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## Notice

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

## History Sheet

Rev	Date	Reason for revision	Revised by
0	6/24/02	Initial issue	Indra Ghosh
1	9/26/02	Issued for Permitting Use	Indra Ghosh / N. T. Desai
2	10/09/02	<ul style="list-style-type: none"> <li>• Revised text in Section 1</li> <li>• Added Yard Transfer Lines structural support description.</li> <li>• Changed material type from 304L to 316L on Fig. 4.</li> <li>• Added Reference to "LAB" building in all sections</li> </ul>	Indra Ghosh / N. T. Desai
3	3/27/03	<ul style="list-style-type: none"> <li>• Revised Figures 1,2,3 and 4, and deleted Figure 5</li> <li>• Replaced Ref. 2.1.5 with Washington Administrative Code</li> <li>• Editorial changes in Section 3.1 as marked.</li> </ul> Issued for Permitting Use	Indra Ghosh / N. T. Desai
4	2/12/04	<ul style="list-style-type: none"> <li>• Addition of AEA Statement</li> <li>• Editorial changes in Section 3.2 as marked.</li> <li>• Revise Figure 1 to reflect changes to LAW vessel skirt</li> <li>• Deleted reference to the Lab in Figure 3</li> <li>• Addition of Figure 5 describing the typical Laboratory vessel support details</li> <li>• Addition of Figures 6 and 7 providing typical Laboratory under sink and fume hood drain secondary containment drip pan details</li> <li>• Addition of Figure 8 describing typical Laboratory piping and pump pit sump weir details</li> </ul>	Harsh Raval
5	8/4/04	Issued for Permitting Use	H. Raval, D. Robertson
6	8/25/04	Issued for Permitting Use	H. Raval, D. Robertson

Rev	Date	Reason for revision	Revised by
7	5/19/05	<ul style="list-style-type: none"> <li>• Revised Section 3.1, Seismic Peak Ground Acceleration. Nathan Kyle</li> <li>• Corrected specification callout on Figure 1</li> <li>• Revised typical PT sump and typical wall/mat penetration details on Figure 4</li> <li>• Revised Note 3 and revised details on Figure 7</li> <li>• General revision to Figure 8 (Added Details 1 and 2)</li> <li>• Revised Notes 3 and 4 for cupsink detail, and revised hot cell transfer port drain details on Figure 9. Added Note 5 for cupsink cover.</li> <li>• Revised Note 3, added Note 4 to embed plate detail on Figure 10. Added adjacent embed plate optional detail.</li> <li>• Added Figures 11 and 12.</li> </ul> <p>Issued for Permitting Use</p>	Nathan Kyle
8	8/25/08	<ul style="list-style-type: none"> <li>• Revised Figures 8 and 11 to provide additional sketch notes for Laboratory weir plans and sections</li> <li>• Addition of Figure 13 LAW Melter Encasement Assembly sketch</li> </ul> <p>Issued for Permitting Use</p>	Bryson Bogart
9	2/8/10	<ul style="list-style-type: none"> <li>• Added Figures 14 through 16, revised Figure 13</li> </ul> <p>Issued for Permitting Use</p>	Bryson Bogart, Dan Robertson
10	10/18/11	<ul style="list-style-type: none"> <li>• Revised Figure 6 and 7, revised figure title blocks</li> </ul> <p>Issued for Permitting Use</p>	Bryson Bogart, Dan Robertson
11	2/16/16	<ul style="list-style-type: none"> <li>• Added Figures 17 through 22</li> <li>• Revised sections 1 and 3 to include EMF related content</li> </ul> <p>Issued for Permitting Use</p>	Janine Smith, Dan Robertson

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# 1 Introduction

In accordance with Chapter 173-303 Washington Administrative Code (Ref. 2.1.5), facilities that manage liquid dangerous waste must provide secondary containment<sup>1</sup>. At the Waste Treatment and Immobilization Plant, secondary containment systems have been designed to prevent a release of dangerous waste to the environment as required by the Code.

This report describes and provides references to the design criteria, load definitions, load combinations, material of construction, and methodology for the analysis/design of Pretreatment (PT), High-Level Waste (HLW), Low-Activity Waste (LAW) facilities, Effluent Management Facility (EMF), and Analytical Laboratory (LAB) building with emphasis on secondary containment components. It also includes several representative typical details.

## 2 Applicable Documents

### 2.1 Codes and Standards

- 2.1.1 ACI 349, Code Requirements for Nuclear Safety-Related Concrete Structures.
- 2.1.2 ACI 318, Code Requirements for Structural Concrete.
- 2.1.3 Uniform Building Code (UBC), 1997.
- 2.1.4 ANSI/AISC N690, Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities.
- 2.1.5 Washington Administrative Code, Chapter 173-303.
- 2.1.6 AISC M016-89, Manual of Steel Construction -Allowable Stress Design, Ninth Edition.
- 2.1.7 ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- 2.1.8 ASCE 4, Seismic Analysis of Safety-Related Nuclear Structures and Commentary.
- 2.1.9 Safety Requirements Document, Volume II, 24590-WTP-SRD-ESH-01-001-02.

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<sup>1</sup> With the exception of ancillary equipment as provided by 173-303-640(4)(f) and approved by DWP.

### 3 Description

#### 3.1 Design Methodology, Material, Loads, and Load Combinations

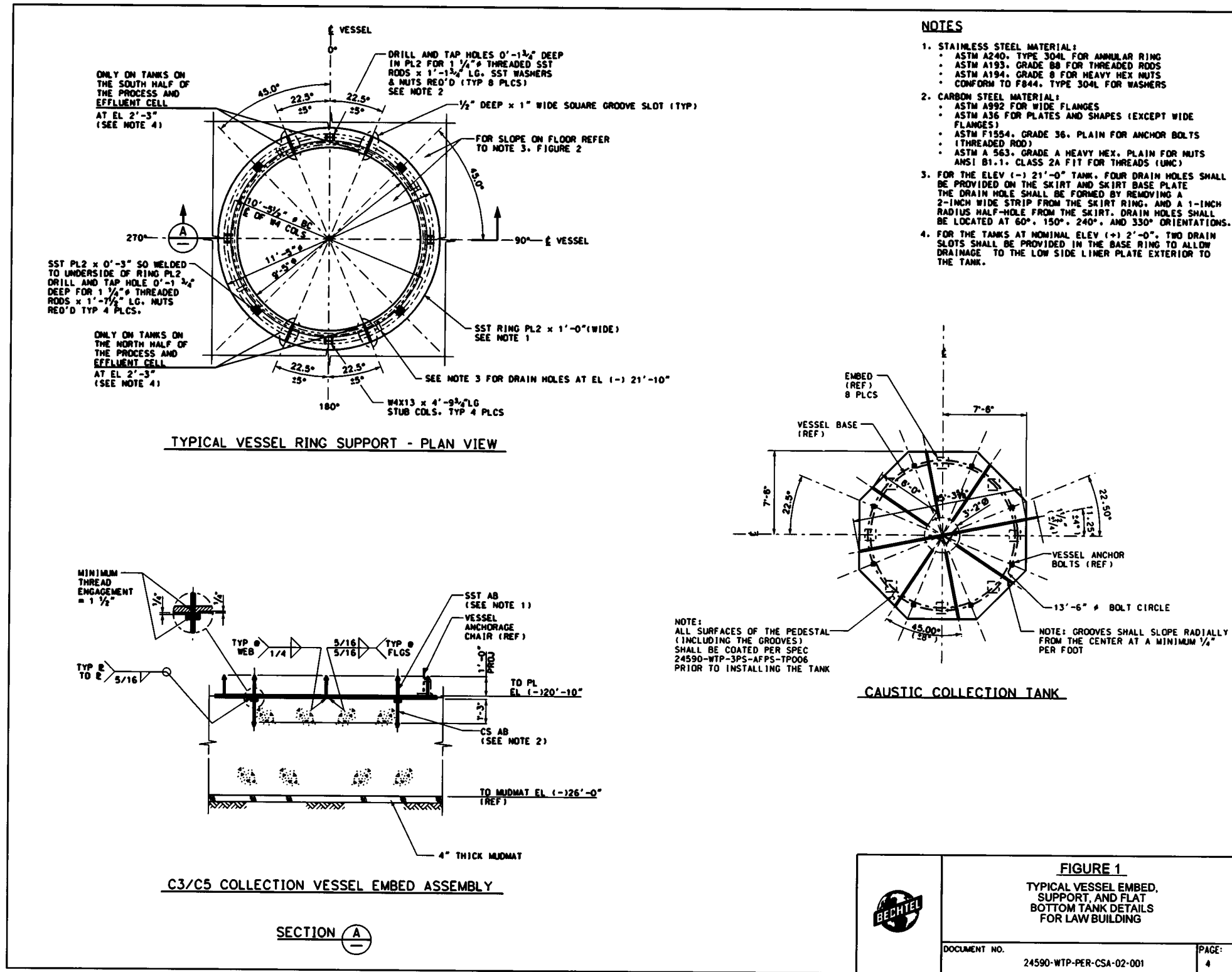
<b>Methodology</b>	<p>Codes and specifications:</p> <ul style="list-style-type: none"> <li>PT and HLW: General: ASCE 4 (Ref. 2.1.8). Concrete: ACI 349 (Ref. 2.1.1). Steel: ANSI/AISC N690 (Ref. 2.1.4) and AISC (Ref. 2.1.6).</li> <li>LAW, LAB and EMF: General: UBC (Ref. 2.1.3). Concrete: ACI 318 (Ref. 2.1.2). Steel: AISC M016 (Ref. 2.1.6).</li> </ul>
<b>Dead Loads and Live loads:</b>	ASCE 7 (Ref. 2.1.7), UBC (Ref. 2.1.3), and Tables 4-1, 4-2 and 4-3 of SRD (Ref. 2.1.9).
<b>Seismic Loads</b>	<p>Site-specific response spectra as specified in SRD (Ref. 2.1.9).</p> <ul style="list-style-type: none"> <li>PT and HLW: Peak Ground Horizontal Acceleration = 0.30g. Peak Ground Vertical Acceleration = 0.21g.</li> <li>LAW, LAB and EMF: Seismic Zone 2B (UBC, Ref. 2.1.3). Peak Ground Horizontal Acceleration = 0.24g. (Zero Period Acceleration) Peak Ground Vertical Acceleration = 0.16g. (Zero Period Acceleration)</li> </ul>
<b>Material</b>	
Concrete	28-day compressive strength, $f'_c = 4,000$ psi and 5,000 psi.
Reinforcing Bar	ASTM A706, deformed.
Steel	W Shape – ASTM A992 or A572 Grade 50; Angles and Channels - ASTM A36 or A529 Grade 50; Plates - ASTM A36; Pipe - ASTM A53; Anchor Rods - ASTM F1554; Welded studs A108; Steel deck-ASTM A653.
<b>Load Combinations</b>	
Concrete	<ul style="list-style-type: none"> <li>HLW and PT: Based on ACI 349 (Ref 2.1.1).</li> <li>LAW, LAB and EMF: ACI 318 (Ref. 2.1.2) and UBC (Ref 2.1.3).</li> </ul>
Steel	<ul style="list-style-type: none"> <li>HLW and PT: Based on ANSI/AISC N690 (Ref 2.1.4) and AISC (Ref 2.1.6).</li> <li>LAW, LAB and EMF: AISC M016-89 (Ref. 2.1.6) and UBC (Ref 2.1.3).</li> </ul>
<b>Stainless Steel Liners (SS)</b>	Most commonly used in the process cells. Refer to Figures 2-5 for typical details concerning PT, HLW, LAW & LAB and Figures 18 & 20 for EMF buildings. Refer to Figures 14 and 15 for ASX liner typical details.
<b>Special Protective Coating</b>	Material for coatings will be compatible with the dangerous waste.
<b>Yard Transfer Lines Structural Support</b>	Structural support for yard transfer lines (intra and inter facility waste transfer lines) is described in Ancillary Equipment Pipe Support Design, 24590-WTP-PER-PS-02-001.

### **3.2 Typical Details**

Figures 1 through 22 show several typical details related to secondary containment for PT, HLW, LAW, LAB and EMF buildings.



Figure 1 Typical Vessel Embed, Support, and Flat Bottom Tank Details for LAW 3 Building



	<b>FIGURE 1</b>	
	TYPICAL VESSEL EMBED, SUPPORT, AND FLAT BOTTOM TANK DETAILS FOR LAW BUILDING	
DOCUMENT NO.	24590-WTP-PER-CSA-02-001	PAGE: 4

Figure 2 Liner Plate and Grillage Support Details for PT, HLW, LAW and LAB Buildings

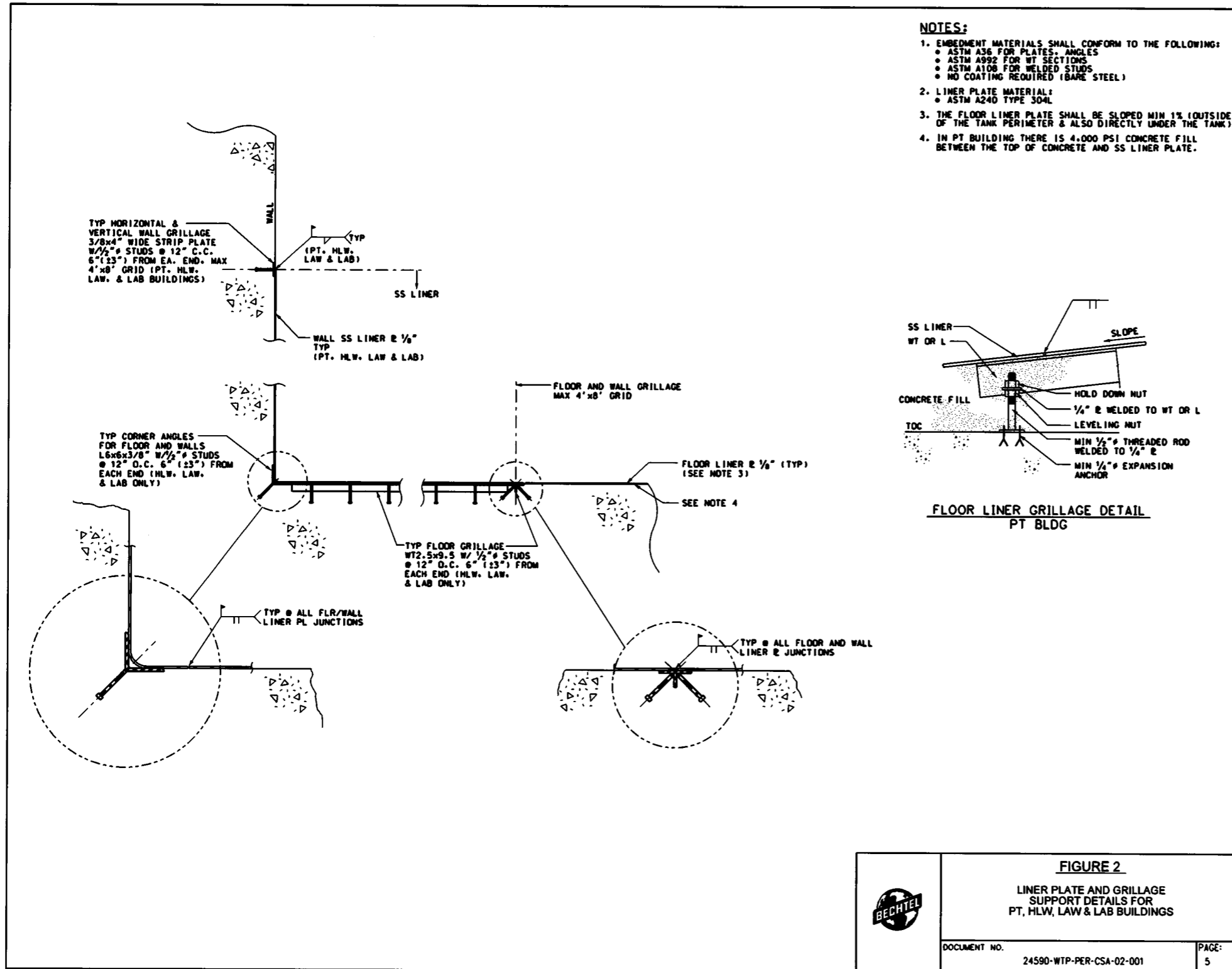


FIGURE 2

LINER PLATE AND GRILLAGE  
SUPPORT DETAILS FOR  
PT, HLW, LAW & LAB BUILDINGS

DOCUMENT NO. 24590-WTP-PER-CSA-02-001 PAGE: 5

Figure 3 Typical Process Vessel Support Details for PT and HLW Buildings

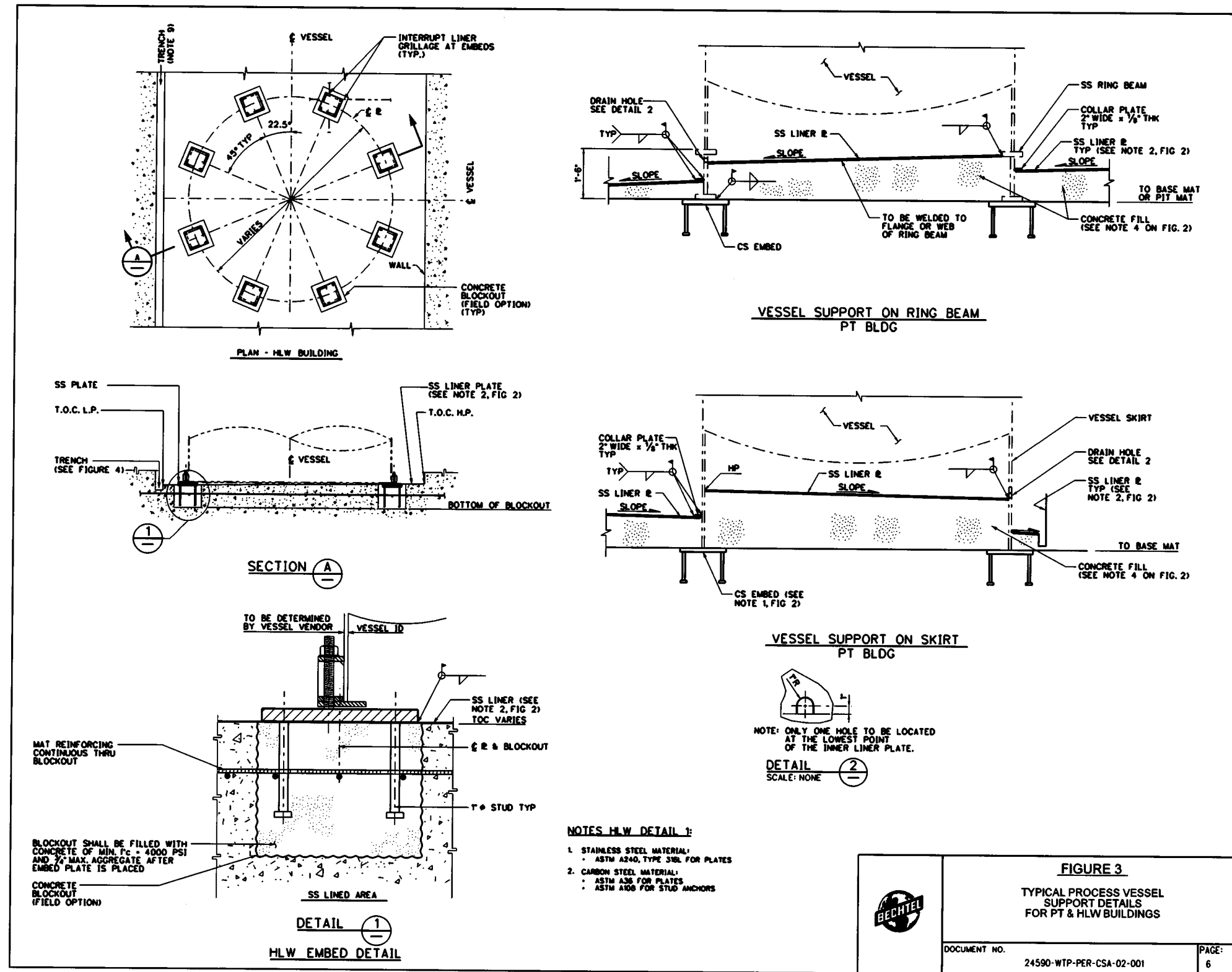


Figure 4 Misc. Typical Details Sumps, Trenches, Wall Penetrations, Embedded Plates and Special Protective Coating PT, HLW, LAW and LAB Buildings

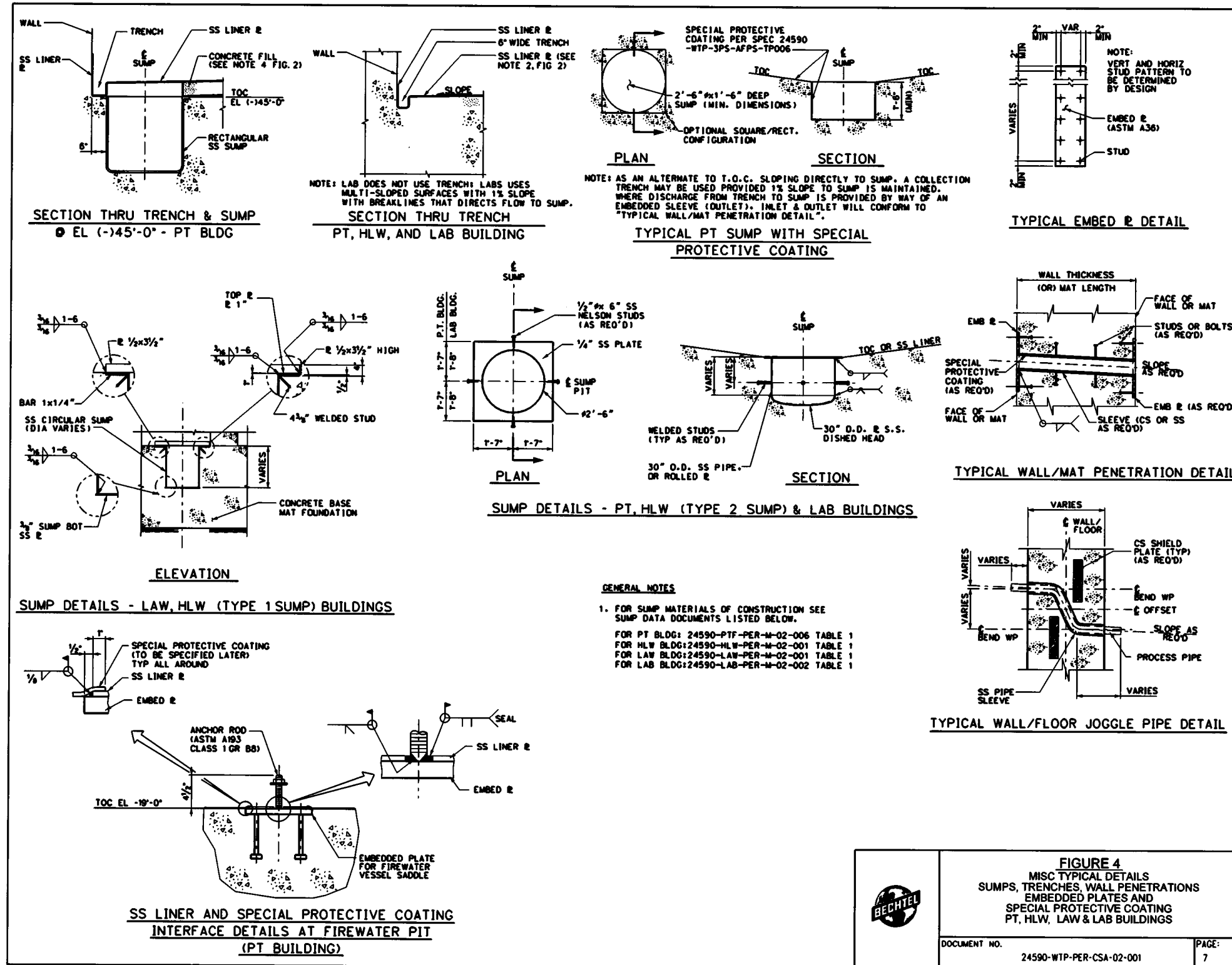
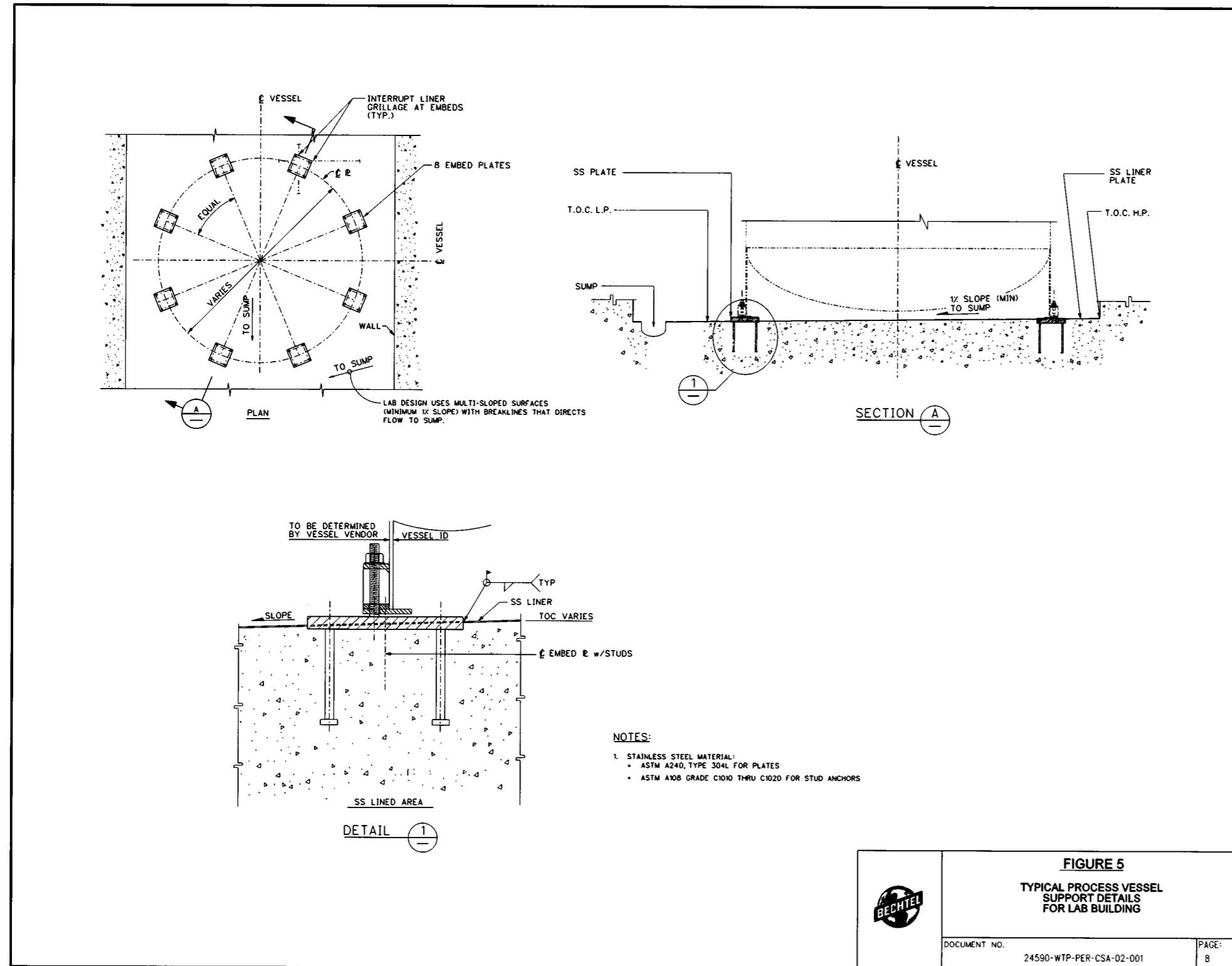


Figure 5 Typical Process Vessel Support Details for LAB Building




	<b>FIGURE 5</b> TYPICAL PROCESS VESSEL SUPPORT DETAILS FOR LAB BUILDING	
	DOCUMENT NO. 24590-WTP-PER-CSA-02-001	PAGE: 8

Figure 6 Plan View of Typical Under Sink and Fume Hood Drain for LAB Bldg Secondary Containment Leak Collection Pan

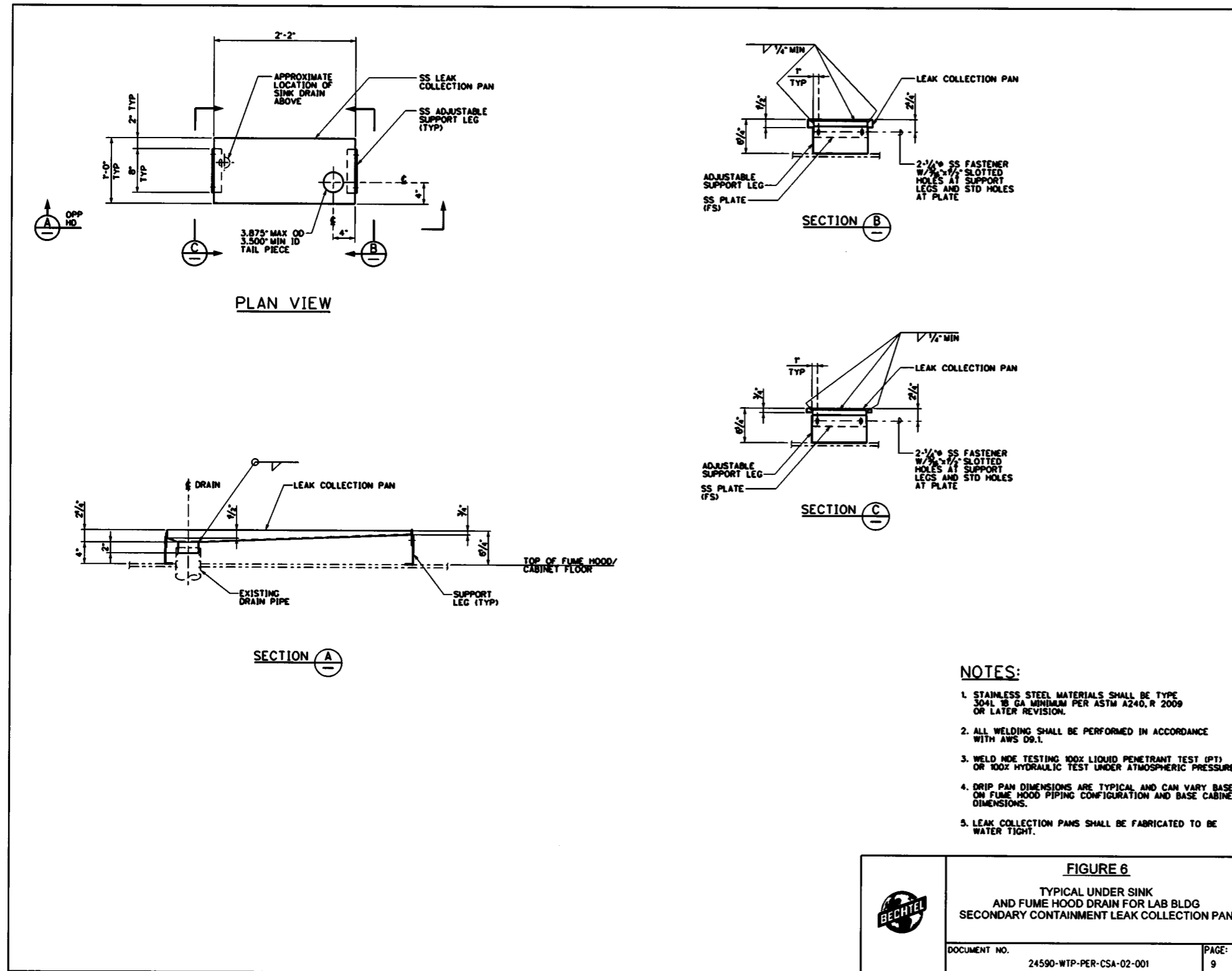


Figure 7 Section View of Typical Laboratory Under Sink and Fume Hood Drain for LAB Bldg Secondary Containment Leak Collection Pan, Including Leak Test Plug

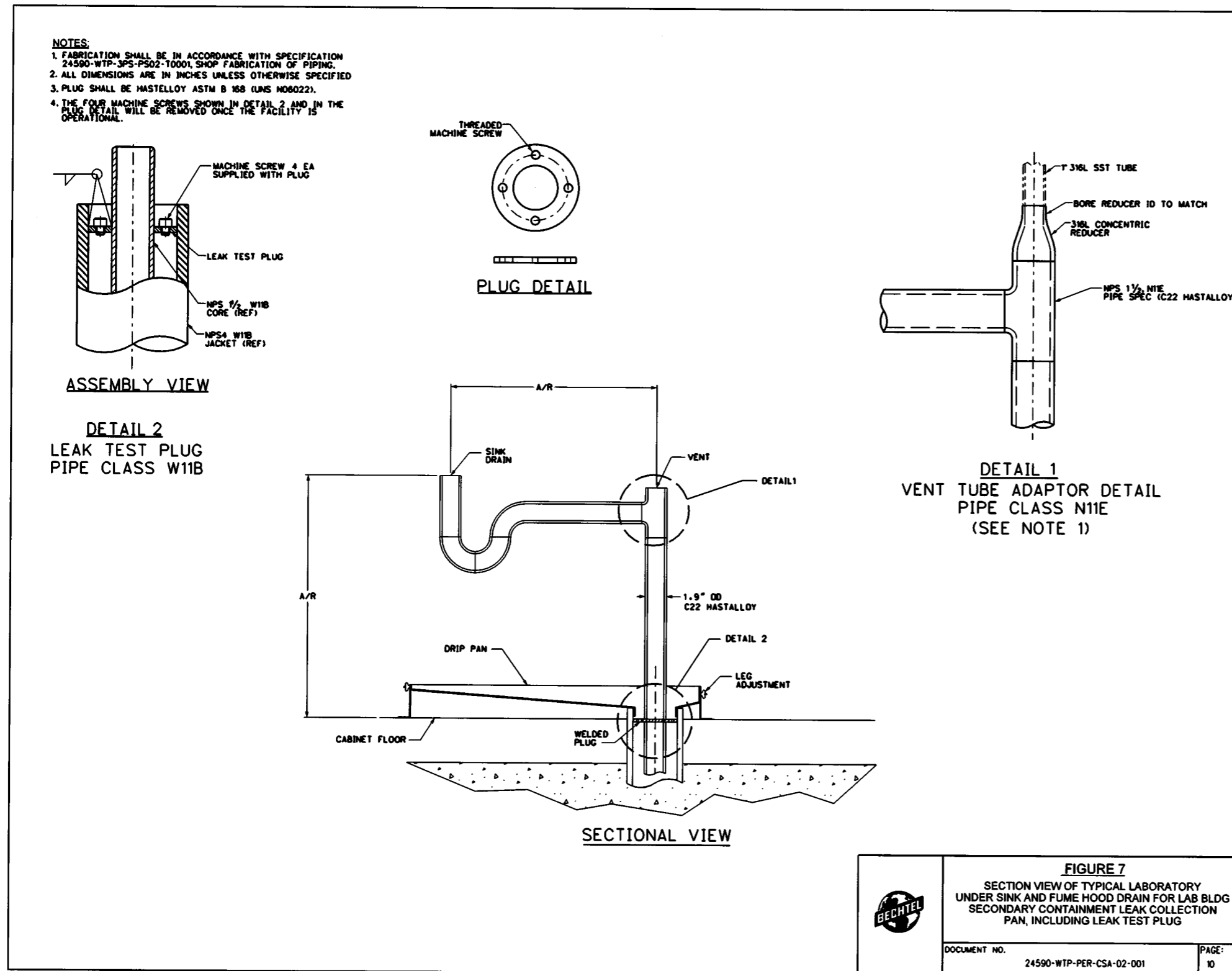


Figure 8 Typical Laboratory Piping and Pump Pit Sump and Weir Details for LAB Building

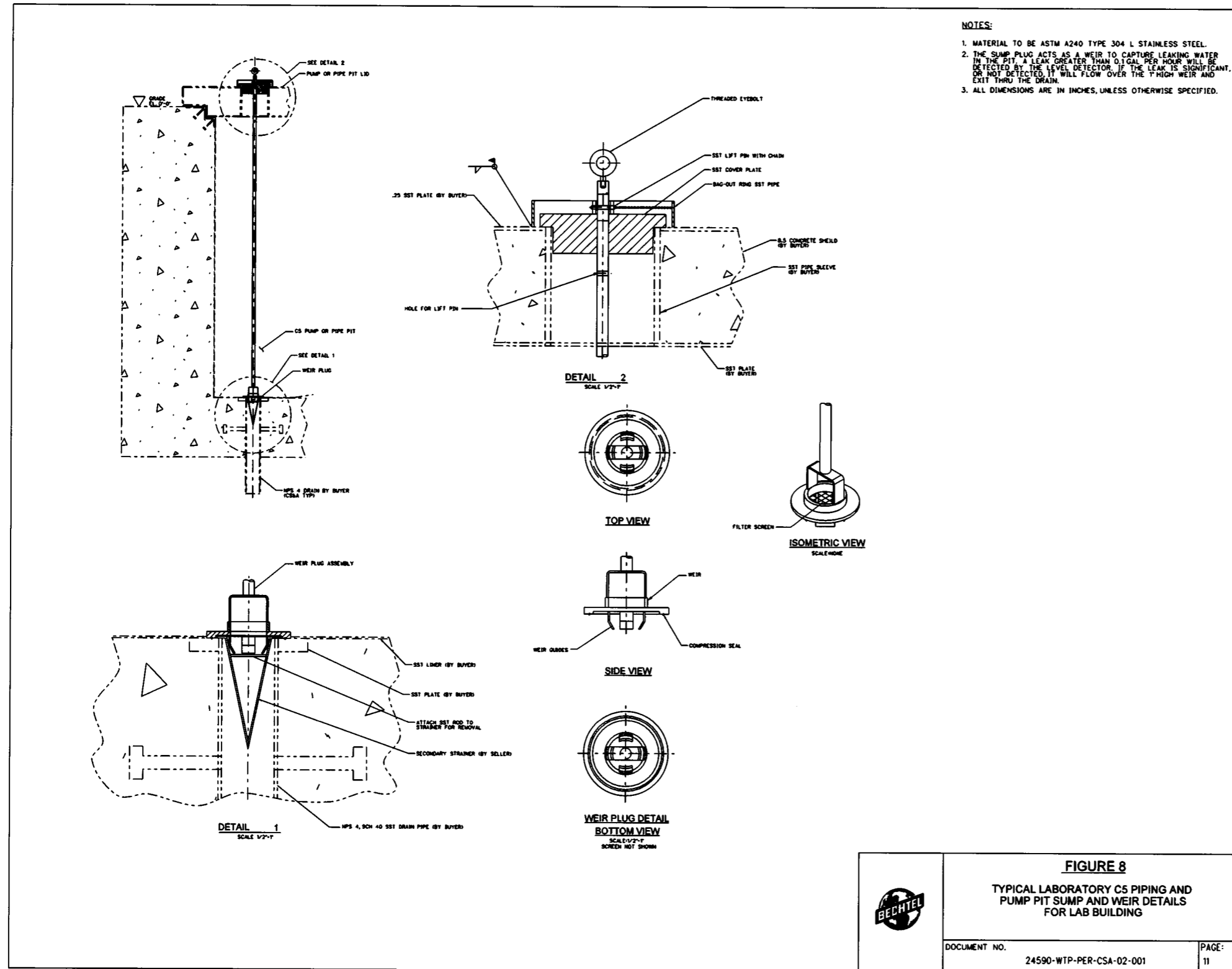




Figure 9 Typical Hot Cell Floor Drain Detail and Transfer Port Drain Detail for LAB Building

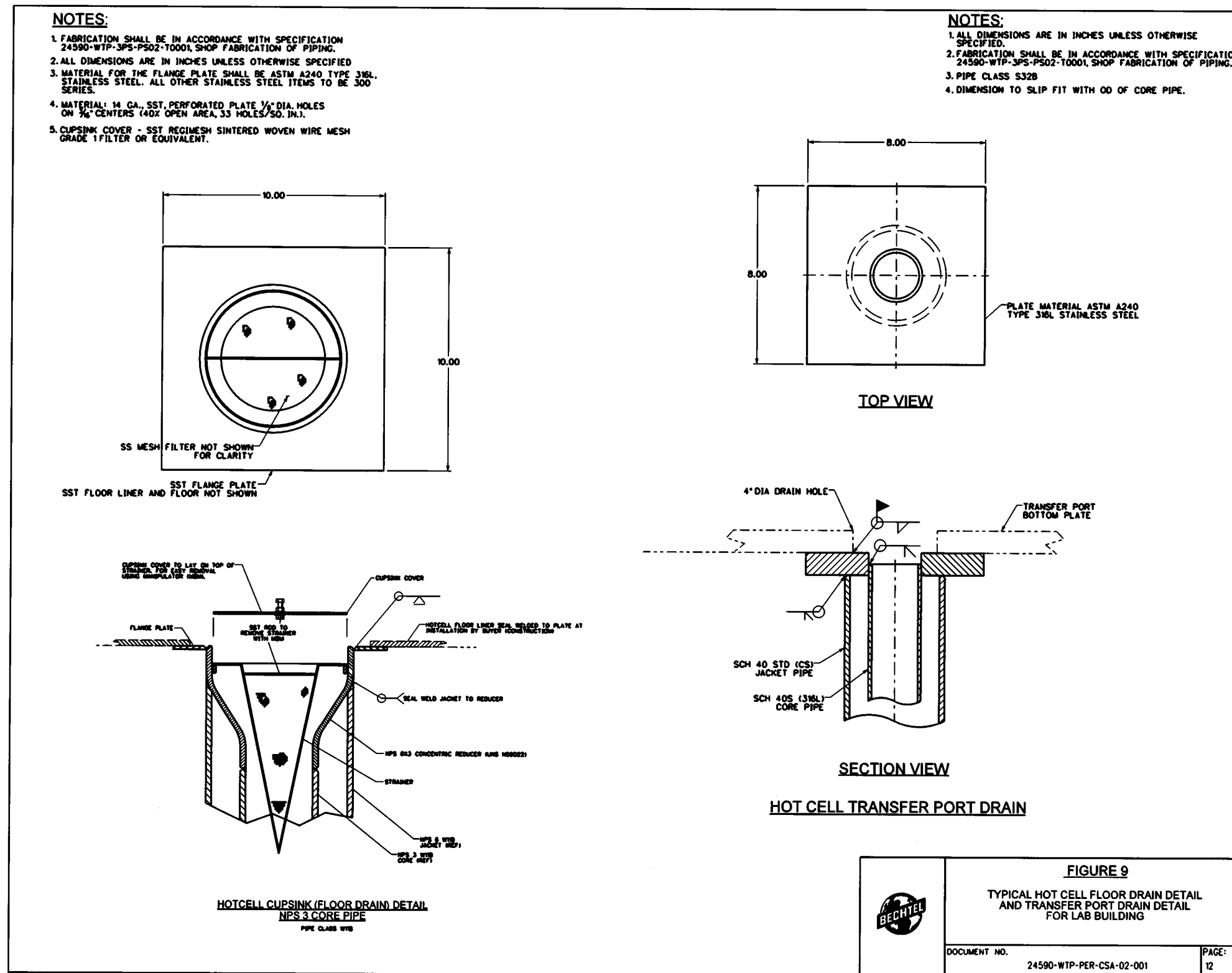


Figure 10 Typical HLW Building Sump Details & Typical PT Building SS Liner/CS Embed Detail

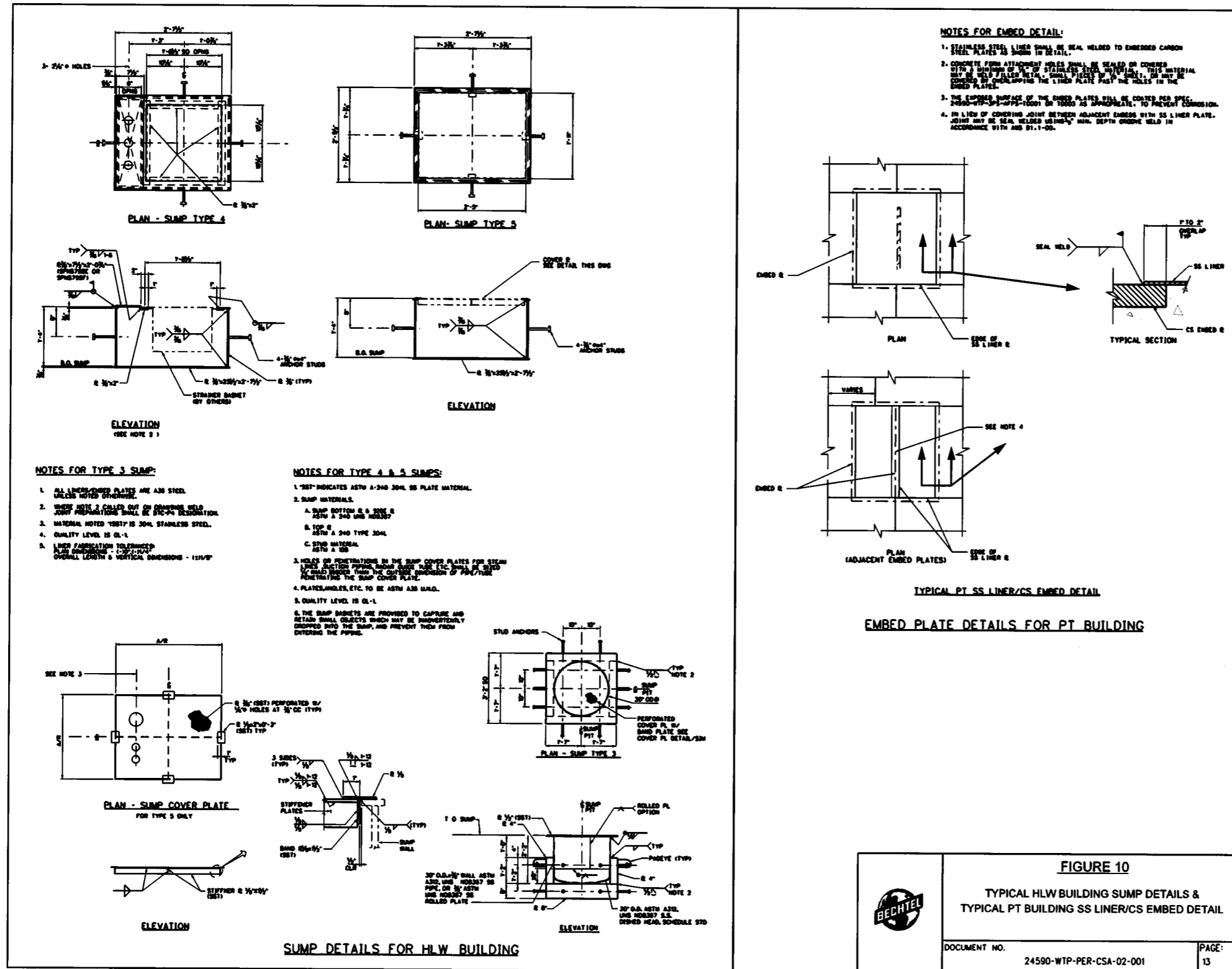


Figure 11 Typical Laboratory C3 Piping and Pump Pit Sump and Weir Details for LAB Building

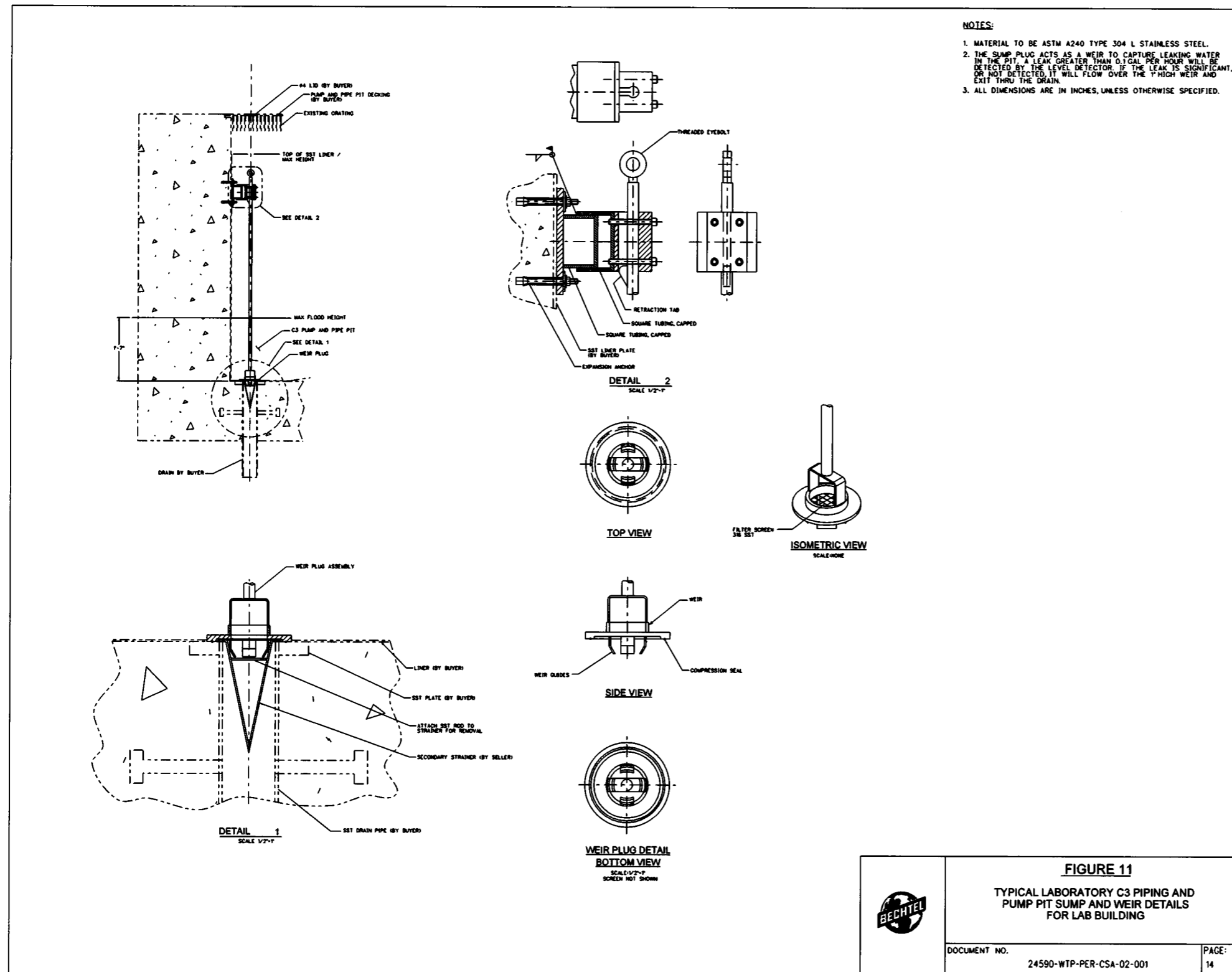


Figure 12 Typical RLD Condensate Tank Support Details for PT Building (Exterior)

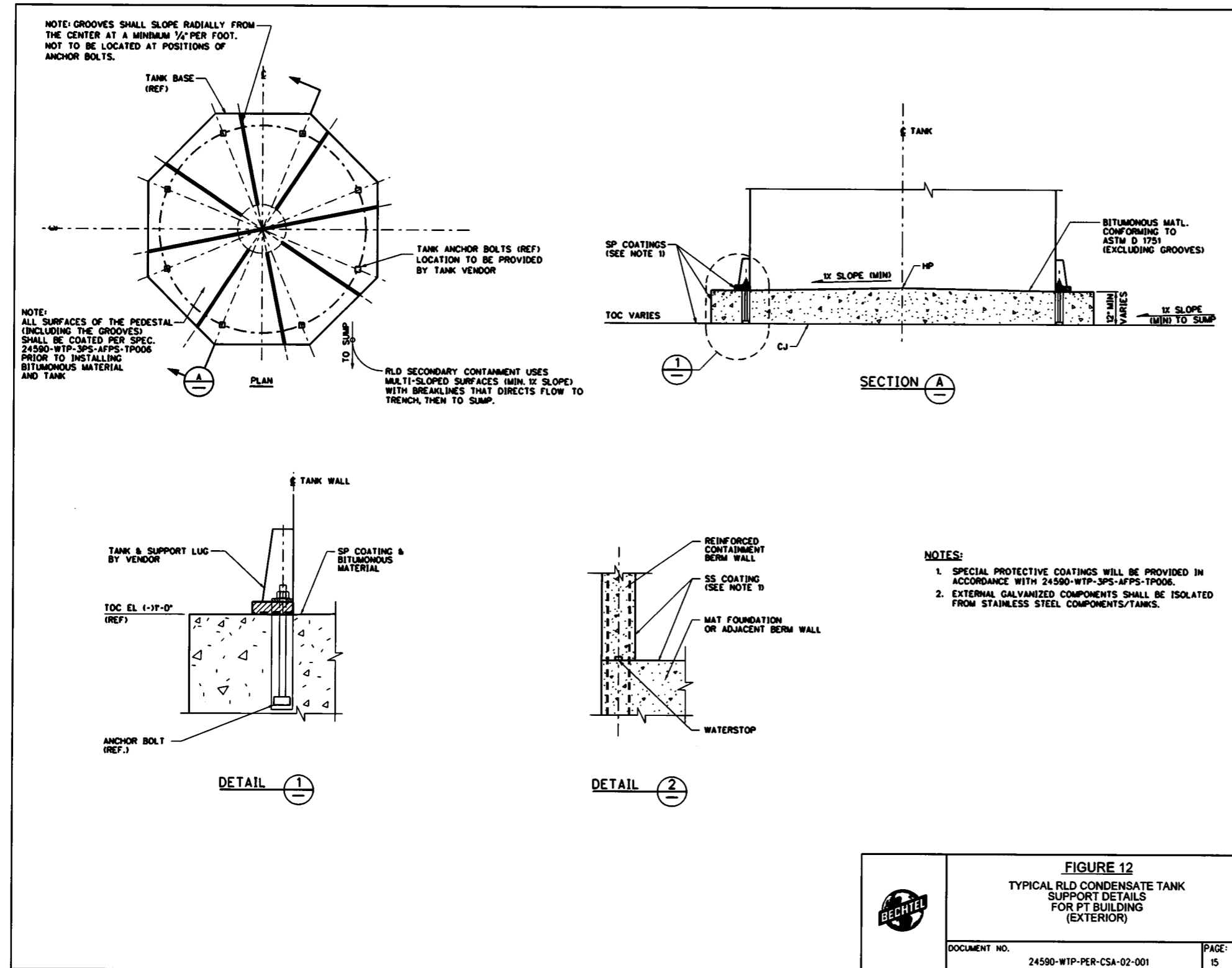


Figure 13 LAW Melter Encasement Assembly Secondary Containment Details

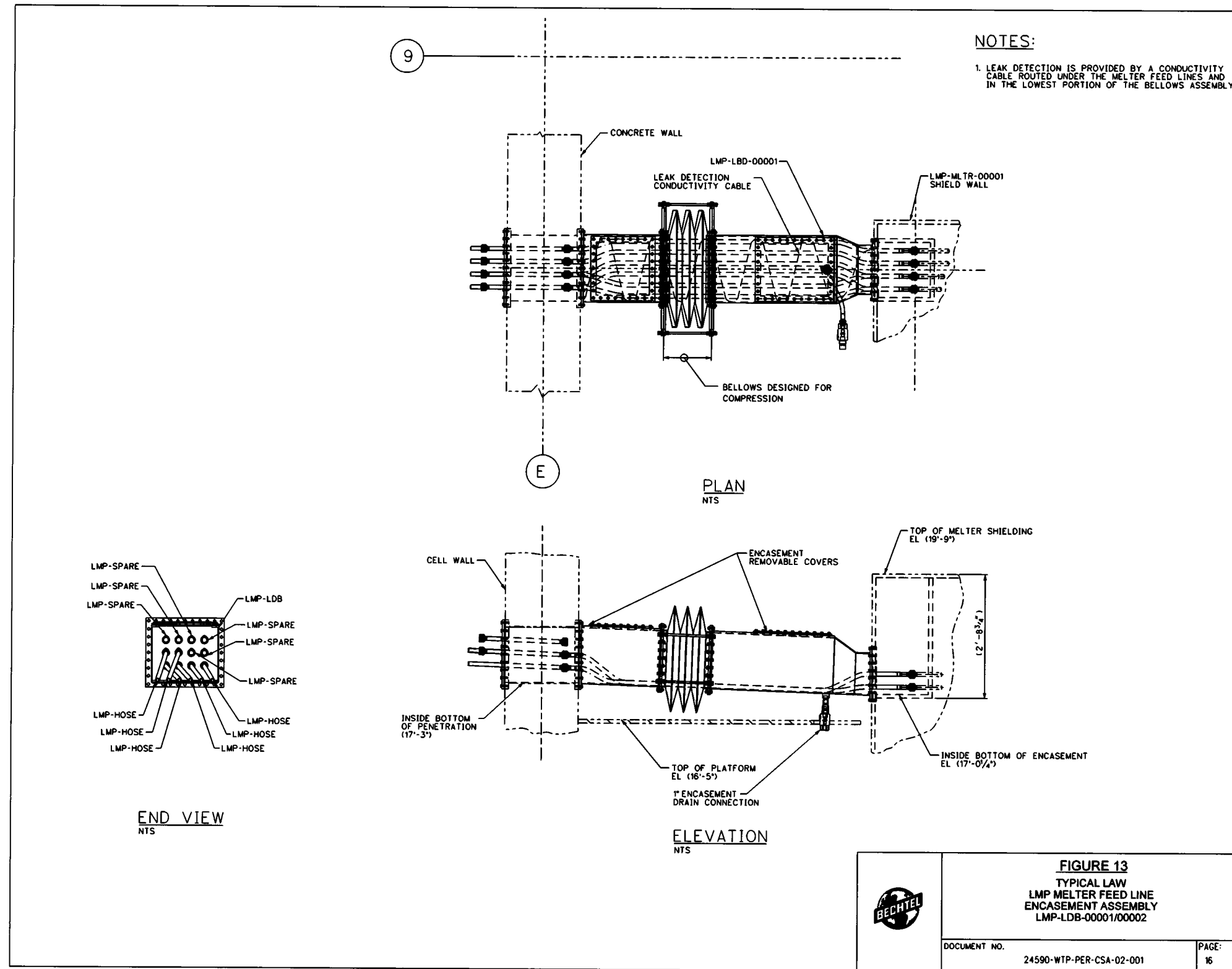


Figure 14 Typical Autosampling System ASX Sampler Full Half Section

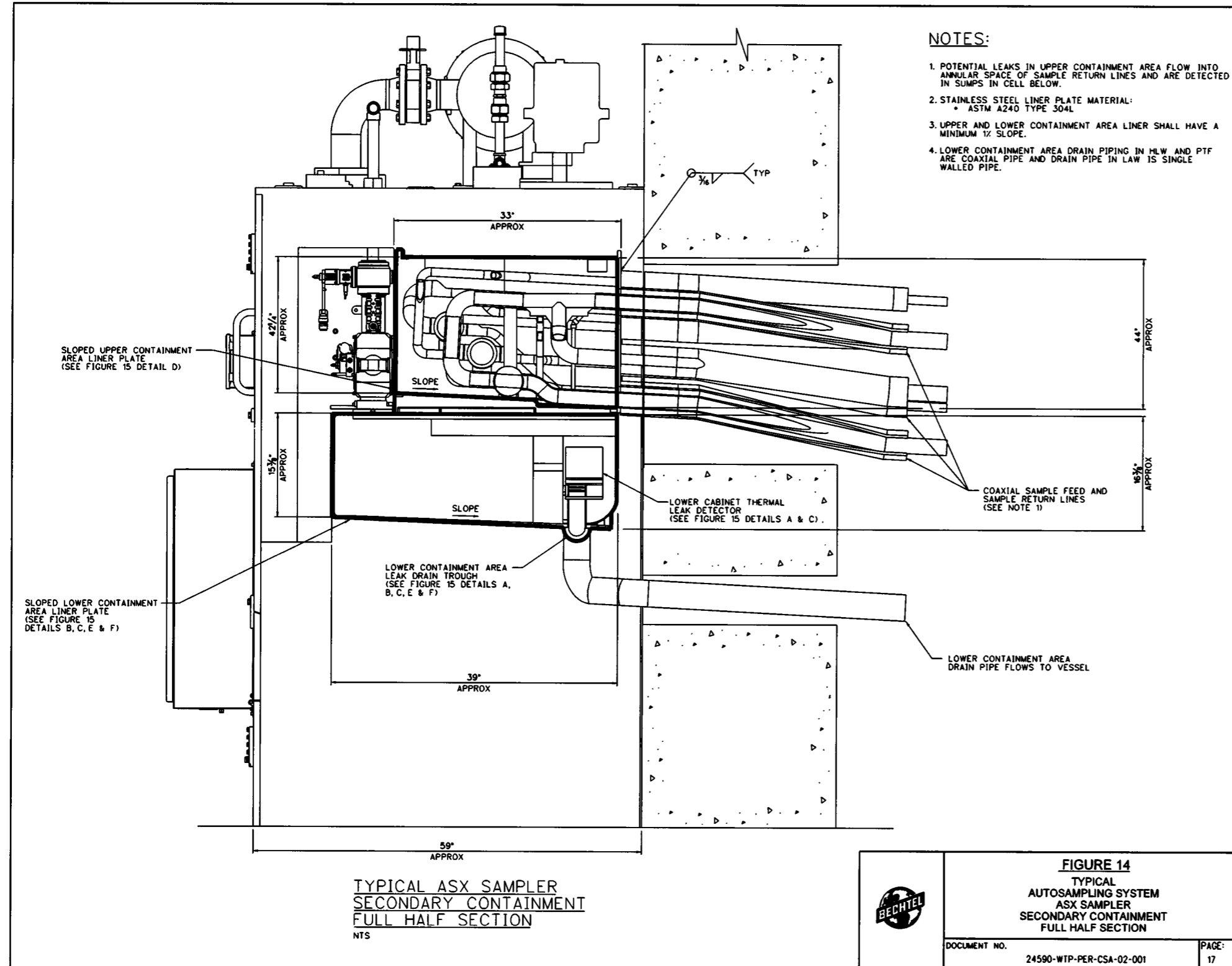


Figure 15 Typical Autosampling System Lower Containment Area Leak Detection Details

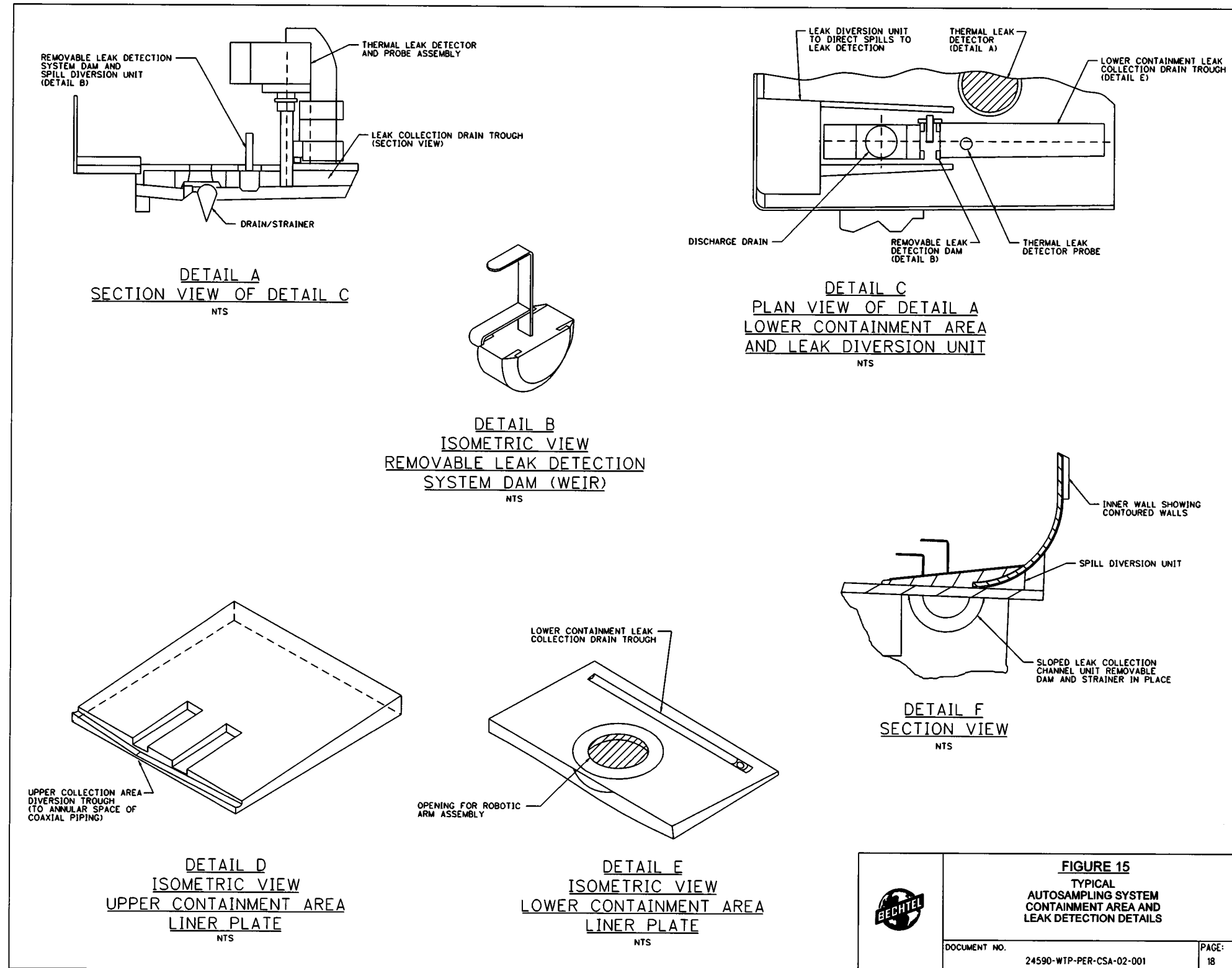
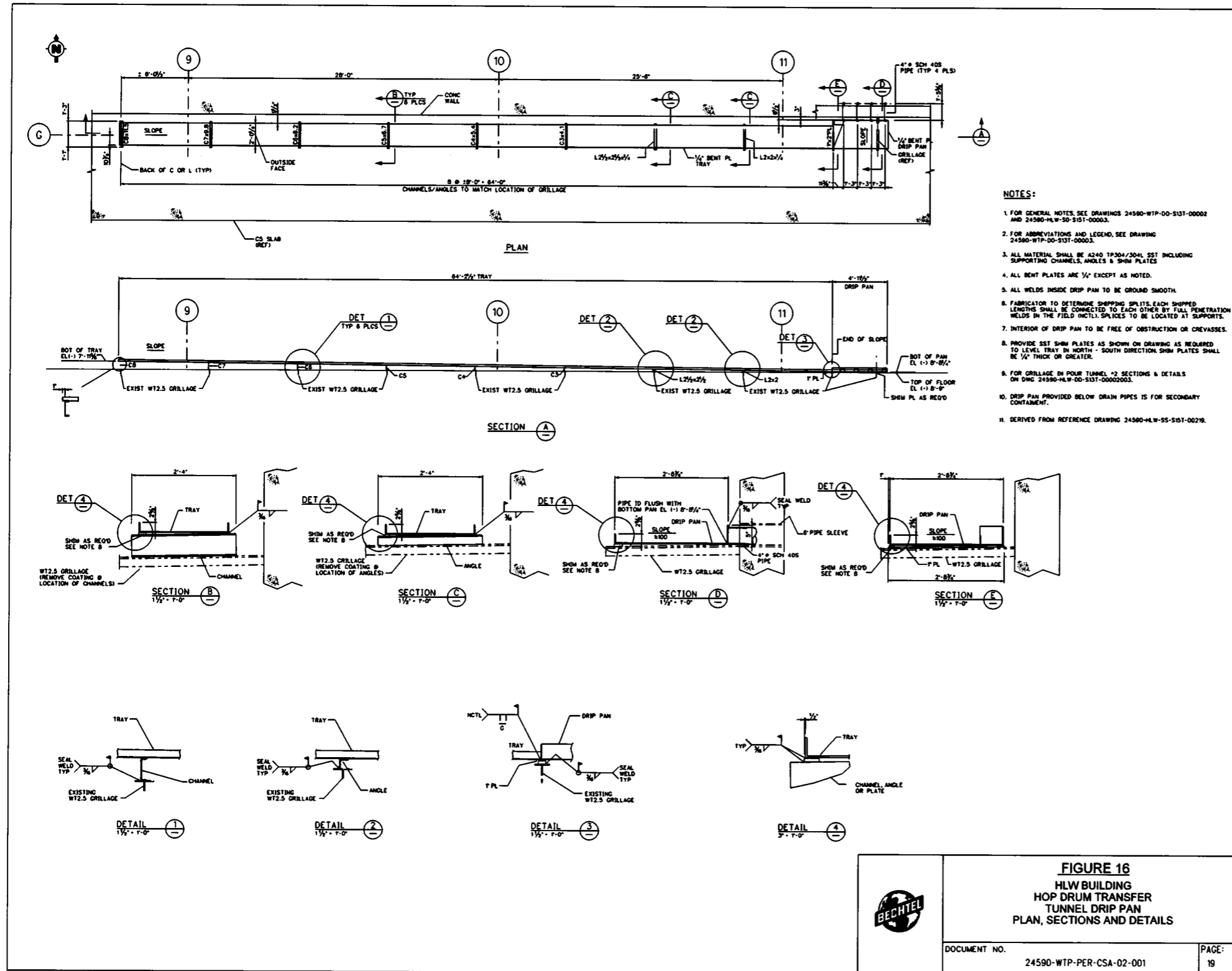


Figure 16 HLW Building HOP Drum Transfer Tunnel Drip Pan Plan, Sections and Details



**FIGURE 16**  
HLW BUILDING  
HOP DRUM TRANSFER  
TUNNEL DRIP PAN  
PLAN, SECTIONS AND DETAILS

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Figure 17 Typical Details; Waterstops; EMF Buildings

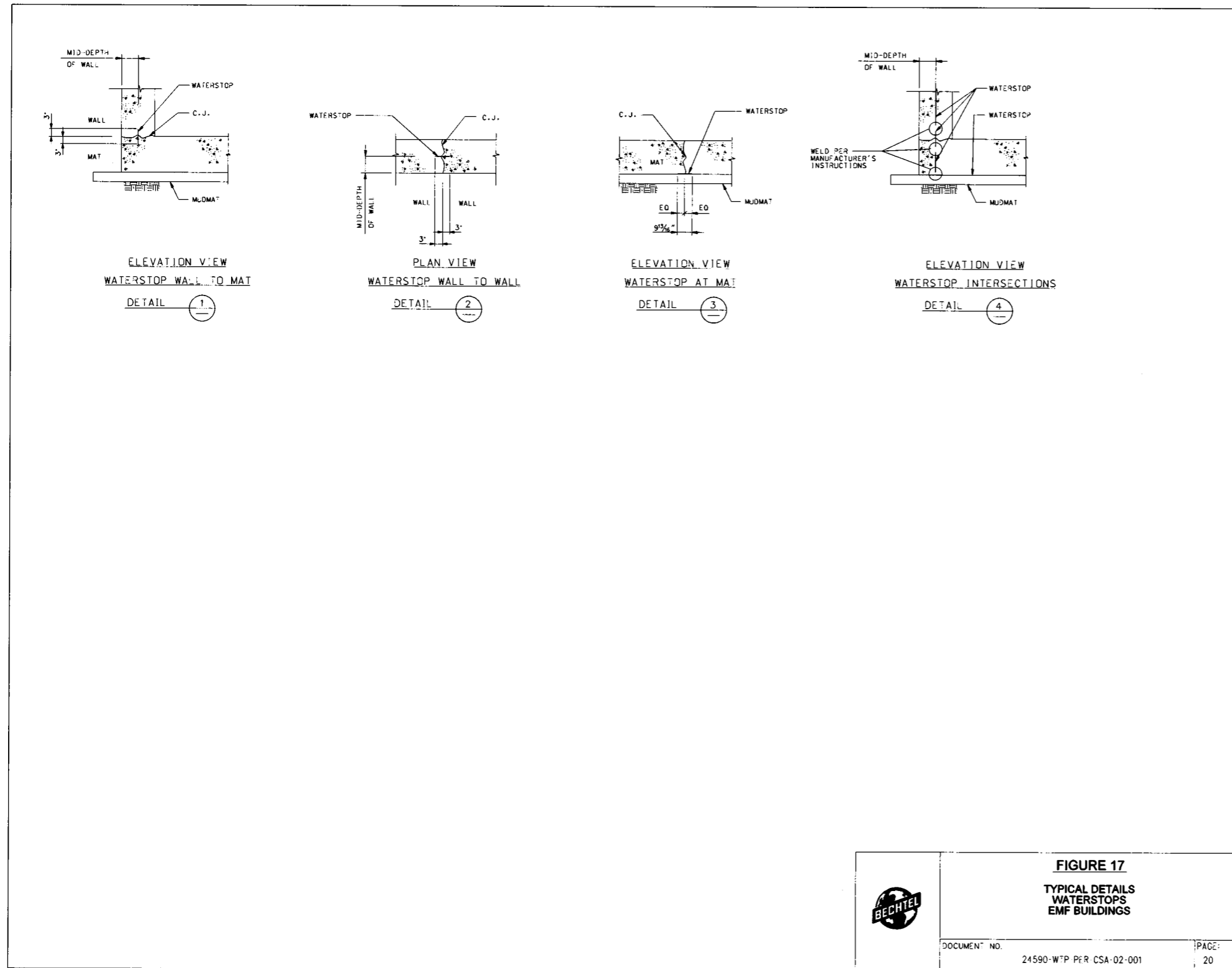


FIGURE 17  
 TYPICAL DETAILS  
 WATERSTOPS  
 EMF BUILDINGS

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Figure 18 Typical Details; Liner Plate and Grillage Support Details; EMF Buildings

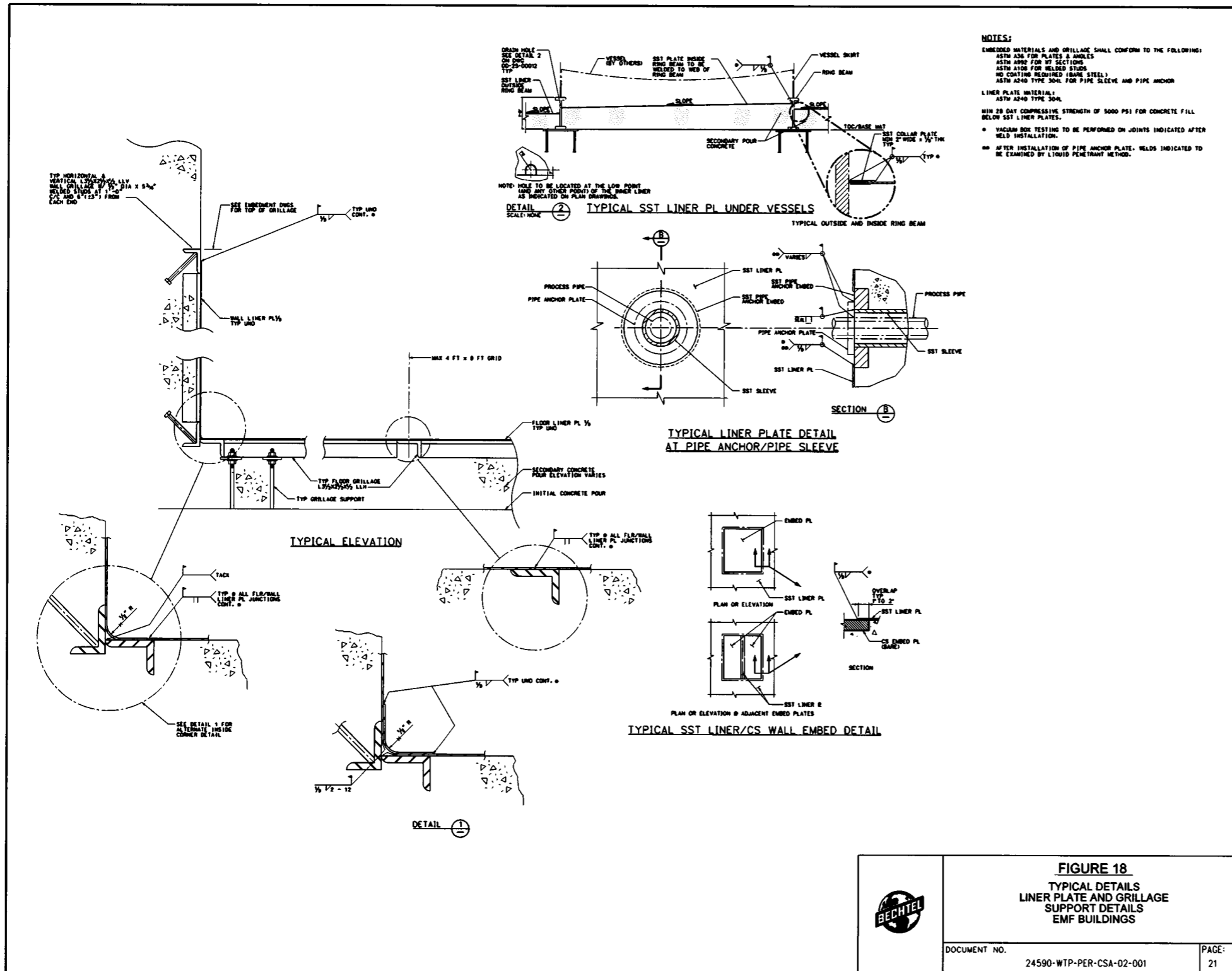


Figure 19 Typical Details; Equipment Support and Ring Beam; EMF Buildings

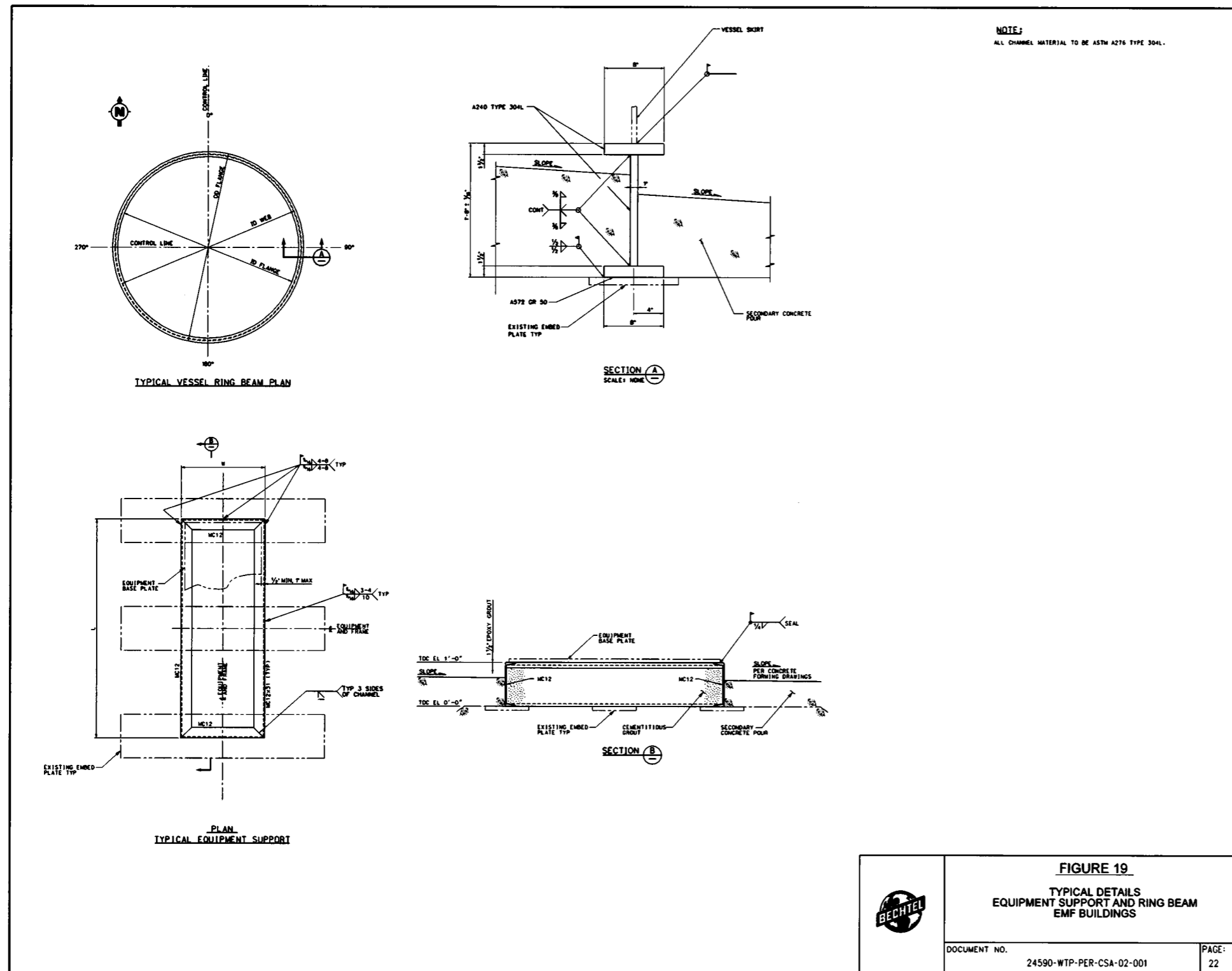


Figure 20 Typical Details; Sumps; EMF Buildings

