



U.S. Department of Energy

Hanford Field Office
P.O. Box 550
Richland, Washington 99352

December 6, 2024

24-ECD-0190

Ms. Stephanie Schleif
Program Manager
Nuclear Waste Program
Washington State Department of Ecology
3100 Port of Benton Boulevard
Richland, Washington 99354

Dear Ms. Schleif:

2,000-GALLON TEST BED INITIATIVE DEMONSTRATION DESIGN ASSESSMENT REPORT AND ASSOCIATED DRAWINGS FOR CLOSURE

The U.S. Department of Energy, Hanford Field Office (HFO) hereby transmits the Independent Qualified Registered Professional Engineer (IQRPE) Design Assessment Report for the 2,000-Gallon Test Bed Initiative (TBI) Demonstration Extraction and associated drawings, pursuant to condition II.H.1 of the Dangerous Waste Research, Development, and Demonstration Permit for the TBI. Attachment 1 contains the permittee certifications, Attachment 2 contains the IQRPE Design Assessment Report, and Attachment 3 contains the associated drawings.

Per discussion with Washington State Department of Ecology staff on December 5, 2024, this transmittal does not include the IQRPE Installation Assessment Report addressed in condition II.H.1 because the report cannot be finalized until TBI closure has been initiated. HFO will transmit the IQRPE Installation Assessment Report in a separate letter once the TBI in-tank pretreatment system has been removed from Tank SY-101, the shield plug is installed into the tank riser, and the IQRPE certifies the plugged configuration.

If you have any questions, please contact me, or you may contact Corey Low, Acting Assistant Manager for Safety and Environment, at (509) 376-4820.

Sincerely,

Brian T.
Vance

Digitally signed by Brian
T. Vance
Date: 2024.12.06
11:10:50 -08'00'

Brian T. Vance
Manager

ECD:MJD

Attachments and cc: See page 2

Ms. Stephanie Schleif
24-ECD-0190

-2-

December 6, 2024

Attachments:

1. Permittee Certifications
2. IQRPE Design Assessment
Report for TBI Extraction
3. Associated Drawings for the
Extraction System

cc w/attachs:

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D. M. Ashley, WRPS
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A. Smith, NPT
Administrative Record, (S-2-3)
Environmental Portal, (G3-35)

Attachment 1
24-ECD-0190

Permittee Certifications

(3 pages including cover sheet)

U.S. Department of Energy Certification

The following certification statement is provided for the submittal of design media stamped by an independent qualified registered professional engineer as required by Condition II.H.1 of the Dangerous Waste Research, Development, and Demonstration Permit for the 2,000-Gallon Test Bed Initiative Demonstration.

I certify under penalty of law that 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.

Brian T. Vance Digitally signed by Brian T. Vance
Date: 2024.12.06 11:11:15 -08'00'

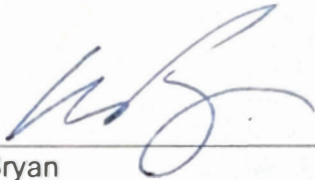
Brian T. Vance, Manager
U.S. Department of Energy
Hanford Field Office

Date

Washington River Protection Solutions, LLC Certification

The following certification statement is provided for the submittal of design media stamped by an independent qualified registered professional engineer as required by Condition II.H.1 of the Dangerous Waste Research, Development, and Demonstration Permit for the 2,000-Gallon Test Bed Initiative Demonstration.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to 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 fines and imprisonment for knowing violations.



Wes H. Bryan
President and Project Manager
Washington River Protection Solutions, LLC

11.26.2024

Date

Attachment 2
24-ECD-0190

IQRPE Design Assessment Report for TBI Extraction

(29 pages including cover sheet)

DOCUMENT RELEASE AND CHANGE FORM				Release Stamp	
Prepared For the U.S. Department of Energy, Assistant Secretary for Environmental Management By Washington River Protection Solutions LLC, (WRPS) Contractor For U.S. Department of Energy, Hanford Field Office TRADEMARK DISCLAIMER: Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States government or any agency thereof or its contractors or subcontractors. Printed in the United States of America.				<div style="border: 2px solid red; padding: 10px; display: inline-block;"> <p style="color: red; font-weight: bold; font-size: 1.2em;">DATE:</p> <p style="color: red; font-weight: bold; font-size: 1.5em;">Nov 19, 2024</p> <div style="border: 1px solid red; padding: 5px; display: inline-block; margin-left: 20px;"> <p style="color: red; font-weight: bold; font-size: 0.8em;">HANFORD RELEASE</p> </div> </div> <p style="color: black; font-weight: bold; font-size: 0.9em;">Clearance Review Restriction Type: Approved for Public Release</p>	
1. Doc No: RPP-IQRPE-50158 Rev. 00					
2. Title: Test Bed Initiative (TBI) Phase 2 - IQRPE TBI Extraction Design Assessment Report					
3. Project Number: T1S03 <input type="checkbox"/> N/A		4. Design Verification Required: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
5. USQ Number: <input checked="" type="checkbox"/> N/A N/A-9		6. PrHA Number Rev. <input type="checkbox"/> N/A PrHA-57373 00 PrHA-57374 00			
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USQ Evaluator		Carlstrom, Dick		Carlstrom, Dick	
8. Description of Change and Justification					
Initial Release.					
9. TBDs or Holds <input checked="" type="checkbox"/> N/A					
10. Related Structures, Systems, and Components					
a. Related Building/Facilities <input type="checkbox"/> N/A		b. Related Systems <input type="checkbox"/> N/A		c. Related Equipment ID Nos. (EIN) <input checked="" type="checkbox"/> N/A	
241-SY 241-SY-101		241-TBI 241-WST 241-WT			
11. Impacted Documents – Engineering <input checked="" type="checkbox"/> N/A					
Document Number		Rev.	Title		
12. Impacted Documents (Outside SPF):					
N/A					
13. Related Documents <input type="checkbox"/> N/A					
Document Number		Rev.	Title		
H-14-112130 SH 001		01	TBI SY-101 DRAWING TREE		
H-14-112131 SH 001		01	TBI SY-101 SITE PLAN		
H-14-112134 SH 001		00	TBI SY-101 42 INCH RISER ADAPTER ASSEMBLY & SHIELD PLUG		
MT-50832		01	TEST BED INITIATIVE (TBI) RELOCATION TO RISER-008		
RPP-IQRPE-50128		00	Test Bed Initiative (TBI) Phase 2 - IQRPE Design Assessment Report		
RPP-RPT-64590		01	TBI-HiLine Vendor Design Package		
14. Distribution					
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RPP-IQRPE-50158
Revision 0

IQRPE Design Assessment Report for TBI Extraction

Prepared by

Doug Kennedy
Washington River Protection Solutions LLC

Date Published
November 2024



Prepared for the U.S. Department of Energy
Office of River Protection

Contract No. DE-AC27-08RV14800

**Independent Qualified Registered Professional Engineer
Design Assessment Report
for
Test Bed Initiative Extraction**

**IQRPE Design Assessment Report
for TBI Extraction
No. DA-361651-02
Rev. 0**

Prepared by:



12 W. Kennewick Ave.
Kennewick, WA 99336

At the request of:



Richland, Washington 99352

Meier Project No. 22-9012
WRPS Subcontract No. 81713, Release 002

November 18, 2024

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1.0 INTRODUCTION

Washington Administrative Code (WAC) 173-303-640, *Tank Systems*, provides a set of requirements for Owner/Operators of dangerous waste tank systems. This Design Assessment Report is prepared for Washington River Protection Solutions, LLC (WRPS) by an Independent Qualified Registered Professional Engineer (IQRPE) to certify that the proposed tank system will have sufficient structural integrity and is acceptable for storing and treating dangerous waste per WAC 173-303-640(3) *Design and Installation of New Tank Systems or Components*. IP-361651-02, *Independent Qualified Registered Professional Engineer Inspection Plan for TBI Extraction*, identified the IQRPE inspections associated with the Project scope of the Test Bed Initiative (TBI) equipment extraction effort which are subject to IQRPE independent inspections and certification.

The IQRPE maintains “independence” at all times. Comments by others are considered by the IQRPE during the preparation of reports and plans. Only the IQRPE can implement changes to the master IQRPE documents.

The TBI equipment was designed, constructed, and installed under DA-361651-01, *Independent Qualified Registered Professional Engineer Design Assessment Report for IQRPE for Test Bed Initiative*, and IA-361651-01, *Independent Qualified Registered Professional Engineer Installation Assessment Report for Assessment Services for TBI*. This Design Assessment Report addresses only the extraction of the TBI equipment from Riser-008 of Double-Shell Tank (DST) 241-SY-101 (H-14-010531, *Dome Penetration Schedules (WST/WSTA) Tank 241-SY-101*) after conclusion of all TBI testing activities.

A separate Installation Assessment Report, IA-361651-02 *Independent Qualified Registered Professional Engineer Installation Assessment Report for TBI Extraction*, will be prepared by the IQRPE to certify that the extraction of the TBI tank system component were extracted in compliance with WAC 173-303-640(3)(c)-(g).

This Design Assessment Report and IA-361651-02 meet the IQRPE certification requirements of WAC 173-303-640(3).

1.1 PROJECT DESCRIPTION

Background

The mission of the TBI was to pretreat 2,000 gallons of Hanford waste in preparation for final treatment and disposal at off-site facilities. Waste processing was achieved via a filter and an ion-exchange column (IXC) to remove undissolved solids and cesium-137 (^{137}Cs). The 241-SY tank farm was configured to allow the installation of the temporary treatment system. The treatment process included removal of undissolved solids and ^{137}Cs from the tank waste, and subsequent discharge of the treated waste/low activity waste into portable containers (totes) for transfer to an off-site facility for further processing. The scope of this report deals with the extraction and removal of TBI components from 42” Riser-008 of DST 241-SY-101 after the TBI system has been removed from service (ECN-718119, *TBI Removal from SY-101*). It also covers the subsequent preparation of the components for disposition as radioactive solid waste.

The TBI extraction design and installation assessments will support work that will occur on the Hanford Nuclear Waste Site in the 200 West Area.

IQRPE Scope

Meier Architecture • Engineering (Meier) provided an IQRPE to perform the Design Assessment Report for the closure of the TBI per WRPS Statement of Work (SOW) No. 361651, *IQRPE Assessment Services for TBI (BMA 81713)*. The Design Assessment Report is required to meet the requirements of WAC 173-303-640(3) and associated drawings for the extraction system of the In-Tank Pretreatment System (ITPS). This effort is needed to meet the needs of WRPS and the TBI RD&D Permit.

This assessment includes an IQRPE review of design media (drawings, specifications, calculations, etc.) needed to support a Resource Conservation and Recovery Act (RCRA) permit modification request and will also evaluate the design media for issues associated with the secondary containment.

The IQRPE will also provide independent reviews, inspections, and assessments in support of TBI equipment extraction in SY Farm. The IQRPE performed the design assessment to the requirements of WAC 173-303-640 for the applicable TBI components.

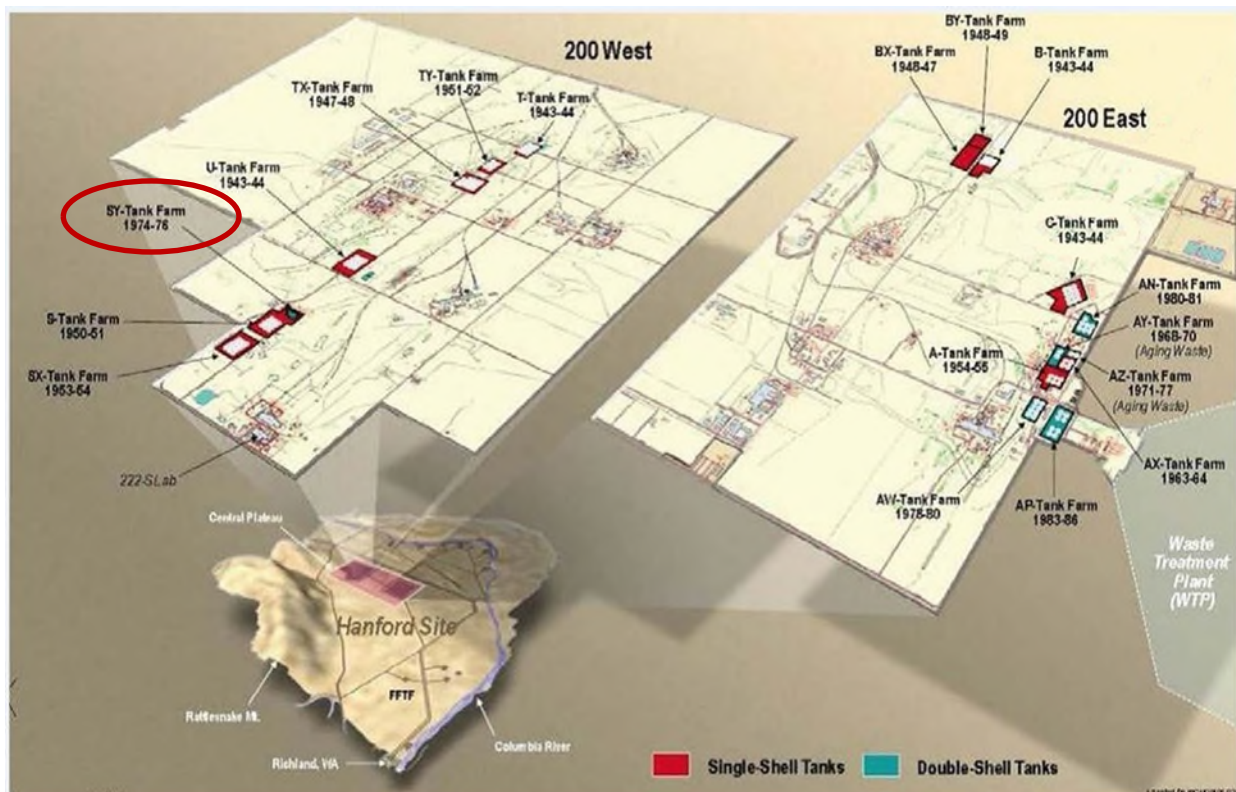


Figure 1: Hanford Map Showing the Location of the 241-SY DST Tank Farm in the 200 West Area

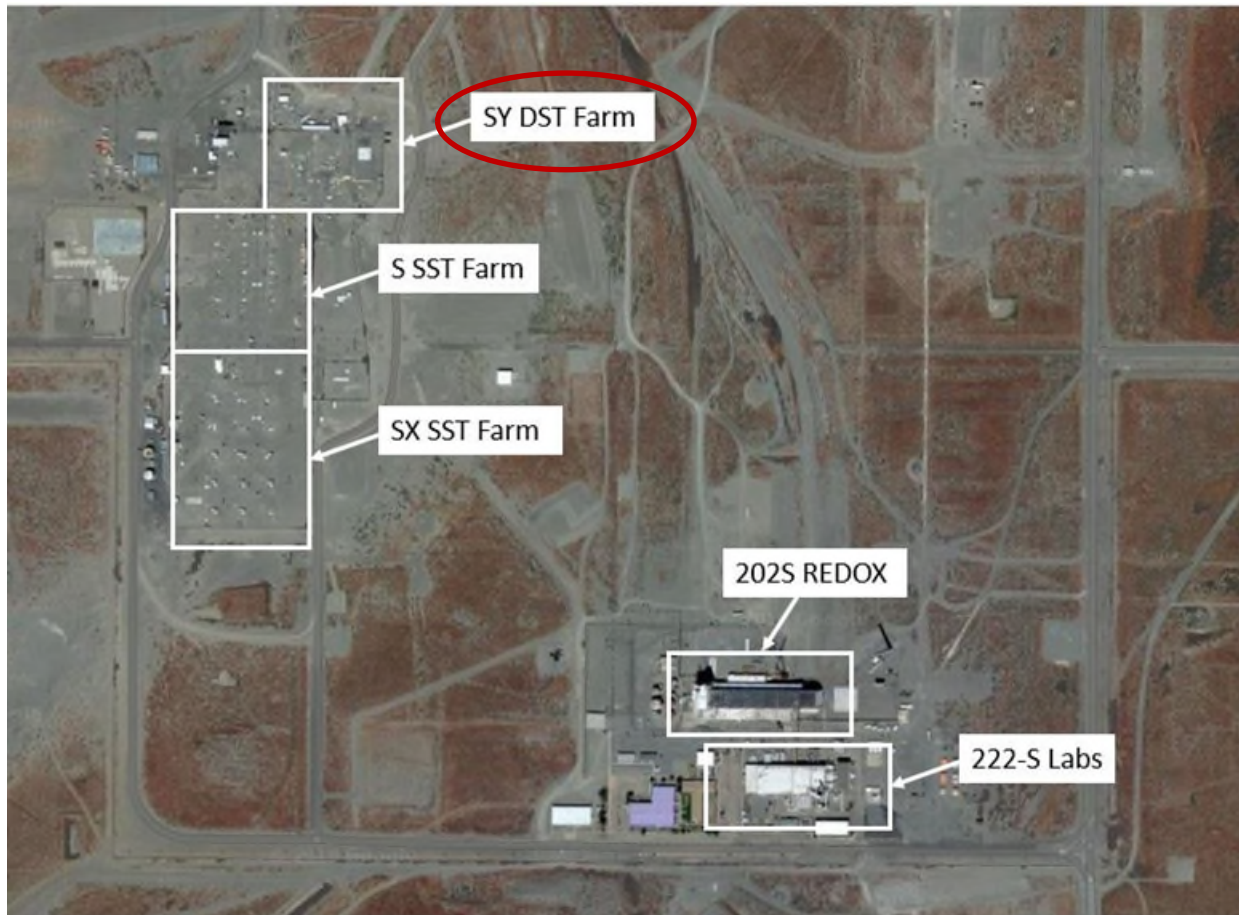


Figure 2: Aerial Photograph Showing the Location of 241-SY Tank Farm in the 200 West Area

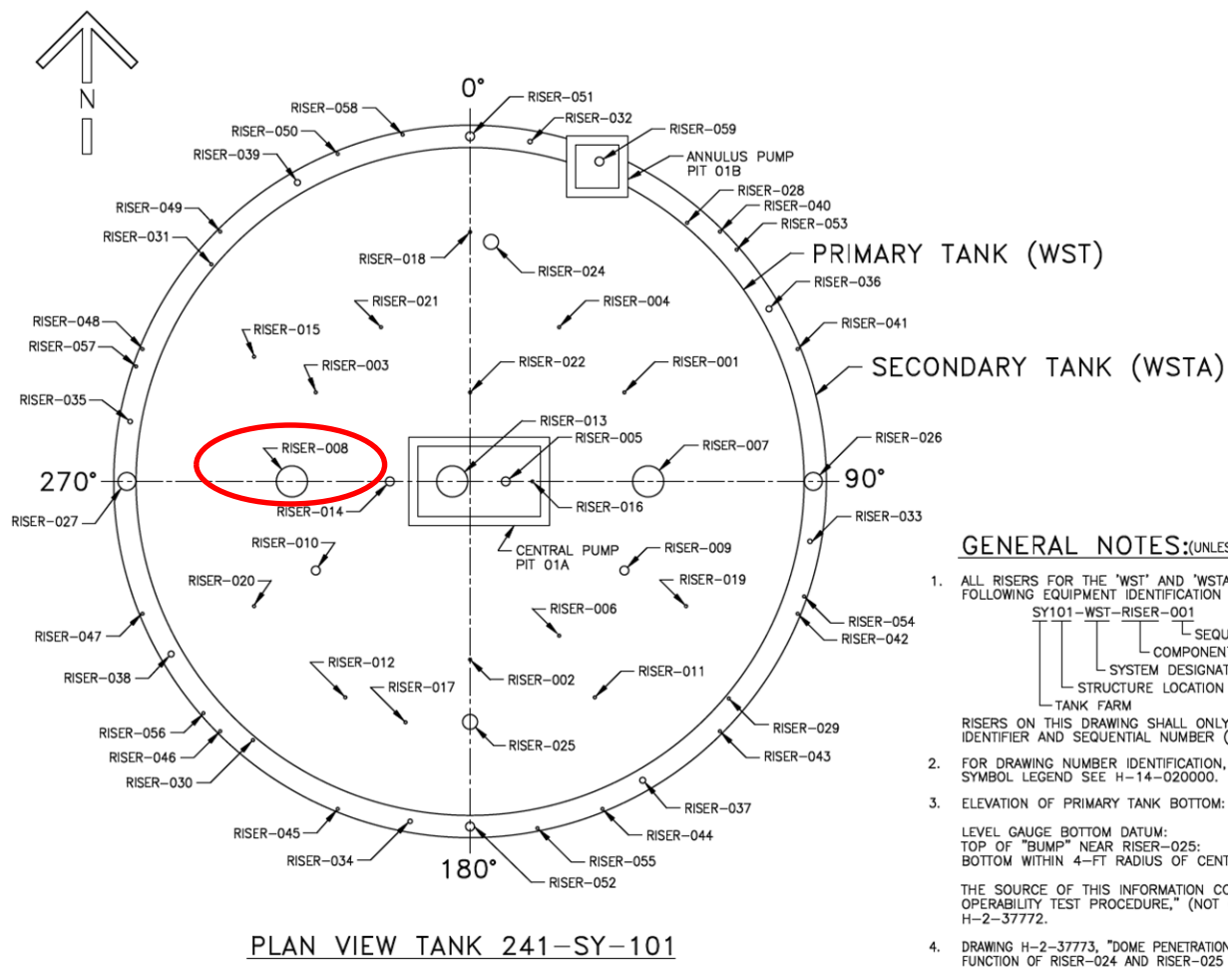


Figure 3: Dome Penetrations for Double-Shell Tank 241-SY-101 (H-14-010531, Sheet 1)

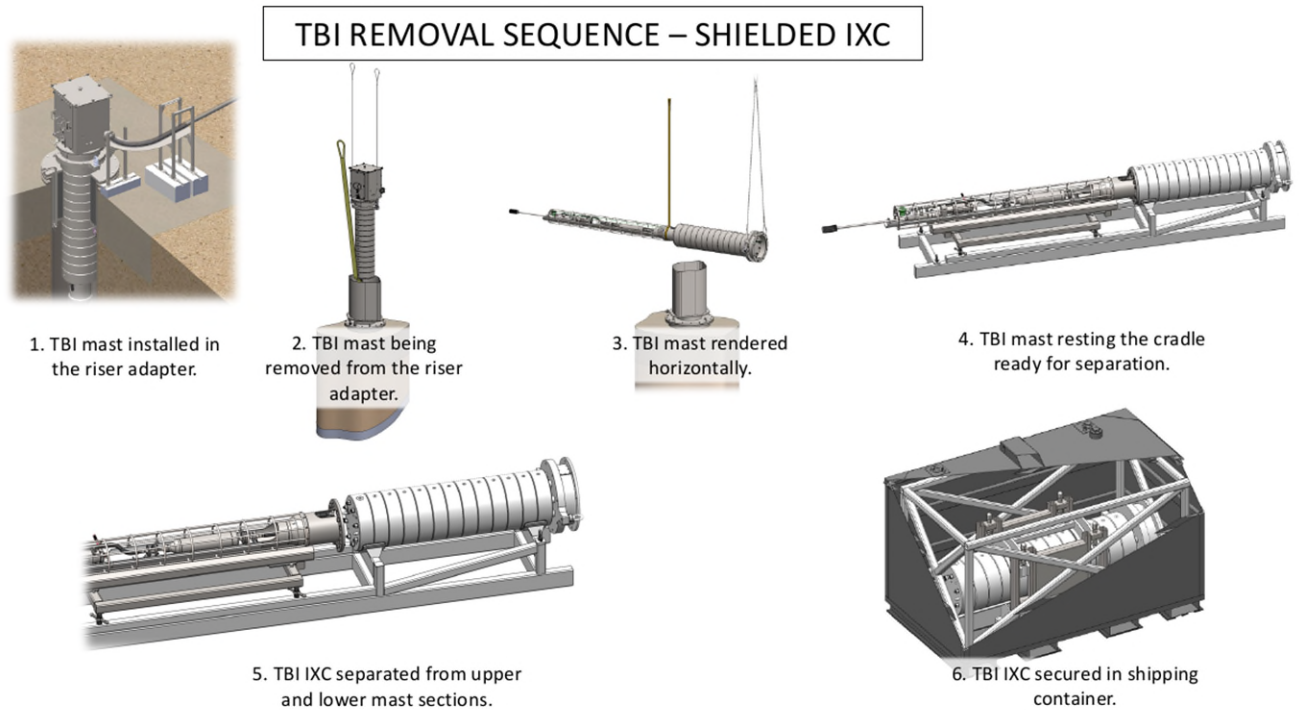


Figure 4: Illustration of TBI Extraction Process (E-Mail Dated 10/17/2024 Attachment Disposal Placemat 3JUN24.pdf)

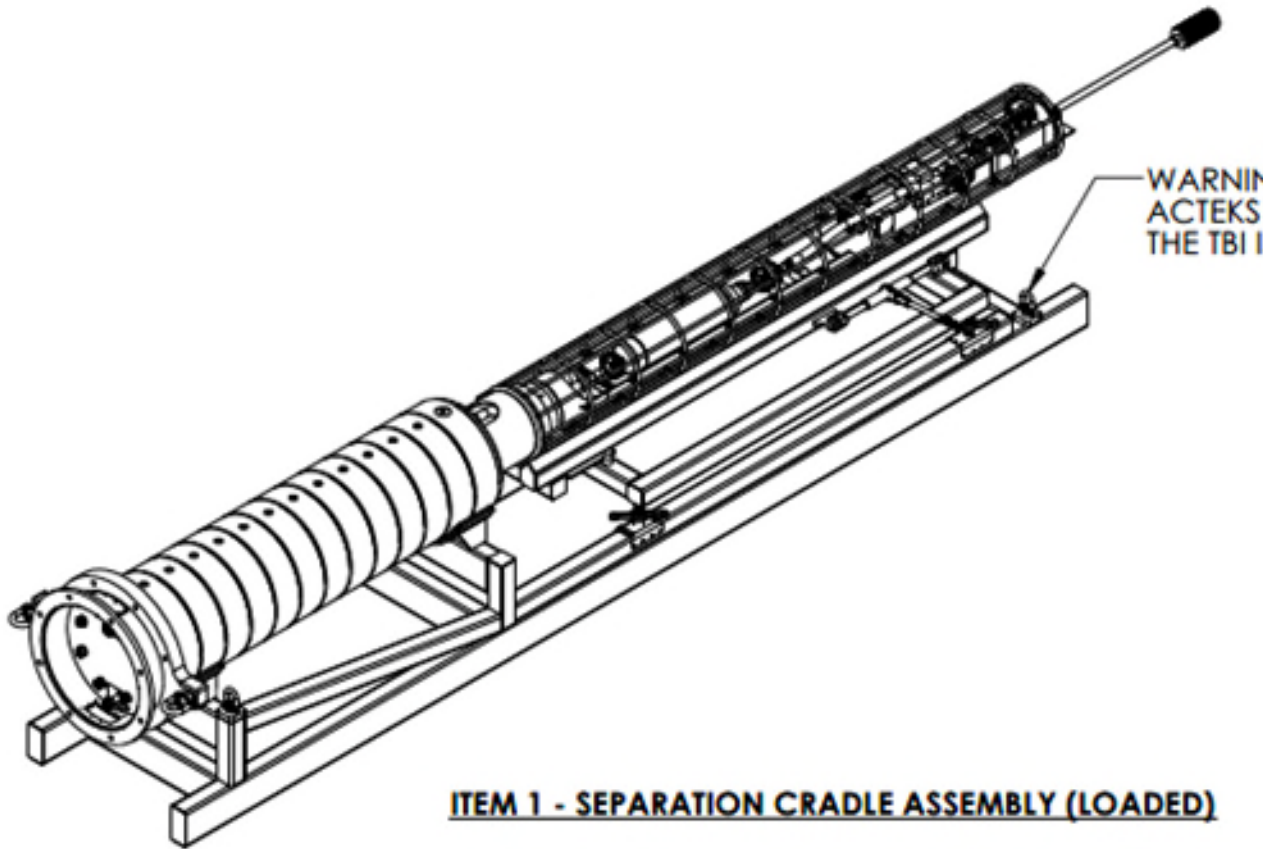
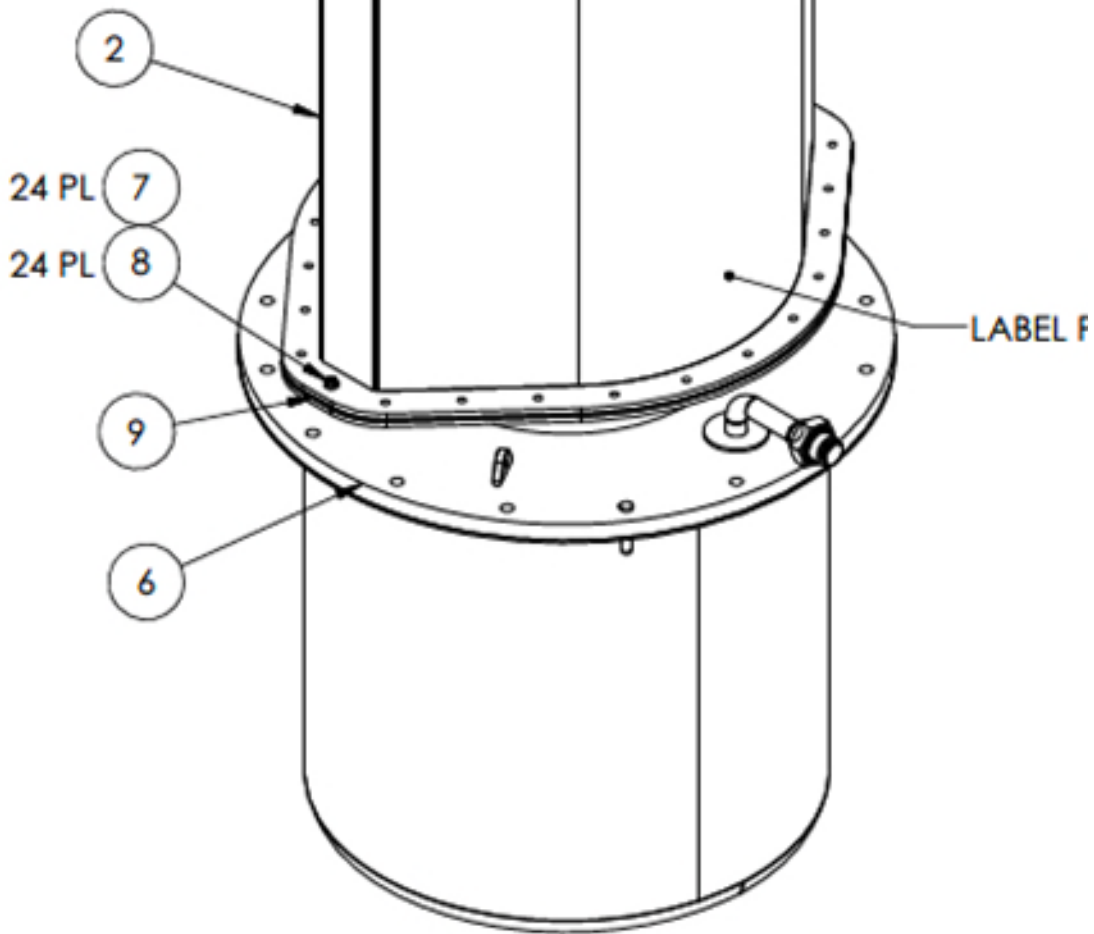


Figure 5: Separation Cradle (2309-WRP-209-SEP, Sheet 2)

VS:

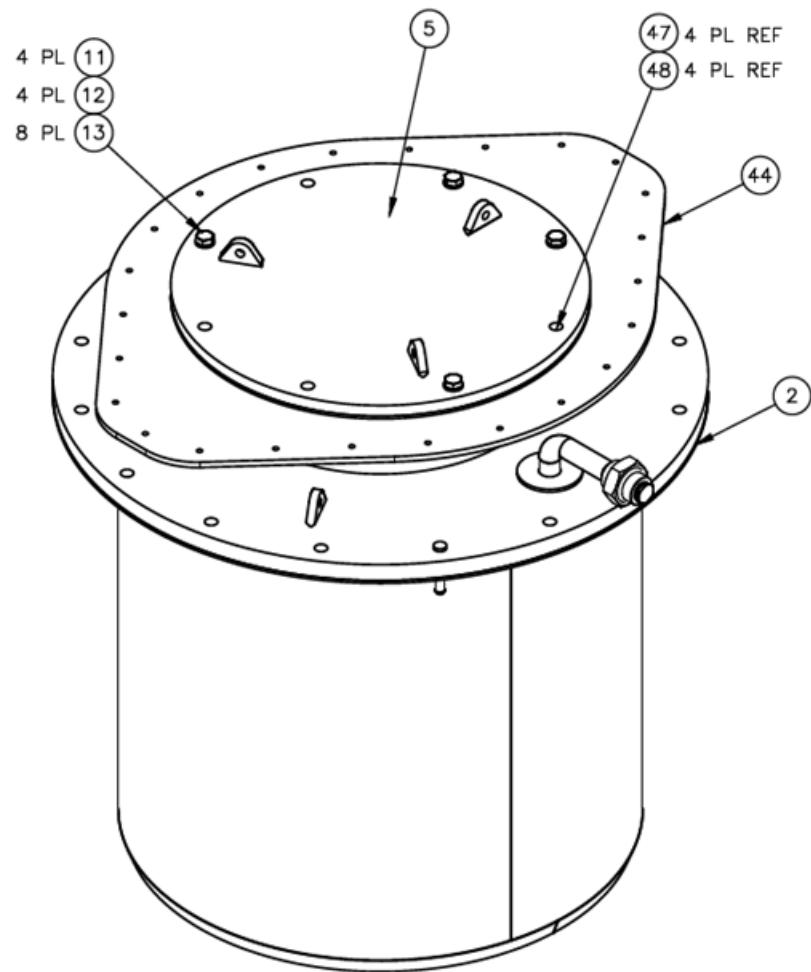
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NOTE 5 - 2 PL



ITEM 1 - TBI TOP HAT ASSEMBLY

Figure 6: TBI Top Hat Assembly (2309-WRP-209-THAT, Sheet 1)



ITEM 1 – RISER ADAPTER W/ PLUG & TOP HAT PREP

Figure 7: TBI SY-101 Riser Adapter Assembly and Shield Plug (H-14-112134, Sheet 2)

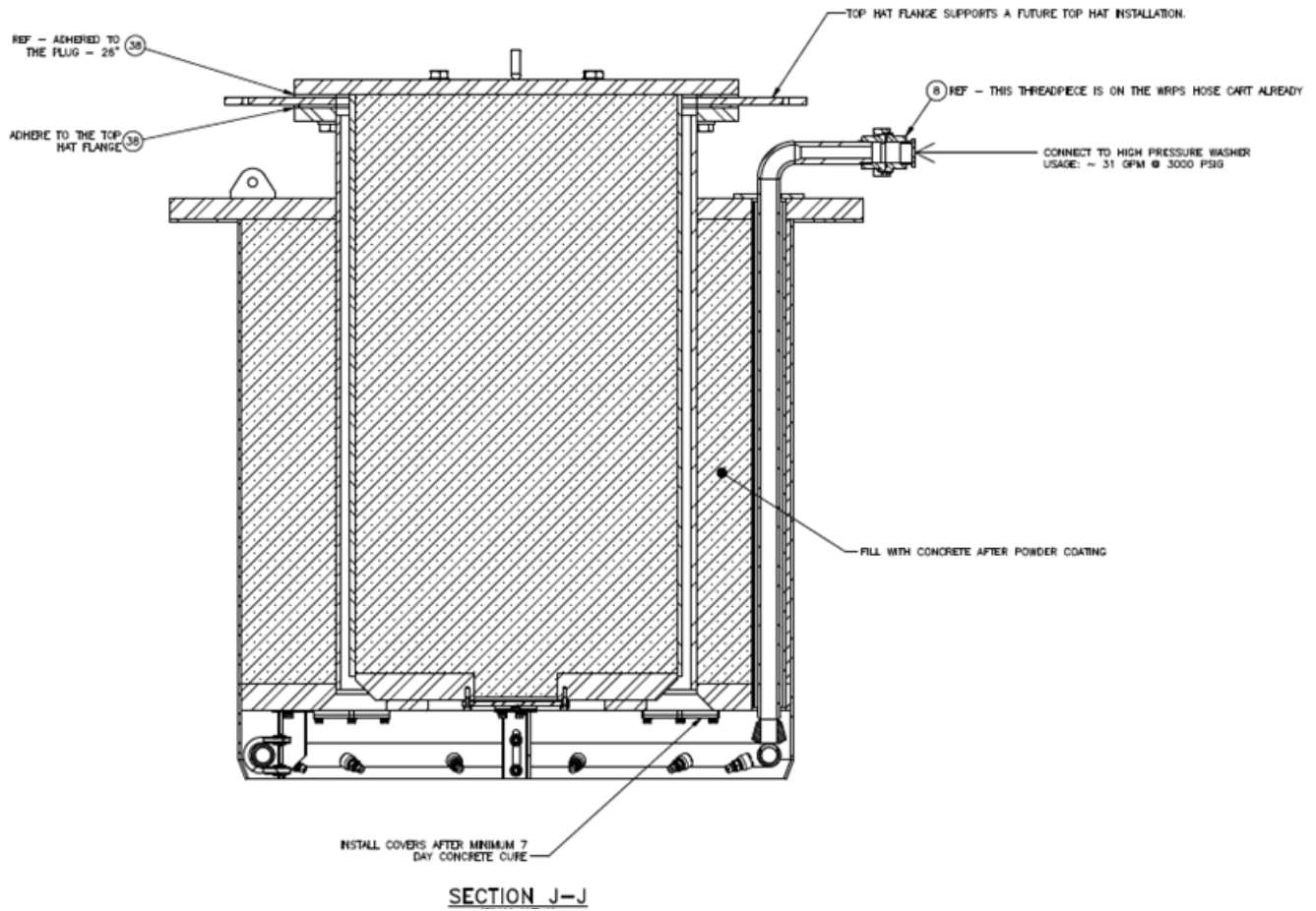
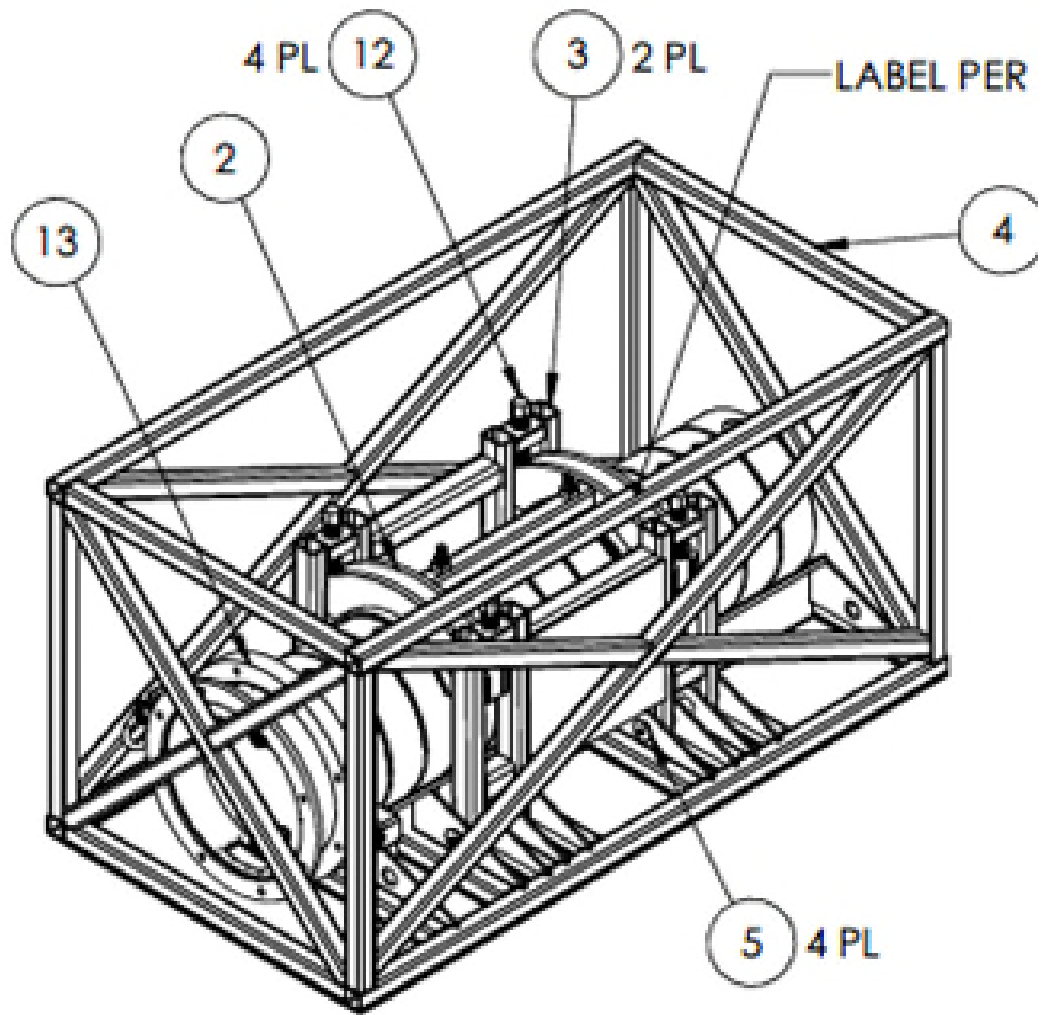


Figure 8: TBI SY-101 Riser Adapter Assembly & Shield Plug (H-14-112134, Sheet 3)



ITEM 1 - WASTE BOX CRADLE ASSEMBLY

Figure 9: Waste Box Cradle (2309-WRP-209-CRD-1, Sheet 2)

IQRPE Design Assessment Report for TBI Extraction

DA-361651-02, Rev. 0

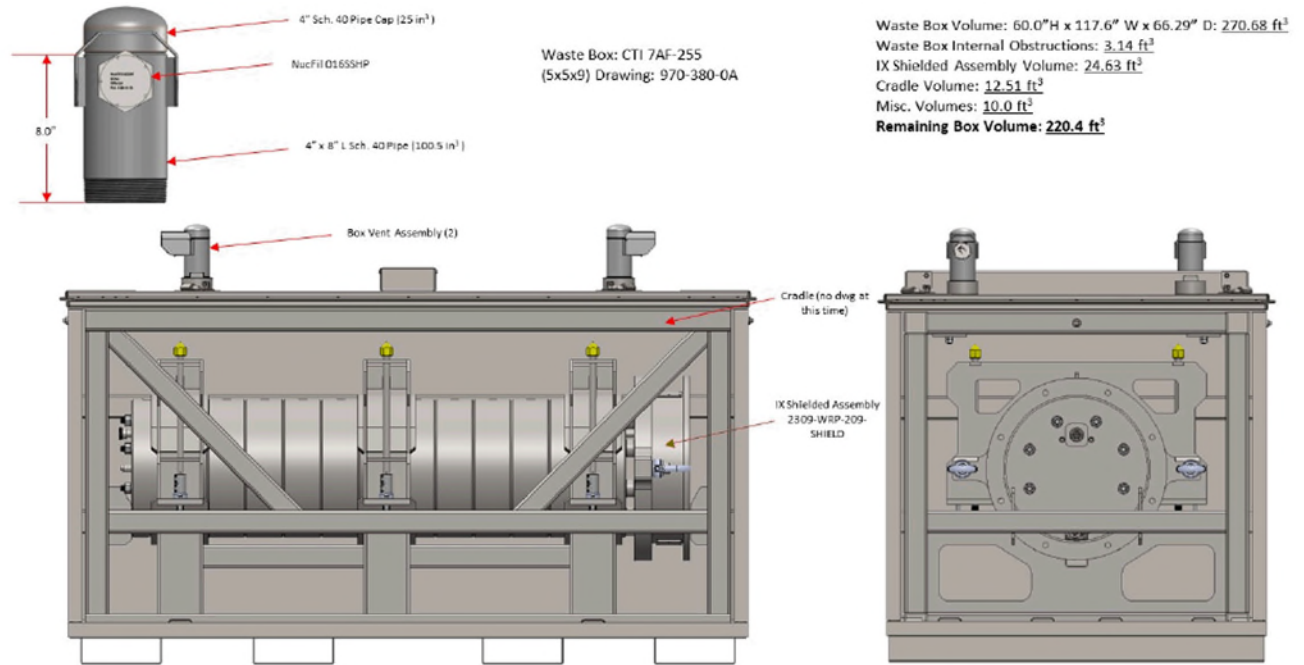
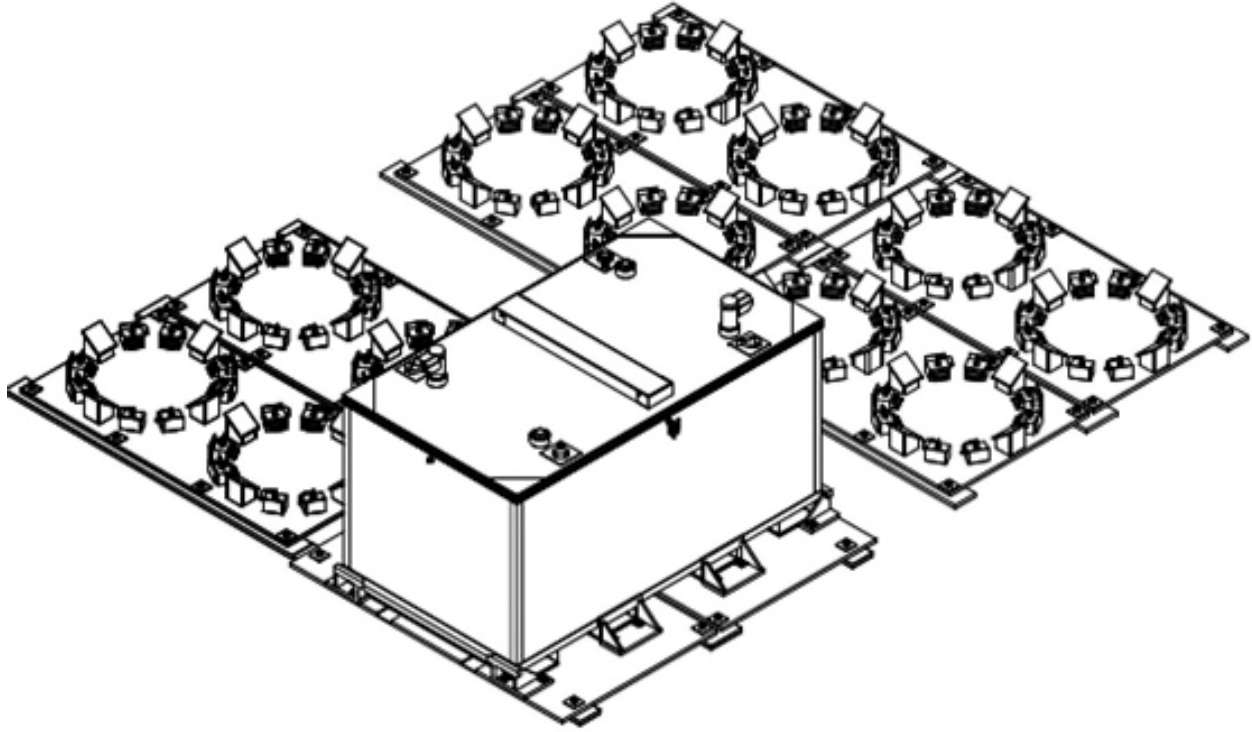


Figure 10: Waste Box with IXC Cradle (RPP-CALC-65565, Figure 4-6)



ITEM 1 - TBI WASTE BOX ON TSCR PAD
CONCRETE NOT SHOWN

Figure 11: TBI Waste Box on TSCR Pad (2309-WRP-209-PAD, Sheet 2)

1.2 DESIGN REVIEW REQUIREMENTS

Many of the components required for the transfer of dangerous or mixed waste are regulated by WAC 173-303-640 requirements. WAC codes require an IQRPE's review of the design of these components.

As a basis for the IQRPE certification, a review is performed on a final version of the document design package as prepared by the WRPS's design agent, HiLine Engineering & Fabrication, Inc., and reviewed by WRPS. Documents such as drawings, calculations, Engineering Change Notices (ECNs), Engineering Design Transmittals (EDTs), Technical Evaluations, and specifications included in the design review package that are marked as final, and have signatures of the preparer, checker, and approver, are reviewed by the IQRPE as a completed document. All other documents will be reviewed as preliminary or supportive information.

The IQRPE maintains "independence" at all times. Comments by others are considered by the IQRPE during the preparation of reports and plans. Only the IQRPE can implement changes to the master IQRPE documents.

1.3 DESIGN OVERVIEW FOR TBI EXTRACTION DESIGN ASSESSMENT

This Design Assessment Report is prepared for WRPS by an IQRPE to certify that the TBI Extraction equipment has sufficient structural integrity and is acceptable for storage of dangerous solid waste per WAC 173-303-640(3)(a).

The TBI utilized a temporarily installed system to collect 2,000 gallons of liquid waste from the upper layer of supernatant in double-shell tank (DST) 241-SY-101. The collected waste was shipped to a facility located away from the Hanford Site for subsequent processing. The packaged TBI system used to extract the liquid waste stream from the tank was entirely contained within a mast assembly inserted into, and suspended from, 42" diameter Riser-008 of DST 241-SY-101 (H-14-010531). This assessment covers only the equipment used in support of the extraction and disposition of the inactivated TBI assembly removed from Riser-008 once all TBI testing scope has concluded (ECN-718119).

The discussion below provides an overview of the TBI Extraction process, and the equipment components included in the scope of this design review used in support of the extraction (E-Mail Message dated: 08/12/2024; Subject: *TBI Extraction System – Extraction Process*). Figure 4 illustrates various details covering the overall extraction process.

The disposal top hat (2309-WRP-209-THAT, *TBI Top Hat Assembly*) is first installed on the top surface of the 42" Riser-008 adapter assembly (H-14-112134, *TBI SY-101 42 Inch Riser Adapter Assembly & Shield Plug*) to assist in the extraction process. The TBI mast assembly will then be extracted from Riser-008 with a crane in a manner typical of the existing process used for routine extractions of long length contaminated equipment such as pump assemblies, and other similar components, from the waste storage tanks (WO# 1048207, *TBI Extraction and Storage*).

Prior to extraction, the column and associated components will be dried to the best extent possible (WO# 1167718 *TBI Flush and Air Dry*). RPP-RPT-64628, *Test Bed Initiative Refurbishment and Modification Process Evaluations*, determined the minimum length of time to achieve the Environmental Protection Agency (EPA) Method 9095B, *Paint Filter Liquids Test*, which proves that drainable free liquids are removed. RPP-RPT-64628 is based on testing performed by Pacific

Northwest National Laboratory (PNNL) (PNNL-28763 / RPT-LPTTS-003, *Drying of Crystalline Silicotitanate (CST) Beds by Air Flow*).

As the TBI assembly is extracted, it is washed with clean water discharged from an originally installed spray ring. The rinse water returns to the tank along with any other liquid draining from the TBI column. No remaining liquid is anticipated to remain other than residual from the spray ring. As the TBI mast assembly is lifted from the waste tank, it will also be wrapped along its length with plastic sleeving.

After the TBI column has been fully extracted from Riser-008, its vertically suspended position will be transitioned to a horizontal position for its placement onto the separation cradle assembly (2309-WRP-209-SEP, *Separation Cradle*). Once it is fully situated in the Separation Cradle, the column will be reduced in overall length by the removal of the lower pump column. Liquid absorbent material will be added on the inside of the lower pump column's sleeving, then it will be sealed for subsequent disposition. The items separated from the TBI column for conventional radioactive waste disposal will be placed into suitable waste containers and sent to the Environmental Restoration Disposal Facility (ERDF) for final disposal. Note: The scope of this assessment does not evaluate the containers used specifically for ERDF waste disposal of the TBI components as these are already evaluated and approved waste containers.

Due to its higher and longer-lasting radioactivity, the shielded IXC assembly will be removed from the TBI column assembly and prepared for longer term storage on the Tank-Side Cesium Removal (TSCR) waste pad. The removal of the IXC assembly will be performed while the column remains supported on the separation cradle. The IXC will then be transferred from the separation cradle to the waste box cradle assembly (2309-WRP-209-CRD-1, *Waste Box Cradle*) in the storage box for its eventual placement on the TSCR waste pad.

The final steps of the extraction process will isolate and secure the opening of Riser-008. This will involve the removal of the disposal top hat from the top surface of the 42" Riser-008 adapter assembly and then the placement and securement of the 24" diameter concrete filled shield plug (Item #5 on drawing H-14-112134) into the cylindrical void volume of the riser adapter.

1.3.1 TBI Extraction Equipment

1.3.1.1 TBI Top Hat Assembly

The TBI top hat assembly (2309-WRP-209-THAT) is used in conjunction with the riser adapter assembly during the removal of the TBI column from Riser-008 for shielding and containment purposes during the TBI column extraction process. It is fabricated from ½" thick ASTM A36 formed carbon steel plate. Once the TBI column has been extracted, the top hat assembly is removed and the shield plug is placed in the riser adapter void space previously occupied by the TBI column. It is a single use component and will be dispositioned as waste or released for reuse after TBI Extraction is completed.

The riser adapter assembly itself (H-14-112134) was evaluated previously in DA-361651-01.

1.3.1.2 Riser Adapter Assembly and Shield Plug

The riser adapter assembly (H-14-112134) was installed at the top of Riser-008 to support the TBI project. It will remain in place to provide shielding and containment for the removal of the TBI assembly from DST 241-SY-101. Once the TBI column has been extracted, the shield plug is placed in the riser adapter void space previously occupied by the TBI column assembly.

1.3.1.3 Separation Cradle Assembly

The separation cradle assembly (2309-WRP-209-SEP) is a fabricated carbon steel frame structure used to hold, position, and secure the TBI column assembly for component disassembly of the IXC. It is a single use component and will be dispositioned as waste after TBI Extraction is completed.

1.3.1.4 Waste Box Cradle Assembly

The waste box cradle assembly (2309-WRP-209-CRD-1) is a fabricated carbon steel frame structure used to position and secure the TBI shield assembly (2309-WRP-209-SHIELD, *IX Shielded Assembly*) containing the spent TBI IXC in the waste box. The cradle assembly remains secured within the Waste Box for the duration of IXC storage.

1.3.1.5 Waste Box Assembly

The waste box assembly is a commercially available, painted carbon steel container procured from Container Technologies Industries, LLC, per the Central Plateau Cleanup Company (CPCCo) Specification CPCC-00807, *Procurement Specification for 9 ft by 5 ft by 5 ft DOT Specification 7A Type A Container with Grout Ports*, as a DOT 7A container (2309-WRP-209-PAD, *TBI Waste Box on TSCR Pad*). After it is loaded with the IXC, it will be placed on the TSCR slab (H-14-112451, *TBI Waste Box Installation on TSCR Pad*) in the Hanford 200 East Area for extended storage.

1.4 SCOPE OF IQRPE DESIGN ASSESSMENT

This design assessment includes a comprehensive review of the design package per WAC 173-303-640. Any exceptions taken by the IQRPE to incomplete or unavailable items in the design package are listed at the end of each subsection.

1.4.1 Portions of the TBI Included in Scope for IQRPE Certification

Documents included in this design review for the TBI include:

- Procurement Information.
- Technical Specifications.
- Design and Fabrication Drawings.
- ECNs.

A list of reference documents reviewed by the IQRPE as part of this Design Assessment Report is included in Section 4.0.

1.4.2 Portions of the TBI Not Included in Scope for IQRPE Certification

Components that are not within the scope of this IQRPE design assessment for the TBI Extraction include all those that do not directly support the extraction of the TBI mast assembly from Riser-008. Additionally, those components that do not provide containment of tank waste per WAC 173-303-640 are not within the scope of this assessment.

Not included in this IQRPE design assessment:

- TBI Top Hat Assembly: The Top Hat Assembly does not provide secondary containment during the TBI Extraction process.
- Riser Adapter Assembly: The Riser Adapter Assembly was previously IQRPE assessed in DA-361651-01.
- Riser Shield Plug: Riser Shield Plug provides no containment of tank waste per WAC 173-303-640.
- Waste Box Cradle Assembly: Waste Box Cradle Assembly provides no containment of tank waste per WAC 173-303-640.
- Waste Box Assembly: Waste Box Assembly provides no containment of tank waste per WAC 173-303-640.

2.0 ASSESSMENT SUMMARY

Systems within the IQRPE scope of this assessment are adequately designed to prevent failure caused by corrosion or by structural loads imposed by the system's intended service. These conditions are described in more detail below. The system design complies with the applicable requirements of WAC 173-303-640. Design documents that were reviewed as part of this assessment are included in Section 4.0.

2.1 CODES, STANDARDS, AND REGULATIONS

The codes, standards, and regulations specifically used during the preparation of this certification are referenced, as necessary, throughout this report. A complete list of applicable references is contained in Section 4.0.

2.1.1 Structural Design Standards

WAC 173-303-640 requires that an IQRPE certify that the proposed tank system will have sufficient structural integrity and is acceptable for storing and treating dangerous waste. This assessment must show, in accordance with WAC 173-303-640(3)(a), that the foundation, structural support, seams, connections, and pressure controls are adequately designed and that the tank system has sufficient structural strength, compatibility with the waste to be stored and treated, and corrosion protection to ensure that it will not collapse, rupture, or fail.

The TBI Extraction involves the removal of an ITPS. The ITPS was a temporary installation with a limited operational life.

TBI Extraction components were analyzed. Calculations include the following areas as applicable:

- Pipe wall thickness calculations for pressure.
- Stress calculations for sustained loads due to pressure, dead load, and other sources.
- Stress calculations for displacement stresses, such as thermal loads.
- Stress calculations for occasional loads such as pressure, weight, and earthquake loads.

WAC 173-303-640(3)(d) requires backfill to provide structural support to prevent excessive settlement and corrosion. The corrosion assessment is addressed in Section 2.1.2 of this report.

The following activities were conducted in the review of design standards for the TBI ITPS:

- Structural design standards, codes, and criteria were reviewed to ensure clear and specific references.
- Structural calculations were reviewed.

Where possible, the IQRPE has reviewed the design package to ensure that the following activities have been incorporated into the technical specifications:

- Structural calculations are provided for the TBI ITPS components.
- Calculations of thickness account for the assumed corrosion/erosion rate.
- Seismic considerations appropriate for the risk zone are included in the structural calculations.
- Foundations are deep enough in the ground to eliminate frost heave per the requirements of WAC 173-303-640(3)(a)(v)(C). New equipment is either attached to existing tank structures or designed to accommodate frost heave.
- Adequate freeze protection is provided.

The information below highlights the IQRPE structural design standard review for the relevant TBI Extraction components and identifies any specific exceptions to this IQRPE certification as they relate to the structural review.

Both the separation cradle assembly (2309-WRP-209-SEP) and the waste box cradle assembly (2309-WRP-209-CRD-1) are fabricated structural steel frames made of welded carbon steel shapes. The TBI top hat assembly (2309-WRP-209-THAT) is a welded, fabricated shape made of ASTM A36 formed carbon steel plate. All these items are welded and inspected in accordance with AWS D1.1, *Structural Welding Code - Steel*.

All TBI Extraction components, except for the waste box cradle assembly (2309-WRP-209-CRD-1), will experience only temporary use. Therefore, structural issues dealing with corrosion/erosion rates; seismic considerations, foundations; and freeze protection requirements are not relevant to the scope of this evaluation for those components.

The combined package consisting of the waste box cradle assembly (2309-WRP-209-CRD-1) inserted in the waste box and the subsequent anchorage and storage on the TSCR pad (2309-WRP-209-PAD) was evaluated for structural and seismic issues (Submittal No. 85457-000-SUB-008-

004, *Submittal Task 1 Sprt Redesign Effort Docs: CALC-2309-WRP-209-020 R1*). The cradle assembly acts as the permanent dunnage for the IXC to prevent the load package from shifting during handling, transport, and storage. The cradle is fabricated to be a snug fit within the waste box and is not physically bolted or welded to the waste box. The waste box itself is closed using standard waste box closure requirements (E-Mail Message dated: 10/17/2024; Subject: *Project #9012: TBI Extraction – Questions and Issues Related to Draft DA*). The waste box includes integral carbon steel pipe fittings used for vent weldments. These are welded and inspected in accordance with ASME B31.3, *Process Piping* (General Note #12 of 2309-WRP-209-PAD).

Hoisting and rigging issues involving the extraction and subsequent repositioning of the TBI mast assembly, and its attached components, are addressed by compliance with RPP-8360, *Lifting Attachment and Lifted Item Evaluation*.

The IQRPE concludes that the appropriate structural considerations for the TBI Extraction components have been made.

2.1.1.1 Structural Design Exceptions

Based on the above review, there are no IQRPE certification exceptions to the structural design of the components used for the TBI Extraction.

The IQRPE concurs that this structural design meets the requirements of WAC 173-303-640(3)(a) and (d).

2.1.2 Waste Compatibility

Prior to the TBI Extraction, the column and associated components will be dried to the best extent possible (WO# 1167718) using air drying parameters previously established in RPP-RPT-64628. They will then be sprayed with clean water from the spray ring and subsequently sleeved with plastic material. There may be a trace amount of rinse water remaining on the surface during extraction. This process sequence ensures there will be no waste compatibility issues due to extraction components contacting any residual liquid tank waste.

2.1.3 Pressure Control System

With the TBI Extraction equipment removed from service and subsequently processed as radioactive waste, overall pressure control issues are no longer relevant. However, there is a note #12 on drawing 2309-WRP-209-PAD dealing with inspection and testing of piping. The note requires inspection of vent piping per ASME B31.3 for normal service and specifies a design pressure of 15 psig and a test pressure of 22.5 psig, minimum. According to the WRPS design engineer, the note was included to ensure the vent weldment is fully sealed (E-Mail Message dated: 10/17/2024). The waste box and vent are not designed or intended to contain any pressure. Item #5 on drawing 2309-WRP-209-PAD is a vent weldment. It is being used to provide a vent path for hydrogen diffusion and to allow natural breathing of the waste box during storage. The configuration of the vent allows for the inspection of the Nucfil filter (Item #34) and provides some protection from the elements for this filter. The IXC generates a very low amount of hydrogen during storage and venting this gas will ensure the Waste Box stays well below 25% of the Lower Flammability Limit (LFL). RPP-CALC-65565, *Flammable Gas Calculations Supporting the Test Bed Initiative*, documents that it requires approximately five (5) years to reach

25% of the LFL if the box were sealed; the vents ensure that this cannot happen (E-Mail Message dated: 10/17/2024).

2.1.4 Secondary Containment System

As described previously, the TBI column and associated components will be dried to the best extent possible (WO# 1167718) using air drying parameters previously established in RPP-RPT-64628. They will then be sprayed with clean water from the spray ring and subsequently sleeved with plastic material. Although there may be trace amounts of rinse water remaining on the surface during this extraction, there will be no waste compatibility issues due to extraction components contacting any residual liquid tank waste. Because there will be no free waste liquids remaining on the TBI assembly, secondary containment is not required.

2.1.4.1 Secondary Containment System Exceptions

Based on the above review, there are no IQRPE certification exceptions to the secondary containment design of the components used for the TBI Extraction.

The IQRPE concurs that this secondary containment design meets the requirements of WAC 173-303-640(4).

2.1.5 Ancillary Equipment Design

Since the extraction process equipment is not the DST 241-SY-101 tank, all of the TBI Extraction equipment is ancillary equipment. The equipment has been assessed as described within this assessment.

2.1.5.1 Ancillary Equipment Design Exceptions

Based on the above review, there are no IQRPE certification exceptions to the ancillary equipment design of the components used for the TBI Extraction.

The IQRPE concurs that this ancillary equipment design meets the requirements of WAC 173-303-640(3).

2.1.6 P&ID Review

With the TBI equipment removed from service and subsequently processed as radioactive solid waste, P&ID reviews are not relevant.

2.1.7 Corrosion Assessment

All TBI Extraction components, within this assessment will experience only temporary use. Therefore, corrosion assessment issues are not relevant.

2.1.8 Recommended Inspection Schedule

Inspections required for the initial installation are detailed in IP-361651-02. Per the requirements of WAC 173-303-640(3)(c), a separate Installation Assessment Report (IA-361651-02) is used to

provide Inspection Reports documenting the TBI Extraction process applicable to this Design Assessment Report.

It should be noted that the waste box assembly, once loaded with the IXC, will be placed on the TSCR slab (H-14-112451) for an extended storage period anticipated to last several years until a more permanent repository for the waste package is made available. The scope of this report does not cover any inspections for the periodic monitoring of the waste package while it is in storage.

2.1.8.1 Inspection Schedule Exceptions

There are no IQRPE certification exceptions to the recommended inspection schedule.

The IQRPE concurs that this design basis meets the requirements of WAC 173-303-640(6).

3.0 DESIGN REVIEW ASSESSMENT CERTIFICATIONS

The TBI Extraction, as previously described, has been reviewed by the IQRPE and was assessed to be in compliance with the applicable sections of WAC 173-303-640. These results are based on a review of the applicable codes, standards, and documents.

The individuals listed below participated in the preparation of this design assessment.

Independent Qualified Professional Engineer

Paul M. Giever

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BS Degreed Engineer

Nathaniel R. Weinman

- E.I.T., Mechanical Engineering, Enrollment Number E-11818

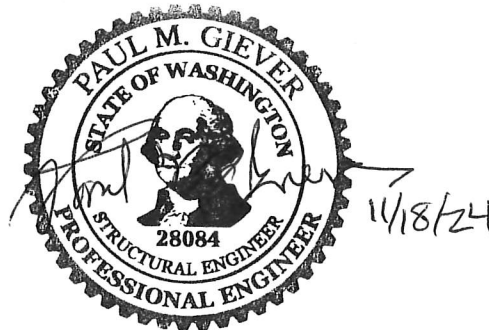
IQRPE Design Assessment Report for TBI Extraction

DA-361651-02, Rev. 0

This Design Assessment Report and IA-361651-02 meets the IQRPE requirements of WAC 173-303-640(3). The certifications below are in accordance with the requirements of WAC 173-303-810(13)(a), *Certification*.

Report IQRPE:WAC 173-303-810(13)(a)

I certify under penalty of the law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to 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.



Report Reviewed by:

Paul M. Giever 11/18/24

Paul M. Giever, PE

Independent Qualified Registered Professional Engineer

November 18, 2024

Date

4.0 REFERENCES

- 2309-WRP-209-CRD-1, 2024, Sheets 1-10, *Waste Box Cradle*, Rev. B, HiLine Engineering & Fabrication, Inc., Richland, Washington.
- 2309-WRP-209-PAD, 2024, Sheets 1-9, *TBI Waste Box on TSCR Pad*, Rev. B, HiLine Engineering & Fabrication, Inc., Richland, Washington.
- 2309-WRP-209-SEP, 2024, Sheets 1-9, *Separation Cradle*, Rev. B, HiLine Engineering & Fabrication, Inc., Richland, Washington.
- 2309-WRP-209-SHIELD, 2023, Sheets 1-13, *IX Shielded Assembly*, Rev. D, HiLine Engineering & Fabrication, Inc., Richland, Washington.
- 2309-WRP-209-THAT, 2024, Sheets 1-4, *TBI Top Hat Assembly*, Rev. B, HiLine Engineering & Fabrication, Inc., Richland, Washington.
- ASME B31.3, 2016, *Process Piping*, American Society of Mechanical Engineers, New York, New York.
- ASTM A36/A36M, 2019, *Standard Specification for Carbon Structural Steel*, ASTM International, West Conshohocken, Pennsylvania.
- AWS D1.1/D1.1M, 2020, *Structural Welding Code - Steel*, American Welding Society, Miami, Florida.
- CPC-00807, 2024, *Procurement Specification for 9 ft by 5 ft by 5 ft DOT Specification 7A Type A Container with Grout Ports*, Rev. 0, CPCo Central Plateau Cleanup Company, Richland, Washington.
- DA-361651-01, 2024, *Independent Qualified Registered Professional Engineer Design Assessment Report for IQRPE for Test Bed Initiative*, Rev. 1, Meier Architecture • Engineering, Kennewick, Washington.
- E-Mail Message dated: 08/12/2024; From: Kennedy, Douglas J. (WRPS) To: Paul Giever (Meier Architecture • Engineering); Subject: *TBI Extraction System – Extraction Process*.
- E-Mail Message dated: 10/17/2024; From: Kennedy, Douglas J. (WRPS) To: Alex Butterfield et. al.; Subject: *Project #9012: TBI Extraction – Questions and Issues Related to Draft DA*.
- ECN-718119, 2024, *TBI Removal from SY-101*, Rev. 00, Washington River Protection Solutions, LLC, Richland, Washington.
- EPA Method 9095B, 2004, *Paint Filter Liquids Test*, Rev 2.
- H-14-010531, 2024, Sheet 1, *Dome Penetration Schedules (WST/WSTA) Tank 241-SY-101*, Rev. 21, Washington River Protection Solutions, LLC, Richland, Washington.
- H-14-112134, 2024, Sheets 1-13, *TBI SY-101 42 Inch Riser Adapter Assembly & Shield Plug*, Rev. 00, Washington River Protection Solutions, LLC, Richland, Washington.
- H-14-112451, 2024, Sheet 1, *TBI Waste Box Installation on TSCR Pad*, Rev. 00, Washington River Protection Solutions, LLC, Richland, Washington.
- IA-361651-01, 2024, *Independent Qualified Registered Professional Engineer Installation Assessment Report for Assessment Services for TBI*, Rev. 0, Meier Architecture • Engineering, Kennewick, Washington.

- IA-361651-02, 2024, *Independent Qualified Registered Professional Engineer Installation Assessment Report for TBI Extraction*
- IP-361651-02, 2024, *Independent Qualified Registered Professional Engineer Inspection Plan for TBI Extraction*, Rev. 0, Meier Architecture • Engineering, Kennewick, Washington.
- PNNL-28763 / RPT-LPTTS-003, 2019, *Drying of Crystalline Silicotitanate (CST) Beds by Air Flow*, Rev. 0, Pacific Northwest National Laboratory, Richland, Washington.
- RPP-8360, 2022, *Lifting Attachment and Lifted Item Evaluation*, Rev. 7, Washington River Protection Solutions, LLC, Richland, Washington.
- RPP-CALC-65565, 2024, *Flammable Gas Calculations Supporting the Test Bed Initiative*, Rev. 02, Washington River Protection Solutions, LLC, Richland, Washington.
- RPP-RPT-64628, 2024, *Test Bed Initiative Refurbishment and Modification Process Evaluations*, Rev. 00, Washington River Protection Solutions, LLC, Richland, Washington.
- Statement of Work (SOW) No. 361651, 2024, *IQRPE Assessment Services for TBI (BMA 81713)*, Rev. 1, Washington River Protection Solutions, LLC, Richland, Washington.
- Submittal No. 85457-000-SUB-008-004, 2024, *Submittal Task 1 Sprt Redesign Effort Docs: CALC-2309-WRP-209-020 RI*, Rev. 01, Vendor: HiLine Engineering & Fabrication, Inc., Washington River Protection Solutions, LLC, Richland, Washington.
- WAC 173-303-640(3), *“Design and Installation of New Tank Systems or Components,”* Washington Administrative Code, as amended.
- WAC 173-303-640, *“Tank Systems,”* Washington Administrative Code, as amended.
- WAC 173-303-810(13)(a), *“Certification,”* Washington Administrative Code, as amended.
- WO# 1048207, 2024, *TBI Extraction and Storage*, Rev. Draft E, Washington River Protection Solutions, LLC, Richland, Washington.

Attachment 3
24-ECD-0190

Associated Drawings for the Extraction System

(20 pages including cover sheet)

GENERAL NOTES:

- BREAK ALL SHARP EDGES & REMOVE ALL BURRS.
- WELD & INSPECT CARBON STEEL PER AWS D1.1-2020.
USE OF ASME IX WELD PROCEDURES AND QUALIFICATIONS IS ACCEPTABLE.
- THE ESTIMATED WEIGHTS ARE:
ITEM 1 - WASTE BOX CRADLE ASSEMBLY: 14,000 LBS
ITEM 2 - CLAMP TOP: 350 LBS
ITEM 4 - CRADLE FRAME WELDMENT: 2,150 LBS
- POWDER COAT THE EXPOSED CARBON STEEL. ABRASIVE BLAST WITH 1 TO 2 MIL PROFILE, WITH 2.5 MIL MINIMUM COATING. USE A TGIC POLYESTER PRODUCT FOR TOPCOAT WITH A ZINC RICH PRIMER, OR A WRPS APPROVED ALTERNATE COATING SYSTEM.
- DRILL ALL TUBES WITH 3/4" HOLE TO AVOID ANY SEALED SPACES. LOCATE HOLES INTERNALLY BEFORE WELDING TUBING TOGETHER.
- INSTALL ACTEK SWIVEL LIFT RINGS (ITEM 11) IN THE LIFT BLOCK FEATURES FOR LIFTING PURPOSE PER ACTEK INSTALLATION DIRECTIONS.
- USE PLIO-BOND OR EQUIVALENT GLUE TO SECURE RUBBER TO THE MATING PARTS.
- TIGHTEN ITEM 12 UNIFORMLY WHEN LOADING & TORQUE TO APPROXIMATELY 300FT-LB
- LABEL THE FOLLOWING USING 1/4" HIGH MIN BLACK TEXT ON YELLOW BACKGROUND, VINYL MATERIAL.

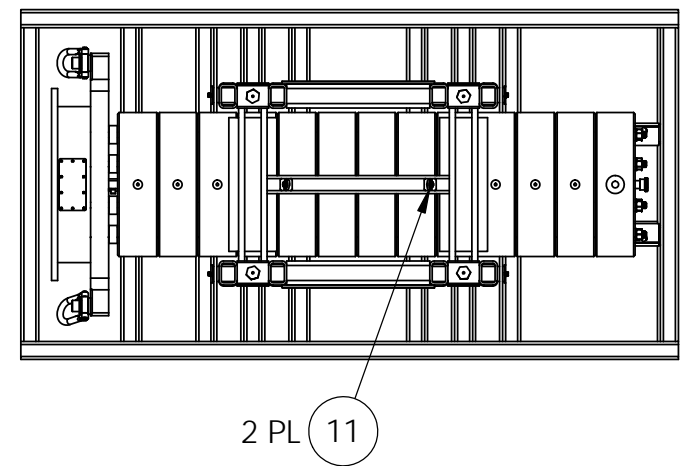
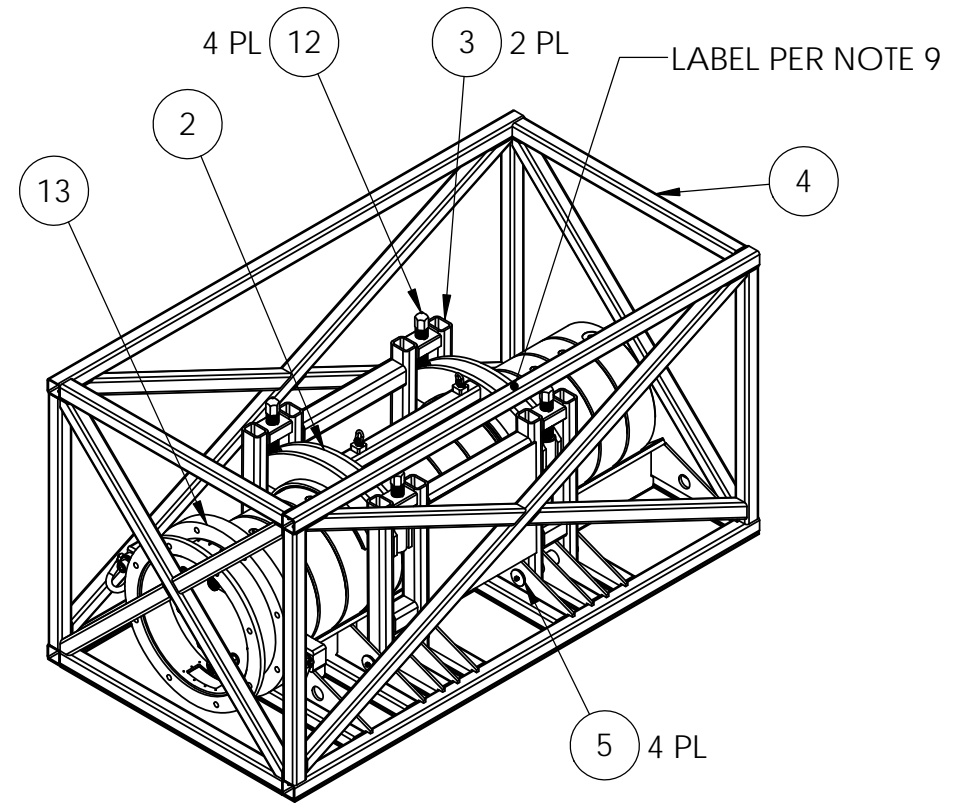
2309-WRP-209-CRD-1 ITEM 2
WRPS 85457
WEIGHT XXX LBS (XXX = ACTUAL WEIGHT)

2309-WRP-209-CRD-1 ITEM 1
WRPS 85457
WEIGHT: 14,000 LBS (INCLUDES ITEM 13)

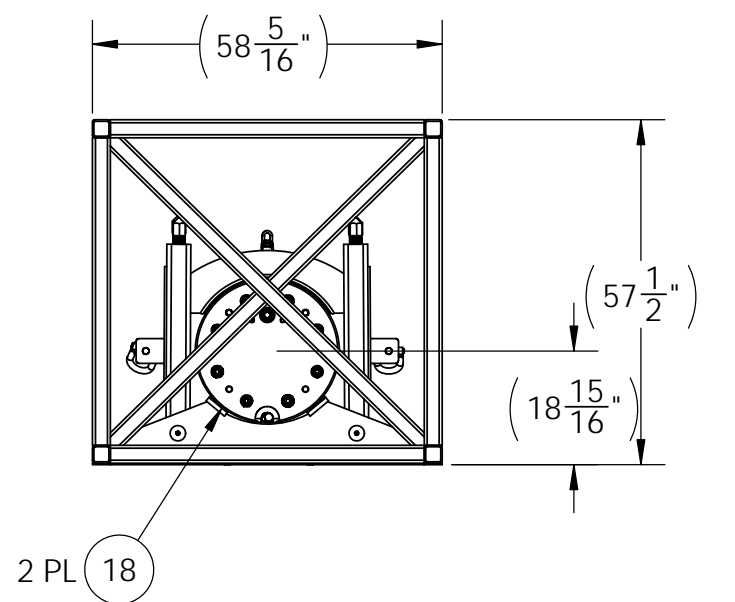
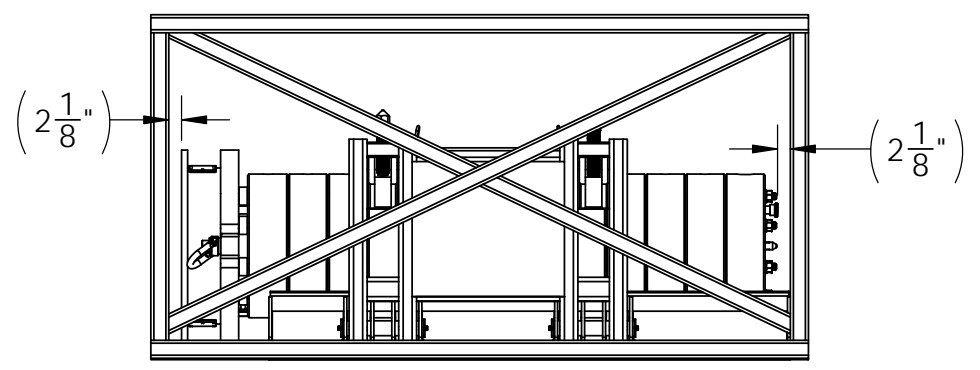
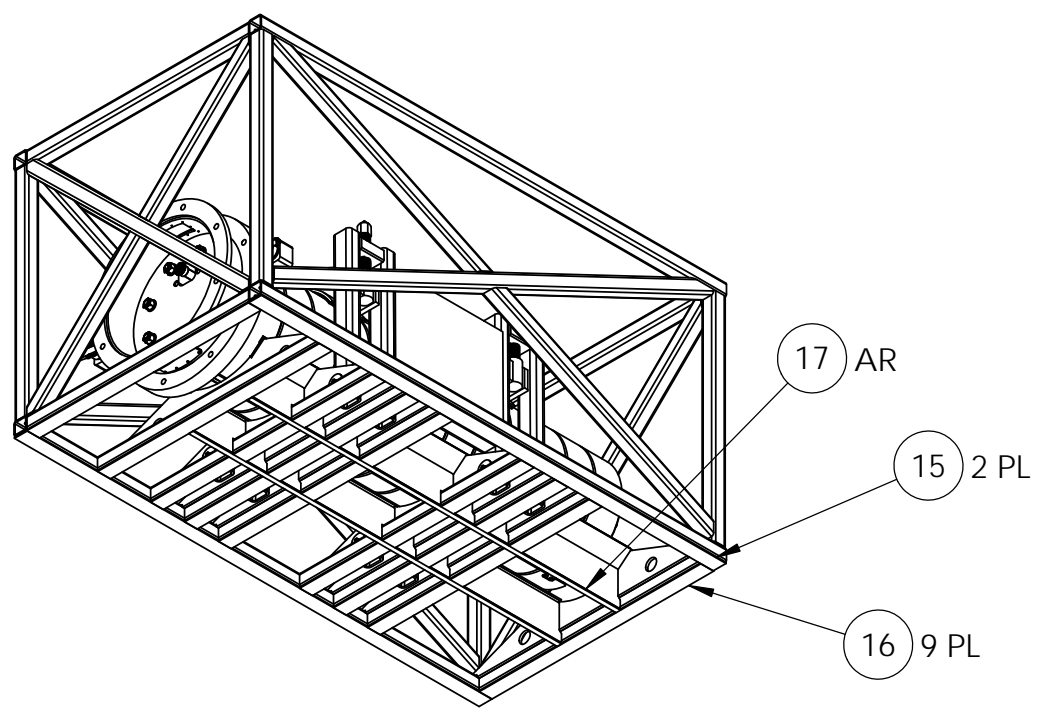
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-100	-090	-080	-070	-060	-050	-040	-030	-020	-010	DESCRIPTION	SPECIFICATION	ITEM NO:
									X	WASTE BOX CRADLE ASSEMBLY		1
								X	1	CLAMP TOP		2
							X		2	CLAMP ARM WELDMENT		3
					X				1	CRADLE FRAME WELDMENT		4
									4	PIN ASSEMBLY		5
				X		1				TUBE FRAME WELDMENT		6
		X										7
	X											8
X												9
												10
									2	SAFETY SWIVEL HOIST RING, 3/8-16 UNC	ACTEK MFG 46106 (1000 LB RATING)	11
									4	CLAMP SCREW	ASTM A193, 4140, 95KSI YIELD MIN	12
									1	IX SHIELDED ASSEMBLY	HILINE 2309-WRP-209-SHIELD	13
												14
									2	EPDM RUBBER, 1/4" THICK, 3"W X 109-1/2"L	COM'L EPDM RUBBER, DUR 50	15
									9	EPDM RUBBER, 1/4" THICK, 3"W X 52-1/4"L	COM'L EPDM RUBBER, DUR 50	16
									AR	EPDM RUBBER, 1/4" THICK, 1"W X LENGTH A/R	COM'L EPDM RUBBER, DUR 50	17
									2	EPDM RUBBER, 1/4" THICK, 4"W X 86-7/16"L	COM'L EPDM RUBBER, DUR 50	18
												19
									2	EPDM RUBBER, 1/4" THICK, 8"W X 25-1/2"L	COM'L EPDM RUBBER, DUR 50	20
									1	TUBE STEEL, 2 x 2 x 1/4"	ASTM A500 GR.B	21
									2	LIFT PLATE, 2 x 2 x 1" L, 3/8"-16UNC ON CENTER	ASTM A36	22
									4	CLAMP SIDE PLATE, 1" THICK	ASTM A36	23
									2	CLAMP SADDLE PLATE, 1/2" THICK	ASTM A36	24
									4	BAR SOCKET, 3" OD	ASTM A36	25
												26
									4	RECT TUBE, 4 x 3 x 1/4	ASTM A500 GR.B	27
									2	PLATE, 2-1/2" THICK	ASTM A36	28
									1	PLATE, 3/8" THICK	ASTM A36	29
									2	SQ. TUBE, 4 x 4 x 1/4	ASTM A500 GR.B	30
									2	SQ. TUBE, 4 x 4 x 1/4	ASTM A500 GR.B	31
												32
									4	GUSSET 1, 1/2" THICK	ASTM A36	33
									2	GUSSET 2, 1/2" THICK	ASTM A36	34
									1	GUSSET 3, 1/2" THICK	ASTM A36	35
									2	GUSSET 4, 1/2" THICK	ASTM A36	36
									2	BEARING PLATE, 3/4" THICK x 4" x 86-7/16"	ASTM A36	37
									10	PIN PLATE, 1/2" THICK	ASTM A36	38
												39
									1	PIN, 2-1/2" OD, 13-1/2" LONG	ASTM A36	40
									2	RETAINER, 3" OD, 1/4" THK, 7/16 CENTER HOLE	ASTM A36	41
									2	HEX HEAD BOLT, 3/8-16 UNC, 1"L	SAE J429 GR.5, ZINC PLATED	42
									2	LOCK WASHER, 3/8, SPIRAL	ASME B18.21.1, ZINC PLATED	43
												44
									AR	SQ. TUBE, 3 x 3 x 1/4	ASTM A500 GR.B	45
												46
												47
												48
												49

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SIZE	DWG. NO.	REV			
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DRAWN DATE: 3-17-24	EDT:		SHT 1 OF 10		

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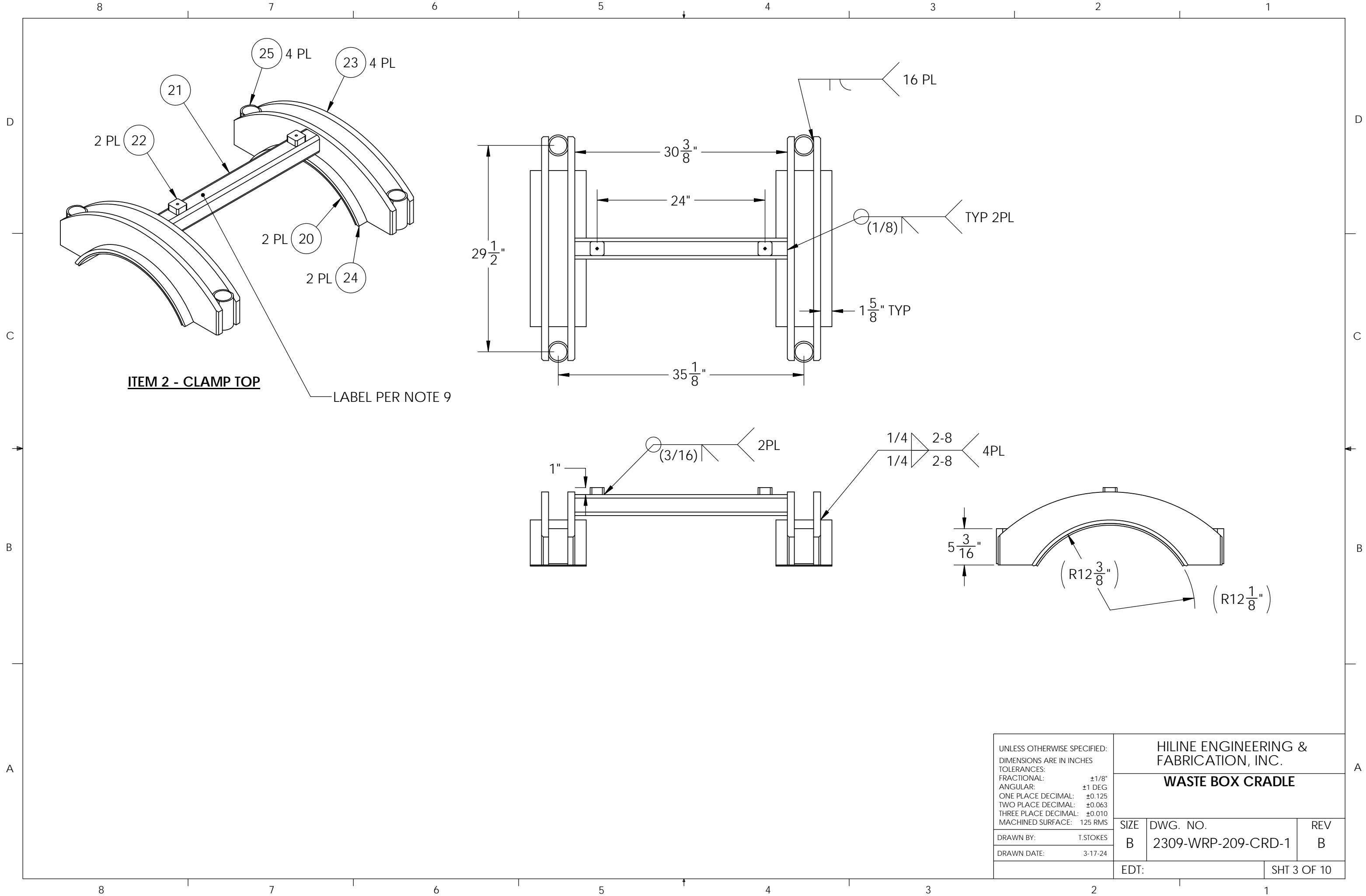


ITEM 1 - WASTE BOX CRADLE ASSEMBLY



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 TWO PLACE DECIMAL: ± 0.063
 THREE PLACE DECIMAL: ± 0.010
 MACHINED SURFACE: 125 RMS

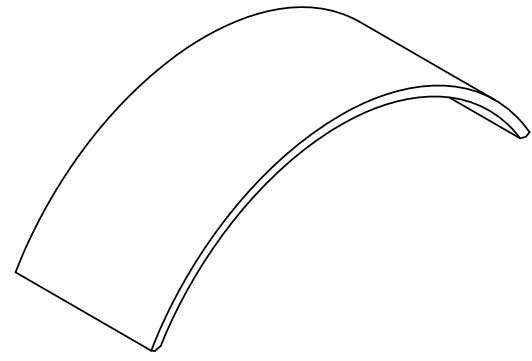
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 FABRICATION, INC.

WASTE BOX CRADLE

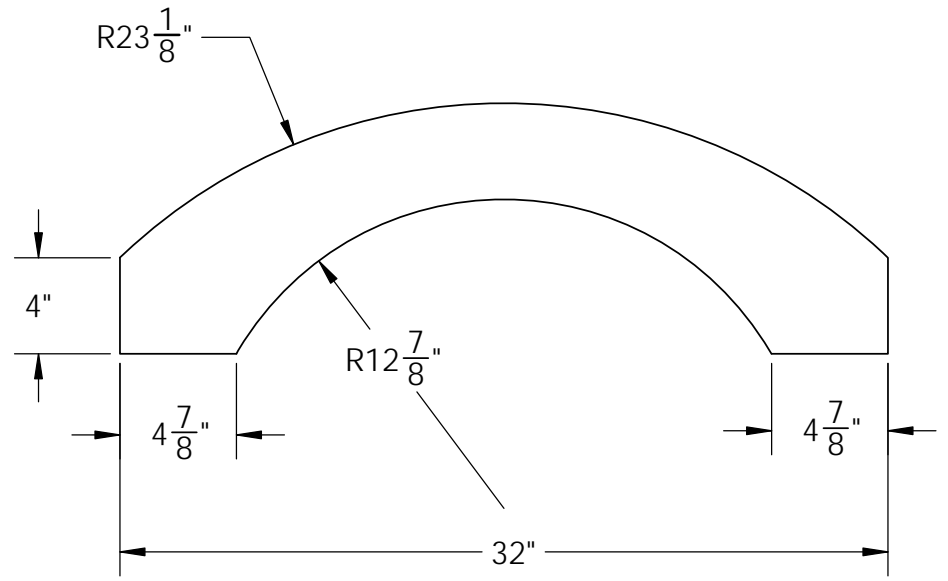
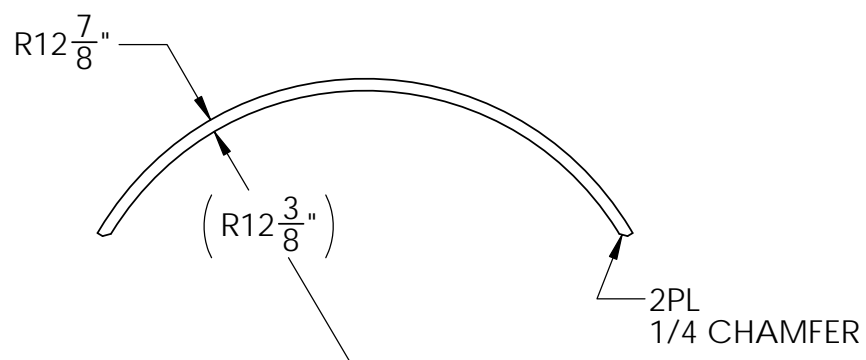
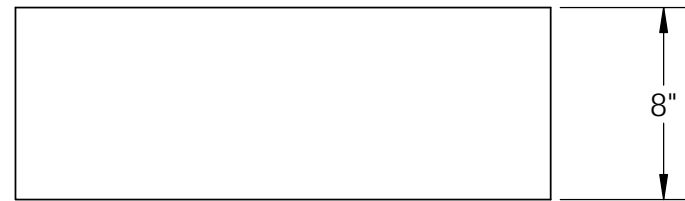
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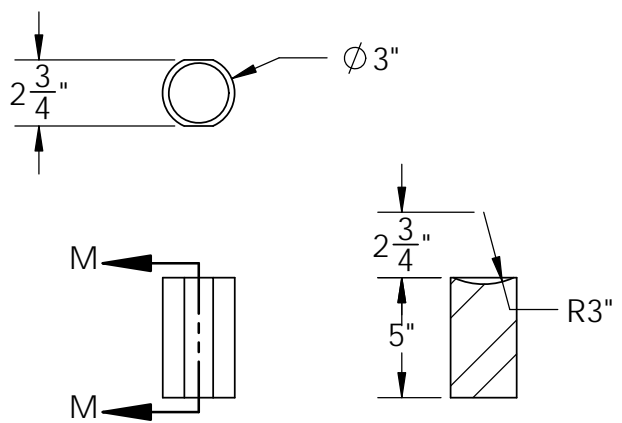
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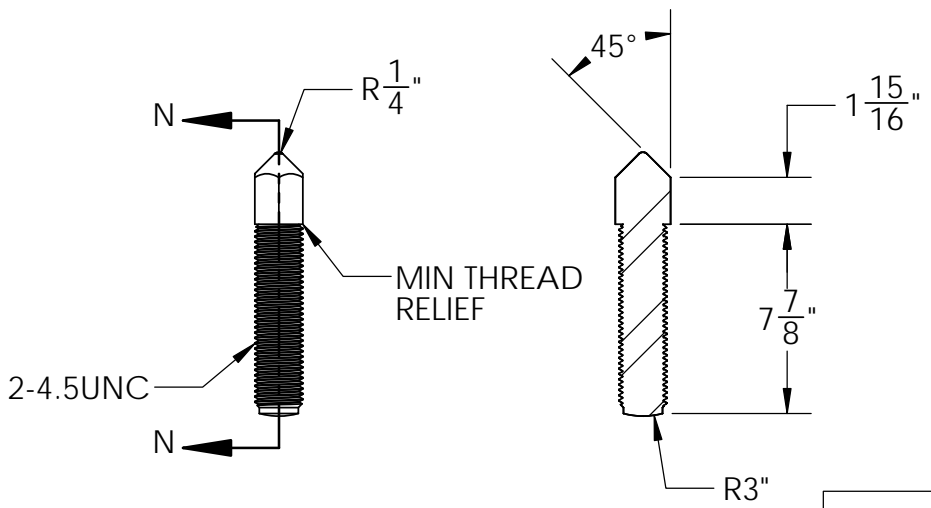
ITEM 24 - CLAMP SADDLE PLATE



ITEM 23 - CLAMP SIDE PLATE



ITEM 25 - BAR SOCKET



ITEM 12 - CLAMP SCREW

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 TOLERANCES:
 FRACTIONAL: ±1/8"
 ANGULAR: ±1 DEG
 ONE PLACE DECIMAL: ±0.125
 TWO PLACE DECIMAL: ±0.063
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 MACHINED SURFACE: 125 RMS

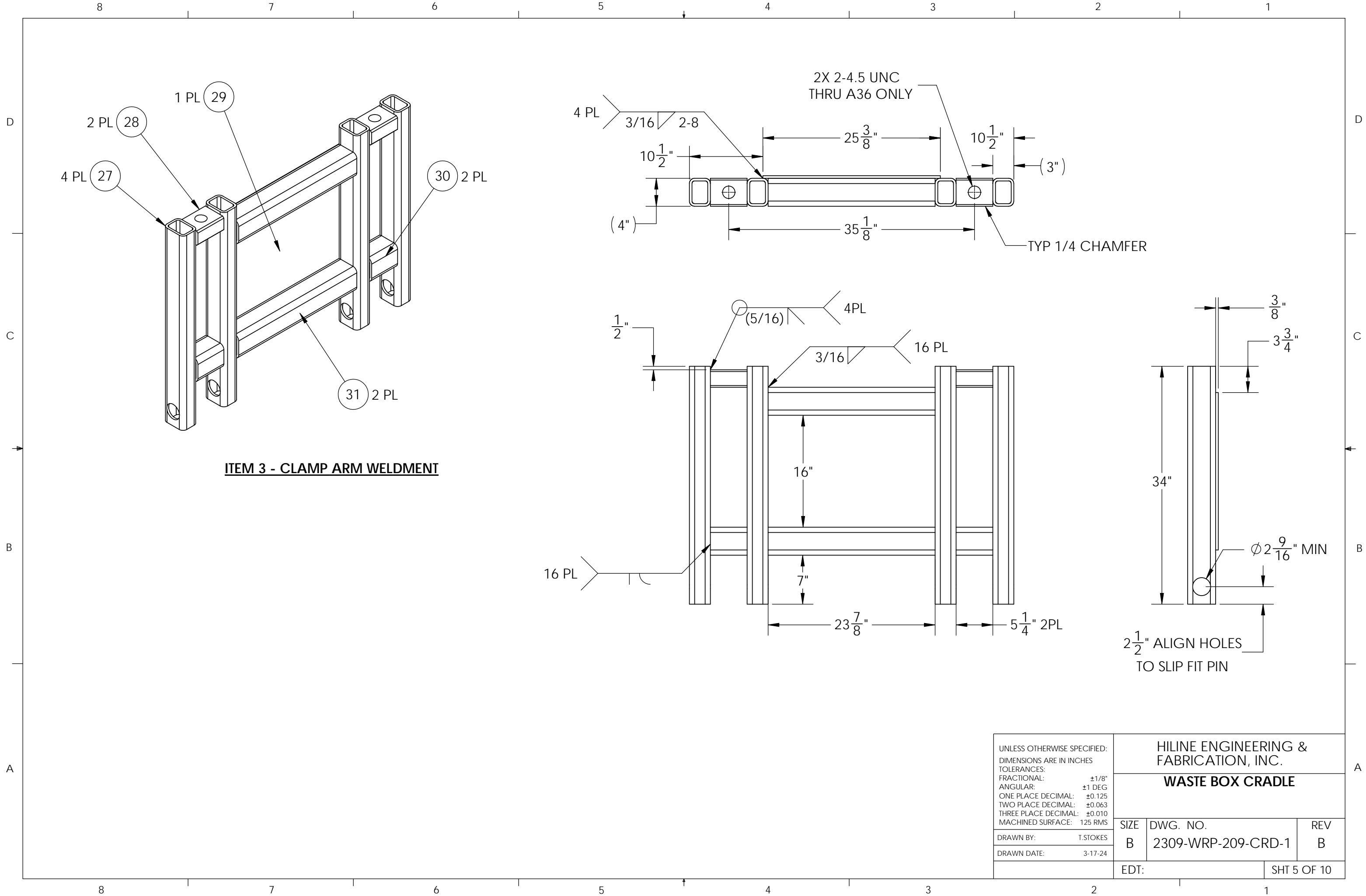
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WASTE BOX CRADLE

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 DRAWN DATE: 3-17-24

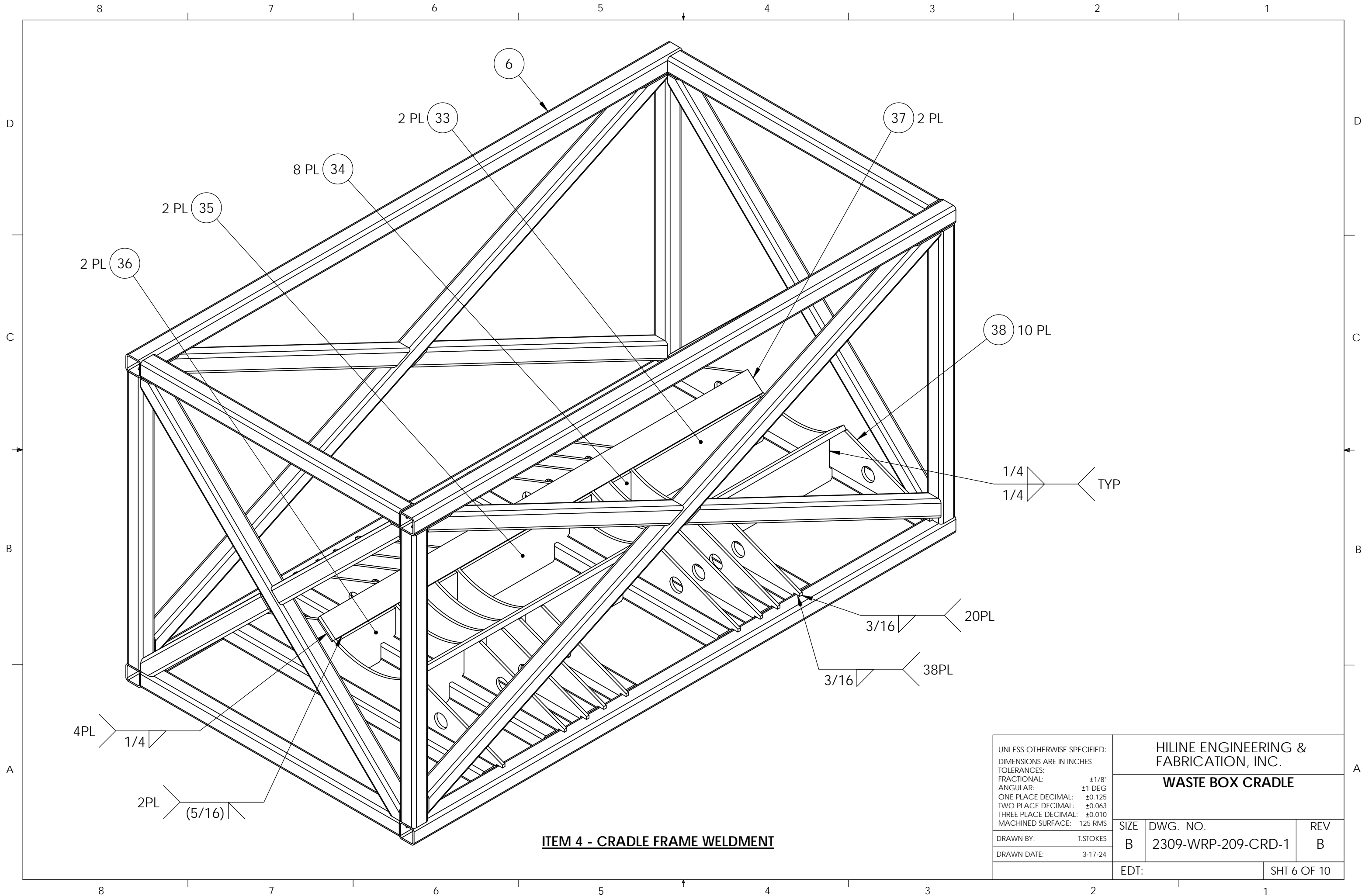
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ITEM 3 - CLAMP ARM WELDMENT

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B	2309-WRP-209-CRD-1	B			
DRAWN BY: T.STOKES		EDT:			
DRAWN DATE: 3-17-24		SHT 5 OF 10			



ITEM 4 - CRADLE FRAME WELDMENT

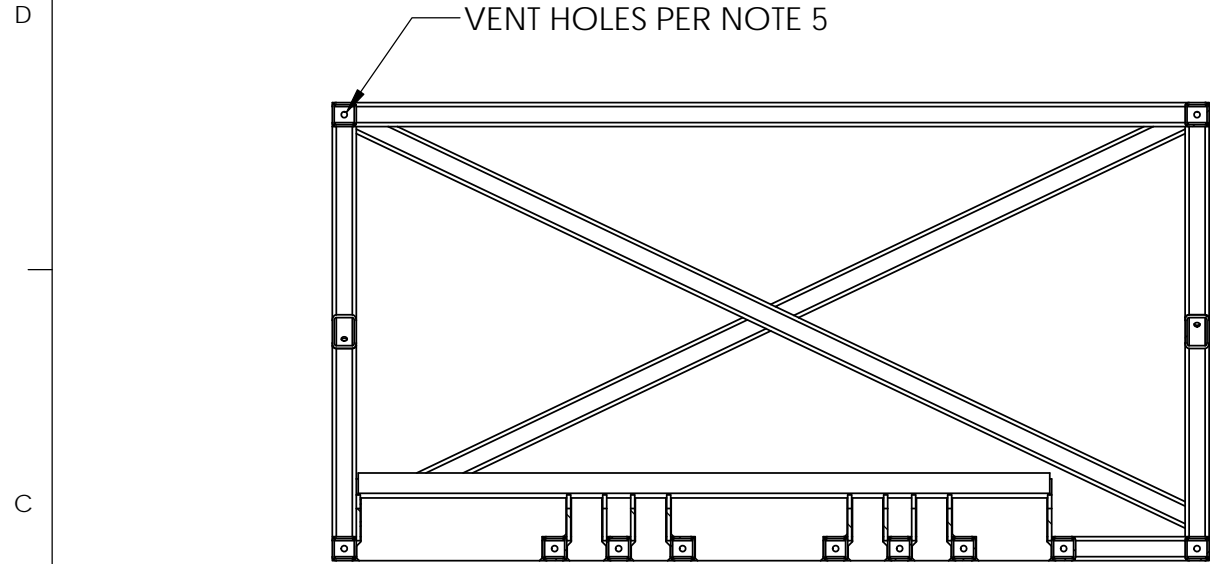
UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 TOLERANCES:
 FRACTIONAL: ±1/8"
 ANGULAR: ±1 DEG
 ONE PLACE DECIMAL: ±0.125
 TWO PLACE DECIMAL: ±0.063
 THREE PLACE DECIMAL: ±0.010
 MACHINED SURFACE: 125 RMS

**HILINE ENGINEERING &
 FABRICATION, INC.**

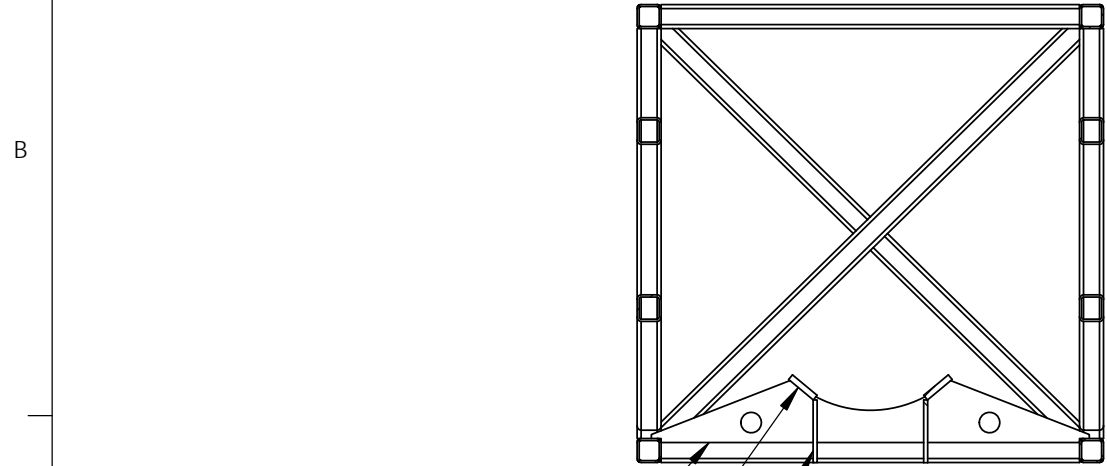
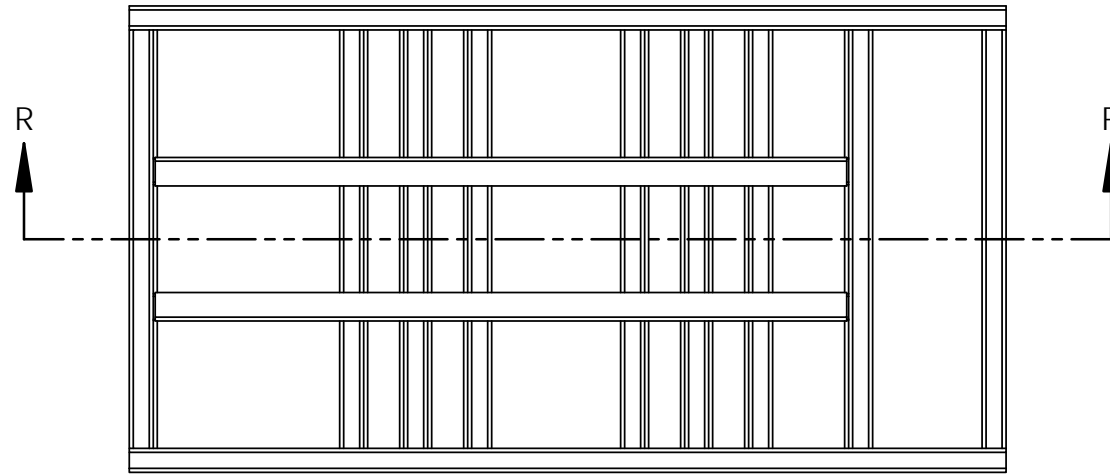
WASTE BOX CRADLE

DRAWN BY:	T.STOKES	SIZE	DWG. NO.	REV
DRAWN DATE:	3-17-24	B	2309-WRP-209-CRD-1	B
EDT:			SHT 6 OF 10	

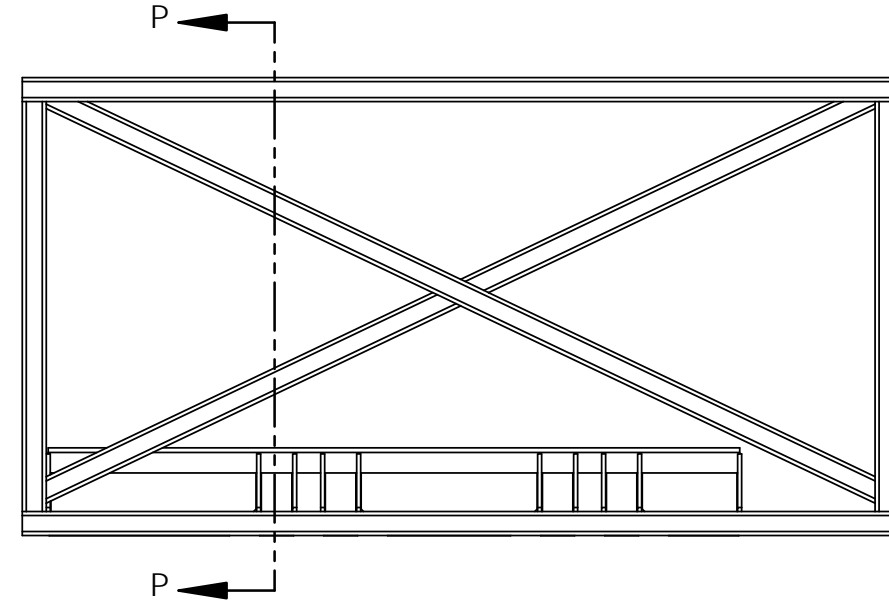
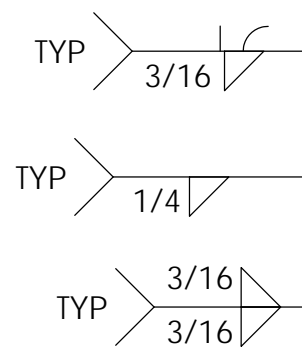
8 7 6 5 4 3 2 1



SECTION R-R



SECTION P-P



UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 TOLERANCES:
 FRACTIONAL: ±1/8"
 ANGULAR: ±1 DEG
 ONE PLACE DECIMAL: ±0.125
 TWO PLACE DECIMAL: ±0.063
 THREE PLACE DECIMAL: ±0.010
 MACHINED SURFACE: 125 RMS

DRAWN BY: T.STOKES
 DRAWN DATE: 3-17-24

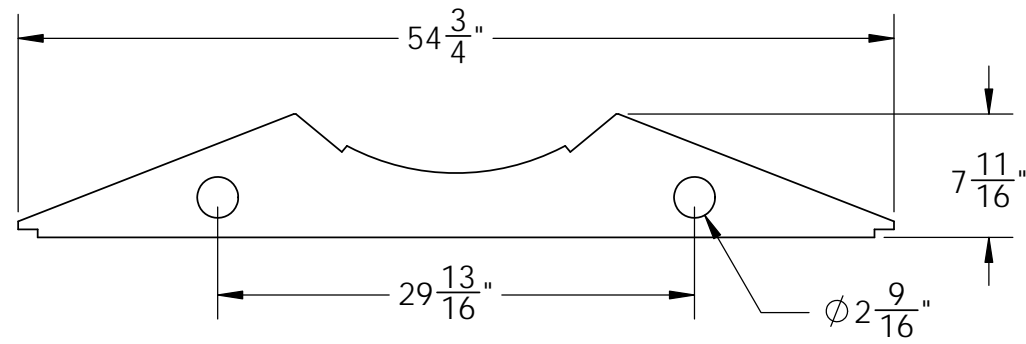
HILINE ENGINEERING &
 FABRICATION, INC.

WASTE BOX CRADLE

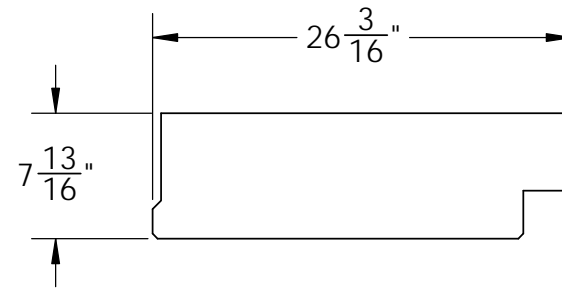
SIZE	DWG. NO.	REV
B	2309-WRP-209-CRD-1	B

EDT: SHT 7 OF 10

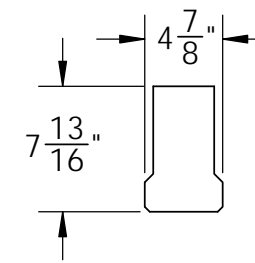
8 7 6 5 4 3 2 1



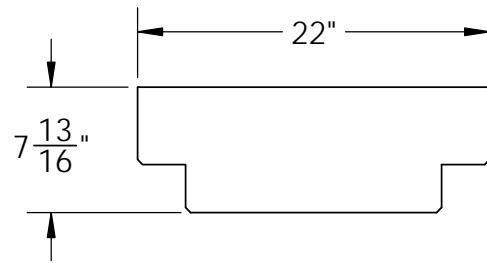
ITEM 38 - PIN PLATE
WATER JET DIRECT FROM CAD FILE



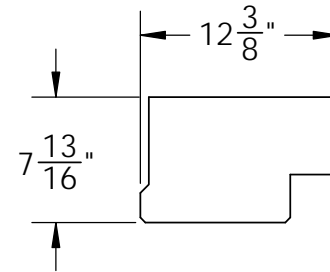
ITEM 33 - GUSSET PLATE 1
WATER JET DIRECT FROM CAD FILE



ITEM 34 - GUSSET PLATE 2
WATER JET DIRECT FROM CAD FILE

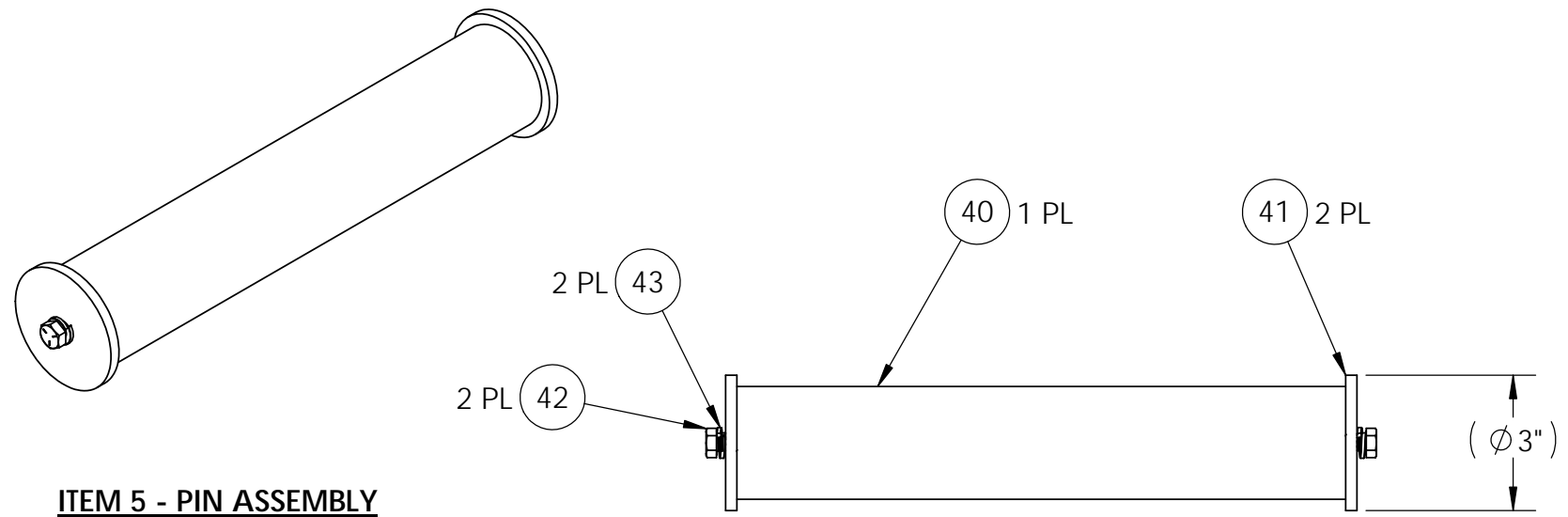


ITEM 35 - GUSSET PLATE 3
WATER JET DIRECT FROM CAD FILE

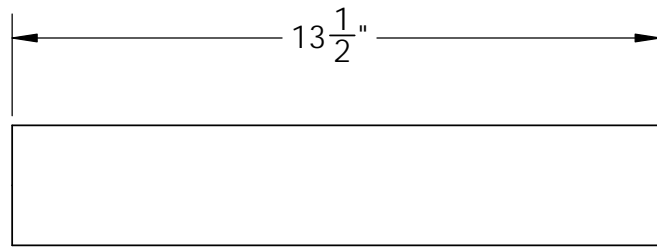


ITEM 36 - GUSSET PLATE 4
WATER JET DIRECT FROM CAD FILE

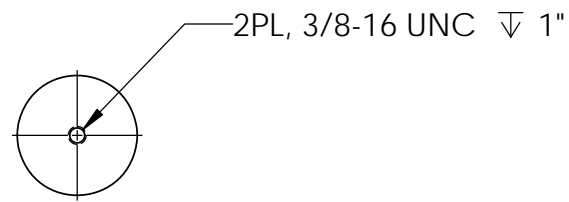
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: ±1/8" ANGULAR: ±1 DEG ONE PLACE DECIMAL: ±0.125 TWO PLACE DECIMAL: ±0.063 THREE PLACE DECIMAL: ±0.010 MACHINED SURFACE: 125 RMS	HILINE ENGINEERING & FABRICATION, INC.		
	WASTE BOX CRADLE		
DRAWN BY: T.STOKES	SIZE: B	DWG. NO.: 2309-WRP-209-CRD-1	REV: B
DRAWN DATE: 3-17-24	EDT:		SHT 8 OF 10



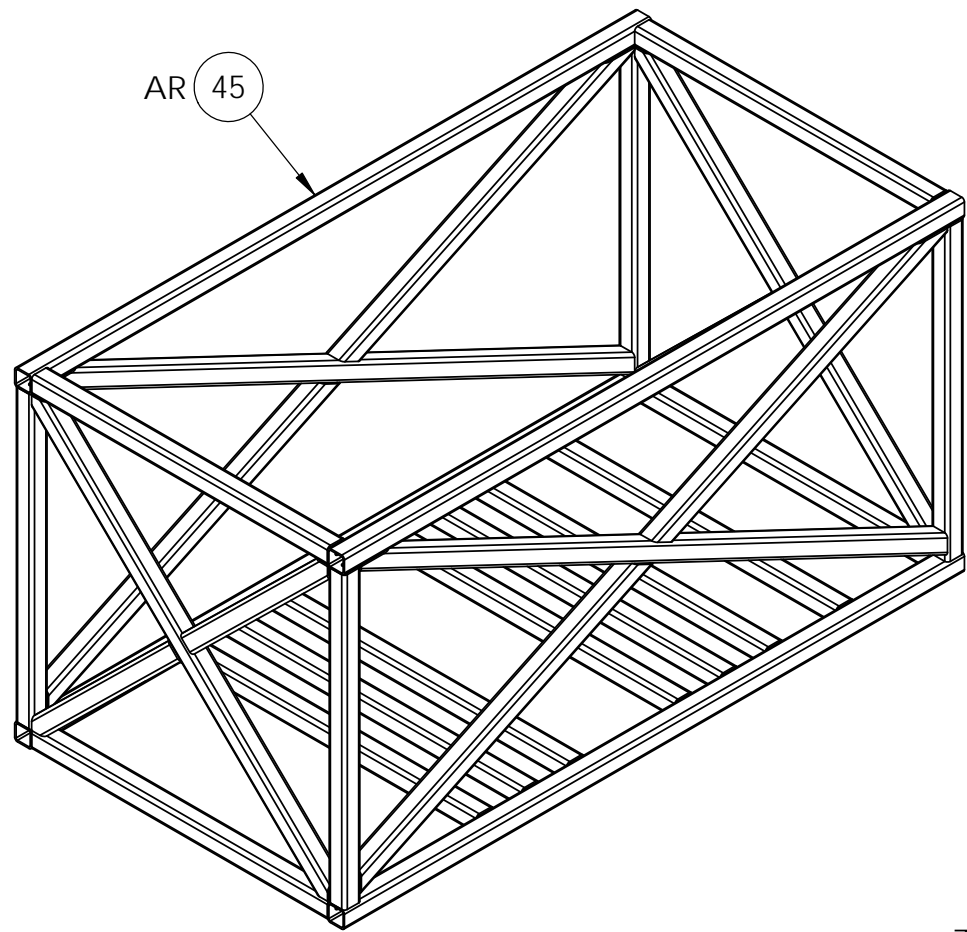
ITEM 5 - PIN ASSEMBLY



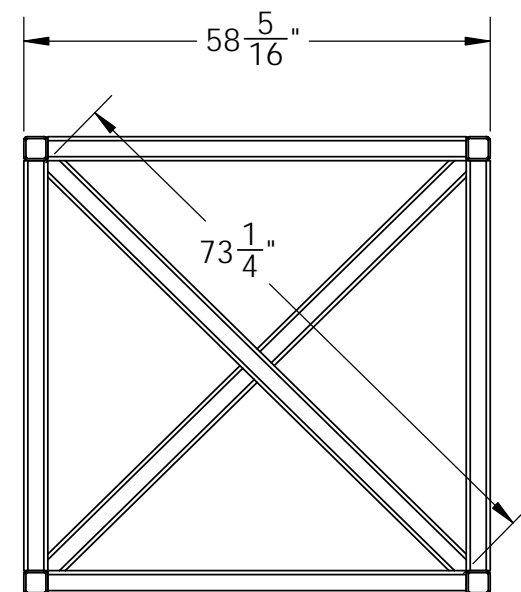
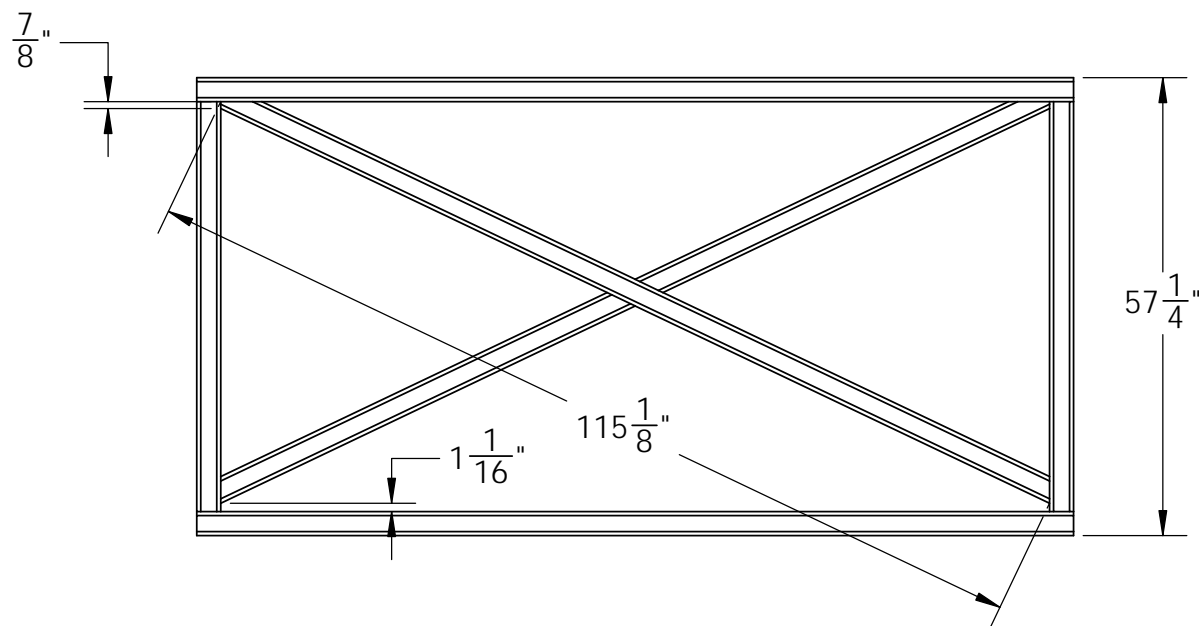
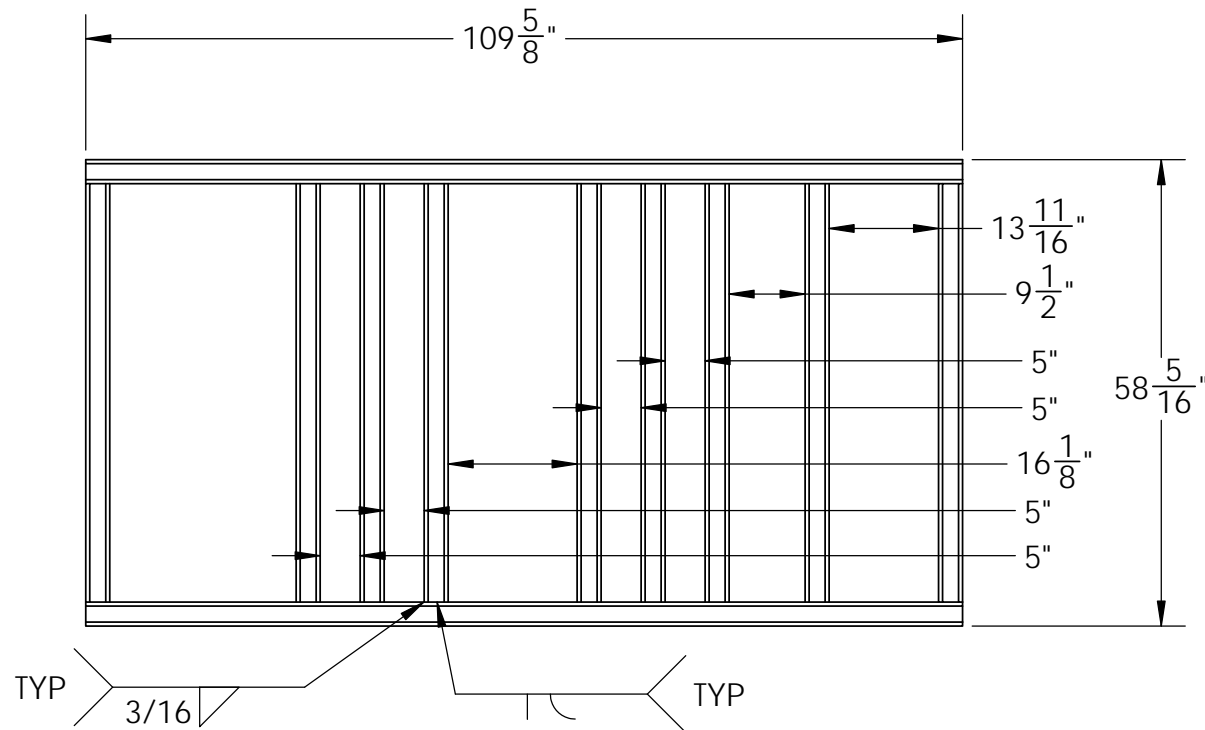
ITEM 40 - PIN



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: ±1/8" ANGULAR: ±1 DEG ONE PLACE DECIMAL: ±0.125 TWO PLACE DECIMAL: ±0.063 THREE PLACE DECIMAL: ±0.010 MACHINED SURFACE: 125 RMS		HILINE ENGINEERING & FABRICATION, INC.	
		WASTE BOX CRADLE	
DRAWN BY: T.STOKES	SIZE: B	DWG. NO.: 2309-WRP-209-CRD-1	REV: B
DRAWN DATE: 3-17-24	EDT:		SHT 9 OF 10



ITEM 6 - TUBE FRAME WELDMENT



UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: ±1/8" ANGULAR: ±1 DEG ONE PLACE DECIMAL: ±0.125 TWO PLACE DECIMAL: ±0.063 THREE PLACE DECIMAL: ±0.010 MACHINED SURFACE: 125 RMS		HILINE ENGINEERING & FABRICATION, INC. WASTE BOX CRADLE	
DRAWN BY: T.STOKES	SIZE: B		
DRAWN DATE: 3-17-24	EDT:		SHT 10 OF 10

GENERAL NOTES:

1. BREAK ALL SHARP EDGES & REMOVE ALL BURRS.
2. WELD & INSPECT CARBON STEEL PER AWS D1.1-2020.
USE OF ASME IX WELD PROCEDURES AND QUALIFICATIONS IS ACCEPTABLE.
3. THE ESTIMATED WEIGHTS ARE:
ITEM 2 - SEPARATION CRADLE ASSEMBLY (UNLOADED): 2,500 LBS
4. POWDER COAT THE EXPOSED CARBON STEEL. ABRASIVE BLAST WITH 1 TO 2 MIL PROFILE, WITH 2.5 MIL MINIMUM COATING. USE A TGIC POLYESTER PRODUCT FOR TOPCOAT WITH A ZINC RICH PRIMER, OR A WRPS APPROVED ALTERNATE COATING SYSTEM.
5. INSTALL ACTEK SWIVEL LIFT RINGS IN THE LIFT BLOCK FEATURES FOR LIFTING PURPOSE PER ACTEK INSTALLATION DIRECTIONS. ACTEK SWIVEL LIFT RINGS ARE FOR LIFTING THE ITEM 2 (UNLOADED SEPARATION CRADLE ONLY) AND ARE NOT RATED TO LIFT THE SEPARATION CRADLE WHEN LOADED WITH THE SHIELDED TBI ASSEMBLY HILINE 2309-WRP-209-SHIELD.
6. USE PLIO-BOND OR EQUIVALENT GLUE TO SECURE EPDM TO THE MATING PARTS.
7. USE JACKSTAND TUBE OUT OF JACKSTAND ASSEMBLY FOR ITEM 14.
8. SEPARATION CRADLE ASSEMBLY USE INSTRUCTIONS:
 - 8.1 PLACE SEPARATION CRADLE ON FIRM LEVEL GROUND.
 - 8.2 PLACE PUMP COLUMN ASSEMBLY SUPPLEMENT ONTO THE SEPARATION CRADLE AS SHOWN.
 - 8.3 USING ITEM 15, ADJUST THE PUMP LIFT FRAME ASSEMBLY MAX AMOUNT TOWARDS THE SHIELD.
 - 8.4 ADJUST THE V-TOP JACK SCREWS UNTIL CONTACT WITH THE PUMP CAGE.
 - 8.5 ADJUST V-TOP JACK SCREWS TO FACILITATE SEPARATION OF THE PUMP FROM THE SHIELD.
 - 8.6 REMOVE 4 FASTENERS THAT SECURE THE PUMP TO THE SHIELD.
 - 8.7 TIGHTEN THE ADJUSTABLE RATCHET JACK TO PULL THE PUMP AWAY FROM THE SHIELD.
 - 8.8 LIFT SHIELD SECTION AWAY AS SHOWN ON HILINE DWG 2309-WRP-209-H&R.
9. LIFTING INSTRUCTIONS:
 - ITEM 2 MAY BE LIFTED AND HANDLED BY A FORKLIFT.
 - ENGAGE FORKS UNDER THE 4X8 BOTTOM TUBE, EQUALLY SPACED ABOUT THE CENTER OF GRAVITY.
10. LABELS TO USE BLACK TEXT ON YELLOW BACKGROUND, MIN TEXT HEIGHT 1/2" TALL.

LABEL 1:
SEPARATION CRADLE
WRPS 85457
HILINE 2309-WRP-209-SEP
UNLOADED WEIGHT: 2500 LBS

LABEL 2: ONE LABEL ON EACH SIDE OF THE 4X8 TUBE.
FORKLIFT
EQUALLY
ABOUT C.G.
11. RESERVED NOTE.

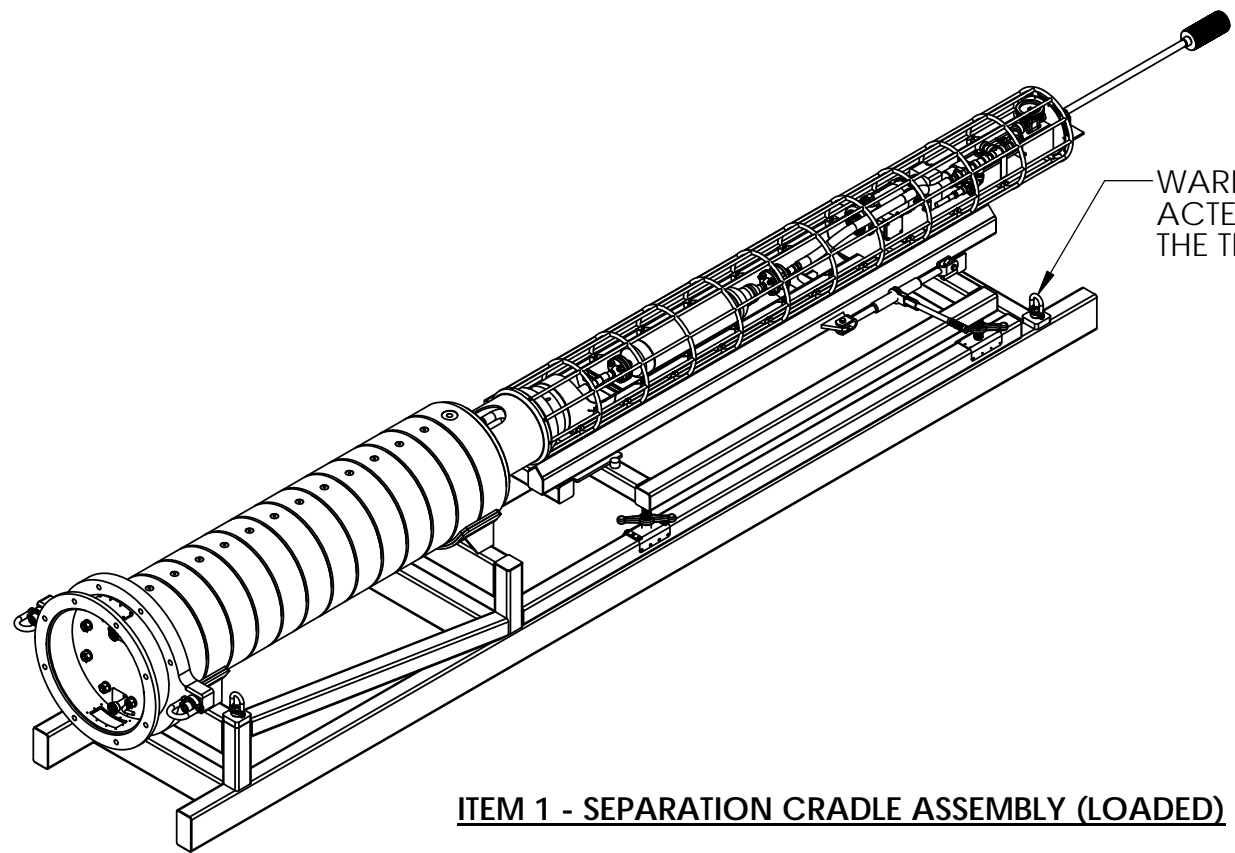
BILL OF MATERIALS												
-100	-090	-080	-070	-060	-050	-040	-030	-020	-010	DESCRIPTION	SPECIFICATION	ITEM NO:
									X	SEPARATION CRADLE ASSEMBLY (LOADED)		1
									X	1 SEPARATION CRADLE ASSEMBLY (UNLOADED)		2
							X	1		CRADLE FRAME WELDMENT		3
						X		1		LIFT FRAME ASSEMBLY		4
					X			1		PUMP LIFT FRAME ASSEMBLY		5
				X								6
			X									7
	X											8
X												9
									1	PUMP COLUMN ASSEMBLY SUPPLEMENT	HILINE 2309-WRP-209-C	11
												12
								AR		EPDM RUBBER, 1/2" THICK, 10" WIDE	COM'L EPDM	13
								4		JACK STAND TUBE, 2000LB RATED	(MCMMASTER 8732T26)	14
								1		ADJUSTABLE RATCHET JACK	AGRI SUPPLY 106054	15
								4		SWIVEL HOIST RING, 5/8-11, 4000LB RATING	ACTEK MFG 46004	16
												17
								2		TUBE STEEL, 8 x 4 x 1/4", 20 FEET	ASTM A500 GR.B	18
								3		TUBE STEEL, 8 x 4 x 1/4", 34 INCH	ASTM A500 GR.B	19
								2		COPEP TUBE STEEL, 8 x 4 x 1/4"	ASTM A500 GR.B	20
								4		CAP 8x4, 11GA	ASTM A1011 CARBON STEEL	21
								4		LIFT PLATE, 1-1/4" THICK	ASTM A36	22
								2		BRACE, TUBE STEEL 4 x 4 x 1/4	ASTM A500 GR.B	23
								2		SADDLE PLATE, 1/2" THICK	ASTM A36	24
								2		TUBE STEEL, 4 x 4 x 1/4", 132 INCH	ASTM A500 GR.B	25
								4		TUBE STEEL, 4 x 4 x 1/4", 14-1/2 INCH	ASTM A500 GR.B	26
					4	4	4			CAP 4x4, 11GA	ASTM A1011 CARBON STEEL	27
								4		GUSSET, 3/8 PLATE	ASTM A36	28
												29
								2		TUBE STEEL, 4 x 4 x 1/4", 92 INCH	ASTM A500 GR.B	30
								2		TUBE STEEL, 4 x 4 x 1/4", 36 INCH	ASTM A500 GR.B	31
								2		ROUND BAR, 1-3/4" OD x 1-3/4" LONG	ASTM A36	32
								2		ROUND BAR, 1" OD x 1-3/4" LONG	ASTM A36	33
								1		LUG 1, 3/4" PLATE	ASTM A36	34
								4		HIGH V-STYLE SUPPORT, MODIFIED	MCMMASTER 8732T21	35
												36
						4				CAP 3, 11GA	ASTM A1011 CARBON STEEL	37
					2					TUBE STEEL, 4 x 4 x 1/4", 17 INCH	ASTM A500 GR.B	38
					2					TUBE STEEL, 4 x 4 x 1/4", 10 FEET	ASTM A500 GR.B	39
					2					ANGLE IRON, 2-1/2 X 2-1/2 X 1/4, 10 FEET	ASTM A36	40
					1					LUG 2, 3/4" PLATE	ASTM A36	41
					4					SLIP SHEET, DELRIN ACETAL AF SHEET, 1/2" THK	(MCMMASTER 8578K514)	42
					24					FLAT HEAD SCREWS, 1/4-20, 82DEG, 3/4"L	(MCMMASTER 91263A559)	43
												44
								4		RUBBER SEAL, 3/16" THICK	COM'L EPDM	45
								56		BUTTON HD HEX DR 1/4-20 UNC X 1"L, SST	(MCMMASTER 92949A542)	46
								8		CLAMP BAR, 1/4" THICK	ASTM A240, 304 OR 304L	47
												48
												49

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: ±1/8" ANGULAR: ±1 DEG ONE PLACE DECIMAL: ±0.125 TWO PLACE DECIMAL: ±0.063 THREE PLACE DECIMAL: ±0.010 MACHINED SURFACE: 125 RMS		HILINE ENGINEERING & FABRICATION, INC. SEPARATION CRADLE	
DRAWN BY: T.STOKES	SIZE: B		
DRAWN DATE: 3-17-24	EDT:		SHT 1 OF 9

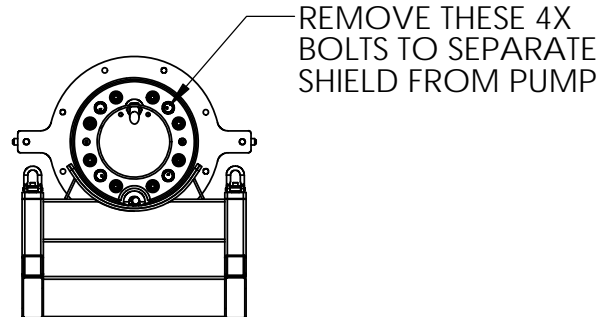
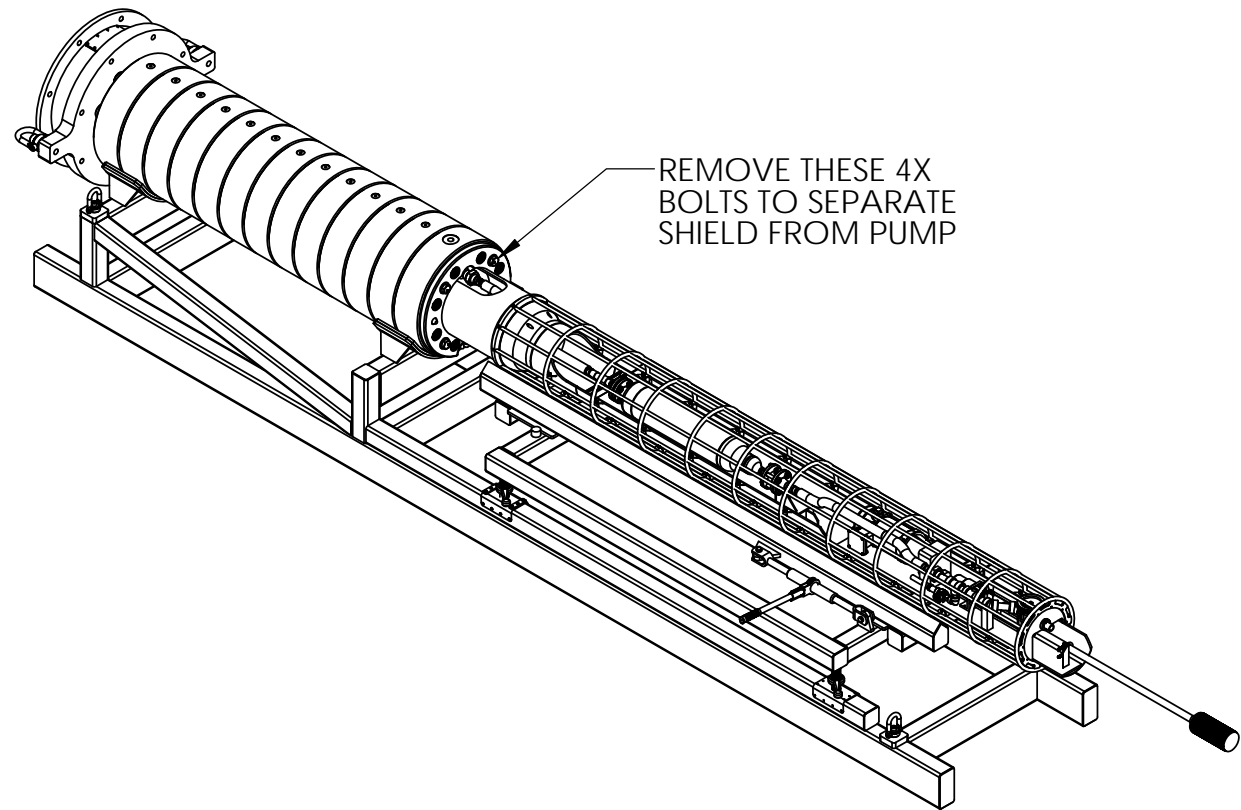
8 7 6 5 4 3 2 1

D
C
B
A

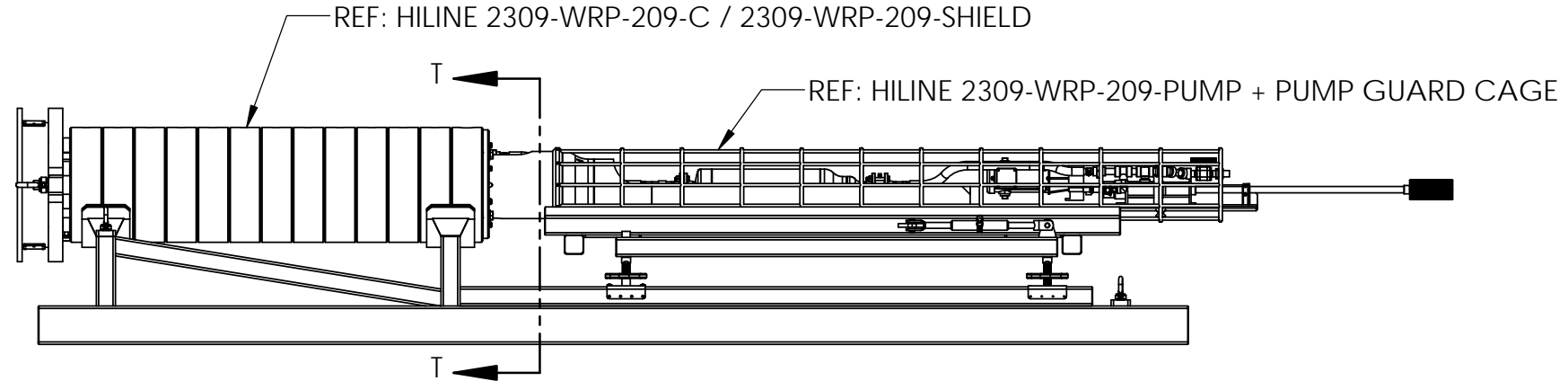
D
C
B
A



ITEM 1 - SEPARATION CRADLE ASSEMBLY (LOADED)



SECTION T-T



UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 TOLERANCES:
 FRACTIONAL: ±1/8"
 ANGULAR: ±1 DEG
 ONE PLACE DECIMAL: ±0.125
 TWO PLACE DECIMAL: ±0.063
 THREE PLACE DECIMAL: ±0.010
 MACHINED SURFACE: 125 RMS

DRAWN BY: T.STOKES
 DRAWN DATE: 3-17-24

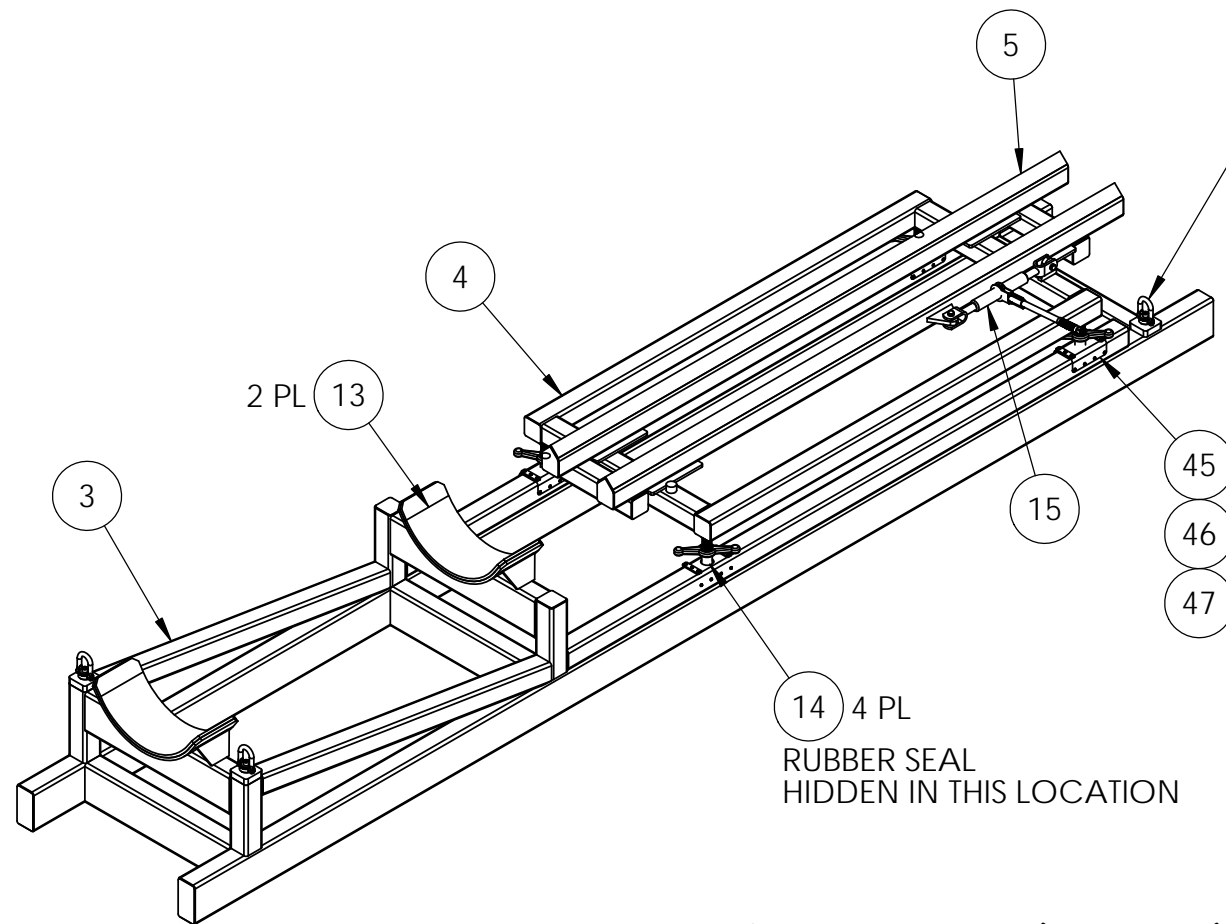
HILINE ENGINEERING & FABRICATION, INC.

SEPARATION CRADLE

SIZE	DWG. NO.	REV
B	2309-WRP-209-SEP	B

EDT: SHT 2 OF 9

8 7 6 5 4 3 2 1

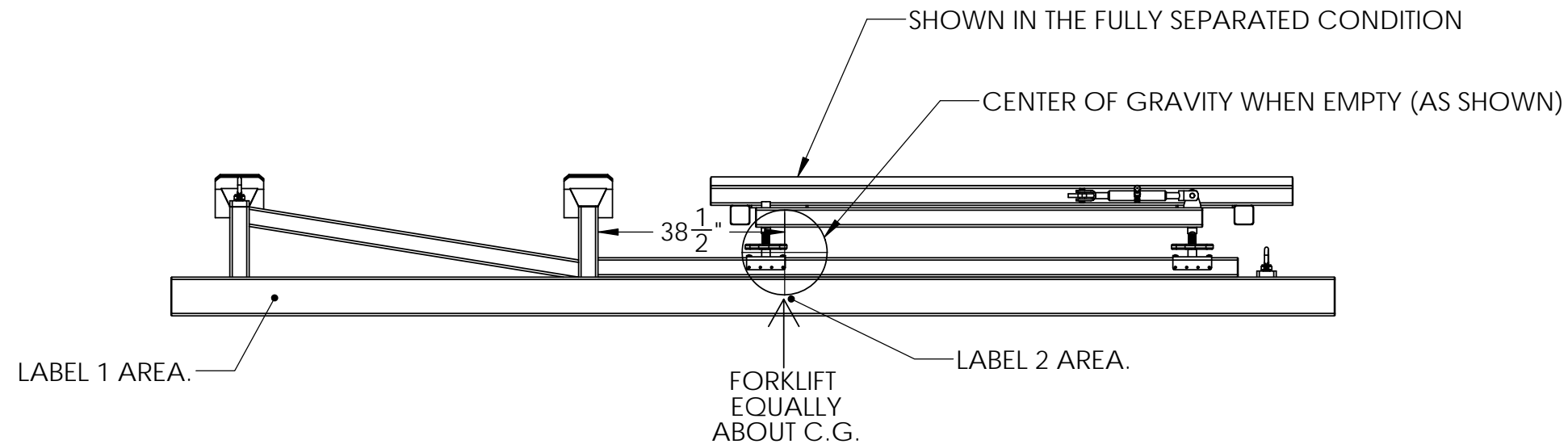


ITEM 2 - SEPARATION CRADLE ASSEMBLY (UNLOADED)

16 4 PL
 ONLY USE ACTEK LIFT RINGS
 FOR MOVING ITEM 2 (UNLOADED = EMPTY = NO TBI LOADED)

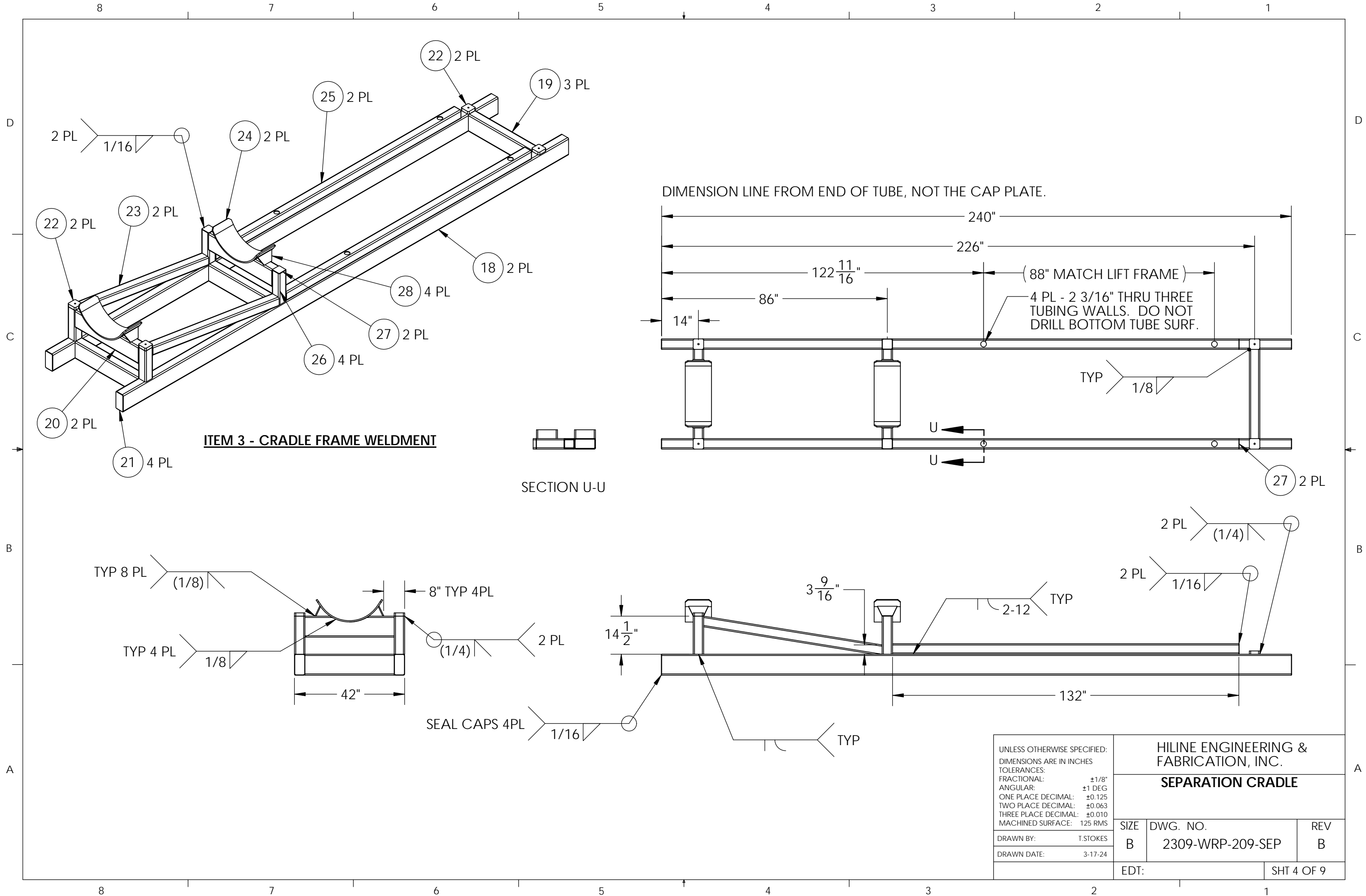
45 4 PL
 46 56 PL
 47 8 PL
 WRAP RUBBER OVER TUBE 4 PL,
 TRANSFER HOLES, DRILL & TAP TUBING 1/4-20 UNC.

14 4 PL
 RUBBER SEAL
 HIDDEN IN THIS LOCATION



ITEM 2 MAY BE LIFTED WITH A FORKLIFT
 BASED ON CENTER OF GRAVITY SHOWN ABOVE.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: ±1/8" ANGULAR: ±1 DEG ONE PLACE DECIMAL: ±0.125 TWO PLACE DECIMAL: ±0.063 THREE PLACE DECIMAL: ±0.010 MACHINED SURFACE: 125 RMS		HILINE ENGINEERING & FABRICATION, INC. SEPARATION CRADLE	
DRAWN BY: T.STOKES	SIZE: B		
DRAWN DATE: 3-17-24	EDT:		SHT 3 OF 9



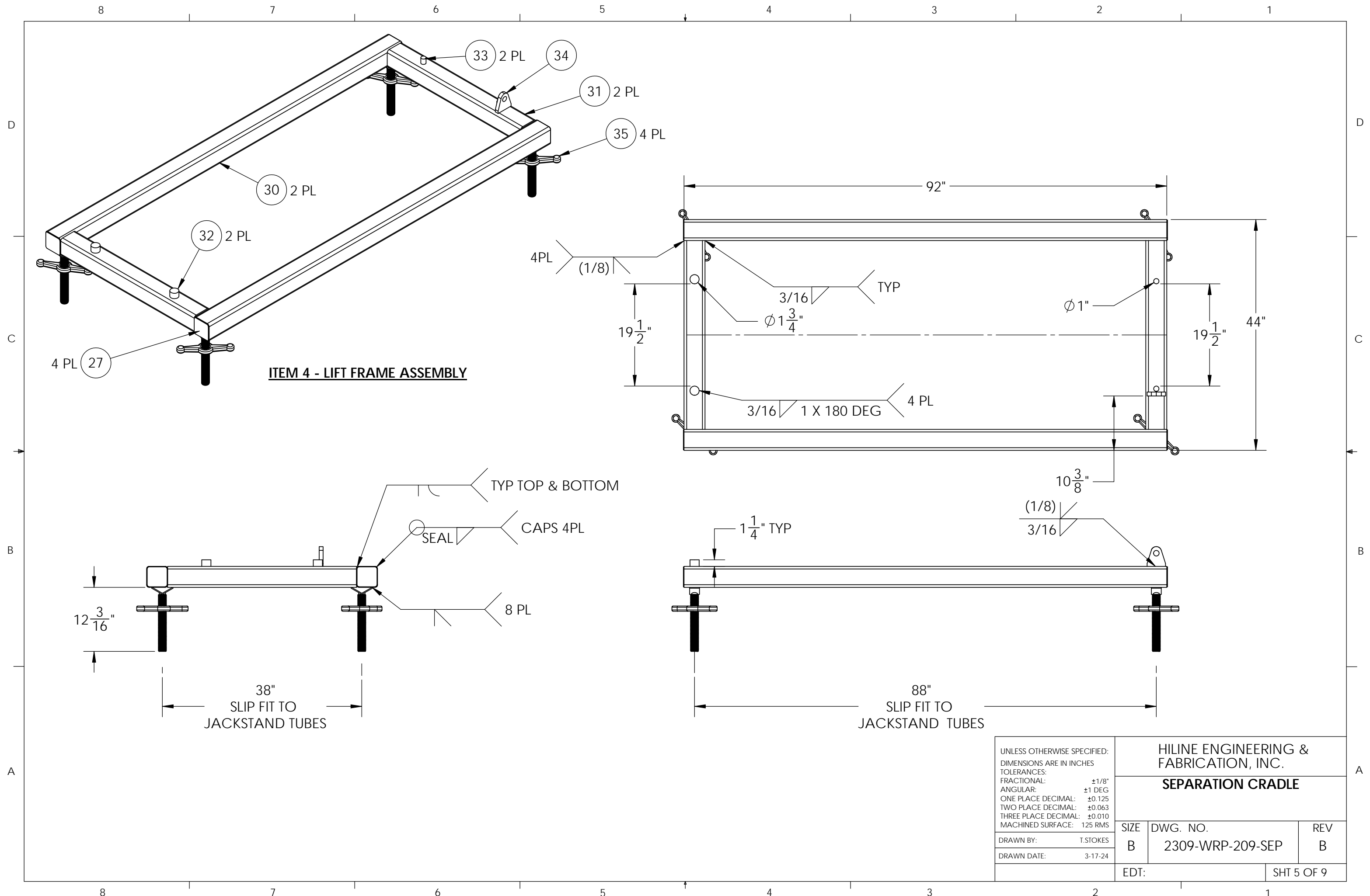
ITEM 3 - CRADLE FRAME WELDMENT

SECTION U-U

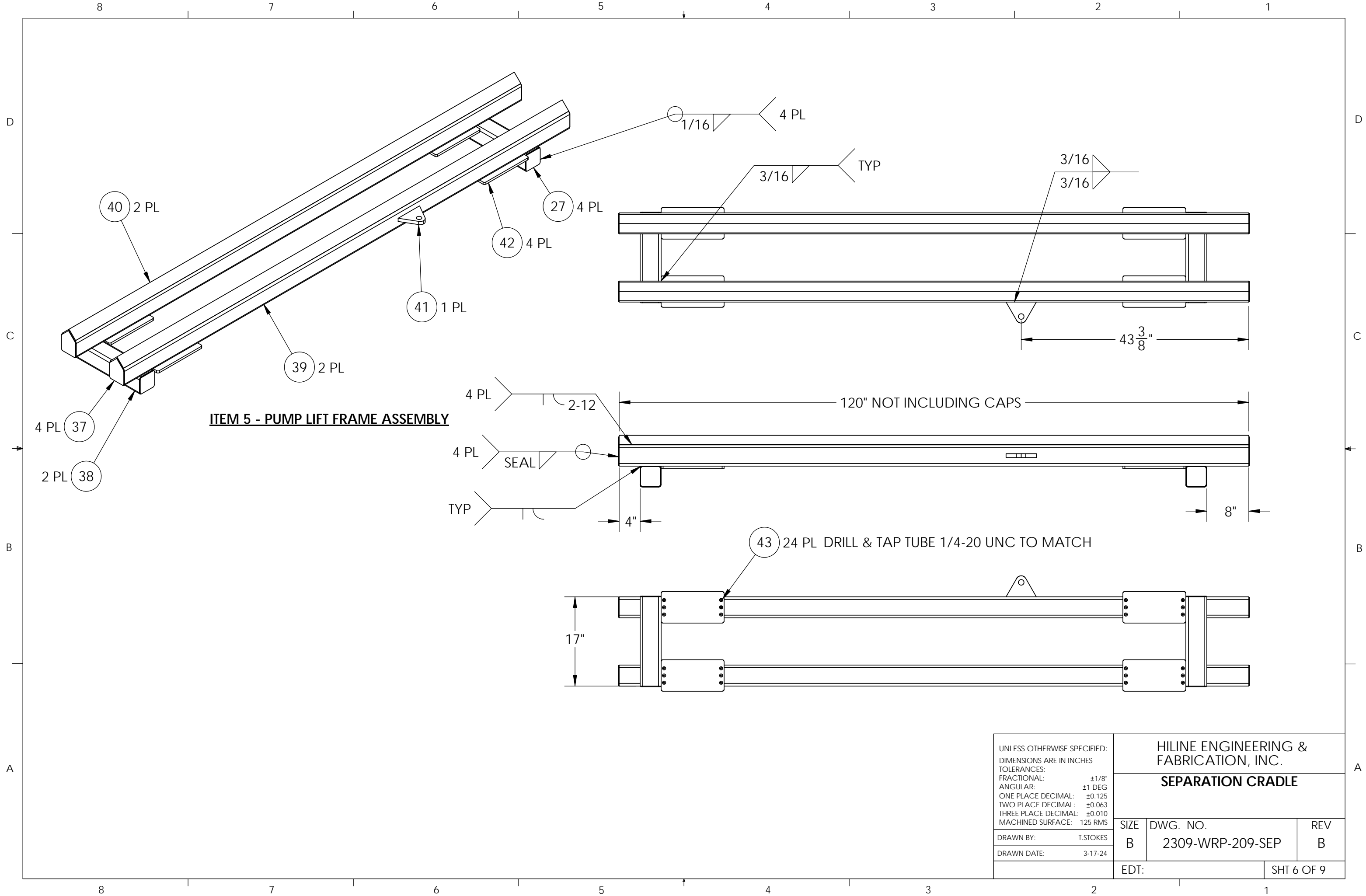
UNLESS OTHERWISE SPECIFIED:
 DIMENSIONS ARE IN INCHES
 TOLERANCES:
 FRACTIONAL: ±1/8"
 ANGULAR: ±1 DEG
 ONE PLACE DECIMAL: ±0.125
 TWO PLACE DECIMAL: ±0.063
 THREE PLACE DECIMAL: ±0.010
 MACHINED SURFACE: 125 RMS

HILINE ENGINEERING & FABRICATION, INC.		
SEPARATION CRADLE		
SIZE	DWG. NO.	REV
B	2309-WRP-209-SEP	B
EDT:		SHT 4 OF 9

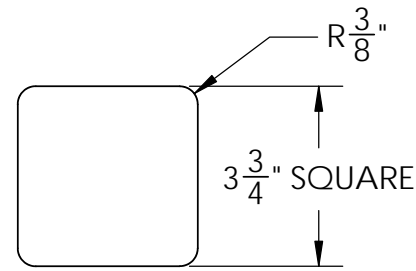
DRAWN BY: T.STOKES
 DRAWN DATE: 3-17-24



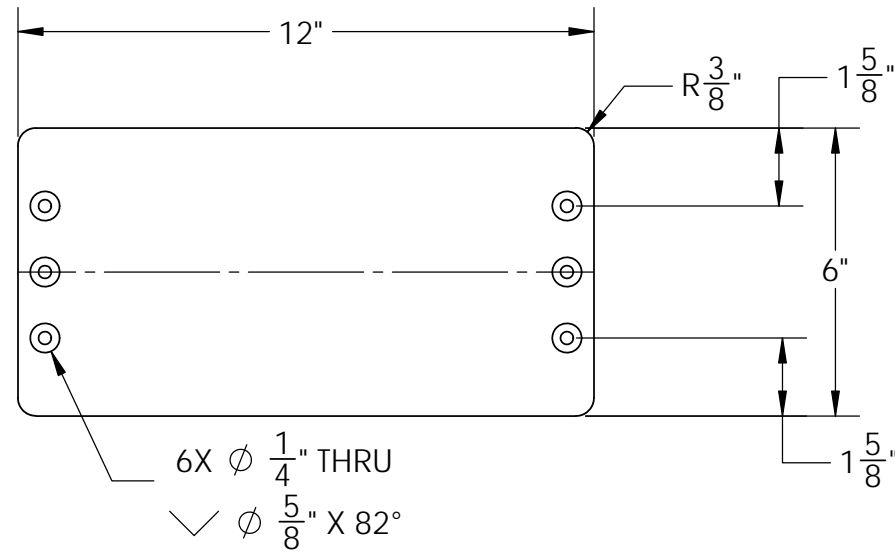
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: ±1/8" ANGULAR: ±1 DEG ONE PLACE DECIMAL: ±0.125 TWO PLACE DECIMAL: ±0.063 THREE PLACE DECIMAL: ±0.010 MACHINED SURFACE: 125 RMS		HILINE ENGINEERING & FABRICATION, INC. SEPARATION CRADLE	
DRAWN BY: T.STOKES	SIZE B		
DRAWN DATE: 3-17-24	EDT:		SHT 5 OF 9



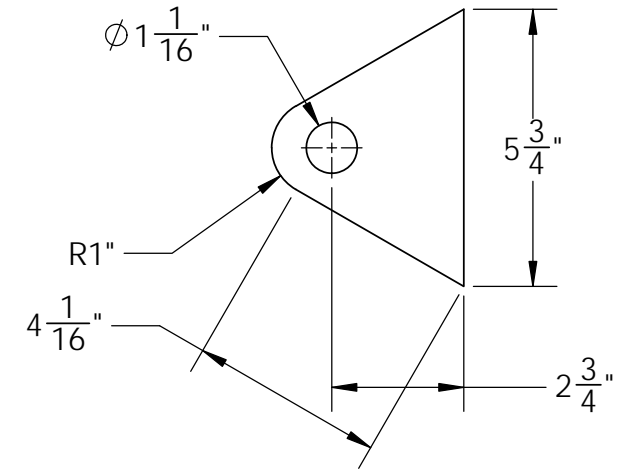
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: ±1/8" ANGULAR: ±1 DEG ONE PLACE DECIMAL: ±0.125 TWO PLACE DECIMAL: ±0.063 THREE PLACE DECIMAL: ±0.010 MACHINED SURFACE: 125 RMS		HILINE ENGINEERING & FABRICATION, INC. SEPARATION CRADLE	
DRAWN BY: T.STOKES	SIZE B		
DRAWN DATE: 3-17-24	EDT:		SHT 6 OF 9



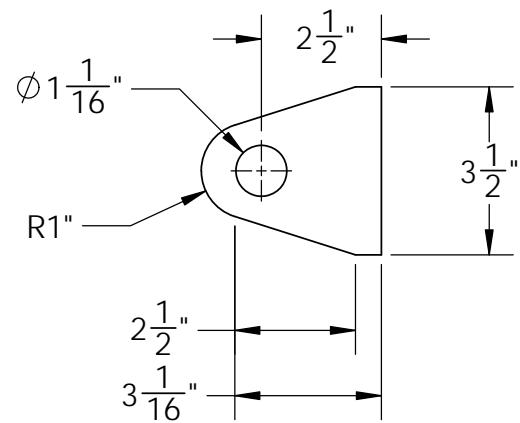
ITEM 27 - CAP 4x4



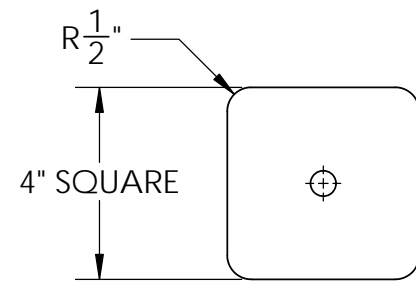
ITEM 42 - SLIP SHEET



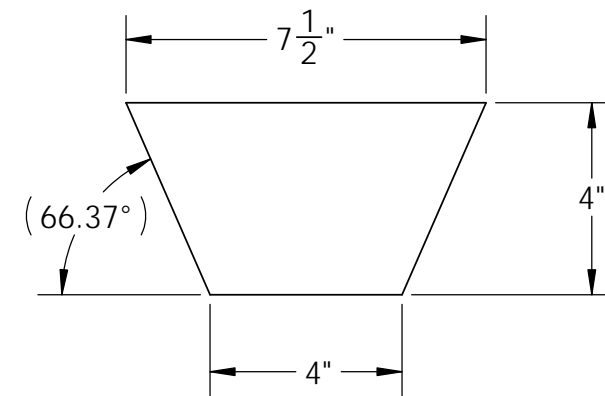
ITEM 41 - LUG 2



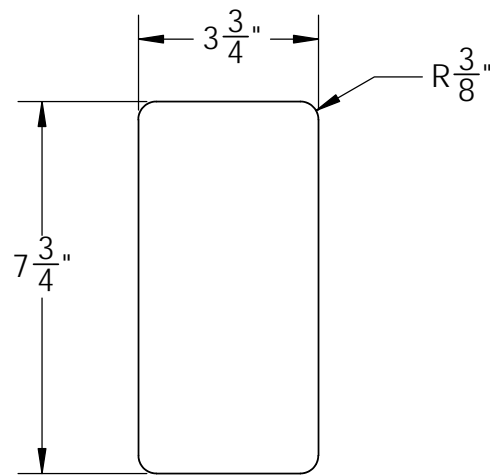
ITEM 34 - LUG 1



ITEM 22 - LIFT PLATE

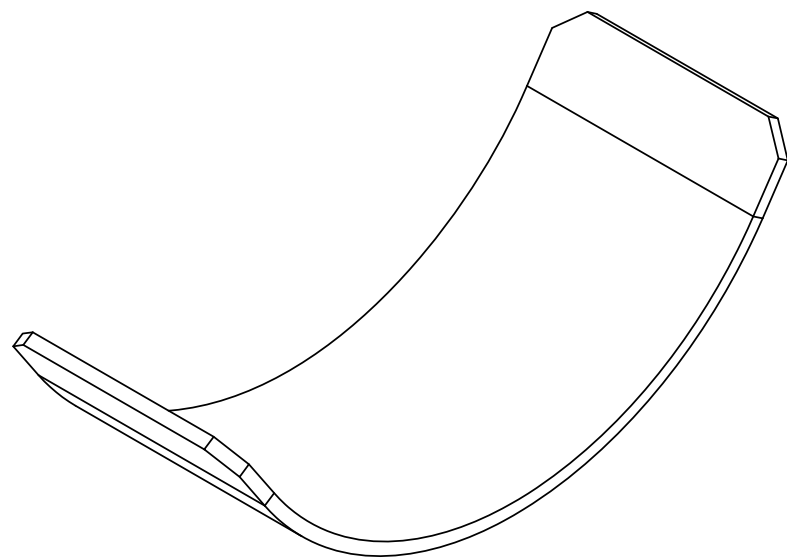


ITEM 28 - GUSSET PLATE



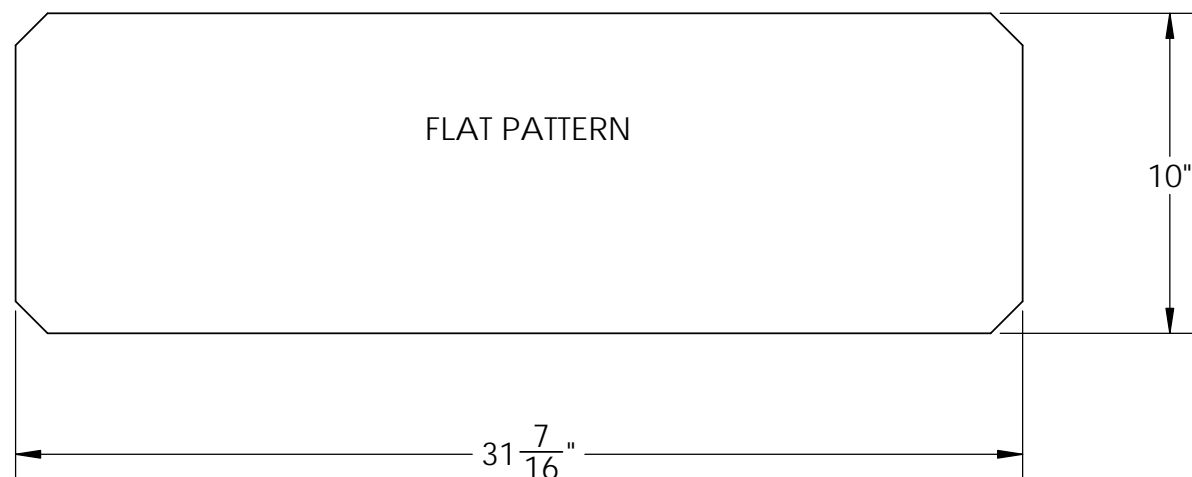
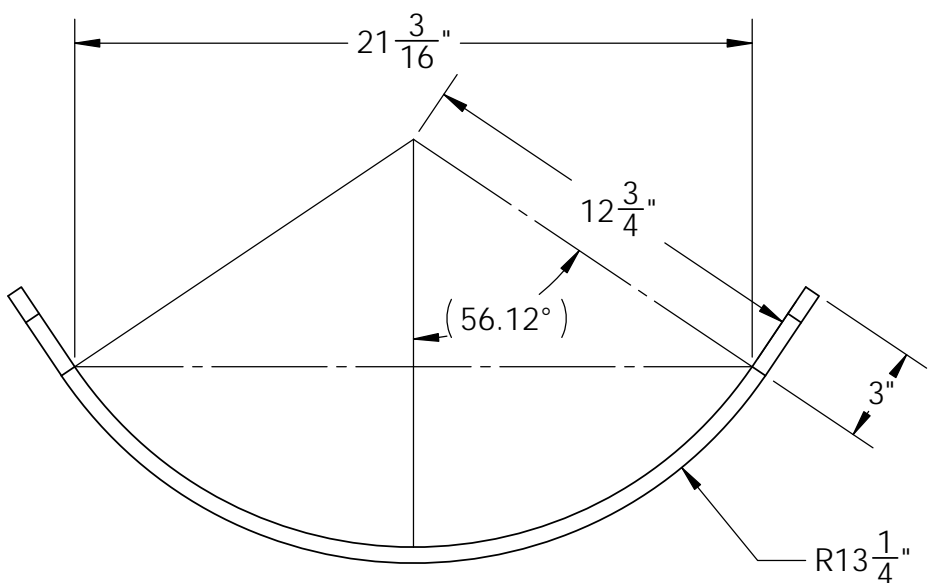
ITEM 21 - CAP 8x4

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: ±1/8" ANGULAR: ±1 DEG ONE PLACE DECIMAL: ±0.125 TWO PLACE DECIMAL: ±0.063 THREE PLACE DECIMAL: ±0.010 MACHINED SURFACE: 125 RMS		HILINE ENGINEERING & FABRICATION, INC.	
		SEPARATION CRADLE	
DRAWN BY: T.STOKES	SIZE: B	DWG. NO.: 2309-WRP-209-SEP	REV: B
DRAWN DATE: 3-17-24	EDT:		SHT 7 OF 9



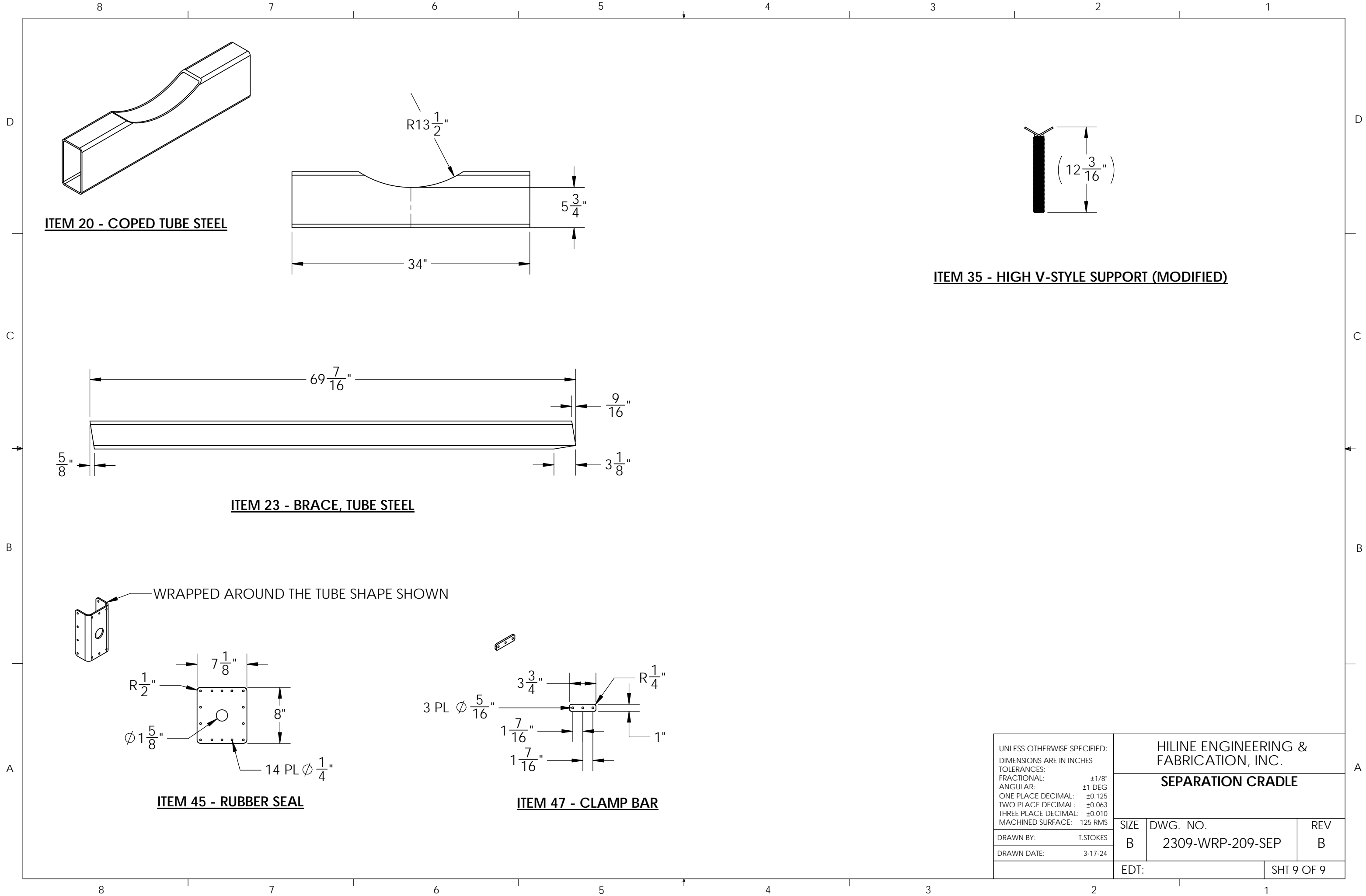
CHAMFER 1 x 1 x 45 DEG
4 PL

ITEM 24 - SADDLE PLATE

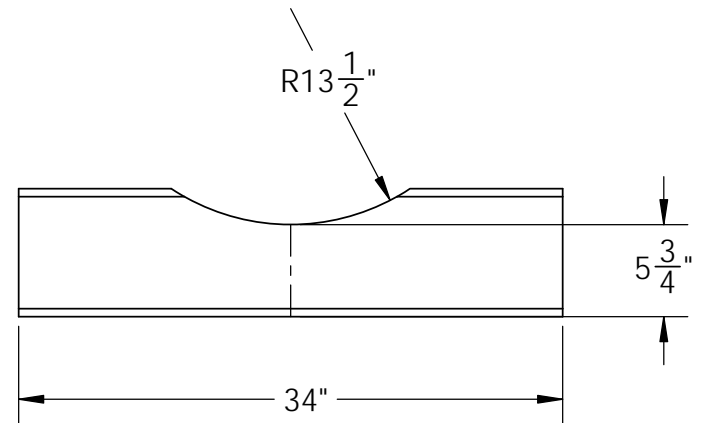


FLAT PATTERN

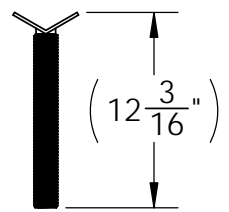
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: ±1/8" ANGULAR: ±1 DEG ONE PLACE DECIMAL: ±0.125 TWO PLACE DECIMAL: ±0.063 THREE PLACE DECIMAL: ±0.010 MACHINED SURFACE: 125 RMS	HILINE ENGINEERING & FABRICATION, INC.		
	SEPARATION CRADLE		
	SIZE B	DWG. NO. 2309-WRP-209-SEP	REV B
	EDT:		SHT 8 OF 9



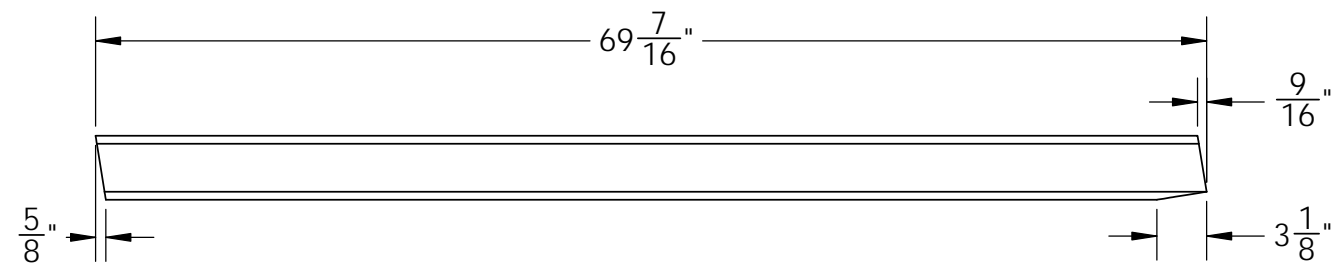
ITEM 20 - COPED TUBE STEEL



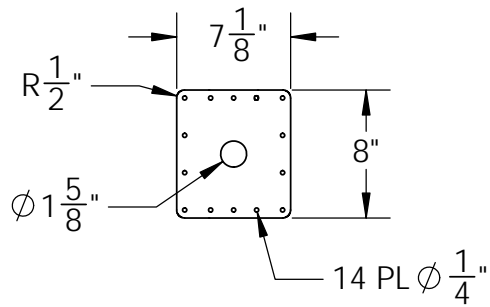
ITEM 35 - HIGH V-STYLE SUPPORT (MODIFIED)



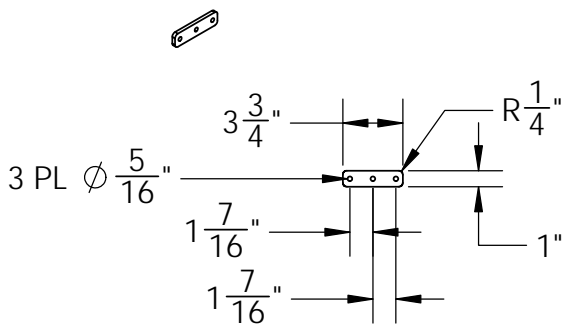
ITEM 23 - BRACE, TUBE STEEL



WRAPPED AROUND THE TUBE SHAPE SHOWN



ITEM 45 - RUBBER SEAL



ITEM 47 - CLAMP BAR

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: $\pm 1/8"$ ANGULAR: ± 1 DEG ONE PLACE DECIMAL: ± 0.125 TWO PLACE DECIMAL: ± 0.063 THREE PLACE DECIMAL: ± 0.010 MACHINED SURFACE: 125 RMS		HILINE ENGINEERING & FABRICATION, INC.	
		SEPARATION CRADLE	
DRAWN BY: T.STOKES	SIZE: B	DWG. NO.: 2309-WRP-209-SEP	REV: B
DRAWN DATE: 3-17-24	EDT:		SHT 9 OF 9