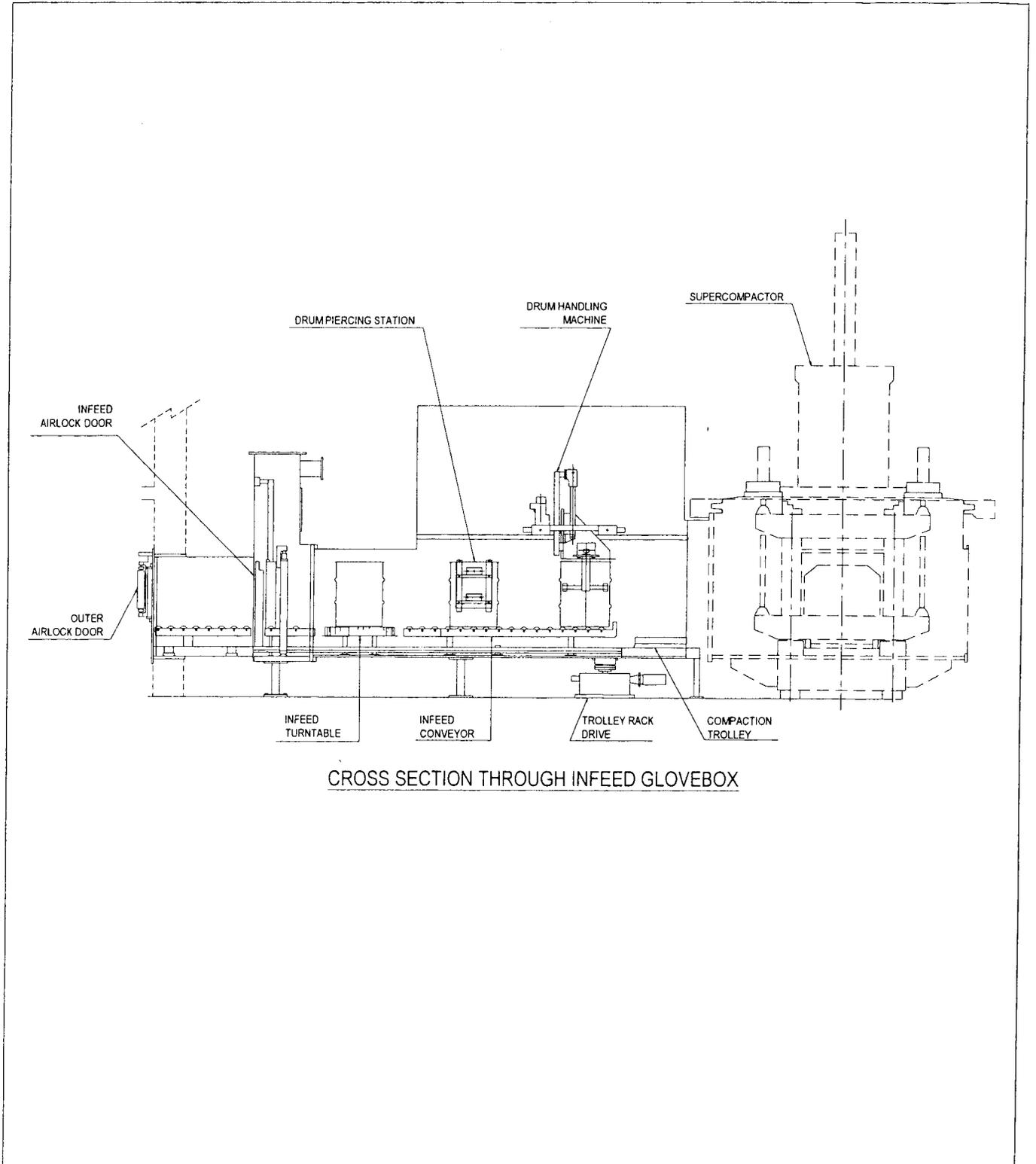
Description: Supercompactor Infeed Glovebox	Site: Idaho Falls	Data Sheet No.: DZ410211
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Description: Supercompactor Infeed
Glovebox

Site: Idaho Falls

Data Sheet No.: DZ410211



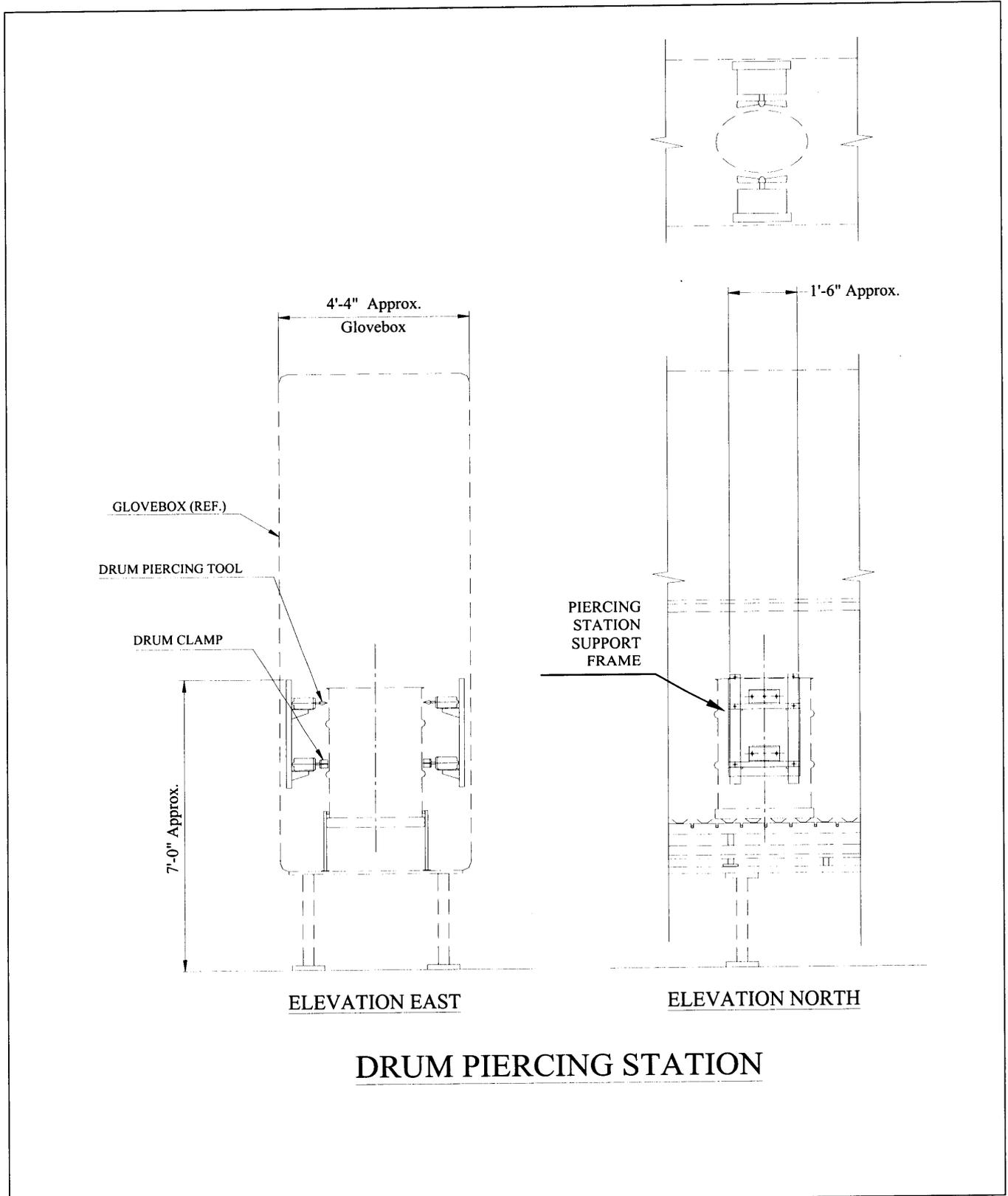


Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ410213
Project No.:	K0105C	Area:	Supercompaction Cell	No. Installed:	1
PI No.:	Z-410-213	Category:	UBC PC 2	% Duty:	On Demand
Description:	Drum Piercing Station	System No.:	410		
Function:	Piercing lidded drums.				
SUMMARY DATA		UNITS			
Maximum Duty		hp		1	
Design Life		year		15	
Failure on Demand		-		0.5%	
Design Capacity		drums per 24 hour		160 (max.)	
Cycle Time		minute		1 (approx.)	
Minimum Design Pressure		in. wg		-4 (Glovebox test depression)	
Maximum Design Pressure		in. wg		+4 (Test pressure)	
Minimum Design Temperature		°F		50	
Maximum Design Temperature		°F		104	
Piercing Station Dimensions		ft & in.		See sheet 2.	
Estimated Weight		lb		200	
Materials and Construction	Stainless Steel & Painted Carbon Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance of components will be done through glove ports.				
Description:					
A machine to pierce drums below the rim.					
Inputs:	Lidded drums				
Outputs:	Lidded, Pierced Drums				
Interfaces:	Infeed Glovebox, Drum Handler				
Operating Environment:	Zone 3, alpha contaminated				
Services:	Electricity (Power & control), pneumatic supply (80 psig ± 5%)				

04/23/07	03	<i>J. Godak</i>	<i>Mark Hatt</i>	<i>Patricia Yew</i>	For permit
1 June 01	02	M.Ogden	K.Shaw	D Yew	For permit
12 Jan 01	01	M Green	E Calvert	D Yew	For permit
22 Nov 00	00	S Mason	E Calvert	D Yew	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Drum Piercing Station	Site: Idaho Falls	Data Sheet No: DZ410213
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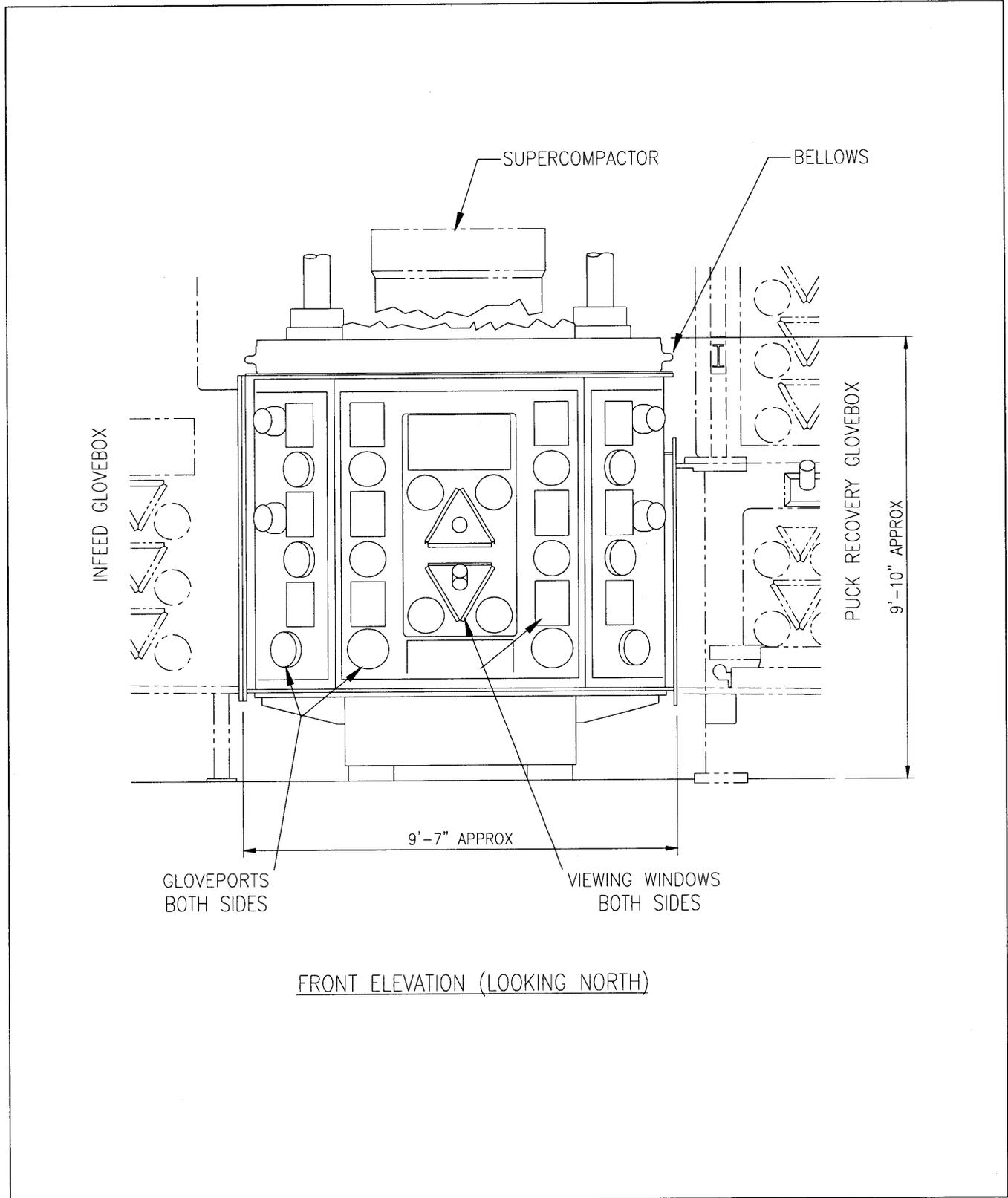


Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ410283
Project No.:	K0105C	Area:	Supercompactor Cell	No. Installed:	1
PI No.:	Z-410-283	Category:	UBC PC 2	% Duty:	On Demand
Description:	Supercompactor Glovebox		System No.:	410	
Function:	To provide a Zone 3 containment to prevent release of radioactivity and toxic substances whilst the process is carried out.				
SUMMARY DATA		UNITS			
Maximum Duty		hp		N/A	
Design Life		year		15	
Failure on Demand		-		N/A	
Minimum Design Pressure		in. wg		-4 (Glovebox test depression)	
Maximum Design Pressure		in. wg		+4 (Test pressure)	
Minimum Design Temperature		°F		50	
Maximum Design Temperature		°F		104	
Length		ft & in.		9'- 7" Approx.	
Width		ft & in.		6'- 8" Approx.	
Height		ft & in.		9'- 10" Approx.	
Estimated Weight		lb		5170	
Materials and Construction	Stainless Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance of components will be done through glove ports.				
<p>Description:</p> <p>The supercompactor glovebox joins the top and bottom flanges of the press to form containment. The trolley passes over the bottom flange interface. The top edge to have a stainless steel bellows fitted to allow press expansion.</p>					
Inputs:	lidded drums for compaction				
Outputs:	Compacts (pucks)				
Interfaces:	Infeed Glovebox, Puck recovery glovebox, and supercompactor press				
Operating Environment:	Zone 3, alpha contaminated				
Services:	Electricity (Power & Control), pneumatic supply (80 psig ± 5%)				

04/23/07	02	<i>J. Godak</i> J. Godak	<i>Mark Hunt</i> E. Calvert	<i>Patricia Yew</i> D. Yew	For permit
01/12/01	01	M. Green	E. Calvert	D. Yew	For permit
11/22/00	00	S. Mason	E. Calvert	D. Yew	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Supercompactor Glovebox	Site: Idaho Falls	Data Sheet No.: DZ410283
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Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DZ410284
Project No.:	K0105C	Area:	Supercompaction Cell	No. Installed:	1
PI No.:	Z-410-284	Category:	UBC PC 2	% Duty:	On Demand
Description:	Puck Recovery Glovebox		System No.:	410	

Function: Connects the upper puck handler area glovebox and the press glovebox and allows a separate area for puck recovery.

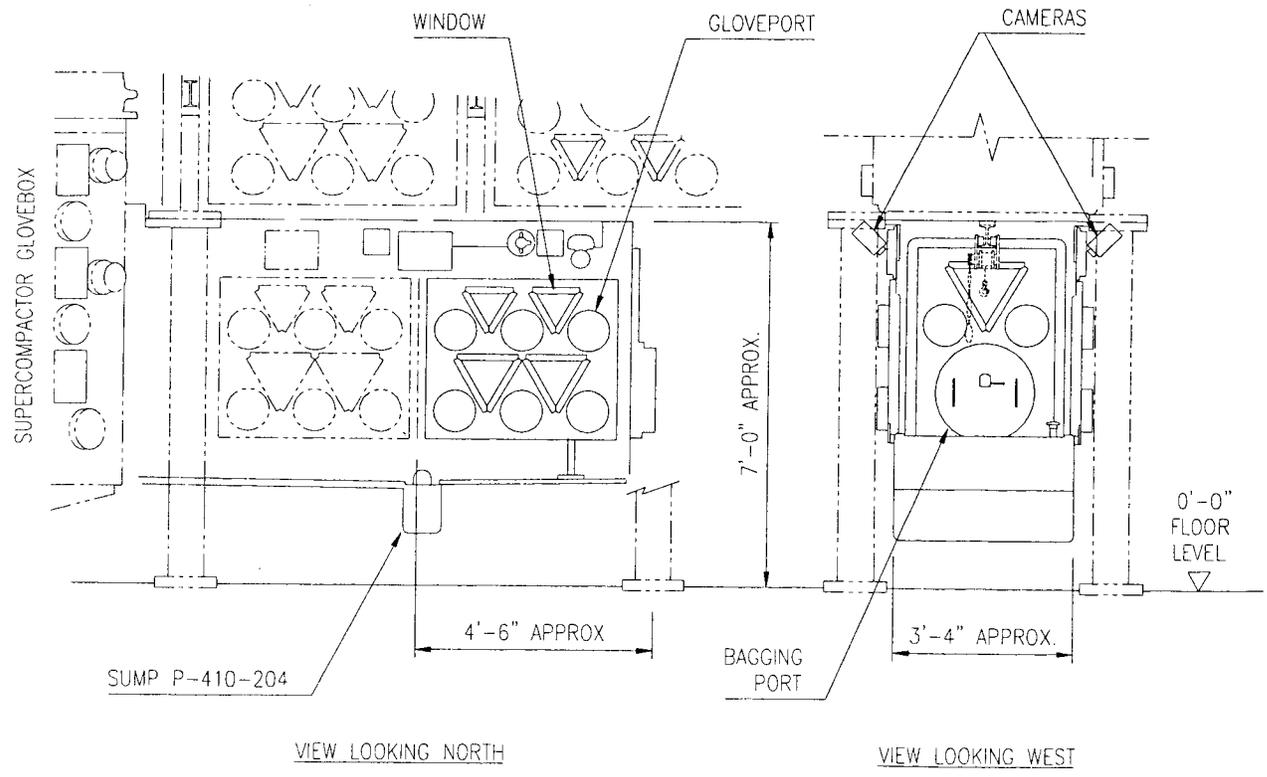
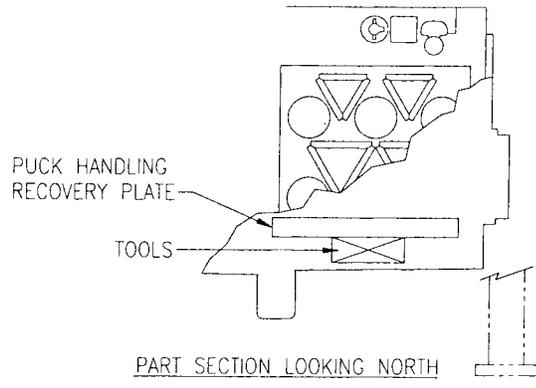
SUMMARY DATA	UNITS	
Maximum Duty	hp	N/A
Design Life	year	15
Failure on Demand	-	N/A
Minimum Design Pressure	in. wg	-4 (Glovebox test depression)
Maximum Design Pressure	in. wg	+4 (Test pressure)
Minimum Design Temperature	°F	50
Maximum Design Temperature	°F	104
Length	ft & in.	4'-6" Approx.
Width	ft & in.	3'- 4" Approx.
Height	ft & in.	7'- 0" Approx.
Estimated Weight	lb	12,000
Materials and Construction	Stainless Steel	
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance of components will be done through glove ports.	

Description:
The Puck Recovery Glovebox will contain puck transfer equipment and tools to allow re-working of puck to enable subsequent satisfactory puck handling operation.

Inputs:	Pucks, Liquid
Outputs:	Pucks, Liquid
Interfaces:	Supercompactor Glovebox, Post Compaction Glovebox
Operating Environment:	Zone 3, alpha contaminated, some puck spillage
Services:	Electricity (Power & Control), pneumatic supply (80 psig ± 5%)

5/17/04	03	T. Kelly			For CCR
10/27/03	02	S. Schulthies	Richard Beck	P. Leatherbarrow	Issue for permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Yew	For permit
11/15/00	00	S. Mason	E. Calvert	D. Yew	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Puck Recovery Glovebox	Site: Idaho Falls	Data Sheet No: DZ410284
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PUCK RECOVERY GLOVEBOX

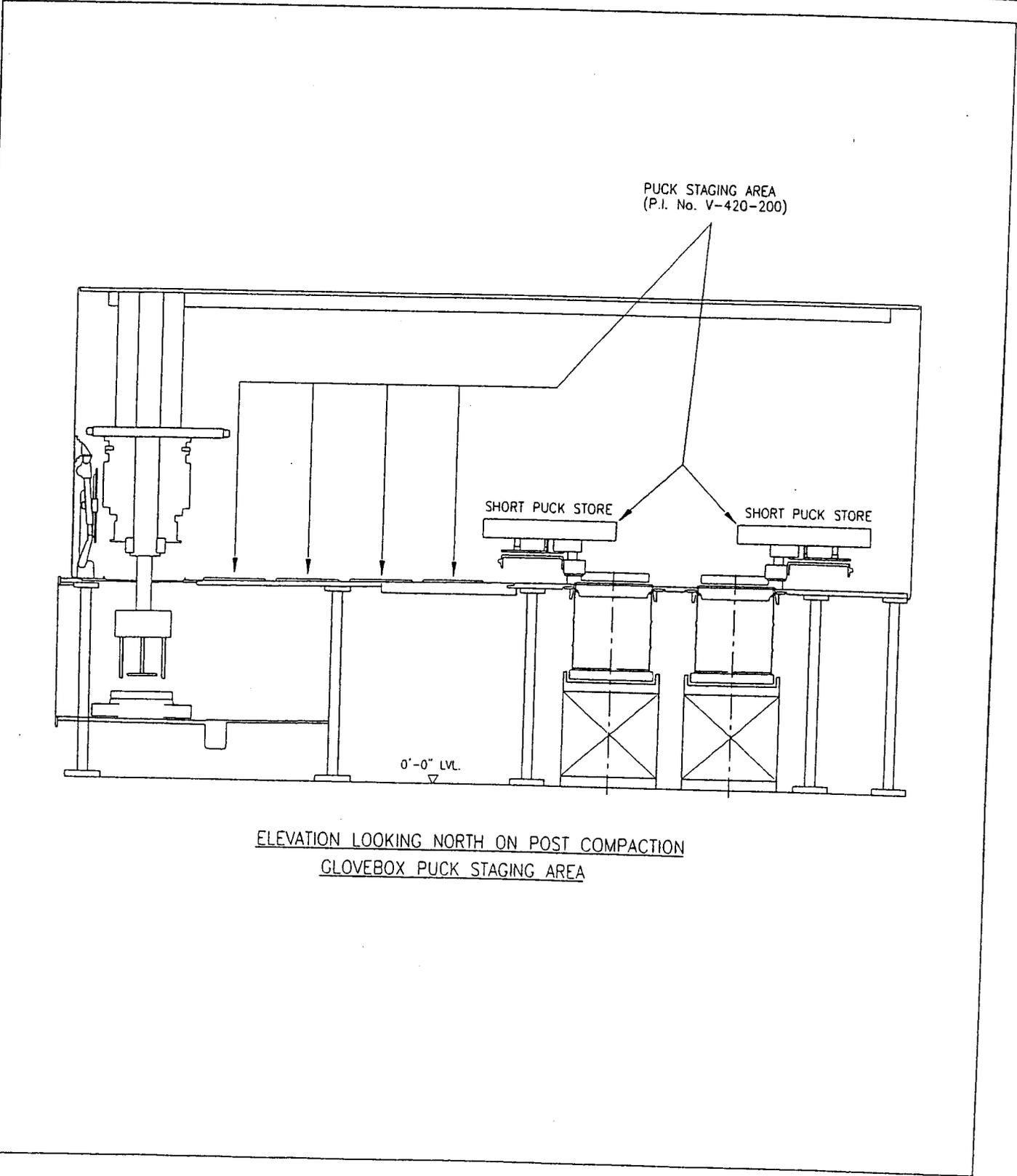
Mechanical Data Sheet



Project:	AMWTP	Site:	Idaho Falls	Data Sheet No:	DZ420200
Project No:	K0105C	Area:	Supercompaction Cell	No. Installed:	1
PI No:	Z-420-200	Category:	UBC PC 2	% Duty:	On Demand
Description:	Puck Staging Area		System No:	420	
Function:	To provide interim storage locations within glovebox.				
SUMMARY DATA		UNITS			
Maximum Duty	hp	N/A			
Design Life	year	15			
Failure on Demand	-	0.5%			
Design Capacity	pucks per 24 hour	160 (max.)			
Minimum Design Pressure	in. wg	-4 (Glovebox test depression)			
Maximum Design Pressure	in. wg	+4 (Test pressure)			
Minimum Design Temperature	°F	50			
Maximum Design Temperature	°F	104			
Materials and Construction	Stainless Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance of components will be done through glove ports.				
<p>Description: Total of 6 pucks; 4 pucks mounted directly on glovebox, 2 pucks set on integral support. Pucks to be easily removable to allow a flat glovebox floor to be used for other operations.</p>					
Inputs :	Pucks				
Outputs:	Pucks				
Interfaces :	Pucks, Puck Handling Machine				
Operating Environment:	Zone 3, Dry, Alpha contaminated, some puck spillage.				
Services	Electricity (Power & Control)				

12 Jan 01	01	M Green	E Calvert <i>E. Calvert</i>	D Yew <i>D Yew</i>	For permit
10 Nov 00	00	K Parkinson	E Calvert	D Yew	For permit
Date	Issue	By	Checked	Approved	Purpose Of Issue

Description: Puck Staging Area	Site: Idaho Falls	Data Sheet No: DZ420200
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Mechanical Data Sheet

Sheet 1 Of 3



Project:	AMWTP	Site:	Idaho Falls	Data Sheet No:	DZ420215
Project No:	K0105C	Area:	Supercompaction Cell	No. Installed:	1
PI No:	Z-420-215	Category:	UBC PC 2	% Duty:	On Demand
Description:	Post Compaction Glovebox		System No:	420	
Function:	To provide a zone 3 containment to prevent release of radioactivity and toxic substances whilst the process is carried out.				
SUMMARY DATA		UNITS			
Maximum Duty		hp		N/A	
Design Life		year		15	
Failure on Demand		-		N/A	
Design Capacity		pucks per 24 hour		160 (max.)	
Minimum Design Pressure		in. wg		-4 (Glovebox test depression)	
Maximum Design Pressure		in. wg		+4 (Test pressure)	
Minimum Design Temperature		°F		50	
Maximum Design Temperature		°F		104	
Length		ft. & in.		28'-0" Approx.	
Width		ft. & in.		5'-11" Approx.	
Height		ft. & in.		29'-1" Approx.	
Estimated Weight		lb.		44,800	
Materials and Construction	Stainless Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance of components will be done through glove ports.				
Description:	The glovebox containment enclosure will include maintenance access ports, compaction trolley, puck handler, puck store, puck drum bagless transfer ports and recovery/maintenance hoist. The base of the glovebox will be fabricated from stainless steel, with fully welded, ground and polished joints. The integrity of the welds in the shell of the glovebox shall be dye penetration tested as a minimum. The floor of the glovebox will be sloped towards the sump.				
Inputs :	Pucks, Baskets, Liquid from compactions.				
Outputs:	Puck drum containing pucks or baskets				
Interfaces :	Puck Recovery Glovebox and Supercompactor Glovebox				
Operating Environment:	Zone 3, Alpha contaminated				
Services:	Electricity (Power & Control), Pneumatic supply (80 psig ± 5%).				

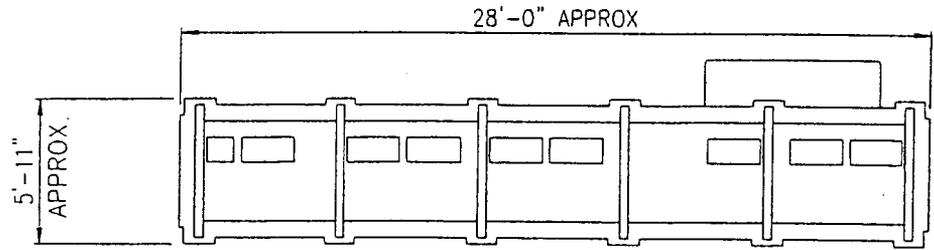
12 Jan 01	01	M Green	E Calvert <i>E. Calvert</i>	D Yew <i>D Yew</i>	For permit
27 Nov 00	00	K Parkinson	E Calvert	D Yew	For permit
Date	Issue	By	Checked	Approved	Purpose Of Issue



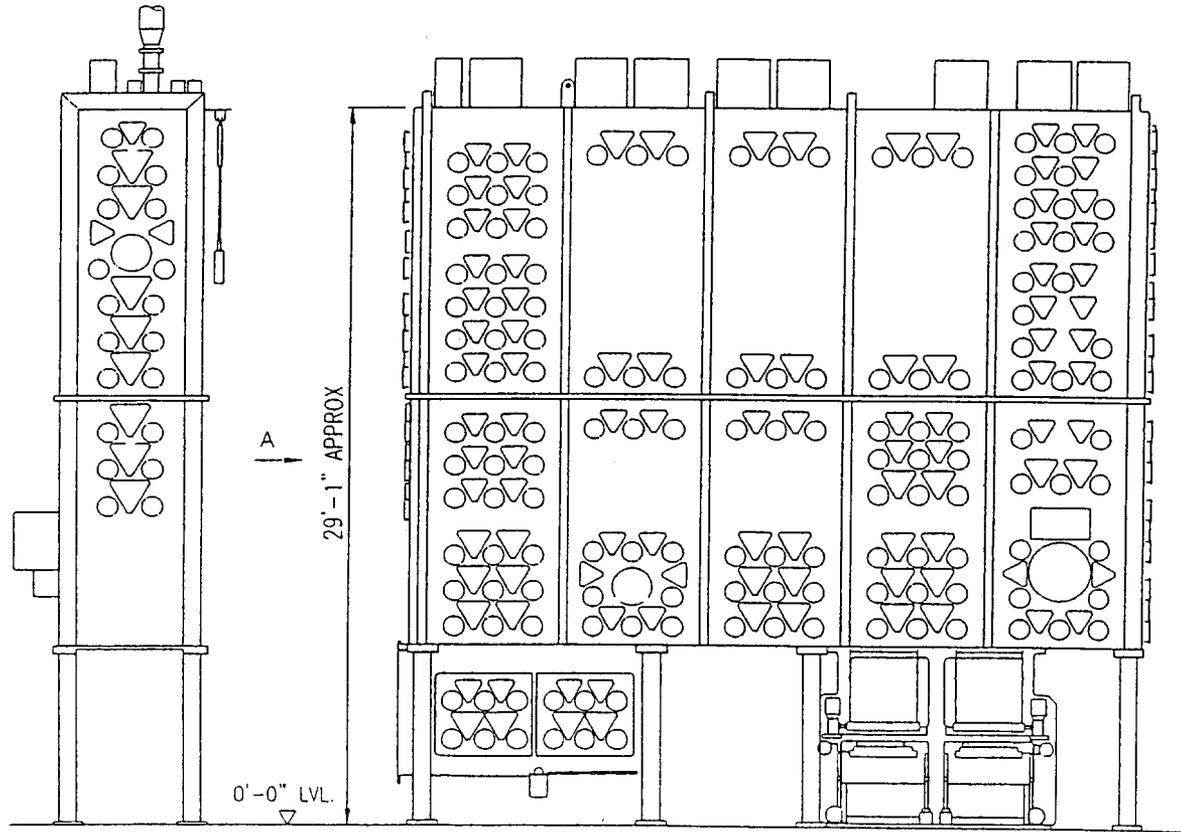
Mechanical Data Sheet

Sheet 2 OF 3

Description: Post Compaction Glovebox	Site: Idaho Falls	Data Sheet No: DZ420215
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PLAN VIEW



VIEW A

ELEVATION LOOKING NORTH

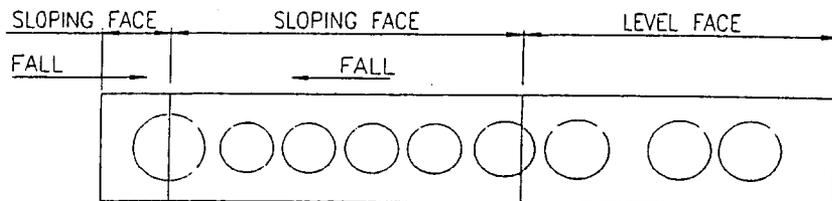
POST COMPACTION GLOVEBOX



Mechanical Data Sheet

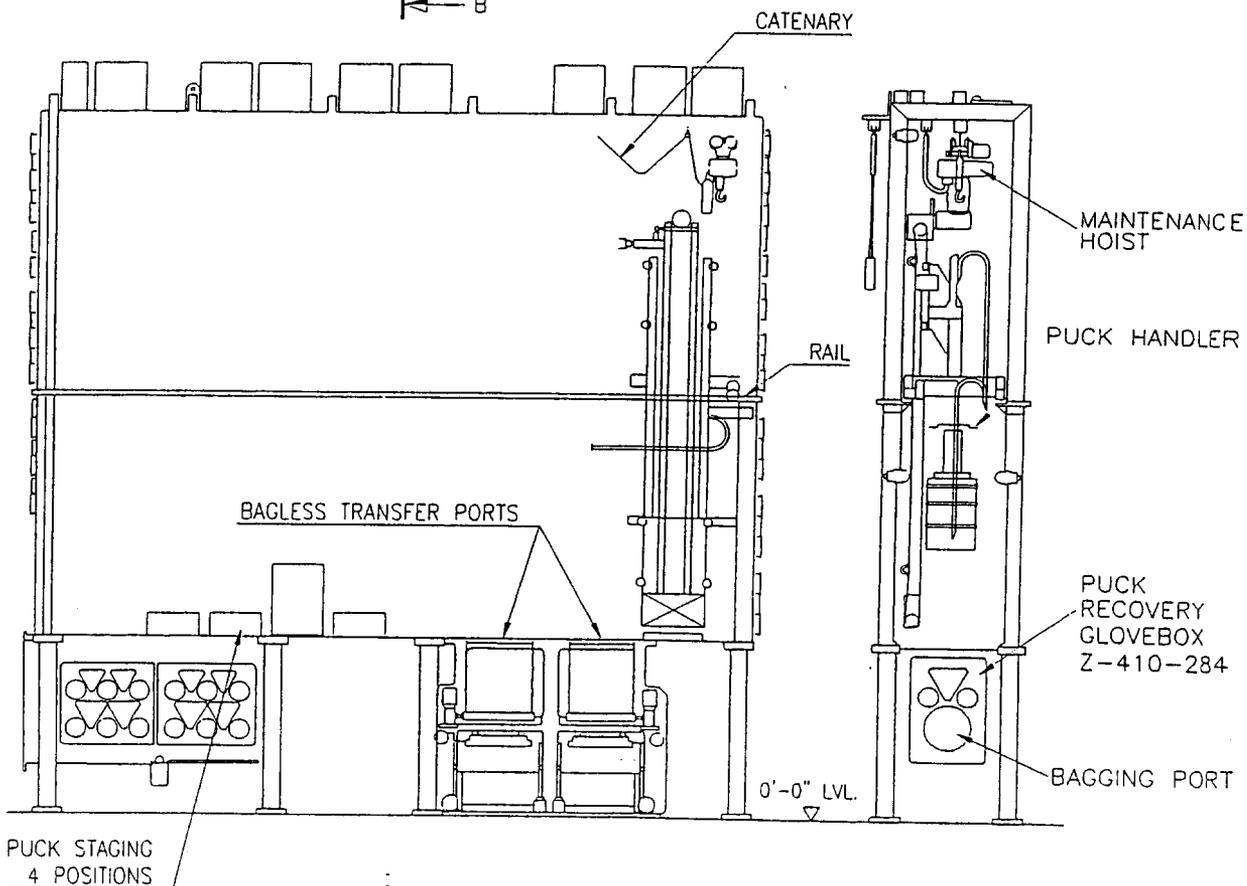
Sheet 3 of 3

Description: Post Compaction Glovebox	Site: Idaho Falls	Data Sheet No: DZ420215
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VIEW ON GLOVEBOX FLOOR SHOWING FALLS TO HATCH AREA

← B



PUCK STAGING
4 POSITIONS

← B

ELEVATION ON POST COMPACTION GLOVEBOX
OUTER SKIN REMOVED FOR CLARITY

SECTION B-B

POST COMPACTION GLOVEBOX

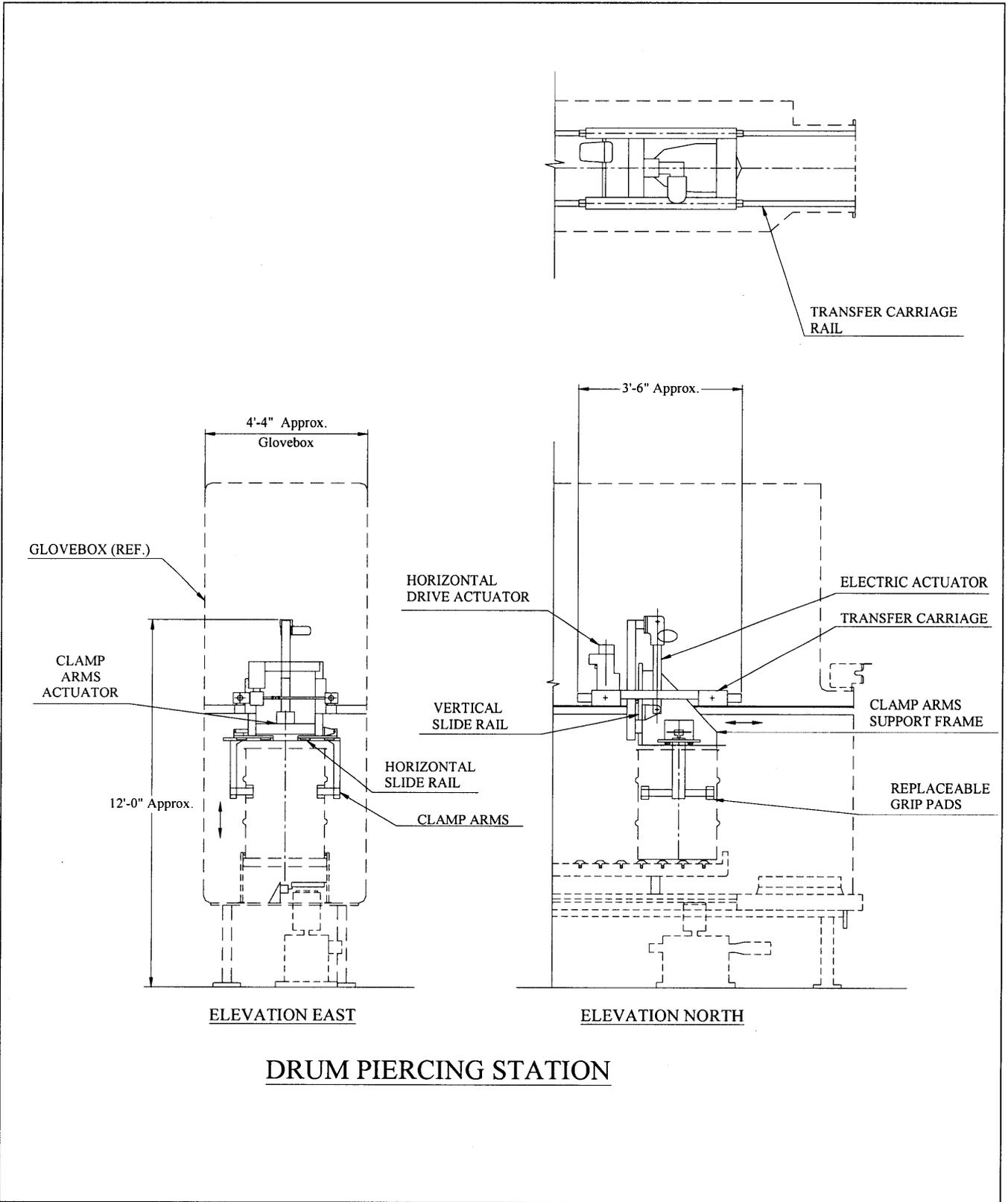


Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DQ410201
Project No.:	K0105C	Area:	Supercompaction Cell	No. Installed:	1
PI No.:	Q-410-201	Category:	UBC PC 2	% Duty:	On Demand
Description:	Drum Handling Machine		System No.:	410	
Function:	To pick and place drums from the conveyor to the press trolley.				
SUMMARY DATA		UNITS			
Maximum Duty		hp	1.5		
Design Life		year	15		
Failure on Demand		-	0.5%		
Design Capacity		drums per 24 hour	160 (max.)		
Minimum Design Pressure		in. wg	-4 (Glovebox test depression)		
Maximum Design Pressure		in. wg	+4 (Test pressure)		
Minimum Design Temperature		°F	50		
Maximum Design Temperature		°F	104		
Drum Handling Machine Dimns:		ft & in.	See sheet 2		
Estimated Weight		lb	1100		
Materials and Construction	Stainless Steel and Painted Carbon Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance of components will be done through glove ports.				
<p>Description:</p> <p>The Drum Handling Machine is used to pick and place drums from the conveyor to the press trolley. It incorporates a drum stop and Clamp Arms that centralize the drum.</p>					
Inputs:	Lidded drums				
Outputs:	Lidded drums				
Interfaces:	Lidded drums, conveyor, press trolley				
Operating Environment:	Zone 3, alpha contaminated, some puck spillage				
Services:	Electricity (Power & Control)				

04/23/07	04	<i>J. Godak</i> J. Godak	<i>Mark Smith</i> Mark Smith	<i>Patrick Yarrow</i> P. Leatherbarrow	For permit
10/27/03	03	S. Schultheis	R. Beck	P. Leatherbarrow	Updated for permit - CCR
06/01/01	02	M. Ogden	K. Shaw	D. Yew	For permit
01/12/01	01	M. Green	E. Calvert	D. Yew	For permit
11/22/00	00	K. Parkinson	E. Calvert	D. Yew	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Drum Handling Machine	Site: Idaho Falls	Data Sheet No.: DQ410201
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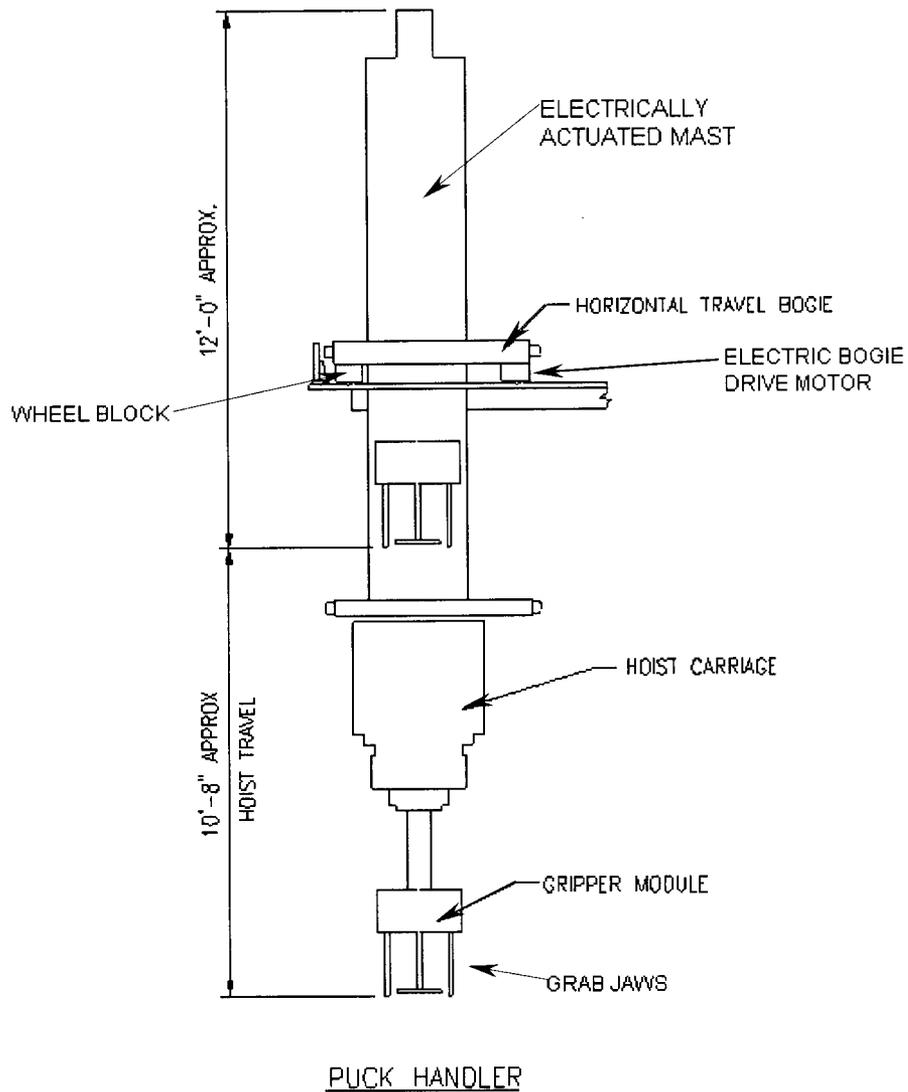
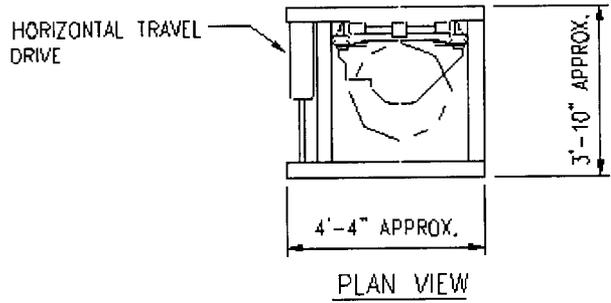


Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DQ420200
Project No.:	K0105C	Area:	Supercompaction Cell	No. Installed:	1
PI No.:	Q-420-200	Category:	UBC PC 2	% Duty:	On Demand
Description:	Puck Handler & Gripper		System No.:	420	
Function:	Enables transfer of pucks from Supercompactor trolley to puck drum or other container.				
SUMMARY DATA		UNITS			
Maximum Duty		hp	7.5		
Design Life		year	15		
Failure on Demand		-	0.5%		
Design Capacity		drums per 24 hour	160 (max.)		
Load Capacity (Normal)		lb	500		
Load Capacity (With Attachment)		lb	1000		
Cycle Time		minute	8 (Approx.)		
Minimum Design Pressure		in. wg	-4 (Glovebox test depression)		
Maximum Design Pressure		in. wg	+4 (Test pressure)		
Minimum Design Temperature		°F	50		
Maximum Design Temperature		°F	104		
Dimensions		ft & in.	See Sheet 2		
Estimated Weight		lb	5600 (Unladen)		
Materials and Construction	Stainless Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance of components will be done through glove ports.				
<p>Description:</p> <p>Puck handler comprises twin railed, wheeled crab, mast stem, three jaw gripper. Measures height of puck. Facility to eject pucks. Facility to fit handling attachments for use instead of jaws.</p> <p>The Puck Handler and Gripper also interfaces with the bagless transfer ports. It fills the drum with pucks.</p>					
Inputs:	Pucks				
Outputs:	Pucks				
Interfaces:	Supercompactor Trolley, Puck Store, Bagless Transfer Ports				
Operating Environment:	Zone 3, alpha contaminated				
Services:	Electricity (Power & Control), pneumatic supply (80 psig ± 5%)				

10/27/03	02	<i>S. Schulz</i>	<i>R. Kauter</i>	<i>D. Yew</i>	Issued for permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Yew	For permit
11/27/00	00	S. Mason	E. Calvert	D. Yew	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Puck Handler & Gripper	Site: Idaho Falls	Data Sheet No.: DQ420200
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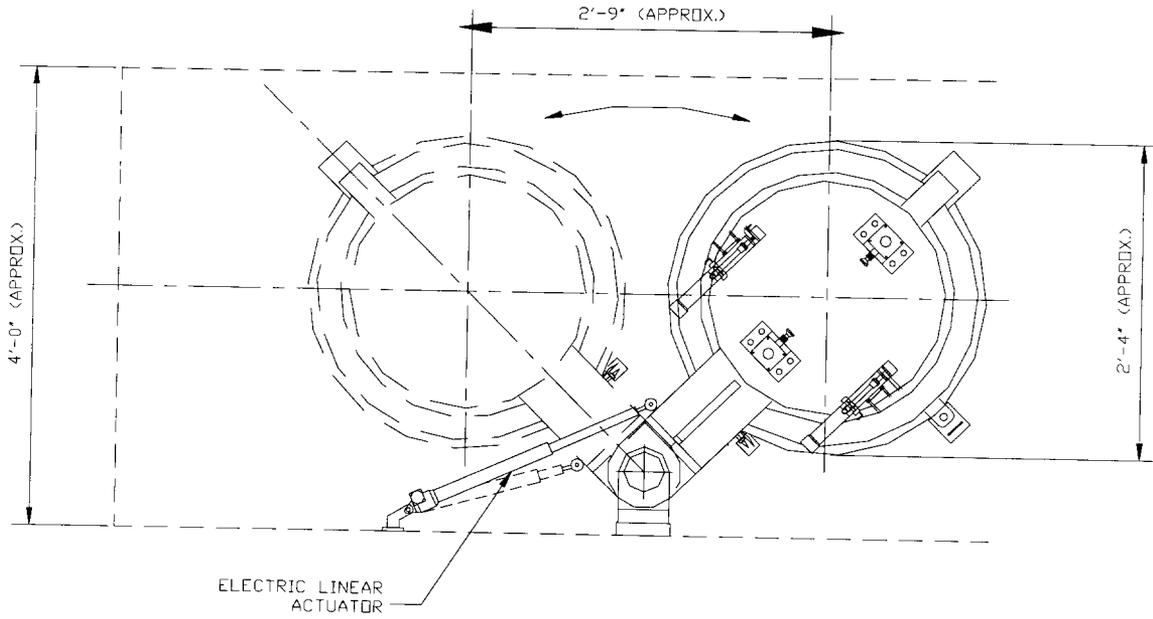


Mechanical Data Sheet

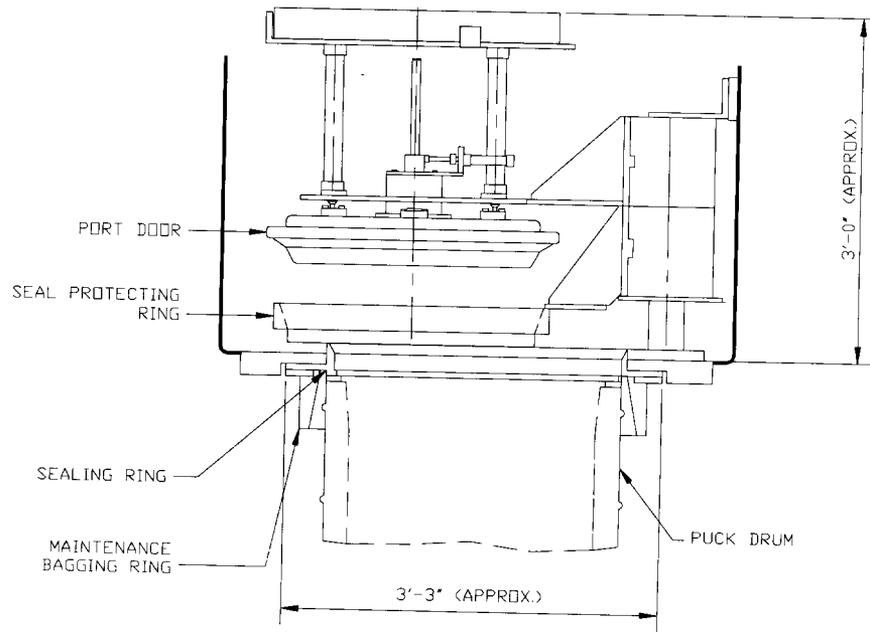
Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DM420207
Project No.:	K0105C	Area:	Supercompaction Cell	No. Installed:	2
PI No.:	M-420-207 & M-420-208	Category:	UBC PC 2	% Duty:	On Demand
Description:	Puck Drum Bagless Transfer Mechanism	System No.:	420		
Function:	Allows transfer of material from Zone 3 containment into puck drum.				
SUMMARY DATA		UNITS			
Maximum Duty		hp	0.5		
Design Life		year	15		
Failure on Demand		-	0.5%		
Cycle Time		second	30 (lid removal time only)		
Maximum Design Capacity		drums/day	50		
Minimum Design Pressure		in. wg	- 4 (Glovebox test depression)		
Maximum Design Pressure		in. wg	+ 4 (Test pressure)		
Minimum Design Temperature		°F	50		
Maximum Design Temperature		°F	104		
Length		ft & in.	5' - 6" Approx.		
Width		ft & in.	3' - 6" Approx.		
Height		ft & in.	3' - 0" Approx.		
Estimated Weight		lb	770		
Feeds		-	Puck drums		
Materials and Construction	Stainless steel and Carbon steel				
Maintenance	The equipment will be of modular construction; modules to be easily removable with the minimum number of fixings and fittings to allow dismantling within containment by glovebox operators via gloveports.				
Description:					
The bagless transfer system will be designed to interface and seal against a puck drum. Puck drums will be presented to the Post Compaction glovebox, the inner lid removed, pucks loaded and then the lid replaced. The sealed drum can then be removed from containment. The bagless transfer port consists of a sealing ring, a port door, a seal protecting ring and a maintenance bagging ring.					
Inputs:	Drum pucks and puck drum				
Outputs:	Lidded puck drums				
Interfaces:	Post Compaction Glovebox				
Operating Environment:	Part Zone 3, dry, alpha contaminated, part Zone 2				
Services:	Electricity (Power & Control), compressed air (80 psig ± 5%)				

10/27/03	01	S. Schulthies	<i>[Signature]</i>	<i>[Signature]</i>	Updated for permit - CCR
01/24/01	00	J. McDonald	E. Calvert	D. Yew	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Puck Drum Bagless Transfer Mechanism	Site: Idaho Falls	Data Sheet No.: DM420207
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PLAN VIEW OF PORT DOOR IN POSITION



ELEVATION LOOKING WEST ON
POST COMPACTION GLOVEBOX

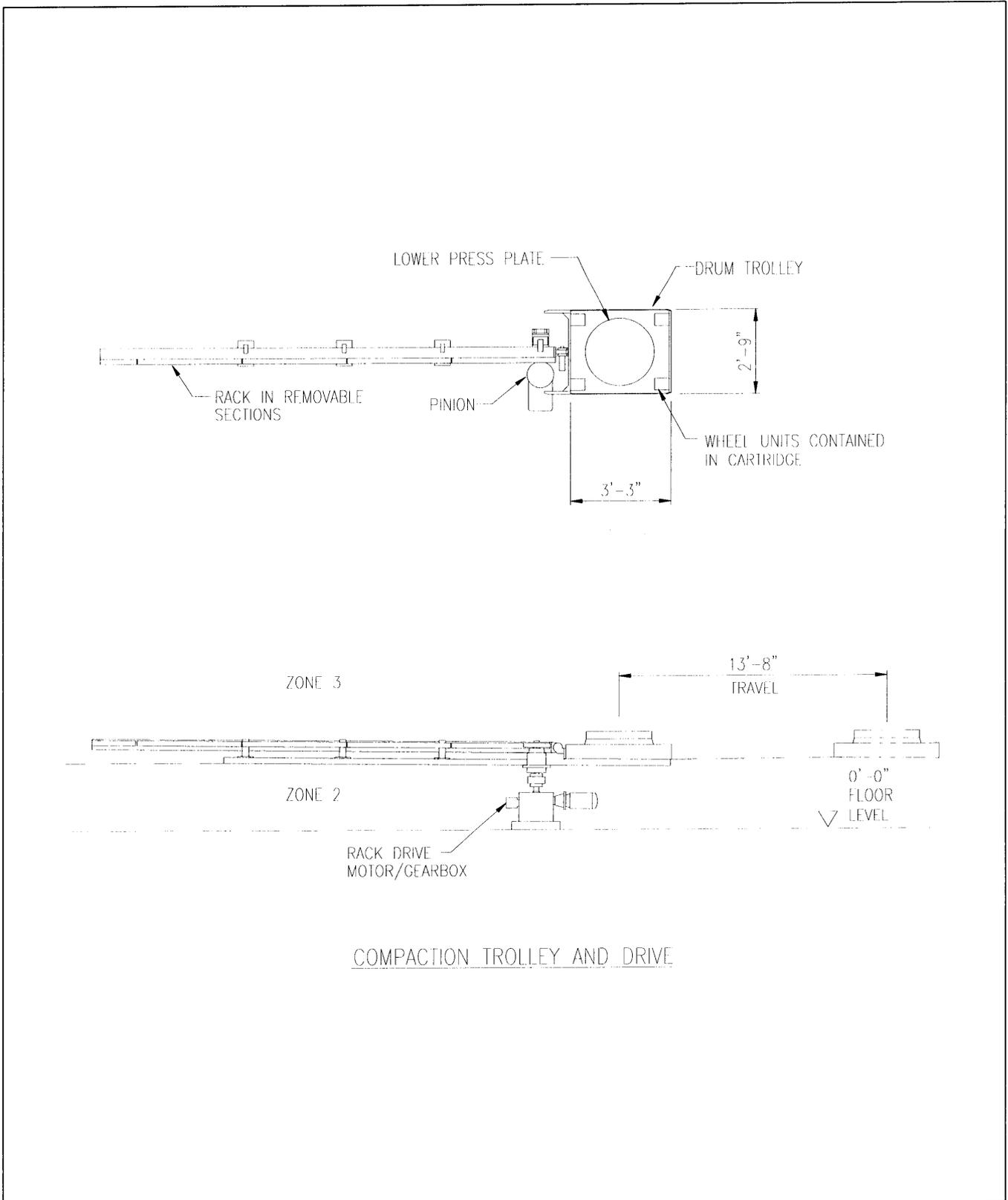


Mechanical Data Sheet

Project:	AMWTP	Site:	Idaho Falls	Data Sheet No.:	DW410204
Project No.:	K0105C	Area:	Supercompaction Cell	No. Installed:	1
PI No.:	W-410-204	Category:	UBC PC 2	% Duty:	On Demand
Description:	Supercompaction Trolley	System No.:	410		
Function:	Transfers lidded drums from Infeed glovebox to the Supercompactor and Post Compaction gloveboxes.				
SUMMARY DATA		UNITS			
Maximum Duty		hp	2.0		
Design Life		year	15		
Failure on Demand		-	0.5%		
Design Capacity		drums per 24 hour	160 (max.)		
Load Carrying Capacity		lb	1000		
Linear Speed		ft/min	4		
Cycle Time		minute	3 (full length of travel)		
Minimum Design Pressure		in. wg	-4 (Glovebox test depression)		
Maximum Design Pressure		in. wg	+4 (Test pressure)		
Minimum Design Temperature		°F	50		
Maximum Design Temperature		°F	104		
Supercompaction Trolley Dimensions		ft & in.	See sheet 2		
Estimated Weight		lb	2200		
Materials and Construction	Stainless Steel				
Maintenance	Maintainable components shall be of modular design/construction and allow rapid access for maintenance and removal/replacement if necessary. Maintenance of components will be done through glove ports.				
<p>Description:</p> <p>The rectangular trolley body shall support a circular removable press plate. The trolley will travel on four wheel assemblies.</p>					
Inputs:	Lidded drums				
Outputs:	Compacts (pucks)				
Interfaces:	Drum Handler, Infeed Supercompactor, and Post Compaction Glovebox				
Operating Environment:	Zone 3, alpha contaminated				
Services:	Hydraulics, Electricity (Power and Control)				

04/23/07	03	<i>J. Godak</i> J. Godak	<i>Mark Witt</i> R. Beck	<i>Pat G...</i> P. Leatherbarrow	For permit
10/27/03	02	S. Schulthies	R. Beck	P. Leatherbarrow	Updated for permit - CCR
01/12/01	01	M. Green	E. Calvert	D. Yew	For permit
11/22/00	00	S. Mason	E. Calvert	D. Yew	For permit
Date	Issue	By	Checked	Approved	Purpose of Issue

Description: Supercompaction Trolley	Site: Idaho Falls	Data Sheet No.: DW410204
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APPENDIX XXII**DRUM REPACK SYSTEM MECHANICAL DATA SHEETS**

MDS Number	Description
Z-440-868	Drummed Waste Handling Enclosure
Z-440-870	Drum Opening Hood
Q-440-805	Drum Lift/Tipper
Z-440-871	Drum Waste Packaging Glovebox

bl

Mechanical Data Sheet

No. Z-440-868

QUALITY LEVEL: NO

Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
0	Final Design Issue - For Permit Use Only	TB Coleman (sign. on file) 1/18/01	D Horn (sign. on file) 1/18/01	N/A	A Zindel (sign. on file) 1/18/01
1	Final Design Issue – Incorporated Permit Review Comments – For Permit Use Only	TB Coleman (sign. on file) 2/23/01	D Horn (sign. on file) 2/23/01	N/A	A Zindel (sign. on file) 2/23/01
2	Final Design Issue – Incorporated Permit Review Comments – For Permit Use Only	/s/ M Maier 06/14/01	/s/ M Zukin 06/14/01	N/A	/s/ TB Coleman 06/14/01
3	Capacity revised (in bold)	<i>John S. ...</i> 10/1/07	<i>Vincent ...</i> 10-1-07		<i>[Signature]</i> 10/2/07

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Engineering and Environmental Laboratory (INEEL)
System Number:	440
Plant Item Number:	Z-440-868
Equipment Name:	Drummed Waste Handling Enclosure (DWHE)
Associated Drawings:	53-9744 Special Case Waste and Drum Repack System Area General Arrangement, 53-9781 Special Case Waste and Drum Repack System Elevation Sht 1 of 4, 53-9782 Special Case Waste and Drum Repack System Elevation Sht 2 of 4, 55-9568 Drum Repack System Block Flow Diagram
Associated Documents:	5232-P-012 Process Description for the Drummed Waste Handling Enclosure

Description

The enclosure provides a containment area for drum repack operations during which there is a potential for contamination release. The enclosure provides a sub-change area and airlocks for personnel and material movement, all intended to minimize any potential spread of contamination. The enclosure is constructed of pre-fab, stainless steel panels

The enclosure is equipped for receipt of drums, staging of drums, movement, drum opening, waste sorting, visual examination (VE), and drum repackaging. The enclosure contains: drum opening exhaust hood, hoists, bar code readers, DMS workstation, weighscale, drum turntable, VE CCTV Camera, hand tools, shielded drum staging area, glovebox loading/bagging platform, drum receipt conveyor, fire rated elevator shaft extension, drum crusher, drum lift/tipper, and breathing air supply.

The enclosure is designed for maximum visibility, maintainability and operational efficiency.

Summary Data

SUMMARY DATA		UNITS	
Annual Duty:		days	365
Daily Duty:		hours	24 (On Demand)
Design Capacity:		per 8hr. shift	18 drums
Nominal Operating Pressure:		in wg	-.5
Nominal Operating Temperature:		°F	66 - 81
Dimensions:	Length:	ft-in	45'-0" (approximately)
	Width:	ft-in	22'-3" (approximately)
	Height:	ft-in	14'-0" (approximately)
Estimated Weight:		lb.	TBD
Materials and Construction:	Stainless steel skin wall, ceiling, and door panels w/ safety glass windows.		
Maintenance:	The equipment is of modular construction, modules are easily removable with a minimum number of fittings to allow disassembly.		
Inputs:	55-gallon metal waste drums and 55-gallon waste drums within 83/85-gallon metal overpack drums via elevator/airlock.		
Outputs:	55-gallon repacked drums via elevator/airlock. Size reduced 55-gallon and 83/85-gallon drums via hand movement.		
Interfaces:	Facility CIP and block floor/walls, ceiling support structure, HVAC, Drummed Waste Packaging Glovebox (DWPG), elevator shaft floor embedment.		
Operating Environment:	Zone 3 (contaminated area) ventilation/extraction, operated as Zone 2.		
Services:	Electrical power (120V, 230V, 480V, 3Ø), ICS control, DMS data, voice and video, instrument air, breathing air		

Special Requirements

Drum opening hood:	The drum opening hood exhausts Zone 3 air at 1590 cfm over and around the drums during opening and repack operations. Maintains a high velocity airflow.
Glovebox bagging platform:	The glovebox loading and bagging platform supports operator functions during drum bagging and initial drum unpacking.

bl**Mechanical Data Sheet****No. Z-440-868**

Drum crusher:	The drum crusher is located in the DWHE and is used for size reducing 55 & 83/85-gallon drums for export to LLW area.
Man entry airlock:	Allows man entryway with HVAC isolation.
Subchange room:	The subchange room supports enclosure decontamination, PPE prep and change in the event of spread of contamination.
Material transfer airlock:	Allows HVAC isolation for repacked drums from the DWPG to be transferred into the enclosure for disposal via elevator as well as transfer of LLW (crushed drums) out of enclosure for export to LLW area.
Elevator airlock/fire box:	The elevator airlock/fire boundary enclosure acts as an extended fire boundary from the cavern below as well as preventing HVAC interaction.
Glovebox interface:	The enclosure mates to the DWPG by a sealing flange attachment.
Hoist structural support:	Local enclosure pads/structure (tied to room ceiling structure) act as hoist structural support capable of supporting 1100 lb drum lift/movement.
Penetrations:	Control, Electrical & Instrumentation (C, E & I) and utility services require enclosure penetration panels/plates.
Depression pressure gauge:	The enclosure will operate at a nominal $-0.8''$ wg requiring depression monitoring/alarm panel(s).
Interlock switching:	All airlock doors are interlocking.
Conveyor:	Waste drums transferred from the elevator into the enclosure are controlled and interlocked with the elevator and airlock doors.

b1

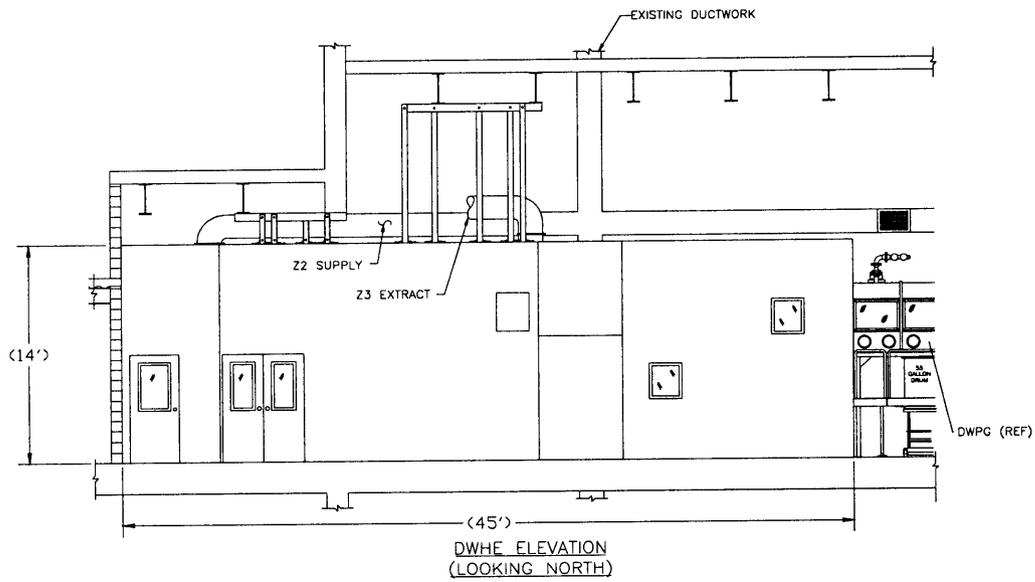
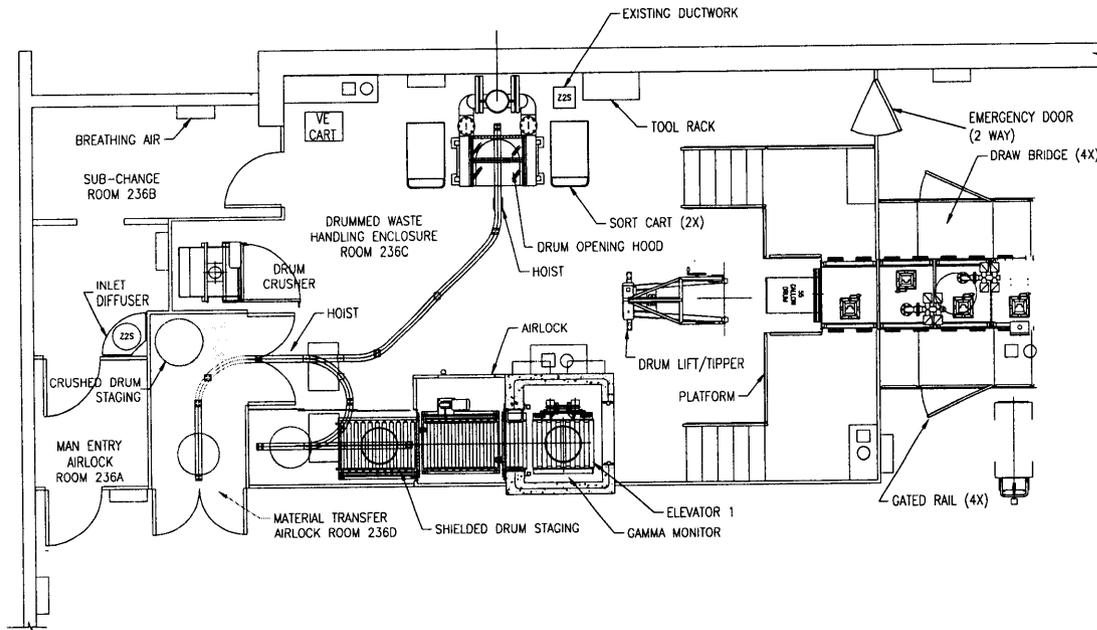
Mechanical Data Sheet

No. Z-440-868

Description: DWHE

Site: INEEL

Data Sheet No: Z-440-868



QUALITY LEVEL: NO					
Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
0	Final design issue – for permit use only	M. Maier 06/07/01	M. Lukin 06/08/01	N/A	TB Coleman 06/14/01
1	For permit - CCR	S. Schulthies 10/27/03	<i>Edward Beck</i>	N/A.	<i>D. Keefe</i> 12/1/03

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Engineering and Environmental Laboratory (INEEL)
System Number:	440
Plant Item Number:	Z-440-870
Equipment Name:	Drum Opening Hood
Associated Drawing(s):	53-9744 Special Case Waste and Drum Repack System Area General Arrangement 53-9842 DWHE Drum Opening Hood General Arrangement
Associated Document(s):	5232-P-012 Process Description for the Drummed Waste Handling Enclosure

Description

The Drum Opening Hood is a custom made Zone 3 exhaust hood providing high flow ventilation over and around a waste drum during opening and unpacking operations.

Summary Data

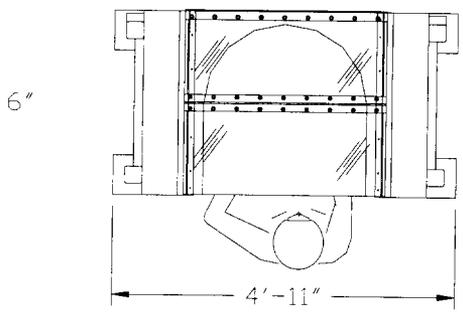
SUMMARY DATA	UNITS	
Annual Duty:	days	365
Daily Duty:	hours	24
Design Capacity:	n/a	83/85-gallon drum
Cycle Time:	min.	n/a
Minimum Design Pressure:	in. wg	n/a
Maximum Design Pressure:	in. wg	n/a
Nominal Operating Temperature:	°F	66 - 81
Dimensions:	Depth	ft & in. See attached sketch
	Width	ft & in. See attached sketch
	Height	ft & in. See attached sketch
Exhaust Flow Rate:	cfm	1590 (approximately)
Estimated Weight:	lb	400 (approximately)
Materials and Construction:	Stainless Steel and Polycarbonate assembly	
Maintenance:		

Inputs:	55-gallon metal drums and 83/85-gallon drums
Outputs:	Repacked or empty 55-gallon and 83/85-gallon metal drums
Interfaces:	HVAC
Operating Environment:	Zone 3 (contaminated area) ventilation/extraction, operated as Zone 2
Services:	None
Safety Features:	Flow meter/alarm

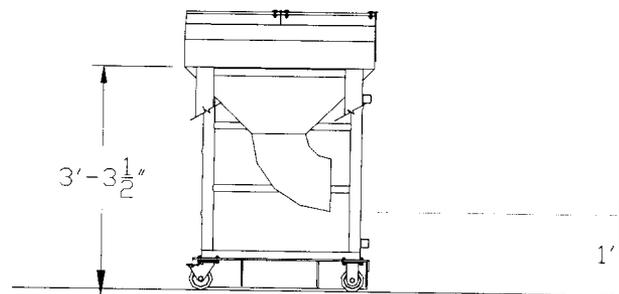
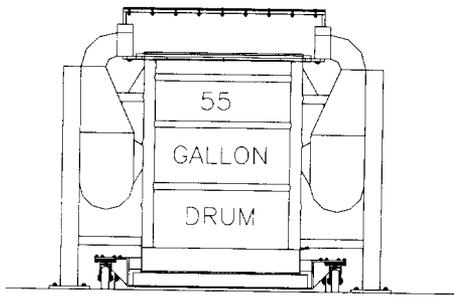
Special Requirements

None	
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Description: Drum Opening Hood	Site: INEEL	Data Sheet No: Z-440-870
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DRUM OPENING HOOD
GENERAL ARRANGEMENT



ALL DIMENSIONS ARE APPROXIMATE

QUALITY LEVEL: NO

Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
A	Preliminary issue – for permit use only	TB Coleman 02/23/01	D. Horn 02/23/01	N/A	Al Zindel 02/23/01
0	Final design issue – for permit use only	K. O'Brien 06/18/01	D. Horn 06/18/01	N/A	TB Coleman 06/18/01
1	Design revision - %100 design	K. 11/28/01	M. Lukin 11/28/01	N/A	D. Horn 11/28/01
2	Updated for permit - CCR	S. Schultheis 10/27/03 <i>S. Schultheis</i>	<i>Richard Reel</i>	N/A.	<i>P. Leathen</i> 12/1/03

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Engineering and Environmental Laboratory (INEEL)
System Number:	440
Plant Item Number:	Q-440-805
Equipment Name:	Drum Lift/Tipper
Associated Drawing(s):	53-9744 Special Case Waste and Drum Repack System Area General Arrangement
Associated Document(s):	5232-P-012 Process Description for the Drummed Waste Handling Enclosure

Description

The drum lift/tipper is a custom designed/built manually operated device for lifting and tipping 55-gallon drums to a drum bag port on the Drummed Waste Packaging Glovebox.

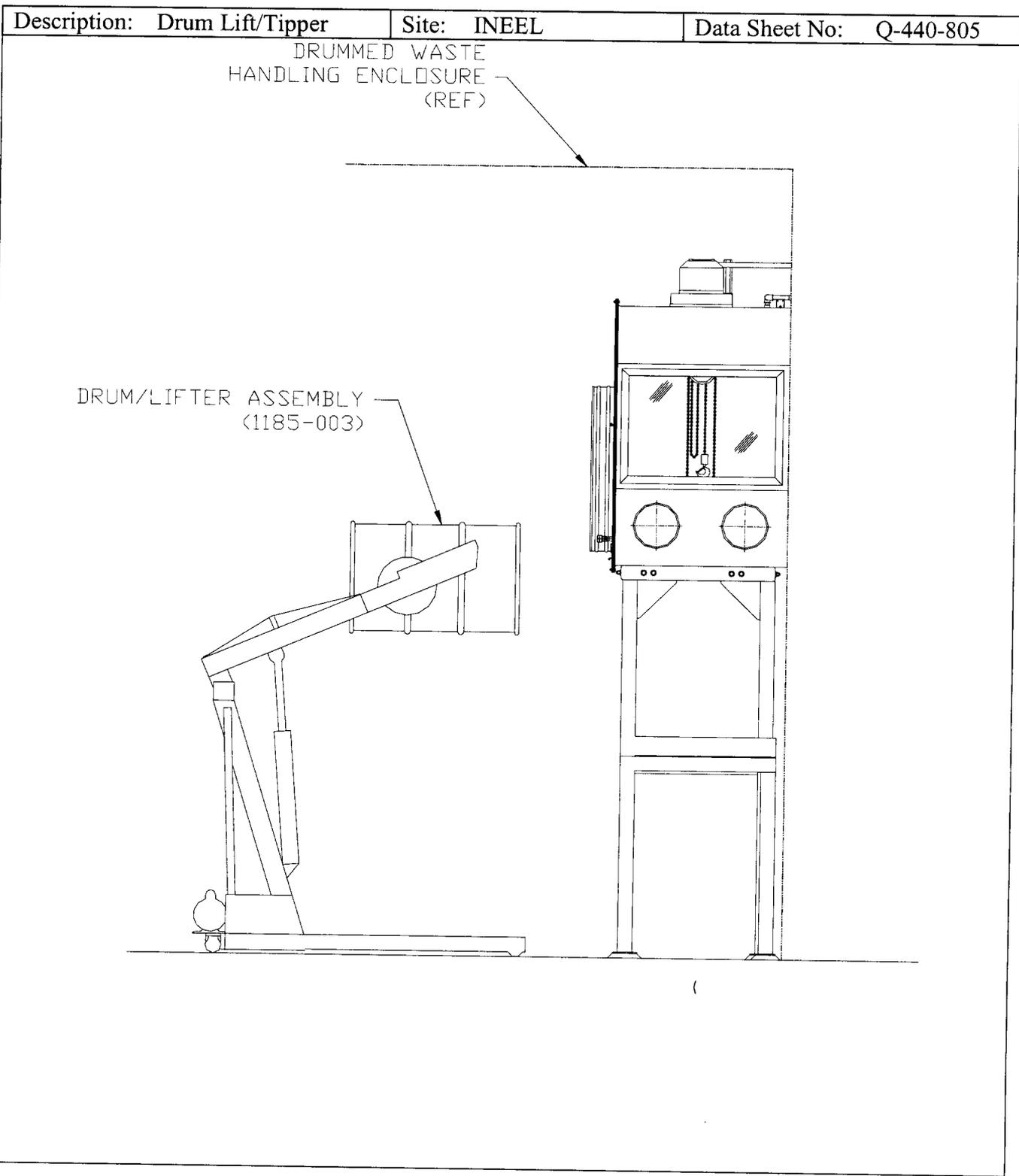
Summary Data

SUMMARY DATA	UNITS	
Annual Duty:	days	365
Daily Duty:	hours	24 (On demand)
Design Capacity:	lb	1200
Cycle Time:	min.	n/a
Minimum Design Pressure:	in. wg	n/a
Maximum Design Pressure:	in. wg	n/a
Normal Operating Temperature Range:	°F	66 – 81
Dimensions: Length	ft & in.	77" which is 6' 5" (approximately)
Width	ft & in.	50" which is 4' 2" (approximately)
Height	ft & in.	70" which is 5' 10" (approximately)
Estimated Weight:	lb	311 (approximately)
Materials and Construction:	Carbon Steel	

Maintenance:	The equipment is of modular construction; modules are easily removable with minimum number of fittings to allow disassembly.
Inputs:	55 - gallon drums
Outputs:	55 - gallon drums
Interfaces:	None
Operating Environment:	Zone 3
Services:	480VAC/60HZ/ three phase
Safety Features:	Pinch point guards, interlocked enclosure, fail safe motor brake

Special Requirements

Tilt angle:	360°
Lift mechanism:	Hand pump – hydraulic
Tilt mechanism:	Hand wheel



b1

Mechanical Data Sheet

No. Z-440-871

QUALITY LEVEL: NO

Rev	Reason for Revision	Originator & Date	Checker & Date	Verifier & Date	LDE & Date
0	Final Design Issue For Permit Use Only	J. Florea 01/18/01	K. O'Brien 01/18/01	N/A	Al. Zindel 01/18/01
1	Permit Comment Incorporation	K. O'Brien 2/23/01	T.B.Coleman 2/23/01	N/A	A. Zindel 2/23/01
2	Final Design Issue	K. O'Brien			
3	Issued for permit CCR	S. Schultheis 10/27/03	R. Beck		Leatherbarrow 12/01/03
4	Capacity revised (in bold)	<i>John Daddis</i> 10/1/07	<i>Robert Cunningham</i> 10/1/07		<i>lc</i> 10/2/07

Project:	Advanced Mixed Waste Treatment Project (AMWTP)
Site:	Idaho National Engineering and Environmental Laboratory (INEEL)
System Number:	440
Plant Item Number:	Z-440-871
Equipment Name:	Drum Waste Packaging Glovebox
Associated Drawing(s):	Drummed Waste Packaging Glovebox External Arrangement Sheet 1 of 2 - 53-9772 Drummed Waste Packaging Glovebox External Arrangement Sheet 2 of 2 - 53-9773 Special Case Waste and Drum Repack System Area General Arrangement - 53-9744 Drum Repack System Block Flow Diagram - 55-9568 Drummed Waste Packaging Glovebox (DWPG) Mechanical Flow Diagram - 55-9578
Associated Document(s):	Process Description for Drummed Waste Packaging Glovebox (DWPG) - 5232-P-015

Description

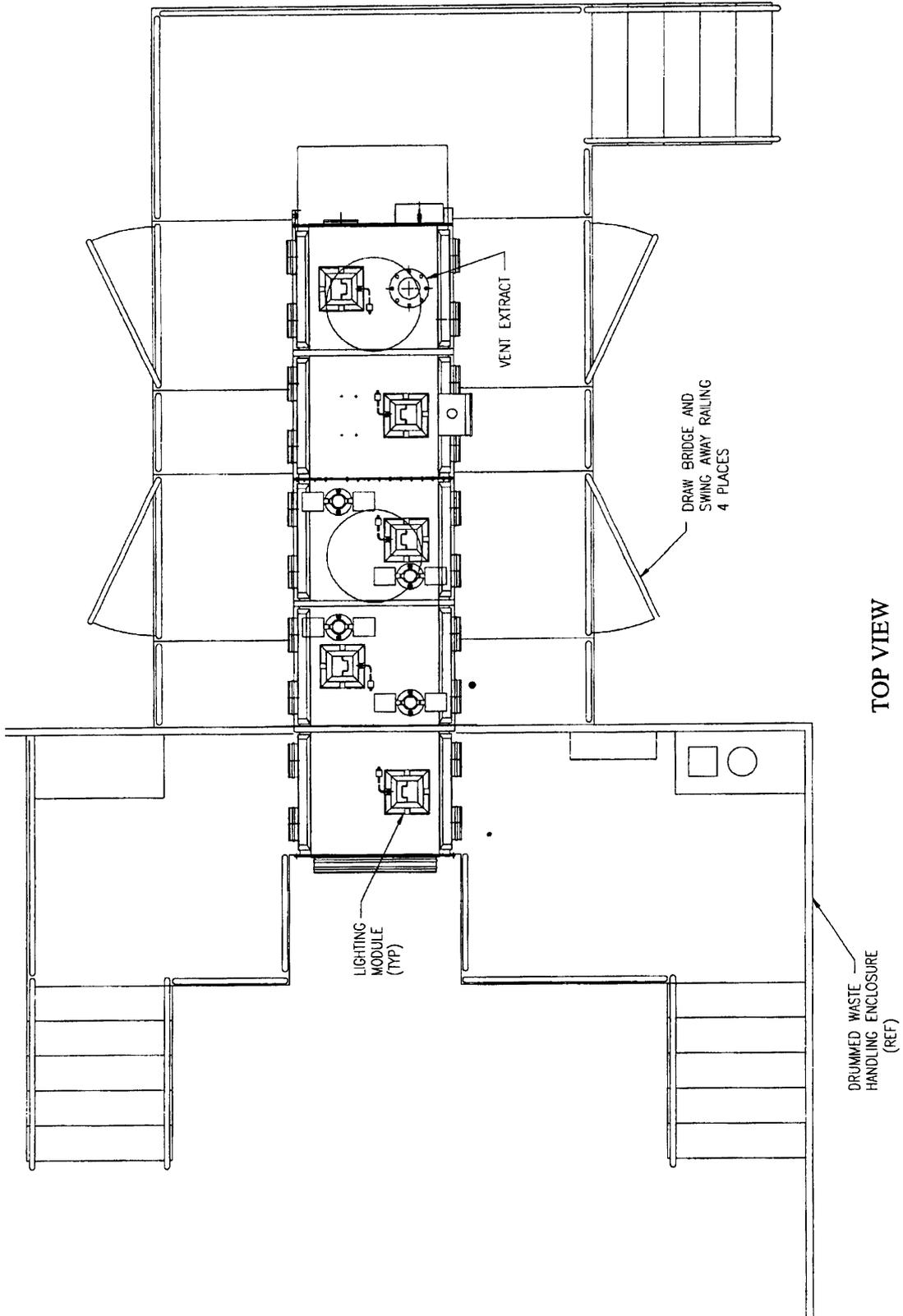
The glovebox is designed for maximum visibility, maintainability and operational efficiency. The glovebox incorporates a receipt/sort and preparation/export area and it has a platform around the perimeter for operator access. The glovebox system includes: a chain fall to handle heavy items within the glovebox, alpha hand monitors to detect contamination, bar code readers, drum lifts, and turntables to handle the export drums, a CCTV System to record visual examination of drum debris and a fire suppression system.

Summary Data

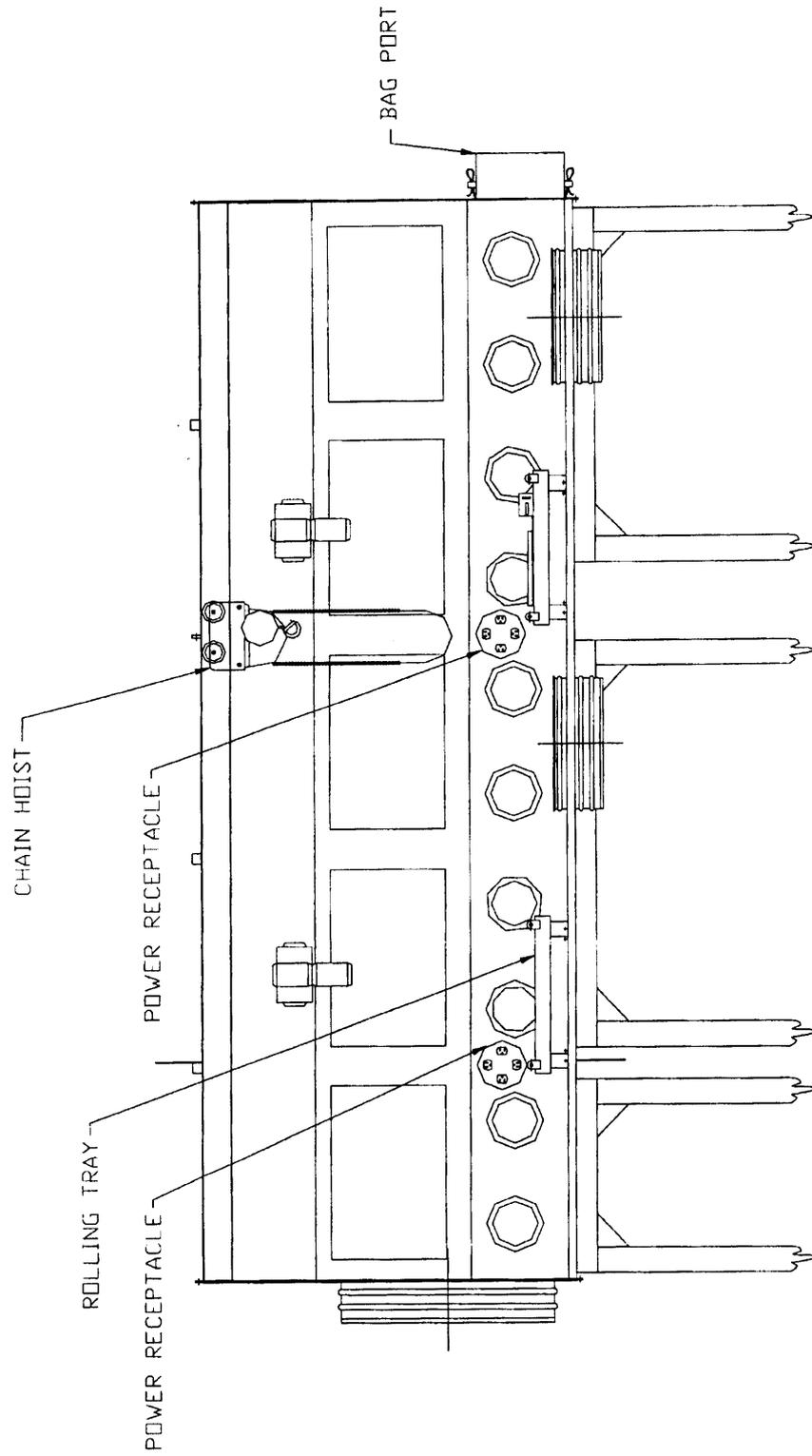
SUMMARY DATA		UNITS	
Annual Duty		day	365
Daily Duty		Hour	24 (On Demand)
Design Capacity		Per 8 hr shift	18 drums
Cycle Time		Hour	Variable (depends on waste stream)
Minimum Design Pressure		In wg	-2 (Depression)
Maximum Design Pressure		In wg	+2
Normal Operating Temperature Range:		°F	66 - 81
Dimensions:	Length	Ft & in	15'-1" (approx.)
	Width	Ft & in	3'-6" (approx.)
	Height	Ft & in	11'-6" (approx.)
Estimated Weight		lb.	3,000 (equipment not included)
Materials and Construction	Stainless Steel		
Maintenance	The equipment is of modular construction, modules are easily removable with a minimum number of fittings to allow dismantling within the containment by operators via gloveports.		
Inputs :	Repack waste through horizontal 55-gallon drum bag port. Process equipment, consumables, absorbents, wipes & reagents through bag port.		
Outputs:	Repack waste trough two vertical 55-gallon drum bag ports. Other waste through bag port.		
Interfaces :	Drummed Waste Handling Enclosure (DWHE)		
Operating Environment:	Zone 2-Operating Area; Zone 3-Glovebox (Contaminated Area)		
Services	Electricity (Power and Control), Ventilation		

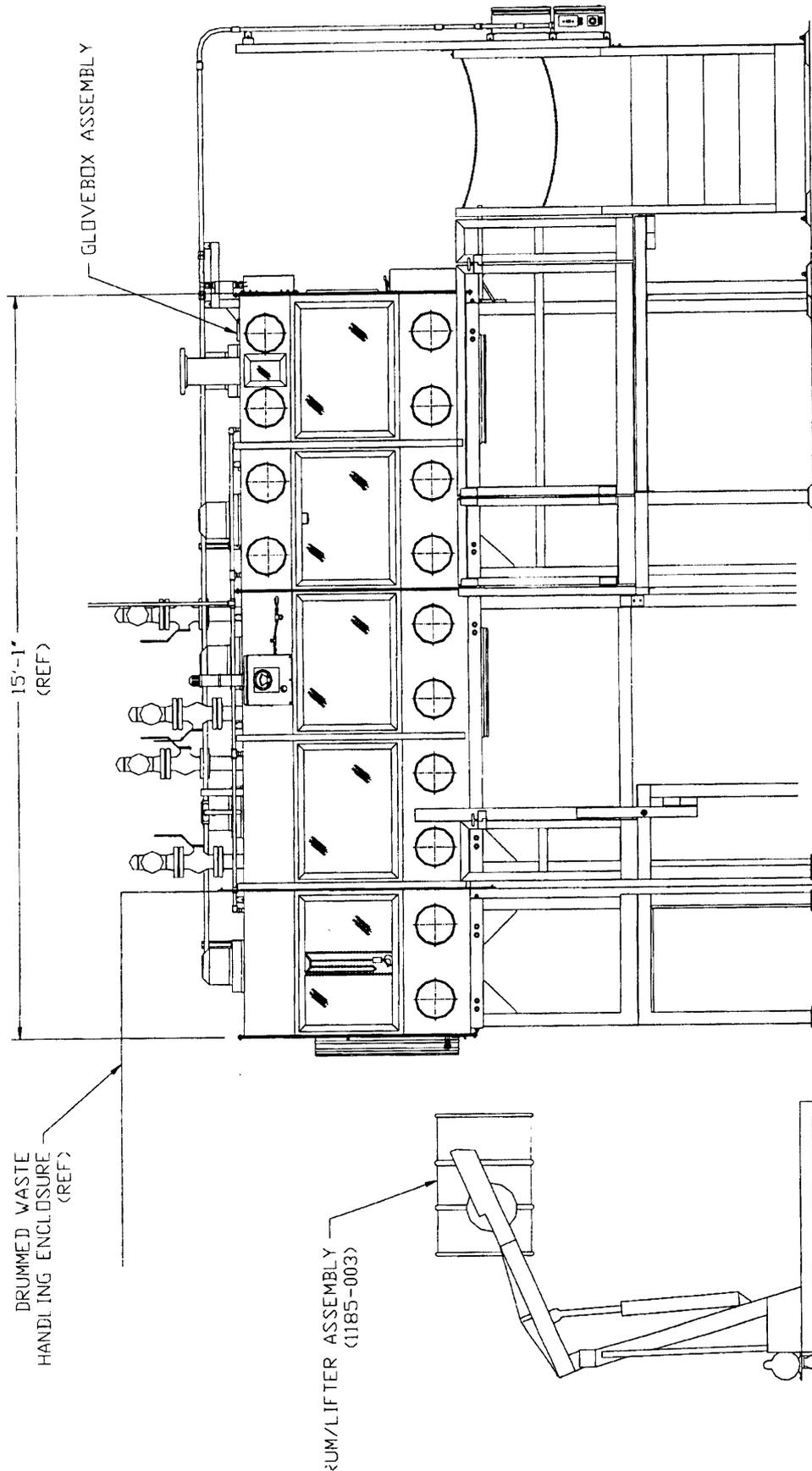
Special Requirements

None	



TOP VIEW





APPENDIX XXIII

EXAMPLE WASTE PROFILE FORM



Non-AMWTP Generator Waste Profile

Profile Identification No.: _____ Date: _____

A separate waste profile is required for each waste stream.

1. Waste Shipper Information

- 1. Company:
2. Address:
3. Generator facility:
4. Generator facility EPA ID:
5. Contact:
6. Phone:

2. Waste Stream Data

- 1. Name of waste stream:
2. Waste generating process:
3. Physical description of waste (solid, sludge, etc.):
4. Item description code (IDC): (if applicable)
5. Generation date
6. Is the source of the waste the Department of Energy?
7. Is the waste defense related?
8. Does the waste contain pyrophoric metals?
9. Does the waste contain oxidizers?
10. Does the waste contain beryllium, or have beryllium contamination?
11. Does the waste contain DOT Class 1 explosives or reactive metals?
12. Does the waste contain TSCA-regulated PCBs?
13. Does the waste contain any free liquids?
14. Does the waste have prohibited containerized liquids?
15. Do internal containers contain less than 1 inch or 2.5 cm liquid in the bottom of the container?
16. Does the total residual liquid in any payload container exceed 1 percent volume of that container?
17. Does the waste contain compressed gas?
18. Does the waste contain corrosive material?
19. Is this a transuranic waste stream?
20. Is this waste included in a Site Treatment Plan?
21. What waste management activity or treatment does this waste stream require?
Compaction
Stabilization
Segregation
Repackaging
Solidification/Absorption
Characterization
Coring
Other

3. Physical Characteristics

- 1. Is waste multi-phased?
2. Physical state at 70°F:
3. Flashpoint (°F):
4. pH:
5. Percent organic (%):
6. Average bulk density:
7. Total waste stream volume (m³):



Non-AMWTP Generator Waste Profile

4. Radionuclide Activity Concentrations

Describe how radioactive material constituents were derived (e.g. sample data, AK, process knowledge, etc.), and the rationale used to determine the activity concentration (e.g. dose conversion versus Federal guide, etc.):

Nuclide	Activity Concentration (Ci/m ³)
Am-241	_____
Am-243	_____
Cf-252	_____
Np-237	_____
Pu-236	_____
Pu-238	_____
Pu-239	_____
Pu-240	_____
Pu-241	_____
Pu-242	_____
Ra-226	_____
Th-232	_____
U-233	_____
U-235	_____
U-238	_____

5. Hazardous Materials Concentrations and Weight Percent

NOTE: The identified hazardous materials below are explicitly evaluated within the safety basis and Environmental HWMA/RCRA and Clean Air Act. Hazardous materials not included on this list are subject to further review within the USQ process and Environmental Compliance Manager must be notified.

Describe how chemical constituents were derived (e.g. sample data, AK, process knowledge, etc.)

Hazardous Material	CAS Number	Mass Concentration (mg/m ³)	Mass Concentration Range (mg/kg)	Weight %
Organic Compounds				
Acetone*	67-64-1	_____	_____	_____
Asbestos*	1332-21-4	_____	_____	_____
Benzene*	71-43-2	_____	_____	_____
Benzyl Chloride	100-44-7	_____	_____	_____
Bis (2-ethylhexyl) phthalate*	117-81-7	_____	_____	_____
Bromoform*	75-25-2	_____	_____	_____
Butyl Alcohol, n- (1-butanol)*	71-36-3	_____	_____	_____
Carbon Disulfide*	75-15-0	_____	_____	_____
Carbon tetrachloride*	56-23-5	_____	_____	_____
Chlorobenzene*	108-90-7	_____	_____	_____
Chloroform (Trichloromethane)*	67-66-3	_____	_____	_____
Chloromethane	74-87-3	_____	_____	_____
Chloromethylene-Benzene	26968-58-1	_____	_____	_____
2-Chloro-1,3,5-Trimethyl-Benzene	-	_____	_____	_____
Cyanide*	592-01-8	_____	_____	_____
Cyclohexane*	110-82-7	_____	_____	_____
1,2-Dichlorobenzene (o-Dichlorobenzene)*	95-50-1	_____	_____	_____
1,4-Dichlorobenzene (Dichlorobenzene, p-)*	106-46-7	_____	_____	_____
1,1-Dichloroethane*	75-34-3	_____	_____	_____
1,2-Dichloroethane*	107-06-2	_____	_____	_____
1,1-Dichloroethylene*	75-35-4	_____	_____	_____
1,2-Dichloroethylene (trans & cis)*	540-59-0	_____	_____	_____
trans-1,3-Dichloropropene*	542-75-6	_____	_____	_____
2,4-Dinitrophenol	51-28-5	_____	_____	_____
2,4 Dinitrotoluene	121-14-2	_____	_____	_____
2-Ethoxyethanol*	110-80-5	_____	_____	_____
Ethyl benzene*	100-41-4	_____	_____	_____
Ethyl ether	60-29-7	_____	_____	_____
Fluoranthene (Polyaromatic Hydrocarbon)*	206-44-0	_____	_____	_____
Ethylene dichloride	107-06-2	_____	_____	_____
Hexachlorobenzene*	118-74-1	_____	_____	_____
Hexachlorobutadiene*	87-68-3	_____	_____	_____
Hexachloroethane*	67-72-1	_____	_____	_____
Hydrogen	1333-74-0	_____	_____	_____



Non-AMWTP Generator Waste Profile

Hazardous Material	CAS Number	Mass Concentration (mg/m ³)	Mass Concentration Range (mg/kg)	Weight %
Organic Compounds (continued)				
Isobutanol*	78-83-1			
Isopropanol*	67-63-0			
Methane	74-82-8			
Methanol (methyl alcohol)*	67-56-1			
Methyl Ethyl Ketone (butanone, 2-)*	78-93-3			
Methyl Isobutyl Ketone*	108-10-1			
Methylene Chloride*	75-09-2			
2-Methylphenol (o-Cresol)*	95-48-7			
2-Methylphenol (m-Cresol)*	108-39-4			
2-Methylphenol (p-Cresol)*	106-44-5			
mixed lead nitrate and organic material	10099-74-8			
Nitrates	-			
Nitric Acid	7697-37-2			
Nitrobenzene*	98-95-3			
Pentachlorophenol*	87-86-5			
Perchloroethylene (tetrachloroethylene)	127-18-4			
Phenol*	108-95-2			
Pyridine*	110-86-1			
Polychlorinated Biphenyl (Aroclor)*	1336-36-3			
Potassium Nitrate	7757-79-1			
Styrene*	100-42-5			
1,1,2,2-Tetrachloroethane*	79-34-5			
Tetrachloroethylene*	127-18-4			
Toluene*	108-88-3			
1,1,1-Trichloroethane (Methyl Chloroform)*	71-55-6			
1,1,2-Trichloroethane*	79-00-5			
Trichloroethylene*	79-01-6			
1,1,1,2,2-Trifluoroethane (Freon 113 or CFC 113)	76-13-1			
1,2,4-Trimethylbenzene*	95-63-6			
1,3,5-Trimethylbenzene*	108-67-8			
Vinyl Chloride*	75-01-4			
Vinyldiene Chloride (1,1-Dichloroethylene)	75-35-4			
Xylenes (m, p & o)*	1330-20-7			

	CAS Number	Mass Concentration (mg/m ³)	Mass Concentration Range (mg/kg)	Weight %
Metals				
Antimony*	7440-36-0			
Arsenic*	7440-38-2			
Barium*	7440-39-3			
Beryllium*	7440-41-7			
Cadmium*	7440-43-9			
Calcium	7440-70-2			
Chromium*	7440-47-3			
Cobalt	7440-48-4			
Copper	7440-50-8			
Iron	7439-89-6			
Lead*	7439-92-1			
Lithium	7439-93-2			
Manganese	7697-37-2			
Mercury*	7439-97-6			
Nickel*	7440-02-0			
Selenium*	7782-49-2			
Silver*	7440-22-4			
Strontium	7440-24-6			
Thallium*	7440-28-0			
Uranium	7440-61-1			
Vanadium*	7440-62-1			
Zinc*	7440-66-6			
Zirconium	7440-67-7			

*Required by AMWTP Environmental Air Permits



Non-AMWTP Generator Waste Profile

List any hazardous materials not listed above.

Hazardous Material	CAS Number	Mass Concentration (mg/m ³)	Mass Concentration Range (mg/kg)	Weight %
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Comment:

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Comment:

List all EPA HWNs



Non-AMWTP Generator Waste Profile

6. Waste Compatibility and Stability

1. Provide any waste compatibility and/or stability evaluation. (List source documents)

2. Is this material chemically stable? If no, explain: Yes [] No []

7. Source References

NOTE: Process and/or analytical data must be provided to accurately identify all applicable HWNs and underlying hazardous constituents, TSCA-regulated wastes, DOT hazard classes, and proper shipping nomenclature. If adequate process knowledge exists to ensure that a particular constituent is not present in the waste and this information is documented, then there is no requirement to analyze for that constituent. However, the waste profile must establish that there is no reason to suspect that the constituent is in the waste.

1. List attachments or accompanying documents.

Analytical data must be included that include metals, volatiles, semi-volatiles, pesticides, and herbicides.

2. Attach 40 CFR 268, LDR Notifications and Certifications, to this form.

8. Accountability Statement

I hereby certify that, to the best of my knowledge, all information submitted in this and all attached documents contain true, accurate, and complete descriptions of this waste. Any sample that was analyzed or submitted was representative as defined in 40 CFR 261, Appendix I. All relevant information regarding known or suspected hazards in the waste described herein, has been disclosed by the AMWTP customer and generator.

Generator Approval: (E-signature is acceptable)

Name and Title (print clearly) Authorized Signature Date

9. Comments - The comments below are for AMWTP management purposes only and do not affect Generator signature.

10. Restrictions - The restrictions below are for AMWTP management purposes only and do not affect Generator signature.

Table with 3 columns: Item, Restriction, Implementation Plan. Includes three rows of blank lines for data entry.

11. USQ Determination

Form-1735 Result Pass [] Fail [] Form-1736 Result Pass [] Fail []
USQ Screening No.: _____ USQ Determination No.: _____

AMWTP Approval: (Environmental Compliance Manager or Designee and Offsite Waste Coordinator or Alternate)

Environmental Compliance Management: _____
Authorized Signature Date

Offsite Waste Coordinator: _____
Authorized Signature Date

APPENDIX XXIV

**ADVANCED MIXED WASTE TREATMENT PROJECT
WASTE CHARACTERIZATION QUALITY ASSURANCE PROJECT PLAN**

**ADVANCED MIXED WASTE TREATMENT PROJECT WASTE
CHARACTERIZATION**

QUALITY ASSURANCE PROJECT PLAN

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ACRONYMS

1	AMWTP	Advanced Mixed Waste Treatment Project
2	ASTM	American Society for Testing and Materials
3	DCSRS	drum core sample retrieval system
4	DEQ	Department of Environmental Quality
5	DMS	data management system
6	DOE	Department of Energy
7	EPA	Environmental Protection Agency
8	GC/MS	gas chromatography/mass spectrometry
9	HSGS	headspace gas sample
10	HWMA	Hazardous Waste Management Act
11	HWN	EPA hazardous waste number
12	IDC	item description code
13	QA	quality assurance
14	QAPjP	quality assurance project plan
15	QC	quality control
16	RCRA	Resource Conservation and Recovery Act
17	RTR	real-time radiography
18	SCW	special case waste
19	SW-846	The EPA Manual for “Test Methods for Evaluating Solid Waste, Physical
20		and Chemical Methods,” current edition
21	SWEPP	Stored Waste Examination Pilot Plant
22	TSA-RE	Transuranic Storage Area-Retrieval Enclosure
23	WAC	waste acceptance criteria
24	WG	waste group
25	WIPP	Waste Isolation Pilot Plant
26	WMF	Waste Management Facility

GLOSSARY

Special Case Waste = Waste that must have special handling prior to treatment in the Advanced Mixed Waste Treatment Facility. This may be an item that requires removal from a container, a liquid requiring solidification, etc. This waste is generally handled in the special case waste glovebox system.

1.0 PROJECT DESCRIPTION AND OBJECTIVES

This quality assurance project plan (QAPjP) describes the quality objectives for the waste characterization activities to be performed for the Advanced Mixed Waste Treatment Project (AMWTP) to meet the requirements of the Hazardous Waste Management Act (HWMA) / Resource Conservation and Recovery Act (RCRA). The AMWTP has the ultimate goal of treating Department of Energy (DOE) waste to produce final waste forms that are certified for disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico or other off-Site disposal facility. The AMWTP is designed to process debris and non-debris waste. The majority of debris waste is treated via supercompaction in Waste Management Facility (WMF) – 676, but debris waste may also be treated via macroencapsulation of waste in WMF-628 through WMF-635 and WMF-610. Waste is characterized at the AMWTP using process knowledge, real-time radiography (RTR), visual examination, assay, and various sampling and analysis techniques.

1.1 Purpose of the QAPjP

This QAPjP provides the quality assurance (QA) requirements associated with the AMWTP, which includes the following areas:

- WMF-676;
- AMWTP Outside Storage Area;
- WMF-636 Pad 2
- AMWTP Characterization Facilities, WMF-628, WMF-634, WMF-635, and the Stored Waste Examination Pilot Plant (SWEPP);
- Type II Modules WMF-629 through WMF-633; and
- Transuranic Storage Area-Retrieval Enclosure (TSA-RE).

To adequately characterize waste, representative samples must be collected, handled, and analyzed in a manner that ensures the accuracy and defensibility of the analytical data. This QAPjP provides the information needed to ensure that sample results meet these criteria. Samples are taken to support the following waste characterization activities:

- 1 • Waste-to-waste compatibility testing,
- 2 • Headspace gas sampling (HSGS),
- 3 • Non-debris waste sampling,
- 4 • Homogeneous debris sampling, and
- 5 • Liquid waste sampling.

6 In addition to sampling, process knowledge and non-invasive examination (e.g., RTR,
7 visual examination) may be used to support waste characterization. While process knowledge
8 reviews, examination, sampling activities, and HSGS are performed by AMWTP personnel, the
9 chemical analysis of the waste is primarily performed by a contracted analytical laboratory.

10 **1.2 Project Objectives**

11 Several objectives exist for the characterization activities. These are:

- 12 • Assign item description code (IDC) / waste group (WG) to waste,
- 13 • Assign Environmental Protection Agency (EPA) hazardous waste numbers (HWNs)
14 to waste,
- 15 • Identify prohibited items,
- 16 • Complete data package preparation required for waste disposition,
- 17 • Facilitate safe and compliant project operations, and
- 18 • Prepare for safe and compliant shipping.

2.0 SAMPLING AND ANALYSIS

This section discusses sampling and analysis requirements for waste managed at the AMWTP. As mentioned previously, the AMWTP manages non-debris and debris waste.

Sampling and analysis of both non-debris and debris waste relies heavily on using process knowledge to differentiate waste containers into various homogeneous waste streams. Using process knowledge, the AMWTP classifies the entire waste stream, rather than individual waste containers, as either hazardous or non-hazardous. Individual waste containers serve as convenient, representative units for characterizing the waste stream of interest through sampling and analysis.

Special case waste (SCW) items, liquids, and squeezants that are collected or generated, are characterized as individual containers versus the entire waste stream. It is expected that these wastes will contain different waste characterization parameters between containers, and therefore characterization on a waste stream basis is not appropriate. Characterization of SCW, liquids, and squeezants is performed through process knowledge, when available. When process knowledge is insufficient to assign HWNs, sampling and analysis is performed on the waste container.

All sampling methods and procedures, and frequencies for AMWTP waste streams are performed using the method(s) specified in the following:

- “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,” Third edition, November 1986, or prevailing edition (SW-846).
- “*Standard Methods for the Examination of Water and Wastewater*,” 20th edition, 1998, or prevailing edition.
- “A Method for Determining the Compatibility of Hazardous Wastes,” EPA-600/2-80-076.
- American Society of Testing and Materials (ASTM) standards.

Any method or procedure not specified in the above documents shall be compatible with the requirements listed in the AMWTP HWMA/RCRA Permit, and be approved the State of Idaho Department of

1 Environmental Quality (DEQ). All deviations to documents specified above shall also be
2 approved by the DEQ.

3 **2.1 Sampling Design For Non-Debris Waste Drums**

4 The sampling design for homogeneous solids and soil/gravel waste relies on using
5 process knowledge to differentiate waste containers into the relatively homogeneous waste
6 stream. Individual waste containers serve as convenient, representative units for characterizing
7 the waste stream of interest. Once assigned to a waste stream, random selection and sampling of
8 the waste containers are performed to estimate the concentrations of contaminants in each waste
9 stream. The AMWTP maintains documentation to verify that the samples collected from within
10 a waste stream were selected randomly.

11 For non-debris sludge drums that are not designated for disposal at WIPP, an initial 5
12 drums per waste stream are sampled and analyzed. For the purpose of this section only, a waste
13 stream is defined as wastes which have similar physical composition and HWNs. The initial
14 sampling frequency may be revised based upon a statistical re-evaluation. Additional samples
15 are randomly determined, collected, and analyzed, if required by the statistical evaluation.

16 Alternatively, if historical information is available, preliminary estimates of the
17 concentration and variance of each HWMA/RCRA-regulated contaminant in the waste may be
18 used to determine the number of waste containers to select for sampling and analysis. If
19 information is not available to make preliminary estimates, then the preliminary estimate is a
20 minimum of 5 waste containers. The drums selected for the preliminary estimate are selected by
21 simple random selection. The preliminary estimates are determined in accordance with the
22 following equations:

$$23 \quad \bar{x} = \frac{1}{n} \sum_{i=1}^n x_i \quad \text{Equation 2-1.}$$

$$24 \quad s^2 = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2 \quad \text{Equation 2-2.}$$

25 Where:

- 1 • \bar{x} is the calculated mean,
- 2 • s^2 is the calculated concentration variance,
- 3 • n is the number of samples analyzed,
- 4 • x_i is the concentration determined in the i^{th} sample, and
- 5 • i is an index from 1 to n .

6 Based upon the preliminary estimates of \bar{x} and s^2 for each chemical contaminant of
 7 concern, the estimate or the appropriate number of samples (n) required to be collected for each
 8 contaminant are calculated using the following formulas from “Test Methods for Evaluating
 9 Solid Waste, Physical/Chemical Methods”, current edition (SW-846):

$$10 \quad n = \frac{t_{\alpha, n_0-1}^2 s^2}{(RT - \bar{x})^2} \quad \text{Equation 2-3.}$$

11 Where:

- 12 • n = the calculated number of samples in the preliminary estimate,
- 13 • t^2 = the 90th percentile for a t distribution with n_0-1 degrees of freedom,
- 14 • n_0 = the initial number of samples used to calculate the preliminary sample estimate,
 15 and
- 16 • RT = regulatory threshold of the contaminant [toxicity characteristic limit for TC
 17 wastes, program required quantitation limit for listed wastes].

18 The number of samples to be collected is based upon the largest n calculated for each of
 19 the contaminants of concern. The actual number of samples collected shall be adjusted as
 20 necessary to ensure that an adequate number of samples are collected to allow for acceptable
 21 levels of completeness.

22 All calculations should be rounded up to the nearest integer. A minimum of five
 23 containers shall be sampled and analyzed in each waste stream.

24 For all contaminants where the number of samples analyzed was equal to or greater than
 25 the number of samples statistically determined to be required, no further analyses are required.
 26 For those contaminants of concern where the largest n statistically determined was greater than

1 the number of samples analyzed, then additional samples are required if the intent is to classify
2 the waste as non-hazardous for those contaminants of concern.

3 Upon collection and analysis of the preliminary samples, or at any time after the
4 preliminary samples have been analyzed, the AMWTP may assign HWNs to a waste stream
5 rather than collecting additional samples. For waste streams with calculated upper confidence
6 limits below the regulatory threshold, the AMWTP shall collect the required number of samples
7 if the AMWTP intends to establish that the constituent is below the regulatory threshold.

8 **2.2 Sampling Design for Debris Waste**

9 Debris waste is primarily characterized by the identification of and IDC or WG via RTR
10 and process knowledge. Headspace gas analysis is performed for debris drums with an
11 unassigned IDC/WG or unknown HWNs.

3.0 AMWTP SPECIFIC CHARACTERIZATION METHODS

3.1 Process Knowledge

Process knowledge, also referred to as acceptable knowledge, refers to using knowledge of the waste to assign IDCs/WGs and HWNs to waste. Process knowledge includes information regarding the physical form of the waste, the base materials composing the waste, and the process generating the waste. The collection and use of process knowledge information applies to all waste forms.

Process knowledge documentation provides primarily qualitative information that cannot be assessed according to specific quality assurance objectives that are used for analytical techniques. Process knowledge includes: records; management, procedural, and quality controls associated with the process generating the waste; historical sampling and analytical data; information about material inputs to the waste generating process; and information on the time period during which the waste was generated. The purpose of process knowledge documentation is to provide a clear and convincing argument to support the characterization of the waste.

Characterization, using process knowledge, starts at the IDC level to take advantage of the most detailed information available. IDCs are grouped into WGs as indicated by process knowledge and characterization data.

The process knowledge information is compiled in an auditable record. This information is confirmed using one or more of the following: RTR, sampling and analysis, visual examination, or other methods as appropriate or required. Process knowledge records shall also be assessed for completeness.

3.2 Real Time Radiography

RTR has been developed by the DOE specifically to aid in the examination and identification of containerized waste. There is no equivalent or associated method found in EPA sampling and analysis guidance documents. The primary goal of RTR is to verify the physical form, presence of prohibited items, and confirm process knowledge.

1 RTR is a radiography system that normally consists of an x-ray producing device, an
2 imaging system, an enclosure for radiation protection, a container handling system, an
3 audio/video recording system, and a control and data acquisition station. The RTR equipment
4 utilizes controls in order to control image quality. The system allows personnel to vary the
5 voltage to provide an optimum degree of penetration through the container. The container is
6 scanned while personnel view the image on a monitor. An audio/videotape or equivalent
7 recording on non-alterable media is made of the waste within the container. Typically, the RTR
8 equipment is used to identify or confirm the waste stream description, packaging configuration,
9 and identify WMF-676 prohibited items.

10 If radiography indicates that the waste does not match the waste stream description, a
11 nonconformance report is completed and the inconsistency is resolved. The proper waste stream
12 assignment is determined, the correct HWNs are assigned, and the resolution is documented.

13 **3.3 Headspace Gas Sampling**

14 Gas chromatography/mass spectrometry (GC/MS) is the principal method used to analyze
15 the headspace gas. Headspace gas samples are collected from 100% of the non-debris drums
16 destined for disposal at WIPP that do not have an assigned IDC/WG or with unknown HWNs.
17 Headspace gas sampling may be used for characterizing non-debris drums with an unknown
18 IDC/WG or unknown HWNs that is not destined for disposal at WIPP, if the off-Site disposal
19 facility will accept headspace gas sampling as a characterization method. Additionally,
20 headspace gas sampling and analysis are performed on 100% of the non-debris drums assigned
21 the D001 HWN that are sent to the drum core sample retrieval system (DCSRS) located within
22 WMF-634 for coring.

23 Prior to receipt at WMF-676, 100% of debris containers for which IDCs or WGs cannot
24 be assigned are typically subjected to headspace gas sampling and analysis via GC/MS. When
25 the chromatographic detections are below the procedurally-established limits, the drum is
26 assigned one of the inorganic debris WGs, and organic HWNs are not assigned.

1 **3.4 Drum Coring**

2 Drum core sampling is a method used to analyze the non-debris waste drums. Drum core
3 samples are collected primarily in the DCSRS located within WMF-634. The DCSRS is used to
4 extract a core from the waste in a drum at a randomly selected location. After the core has been
5 extracted, a sample is collect from a random location in both the horizontal and vertical planes.
6 The sample, therefore, is extracted from a random location in both the horizontal and vertical
7 planes. After the core has been extracted, a sample is sent to a laboratory for analysis. The
8 results from the sampling and analysis are used either to determine or verify HWNs for a given
9 IDC/WG.

4.0 QUALITY ASSURANCE / QUALITY CONTROL

4.1 Quality Assurance

The quality assurance criteria for method accuracy, method precision, reporting limits, completeness, and sampling accuracy are identified through the method chosen for performing characterization in accordance with DEQ approved methods or one of the resources listed in Section 3.0 (e.g., SW-846).

4.2 Quality Control

The quality control (QC) criteria for AMWTP characterization techniques are identified through the method chosen for performing characterization in accordance with DEQ approved methods or one of the resources listed in Section 3.0 (e.g., SW-846). However, unlike most analytical techniques (e.g., GC/MS), standards and knowns are not readily available for RTR; therefore, an alternate technique is utilized for performing QC checks on RTR. Visual examination is an invasive examination of the waste and serves as the QC check for RTR.

4.2.1 Quality Control of Real-Time Radiography

The RTR system involves qualitative and semi-quantitative evaluations of visual displays. QC during RTR is assured by operator training, equipment standards, and subsequent independent visual examinations of the waste to verify RTR results.

4.2.1.1 Real-Time Radiography Operator Training

Operator training and experience are the most important considerations for ensuring QC with regard to the operation of the RTR equipment and for interpretation and application of radiography results. Only trained personnel are allowed to operate RTR equipment.

RTR operators are instructed in the specific waste generating practices, typical packaging configurations, and associated waste material parameters expected to be found in each WG. On-the-job training and apprenticeship is conducted by an experienced, qualified operator prior to qualification of the training candidate.

1 A specific training program is used to assess operator performance before actual waste
2 characterization. This training program employs exercises such as evaluation of simulated waste
3 (non-radioactive materials), identification of waste drums containing greater than 50 volume
4 percent debris waste, review of audio/videotapes of previous RTR examinations, and
5 familiarization with estimating techniques. Standard nomenclature is established to ensure that
6 all operators recognize waste by the same descriptors.

7 **4.2.1.2 Quality Control Checks for Real-Time Radiography**

8 As a QC check on the radiographic examination of waste containers, a statistically
9 selected portion of the certified waste drums must be opened and visually examined or an
10 independent review of the RTR examination data is performed. Independent RTR examination
11 is performed by the off-Site receiving facility, or the off-Site receiving facility's designated
12 representative. The data obtained from RTR verification shall be used to verify the IDC and/or
13 WG and identify all discernable waste items, waste parameter weights, residual materials, and
14 other appropriate waste material parameters.

15 The data obtained from RTR verification activities (i.e., visual examination or
16 independent RTR data review) shall also be used to determine, with acceptable confidence, the
17 percentage of miscertified waste containers from the radiographic examination. Miscertified
18 containers are those that radiography indicates meet a specified criteria [e.g., WIPP waste
19 acceptance criteria (WAC), AMWTP WAC, and Transuranic Package Transporter-II Authorized
20 Methods for Payload Control] but RTR verification results conclude do not meet these
21 requirements. Based upon the miscertifications found, a miscertification rate shall be used to
22 calculate the number of waste containers that shall be subject to RTR verification. The
23 miscertification rate shall be determined in accordance with the WAC of the facility that will be
24 receiving the waste for final disposal. At a minimum, the miscertification rate will ensure that
25 the RTR characterization method correctly identifies the waste stream to allow the assignment of
26 chemical contaminants potentially present in each waste stream. Any statistical method utilized
27 for establishing a miscertification rate is documented in the Operating Record.

28 When performing visual examination, all documented data, except RTR results, related to
29 the waste container and its contents are reviewed. RTR results shall not be made available until

1 after the visual examination is completed, with the exception of items or conditions that could
2 pose a hazard to visual examination personnel. After the initial assessment, the lid (and the rigid
3 liner lid, if present) is removed from the waste container, and the waste container volume
4 utilization percentage is estimated. Individual inner bags/packages, if present, are removed.
5 Taking care to ensure that the video camera (used for documentation purposes) is properly
6 focused, the visual examination of an unopened inner bag/package begins while the operator's
7 verbal description of the inner bag/package's inventory is recorded.

5.0 DATA REPORTING, REDUCTION, AND VALIDATION

5.1 Reporting Requirements

All handwritten documentation is legible, made with indelible ink, signed, and dated. Corrections are marked with a single line, dated, and initialed. All documentation, including voided entries, are maintained within the AMWTP operating record. Electronic and video data are stored appropriately to ensure waste container identification, sample information, and associated QC data are readily retrievable.

Sampling records are kept during sampling operations. Daily activities are recorded in either bound notebooks or the data management system (DMS). Information recorded includes:

- Date, time, and place of sampling;
- Name of sampler;
- Samples collected;
- Sample preservation procedures used;
- Sampling procedures used and anomalies encountered; and
- Observations about samples (appearance, etc.).

All original laboratory data are recorded in a permanent manner, and are readily traceable through all steps of the data generation/reduction/validation/review process. Any anomalies in the samples or in the analytical methodology are immediately reported to the laboratory supervisor. The laboratory report may include associated raw data, laboratory logs, non-conformance records, memoranda, communication records, and any other documentation for the analysis of the reported samples. These data are reviewed and approved by the laboratory.

The results of the RTR examination for each waste container are documented. Audio/video recordings are stored as quality records. The RTR results and the visual examinations are recorded in the operating record/DMS, and any items that require removal prior to downstream treatment are noted. The DMS incorporates this information to update IDC-specific waste profiles to ensure that future containers with the same IDC are screened for similar SCW and/or prohibited items.

5.2 Data Deliverables

AMWTP management ensures that contract laboratory personnel perform the following minimum requirements for raw data collection and management:

- Sign and date all handwritten raw data;
- Record clearly, legibly, and accurately all waste characterization data, and include applicable sample identification numbers;
- Line out, initial, and date all changes to original data, include justification for changing the original data, and do not obliterate or otherwise mark original data so as to be unreadable;
- Transfer and reduce from field and laboratory records all data completely and accurately;
- Organize data into a standard format for reporting purposes; and
- Store all electronic and video data to ensure waste container, sample, and associated QC data are readily retrievable.

The documentation required to be delivered to the AMWTP includes tabulated results, case narrative, raw data, chromatograms, instrument printouts, and QC data. Laboratory results from contract laboratories include tabulated results of all samples, along with a cross reference of laboratory identification. The case narrative includes method summaries that detail any deviations from, or modifications to, the proposed methods, as applicable. Data are submitted in a report with sufficient detail, such that, independent validation of the data can occur and the report is organized into a standard format for reporting purposes.

5.3 Data Reduction

All measurement system outputs are reduced into units that are consistent with the methods and that meet the comparability objective. In general, all raw data are recorded in laboratory notebooks by the analyst performing the test, or on worksheets in standardized format, except for data electronically captured by instrument computers. Each analytical method contains detailed instructions and equations for calculating the respective analyte concentrations.

1 All computer programs used for data reduction or transmitting electronic data are
2 controlled. Procedures are used that, at a minimum, control the version of the program being
3 used.

4 **5.4 Data Validation**

5 Data validation assesses the quality of waste characterization data based upon project
6 data quality indicators. The AMWTP performs validation (qualitative as well as quantitative) so
7 that data used for compliance programs are of known and acceptable quality. Validation
8 includes a quantitative determination of precision, accuracy, completeness, and method detection
9 limits (as appropriate) for analytical data (volatile organic compounds, semi-volatile organic
10 compounds, and metals data). Data validation is utilized to ensure that accurate information is
11 generated and reported. Laboratory QA is used to ensure that the data are correctly reported.
12 Any items affecting the quality of the data are identified, and the data are flagged accordingly.

13 If minor data package errors or omissions are identified, the AMWTP QA Officer and
14 AMWTP management evaluate the nature of the problem and the data package is revised as
15 necessary. If the problem can not be rectified by correcting the data package or if the problem is
16 of a recurring nature, a nonconformance report is generated.

17 Data validation is a systematic process of reviewing data against a set of criteria to
18 identify outliers or errors and to delete suspect values or to flag them for the user. The data are
19 checked for errors in transcription, calculations, and dilution factors and for compliance with QC
20 requirements. Failure to meet method performance QC criteria results in reanalysis of the
21 sample lot. After the initial review is completed, the data are collected from summary sheets,
22 workbooks, or computer files and assembled into a data package.

23 The data generated for the AMWTP must be of a quality so as to be legally defensible.
24 This requires that the analysis of the samples be precise and accurate, and the documentation
25 generated during the sampling and analysis be precise and accurate.

1 **5.5 Data Storage Requirements**

2 The preferred method of data recording is electronic, whenever possible. Electronic data
3 are transferred to hard copy when required. Electronic media are backed up as required in
4 specific procedures.

6.0 QUALITY PROTOCOLS

The initial responsibility for assuring the quality of data lies with the sampling personnel. The lead sampler/operator is responsible for verifying that all QA procedures associated with waste sampling are followed. This requires that the lead sampler/operator assess the correctness of procedures and their ability to meet project objectives, and make a subjective assessment of the impact that a procedure has on sampling objectives and subsequent data quality.

If a quality problem occurs during characterization, the sampler/operator tries to correct the problem. If the problem can not be corrected without loss of field data or samples, AMWTP environmental personnel are immediately contacted for additional instructions.

If a problem occurs that might jeopardize the integrity of the characterization process, cause an objective not to be met, or jeopardize data quality, the sampler/operator immediately stops, then notifies the AMWTP environmental personnel. The sampler/operator documents the situation, the objectives affected, the corrective action taken, and the results of that action. Copies of the documentation are provided to management and AMWTP environmental personnel. Management then notifies or consults with the appropriate individuals, including the AMWTP environmental personnel and the QA Officer, who make recommendations for corrective actions.

6.1 Audits

Audits are conducted by the AMWTP QA Officer, with outside assistance, as required. The laboratories are audited on all applicable areas (sample receipt, analysis, computer control, etc.) related to analysis, and in all disciplines (inorganic, organic, etc.) of the laboratory. Sampling activities are audited, as required. Audits are also performed to evaluate QA programs for off-Site generators.

An audit is an independent means of confirming the operation or capability of a measurement system and of documenting the use of QC measurements designed to generate valid data of known and acceptable quality. An audit is performed by a technically-qualified person who is not directly involved with the measurement system being evaluated.

1 **6.2 Performance Audits**

2 In addition to audits, method performance samples and blind audit samples may be used
3 to evaluate the laboratory, as necessary.

4 **6.3 Nonconformances**

5 Nonconformances are uncontrolled and unapproved deviations from an approved plan,
6 procedure, or expected result. All personnel are responsible for identifying and reporting
7 nonconforming items and processes. Management is responsible for evaluating
8 nonconformances and taking appropriate corrective action. A nonconformance report is
9 prepared by the individual identifying the nonconformance, and the report is included in the
10 Operating Record.

11 **6.4 Corrective Action**

12 Primary responsibility for corrective actions lies with the appropriate manager
13 (operations, laboratory, etc.). These actions are initiated after coordination with the appropriate
14 manager and auditing personnel, along with the AMWTP QA Manager, as necessary.

7.0 REFERENCES

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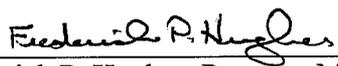
CERTIFICATION STATEMENTS

Fluor Idaho Certification Statement
Class 1 Permit Modification Request
Requiring Prior Written Approval
for the
Advanced Mixed Waste Treatment Project
HWMA/RCRA Permit
AMWTP-PMR-14 (Rev. 0)

The undersigned certifies, as required by Permit Condition I.V of the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d]) and 270.30[k]), as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature:



Frederick P. Hughes, Program Manager
Fluor Idaho, LLC

04/15/16

Date

DOE-ID Certification Statement
Class 1 Permit Modification Request
Requiring Prior Written Approval
for the
Advanced Mixed Waste Treatment Project
HWMA/RCRA Permit
AMWTP-PMR-14 (Rev. 0)

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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner Signature:



Richard B. Provencher, Manager
DOE-ID Operations Office

4/19/16
Date

ITG Certification Statement
Class 1 Permit Modification Request
Requiring Prior Written Approval
for the
Advanced Mixed Waste Treatment Project HWMA/RCRA Permit
AMWTP-PMR-13 (Rev. 0)

The undersigned certifies, as required by Permit Condition I.V of the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d]) and 270.30[k]), as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature:



David J. Richardson, President & AMWTP Project Manager
Idaho Treatment Group, LLC (ITG)

9/14/12

Date

DOE-ID Certification Statement
Class 1 Permit Modification Request
Requiring Prior Written Approval
for the
Advanced Mixed Waste Treatment Project HWMA/RCRA Permit
AMWTP-PMR-13 (Rev. 0)

The undersigned certifies, as required by Permit Condition I.V of the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d]) and 270.30[k]), as follows:

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Owner Signature:



Richard B. Provencher, Manager
DOE-ID Operations Office

4/19/16
Date

ITG Certification Statement
Class 1 Permit Modification Request
for the
Advanced Mixed Waste Treatment Project HWMA/RCRA Permit
AMWTP-PMR-12 (Rev. 1)

The undersigned certifies, as required by Permit Condition I.V of the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d]) and 270.30[k]), as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature:



David J. Richardson, President & AMWTP Project Manager
Idaho Treatment Group, LLC (ITG)

7/22/16

Date

DOE-ID Certification Statement
Class 1 Permit Modification Request
for the
Advanced Mixed Waste Treatment Project HWMA/RCRA Permit
AMWTP-PMR-12 (Rev. 1)

The undersigned certifies, as required by Permit Condition I.V of the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d]) and 270.30[k]), as follows:

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Owner Signature:



Richard B. Provencher, Manager
DOE-ID Operations Office

3/3/16

Date

ITG Certification Statement
Class 1 Permit Modification Request
Requiring Prior Written Approval
for the
Advanced Mixed Waste Treatment Project HWMA/RCRA Permit
AMWTP-PMR-11 (Rev. 2)

The undersigned certifies, as required by Permit Condition I.V of the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d]) and 270.30[k]), as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature:



David H. Haar, Vice President, Waste & AMWTP Deputy Project Manager
Idaho Treatment Group, LLC (ITG)

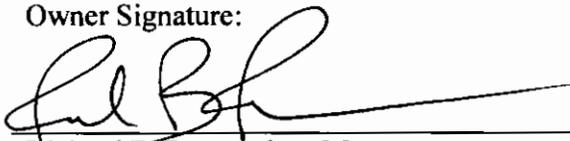
11/6/2014
Date

DOE-ID Certification Statement
Class 1 Permit Modification Request
Requiring Prior Written Approval
for the
Advanced Mixed Waste Treatment Project HWMA/RCRA Permit
AMWTP-PMR-11 (Rev. 2)

The undersigned certifies, as required by Permit Condition I.V of the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d]) and 270.30[k]), as follows:

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Owner Signature:



Richard B. Provencher, Manager
DOE-ID Operations Office

11/17/14
Date

ITG Certification Statement
Class 1 Permit Modification Request
Requiring Prior Written Approval
for the
Advanced Mixed Waste Treatment Project HWMA/RCRA Permit
AMWTP-PMR-10 (Rev. 0)

The undersigned certifies, as required by Permit Condition I.V of the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d] and 270.30[k]), as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature:



David H. Haar, Waste Programs Manager & AMWTP Deputy Project Manager
Idaho Treatment Group, LLC (ITG)



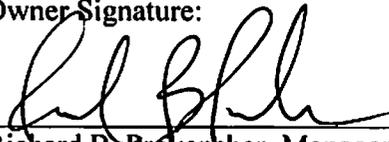
Date

DOE-ID Certification Statement
Class 1 Permit Modification Request
Requiring Prior Written Approval
for the
Advanced Mixed Waste Treatment Project HWMA/RCRA Permit
AMWTP-PMR-10 (Rev. 0)

The undersigned certifies, as required by Permit Condition I.V of the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d]) and 270.30[k]), as follows:

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Owner Signature:



Richard B. Provencher, Manager
DOE-ID Operations Office

5/8/14
Date

**ITG Certification Statement for a
Class 2 Permit Modification Request and Request for Temporary
Authorization [AMWTP-PMR-09, Rev. 0]**

The undersigned certifies as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d]) and 270.30[k]) as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature:



Danny Nichols, President and AMWTP Project Manager
Idaho Treatment Group, LLC (ITG)

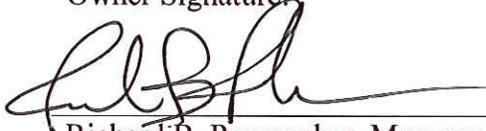
11/15/14
Date

**DOE-ID Certification Statement for the
Class 2 Permit Modification Request and a Request for Temporary
Authorization [AMWTP-PMR-09, Rev. 0]**

The undersigned certifies as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)], as follows:

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Owner Signature:



Richard B. Provencher, Manager, DOE-ID Operations Office

1/15/14

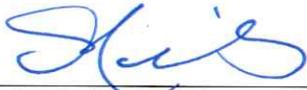
Date

ITG Certification Statement
Class 1 Permit Modification Request
Requiring Prior Written Approval
for the
Advanced Mixed Waste Treatment Project HWMA/RCRA Permit
AMWTP-PMR-08 (Rev. 0)

The undersigned certifies, as required by Permit Condition I.V of the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d] and 270.30[k]), as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature:



Danny Nichols, President and AMWTP Project Manager
Idaho Treatment Group, LLC (ITG)

11-7-13

Date

DOE-ID Certification Statement
Class 1 Permit Modification Request
Requiring Prior Written Approval
for the
Advanced Mixed Waste Treatment Project HWMA/RCRA Permit
AMWTP-PMR-08 (Rev. 0)

The undersigned certifies, as required by Permit Condition I.V of the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d] and 270.30[k]), as follows:

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Owner Signature:



Richard B. Provencher, Manager
DOE-ID Operations Office

11/13/13

Date

**ITG Certification Statement for the December 2012
Class 2 Permit Modification Request Including a Request for
Temporary Authorization [AMWTP-PMR-07, Rev. 0]**

The undersigned certifies as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 (Title 40 of the Code of Federal Regulations [CFR] 270.11[d]) and 270.30[k]) as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature:



David H. Haar, AMWTP Waste Program Manager
Idaho Treatment Group, LLC (ITG)

12/17/2012

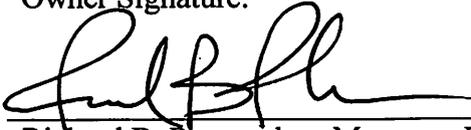
Date

**DOE-ID Certification Statement for the December 2012
Class 2 Permit Modification Request Including a Request for
Temporary Authorization [AMWTP-PMR-07, Rev. 0]**

The undersigned certifies as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)], as follows:

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Owner Signature:



Richard B. Provencher, Manager, DOE-ID Operations Office

12/17/12

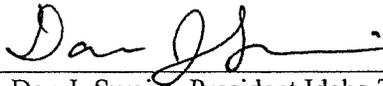
Date

**ITG Certification Statement for the April 2010
Class 1 Permit Modification Request Requiring Prior Written Approval
[AMWTP-PMR-06, Rev. 0]**

The undersigned certifies as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)] as follows:

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Operator Signature:



Dan J. Swaim, President Idaho Treatment Group, LLC

8/31/20~~00~~²⁰¹¹

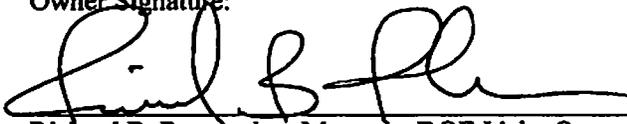
Date

**DOE-ID Certification Statement for the April 2010
Class 1 Permit Modification Request Requiring Prior Written Approval
[AMWTP-PMR-06, Rev. 0]**

The undersigned certifies as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)], as follows:

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Owner Signature:



Richard B. Provencher, Manager, DOE Idaho Operations Office

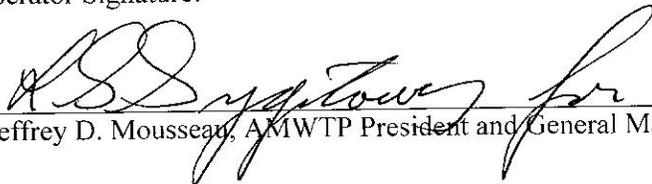
8/30/2011
Date

**BBWI Certification Statement for the June 2011
Class 2 Permit Modification Request Including a Request for Temporary
Authorization [AMWTP-PMR-05, Rev. 0]**

The undersigned certifies as required by the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)] as follows:

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Operator Signature:

 for 6/8/11

Jeffrey D. Mousseaux, AMWTP President and General Manager, Bechtel BWXT Idaho, LLC. Date

**DOE-ID Certification Statement for the June 2011
Class 2 Permit Modification Request Including a Request for Temporary
Authorization [AMWTP-PMR-05, Rev. 0]**

The undersigned certifies as required by the Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)], as follows:

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Owner Signature:



Richard B. Provencher, Manager, DOE Idaho Operations Office

6/8/2011

Date

**BBWI Certification Statement for the June 2010
Class 1 Permit Modification Request Requiring Prior Written Approval
[AMWTP-PMR-04, Rev. 0]**

The undersigned certifies as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)] as follows:

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Operator Signature:

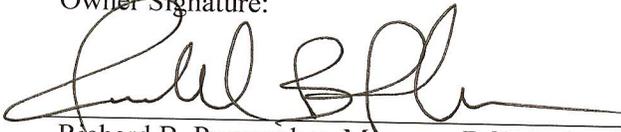
J. Zorn for J. Mousseau 6/1/10
Jeffrey D. Mousseau, AMWTP President and General Manager, Bechtel BWXT Idaho, LLC. Date

**DOE-ID Certification Statement for the June 2010
Class 1 Permit Modification Request Requiring Prior Written Approval
[AMWTP-PMR-04, Rev. 0]**

The undersigned certifies as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)], as follows:

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Owner Signature:



Richard B. Provencher, Manager, DOE Idaho Operations Office

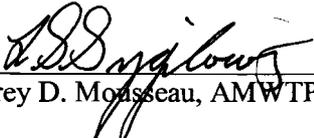
6/9/10
Date

**BBWI Certification Statement for the January 2010
Class 1 Permit Modification Request Requiring Prior Written Approval
[AMWTP-PMR-02, Rev. 0]**

The undersigned certifies as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)] as follows:

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Operator Signature:



Jeffrey D. Moisseau, AMWTP President and General Manager, Bechtel BWXT Idaho, LLC. 1/05/10 Date

**DOE-ID Certification Statement for the January 2010
Class 1 Permit Modification Request Requiring Prior Written Approval
[AMWTP-PMR-02, Rev. 0]**

The undersigned certifies as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)], as follows:

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Owner Signature:



for Dennis M. Miotla, Interim Manager, DOE Idaho Operations Office

1-21-2010

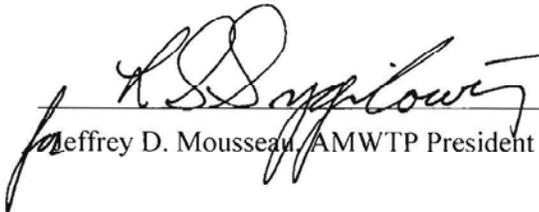
Date

**BBWI Certification Statement for the March 2009 Class 3 Permit
Modification Request Including a Request for Temporary Authorization
[AMWTP-PMR-01, Rev. 1]**

The undersigned certifies as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)] as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature:



Jeffrey D. Mousseau, AMWTP President and General Manager, Bechtel BWXT Idaho, LLC.

02/24/2009

Date

**DOE-ID Certification Statement for the March 2009 Class 3 Permit
Modification Request Including a Request for Temporary Authorization
[AMWTP-PMR-01, Rev. 1]**

The undersigned certifies, as required by the Final Advanced Mixed Waste Treatment Project HWMA/RCRA Permit, Permit Condition I.V and IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)], as follows:

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Owner Signature:



Dennis M. Miotla, Interim Manager, DOE Idaho Operations Office

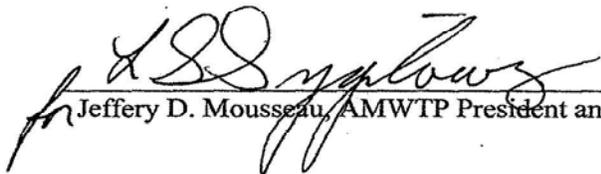
3/5/09
Date

L. PART B CERTIFICATION

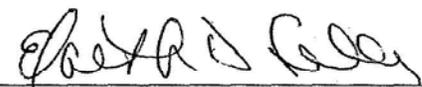
The undersigned certifies as required by IDAPA 58.01.05.012 [Title 40 of the Code of Federal Regulations (CFR) 270.11(d) and 270.30(k)] as follows:

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Operator Signature:


Jeffery D. Mousseau, AMWTP President and General Manager, Bechtel BWXT Idaho, LLC. 12/3/07
Date

Owner Signature:


Elizabeth D. Sellers, Manager, DOE Idaho Operations Office 12/17/07
Date