HANFORD TANK WASTE TREATMENT AND IMMOBILIZATION PLANT

BIDDER REQUEST FOR INTEREST & PRE-QUALIFICATION PACKAGE

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May be exempt from public release under the Freedom of Information Act (5 U.S.C. 552), exemption number and category: 4. Commercial/Proprietary
Department of Energy Review required before public release
Name/Org: Jose Velasquez/ P&S Date: 12/28/2023
Guidance (if applicable): N/A

Requisition No. 24590-QL-MRA-PS02-00020

Dual-Contained Pipe Spools

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COMPANY NAME: _____

BIDDER REQUEST FOR INTEREST & PREQUALIFICATION

CRITERIA AND RESPONSE

1.0 Introduction

Bechtel National Inc., herein referred to as Contractor, intends to issue a Request for Proposal (RFP) for a Plant Material Purchase Order for the Hanford Waste Treatment and Immobilization Plant (WTP) project in Richland, WA. Companies must be pre-qualified by Contractor to be included on the bid list. To support the pre-qualification evaluation process, the prime potential bidder (1st tier subcontractor) must provide the requested information and respond to questions within this document. The Experience Statement should include relevant information for both the prime bidder and any planned lower-tier supplier or subcontractor. Additional supporting documentation such as brochures and company profiles may also be submitted.

***Please note that additional supporting documentation will be required as part of the formal RFP process.**

2.0 Project Description and Location

The Hanford Tank Waste Treatment and Immobilization Plant (WTP) is a complex of radioactive waste treatment processing facilities designed and constructed by Bechtel National, Inc. for the Department of Energy (DOE). The facility will process the Hanford Site tank waste and convert the waste into a stable glass form.

The Project site is located in the 200 East Area of the Hanford Reservation near Richland, Washington, along the Columbia River. The site elevation varies from 662 to 684 feet above mean sea level. Ambient temperature range is -23 degrees F minimum to 113 degrees F maximum, with relative humidity of 5% minimum to 100% maximum. The project design life is 40 years.

Information about the WTP Project can be found on http://www.hanfordvitplant.com.

3.0 Scope of Work

Award Type: Firm Fixed Price Purchase Order with Economic Price Adjustment
Estimated RFP Date: ***March 2026***

Fabrication of Dual-Contained Pipe Spools

Work to be included:

1. Work performed per ASME B31.3 – current version
2. Purchase piping bulk material
3. Welding of Piping (isometrics will be provided)
4. Cold bending of pipe
5. Pickling
6. Coating (Fusion Bonded Epoxy, FBE) and Insulation (High Density Polyethylene, HDPE jacketing
7. Welding in Valves. WTP will provide valves, some valves will have soft seats, temperatures will require monitoring to prevent damage
8. Spools will have pipe supports. Pipe support drawings provided by WTP (supports between the inner and outer pipe, stanchions on outer pipe.
9. Material Testing
    a) Independent testing of bulk materials for full physical and chemical properties to associated ASTMs utilizing laboratories accredited to ISO/IEC 17025. Testing will result in Certified Material Test Reports Confirming MTRs received with purchased materials. Sample lot sizes tables for testing will be provided.
    b) Independent testing of weld rod materials for full chemical properties to associated ASTMs utilizing laboratories accredited to ISO/IEC 17025.

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c) Impact testing for piping, weld deposit and heat affected zone
d) Fittings per ASME B16.9, MSS SP-95, and MSS SP-97
e) Pressure (hydrostatic and pneumatic) testing of spools

10. Material Inspections
    a) All measuring and testing equipment utilized shall be calibrated by an accredited ISO/IEC 17025 laboratory.
    b) Wall thickness measurements shall be documented and submitted to the Buyer
    c) NDE of welds (RT), Weld repair, post weld heat treatment results shall be submitted to the Buyer

Equipment and Materials Required

Supplier shall provide all equipment and materials necessary to accomplish work in section above

Codes

- ASME B31.3
- ASME Boiler and Pressure Vessel Code

Standards

- Various ASME and ASTMs for piping components and materials

ASNT SNT-TC-1A, *Recommended Practice No. SNT-TC-1A Personnel Qualification and Certification in Nondestructive Testing*

- ASME B16.9, MSS SP-95, and MSS SP-97

Please note that this solicitation may result in material procurements and proposals greater than $10,000 and must comply with FAR 52.225-11 Buy American Act – Construction Materials Under Trade Agreements (SEP 2010). If you cannot comply or foresee any issues with compliance, please provide a detailed explanation.

If your company is interested in this solicitation, please proceed to Section 4.0 and complete the below sections as requested. The BNI Acquisition Services Purchasing group is responsible for collection, evaluation, and internal publication of potential bidders' information for the purpose of pre-qualification for all solicitations.

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COMPANY NAME: _____

BIDDER REQUEST FOR INTEREST & PREQUALIFICATION

CRITERIA AND RESPONSE

4.0 Response Submittal

4.1 Submission Due Date: **May 31, 2025**

Submission Method: Submissions must be received no later than the due date to the Purchasing Representative, Andrea Riste, via email at adriste@bechtel.us. For questions, call (509) 430-9055.

5.0 Pre-Selection Criteria

5.1 Company Response

Prime Subcontractor Company Name: _____

Address: _____

_____

Pre-qualification Contact Name: _____

Phone Number: _____

E-mail Address: _____

DUNS No. (Dun & Bradstreet): _____

5.2 North American Industry Classification System Code (NAICS)

The NAICS (North American Industry Classification System code for this work is **332996.** The SBA size standard for this code is **550 employees**. For pre-qualification purposes, you are a small business if your company's number of employees does not exceed 550 employees.

Business Size Classification (according to U.S. Small Business Administration Criteria)

- ☐ Small
- ☐ Small Disadvantaged Business
- ☐ Woman Owned Small Business
- ☐ HUBZone Business
- ☐ Veteran-Owned Small Business Concern
- ☐ Service-Disabled Veteran-Owned Small Business Concern.
- ☐ N/A – Registered as a Large Business

5.3 Quality Assurance Requirements Program

Programmatic Quality Assurance (QA) requirements for this purchase orders will be in accordance with Supplier QA program, please mark as applicable:

	Commercial Quality - Based on DOE Order 414.1C
	Nuclear Level Quality - Based on ASME NQA-1 2022

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COMPANY NAME: _____

BIDDER REQUEST FOR INTEREST & PREQUALIFICATION

CRITERIA AND RESPONSE

A. Does your Company have a written Quality Assurance Program?

☐ Yes ☐ No

B. Which QA standards does this program meet? _____

☐ DOE/RW/0333P ☐ ASME NQA-1 ☐ ASME Section VIII ☐ ISO-9000 ☐ Other

C. If selected "other" above, please furnish a copy of its QA Program Table of Contents and a brief summary identifying each of the requirements listed below. The level of rigor applied to the elements shall be commensurate with the risks associated with the Work.

- A description of the organizational structure, functional responsibilities, levels of authority, and interfaces for those managing, performing, and assessing the Work.
- Personnel Training and Qualifications
- Quality Improvement
- Control of Documents and Records
- Work Processes
- Design
- Procurement
- Product Identification and Traceability
- Inspection and Acceptance Testing
- Control of the Testing Equipment
- Control of Non-Conforming Product
- Corrective and Preventative Actions
- Handling, Storage and Shipping Procedures
- Management Assessment
- Independent Assessment

D. Your company has the option to submit their full Quality Assurance Plan with this interest.

5.4 Commercial Data

Potential bidders are required to register on the Bechtel Supplier and Contractor Portal: https://www.Bechtel.com/supplier/ in order to be considered.

What was the date your company registered or updated its information on the Portal?

Date Updated:_____

A. Rough Order of Magnitude for Scope of Work (USD): $_____

B. Estimated Delivery Schedule:

i. Engineering/Design: _____ weeks ARO
ii. Material Procurement: _____ weeks ARO
iii. Fabrication: _____ weeks ARO
iv. Delivery: _____ weeks ARO

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C. Are there long lead items to be aware of (if yes, please specify)?
_____
_____

D. Does your company have a suggested alternate offering/product that offers an improvement, more cost effective, or offers shorter delivery (i.e. "buy what you make")?

☐ No, we will supply an identical or similar product.

☐ Yes, we have an alternate offering. If so, please describe below or provide as an attachment.

_____
_____
_____

E. What risks do you foresee with this procurement that BNI should be aware of and possibly help mitigate?_____
_____
_____

5.5 Technical Criteria

A. Direct Relevant Experience Documentation: If the Respondent has answered "yes" to the foregoing questions, provide a reference list of example projects over the last ten years, on the included Experience Statement, that demonstrate direct relevant project experience to support each "yes" response. Example projects should be detailed as to both the technical scope of the project and your participation in the project.

Column completion notes for the below, Experience Statement, to be completed by the Prime contractor:

A. Customer Name, Address, Contact Name and Phone No.- So that we may contact as a reference as needed.

B. Work Description and Location- Describe work scope and location and indicate if prime or subcontract.

C. Original/ Final Contract Value- Original award value and final closeout contract value.

D. Commencement/ Completion Dates- Provide starting date and actual completion (or forecast if still in progress) by month/year format (e.g., Jan 2006/ Sept 2007)

Customer Name, Address, Contact Name and Phone No.	Work Description and Location	Original/Final Contract Values	Commence/ Complete Dates

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6.0 Pre-Qualification Document Checklist

Companies are encouraged to use this checklist to ensure their submittal is complete.

☐ Interest & Prequalification Criteria and Response Package (this document)

☐ QA Program Table of Contents and summary *or* a copy of QA Plan

☐ Additional supporting documentation such as brochures and company profiles.

☐ Direct Relevant Experience Documentation (included in this document or provided as attachment)

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RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

Q Dual Containment Piping and CM Black Cell/Hard-to-Reach Dual Containment Piping

Content applicable to ALARA? ☐ **Yes** ☒ **No** **ADR No.** N/A **Rev** N/A **Retroactive applicability:** Changes are retroactively applied to the full scope of the specification. There are no exisitng, procured, in fabrication, ready-to-ship, delivered, or installed items or materials. As such, there are no material impacts. ☐ **N/A** *(alpha revision or revision 0)*	**Quality Level** Q	DOE Contract No. DE-AC27-01RV14136

REV	DATE	BY	CHECK	AUTHORIZATION	APPROVER
		Originator By: Dave Holland - dholland Org Name: Plant Engineering (PENG) Placed: Jan 22, 2024	**Checked** By: Casey Byrne - cjbyrne Org Name: Bechtel Placed: Jan 22, 2024		
1		D.Holland	C.Byrne	N/A	J.McGrath
0	12-15-21	J.Fugate	C.Byrne	N/A	J.McGrath

SPECIFICATION No. 24590-WTP-3PS-PS02-T0014 **Rev** 1

Revision History

Revision	Reason for Revision	Q Specification Revision Only Margin Reduced?		CM Only
		YES	NO	N/A
0	Initial Issue	N/A	N/A	N/A
1	Issued for Procurement. Comprehensive Revision including, removal of the reference to year 1996 of B31.3 code for fabrication and procurement, updates to correct formatting issues, Source References, added acronym section, updated technical supply conditions for pipe, fittings, and flanges, added minimum wall thickness examination requirement, added proof test data submittal requirement, made corrections and additions to Table 3 Base Material and Weld Filler Metal Composition Requirements (in accordance with MET current specification), removed Identification as a critical characteristic in Section 4.8, made updates to the Welding Requirements Section 5.4.5 & 5.4.6, updated Inspection and Test Plan Section 6.1.2, updated Personnel Qualifications and Certification requirements Section 6.2, updated Section 7 Packing, Cleaning, Handling, and Storage Requirements, updated Marking and Labeling Requirements Section 7.6, and updated Section 10 Documentation and Submittal requirements. This is an extensive revision, the specification has been completely rewritten and therefore the changes are not identified with change bars in the right margin.	☐	☒	☐
		☐	☐	☐
		☐	☐	☐

Contents

Appendices

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1 Scope

This specification defines the requirements and the work necessary for fabrication of Q dual-containment piping subassemblies (pipe spools) in accordance with the American Society of Mechanical Engineers (ASME) B31.3, Process Piping code, other codes and standards, and documents as referenced in this specification. This specification applies to Q Dual Containment piping, Q Dual Containment Black Cell/Hard-to-Reach piping, and CM Dual Containment Black Cell/Hard-to-Reach piping.

The WTP design incorporates the "black cell" concept as a key part of the facility design of the Pretreatment (PT) and the High-Level Waste (HLW) facilities. This entails locating certain equipment in the shielded cells for which no maintenance or entry is planned for the 40-year design life of the plant. Black cell (BC) Piping - all piping and tubing within a black cell up to the first weld outside the black cell.

There are areas of the WTP facilities that have components that are considered to be hard-to-reach (HtR) because of location and expected difficulty to perform repairs or maintenance which has the potential to impact mission life. HtR areas are designated as such based on R5 area radiation levels after removal of transient sources and decontamination and 1) piping and components cannot be manually or remotely maintained, and/or 2) piping and components are isolated physically by permanent plant equipment which cannot be manually or remotely removed. HtR piping extends out to the first accessible weld.

There are no valves in BC areas, and there are no inaccessible valves in HtR areas.

The term "Black Cell Weld" applies to any weld in a BC pipe or pipe spool.

The term "Hard to Reach Weld" applies to any weld in an HtR pipe or pipe spool.

Isometrics issued prior to February, 2008 are reviewed by BUYER's Engineering to determine whether a pipe spool is "BLACK CELL" or "HARD To REACH" or not. This review and spool identification information is provided to the SELLER.

Isometric drawings issued on or after 1 February 2008 identify the pipe spools that are to be installed in black cells or hard-to-reach areas. The isometric drawing identifies each black cell or hard-to-reach pipe spool with a spool tag which will include the spool ID number and the words "BLACK CELL" or "HARD TO REACH", as appropriate. Additionally, the respective isometric will have the words "CONTAINS BLACK CELL (or HARD TO REACH, as appropriate) PIPE" in large type located just above or beside the title block.

1.1 Work Included[1]

1.1.1 Perform the following work for piping in systems listed in the purchase order in accordance with the requirements of this specification, its appendices, and reference documents.

1.1.1.1 Furnish shop pipe spool sheets, extended spool sheets, or detailed drawings when specifically required by the purchase order.

1.1.1.2 Furnish materials as required by the purchase order including pipe, fittings, flanges, and welding materials required for fabrication

1.1.1.3 Fabricate pipe spools as follows:

1.1.1.3.1 Fabricate pipe spools including the installation of fittings, nozzles, thermowell connections, radiographic access holes and bosses, breather holes when required, and the preparation of field welding ends.

1.1.1.3.2 Install valves, valve actuators, and other piping components and specialty items supplied by the BUYER when required by the purchase order.

1.1.1.3.3 Supply and install integral structural attachments and supports as shown on piping isometric drawings, orthographic drawings, and/or detailed support drawings.

1.1.1.4 Perform post-weld heat treatment (PWHT) as required.

1.1.1.5 Perform all required testing and examinations.

1.1.1.6 Perform all required external cleaning, coating (including Fusion Bonded Epoxy), insulation, preservation, and shipping preparation.

1.1.1.7 Chemically clean and/or pickle piping where indicated on the piping isometric drawing and/or the piping material class.

1.1.1.8 Mark pipe spools with identification numbers in accordance with the identification numbers shown on the piping isometric drawings, orthographic drawings, or other instructions furnished by the BUYER.

1.1.1.9 Apply color coding for material lay down purposes when required by the purchase order.

1.1.1.10 Furnish all required submittals and documentation in accordance with requirements as shown on the G-321-E, *Engineering Document Requirements* and G-321-V, *Quality Verification Document Requirements* forms included in the purchase order.

1.1.1.11 Package fabricated spools and associated materials, with packing lists, for delivery to the jobsite.

1.1.1.12 Perform hydrostatic leak testing of fabricated spools when specifically required by Section 6.4.1 using BUYER reviewed test procedures.

1.1.1.13 Perform pneumatic leak testing of fabricated spools when specifically required by Section 6.4.1 using BUYER reviewed test procedures.

1.1.1.14 Perform Positive Material Identification (PMI) on materials and fabrication and fabrication per the requirements of this specification. PMI is not to be performed on BUYER-furnished valves or BUYER furnished piping materials.

1.1.1.15 Provide pieces for field insulation work if supplier pre-insulates the pipe per 24590-WTP-3PS-PX04-T0005.

1.2 Related Work Not Included[2]

1.2.1 The following items are not included in the SELLER's scope of work:

1.2.1.1 Jacket piping leak testing except as noted in section 1.1.1.13.

1.2.1.2 Furnish and install flanged valves, specialty items, expansion joints, instrumentation (including sensing devices), relief valves, orifice plates, and flow elements.

1.2.1.3 Furnish and install pipe supports (except as noted in Section 1.1.1.3.3).

1.2.1.4 Furnish thermowells.

1.2.1.5 Furnish and install flow nozzles and associated hardware.

1.2.1.6 Install fabricated piping subassemblies in the field.

1.2.1.7 Furnish and install thermal insulations for piping in the field.

1.2.1.8 Design piping and prepare piping drawings (except detailed spool drawings in accordance with Section 1.1.1.1.

1.2.1.9 Furnish bolting materials, gaskets, insulated flange kits, or backing rings required for field assembly.

1.2.1.10 Pipe wall thickness and branch reinforcement calculations.

1.3 Safety/Quality Classifications

The scope of this specification only includes Q Dual Containment Piping and CM Black Cell/Hard-to-Reach Dual Containment Piping safety and quality classified piping.

2 Applicable Documents

The editions of reference codes, standards and specifications shown in Appendix E of ASME B31.3 listed below, and any subsequent edition, up to and including the latest issued edition, is approved for use. This does not include Standard Specifications where the specified material grade tensile requirements have been reduced. A Supplier Deviation Disposition Request (SDDR) is required in this case.

Other codes and standards that are not references of ASME B31.3, are acceptable for use to facilitate ASME B31.3 piping fabrication or are used for pipe fabrication that is not within the scope of ASME B31.3.

2.1 Codes[3]

ASME, 1995, *Boiler and Pressure Vessel Code*, as amended, American Society of Mechanical Engineers, New York, NY.

ASME B31.3, ASME Code for Pressure Piping, "Process Piping," American Society of Mechanical Engineers, New York, NY.

2.2 Industry Standards[4]

API 5L, 1992, *Specification for Line Pipe*, Fortieth Edition, as amended, American Petroleum Institute Publishing Services, Washington, DC.

ASME B1.20.1, 1983, *Pipe Threads, General Purpose (Inch)*, as amended, American Society of Mechanical Engineers, New York, NY.

ASME B16.5, 1988, *Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inches Standard*, as amended, American Society of Mechanical Engineers, New York, NY.

ASME B16.9, 1986, *Factory-Made Wrought Buttwelding Fittings*, as amended, American Society of Mechanical Engineers, New York, NY.

ASME B16.11, 1991, *Forged Fittings, Socket-Welded and Threaded*, as amended, American Society of Mechanical Engineers, New York, NY.

ASME B16.25, 1986, *Buttwelding Ends*, as amended, American Society of Mechanical Engineers, New York, NY.

ASME B16.28, 1986, *Wrought Steel Buttwelding Short Radius Elbows and Returns*, as amended, American Society of Mechanical Engineers, New York, NY.

ASME B16.36, 1988, *Orifice Flanges*, as amended, American Society of Mechanical Engineers, New York, NY.

ASME B16.47, 1990, *Large Diameter Steel Flanges NPS 26 through NPS 60*, as amended, American Society of Mechanical Engineers, New York, NY.

ASME B16.48, 2015, *Steel Line Blanks*, as amended, American Society of Mechanical Engineers, New York, NY.

ASME B36.10M, 1985, *Welded and Seamless Wrought Steel Pipe*, as amended, American Society of Mechanical Engineers, New York, NY.

ASNT SNT-TC-1A, 2006, *Recommended Practice No. SNT-TC-1A Personnel Qualification and Certification in Nondestructive Testing*, The American Society for Nondestructive Testing, Columbus, OH.

ASTM A53-93a, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*, as amended, ASTM International, West Conshohocken, PA.

ASTM A105-93b, *Standard Specification for Carbon Steel Forgings for Piping Applications*, as amended, ASTM International, West Conshohocken, PA.

ASTM A106-93, *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*, as amended, ASTM International, West Conshohocken, PA.

ASTM A123-17, *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products*, as amended, ASTM International, West Conshohocken, PA.

ASTM A182-93b, *Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High Temperature Services*, as amended, ASTM International, West Conshohocken, PA.

ASTM A234-92a, *Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service*, as amended, ASTM International, West Conshohocken, PA.

ASTM A312-21, *Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*, as amended, ASTM International, West Conshohocken, PA.

ASTM A403-93, *Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings*, as amended, ASTM International, West Conshohocken, PA.

ASTM B366-20, *Standard Specification for Factory-Made Wrought Nickel and Nickel Alloy Fittings*, as amended, ASTM International, West Conshohocken, PA.

ASTM B675, *Standard Specification for UNS N08367 Welded Pipe*, as amended, ASTM International, West Conshohocken, PA.

EPRI 3002002982, 2014, *Plant Engineering: Guideline for the Acceptance of Commercial-Grade Items in Nuclear Safety-Related Applications Revision 1 to EPRI NP-5652 and TR-102260*, Electric Power Research Institute, Palo, Alto, CA.

EPRI TR-017218, 1999, *Guideline for Sampling in the Commercial Grade Item Acceptance Process*, Electric Power Research Institute, Palo Alto, CA.

MSS-SP-25-1978 (R1988), *Standard Marking System for Valves, Fittings, Flanges and Unions*, as amended, Manufacturers Standardization Society of the Valve and Fittings Industry, Inc., Vienna, VA.

MSS SP-95-1986, *Swage(d) Nipples and Bull Plugs*, as amended, Manufacturers Standardization Society of the Valve and Fittings Industry, Inc., Vienna, VA.

MSS SP-97-1987, *Integrally Reinforced Forged Branch Outlet Fittings - Socket Welding, Threaded, and Buttwelding Ends*, as amended, Manufacturers Standardization Society of the Valve and Fittings Industry, Inc., Vienna, VA.

PFI ES-3, 2009, *Fabricating Tolerances*, as amended, Pipe Fabrication Institute, New York, NY.

PFI ES-5, 2013, *Cleaning of Fabricated Piping*, as amended, Pipe Fabrication Institute, New York, NY.

PFI ES-24, 2015, *Pipe Bending Methods, Tolerances, Process, and Material Requirements,* as amended, Pipe Fabrication Institute, New York, NY.

PFI ES-31, 1992, *Standard for Protection of Ends of Fabricated Piping Assemblies,* as amended, Pipe Fabrication Institute, New York, NY.

2.3 Engineering Specifications[5]

24590-WTP-3PS-AFPS-T0001, Rev. 5, *Engineering Specification for Shop Applied Special Protective Coatings for Steel Items and Equipment*

24590-WTP-3PS-G000-T0002, Rev 10, *Engineering Specification for Positive Material Identification (PMI) for Shop Fabrication*

24590-WTP-3PS-G000-T0019, Rev. 2, *Engineering Specification for Acquisition of Commercial Items and Services for Use in Safety Applications at WTP*

24590-WTP-3PS-G000-T0050, Rev 1, *Engineering Specification for Supplier Documentation*

24590-WTP-3PS-NW00-T0002, Rev. 1, *Engineering Specification for Chemical Requirements for Materials Used in Contact with Austenitic Stainless Steel and Nickel Based Alloys*

24590-WTP-3PS-PX04-T0001, Rev. 1, *Engineering Specification for Shop Applied Fusion Bonded Epoxy Coating for Underground Carbon Steel Pipe*

24590-WTP-3PS-PX04-T0002, Rev. 5, *Engineering Specification for Application of Liquid Epoxy Coating for Piping Applications*

24590-WTP-3PS-PX04-T0005, Rev. 0, *Engineering Specification for Installation of Insulation and Jacketing for a Pre-Insulated Piping System*

24590-WTP-3PS-PX04-T0006, Rev. 0, *Engineering Specification for Installation of High Density Polyethylene (HDPE) Shrink Sleeves for Piping Application*

24590-WTP-PW-P30T-00001, Rev. 1, *WTP End Prep Detail for Field Butt Welds*

2.4 Reference Documents/Drawings[6]

N/A

2.5 Requirement Source References

1. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 1.2

2. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 1.3

3. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 1.4

4. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 1.4

5. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 1.5

6. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 1.5

7. 24590-WTP-DB-ENG-18-001, Rev 3, *Basis of Design*, Sections 9.8.4, 11.5.4, & 12.3.4

8. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 2.1.1.5

9. 24590-WTP-3PS-PB01-T0001, Rev. 9, *Technical Supply Conditions for Pipe, Fittings, and Flanges*, Section 5.1

10. 24590-WTP-3PS-PB01-T0001, Rev. 9, *Technical Supply Conditions for Pipe, Fittings, and Flanges*, Section 5.5

11. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 2.1.1

12. 24590-WTP-3PS-PB01-T0001, Rev. 9, *Technical Supply conditions for Pipe, Fittings, and Flanges*, Section 5.3, 5.4 & 5.8

13. 24590-WTP-3PS-PV00-T0001, Rev. 9, *Technical Supply Conditions for Valves*, Section 3.30

14. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 2.1.1.1.1

15. 24590-WTP-DB-ENG-18-001, Rev 3, *Basis of Design*, Appendix C, Section C3.3.

16. 24590-WTP-DB-ENG-18-001, Rev 3, *Basis of Design*, Section 16.4.1.3

17. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 2.1.8

18. 24590-WTP-3PS-PB01-T0001, Rev. 9, *Technical Supply Conditions for Pipe, Fittings, and Flanges*, Section 6

19. 24590-WTP-QAM-QA-06-001, Rev. 21, *Engineering, Procurement, and Construction Quality Assurance Manual*, Section 8.1.2.2, & 8.1.2.3

20. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 2.1.2

21. 24590-WTP-3PS-PB01-T0001, Rev. 9, *Technical Supply Conditions for Pipe, Fittings, and Flanges*, Section 8

22. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 2.1.6

23. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 2.1.9

24. 24590-WTP-DB-ENG-18-001, Rev 3, *Basis of Design*, Section 16.4.1.8

25. 24590-WTP-3PS-G000-T0002, Rev. 10, *ENGINEERING SPECIFICATION FOR POSITIVE MATERIAL IDENTIFICATION (PMI) FOR SHOP FABRICATION*, Sections 1 & 3

26. 24590-WTP-3PS-G000-T0002, Rev. 10, *ENGINEERING SPECIFICATION FOR POSITIVE MATERIAL IDENTIFICATION (PMI) FOR SHOP FABRICATION*, Appendix B

27. 24590-WTP-QAM-QA-06-001, Rev.21, *ENGINEERING, PROCUREMENT, AND CONSTRUCTION QUALITY ASSURANCE MANUAL*, Section 7.1.2.12.1, 7.1.2.12.2, 7.1.2.12.3, 7.1.2.12.4 & 7.1.2.12.9

28. 24590-WTP-3PS-G000-T0019, Rev. 2, *Acquisition of Commercial Items and Services for Use in Safety Applications at WTP*, Sections 3, 4.3, 4.6, 5, 6, 7, 8, 9, 10, and 11

29. 24590-WTP-DB-ENG-18-001, Rev 3, *Basis of Design*, Sections 9.8.4, 11.5.4, & 12.3.4

30. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 3.1.1

31. 24590-WTP-3PS-PS02-T0002, Rev. 2, *Cold Bending of Pipe*, Sections 1, 2, 3, 4, 5, 6 & 10

32. 24590-WTP-QAM-QA-06-001, Rev. 21, *Engineering, Procurement, and Construction Quality Assurance Manual*, Sections 9.1.2.1, 9.1.2.2 & 9.1.2.4

33. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 3.1.5

34. 24590-WTP-3PS-NWP0-T0001, Rev. 2, *General Welding and NDE Requirements for Supplier Fabricated Piping*, Sections 4, 5, 6, 7, 8, 9 & 13

35. 24590-WTP-QAM-QA-06-001, Rev. 21, *Engineering, Procurement, and Construction Quality Assurance Manual*, Sections 9.1.2.1, 9.1.2.2 & 9.1.2.4

36. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 1.7.2

37. 24590-WTP-QAM-QA-06-001, Rev. 21, *ENGINEERING, PROCUREMENT, AND CONSTRUCTION QUALITY ASSURANCE MANUAL*, Sections 8.1.2.3 & 13.1.2.2

38. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 1.8.2

39. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 3.1.11

40. 24590-WTP-QAM-QA-06-001, Rev.21, *ENGINEERING, PROCUREMENT, AND CONSTRUCTION QUALITY ASSURANCE MANUAL*, Section 10.1.2.1

41. 24590-WTP-DB-ENG-18-001, Rev 3, *Basis of Design*, Section 9.8.4, 11.5.4, & 12.3.4

42. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, SECTION 3.2

43. 24590-WTP-3PS-NWP0-T0001, Rev. 2, *General Welding and NDE Requirements for Supplier Fabricated Piping*, Sections, 11, 13

44. 24590-WTP-QAM-QA-06-001, Rev. 21, *ENGINEERING, PROCUREMENT, AND CONSTRUCTION QUALITY ASSURANCE MANUAL*, Section 10.1.2.4, 10.1.2.7, 11.1.2.3, & A10.1.1.4

45. 24590-WTP-3PS-G000-T0050, Rev. 1, *ENGINEERING SPECIFICATION FOR SUPPLIER DOCUMENTATION*, Section 3.2.2.1, 3.2.2.2, 3.2.2.3, 3.2.2.4, 3.2.2.9 & 3.2.20.1

46. 24590-WTP-QAM-QA-06-001, Rev. 21, *ENGINEERING, PROCUREMENT, AND CONSTRUCTION QUALITY ASSURANCE MANUAL*, Sections 2.6.6

47. 24590-WTP-QAM-QA-06-001, Rev. 21, *ENGINEERING, PROCUREMENT, AND CONSTRUCTION QUALITY ASSURANCE MANUAL*, Section 9.1.2.1

48. 24590-WTP-DB-ENG-18-001, Rev. 3, *Basis of Design*, Section 16.4.1.3 & 16.4.2.4

49. 24590-WTP-QAM-QA-06-001, Rev. 21, *ENGINEERING, PROCUREMENT, AND CONSTRUCTION QUALITY ASSURANCE MANUAL*, Section 13.1.2

50. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 1.8

51. 24590-WTP-3PS-G000-T0003, Rev. 3, *Packaging, Hanging, and Storage Requirements*, Sections 4, 5, 6, 7, 8, 9, 10 & 11

52. 24590-WTP-QAM-QA-06-001, Rev. 21, *ENGINEERING, PROCUREMENT, AND CONSTRUCTION QUALITY ASSURANCE MANUAL*, Section 13.1.2

53. 24590-WTP-QAM-QA-06-001, Rev.21, *ENGINEERING, PROCUREMENT, AND CONSTRUCTION QUALITY ASSURANCE MANUAL*, Section 7.1.2.12.5, 7.1.2.12.6 & 7.1.2.12.8

54. 24590-WTP-QAM-QA-06-001, Rev. 21, *ENGINEERING, PROCUREMENT, AND CONSTRUCTION QUALITY ASSURANCE MANUAL*, Policy Q-04.1 Procurement Document Control

55. 24590-WTP-QAM-QA-06-001, Rev. 21, *ENGINEERING, PROCUREMENT, AND CONSTRUCTION QUALITY ASSURANCE MANUAL*, Section 17.1.2.2, 17.1.2.3 & A17.1.5.1

56. 24590-WTP-3PS-G000-T0050, Rev. 1, *ENGINEERING SPECIFICATION FOR SUPPLIER DOCUMENTATION*, Section 3.1.2, 3.1.3, 3.3.2.3, 3.3.2.4 & 3.3.2.5

57. 24590-WTP-3PS-PS02-T0001, Rev. 10, *Shop Fabrication of Piping*, Section 1.9

2.6 Acronyms

3D – Three Times Diameter
B&PVC – Boiler and Pressure Vessel Code
BC – Black Cell
BM – Base Metal
C of C – Certificate of Compliance / Conformance
CC – Critical Characteristics
CGD – Commercial Grade Dedication
CGI – Commercial Grade Item
CHW – Chilled Water (System)
CM – Commercial Grade
DCM – Design Compliance Matrix

GMAW – Gas Metal Arc Welding
GTAW – Gas Tungsten Arc Welding
HDPE – High Density Polyethylene
HLW – High Level Waste
HtR – Hard to Reach
I.D. – Inside Diameter
ID - Identification
Min – Minimum
MR - Material Requisition
MT – Magnetic Particle Test
MTR – Material Test Report
N/A – Not Applicable
NDE – Nondestructive Examination
NPS – Nominal Pipe Size
OES - Optical Emission Spectroscopy
PEEK - Polyether ether ketone
PFA – Perfluoroalkoxy (Teflon®)
PMI – Positive Material Identification
PMIV - Positive Material Identification Verified
PO – Purchase Order
PQR – Procedure Qualification Record
PT – Liquid Penetrant Examination
PTFE - Polytetrafluoroethylene
PWHT - Post-Weld Heat Treatment
QA – Quality Assurance
QVD – Quality Verification Documentation
Rm – Mean Radius of the Pipe
RT – Radiographic Examination
RTFE - Reinforced Polytetrafluoroethylene (Teflon®)
SAW - Submerged Arc Welding
SDDR – Supplier Deviation Disposition Request
SQR – Supplier Quality Representative
SW – Socket Weld
t – Thickness of the Pipe (Wall)
TE – Threaded End
UHMWPE - Ultra-High-Molecular-Weight Polyethylene
UT – Ultrasonic Examination
VT – Visual Examination
WFM – Weld filler Material
WPAL – Welding Procedure Application List

WPS – Weld Procedure Specification
WTP – Hanford Tank Waste Treatment and Immobilization Plant
XRF – X-ray Fluorescence

3 Design Requirements

3.1 Basis of Design[7]

Process piping is designed in accordance with ASME B31.3, *Process Piping*, unless otherwise justified.

3.2 Codes

The applicable design codes are as noted on the piping class sheets. Any conflicts between this document and the applicable design codes shall be brought to the attention of the BUYER's Engineering.

3.3 Design Conditions

The service limits and the corrosion/erosion allowance referred to in each piping material class are enveloping conditions. Pressures and temperatures listed in the piping material classes shall not be exceeded except as permitted by the applicable code.

3.4 Pipe Wall Thickness and Branch Reinforcements

Each piping class is supported by BUYER's Engineering wall thickness calculations, external pressure calculations (as applicable) and if necessary, by a branch reinforcement calculation.

The commercially available pipe wall thickness, specified in the stock codes of the piping classes, meets or exceeds the minimum calculated wall thickness.

Integrally reinforced branch connections do not require a BUYER's Engineering separate calculation.

4 Materials

4.1 Piping Material Classes

4.1.1 General[8,9]

This section defines the piping material requirements for pipes, fittings, flanges, valves, and other piping components for each noted service and the pressure and temperature limitations within which they may be used. The design and constituent components for branch connections, vents and drains, pressure, temperature, and orifice instrument connections are also covered. The piping material classes are listed in Part 2, Section 1.2 of the purchase order.

The Bechtel stock code description (identified in Attachment 2 of the referenced Piping Material Classifications), also referred to as long stock code description, for piping components shall be used for the specification and purchase of bulk piping materials. The stock code short description (shown in

Attachment 1 of the Piping Material Classifications and on the isometric bill of materials) is often truncated or otherwise shortened. As such, it shall not be used for the specification and purchase of bulk piping materials.

4.1.2 Pipe

Nominal pipe sizes (NPS) 1/8, 1/4, 3/8, 1 1/4, 2 1/2, 3 1/2, 5, and 22, and any other nominal pipe size not shown in ASME B36.10, should not be used except to match manufacturer's equipment connections or as specified on the isometric drawings. Where necessary to match a manufacturer's equipment connection, a transition piece must be used immediately adjacent to the equipment for the transition to the next acceptable pipe size.

In general, all NPS 2 and larger pipe with a schedule of standard weight and heavier has been specified as double random length and NPS 1 1/2 and smaller as single random length. The majority of pipe included in these classes is multiple stamped.

Example:

(ASTM A106 Grade B and A53 Grade B).

For carbon steel material by ASME B31.3 paragraph 323.2.2/Fig. 323.2.2, impact testing may be required.

Schedule 160 threaded pipe nipples for carbon steel (except galvanized) may be used to provide enhanced mechanical strength.

Pipe stock codes used in the piping material classes reflect pipe in the unpainted condition.

4.1.3 Flanges

NPS 24 and smaller steel flange dimensions and ratings are to meet ASME B16.5, *Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inches.*

NPS 26 through NPS 60 steel flange dimensions and ratings are to meet ASME B16.47, *Large Diameter Steel Flanges NPS 26 through NPS 60,* Series A. However, ASME B16.47 Series B to be used when needed to mate with existing equipment.

Flat faced flanges shall be used to match flat face equipment and other flat faced flanged components (e.g., copper alloy, cast iron flanges, glass reinforced plastic flanges, and for NPS 30 and larger flanges in large diameter water lines).

Orifice flanges shall be in accordance with ASME B16.36, *Orifice Flanges,* and shall be supplied in pairs, complete with jackscrews, but without bolts, gaskets, or orifice plates. Quantities on bills of material, material requisitions, etc., shall indicate sets, not individual flanges.[10]

Blanks, either permanent or temporary are required to have sufficient thickness per the ASME B31.3 code. Spectacle blinds (Steel Line Blanks) shall be in accordance with ASME B16.48. These spectacle blinds can be used as permanent blanks; or when required to isolate line for pressure testing, start-up, or maintenance. Gasket contact surface finishes shall be the same as the mating flanges.

4.1.4 Fittings

Butt weld fittings shall conform to the material requirements and wall thickness of the pipe with which they are used.

The wall thickness of reducing tees, concentric, and eccentric reducers shall correspond on each end to the wall thickness of the mating pipe.

Half couplings shall not be used for branch connections per ASME B31.3.

4.1.5 Branch Connections

The branch connections are limited to fittings specified in the piping material classes.

4.1.6 Bolting and Gaskets

Bolting and gaskets are supplied by others.

Machine bolts shall not be used except as jackscrews. Jackscrews shall be threaded full length. The length shall be measured from the bearing surface of the head and shall include the end point.

4.2 Technical Supply Conditions for Pipe, Fittings, and Flanges

4.2.1 General Notes[11, 12, 13]

4.2.1.1 Individual line service class material will be identified on piping isometrics by indicating the appropriate piping class. Stock codes will generally be assigned for each item of shop material. Materials shall be in accordance with BUYER stock code purchase descriptions (i.e., all materials shall be purchased to the BUYER long stock code description as listed in the applicable pipe class specification). The BUYERs short description as shown on the isometric shall not be used for purchasing materials. Materials shall conform to the material specification and the applicable code. Materials shall be new and traceable to the respective material test report (MTR).

4.2.1.2 The following are acceptable exceptions to the long stock code description:

4.2.1.2.1 Seamless pipe and fittings are an acceptable substitute when welded pipe or fittings are specified. Welded pipe and fittings are an acceptable substitute for seamless pipe or fittings only when approved by SDDR.

4.2.1.2.2 Where material is specified as triple stamped, seamless A106/A53/API 5L Grade B, the following single stamped materials are acceptable:

a) A106 Grade B
b) Seamless A53 Grade B
c) Seamless API 5L Grade B

4.2.1.2.3 Where material is specified as double stamped, welded A53/API 5L Grade B, the following single and triple stamped materials are acceptable:

a) Welded A53 Grade B
b) Welded API 5L Grade B
c) Seamless A53/A106/API 5L Grade B

4.2.1.2.4 Where material is specified as dual grade, Type 316/316L stainless steel, a single grade Type 316L is acceptable.

4.2.1.2.5 Where material is specified as dual grade, Type 304/304L stainless steel, a single grade Type 304L is acceptable.

4.2.1.2.6 Where BUYER's long stock code description specifies pipe to be furnished "Beveled Both Ends," pipe furnished with "Plain Ends" is acceptable.

4.2.1.2.7 Where BUYER's purchase order description specifies pipe to be furnished "Double Random Lengths," pipe furnished in "Single Random Lengths" is not acceptable.

4.2.1.2.8 Where ASTM B675 (*Standard Specification for UNS N08367 Welded Pipe*) N08367 Class 1 pipe with a hydrostatic test is specified, N08367 Class 2 pipe with hydrostatic test is acceptable.

4.2.1.2.9 External rust staining of carbon steel due to contact with austenitic stainless steel and nickel alloys is acceptable. This applies to bulk piping materials and not to shop fabricated spools.

4.2.1.2.10 Where ASTM B619 UNS N06022 Class I pipe is specified, ASTM B619 UNS N06022 Class II is acceptable. The hydrostatic and nondestructive electric tests specified for Class I shall also apply to Class II pipe.

4.2.1.2.11 Double Submerged Arc Welding (SAW) API 5L Grade B is acceptable in lieu of Electric Resistance Welded API 5L Grade B for all pipe sizes larger than NPS 24.

4.2.1.2.12 Where ASTM A53 Grade B is specified, ASTM A106 Grade B is an acceptable alternate for NPS 2 and smaller.

4.2.1.2.13 Galvanizing of ASTM A106 Grade B shall be per ASTM A123.

4.2.1.2.14 Taper boring of standard schedule 40S butt weld reducing fittings, per ASME B16.25, *Buttwelding Ends*, is permitted where NPS 4 and smaller schedule 40S piping transitions to NPS 6 and larger schedule 10S piping. The applicable fitting MTRs shall be annotated accordingly.

4.2.1.2.15 Where ASTM B366 (*Standard Specification for Factory-Made Wrought Nickel and Nickel Alloy Fittings*) grades WP6XN, WP6XN-W, or WP6XN-WX are specified in the stock code descriptions for swages manufactured to the requirements of MSS SP-95, ASTM B366 grade CR6XN seamless shall be used.

4.2.1.2.16 Where ASTM B366 grades WPHC22-S, WPHC22-W. or WPHC22-WX are specified in stock code descriptions for swages manufactured to the requirements of MSS SP-95, ASTM B366 material Grade CRHC22 seamless shall be used.

4.2.1.2.17 Pipe size 4 in. and smaller fittings, and swages marked as ASTM A403 (*Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings*) and/or ASTM A182 (*Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Services*) with the same grade or type markings are acceptable for use on piping isometrics. No piping isometric bill of material change is required.

4.2.1.2.18 Certain ASTM standards list specific available lengths and do not use the terms "Double Random Lengths" or "Single Random Lengths". The lengths specified in the ASTM standard are to be used in those cases.

4.2.1.2.19 If purchase order calls out a specific item pipe length (e.g., 20 feet or 40 feet), it is meant as a nominal length for a single random length or a double random length, as applicable.

4.2.1.2.20 Pipe size 4 inches and smaller fittings, and swages marked as ASTM A234 and/or A105 with the same grade/type markings are acceptable for use on piping isometrics. No piping isometric bill of material change is required.

4.2.1.2.21 Class 600 SW end ball valves, when identified with the proper BUYER stock code, are acceptable to be used where the valve description, both short (listed on the isometric bill of material) and the purchase description (specified in the piping class), specifies 150 or 300 SW end ball valves.

4.2.1.3 When appropriate, BUYER will furnish SELLER with pipe, fittings, and/or flanges. These items will be shipped to the SELLER accompanied with the applicable documentation package(s), including MTRs. Once these items are fabricated into spools, the spools shall be shipped with the applicable documentation package including the BUYER-supplied documentation package showing the fabricator assigned material code number. The BUYER will ensure that all supplied material is in compliance with this purchase order when it is shipped to the SELLER and no further receipt inspection, other than ensuring that the paperwork agrees with the markings, checking for damage, and kick and count, will be required. Purchase order fabrication requirements and inspections, as appropriate, are to be applied, prior to shipment of the spool to the BUYER.

4.2.1.4 Impact testing shall apply where required per Table 323.2.2 of ASME B31.3 for piping, weld deposit and heat affected zone.

4.2.1.5 Threaded pipe, fittings, and flanges shall be supplied with threads in accordance with ASME B1.20.1, *Pipe Threads, General Purchase (Inch)*. Threaded galvanized pipe, fittings, and flanges shall be supplied with threads free of galvanizing.

4.2.2 Wall Thickness

4.2.2.1 For all Q piping and black cell (BC) and all hard-to-reach (HtR) area piping, each heat/lot of bulk pipe and butt weld fittings shall be examined to establish that the minimum wall thickness to establish that the minimum wall thickness meets or exceeds 87 ½% of the generally published specification or standard nominal wall thickness. This requirement applies to both CM and Q piping in black cells and hard-to-reach areas and to all associated butt weld fittings. The term "butt weld fitting" includes elbows, tees, reducers, caps,

laterals, crosses, and swages: however, it excludes pipe nipples, flanges, socket weld fittings, and integrally reinforced welded branch fittings.[14]

4.2.2.2 Bulk pipe and butt weld fittings require wall thickness measurements on each heat of material. Butt weld fittings include elbows, tees, reducers, caps, laterals, crosses, and swages. They exclude pipe nipples, flanges, socket weld fittings, and integrally reinforced fittings. Measurements shall be made at 4 locations approximately 90 degrees apart on all ends (i.e., Pipe-2 ends, elbows-2 ends, tees-3 ends, reducers-2 ends, caps-1 end, laterals-3 ends, crosses-4 ends, and swages-2 ends). In addition, pipe greater than or equal to 10 feet in length shall be measured at the midpoint at 4 locations approximately 90 degrees apart. Measurements shall be taken with calipers, micrometers, or ultrasonic equipment. Wall thickness reports shall be submitted (as part of the Quality Verification Documentation (QVD) package) for these components for each heat or lot used for spool fabrication. The applicable bulk pipe and butt weld fitting wall thickness report shall include the ASTM or ASME material specification number, grade/type, NPS, wall thickness/wall thickness designation/schedule number, heat number/material code, and actual measured dimensions. Wall thickness measurements taken as part of commercial grade dedication (CGD) tests and inspections may be used to satisfy this requirement.

4.2.3 Proof Tests[15]

4.2.3.1 ASME B16.9, Factory-Made Wrought Buttwelding Fittings, MSS SP-95, Swage(d) Nipples and Bull Plugs, and MSS SP-97, Integrally Reinforced Forged Branch Outlet Fittings - Socket Welding, Threaded and Butt-welding Ends, require adequacy of design to be established by either a fitting mathematical analyses or successful proof test data. The proof test data is the only acceptable data and is required as an engineering submittal prior to use. Mathematical Analyses is not an acceptable engineering submittal. The Buyer will review and provide permission to proceed for use via the return of the submittal with a Code 1 status. Once Code status 1 Submittal is returned, the Supplier shall record the Buyer assigned submittal number, including revision, on the first page of the applicable MTR. As stated per the applicable code/standard, it is not necessary to conduct an individual proof test of fittings with all combinations of sizes, wall thicknesses, and material. A Successful proof test on one representative fitting may represent others to the extent described in the applicable standard.

4.2.4 Additional Nondestructive Examination (NDE) for Pipe and Fitting Materials in Q Black Cell/Hard-to-Reach piping, and CM Black Cell/Hard-to-Reach piping.[16]

4.2.4.1 Longitudinal seam welds in seam welded Stainless Steel, Hastelloy, AL-6XN, Inconel, and Titanium pipe and fittings shall have full volumetric examination (100% RT or 100% UT) of the longitudinal seam weld. The material manufacturer is required to perform 100% full volumetric examination, either by radiographic (RT) or ultrasonic (UT) methods, as allowed by the applicable material specification, for all longitudinal seam welds in pipe and fitting material using the examination techniques in accordance with the requirements of applicable material specification. As required by the ASTM material standard, the NDE results shall be shown on the applicable material test report that is supplied with the material. For RT, the acceptance criteria shall be per UW-51 of ASME Boiler & Pressure Vessel Code Section VIII, Division 1. For UT, the acceptance criteria for single longitudinal seam welds shall be per UW-53 of ASME Boiler & Pressure Vessel Code

Section VIII, Division 1. There are no procedure submittal requirements for NDE performed by material manufacturers of pipe and fittings manufactured in accordance with a standard listed in ASME B31.3 Table A-1 or Table 326.1.

4.2.4.2 Where these longitudinal seam weld examinations have not been performed as required by the material manufacturer, the SELLER shall perform the examinations in accordance with the above paragraphs, including the following.

- The SELLER RT and/or UT procedures used for the above examinations shall be submitted for BUYER's review and permission to proceed, prior to use against the scope of the applicable P.O.
- The results of these SELLER performed examinations shall be included in the material quality verification documentation (QVD) package.

4.3 Identification Marking Requirements[17,18]

4.3.1 Materials shall be new and marked with the information required by the applicable ASTM or ASME material specification at receipt. Materials shall be marked using marking materials required by the specific ASTM or ASME material specification. Fabricator may use a material code for identification and control of materials in the shop after receipt and acceptance. Marking shall be done by any permanent method that will neither result in harmful contamination or sharp discontinuities, nor infringe upon the minimum wall thickness. It is acceptable to use a rounded, low stress, vibro etch tool for this marking.

4.3.2 Marking materials in contact with austenitic stainless steel and nickel-based alloys shall meet the following:

4.3.2.1 The total leachable halogen content shall not exceed 200 ppm.

4.3.2.2 The total leachable sulfur content shall not exceed 400 ppm.

4.3.2.3 The total of low melting point metals such as lead, zinc, copper, tin, antimony, and mercury shall not exceed 1 percent. Of this, mercury should not exceed 50 ppm. These low melting metals shall not be intentionally added during the manufacturing of the marking material.

4.3.3 Pipe, fittings, and flanges shall be color coded if specified in the material requisition.

4.3.4 Fittings, flanges, and unions are marked in accordance with the applicable ASTM material specification requirements, including MSS-SP-25, *Standard Marking System for Valves, Fittings, Flanges and Unions*. This includes the omission of marking information because of small fitting, flange, or union size, or configuration limitations. This may require special tagging and packaging requirements in order to properly match and control the small fitting, flange, or union to the BUYER stock code purchase descriptions / long stock code description discussed in Section 4.2.1.1, and the material certification requirements listed in Section 4.4.1.

4.3.5 Valves installed by the SELLER shall be tagged after being welded into the pipe spool (this tag is in addition to the tag being furnished with the valve). Each tag shall be stamped (not

etched) with the individual unique valve identification number specified on the face of the isometric drawing (e.g., CHW-V-04558). Tags shall be ½ inch by 2 inches (min.) rectangle or 1-inch diameter (min.) stainless steel material and securely attached to the valve with 1/32-inch diameter (min.) braided stainless steel wire. Characters shall be 3/16-inch (min.) height.

4.3.6 Any piece of material not readily identifiable during fabrication shall be rejected, including other components welded thereto.

4.4 Traceability[19, 20, 21]

4.4.1 Material traceability (e.g., identification of the item to applicable material specification, heat, batch, lot, part, or serial number or specified inspection, test, or other records) also includes transferring material identification mark(s) prior to subdividing material for piping material. Traceability is being able to trace the piping material to the applicable Material Test Report (MTR).

An MTR shall be provided for stainless steel, nickel alloy, and carbon steel materials. The material shall have a heat number that is traceable to the MTR produced by the material manufacturer. MTRs shall include, as a minimum, all data required by the applicable material specification (e.g., chemical analysis, mechanical properties, heat treatment statement, nondestructive test results, hydrostatic test results, as applicable, and heat number). A material Certificate of Compliance (C of C) shall be provided for galvanized carbon steel and other materials. MTRs or C of C for all materials, as applicable, shall be included with each shipment of the materials.

The material C of C shall contain the following information:

a) BUYER purchase order number

b) BUYER purchase order item number

c) BUYER stock code number

d) Manufacturer's name

e) The C of C identifies the specific procurement requirements met by the purchased material, equipment, or service (i.e., codes, standards, and other specifications)

f) Any approved changes, waivers, or deviations applicable to the material, service, or equipment (i.e., SDDRs).

g) The C of C shall be signed or authenticated by an authorized SELLER representative.

4.4.2 Individual spools shall have a pipe spool sheet, extended spool sheet, or detailed drawing that reflects the heat number of pressure retaining piping and items. Heat numbers/material codes of pressure retaining piping and items shall be noted on the pipe spool sheet, extended spool sheet, or detailed drawing for material traceability. A pipe spool sheet, extended spool sheet, or detailed drawing may be defined as the actual fabrication detail drawing, bill of materials, and/or traveling data table for that spool piece. Second sheets, if used, that provide spool material heat number information that is not shown on the pipe spool sheet, extended spool sheet or detailed drawing shall list the pipe spool number in order to maintain traceability. These sheets and drawings shall accompany each shipment of fabricated spools. Identify material by the specific ASTM or ASME material specification number and grade or type on

shop spool drawings and extended spool sheets, as applicable, along with heat number or material code applied to or maintained on the piping material, traceable to the MTR. Weld identification symbols shall also be recorded on detailed spool sheets and extended spool sheets, as applicable, with a cross-reference to any nondestructive examination (NDE) report numbers.

4.4.3 The SELLER shall ensure that the stock code shown on the isometric bill of material matches stock codes attached to or inscribed on materials prior to their installation. Fabricator may use a material code in lieu of stock code for identification and control of materials.

4.4.4 The SELLER is not required to submit MTRs for customer-furnished weld-in valves. Traceability of these valves to the original procurement source is the responsibility of the BUYER. The SELLER shall notify the BUYER if tags on customer-furnished valves are missing.

4.5 Material Commitment[22]

The SELLER shall submit to the BUYER a complete itemized listing of materials purchased or reserved from the SELLER's inventory for each project as requested. The SELLER shall also provide, upon request, the current status of pre-bought or BUYER-furnished material.

4.6 Damaged Materials[23]

4.6.1 Materials that have been damaged, gouged, or found to have defects affecting their form, fit, function, or encroaching on minimum wall thickness, shall not be used. Minor surface marks may be dressed, after considering the manufacturing tolerances defined in the appropriate material or technical specification and provided that the minimum wall thickness is not encroached upon. Raised metal shall be blended into surrounding base metal. Base material repair of damaged material, using welding shall not be permitted.

4.6.2 Particular care must be taken with flange faces. Flanges are required to meet the requirements of ASME B16.5. Flange facing imperfections outside of those specifically discussed in ASME B16.5 are not permitted. In addition, should a scratch be deeper than the flange facing serrations, the flange may be refaced, provided the height of the raised face portion of the flange is maintained. Weld repair of the damaged facing is not permitted. Radial grooves or scratches are not permitted.

4.7 Positive Material Identification (PMI)[24]

PMI is required for all applicable materials used in Q BC/HtR and CM BC/HtR shop fabricated pipe spools provided under this specification[25].

The purpose of positive material identification (PMI) is to verify that materials are correctly supplied as specified by industry standards and WTP project specifications. Materials, and piping requiring PMI per this Specification are identified in Table 1 – PMI Requirements for Pipe, Flanges, Fittings and other Components Pieces, and Table 2. The methods/instruments listed below are acceptable. In application, they shall not be used in a "go-no-go" mode. The only acceptable objective is the positive identification, listing, and quantification of the relevant elements listed in Table 1 – Alloy / Element Record

Requirements (Min) and Table 3., Base Material and Weld Filler Metal Composition Requirements (Wt %).

PMI testing shall be done on each pressure retaining component used for a pipe spool. This shall include each individual segment of pipe, each plate, and all other pieces of base materials (e.g., flanges, fittings) and all required pressure retaining welds.

BUYER supplied bulk piping material does not require PMI. This was provided by others at time of procurement in accordance with the applicable BUYER PO requirements.

For purposes of this Specification, the following definitions are used:

Alloy: Metallic materials (including welding filler materials) which contain alloying elements, including but not limited to: Chromium (Cr), Nickel (Ni), Molybdenum (Mo), Copper (Cu) or Tungsten (W).

300 Series Stainless: Austenitic Stainless Steels (304L, 316L, etc.)

6% Mo: AL6XN, 254 SMO, etc.

The Seller shall submit to the BUYER, for review and comment prior to fabrication, procedures covering how PMI will be conducted and documented. The Seller's procedures shall include the instrument manufacturer's procedures and requirements, operator qualification/re-qualification requirements, instrument calibration method(s), calibration: frequency during testing, criteria for acceptance or rejection, material identification method, and record keeping.

4.7.1 Verification Method

4.7.1.1 Instruments used for PMI shall be of the type that shall provide quantitative, recordable, elemental composition results for positive identification of the alloy elements present.

a) PMI shall be done per the procedures outlines by the manufacturer of the PMI instrument being used. Modification of those procedures shall be approved by the BUYER.

b) Each PMI instrument shall be calibrated according to the manufacturer's requirements.

4.7.1.2 The methods/instruments listed below are acceptable. In application, they shall not be used in a "go-no-go" mode. The only acceptable objective is the positive identification, listing, and quantification of the relevant elements listed in Table 1- Alloy / Element Record Requirements (Min) and Table 3.

a) Portable X-ray fluorescence analyzers. Use is limited to the following instruments or their equivalent unless prior approval is given by the BUYER:

- TN Technologies Alloy Analyzer 9266, 9277 (The Metallurgist XR) or 9288
- Outokumpu X-Met 840, or X-Met 880
- Thermo Scientific Niton Metal Alloy Analyzers
- Metorex X-Met 920, X-Met 3000TA or X-Met 3000TX Metal Analyzer
- Innov-X Systems XT Series Analyzer
- Innov-X Systems Alpha 6500 Series Analyzer

- Innov-X Systems Delta Model DP-2000, DS-2000, or DC-200 Analyzer
- Bruker S1 Titan Series or Tracer 5 Series Analyzer
- Hitachi X-MET8000 Series Analyzer

b) Portable optical emission analyzers. Use is limited to the following instruments or their equivalent unless prior approval is given by the BUYER, regardless of whether analysis for Carbon is required:

- SpectroPort Model TP-07 or TFO-02
- Outokumpu ARC-MET 900 or the New Spectrotest
- SpectroLab, Spectrotest and Spectrotest Jr.

c) Laser Induced Breakdown Spectroscopy (LIBS) analyzers. Use is limited to the following instruments or their equivalent unless prior approval is given by the BUYER:

- Thermo Scientific Niton Apollo handheld LIBS analyzer
- Hitachi High-Technologies Vulcan Smart+ and Vulcan Expert+
- SciAps handheld LIBS Z-200 C+ and Z-300

d) Any other instrument will require BUYER's approval via the submittal process.

4.7.1.3 Optical Emission Spectroscopy (OES) may be used verify the Carbon content in 304L and 316L stainless steel materials.

4.7.1.4 Arc strikes, if any, shall be ground/sanded smooth.

4.7.1.5 Parts that are too small to be tested using an alloy analyzer are exempt from PMI testing. If such exemption is claimed, the PMI procedure shall specify the minimum part size capable of being tested.

4.7.2 Welding Consumable Control

4.7.2.1 PMI of completed pressure retaining welds is required as indicated in Appendix A.

4.7.2.2 Production "Run Off" weld test coupons may be used for chemical analysis checks of deposited metal for each heat of filler material.

4.7.3 Extent of PMI

PMI shall be performed on all bulk pipe, fitting, flanges, components, and welding consumable materials used in pipe spool fabrication prior to usage. In the case where a pipe, fitting, flange, component or welding consumable materials that did not get PMI prior to usage in spool fabrication then the component or weld shall be PMI tested at time of spool fabrication and noted as such on the PMI documentation.

BUYER supplied bulk piping material does not require PMI.

4.7.3.1 Shop Fabricated Piping

PMI is required for all pressure retaining piping and piping components, circumferential welds, and nonautogenous longitudinal welds as indicated in Table 2. For welds it is acceptable to supply the results of base metal welding consumables prior to fabrication as indicated in Table 3.

PMI is not required on autogenous welds, fillet welds, or socket welds.

Bulk Materials (straight run piping, fittings, and flanges, welding consumable materials, etc.) PMI is required as indicated in Table 2 and Table 3.

4.7.4 Identification

4.7.4.1 General

All pipe, fitting, flanges, and components used in the shop fabricated pipe spools that have been successfully subjected to the required PMI shall be marked "PMIV". The mark shall be durable and last through shop fabrication, transportation, and receiving inspection at the BUYER's facility. See Section 4.7.5 for items that do not pass PMI.

When a material is cut after PMI testing and identification, each piece shall be identified and other items/pieces with the same heat number shall be identified in accordance with Seller's written practice, including the transferring of the "PMIV" marking.

BUYER supplied bulk piping material does not require PMI. This was provided at time of BUYER in accordance with the applicable BUYER PO requirements.

4.7.4.2 PMI Marking Materials

Marking materials selected shall not cause corrosion or other harmful effects and shall be in accordance 24590-WTP-3PS-NW00-T0002, Rev 1, *Engineering Specification for Materials Used in Contact with Austenitic Stainless Steel and Nickel Based Alloy*s.

4.7.4.3 Piping Materials After PMI

When it has been verified that the material has a composition consistent with the material specified, it shall be marked in accordance with the Seller's procedure using a hard marking method, an indelible ink, paint. Or other BUYER approved marking method. The marking shall be applied at one end to facilitate proper identification. The use of stamps for identification is prohibited on pipe. It is acceptable to use a rounded, low stress, vibroetch tool for this marking. To the maximum extent possible, the stamping/marking shall be located for ease of future reference/verification.

When a material is cut after PMI testing and identification, each piece shall be identified and other items/pieces with the same heat number shall be identified in accordance with Seller's written practice.

4.7.4.4 Fasteners and Small Parts

Fasteners and small parts shall be marked in accordance with the Seller's procedure using a hard marking method, an indelible ink, or paint.

4.7.5 Records of PMI

Results shall be recorded on PMI report forms, which shall indicate, as a minimum, the following for each examination:

a) Name of inspector
b) Date of testing
c) Test method, including PMI instrument name and serial number
d) Stock code number for bulk pipe, fittings, flanges, components or consumable welding materials used in pipe spool fabrication
e) Pipe spool number for the specific pipe, fitting, flange or components which did not get PMI prior to usage in spool fabrication
f) Quantitative analysis results for relevant elements (See Section 4.7.1.3)

In the case where a pipe, fitting, flange, components or consumable welding materials that did not get PMI prior to usage in spool fabrication, then is it required that a PMI map shall be prepared for the affected pipe spool. The map shall include applicable components and welds and include the applicable PMI test locations. This may be noted on the pipe spool sheet, extended spool sheet or detailed drawing.

Results shall be reported 100% of each heat/lot of material and shall include the following:

a) Name of inspector
b) Date of testing
c) Test method, including PMI instrument name and serial number
d) Type and number of pieces tested
e) Acceptable composition ranges for the relevant
f) Material identified

PMI forms shall become a part of the permanent inspection records. Seller shall submit the completed forms as part of the Final Document Package when required by the Form G-321-V in the Purchase Order.

4.7.6 Acceptance, Rejection, and Retesting Requirements

All materials tested shall be identified by the PMI instrument as being consistent with the composition of the specified material. The verification results shall fall within the chemical composition requirements of the ASTM, ASME, AWS or other applicable material specification (including the product analysis tolerances allowed therein) and allowing for the accuracy of the instrument. Any questionable PMI result shall be re-analyzed by the same or another instrument, after verification of proper surface preparation. See below, for materials and welds that fail to meet requirements on the second analysis.

The following elements shall be identified and recorded, even if the instrument does provide immediate identification (e.g., display of “316”, “6 Mo”, etc.):

Table 1 Alloy/Element Record Requirements (Min)

Alloy	Elements
304L	Ni, Cr,C
304	Ni, Cr

316L	Ni, Cr, Mo, C
316	Ni, Cr, Mo
347	Ni, Cr, Nb
Duplex, 6% Mo, 254 SMO, AL6XN, etc.	Ni, Cr, Mo, Cu

For PMI measurement tolerance, refer to ASME Boiler and Pressure Vessel Code Section I, Nonmandatory Appendix B, Section B-8.2

Welds joining dissimilar base materials or having filler materials that do not match the base material composition may include an allowance for dilution. Acceptable composition ranges for commonly used combinations of base material and weld filler metals are included in Table 3. Other combinations, when required, shall be identified to the BUYER for approval. Please note that the only proper use of Table 3 is for assessing dissimilar welds.

4.7.6.1 If any material, component, or weld is found to be unacceptable, all other materials, components, or welds (same heat, lot, etc.) represented by that failed item shall be considered suspect. The BUYER shall be notified immediately if a component is confirmed to have failed the PMI. The Seller will then have the following options, with BUYER concurrence:

a) Scrapping/removing all materials, components, or welds represented by the test piece (all of that heat lot, etc.) and replacing with new components or filler metals, or

b) Performing 100% examination of the remainder of the represented materials, components, or welds, and replacing each item that fails the PMI check, or

c) Verifying correct chemistry by laboratory chemical analysis (OES method may be used on a case-by-case basis, specifically when the XRF method was used when unacceptable results were obtained).

4.7.6.2 If questionable values obtained with portable analyzers are verified by laboratory analysis, the laboratory analysis data shall be used and recorded.

4.7.6.3 Any item or component containing materials that have not passed the PMI shall be clearly marked as “DO NOT USE PMI FAILED” and segregated from the remainder of the stock. Included in the material segregation shall be all other materials and components with the same heat number.

Table 2 PMI Requirements for Pipe, Flanges, Fittings and other Component Pieces

ITEM – (Note 1)	VERIFICATION REQUIRED
TYPE 304, 304L, 316, 316L, & 347 Stainless Steel Components	Yes – 100%, including non-autogenous longitudinal pipe and fitting welds, and pressure retaining shop circumferential welds.
6% Mo Components	Yes – 100%, including non-autogenous longitudinal pipe and fitting welds, and pressure retaining shop circumferential welds.

ITEM – (Note 1)	VERIFICATION REQUIRED
Duplex Stainless Steel Components	Yes – 100%, including non-autogenous longitudinal pipe and fitting welds, and pressure retaining shop circumferential welds.

Note:

1. The following items are exempted unless specifically designated for PMI by the PO:

   a) C content for low grade material (see section 4.7.6) does not need to be verified if there is no weld in the fabrication process or there is a solution annealed post of welding process.

   b) Non pressure-retaining parts, such as baffles, trays, tray clips, supports, pall-rings, support rings, etc.

   c) Non pressure-retaining welds and sections of piping, such as drains, vents, overflows, hanger guides, gussets, etc.

   d) BUYER supplied bulk piping material does not require PMI.

Table 3 Base Material and Weld Filler Metal Composition Requirements[26](Wt%)

MATERIAL	Cr	Ni	Mo	Cu	W	Notes
304L BM[3]	18.0-20.0	8.0-12.0		---	---	
308L WFM[3]	19.5-22.0	9.0-11.0	0.75 max	---	---	E/ER308L & LT
304L Welds	18.0-22.0	8.0-12.0	0.75 max	---	---	Note 1
304L BM[3]	18.0-20.0	8.0-12.0	---	---	---	
316L BM[3]	16.0-18.0	10.0-14.0	2.0-3.0	---	---	
316L WFM[3]	17.0-20.0	11.0-14.0	2.0-3.0	---	---	E/ER316L & LT
304L/316L Welds	16.0-20.0	8.0-14.0	3.0 max	---	---	Note 1
304L BM[3]	18.0-20.0	8.0-12.0	---	---	---	
316L BM[3]	16.0-18.0	10.0-14.0	2.0-3.0	---	---	
308L WFM[3]	19.5-22.0	9.0-11.0	0.75 max	---	---	E/ER308L & LT
304L/316L Welds	16.0-22.0	8.0-14.0	3.0 max	---	---	Note 1
304L BM[3]	18.0-20.0	8.0-12.0	---	---	---	
308L WFM[3]	19.5-22.0	9.0-11.0	0.75 max	---	---	E/ER308L & LT
CD4MCu BM	24.5-26.5	4.75-6.0	1.75-2.25	2.75-3.25	---	
304L/CD4Mcu Welds	18.0-26.5	4.75-12.0	2.0 max	---	---	Note 1
316L BM[3]	16.0-18.0	10.0-14.0	2.0-3.0	---	---	
316L WFM[3]	17.0-20.0	11.0-14.0	2.0-3.0	---	---	E/ER316L & LT
316L Welds	16.0-20.0	10.0-14.0	2.0-3.0	---	---	Note 1
316L BM[3]	16.0-18.0	10.0-14.0	2.0-3.0	---	---	
316L WFM[3]	17.0-20.0	11.0-14.0	2.0-3.0	---	---	E/ER316L & LT
CD4Mcu BM	24.5-26.5	4.75-6.0	1.75-2.25	2.75-3.25	---	

MATERIAL	Cr	Ni	Mo	Cu	W	Notes
316L/CD4Mcu Welds	16.0-26.5	4.75-16.0	1.75-3.0	---	---	Note 1
AL6XN BM	20.0-22.0	23.5-25.5	6.0-7.0	0.75 max	---	
625 WFM	20.0-23.0	58.0 min	8.0-10.0	0.50 max	---	E/ERNiCrMo-3
AL6XN Welds	20.0-23.0	25.5 min	7.0-10.0	0.75 max	---	Note 2
C-22 BM	20.0-22.5	Remainder	12.5-14.5	---	2.5-3.5	
CD4Mcu BM	24.5-26.5	4.75-6.0	1.75-2.25	2.75-3.25	---	
C-22 WFM	20.0-22.5	Remainder	12.5-14.5	0.5 max	2.5-3.5	E/ERNiCrMo-10
C-22/CD4Mcu Welds	16.0-22.5	25.0 min	10.5-14.5	---	2.5-4.5	
C-22 BM	20.0-22.5	Remainder	12.5-14.5	---	2.5-3.5	
C-22 WFM	20.0-22.5	Remainder	12.5-14.5	0.5 max	2.5-3.5	E/ERNiCrMo-10
C-22 Welds	20.0-22.5	52.0 min	12.5-14.5	---	2.5-3.5	Note 1
Alloy 625 BM	20.0-23.0	58.0 min	8.0-10.0	---	---	
to 304L[3]	18.0-20.0	8.0-12.0	---	---	---	
to 316L[3]	16.0-18.0	10.0-14.0	2.0-3.0	---	---	
625 WFM	20.0-23.0	55.0 min	8.0-10.0	0.50 max	---	E/ERNiCrMo-3
Alloy 625 to 304L/316L Welds	19.0-23.0	50.0 min	8.0 min	0.50 max	---	
AL6XN (N08367) BM	18.0-22.0	23.5-25.5	6.0-7.0	0.75 max	---	
to 304L[3]	18.0-20.0	8.0-12.0	---	---	---	
to 316L[3]	16.0-18.0	10.0-14.0	2.0-3.0	---	---	
625 WFM	20.0-23.0	55.0 min	8.0-10.0	0.50 max	---	E/ERNiCrMo-3
AL6XN (N08367) to 304L/316L Welds	19.0-23.0	25.0 min	4.0-10.0	---	---	

BM = Base Metal; WFM = Weld Filler Material, Wt = Weight

Notes:

1. Acceptance is based on the combined base metal and WFM spec requirements.
2. Acceptance is based on WFM spec and the expected amount of dilution for molybdenum.
3. Carbon content of base metals (prior to being welded) and undiluted filler metal shall be verified by the applicable ASME/ASTM/AWS specification.
4. The measured value of alloying elements shall be within 10% of the specified level or range in the applicable materials standards.

4.8 Commercial Grade Dedication[27,28]

4.8.1 Commercial Grade Dedication Documentation for Q Material Applications

While it is the intent that all items be procured from ASME NQA-1 qualified SELLER's and Sub-SELLER's, it is recognized that cases will likely exist where ASME NQA-1 SELLER's or Sub-SELLER's are not available. In such cases, Commercial grade components shall be commercially grade dedicated for use in safety functions material requisitions in accordance with a commercial grade dedication (CGD)procedure and acceptance plan developed under the Seller's ASME NQA-1 program. Section 4.8.3 below lists the BUYER's minimum critical characteristics for acceptance that are to be included in the procedure/plan. The CGD methodology is based on 24590-WTP-3PS-G000-T0019, *Engineering Specification for Acquisition of Commercial Items and Services for Use in Safety Applications at WTP*.

The BUYER will review the SELLER's program for verification of commercial grade items and services, including sub-supplier dedication activities. The program shall include requirements for special tests, inspections, and/or analysis, commercial grade survey of suppliers, and/or source verifications required to perform dedication activities as appropriate for the item or service provided. The SELLER shall submit for review and permission to proceed, prior to use against the scope of the applicable P.O the SELLER's commercial grade dedication procedure/plan and any sub-supplier's dedication procedures/plans. See 4.8.2 for sample size determination. CGD quality verification documentation shall be submitted with each shipment as part of the G-321-V documentation package. This documentation shall include test reports or results, inspection reports, analysis reports, commercial grade survey reports and/or source verification reports, as applicable depending on dedication method. Documentation of the commercial grade item or service dedication process shall be traceable to the item, group of items, or service. In addition, a CGD release form shall be included as the first page of Document Category Number (DCN) 33.0 in the PO G-321-V document package. The CGD release form shall list each spool identification number in the shipment. It shall also include page numbers to the CGD documentation (i.e., test reports or results, inspection reports, analysis reports, commercial grade survey reports and/or source verification reports, as applicable) for each spool that demonstrates all required CGD procedure/plan activities have been completed for each critical characteristic. The form to be used shall also be included in the submitted CGD procedure/plan.

CGD is not required for materials used for CM BC/HtR material applications.

4.8.2 Commercial Grade Dedication Sample Size Determination

The sampling acceptance process is valid only if all technical supply conditions have been met as evidenced by MTR and appropriate markings on the material. A material test report documents the product form specification for the purchased item. In addition to listing the product specification, the MTR includes product description, heat number, chemistry, heat treatment (if completed), physical properties, mechanical properties and the results of any supplemental testing if requested.

4.8.2.1 Lot Formation

Products are grouped into lots for product sampling to allow commercial dedication. A lot is comprised of one product form (i.e., pipe segment, flange, fitting or integral attachment), and one type of material (based on material specification). A lot is products from the same manufacturer and manufacturing process, preferentially, with the same heat number. If a lot needs to be formed using components from

multiple manufacturers, then refer to Section 4.8.2.4 below. Forming lots from products made by multiple manufactures is not preferred.

Markings placed on components by the original manufacturer shall be used to provide traceability to MTRs, and to forms lots, providing the marking follows the product form specification. For the purpose of this sampling strategy, re-marked products, illegible markings, or partial markings are not acceptable.

Items in a lot are accepted on the basis of the associated samples passing applicable tests for critical characteristics.

4.8.2.2 Sample Size for Testing Dimension and Seam Quality (Single Manufacturer)

When testing product, dimensions or seam quality from a single manufacturer with single heat numbers in the lot, a "Reduced" sampling plan approach following EPRI TR-017218-R1 Table 2-1 shall be used to determine sample quantities. Lot acceptance shall be based on zero defective items with respect to the defined acceptance criteria. Samples shall be randomly selected.

When testing product, dimensions or seam quality from a single manufacturer with multiple heat numbers in the lot, a "Normal" sampling plan approach following EPRI TR-017218-R1 Table 2-1 shall be used to determine sample quantities. Lot acceptance shall be based on zero defective items with respect to the defined acceptance criteria. Samples shall be randomly selected.

4.8.2.3 Sample Size for Testing Chemical Composition and Material Strength (Single Manufacturer)

When testing product chemical composition or material strength from a single manufacturer with a single heat number/production lot number/batch number in the lot, a sample size of one is acceptable when production traceability is verified by audit of the manufacturer and all intermediate supply chain entities. When testing product chemical composition or material strength from a single manufacturer with a single heat number/production lot number/batch number in the lot, EPRI TR-017218-R1 Table 2-2 shall be used to determine sample quantities. When testing product chemical composition or material strength from multiple heat numbers/production lot numbers/batch numbers in the lot, EPRI TR-017218-R1 Table 2-1 "Reduced" sampling shall be used to determine sample quantities. Lot acceptance shall be based on zero defective items with respect to the defined acceptance criteria. Samples shall be randomly selected.

When a documented history of supplier product compliance has been established, or when a manufacturer's processes has been surveyed, WTP may analyze the data to determine if a change in sampling strategy is warranted.

4.8.2.4 Sample Size for a Lot with Components from Multiple Manufacturers

Forming a lot with components produced by multiple manufacturers should be avoided since there is reason to question whether a randomly selected sample shall represent the whole population. However, if it is necessary to form such a lot, then apply the rules of this section.

If the following conditions are true, then the sample sizes can be selected as indicated below.

MTRs are available for each component included in the lot.

Components have the manufacturers' original markings and are traceable to the MTRs received.

Components in the lot were manufactured to the same national standard that specifies the critical characteristics of interest.

All manufacturers included in the lot have a history of providing consistently conforming components of the kind included in the lot. For the purpose of this strategy, history information includes quality records indicating previous pass or failure of parts or lots as indicated on supplier quality records. For quality records to be acceptable, they must address lot acceptance based on the same critical characteristics identified in this material requisition.

When testing, dimensions or seam quality on products from multiple manufacturers, a "Tightened" sampling plan approach following EPRI TR-017218-R1 Table 2-1 shall be used to determine sample quantities. Lot acceptance shall be based on zero defective items with respect to the defined acceptance criteria. To the extent possible, sample selection shall be biased to select one sample from each manufacturer, and thereafter selected proportionately to the quantities provided by each manufacturer. If components cannot be distinguished by manufacturer, then samples shall be randomly selected.

When testing chemical composition, and material strength on products from multiple manufacturers a "Reduced" sampling plan approach following EPRI TR-017218-R1 Table 2-1 shall be used to determine sample quantities. Lot acceptance shall be based on zero defective items with respect to the defined acceptance criteria. To the extent possible, sample selection shall be biased to select one sample from each manufacturer, and thereafter selected proportionately to the quantities provided by each manufacturer. If components cannot be distinguished by manufacturer, then samples shall be randomly selected.

4.8.2.5 Material Control

For the sampling results produced through the strategy outlined above to be valid, strict material control is required. Lots shall be assigned a unique identifier. For each lot, work processes shall maintain traceability among lot identity, heat numbers, manufacturer, MTRs, sampling test results and each member of the lot. Each member of the lot shall be marked with either its heat or lot number. Any part that loses this identity cannot be used. Pieces cut from a component in the lot shall be marked with either the heat or lot number of the part from which it was cut.

4.8.3 Critical Characteristics

The following are the BUYER's critical characteristics used for the verification requirements for pipe, fittings, flanges, and plate that are commercial grade dedicated by the SELLER for pressure boundary confinement safety functions at WTP. These critical characteristics are based on the definitions listed in EPRI 3002002982, September 2014, *Plant Engineering: Guideline for the Acceptance of Commercial-Grade Items in Nuclear Safety-Related Applications Revision 1 to EPRI NP-5652 and TR-102260*. These critical characteristics are to be included in the SELLER's material commercial grade dedication procedure/plan discussed in Section 4.8.1. Sampling, if used, shall follow Sections 4.8.2.2, 4.8.2.3, and 4.8.2.4 in accordance with EPRI TR-017218, Rev. 1, January 1999, *Guideline for Sampling in the Commercial Grade Item Acceptance Process*. These critical characteristics for pipe, fittings, flanges, and plate required for the dedicating of commercial material that provides a safety function are in addition to those characteristics for the material that are already required of the SELLER. All commercial grade pipe, fittings, flanges, and plate that are commercial grade dedicated shall be manufactured to nationally recognized ASTM material specifications and ASME or MSS standards as applicable.

Note: The SELLER can choose to perform a Method 2 survey of a CM sub-supplier.

4.8.3.1 Pipe

4.8.3.1.1 –Dimension – Outside diameter and wall thickness at each end and the wall thickness at mid-length of each pipe length in accordance with the applicable pipe ASTM material specification and the material requisition requirements to establish the ASTM required minimum wall thickness of 87-1/2% of the specified nominal wall is not violated.

4.8.3.1.2 Materials –

Chemical verification of materials shall be performed.

For austenitic stainless steel or high alloy pipe, the SELLER shall use a PMI procedure which meets the requirements of this Specification and has been submitted to the BUYER for review and permission to proceed, prior to use against the scope of the applicable P.O, for the applicable pipe ASTM specification for the specified material type and grade.

Tensile strength, yield strength, and elongation verification shall be performed on material final product form. The tensile strength, yield strength, and elongation properties shall meet the applicable ASTM material specification requirements for the material type and grade.

4.8.3.2 Fittings

4.8.3.2.1 –Dimension – Dimensions shall be in accordance with the requirements of the applicable ASME B16, ASTM, or MSS standard that the particular fitting is being manufactured under. This includes the tolerances and other dimensional notes discussed and listed in the applicable standard. As a minimum the following are the dimensions to be verified.

- Elbows – centerline to end dimension
- Tees – centerline to end dimension
- Reducers – end to end dimensions
- Swages – end to end dimensions
- Integrally reinforced fittings (These are specialty fittings which are ordered in accordance with the specific fitting manufacturer catalog requirements related to header size, branch size, end connection, and branch style) – specified MSS-SP-97 dimensions.

4.8.3.2.2 Materials

Chemical verification of materials shall be performed.

For austenitic stainless steel or high alloy fittings, the SELLER shall use a PMI procedure, which meets the requirements of this specification and has been submitted to the BUYER for review and permission to proceed, prior to use against the scope of the applicable P.O, for the applicable ASTM material specification for the specified material type and grade.

Tensile strength, yield strength, and elongation verification are to be performed on material final product form. The tensile strength, yield strength, and elongation properties shall meet the applicable ASTM material specification requirements for the specified material type and grade.

Longitudinal seam welds in fittings shall be 100% volumetrically examined (RT or UT) in accordance with the SELLER requirements listed in Section 4.2.3.1.

4.8.3.3 Flanges

4.8.3.3.1 –Dimension – The following dimensions shall be verified to be in accordance with flange dimensions listed in ASME B16.5 or B16.47 for the particular nominal pipe size, flange type, and flange pressure rating class being checked. This includes the tolerances and other dimensional notes discussed and listed in ASME B16.5. The letter listed after each dimension is those listed, for reference purposes, in ASME B16.5 for that particular dimension:

- Outsider diameter of flange, O.
- Thickness of flange, C.
- Diameter of hub, X, not applicable to blind flanges.
- Length though hub, Y, not applicable to blind flanges.
- Thread length, threaded flange only, T, not applicable to blind flanges.
- Bore, B, not applicable to blind flanges.
- Depth of socket, socket welding flange only, D, not applicable to blind flanges.
- Hub diameter beginning of chamfer welding neck only, A, not applicable to blind flanges.
- Outside diameter of the raised face, R.
- Heigh of raised face (not applicable to flat face flanges).
- Diameter of bolt circle.
- Diameter of bolt holes.
- Number of bolt holes.

4.8.3.3.2 Materials –

Chemical verification of materials shall be performed.

For austenitic stainless steel or high alloy flanges, the SELLER shall use a PMI procedure, which meets the requirements of this specification and has been submitted to the BUYER for review and permission to proceed, prior to use against the scope of the applicable P.O, for the applicable ASTM material specification for the specified material type and grade.

4.8.3.4 Plates and Shapes

4.8.3.4.1 –Dimension – Nominal thickness shall be in accordance with BUYER drawing.

4.8.3.4.2 Materials

Chemical verification of materials shall be performed.

For austenitic stainless steel or high alloy plate, the SELLER shall use a PMI procedure, which meets the requirements of this specification and has been submitted to the BUYER for review and permission to proceed, prior to use against the scope of the applicable P.O, for the applicable ASTM material specification for the specified material type and grade.

Tensile strength, yield strength, and elongation verification are to be performed on material final product form. The tensile strength, yield strength, and elongation properties shall meet the applicable ASTM material specification requirements for the material type and grade.

4.8.3.5 Welding Filler Materials

Welding material consumables are supplied as bare wire for GTAW, GMAW, or SAW processes or with a flux for FCAW or SMAW processes. A material test report (MTR) must be provided for all welding material consumables. The MTR with actual test results is required for each heat. Alternatively, a Certified Material Test Report (CMTR) in accordance with ASME Boiler and Pressure Vessel Section II, Part C, is acceptable.

Since the method of verification used is dependent upon the configuration of filler metal used, a dedication procedure that includes each configuration of weld filler metal intended for use on WTP must be supplied for BUYER review and permission to proceed, prior to use against the scope of the applicable P.O.

The following are the BUYER's critical characteristics used for the acceptance requirements for commercially dedicated weld filler metal:

4.8.3.5.1 –Materials:

Chemistry – For reasonable assurance, all that is required is a chemistry check to ensure consistency with the applicable AWS A / ASME SFA specification. As a minimum, the SELLER can use a SELLER prepared PMI procedure, that meets the requirements of this specification. The minimum requirements for the chemical check on the weld filler material is an analysis for the concentrations of the major elements of the alloy. These tests may be performed using portable PMI techniques. X-ray fluorescence PMI techniques are appropriate for stainless steel.

For GTAW, GMAW, or SAW, the solid bare electrode metal can be chemically checked by performing PMI directly on a piece of wire to confirm the PMI specification major elements. If the chemical analysis is performed on a weld deposit, the cast button (or slug) shall be made in accordance with the applicable AWS / ASME specification. Chemical check must provide results which are between the ranges listed in the PMI procedure for the AWS A / ASME SFA specification and be in reasonable agreement with the provided MTR, allowing for the accuracy of the test / equipment used.

For SMAW and FCAW filler metal, a chemical check needs to be made on the top layer of a weld test pad. The test pad shall be made in accordance with the respective AWS

/ASME specification. This includes using a qualified welder and a qualified Weld Procedure Specification (WPS) to deposit a minimum of four passes on a plate. The plate shall have a suitable chemistry (See the applicable section of the AWS / ASME specification) that ensures electrode deposits are not contaminated by dilution. The top of the deposited weld shall be cleaned, and PMI may be used to confirm the major elements are within the specified values of the SELLER PMI procedure for the respective AWS / ASME specification and also be within reasonable agreement of the provided MTR, allowing for the accuracy of the test equipment used.

5 Fabrication

Fabricated piping shall be in accordance with ASME B31.3, and BUYER-furnished piping isometrics and specifications.[29]

5.1 General[30]

5.1.1 Use welded joint construction for all piping, except where otherwise called for on the design drawings and piping material class.

5.1.2 Bending to the specified radius indicated on the orthographic/isometric drawing shall be utilized in the fabrication of the dual contained pipe spools (carrier and encasement piping). Butt weld fittings may be utilized if specified on the drawing.

5.1.3 For dual contained piping, intermediate bend profiles shall meet the following criteria:

5.1.3.1 The carrier pipe shall not contact the I.D. of the encasement pipe at any point after fabrication. A minimum of 1/2 in. clearance (all around) between the carrier and encasement pipe shall be maintained for thermal expansion.

5.1.3.2 Misalignment between the centerlines of the carrier and encasement pipe is permitted.

5.1.3.3 Pipe slopes and fit up at field welds shall be maintained as indicated on the design drawing.

5.1.4 Make all welds full penetration butt welds except as permitted otherwise for welded attachments, socket welds, slip-on flanges, and joggle pipe jackets. Mark all welds with welder's unique identification marks. It is acceptable to use a rounded, low stress, vibroetch tool for this marking.

5.1.5 Dual contained pipe supports shall be fabricated and installed in accordance with the applicable pipe support and fabrication details referenced on the isometric drawings.

5.1.6 Pipe Supports

5.1.6.1 The pipe fabricator is responsible for welded attachments to pipe spools when referenced on the isometric drawings in the bill of material under FIELD MATERIALS with the following text: WELDED PIPE ATTCHMT.

5.1.6.2 The WELDED PIPE ATTACH applies to engineered and the standard pipe support detail drawings.

5.1.6.3 Welded pipe attachments include any material such as a base plate that is attached with a shop weld (e.g., pipe stanchion and base plate).

5.1.6.4 Welded pipe attachment vent holes shall be within the lower 20% of the vertical members unless otherwise noted on the drawing. If this criterion cannot be met, the fabricator may locate the vent holes as required for fabrication and installation. Vent holes shall be 1/8 inch with a tolerance of + 1/8 inch and – 0 inches.

5.1.6.5 The pipe support drawing must show a shop weld for the pipe fabricator attachments.

5.1.6.6 Welded pipe support attachments are considered an integral component of the pipe spool. As such, welded pipe support attachments shall be coated with the same system code identified for the piping on the isometric.

5.1.6.7 No pipe support tags are required on the pipe spool.

5.1.7 Where field-supplied components are shown within an overall dimension, it shall be considered a reference dimension for both the spool fabricator and the Hanford Tank Waste Treatment and Immobilization Plant (WTP) supplier quality representative (SQR), and not a dimension used to determine the acceptability of the shop fabricated spool. The dimension(s) of the field installed component(s) will be verified during the field installation and verification process.

5.1.8 Flanges shall be installed with the bolt holes straddling the vertical centerline unless otherwise specified on the piping isometrics.

5.1.9 Threaded branch fittings on piping spools that have been hot-dipped galvanized shall have the threads “chased” after dipping to ensure that threads are free from excess galvanizing materials that would prevent the threaded joints from being made up upon installation.

5.1.10 Straight pipe orifice runs shall not contain welds, except at flanges. Pipe ends at orifice flanges shall be machine cut perpendicular to the pipe axis. Welds at orifice flanges shall be ground smooth inside. Pipe tap connections (if required) are to be drilled through the pipe wall and shall be smooth inside. Orifice flanges shall be drilled and tapped for jack screws. BUYER supplied drawings show the orientation of orifice flange taps and the locations of pipe taps. Unused orifice flange taps shall be supplied with appropriate plugs.

5.1.11 BUYER Supplied Valves

5.1.11.1 The BUYER will supply valves to the SELLER for welding into the piping spools.

5.1.11.2 The SELLER shall store BUYER-supplied valves indoors in a weather-tight and well-ventilated building or enclosure.

5.1.11.3 Valves shall be handled and supported with care to preclude damage to hand wheels and appurtenances. Lifting lugs shall be used whenever they are provided on a valve. In no case shall a valve be picked up by the valve actuator.

5.1.11.4 Valve stems shall be positioned in accordance with the isometric. Also, flow arrows, when present on the valve, shall align with the flow arrow shown on the isometric.

5.1.11.5 Valves shall be installed so there is no interference with other piping items (e.g., valve handles shall operate without interference including other valve operations).

5.1.11.6 SELLER shall install valves in accordance with the manufacturer's recommended instructions, and design drawings. BUYER will furnish valve manufacturer's installation and disassembly instructions for SELLER's use and reference. The SELLER shall notify the BUYER if they have not been sent the applicable valve manufacturer's installation and disassembly instructions.

To prevent damage or distortion to valve seat and disc, follow the vendor's instructions with respect to position of the valve stem and the disc during installation and welding.

5.1.11.7 The first time a valve is to be welded into a spool, the SQR shall witness the setup and welding to ensure compliance with the manufacturer's instructions. The SQR need only witness one valve installation for each valve instruction provided.

5.1.11.8 Temperatures shall be monitored at the seat location on the external surface of soft seated (UHMWPE, PTFE, RTFE, PFA, PEEK, etc.) valves that do not require disassembly for installation. Temperatures shall be monitored with pyrometers or temperature crayons. Temperatures shall not exceed the valve manufacture's recommendation. If no recommendation exists, then the limitation in the applicable Piping Class applies. This limitation is found in the "Temperature/Pressure Limits" or "Notes for Specific Stock Sizes".

Care should be taken to minimize heat input and maximize heat dissipation. This may include but not limited to weld sequencing (1/4 circumferential weld, allow to cool, repeat), use of heat absorbing paste, and/or wrapping valve with heat shield/damp cloth. These recommendations are of particular concern with respect to NPS 1 and small valves.

5.1.11.9 Valves shall be disassembled only when required by the valve manufacturer's instructions for installation. Valves shall be disassembled and reassembled, if required, in accordance with the manufacturer's disassembly and reassembly procedures.

If disassembly beyond the vendor's standard installation instruction is required, valves and actuators shall be disassembled and reassembled only after documented concurrence has been obtained from the BUYER by an SDDR.

5.1.11.10 The SELLER shall complete a copy of Appendix B, Figure 3 "Soft Seated Valve Installation Record" for each soft seated, weld end valve installed. Records shall be submitted with each shipment per the G-321-V form.

5.1.11.11 Instrument legs and plugged or capped vent and drain legs containing any of the following valves shall have a fabrication tolerance of +/- 1/2 inches.

Stock Code	Size	Material	Manufacturer	End Conn	E to E (inches)
PVVGGZ80AN00	0.5	A105	Bonney Forge	SW	3.125
PVVGGZ80AN01	0.75	A105	Bonney Forge	SW	3.563
PVVGGZ80AN02	1	A105	Bonney Forge	SW	4.313
PVVGGZ80AN03	1.5	A105	Bonney Forge	SW	5.000
PVVGGZ80AN04	2	A105	Bonney Forge	SW	5.250
PVVGGZ80NN00	0.5	A105	Velan	SwxTE	3.130
PVVGGZ80NN00	0.5	A105	Bonney Forge	SwxTE	3.125
PVVGGZ80NN01	0.75	A105	Velan	SwxTE	3.250
PVVGGZ80NN01	0.75	A105	Bonney Forge	SwxTE	3.563
PVVGGZ80NN02	1	A105	Bonney Forge	SwxTE	4.313
PVVGGZ80NN04	2	A105	Velan	SwxTE	5.250
PVVLGZ80JJ00	0.5	A105	Powell	SW	3.150
PVVLGZ80JJ01	0.75	A105	Powell	SW	3.540
PVVLGZ80JJ02	1	A105	Powell	SW	4.330

SW = Socket Welded TE = Threaded End

5.1.11.12 The SELLER shall store all in-process and completed piping spools that contain BUYER-provided valves in a weather-tight and well-ventilated building or enclosure until the time of shipment.

5.1.12 Certain BUYER isometric drawings are dimensioned to the centerline of a BUYER field supplied and installed welded component between the two spools. For these isometrics, the SELLER shall fabricate that portion of the spool length to the centerline of that component. Each of these spools shall have a plain end at the center point of the BUYER field installed welded component. BUYER is responsible for cutting and end preparation, as required, for field installation of this BUYER supplied component. These plain ends are not field fit up welds; as such, they do not require an additional 6 inches of pipe length.

5.1.13 Shop butt welds not represented on the isometric drawing(s) may be added to fabricate the spool(s) in accordance with the general configuration portrayed on the isometric drawing(s), provided that the added straight length of pipe is greater than or equal to 6 feet and additional weld(s) do not rest on pipe supports. The minimum required edge distance (D) between an integral attachment to the pipe and pipe weld or other inline components is provided in the table below. (The equation used to develop this table is sqrt(Rm x t) . Rm = mean radius of the pipe and t = thickness of the pipe.)

Table 4 Minimum Required Edge Distance Between Welds

Nominal Pipe Size (inches)	D (inches)
3 & Under	1
3.5 to 6	1 5/8
8 to 12	2 ¾
14 to 18	3 7/8
20 to 24	5 1/8

5.1.13.1 The addition of butt welds is preferred over the addition of socket welds, even in a socket welded system. However, socket welded couplings may be added by the SELLER to socket welded piping systems provided that the added straight length of pipe is greater than or equal to 6 feet and the added coupling(s) do not rest on pipe supports.

5.1.13.1.1 It is acceptable for the SELLER to add a socket welded coupling to one side of the field weld joint when just a field weld (without a coupling) is shown on an isometric drawing for a socket welded system.

5.1.14 Dimensional Tolerances, Except for Pipe Bends

Unless otherwise indicated on the piping isometric, do not exceed the dimensional tolerances of PFI-ES-3, *Fabricating Tolerances*, for fabricated piping assemblies.

5.2 Cold Bending of Pipe[31]

Cold bending is permitted for seamless ASTM A106 Grade B, ASTM A53 Grade B, API 5L Grade B carbon steel and seamless ASTM A312 Type 304L and Type 316L stainless steel pipe. This also includes all double stamped combinations thereof and triple stamped materials. Pipe may be cold bent by rotary draw bending or ram and roll bending. Material allowances are dependent upon the equipment used and will vary with the cold bending method, material, pipe size, and bend radius. The maximum size pipe to be bent shall be 4 NPS schedule 80S for stainless steel and 6 NPS schedule 40 carbon steel with a maximum wall thickness of 0.375 inches. Bending is restricted to 3D or larger radius bends. BUYER designed piping includes a 20% thinning allowance due to bending.

The SELLER shall submit a detailed pipe bending procedure for review and receive permission to proceed prior to use, against the scope of the applicable P.O. The procedure shall include the bending method to be used, equipment descriptions, lubricants, inspections, and documentation.

5.2.1 Qualification Testing

5.2.1.1 Qualification testing shall be performed in accordance with ASME B31.3 and this specification. Sample bends shall be made using schedule 40 pipe with the minimum bend radius used in production, or smaller. Bend qualification record shall be attached to or included in submitted bending procedure.

5.2.2 Acceptance Criteria

5.2.2.1 Pipe bends shall be free of cracks, seams, gouges, and notches. Refer to PFI-ES-24, paragraph 6, for form tolerances related to buckling. Minor defects shall be removed by grinding or buffing provided the wall thickness is not less than 70 % of the specified wall thickness. Bends with cracks or other major defects shall be rejected.

5.2.2.2 Pipe bend dimensional tolerances shall be as follows:

- Total angularity ±.5 degree
- Plane of bend ±1.0 degree
- Linear – PFI ES-3
- Minimum Radius and tangent – PFI ES-24

5.2.2.3 Ovality shall not exceed 8% of the nominal outside diameter [Ovality % = (Dmax – Dmin) x 100 / Dnom].

5.2.2.3.1 Ovality shall be checked at the bend start, finish, 1/4, mid, and 3/4 points on the first five bends with each procedure for each diameter and schedule or wall thickness on each shift.

5.2.2.3.2 If ovality test results are acceptable, the ovality test may be reduced to a single test at the mid-point of 10% of the bends for the remainder of the shift, as long as the ovality remains acceptable.

5.2.2.3.3 If any bend is found with out of tolerance ovality, all previous bends from that procedure shall be verified by the full ovality check (start, finish, 1/4, mid, and, 3/4).

5.2.2.3.4 Full ovality testing may again be reduced after five consecutive acceptable full examinations.

5.2.2.4 Wall thickness measurements shall be made along the extrados at the start, finish, 1/4, mid, and 3/4 points on the first five bends with each procedure on each shift. The measured wall thickness shall not be less than 70% of the specified nominal wall thickness. Thinning that exceeds that shall be brought to BUYER's attention via an SDDR.

5.2.2.4.1 If wall thickness measurements are acceptable, all subsequent bends made with the same procedure on the same shift of the same diameter and schedule, or wall thickness of pipe shall have wall thickness measurements taken at the location of greatest thinning only.

5.2.2.4.2 If any bend is found with out-of-tolerance thickness, all previous bends from that procedure shall be verified by the full thickness check (start, finish, 1/4, mid, and 3/4).

5.2.2.4.3 Full wall thickness testing may again be reduced after five consecutive acceptable full examinations.

5.2.2.5 Where bends shown on isometric drawings are labeled with no specific bend angle shown, the bend angle is understood to be 90 degrees. The tolerances in the previous subparagraph also apply to these bends.

5.2.2.6 The SELLER shall submit dimensional and tolerance acceptance verification reports in accordance with this technical specification. Applicable wall thickness measurements (as required above) shall also be included in these reports. Wall thickness reporting shall be actual dimensions. Verification reporting format may be either by tabular listing of reports or by tabular listing and sketch, as specified by SELLER's accepted procedure.

5.3 Method of Construction

Use welded joint construction for piping, except where otherwise called for on the piping isometrics and the piping material class. In general, the method of pipe spool construction is as follows:

- Shop fabricated carbon steel NPS 1 ½ and smaller pipe are socket welded while NPS 2 and larger pipe are butt-welded construction.

- Small-bore valves are socket welded up to size NPS 2 for both cases.

However, certain isometrics require all butt weld piping construction based on the service requirements.

5.4 Welding[32, 33, 34]

5.4.1 Welding Procedures and Welder Qualifications

5.4.1.1 Welding (including tack welds) shall be performed by qualified welders in accordance with welding procedure specifications prepared and qualified in accordance with the applicable code and/or standard, and ASME BPVC, Section IX.

Welder Qualification procedure, Welding Procedure Specifications (WPS) and Procedure Qualification Records (PQR) shall be submitted to the BUYER for review and permission to proceed, prior to use against the scope of the applicable P.O. Welder personnel qualification records shall be available for review by the BUYER's SQR upon request.

It is not the BUYER's intent to require revisions to the SELLER's standard WPSs to meet these requirements, yet the limitations shall be clearly acknowledged, and the instructions employed by the welders on the shop floor. To accommodate this, Sellers may revise WPSs or issue job-only amendments or addenda to standard WPSs. Any amendment or addenda shall become part of the WPS for the purchase order and shall be issued to the welders employed in the work.

5.4.1.2 A Welding and NDE Matrix (Welding Procedure Application List) shall be submitted to the BUYER for review and permission to proceed, prior to use against the scope of the applicable P.O.

5.4.1.3 Weld repairs shall be in accordance with a Weld Repair procedure. The Weld Repair procedure shall be submitted to the BUYER for review and permission to proceed prior to start of repairs. The Weld Repair procedure shall include the following:

a) Method of evaluating the type and extent of the defect.
b) Methods used for removing the defect.
c) NDE conducted to ensure the defect has been removed.
d) WPS/PQR employed. For weld repair, either the original WPS/PQR or one originally submitted as a designated repair WPS/PQR shall be used.
e) NDE methods used to inspect completed weld.
f) Example of "Major Weld Repair" record.

Major Weld Repair records shall be submitted as part of the quality verification documentation. A major weld repair is when the depth of repair encroaches on 50% of a generally published specification or standard nominal wall thickness and any incident of breaching the pressure boundary. Major Weld Repair records shall include the following:

a) Spool ID.
b) Weld number/symbol.
c) NDE conducted to ensure the defect has been removed.

d) WPS/PQR used for weld repair.

e) NDE methods used to inspect completed weld.

5.4.2 Weld Joint Preparation

5.4.2.1 Unless otherwise noted on the piping isometrics, field butt weld end preparations shall be in accordance with drawing 24590-WTP-PW-P30T-00001, *WTP End Prep Detail for Field Butt Welds.*

Dual contained spools requiring field welds shall be furnished with the standard 37 1/2 (±2 1/2) degree end preparation as depicted in ASME B31.3. This applies to all field welds for the carrier and encasement pipe.

5.4.2.2 Misalignment (high-low) in butt joints shall not exceed 1/16" maximum.

5.4.2.3 Prior to welding, socket welds shall have a gap of 1/16-inch minimum to 1/8-inch maximum between the bottom of the socket and the end of the pipe.

5.4.3 Welding Process Limitations

5.4.3.1 Root Pass of Single Side Butt Welds without backing subject to the limitations listed, only the following welding processes shall be used:

5.4.3.1.1 Shield Metal Arc Welding (SMAW)

a) EXX10 or EXX11 electrodes on P-No. 1, S-No. 1, S-No. 3, P-No. 3, SP-I, SP-2, and SP-3 (refer to B31.3) steels.

b) Maximum electrode diameter of 3/32 inch for NPS less than 2 ½ inches.

c) EXX10, EXX11, EXX12, and EXX13 limited to impact test temperature not lower than -20°F.

5.4.3.1.2 Gas Tungsten Arc Welding (GTAW)

a) All groove welds 1-1/2" NPS and smaller shall be welded with gas tungsten arc welding (GTAW).

b) Back purge two layers minimum for alloy content higher than 2-1/4 wt% Cr and 1wt% Mo.

c) GTAW is required for all lubrication, hydraulic and instrument piping (lines).

d) Filler material addition is required, except for thin wall expansion bellows and titanium.

5.4.3.1.3 Gas Metal Arc Welding (GMAW)

a) Globular transfer with mixed gas or CO_2

b) Pulsed spray transfer

c) Short circuiting transfer using solid wire and shielding gas neutral to the base metal.

d) Back purge two layers minimum for alloy content higher than 2-1/4 wt% Cr and 1 wt% Mo.

e) For NPS less than 6 inches, all shop welding should be performed in the 1G rotated position whenever possible.

5.4.3.2 Other than Open Butt Root Passes (fill and cap passes, sockets, fillets)

Subject to the limitations listed, only the following welding processes shall be used:

5.4.3.2.1 Shielded Metal Arc Welding (SMAW)

a) Maximum electrode diameter 3/32 inch on socket welds.
b) Filler metal "F" numbers (see ASME, Section IX, QW – 432).

F1 & F2	Not permitted on pressure retaining welds.
F3	Not permitted for welding on castings.
	Acceptable for P-No. 1 with 0.30% maximum carbon or 70 ksi maximum ultimate tensile strength.
	Not permitted for use when base material requires impact testing below -20°F (minus 20°F).
F4	Maximum electrode diameter 3/32 inch for NPS less than 2-1/2 inches.

5.4.3.2.2 Gas Tungsten Arc Welding (GTAW)

a) All groove welds in 1-1/2-inch NPS and smaller shall be welded with GTAW.

5.4.3.2.3 Gas Metal Arc Welding (GMAW)

a) GMAW-P Pulsed spray transfer – No limitations.
b) GMAW-S Short circuiting or globular transfer – maximum base metal thickness 3/8 inch
c) Continuous spray No limitations transfer
d) For NPS less than 6 inches, all welding shall be performed in the 1G rotated position.

5.4.3.2.4 Flux Cored Wire Arc Welding (FCAW)

b) Arc shielding gas required for pressure retaining welds.

5.4.3.2.5 Submerged Arc Welding (SAW)

a) A minimum of 6-inch NPS.
b) Neutral flux (no active or alloy)
c) Run on/Run off tabs where possible.

5.4.4 Welding Filler Materials

AWS Classification "G" electrodes and filler metals shall not be used without prior acceptance by the BUYER. The specific brand name, product name, and number, used for procedure qualification (as stated on the PQR) shall also be stated on the accompanying WPS. The MTR for the specific "G" Class electrode or filler proposed, as well as the electrode or filler material manufacturer's published product

information, shall be submitted with the WPS and PQR, for review and acceptance by the BUYER. The WPS will not be reviewed without the PQR and the electrode/filler metal MTR and information.

Production welding using "G" Class electrodes and filler metals shall be restricted to the specific brand name, and product name and number stated on the BUYER-accepted PQR and WPS. Changes in the specific brand name, and product name and number shall require re-qualification and re-submittal for BUYER acceptance.

5.4.4.1 Except where specifically allowed, welding materials shall be selected so that the deposited weld metal is similar in chemical composition and not significantly harder or stronger than the base material. Test temperature shall be at or below the design metal temperature.

5.4.4.2 For filler metal, an MTR with actual test results is required. A certified material test report in accordance with ASME, Section II, Part C, is an acceptable alternative. It shall be maintained in the shop for each heat/batch in storage and made available to the BUYER's SQR upon request.

5.4.4.3 Filler material shall be controlled and stored in accordance with a procedure submitted to the BUYER for review and permission to proceed, prior to use against the scope of the applicable P.O. The storage, baking and drying of welding consumables (e.g., covered electrodes, flux cored electrodes, and fluxes) shall be as recommended by the manufacturer. Segregation of carbon steel, low alloys, and alloy consumables is required during storage, baking, holding, and handling (including portable ovens).

5.4.5 General Welding Requirements

5.4.5.1 Welding shall be protected from wind, rain and other harmful weather conditions which may affect weld quality.

5.4.5.2 Surfaces to be welded shall be dry and substantially free of mill scale, oil, grease, dirt, paint, galvanizing, and other contaminants.

5.4.5.3 Weld bevel preparations for P-No. 4 and higher alloys shall be machined or ground back to bright metal if they have been flame, arc, plasma, or laser cut.

5.4.5.4 Permanently installed backing rings or straps shall not be used. Temporary backing requires BUYER approval prior to use.

5.4.5.5 Make welds full penetration butt welds except as permitted otherwise for welded attachments, socket welds, slip-on flanges, and joggle pipe jacket.

5.4.5.6 Each weld shall be marked with the welder's unique symbol or number identification using low stress stamps or "vibro etch." Alternate methods shall be submitted for BUYER review and approval.

5.4.5.7 Welds performed by a SELLER shall be uniquely identified on vendor spool sheets and extended spool sheets, as applicable.

5.4.5.8 All weld joints for pressure retaining applications shall have a minimum of two passes. This includes socket welds.

5.4.5.9 The individual weld layer thickness for all processes shall not exceed 3/8 inch for materials less than 1-1/4-inch-thick, or 1/2 inch for greater material thicknesses.

5.4.5.10 Each layer of welding shall be smooth and free of slag inclusions, porosity, excessive undercut, cracks, and lack of fusion prior to beginning the next layer. In addition, the final weld layer shall be sufficiently free of coarse ripples, non-uniform bead patterns, high crown and deep ridges to permit the performance of any required inspection. All arc strikes, starts, and stops shall be confined to the welding groove or shall be removed by grinding. Welds containing cracks shall be locally repaired.

5.4.5.11 Where joints are welded from both sides, the first pass shall be back chipped, ground or arc-gouged to sound metal before welding the second side. This requirement shall be stated on the WPS. (Except on welds that are not full thickness)

5.4.5.12 Peening shall not be used. The use of pneumatic tools or steel shot for slag removal is not considered peening.

5.4.5.13 Welding sequences in which a layer is not completed before the next layer is started (block welding) shall require approval by the BUYER.

5.4.5.14 Except for root passes, vertical welding shall be vertical up unless approved otherwise by BUYER for each specific application.

5.4.5.15 Gas mixture combinations for weld shielding and purging shall be documented and approved as part of the WPS. Any change in gas mixture requires revision of the WPS and may require requalification. Welding consumables shall be qualified using the gas mixture of the WPS.

5.4.5.16 Welding of stainless steel and nickel based materials shall be physically separated from carbon steel to ensure contamination by tools, grinding dust, etc. does not occur.

5.4.5.17 All slip-on flanges shall be double welded in accordance with ASME B31.3, paragraph 328.5.2, unless directed otherwise by design document(s).

5.4.5.18 When welding titanium, each bead and the adjacent metal shall be cleaned to remove all surface discoloration prior to deposition of the next bead. The Final weld surface may have intermittent iridescent, straw-colored oxides.

5.4.6 Preheat and Inter-pass Temperatures

5.4.6.1 Preheat temperature shall be in accordance with the applicable codes and Welding Procedure Application List (WPAL), except that code recommended minimum preheat temperatures shall be mandatory. Preheat requirements shall apply to all welding, including tack welding and welding of temporary attachments. Preheat requirements also apply to all thermal gouging and cutting operations except for P-No. 1 steels. For GTAW root pass welding only, reduced preheat levels as permitted by the applicable code maybe used. Preheat shall be maintained a minimum of 3 inches on either side of the joint.

5.4.6.2 The interpass temperature shall not exceed:

- 350°F for austenitic stainless steels and nickel based alloys
- 800°F for hard facing of low carbon austenitic stainless steels
- 300°F for superaustenitic stainless steels, with heat input not exceeding 50 KJ/in

5.4.6.3 For welds requiring preheating, the weld joint shall be completed with no intermediate cooling except that cooling under an insulating blanket is permitted provided at least applicable code required minimum joint depth has been filled, and provided that applicable documents do not specify more stringent requirements.

5.4.6.4 Preheat shall be determined by temperature indicating crayons, contact pyrometers or other equally suitable means. Temperature indicating crayons used on austenitic stainless steels and nickel base alloys shall not cause corrosive or other harmful effects. It is the SELLER's responsibility to determine suitable brands that may be used. This information shall be made available to the BUYER's representative on request.

5.4.6.5 If oxy-fuel torches are used for preheating, the torch tip shall be appropriate for the work (i.e., a "rosebud," not a cutting or welding tip).

5.5 Heat Treatment[35]

5.5.1 Postweld Heat Treatment

5.5.1.1 If Postweld Heat Treatment (PWHT) is required, it shall be performed in accordance with procedures that have been reviewed and provided permission to proceed by the BUYER before use against the scope of the applicable P.O. The procedure shall describe cleaning requirements, heating and cooling rates, type of heat treatment atmospheres, thermocouple locations, type of heating equipment, etc. The PWHT requirements for piping shall be in accordance with the applicable code and project specifications. The heat treatment temperature range and holding time at temperature shall be as specified in the WPAL.

5.5.1.2 Direct impingement by furnace burner flames is not permitted.

5.5.1.3 Only resistance, induction, furnace or quartz lamp heating methods are permitted. Exothermic heat treatment is prohibited.

5.5.1.4 PWHT cycles shall be recorded on print out charts. Thermocouples shall be independently recorded. When PWHT is performed outside of a controlled furnace environment, each weld shall have at least one thermocouple attached for temperature monitoring. The heat treat chart shall be submitted to the BUYER with each shipment.

5.6 Pickling[36]

When pickling of carbon steel piping is required by the design drawing and/or piping material class, the following shall apply:

5.6.1 Degrease to remove grease, dirt, and other contaminants.

5.6.2 Acid clean to remove mill scale, rust, and other foreign substances on the inside of the pipe, without loss of base metal.

5.6.3 Neutralize, rinse, and completely remove pickling solution.

5.6.4 Dry thoroughly. The interior of the pipe shall be free of mill scale, rust, acid, and other foreign materials.

5.6.5 Coat the inside of pipe with one of the following rust preventatives (or BUYER-approved equal):

5.6.5.1 Lectra Shield or SP-400, CRC Industries.

5.6.5.2 Mobilarma 247, Mobil.

5.7 Coating and Insulation System

5.7.1 Coating and insulation with High Density Polyethylene (HDPE) jacketing requirements may apply to carbon steel or stainless-steel dual contained piping.

5.7.2 Coatings shall be in accordance with specifications 24590-WTP-3PS-AFPS-T0001, 24590-WTP-3PS-PX04-T0001, 24590-WTP-3PS-PX04-T0002.

5.7.3 Insulation and jacketing for underground piping shall be in accordance with 24590-WTP-3PS-PX04-T0005.

5.7.4 HDPE shrink sleeves are installed per 24590-WTP-3PS-PX04-T0006.

5.7.5 Shop welds, located on the carbon steel or stainless steel encasement piping, shall not be coated or insulated prior to the pneumatic test being completed for that particular spool.

5.7.6 Coat the exterior surface of above ground piping in accordance with specification 24590-WTP-3PS-AFPS-T0001 as follows: Prepare surfaces in accordance with Appendix D for the supplied piping. Apply the coating system as listed on the individual isometric drawing. Appendix C, Table 2 defines the coating system details. Appendix C, Table 1 defines approved coating materials and thicknesses. Submittal requirements are defined in the Material Requisition (MR) on Form G-321-E and in coating specification section 9.0. Submittals include, but may not be limited to, personnel training records, coating application procedures, a listing of specific products to be applied including submittal of a Product Identity Certification Record (Appendix F) for each batch of coating material used, and daily inspection record of all work completed (Ref. Appendix G).

5.7.7 Coat the exterior surfaces of buried carbon steel in accordance with specifications 24590-WTP-3PS-PX04-T0001 for straight sections of pipe and/or 24590-WTP-3PS-PX04-T0002 for fittings, weld areas, and straight pipe (shop and field). Do not paint the gasket seating surface of flange faces.

5.7.8 Certain fabricated spools identified on the piping isometrics shall be furnished complete with a coating, on the exterior of the carbon steel encasement pipe, plus a shop applied insulation system installed in accordance with 24590-WTP-3PS-PX04-T0005 and as applicable 24590-WTP-3PS-PX04-T0006.

5.8 Marking[37, 38]

5.8.1 The fabricator shall apply the spool piece mark number, indicated on the isometric/orthographic drawing, to all spools. Mark spools of 15 feet or less in length once on one end. Mark spools greater than 15 feet in length once on each end, with markings appearing on opposite sides of the spool. Piece marks shall be stenciled or legibly hand lettered in letters not less than 2 inches high (when possible), with a visible weatherproof marker. Piece marks shall not be placed on end caps or flange protectors. Piece marks shall be readable from a reasonable distance.

5.8.1.1 For isometric drawings, the encasement pipe spool shall be marked to indicate both the carrier and the encasement piece mark number. This will assist in receiving of the dual contained spools.

Example: Spool pc. Mk.= LAW-LCP-PB01368001-A/LAW-LCP-PB01368002-A

5.8.1.2 5.8.1.2 For orthographic drawings, the encasement pipe spool shall be marked indicating only one piece mark number as indicated (the carrier and encasement spools will have the same number).

Example: Spool pc. Mk.= BOF-TCP-PH00118-A

5.8.2 Paint markings shall be at least 4 inches away from a surface to be welded.

5.8.3 A chemical analysis report for marking materials shall be submitted for BUYER review and permission to proceed prior to use against the scope of the applicable P.O.

5.8.4 Marking materials shall meet the requirements of Section 4.3 of this specification.

5.9 Rework of Fabricated Spools[39]

5.9.1 Reworked spools being shipped to the jobsite shall be provided with a Certificate of Compliance (C of C) stating the spools identified are the same spool number(s) originally delivered and received. The C of C shall state that the re-worked spools are in strict accordance and fully comply with the purchase order and all procedures and specifications. The C of C shall also state the re-work performed on each spool.

If additional materials are added, or if additional documentation is provided (NDE reports, MTRs, etc.) a complete documentation package for that spool shall be furnished.

6 Inspections, Examinations & Testing[40, 41, 42, 43]

Inspection, examination, and testing shall be in accordance with ASME B31.3, this specification, and other governing codes and standards, as applicable.

The SELLER is responsible for inspection, NDE, and testing of piping furnished under this specification.

6.1 Inspection

BUYER's representative shall be provided free access to the SELLER's and SELLER's subcontractors facilities, to witness, inspect, and report progress of work. This includes manufacture, fabrication, heat treatment, assembly, examination, and testing of piping. They have the right to audit any examination, to inspect the piping using any examination method specified by the engineering design, and to review all certifications and records necessary to ensure piping conforms to all applicable examination and testing requirements of the Code and of the engineering design.

6.1.1 SELLER Inspections

An organized process shall be followed for the purpose of determining that specified requirements (dimensions, properties, performance results, etc.) are met. Procedures for dimensional inspections and wall thickness measurements shall be submitted for BUYER review and permission to proceed.

6.1.2 Inspection and Test Plan[44, 45]

6.1.2.1 SELLER shall submit a detailed description of the inspections and tests planned during the receipt, fabrication, and conformance verification activities for permission to proceed, prior to use against the scope of the applicable P.O. This shall include characteristic to be inspected, methods of inspection, identification of the organization responsible for performing the inspection, acceptance criteria (which is measurable and verifiable), measuring and test equipment to be used (ensure equipment is of the proper type, range, accuracy and tolerance to accomplish the intended function), identification of sample plan if applicable, and the identification of BUYER and SELLER witness and hold points. When sample plans procedures are used, they shall be based on valid statistical methods.

6.1.2.2 If an outside accredited lab is selected to perform the inspection / test, objective evidence of their accreditation shall be provided in the plan.

6.1.2.3 Sequential hold and notification points for inspection and tests to be performed, including BUYER designated source inspection/witness notification point in accordance with the BUYER's quality surveillance plan included in the material requisition shall be provided in the plan.

6.1.2.4 The inspection and test report form to be used shall be provided in the plan.

6.1.2.5 Other requirements as required by codes and standards, or other invoked specifications, shall be provided in the plan.

Appropriate inspection records shall be established, maintained and, as a minimum, identify the following:

- Item inspected (Spool ID or Piece part #).
- Description of inspection or test performed.
- Type of observation or method of inspection.
- Date of inspection.
- Identification of the organization responsible for performing the inspection

- Name or unique identifier of the inspector who documented, evaluated, and determined acceptability.
- The inspection criteria, sample plan, or reference documents (including revision levels) used to determine acceptance. General note drawings, detail drawings, consensus standard codes, and vendor documents do not need to be identified on the record provided those documents are traceable from the documents that are identified on the record.
- Results indicating acceptability of characteristic inspected.
- Measuring and test equipment used to document inspection results during the inspection, including the identification number and the most recent calibration date and calibration due date.
- Reference to information on action taken in connection with nonconformances.

Test procedures shall include or reference the test configuration and test objectives. Test procedures shall also include provisions for assuring that prerequisites and suitable environmental conditions are met, adequate instrumentation is available and used, appropriate tests and equipment are used, and necessary monitoring is performed. Prerequisites shall include the following, as applicable: calibrated instrumentation, appropriate equipment, including accuracy requirements, trained personnel, condition for test equipment, and completeness of item to be tested, suitable environments conditions, and provisions for data acquisition and storage.

6.2 Personnel Qualifications and Certifications[46]

6.2.1 All NDE, including visual examination and UT thickness measurements, shall be performed by personnel certified in accordance with American Society for Nondestructive Testing Recommended Practice SNT-TC-1A, *Personnel Qualification and Certification in Nondestructive Testing*.

Personnel who perform NDE (including RT, magnetic particle testing, UT, UT thickness measurements, liquid penetrant testing, electromagnetic testing, neutron RT, leak testing, acoustic emission testing , and visual testing) to specified acceptance criteria shall be qualified to a "Written Practice" (or procedure) meeting the requirements of the American Society for Nondestructive Testing Recommended Practice No. SNT-TC-1A. This "Written Practice" must meet all the requirements from the 2006 edition or later of SNT-TC-1A with the following supplement:

This "Written Practice" must meet all of the requirements from any one given edition of SNT-TC-1A and its applicable supplements.

The re-certification interval for Level III NDE personnel shall not exceed 5 years.

6.2.2 The SELLER's NDE "Written Practice" (or procedure) shall be submitted to the BUYER for review and permission to proceed, prior to use against the scope of the applicable P.O.

6.2.3 The SELLER NDE personnel certifications shall be available to the BUYER's SQR upon request.

6.3 Nondestructive Examinations[47]

6.3.1 Perform and evaluate examinations in accordance with procedures and acceptance standards prepared in accordance with the ASME B31.3 and/or standard, and the ASME, Section V.

Procedures for each method of examination shall be submitted to the BUYER for review and permission to proceed, prior to use against the scope of the applicable P.O. No sub-supplier shall perform NDE work without prior submittal of the sub supplier's NDE procedure and BUYER's review and permission to proceed, prior to use against the scope of the applicable P.O.

NDE reports shall be submitted with the shipment as part of the quality verification documentation.

Radiography film with technique and reader sheets shall be submitted as part of the G-321-E submittals in accordance with the material requisition.

Per ASME B31.3, paragraph 344.2.2, records of individual visual examinations are not required, except for those of in-process examinations.

6.3.2 WPAL shall identify the extent of NDE per individual pipe class to address the NDE requirements listed in Sections 6.3.3.

6.3.3 The extent and acceptance criteria are as listed in ASME B31.3, para 341.4.1 and Table 341.3.2 respectively, for normal fluid service conditions with the following additions. These requirements are summarized in Appendix A of this specification. Weld repair shall be examined in accordance with the requirements used for the original weld.

6.3.3.1 Where RT is allowed or specified for shop welds, the radiographic acceptance criteria for normal fluid service apply, except that incomplete penetration shall not be permitted.

6.3.3.2 Where liquid penetrant examination or magnetic particle examination is allowed or specified, no cracks shall be permitted.

6.3.4 Piping Outside BC and HtR Weld NDE and Inspection Requirements

6.3.4.1 Shop girth welds require full visual examination in accordance with the requirements of ASME B31.3, para 341.4.1*(a)*, and NDE examination in accordance with the requirements of ASME B31.3, para 341.4.1*(b)*. If the RT examination cannot be performed then the selected welds shall be examined by in-process examination in accordance with ASME B31.3, para 344.7, including PT of the root pass and the final pass in accordance with ASME B31.3, para 344.7.1(e).

6.3.4.2 Integrally reinforced forged branch fitting connection welds, welded to the main piping run shall have 100% visual examination in accordance with the requirements of ASME B31.3, paragraph 341.4.1. If these welds are selected for RT then the selected welds shall be examined by in-process examination, in lieu of volumetric examination, in accordance with ASME B31.3, para 344.7, including PT of the root pass and the final pass in accordance with ASME B31.3, para 344.7.1(e).

6.3.4.3 Fillet welds including socket welds, integral support welds, and non-pressure and non-load bearing piping attachment welds (e.g., cathodic protection clips) welds require 100% visual examination and NDE in accordance with ASME B31.3, paragraph 341.4.1.

6.3.4.4 Full penetration welded stub-in lateral branch connection fittings used on gravity drain piping require 100% VT and 100% PT of final pass only.

6.3.5 Piping Inside BC and HtR Weld and Inspection Requirements[48]

6.3.5.1 Shop girth welds require 100% full visual examination in accordance with the requirements of ASME B31.3, para 341.4.1*(a)*, and 100% NDE examination in accordance with the requirements of ASME B31.3, para 341.4.1*(b)*. If this RT examination cannot be performed then the selected welds shall be examined by in-process examination in accordance with ASME B31.3, para 344.7, including PT of the root pass and the final pass in accordance with ASME B31.3, para 344.7.1(e).

6.3.5.2 Integrally reinforced forged branch fitting connection welds, welded to the main piping run shall have 100% visual examination in accordance with the requirements of ASME B31.3, paragraph 341.4.1 In lieu of 100% volumetric examination these welds shall be examined by in-process examination in accordance with ASME B31.3, para 344.7, including PT of the root pass and the final pass in accordance with ASME B31.3, para 344.7.1(e).

6.3.5.3 Fillet welds including socket welds, integral support welds, and non-pressure and non-load bearing piping attachment welds (e.g., cathodic protection clips) welds require 100% visual examination and NDE in accordance with ASME B31.3, paragraph 341.4.1.

6.4 Shop Testing

6.4.1 Leak Testing

6.4.1.1 Shop hydrostatic leak testing shall be performed in accordance with ASME B31.3 by the SELLER on inner piping prior to the jacket piping being completed. Potable water shall be used for the leak test performed by the SELLER. Test pressure shall be determined based on the applicable pipe class. All water shall be drained and spools dried within 72 hours of testing. Seller shall submit their hydrostatic leak test procedure for BUYER's review and permission to proceed. Test results shall be submitted as part of G-321-V.

6.4.1.2 Shop pneumatic leak testing shall be performed in accordance with ASME B31.3 by the SELLER on fabricated jacket piping insulated and/or wrapped in the SELLER's shop. Test pressure shall be in determined based on the applicable pipe class. Seller shall submit their pneumatic leak test procedure for BUYER's review and permission to proceed, prior to use against the scope of the applicable P.O. Test results shall be submitted as part of G-321 V. Perform leak testing prior to coating (if applicable) and insulating and/or wrapping.

6.4.1.3 Welding of integral supports shall be avoided in previously hydrostatically or pneumatically leak tested piping. BUYER's engineering shall be consulted immediately when this situation occurs.

6.5 Site Testing

After installation, all fabricated spool assemblies will be leak tested by others in accordance with the applicable code. Should any fabrication defect be detected in shop welds during field testing, the defect shall be repaired by the SELLER or BUYER in accordance with the Purchase Order Terms and Conditions.

7 Packing, Cleaning, Handling, and Storage Requirements[49, 50, 51]

This section covers general requirements for packaging, shipping preparation, handling, and storing of components procured for use at the WTP.

7.1 General

7.1.1 The handling, storage, cleaning, packaging, and preservation of items shall be controlled to prevent damage or loss and to minimize deterioration. These activities shall be conducted in accordance with established work and inspection instructions, drawings, specifications, or other pertinent documents or procedures specified for use in conducting the activity. SELLER shall submit their general procedure for handling, storage, and preparation for shipments. It shall also include a section addressing the requirements in 7.8.3, 7.8.4, 7.8.5 and 7.8.6 of this specification.

7.1.2 Material and equipment (cargo) must be prepared for shipment such that it can be secured for protection against shifting and falling cargo as specified in 49 CFR 393 Subpart I, *Protection Against Shifting and Falling Cargo*. For cargo that cannot be crated or that requires direct securement to a transport vehicle, the Seller shall ensure that the cargo is designed or packaged with sufficient and adequate attachment points to limit movement in accordance with the requirements of 49 CFR 393 Subpart I.

7.1.3 Materials in contact with austenitic stainless steel shall meet the chemical requirements specified in 24590-WTP-3PS-NW00-T0002.

7.1.4 Prior to shipment of equipment made of stainless steel or nickel based alloys, the SELLER shall perform a visual inspection of all surfaces in contact with wooden supporting structures looking for evidence of surface corrosion. A nonconformance report (NCR) shall be created to resolve any corrosion issues identified.

7.2 Preservation

7.2.1 Pipe spool surfaces shall be cleaned and coated as specified on the isometric and purchase order.

7.2.2 Piping spools shall be prepared for long-term (greater than 6 months) storage.

7.2.3 WTP has limited capacity for storage of equipment and materials in climate-controlled areas. Equipment and materials should be prepared for outside storage. Indoor storage or climate-controlled storage should be specified only when absolutely necessary.

7.3 Cleaning

7.3.1 Perform cleaning after fabrication has been completed. Cleaned piping shall be free of loose rust or mill scale, blisters, grease, sand, oil, dirt, and other foreign materials.

7.3.2 Fabricated spools shall be cleaned in accordance with the standard cleaning method described in PFI ES-5, *Cleaning of Fabricated Piping*.

7.3.3 After cleaning, blow dry the interior surfaces of all piping with clean, filtered, oil-free air. There shall be no standing liquids (i.e., water) on the interior of piping.

7.3.4 The gasket seating surface of flange faces shall be cleaned and coated with a one of the following rust preventives:

7.3.4.1 Grease (manufacturer's standard).

7.3.4.2 Lectra Shield or SP-400, CRC Industries.

7.3.4.3 Mobilarma 247, Mobil.

7.3.4.4 Any preservative listed in specification 24590-WTP-3PS-AFPS-T0001.

7.4 Weldable Coating

Apply a preservative coating of Bloxide from Tempil or Deoxaluminite from D.C. Sales Engineering (or BUYER-approved equal) weldable primer on field weld end preparations to carbon steel surfaces including coating the hold back area. Overlap onto the coating is acceptable. Weldable primers containing zinc are not acceptable.

7.5 Packaging

This section contains requirements for packaging of items for protection against corrosion, contamination, physical damage, or any effect that would lower the quality or cause the components to deteriorate during the time they are shipped, handled, and stored.

7.5.1 Package design requirements shall be used for environmental protection to avoid the deleterious effects of shock and vibration, to control temperature and humidity within specified limits, or for any other special requirements.

7.5.2 Items shall be inspected for cleanliness immediately before packaging. Dirt, oil, residue, metal chips, or other forms of contamination shall have been removed by cleaning methods approved by the BUYER. Any trapped water shall have been removed and the component dried.

7.5.3 Components not immediately packaged shall be protected from contamination.

7.5.4 Items requiring protection from damage from water vapor, salt air, dust, dirt, and other forms of contamination penetrating the package shall be packaged with a barrier. The barrier shall be based on the type, size, and weight of equipment and shall not be easily damaged by puncture, abrasion, weathering, cracking, temperature extremes, wind conditions, and the like. Barrier and wrap materials shall be noncorrosive and not harmful to the component protected. Also, barrier and wrap materials shall not readily support combustion. Vapor proof barrier materials used with desiccants constitute another preservation system that protects against potential damage by water vapor condensate. Adequate protection shall be provided against mechanical damage and atmospheric corrosion in transit and, for equipment suitable for outside storage, for at least 12 months outdoor storage at the job site prior to installation.

7.5.4.1 Waterproof barrier material – Waterproof barrier material shall be resistant to grease and water; it shall protect items from airborne and windblown soils.

7.5.4.2 Components that can be damaged by condensation trapped within the package shall be packaged with approved desiccant inside the sealed waterproof or vapor proof barrier or an equivalent method. Signs indicating that desiccant has been installed shall be conspicuously located on the exterior of the packaging, adjacent to where the desiccant has been installed. A humidity indicator shall be included in every waterproof or vapor proof envelope containing desiccant.

7.5.5 Sealing Openings

7.5.5.1 Comply with the minimum end protection requirements criteria outlined in PFI ES-31, *Standard for Protection of Ends of Fabricated Piping Assemblies,* to protect openings and (or) as required in the purchase order. The SELLER shall provide to the BUYER for review and permission to proceed prior to use, against the scope of the applicable P.O of each specific type of desiccant material. Fabrications must be clearly marked, indicating desiccant inside.

7.5.5.2 Cover pipe openings with metal, polyethylene, or nonmetallic end caps, flange protectors, or plugs. Caps or plugs shall consist of materials that enable them to perform their intended function adequately without causing deleterious effects on the items or system operation. Simplicity of installation, inspection, and removal without damage to the item shall be considered.

Metallic plugs and caps contacting metal surfaces shall not cause galvanic corrosion at the contact areas. Gasketing or other nonmetallic materials used in conjunction with metallic caps or plugs shall exhibit no corrosive effect on the material.

Polyethylene or nonmetallic end caps and plugs shall be friction fit or secured by other means. Nonmetallic plugs and caps shall be brightly or contrastingly colored. Clear plastic closures are not to be used except when indicated for a special purpose.

At a minimum, one of the caps or plugs on each spool shall be provided with a 1/8-inch maximum diameter vent hole to preclude the buildup of internal pressure.

Avoid placing the cap or plug with the vent hole on a spool that is oriented in an upward, vertical position. Tape shall not be used to secure end caps or plugs.

7.5.5.3 Welding end connections shall be provided with adequate bevel protectors to protect from corrosion and physical damage.

7.5.6 Components packed in containers shall be blocked, anchored, braced, or cushioned to prevent physical damage to the item or barrier.

7.6 Marking and Labeling[52]

7.6.1 Measures shall be established for marking and labeling for the packaging, shipping, handling, and storage of items as necessary to adequately identify, maintain, and preserve the item.

7.6.2 Markings and labels shall indicate the presence of special environments or the need for special controls if necessary.

7.6.3 Items or containers of equipment or material shall be marked "Special Storage Requirements" when the storage is other than outside.

7.6.4 Temporary structural members for bracing or protection of spools shall be painted bright, fluorescent yellow (including nuts and bolts).

7.6.5 Components and their containers shall be identified by marking. Shipping marks shall be on all four sides of the package excluding top and bottom. The shipping marks shall be at least 3-inches high where space permits. Markings are to be in black or white paint or ink depending on the shade of the package surface. International cautionary symbols shall be stenciled in red waterproof paint or ink. Bundles and reels and other packages which cannot be marked directly will have attached corrosion resistant metal tags with raised markings. Hazardous materials will have appropriate markings. For the following types of packages, special markings shall apply:

- Containers of liquids, sensitive equipment, other items that must be maintained in a specified orientation during storage, handling, or shipping: Arrows, "This Side Up."
- Packages or pieces exceeding 8 feet in length or height: "Center of Gravity."
- Packages or pieces to be hoisted by tack or cranes: "Sling Here."
- Top heavy packages or pieces: "Top Heavy" or "End Heavy."

7.7 Shipping Instructions

7.7.1 Pipe spools shall be protected from exposure to adverse environmental conditions.

7.7.2 Block, strap, or otherwise hold pipe, fittings, and valves in position and further separate them by dunnage as necessary to prevent damage during shipment.

Note: Pipefitters must be able to walk around the shipment and place slings as required to unload safely. This must be considered when separating pipe, fitting, and valves in position and separating them by dunnage.

7.7.3 The weight, lifting points, or center of gravity shall be indicated on the crate, skid, or package by the shipper and shall be used to ensure proper handling during loading, transfer between carriers, and unloading.

7.7.4 Package or preservative coatings shall be visually inspected after loading and damaged areas repaired prior to shipment. Components shipped with desiccant shall be inspected to ensure closures are intact.

7.7.5 Sealed openings shall be visually inspected after loading to ensure closures are intact. Materials used for resealing shall be in accordance with original packaging requirements.

7.7.6 Where special care is deemed necessary to avert damage, written instructions concerning the location or stacking limits for crates or boxes shall be marked on the containers.

7.7.7 Precautions shall be taken to minimize the possibility of theft or vandalism during shipment of components.

7.7.8 Pipe spools and other equipment (i.e., valves) subject to internal moisture damage and protected by desiccant shall be provided with sufficient desiccant during shipment. Temporary bracing or supports, marked and tagged for removal after installation, shall be provided to prevent damage during shipment and shall be painted bright, fluorescent yellow.

7.8 Storage

7.8.1 SELLER shall store BUYER supplied in-line components indoors in a weather-tight and well-ventilated building or enclosure.

7.8.2 SELLER shall store all in-process and completed piping spools that contain welded inline components in a weather-tight and well-ventilated building or enclosure until the time of shipment.

7.8.3 The Seller shall specify storage requirements to minimize the possibility of damage or lowering of quality due to corrosion, contamination, deterioration, or physical damage from the time the component is received by the BUYER until it is removed from storage and placed in its final location.

7.8.4 For components that may be stored outdoors, the Seller shall specify any cribbing or equivalent to allow for air circulation and to avoid trapping water.

7.8.5 Seller shall provide specific guidelines for storage beyond 6 months at the construction site.

7.8.6 Seller shall specify the shelf life for any items that may become unserviceable as a result of extended storage.

8 Quality Assurance

SELLER shall implement a Quality Assurance (QA) program in accordance with the QA requirements specified in the Material Requisition. BUYER will specify QA requirements in QA Program Requirements Data Sheets, BUYER specifications, and/or requirements written directly into the Material Requisition (MR). SELLER shall submit Quality Assurance Manual for review.

SELLER's shall perform all work in accordance with a program that meets the requirements of the Q Datasheet of ANSI/ASME NQA-1 (2000)/2004 Addendum for Commercial Grade Dedication. Quality Assurance Program Requirements for Fabricator (Build to Print) and/or Site Installer SELLER/Subcontractor attached to the MR.

8.1 Q Datasheet of ANSI/ASME NQA-1 (2000) Quality Assurance Program Requirements Clarification

MR Attachment A, Q Datasheet of ANSI/ASME NQA-1 (2000) Quality Assurance Program Requirements, Section A. SELLER Qualification, 1. E) is clarified by the following:

8.1.1 The term "periodic" means, testing the first items (one of each lot) for each of the first five shipments from each Sub-supplier's PO. Thereafter, for each Sub-supplier's PO, test one of each lot for every tenth (10^{th}) shipment.

8.1.2 The term "physical properties" testing means tensile testing which will provide results comparable those reported on the MTR. As an alternate approach, test blanks or test coupons, in accordance with the applicable ASTM, procured from the same heat / lot as the delivered item, maybe used to generate the tensile test specimen.

8.2 NCA 3800/4000 SELLER

This note applies to all PO's issued by the SELLER to their Sub-SELLERS, where an item has to meet the requirements of NCA 3800/4000.

8.2.1 After awarding a PO, the SELLER may evaluate the procurement requirements and determine that implementation audits are not necessary for procuring items that are:

a) Relatively simple and standard in design, manufacturing, and testing; and

b) Adaptable to standard or automated inspections or tests of the end product to verify quality characteristics after delivery to the SELLER's facility.

8.2.2 Pipe, flanges, fittings, and weld filler metal are considered to be relatively simple and standard in design; therefore, audits are not necessary for these items when procured from an NCA 3800 certificate holder.

8.3 Commercial Grade Dedication[53]

See section 4.8.

8.4 Supplier Deviation Disposition Request

The SELLER shall identify and document conditions that do not meet the requirements of the BUYER's procurement document(s) and/or the BUYER accepted SELLER document(s). Those deviations, along with the SELLER's suggested corrective actions, shall be transmitted to the BUYER on the Supplier Deviation Disposition Request (SDDR) Form for review and disposition. Any deviation is considered unacceptable until approved by the BUYER in writing. Detailed instructions are provided as part of the SDDR Form, a copy of which is attached to the PO. Note that deviations from any code or regulation are not permitted.

9 Configuration Management[54]

Configuration management is maintained by conformance to standards and procedures. The BUYER shall be promptly notified by SDDR of any potential deviation or conflict with the requirements. Work shall not proceed until a resolution is accepted and proper documentation is provided to the BUYER.

10 Documentation and Submittals[55, 56, 57]

10.1 General

Preparing, maintaining, and submitting any documents for BUYER's review and permission to proceed does not relieve the SELLER from the responsibility of complying with the requirements of the purchase order.

Records shall be legible and complete. Documentation shall be traceable to the applicable hardware. Each document and each entry on each document shall be complete. Blank spaces or incomplete entries are not acceptable. Items not applicable are marked as such. Elements that are not applicable may be marked by "NA" or "N/A". Documents shall be considered valid records only if stamped, initialed, or signed and dated by authorized personnel or otherwise authenticated. Corrections to quality assurance records, including documents that will become quality assurance records, shall be corrected using a single strikethrough method and include the initials of the initiator and date the correction was made immediately adjacent to the change. Whiteout™ or similar type products are specifically prohibited and will not be accepted. It shall be clear as to what was changed, who initiated the change, and when the change occurred.

Corrections made by manual correction should be avoided.

Submit the following documents as specifically noted in the G-321-E or G-321-V forms attached to the purchase order. Documents listed below in 10.2 and, on the G-321-E form require early submittal. This is necessary to allow time for proper BUYER's review and possible revision required to incorporate BUYER's comments. A review status of "Work May Proceed" shall be obtained prior to use. Submittal of procedures for review applies to any sub-vendor used by the SELLER.

10.2 G-321-E Form Submittals

10.2.1 Inspection and test plan. (Section 6.1.2.1) (DCN 6.1)

10.2.2 Supplier shall submit a typical quality verification document (QVD) package for BUYER's review and permission to proceed. This submittal will be representative of a QVD package of a completed spool and is required to afford the project an advance review of how a QVD package is formed and is constituted. It is expected that the QVD package will be ordered in sequence of the Document Category Number (DCN) and each DCN will be paginated. This document shall include forms represented in the SELLERs procedures and BUYERs specifications (when applicable) throughout all the processes used in executing the procurement, receipt and tracking of materials, fabrication, coating, insulation, wrapping, including all inspection, repair (if applicable) and testing (as applicable). (DCN 10.1)

10.2.3 The SELLER shall identify the specific products by manufacturer and catalog number and shall submit the coating manufacturer's latest published product data sheet, application instructions, and Safety Data Sheets (SDS). Conflicts, if any, between the SELLER's normal procedures, the coating manufacturer's recommendations, and this specification shall be brought to the attention of the BUYER for resolution and require written permission to proceed (Ref Para 9.2.4 of 24590-WTP-3PS-AFPS-T0001) (DCN 11.0).

10.2.4 The SELLER shall submit a current copy of the Product Data Sheet, application instructions and SDS for each coating product to be applied. (Ref Para 9.2.2.4 of 24590-WTP-3PS-PX04-T0002) (DCN 11.0)

10.2.5 The SELLER shall submit original coating manufacturer's Product Identity Certification Records (PICR) for every batch of coating material intended for use (Appendix A). (Ref Para 9.2.2.5 of 24590-WTP-3PS-PX04-T0002) (DCN 11.0)

10.2.6 The SELLER shall identify the specific products by manufacturer and catalog number and shall submit the manufacturer's latest published Product Data Sheet, application instructions and Safety Data Sheets (SDS). (Ref Para 9.2.2 of 24590-WTP-3PS-PX04-T0005)(DCN 11.0)

10.2.7 The SELLER shall submit a current copy of the Product (or Technical) Data Sheet, application instructions and SDS for each product to be applied. (Ref Para 9.2.2.3 of 24590-WTP-3PS-PX04-T0006)(DCN 11.0)

10.2.8 Chemical analysis report for shop marking materials and tape. (Section 5.8.3) (DCN 11.0)

10.2.9 Material description (safety data sheet) for each specific type of desiccant material. (7.5.5.1) (DCN 11.0)

10.2.10 Weld Procedure Specification (WPS) and associated Procedure Qualification Record (PQR) (submit each WPS with the respective PQR). Welding includes tack welds. (Section 5.4.1.1) (DCN 12.0)

10.2.11 Filler Material Control and Storage Procedure. (Section 5.4.4.3) (DCN 13.0)

10.2.12 Weld Repair Procedure. (Section 5.4.1.3) (DCN 14.0)

10.2.13 The final procedure and documentation forms shall be submitted and reviewed with BUYER's permission to proceed prior to the start of coating Work. Submittal requirements for manufacturer's standard coating are found in 24590-WTP-3PS-AFPS-T0001 Section 3.2.(Ref Para 9.2.1 of 24590-WTP-3PS-AFPS-T0001) (DCN 15.0)

10.2.14 Post Weld Heat Treatment (PWHT) Procedure. (If applicable) (Section 5.5.1.1) (DCN 16.0)

10.2.15 UT – Ultrasonic Examination Procedure. (Section 4.2.4.1 & 6.3) (DCN 19.0)

10.2.16 RT – Radiographic Examination Procedure. (Section 4.2.4.1 & 6.3) (DCN 20.0)

10.2.17 Radiograph examination film and technique reader sheets. (Section 4.2.4.1 & 6.3) (DCN 20.1) Shipped directly to PDC with notification of such to the BUYER.

10.2.18 MT – Magnetic Particle Examination Procedure. (Section 6.3) (DCN 21.0)

10.2.19 PT – Liquid Penetrant Examination Procedure. (Section 6.3) (DCN 22.0)

10.2.20 Hydrostatic leak testing procedure. (Section 6.4.1.1) (DCN 24.0)

10.2.21 Pneumatic leak testing procedure. (Section 6.4.1.2) (DCN 24.0)

10.2.22 Bending procedure for pipe bends and bend qualification record. (Sections 5.2 and 5.2.1.1) (DCN 25.0)

10.2.23 VT – Visual Test Procedure. (Section 6.3) (DCN 25.0)

10.2.24 Inspection procedure (s) (Section 6.1.1) (Dimensional DCN 25.0)

10.2.25 Inspection procedure (s) (Section 6.1.1) (Wall Thickness DCN 25.0)

10.2.26 Inspection procedure (s) (Section 6.1.1 & 5.2) (Bending DCN 25.0)

10.2.27 Proof Tests (Section 4.2.3) (DCN 27.0)

10.2.28 Welder Personnel Qualification Procedure. (Section 5.4.1.1) (DCN 28.0)

10.2.29 Nondestructive Examination (NDE) "Written Practice" (NDE Personnel Qualification Procedure). (Section 6.2.2) (DCN 28.0)

10.2.30 SELLER shall prepare detailed written procedures for material receiving, marking, storage, handling, surface preparation, environmental control, application, curing, inspection, testing, touch-up/repair, application personnel qualification, inspector qualification, and proposed documentation forms as described within specification 24590-WTP-3PS-AFPS-T0001. (DCN 28.0

10.2.31 The SELLER shall provide a personnel training and certification plan for applicators and inspectors. (refer to Specification 24590-WTP-3PS-AFPS-T0001 Sections 1.4.17, 4.1.2, 5.1.1, 7.1.6 & 9.2.7) (DCN 28.0).

10.2.32 SELLER shall submit a detailed written procedure that addresses material receiving, marking, storage, handling, surface preparation, environmental control, application, curing, inspection, testing, touch-up/repair, and proposed documentation forms. The procedure and documentation forms shall be submitted for the BUYER approval prior to the start of coating work. (Ref Para 9.2.2.1 of 24590-WTP-3PS-PX04-T0002) (DCN 28.0)

10.2.33 The SELLER shall submit a daily inspection record as part of the work procedures that includes the required elements provided in Appendix C. (Refer to Section 7.1.1) (Ref Para 9.2.2.2 of 24590-WTP-3PS-PX04-T0002) (DCN 28.0)

10.2.34 SELLER shall submit a detailed written procedure that addresses material receiving, marking, storage, handling, surface, preparation, environmental control, application, curing, inspection, testing, touch-up/repair, and proposed documentation forms. The suppliers submitted

procedure shall clearly define each step in the work process including inspection and installation. (Ref Para 9.2.2 of 24590-WTP-3PS-PX04-T0005)(DCN 28.0)

10.2.35 SELLER shall submit a detailed written procedure that addresses material receiving, storage, handling, surface preparation, environmental control, application, inspection, testing, touch-up/repair, and proposed documentation forms. (Ref Para 9.2.2.1 of 24590-WTP-3PS-PX04-T0006)(DCN 28.0)

10.2.36 The SELLER shall submit their general procedure for handling, storage, and preparation for shipment of pipe spools. (Section 7.1.1) (DCN 29.0)

10.2.37 Positive Material Identification (PMI) Procedure (Section 4.7) (DCN 31.0)

10.2.38 Commercial Grade Dedication (CGD) Procedure(s) & Plan(s) (Section 4.8.1 & 8.3) (DCN 33.0)

10.2.39 Welding Procedure Application List (WPAL) identifying WPSs being used for each individual pipe class. This list shall also identify the extent of NDE per individual pipe class, preheat, and PWHT as applicable. The attached form (Figure 1) in Appendix B is a typical example of a welding procedure application list. (Section 5.4.1.2) (DCN 36.0)

10.3 G-321-V Form Submittals

The following quality verification documentation (QVD) listed on the G-321-V form shall be submitted for each spool as applicable, and provided with the spool shipment:

10.3.1 The SELLER shall submit the original or copies of the original Coating Manufacturer's Product Identity Certification Records (24590-WTP-3PS-AFPS-T0001 Appendix F) for each and every batch of coating material used.(Ref Para 9.2.5 of 24590-WTP-3PS-AFPS-T0001) (DCN 13.0).

10.3.2 All original documentation generated during the coating work shall be submitted within 30 days after the last item in the order is completed. The documentation package shall have a cover page that identifies the project, contract number and the report issue date. There shall be a letter of certification signed by management certifying the work performed complied with all the contract performance and quality requirements. The submittal package shall contain a table of contents and organized sections that contain the original documents generated during the work. (Ref Para 10.7 of 24590-WTP-3PS-PX04-T0001) (DCN 13.0)

10.3.3 There shall be a letter of certification signed by management certifying the work performed complied with all the contract quality requirements (Ref Para 9.2.3.2 of 24590-WTP-3PS-PX04-T0002) (DCN 13.0)

10.3.4 There shall be a letter of certification signed by management certifying the work performed complied with all the contract quality requirements. (Ref Para 9.2.3.3 of 24590-WTP-3PS-PX04-T0005) (DCN 13.0)

10.3.5 There shall be a letter of certification signed by management certifying the work performed complied with all the contract quality requirements. (Ref Para 9.2.5.2 of 24590-WTP-3PS-PX04-T0006)(DCN 13.0)

10.3.6 A Certificate of Conformance (C of C) from the HDPE shrink sleeve manufacturer for each batch of material (sleeve, filler & patch material) shall be provided, the C of C shall certify the supplied material meets all the physical properties contained in their published technical data sheet. The C of C shall be provided with purchased material (Attach "C of C") to an Appendix A Product Identity Record filling in applicable sections, signed and dated by the product manufacturer. (Ref Para 9.2.2.4 of 24590-WTP-3PS-PX04-T0006)(DCN 13.0)

10.3.7 Major Weld Repair Record. (Section 5.4.1.3) (DCN 14.0)

10.3.8 The SELLER shall submit a daily inspection record as part of the work procedures that includes the required elements as noted in specification 24590-WTP-3PS-AFPS-T0001 Appendix G (Ref Para 9.2.6 of 24590-WTP-3PS-AFPS-T0001) (DCN 15.0)

10.3.9 A record of all required daily production test results for pre-surface preparation, chloride contamination testing, environmental conditions, compressed air cleanness, surface preparation and profile, acid wash, steel defects, FBE coating, water quench, etc. shall be included as part of the shipping documentation package. (Ref Para 10.2 of 24590-WTP-3PS-PX04-T0001) (DCN 15.0)

10.3.10 A record of all required daily production test results on each FBE coated pipe, such as dry film thickness, holiday testing, visual defects including X cut knife adhesion tests shall be included as part of the shipping documentation package. (Ref Para 10.3 of 24590-WTP-3PS-PX04-T0001) (DCN 15.0)

10.3.11 A record of all required daily laboratory test results for each Lot of FBE coated pipe shall be included as part of the shipping documentation. (Ref Para 10.4 of 24590-WTP-3PS-PX04-T0001) (DCN 15.0)

10.3.12 Material test reports (MTR). (Section 4.4.1) (DCN 17.1)

10.3.13 A record of all material test reports (individual batches of FBE powder, phosphoric acid, abrasive, rinse water quality, silver nitrate, etc.) for materials used for a given Lot of FBE coated pipe, shall be included as part of the shipping documentation package. (Ref Para 10.1 of 24590-WTP-3PS-PX04-T0001) (DCN 17.1)

10.3.14 Certificates of Compliance. (Sections 4.4.1 and 5.9.1) (DCN 17.4)

10.3.15 UT – Ultrasonic Examination Reports. (Section 4.2.4.1 & 6.3) (DCN 19.0)

10.3.16 RT – Radiographic Examination Reports. (Section 4.2.4.1 & 6.3) (DCN 20.0)

10.3.17 MT – Magnetic Particle Examination Report. (Section 6.3) (DCN 21.0)

10.3.18 PT – Liquid Penetrant Examination Report. (Section 6.3) (DCN 22.0)

10.3.19 Hydrostatic leak testing results. (Section 6.4.1.1) (DCN 24.0)

10.3.20 Pneumatic leak testing results. (Section 6.4.1.2) (DCN 24.0)

10.3.21 Bulk pipe and buttweld fitting wall thickness reports. (Section 4.2.2) (DCN 25.0)

10.3.22 Bend dimensional verification reports. (Section 5.2.2.6) (DCN 25.0)

10.3.23 A record of all required inspections shall be provided that includes pre-surface preparation, compressed air cleanliness, environmental conditions, surface preparation and profile, location of repair or field joint protected, sleeve application, visual inspection, and holiday testing, and all touch-up and repair of applied HDPE shrink sleeves. These records shall include the batch or lot number of the HDPE shrink sleeve materials used, and the ID of the items protected to provide traceability. Multiple items, areas or joints may be documented on the same inspection record for each day's production. (Ref Para 9.2.4 of 24590-WTP-3PS-PX04-T0006)(DCN 25.0)

10.3.24 Positive Material Identification (PMI) results (Section 4.7.5) (DCN 31.0)

10.3.25 Commercial grade dedication (CGD) quality verification documentation (Section 4.8.1) (DCN 33.0)

10.3.26 Pipe spool sheets, extended spool sheets, or detailed drawings. (Section 4.4.2) (DCN 36.0)

10.3.27 Completed Soft Seated Valve Installation Records. (Section 5.1.11.10) (DCN 36.0)

Appendix A

Nondestructive Examinations (NDE) Summary of Shop Welds

SEE SECTION 6.3 FOR APPLICABLE SHOP WELD NDE, INSPECTION, AND ACCEPTANCE CRITERIA REQUIREMENTS. **Type of Weld**	**Dual Containment Piping[1]**	
	Inner Piping	**Jacket Piping**
All Girth and Miter Welds	100% VT 100% RT or 100% UT	100% VT 5% RT or 5% UT
Outer Pipe Shop Performed Longitudinal/Clam Shell Welds for Dual Contained Piping	N/A	100% VT 5% RT or 5% UT
All Pipe and Integral Attachment Fillet Shop Welds – including thermowell socket welds, integral support weld, non-pressure & non load bearing piping attachment welds	100% VT 100% PT	100% VT
All integrally reinforced forged branch fittings welded to main piping run. If weld is chosen as part of 5% RT population and RT will not produce an interpretable radiograph, In-Process Examination and liquid penetrant examination of the exterior of both the root and final pass is acceptable. Footnote: The circumferential weld that connects an integrally reinforced forged branch fitting to the branch pipe run shall be examined as a girth weld.	100% VT 100% PT	100% VT

Legend: VT = Visual Examination per ASME B31.3 para 344.2
RT = Radiographic Examination per ASME B31.3 para 344.5
UT = Ultrasonic Examination per ASME B31.3 para 344.6
PT = Liquid Penetrant Examination per ASME B31.3 para 344.4

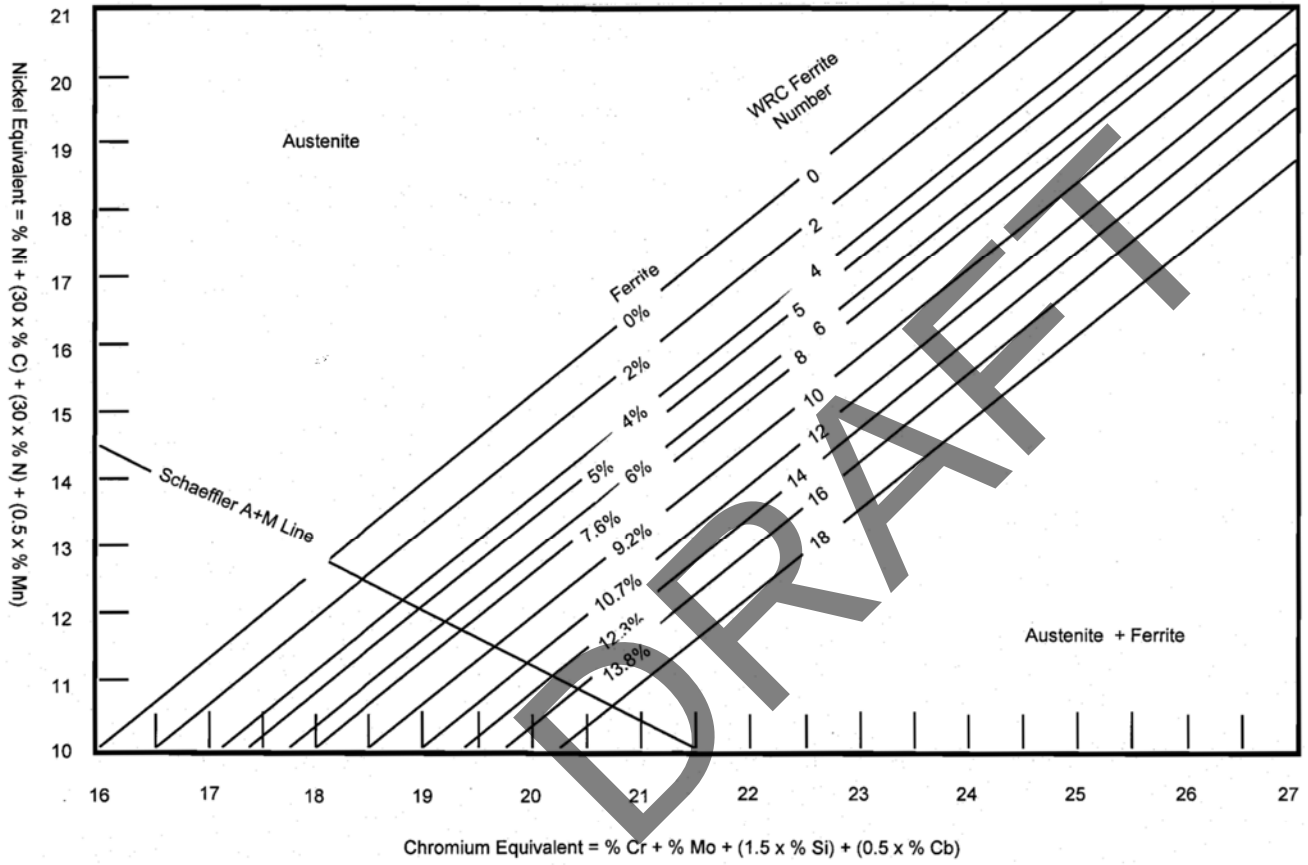
[1]Includes embedded piping, if applicable

Appendix B
Forms

Figure 1 Welding & NDE Matrix (Welding Procedure Application List)

Piping Classes												
Design Code:						Category:						
Pipe Class(es):	Line Services:					Limits: - Temperature °F, °C / Pressure psig, bars						
Piping Material Type:				P Number:		Hardness Requirements:						
CVN Requirements:			PMI Requirements:			Ferrite Requirements:						
Pipe Class or Weld Description	Pipe Size (nps)	Max W.T. ☐ Sched. ☐ inches ☐ mm	Joint Type	Heat Treatment °F, °C		Welding Procedure Specification(s)	NDE (%)					
				PRE	POST		RT	MT	PT	VT	Other	
Notes:												

Figure 2 WRC Delta Ferrite Diagram



GENERAL NOTE:
The actual nitrogen content is preferred. If this is not available, the following applicable nitrogen value shall be used:

a) GMAW welds–0.08% (except self-shielding flux colored electrode GMAW welds–0.12%)
b) welds of other processes–0.06%

Figure 3 Soft Seated Valve Installation Record

Soft Seated Valve Installation Record

Bechtel Pipe Spool Identification: _____

1. **Valve Information**
   a. Manufacturer: _____
   b. Bechtel Stock No: PVV _____
   c. Bechtel Valve Tag No: _____
   d. Manufacturer's Instructions WTP No: 24590- _____
   e. Size: _____ NPS
2. **Assembled Valve Welding**
   a. Assembled Welding Permitted:
      [ ] - Yes
      [ ] - No - Skip to Step 3
   b. Assembled Welding Selected:
      [ ] - Yes
      [ ] - No - Skip to Step 3
   c. Valve body heat control in accordance with manufacturer's steps:
      _____
   d. Maximum valve body temperature observed during welding: _____
      Pyrometer ID No: _____
      Temperature Crayon Brand/Rating: _____
      Signature / Date: _____/_____
3. **Valve Disassembly / Reassembly / Torquing**
   a. Valve disassembled in accordance with manufacturer's steps:
      _____
   b. Valve reassembled in accordance with manufacturer's steps:
      _____
   c. Final fastener torque required (max / min or range): _____
   d. Actual fastener torque:
      #1 _____ #2 _____ #3 _____ #4 _____
      #5 _____ #6 _____ #7 _____ #8 _____
      Torque Wrench ID No: _____
      Signature / Date: _____/_____

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

Application of Liquid Epoxy Coating for Piping Applications

Content applicable to ALARA?	☐ Yes ☒ No	**Quality Level**
ADR No.	**Rev**	CM
Retroactive applicability: No	☐ **N/A** *(alpha revision or revision 0)*	DOE Contract No. DE-AC27-01RV14136

REV	DATE	BY	CHECK	AUTHORIZATION	APPROVER
5	2/26/2020	Originator By: Mark Malloy - mmalloy Org Name: MET Placed: Feb 14, 2020	Checked By: Ming Fang - mfang Org Name: Placed: Feb 14, 2020	N/A	
4	11/18/08	TRC	LRL	LDK	JP
3	11/8/04	TRC	LDK	LDK	MB
2	6/3/03	TRC	MSR	DTS	DTS
1	4/5/02	TRC	LDK	DTS	DTS FOR SF
0	10/23/01	TRC	LDK	DTS	DTS

SPECIFICATION No. 24590-WTP-3PS-PX04-T0002 **Rev** 5

Revision History

Revision	Reason for Revision	Q Specification Revision Only Margin Reduced?		CM Only
		YES	NO	N/A
0	Issued for Construction	N/A	N/A	N/A
1	Revised for Construction Direct Hire.	N/A	N/A	N/A
2	Identify Coal Tar Epoxy; previously incorporated 24590-WTP-FCR-P-01-013 in rev.1; incorporate 24590-WTP-FCR-P-02-047; incorporate 24590-WTP-FCR-P-03-008; incorporate 24590-WTP-SDDR-PROC-02-0009; incorporate by reference 24590-WTP-NCR-CON-02-079	N/A	N/A	N/A
3	Include field coating of buried stainless steel items; Clarify shrink sleeve temperature limits; FBE touch up w/Scotchkote 323; incorporated 24590-WTP-FCR-P-03-058; incorporated 24590-WTP-3PN-PX04-00003; incorporated 24590-WTP-FCR-P-04-0097.	N/A	N/A	N/A
4	Incorporated 24590-WTP-3PN-PX04-00008; incorporated 24590-WTP-FC-C-07-0244; incorporated 24590-WTP-FC-P-06-0108; incorporated 24590-WTP-FC-P-07-0225; incorporated 24590-WTP-FC-P-08-0201; added DuPont Nap-Gard 7-2508 fusion bonded epoxy coating to Section 5.1.1.3	N/A	N/A	N/A
5	Major revision - Superseding specifications 24590-WTP-3PS-PX04-T0003 and 24590-WTP-3PS-PX04-T0004 by incorporation into this specification. Moved insulation data into specification 24590-WTP-3PS-PX04-T0005. Moved HDPE shrink sleeve data into specification 24590-WTP-3PS-PX04-T0006. The following affected by documents, found in EDMS, against Rev. 4 have been Incorporated: 24590-WTP-3PN-PX04-00010; 24590-WTP-FC-P-13-0365; 24590-WTP-FC-P-16-0175; 24590-WTP-FC-P-19-1106. The following change documents against Rev. 4 of this spec were incorporated with no changes; 24590-WTP-FC-P-09-0413 was a one-time exception and 24590-WTP-SDDR-PL-17-00041 was an as-built material clarification that also met original spec requirements. The following change documents were written against spec 24590-WTP-3PS-PX04-T0003 and were included into this specification revision: 24590-WTP-3PN-PX04-00004; 24590-WTP-3PN-PX04-00021; 24590-WTP-SDDR-PROC-04-00513. The following affected by documents are incorporated with no changes made, as the information has been included in new specifications 24590-WTP-3PS-PX04-T0005 and/or 24590-WTP-3PS-PX04-T0006: 24590-WTP-3PN-PX04-00022; 24590-WTP-FC-P-18-0248; 24590-WTP-FC-P-18-0252; 24590-WTP-FC-P-19-1142.	N/A	N/A	☒

Contents

Appendices

Tables

1 Scope

1.1 Equipment, Material, and Services Required

1.1.1 This Specification defines the minimum requirements for procurement, application and inspection of liquid epoxy coating for piping applications; including but not limited to underground, embedded (including incidental sections that may be above ground or not embedded) and insulated installations. This includes initial application of coating to pipe and pipe components such as fittings and valves (before or after installation) to either Carbon Steel (CS) or Stainless Steel (SS) substrates. This includes application of coating to shop and field weld areas, spot repairing damage to Fusion Bonded Epoxy (FBE) coated pipe, and spot repair of liquid epoxy coated components, and other applications as deemed necessary/applicable.

1.1.2 For initial coating application to a component that will later be welded to another component the ends of the component shall not be painted. This coating holdback area shall be two to three inches (2.0” - 3.0”). For irregular shaped components such as elbows or valves if this holdback is greater than 50% of the surface area of the item then the item does not require shop coating.

1.1.3 The epoxy coating application and/or repair work, described herein, is considered Commercial Grade quality and NQA-1 does not apply.

1.1.4 Surface preparation, material application, and inspection shall be in accordance with this Specification and approved procedures.

1.1.5 All materials shall be stored in accordance with this specification and individual product manufacturer recommendations.

1.1.6 Application and inspection documentation for all liquid epoxy coated pipe, valves and fittings shall be provided in accordance with this specification. After installation, all exposed portions of bare carbon steel bolts and stainless-steel bolts shall be coated the same as required for repair areas on fitting and valves.

1.1.7 Inspection equipment shall be calibrated and controlled by an established Measuring and Test Equipment (M&TE) calibration program.

1.1.8 Personnel performing application and/or inspection shall be trained and/or certified as further defined in Section 1.5.

1.1.9 For shop applications this scope includes handling of pipe and pipe components and may include shipping as defined in the Material Requisition (MR).

1.2 Work by Others

1.2.1 Welding.

1.2.2 Application of FBE coating.

1.2.3 Handling of components in the field.

1.3 Definitions

1.3.1 Batch/Lot – A quantity of material made in one production run. A unique batch number is assigned for each production run of each component for the resin material (Part A), the curing agent Part B, any fillers (Part C or other) and the thinner for coating materials. Single component products will only have 1 batch number assigned to them.

1.3.2 BUYER – The Bechtel entity shown on the PURCHASE ORDER form.

1.3.3 Dry Film Thickness (DFT) – The thickness of an applied coating once dry or cured. Usually expressed in mils (each mil is $1/1000^{th}$ of an inch (0.001")).

1.3.4 Field Work – Includes work performed on the project jobsite as described in Section 1.1.

1.3.5 Fingernail Hard – Using a thumbnail perpendicular to the surface, press down hard and move thumbnail across the surface. If coating surface is only slightly marred with no indentation, the coating is fingernail hard.

1.3.6 Fish Eyes (cratering) – Formation of holes or visible depressions in the coating film. Usually from contamination on the surface prior to applying the coating.

1.3.7 Holiday – A pinhole, skip, discontinuity, or void in the applied coating.

1.3.8 mil – a unit of measurement equal to 0.001 inches.

1.3.9 NIST – National Institute of Standards and Technology

1.3.10 Non-Radiation areas – The Special Protective Coating (SPC) quality designation for items that are NOT located in an area where radioactive material is transported, processed or stored (areas designated C2 and less, or R2 and less. Refer to 24590-WTP-3DI-W12W-00004 (formerly 24590-WTP-GPP-SRAD-007), Classification of Areas for Design).

1.3.11 Pinholes – Minute holes through the entire thickness of the coating.

1.3.12 Profile – The surface roughness resulting from surface preparation by abrasive blasting or power tool cleaning. The specified angular profile can be destroyed by chemical etching, power tool cleaning or other methods.

1.3.13 Radiation areas – The Special Protective Coating (SPC) quality designation for items that are located in an area where radioactive material is transported, processed or stored) areas designated C3 and greater, or R3 and greater. Refer to 24590-WTP-3DI-W12W-00004 (formerly 24590-WTP-GPP-SRAD-007), Classification of Areas for Design.

1.3.14 Sag – A nonuniform downward flow of coating that results in an uneven application having a thicker lower edge. (Same definition for runs and drips)

1.3.15 SELLER – Means the company, corporation, partnership, individual or other entity to which this subcontract (Purchase Order/ Material Requisition) is issued. Including its authorized representatives, successors, and permitted assigns. This also includes Buyer construction personnel when the BUYER is self-performing the work.

1.3.16 Shop Work – Includes all work performed not on the project jobsite as described in Section 1.1.

1.3.17 Training and Certification – Training to include applicable work specific skills and an understanding of the specification, approved work procedures and/or manufacturers published instructions. Certification constitutes documented attendance at a training session and a documented performance test demonstrating satisfactory capability.

1.4 Safety/Quality Classifications

1.4.1 Surface preparation and coatings work shall comply with all applicable environmental and safety provisions, laws, regulations, ordinances, etc., of the City, County, and State or Federal (National) requirements for the coating materials being used. Work shall be in strict accordance with OSHA 29 CFR 1910, and OSHA 29 CFR 1926.26.

1.4.2 Compliance with OSHA Hazard Communication Standard 29 CFR 1910.1200 is required. Safety Data Sheets (SDS) (formerly Material Safety Data Sheets or MSDS) shall be obtained from the materials manufacturer and shall be readily available at the construction site.

1.4.3 The Volatile Organic Compound (VOC) content of all materials shall meet Federal, State, and Local Regulations.

1.4.4 Solvents and coatings have volatiles, and their vapors shall be kept away from sources ignition. This is especially critical when working in trenches or excavations where solvent vapors tend to collect or settle.

1.5 Personnel Training

1.5.1 Individual applicators shall be trained, qualified and certified in accordance with the SELLERS prepared procedures. Hands-on training shall encompass satisfactorily installing the liquid epoxy materials in accordance with approved procedures. Satisfactory training and installation proficiency testing shall be documented for each applicator.

1.5.2 Individual inspectors shall be trained, qualified and certified in accordance with the SELLER's prepared and approved procedures, the procedure shall be based on ASTM D4537. Training shall include a review of the applicable requirements of this specification and the SELLERS approved procedures. The training procedure shall ensure that inspectors meet or exceed the minimum requirements for a Level I coatings inspector, as described in ASTM D4537. Inspectors will preferably satisfactorily demonstrate their proficiency during applicator proficiency testing on at least one liquid epoxy application and be issued a certification in accordance with ASTM D4537. The NACE Coating Inspector Program is considered equivalent to the ASTM D4537 program for the execution of this scope of work.

1.5.3 The applicator trainer/qualifier shall have had previous work experience with multi-component epoxy coatings and be fully familiar with this specification, approved procedures, multi-component epoxy materials, and associated installation equipment.

1.5.4 The inspector trainer/qualifier shall have the same qualifications as the applicator trainer/qualifier in addition to a full understanding of the inspection requirements, use of inspection equipment and documentation requirements.

2 Applicable Documents

2.1 Codes and Standards

The applicable requirements of the following codes, standards and specifications form part of this Specification.

2.1.1 ASTM International formerly American Society for Testing and Materials (ASTM)

ASTM E337	Test for Relative Humidity by Wet-and-Dry Bulb Psychrometer
ASTM D4285	Test Method for Indicating Oil or Water in Compressed Air
ASTM D4417	Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D4537	Standard Guide for Establishing Procedures to Qualify and Certify Personnel Performing Coating and Lining Work Inspection in Nuclear Facilities.
ASTM D4940	Test for Conductimetric Analysis of Water-Soluble Ionic Contaminants of Blasting Abrasives.
ASTM D5162	Practice for Discontinuity (Holiday) Testing of Non-Conductive Protective Coating on Metallic Substrates

2.1.2 The Society for Protective Coatings (SSPC)

SSPC-AB 1	Mineral and Slag Abrasives

SSPC-PA 2	Procedure for determining Conformance to Dry Coating Thickness Requirements
SSPC-SP 1	Solvent Cleaning
SSPC-SP 6	Commercial Blast Cleaning
SSPC-SP 7	Brush-Off Blast Cleaning
SSPC-SP 10	Near White Metal Blast Cleaning
SSPC-SP 11	Power Tool Cleaning to Bare Metal
SSPC-SP 16	Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.
SSPC-Vis 1	Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC-Vis 3	Guide and Reference Photographs for Steel Surfaces Prepared by Power and Hand Tool Cleaning

2.1.3 Occupational Safety and Health Administration (OSHA)

OSHA 29 CFR 1910	Occupational Safety and Health Standards
OSHA 29 CFR 1926	Safety and Health Regulations for Construction

2.1.4 American Water Works Association

AWWA C210	Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

2.2 Reference Documents/Drawings

24590-WTP-3DI-W12W-00004, Classification of Areas for Design; (formerly 24590-WTP-GPP-SRAD-007, Classification of Areas)

24590-WTP-3PS-NW00-T0002, Engineering Specification for Chemical Requirements for Materials Used in Contact with Austenitic Stainless Steel and Nickel Based Alloys

24590-WTP-3PS-PX04-T0001, Engineering Specification for Shop Applied Fusion Bonded Epoxy Coating for Underground Carbon Steel Pipe

24590-WTP-GPP-CON-7101, Construction Quality Control Program.

CCN 054843, DCN No. 24590-PTF-M6C-PWD-00047 Drain Collection System Line Calculations (Information Only)

24590-WTP-RPT-ENG-16-015, Thermally Insulated and High Density Polyethylene Jacketed Waste Transfer Line NACE SP-0169-2013 Evaluation.

24590-WTP-LIST-ESH-16-0001 Restricted Materials List Hanford Tank Waste Treatment and Immobilization Plant (WTP Project)

2.2.1 This specification revision (Rev. 5) Supersedes the following specifications, all change papers to these documents have also been incorporated.

24590-WTP-3PS-PX04-T0003 Revision #2 – Shop and Field Application of an Epoxy Coating for Underground Carbon Steel Fittings, Valves and Special Items

24590-WTP-3PS-PX04-T0004 Revision #1 – Epoxy Coating of Stainless Steel Items that are Buried, Embedded or Insulated

3 Materials

3.1 Abrasives

3.1.1 Abrasives for blast cleaning carbon steel surfaces shall be clean, free of oil or contamination, and dry. The particle size shall be capable of producing the specified surface profile. Mineral and Slag abrasive used on site shall meet the requirements of SSPC-AB 1 Class A (<1% Crystalline Silica).

3.1.2 Abrasives for blast cleaning stainless steel surfaces shall be clean, free of oil or contamination, dry and suitable for use on SS surfaces. Ferrous metallic abrasives such as carbon steel and chilled iron in either shot or grit form is **NOT** acceptable for use on SS surfaces. The particle size shall be capable of producing the specified surface profile.

3.1.3 Each batch or lot of mineral abrasive used on stainless steel shall be tested for water soluble contaminants and the conductivity shall not exceed 500 micro siemens when tested in accordance with ASTM D4940.

3.1.4 As an alternate, a chloride ion test kit such as the Chlor*Test “A” manufactured by Chlor-Rid International, Inc or approved equal may be used. The maximum allowable chloride level is 200 ppm.

3.1.5 Abrasives shall not be recycled. Pre-packaged abrasives do not require conductivity or chloride testing.

3.2 Coating Materials

3.2.1 Coating materials shall be one of the products as listed below or as approved by the BUYER. The coating manufacturer shall complete a Product Identity Certification Record (PICR) form as provided in Appendix A for each batch of material used per this scope of work as further defined in Section 9.2.2.5.

Table 1 - Coating Materials for Carbon Steel Substrates

Material	Manufacturer	Generic Type	Use
Protal 7000	Denso	100% Solids Epoxy	Full application and repair work
SPC-3888	Specialty Polymer Coatings	Novolac Epoxy	Full application and repair work
Coal Tar Epoxy such as: Bitumastic 300M Amercoat 78 HB Targuard	Varies From: Carboline PPG Sherwin Williams	Coal Tar Epoxy	Use same material as originally applied to repair damage to existing Coal Tar Epoxy materials.
Nap-Gard 1847	Axalta (formerly DuPont)	Liquid Epoxy Coating	Repair of Axalta Nap-Gard 7-2500 or 7-2501 FBE coatings
Scotchkote 323*, Scotchkote 323+	3M	Liquid Epoxy Coating	Repair of Scotchkote 206N, 226N and 6233 FBE coatings and Axalta Nap-Gard 7-2500, 7-2501, 7-2599, 7-5208 FBE coatings

* This product has been modified to remove potentially hazardous components, only 323+ will be available after ~4th quarter of 2019.

Table 2 - Coating Materials for Stainless Steel Substrates

Material*	Manufacturer	Use
Carboguard 890	Carboline	Full application and repair work
Macropoxy 646	Sherwin Williams	Full application and repair work

* Materials comply with project specification 24590-WTP-3PS-NW00-T0002 and contain <200ppm leachable halogen, <400ppm sulfur and only trace amounts of listed low melting point metals.

Table 3 - Repair Only Coating Materials

Material	Manufacturer	Generic Type	Use
Scotchkote 226P	3M	Patch Melt Stick	Repair of 3M Scotchkote 206N, 226N and 6233 FBE coatings
Protal 7125 or Protal 7200	Denso	Liquid Epoxy Coating*	Repair of Denso's Protal 7000

3.3 Prohibited Materials

3.3.1 Refer to 24590-WTP-LIST-ESH-16-001 for a list of materials that are restricted from use on the River Protection Project – Waste Treatment Plant (WTP) Project job site. These materials may be used in shop applications provided the shop has appropriate personnel protection measures in place, their use does not violate local or federal regulations and they will not present a problem upon delivery to the project site.

4 Application

4.1 General

4.1.1 Surface preparation and the application of liquid epoxy shall be immediately stopped at any time when conditions exist that might adversely affect the quality. This includes but is not limited to contaminated surfaces, rusted surfaces, expired materials, rain, snow, condensation, deviations in environmental conditions, improper equipment or materials, non-qualified applicators or inspectors, poor workmanship, etc.

4.1.2 Prior to the start of surface preparation, sharp edges, slag, weld spatter or burrs shall be removed.

4.2 Pre-Surface Preparation

4.2.1 Prior to abrasive blasting or mechanical cleaning, the surfaces to be coated shall be cleaned in accordance with SSPC-SP 1, to remove oil, grease, dirt, and other foreign matter that can interfere with the proper bonding of the coating. Pneumatic tools shall not be used unless they are fitted with effective oil and water traps on the exhaust air.

4.2.2 For stainless steel substrates ferrous metallic (i.e. carbon steel) brushes, grinders, files or other such tools shall NOT be used. Only liquids containing less than 200 ppm halogen and/or demineralized water shall be used on SS surfaces. If SS items were shipped or stored so that the surface could have become contaminated with soluble salts (e.g. above deck ship transport, truck shipment on dirt roads close to the ocean or stored close to the ocean) the item shall be high pressure washed with demineralized water to remove as much soluble salt contamination as possible prior to abrasive blast cleaning.

4.3 Surface Preparation

4.3.1 Surface preparation for the installation of liquid epoxy material shall be based on the existing surface condition of the pipe or fitting. The following generic situations are addressed:

- Bare Surfaces
- Painted Surfaces (FBE, Liquid Epoxy, including Coal Tar Epoxy for CS and SS surfaces)

4.3.2 Bare Surfaces

4.3.2.1 For carbon steel surfaces abrasive blasting is the preferred surface preparation method and shall be performed in accordance with SSPC-SP 10 using abrasives as defined in Section 3.1. The surface profile shall be 1.0 - 3.0 mils for coatings applied to carbon steel surfaces.

4.3.2.2 For stainless steel surface abrasive blasting is the preferred surface preparation method and shall be performed in accordance with SSPC-SP 16, using abrasives as defined in Section 3.1. The surface profile shall be a minimum of 0.75 mils for coatings applied to stainless steel surfaces.

4.3.2.3 As an alternate, power tool cleaning weld areas and defective areas of the pipe, fittings and valves or exposed surface of installed bolting material in accordance with SSPC-SP 11 is acceptable. The surface profile shall be 1.0 mils minimum.

4.3.3 Painted Surfaces

4.3.3.1 Surfaces with existing coating that is to be replaced shall be completely cleaned to a bare surface condition as required in Section 4.3.2 of this specification.

4.3.3.2 Where the applied coating is to remain in place (e.g., coating of weld seams where the adjacent FBE coating or liquid epoxy is to remain or for local spot repairs), the coating shall be feathered back a minimum of one inch to one and one half inches (1.0”-1.5”). The feathered area shall be uniformly roughened by brush blast cleaning in accordance with SSPC-SP 7 or hand/power tool cleaning in accordance with SSPC-SP 2/SSPC-SP 3 or other approved method.

Note: Remedial work to defects is to be done per Section 4.5 of this specification. A defect that does not go to the substrate does not require feathering.

4.3.4 For Stainless Steel surfaces, ferrous metallic (i.e. carbon steel) shot/grit, carbon steel tools, discs, brushes or wheels shall not come into direct contact with stainless steel surfaces. The resulting surface shall be uniformly roughened.

4.3.5 After surface preparation is complete and before coating, pressurized air or a vacuum shall be used to remove all dust and abrasive residue. The pressurized air shall be clean and dry as verified in accordance with Section 5.1.3 so as not to contaminate the surface. If field conditions do not allow the use of pressurized air or a vacuum, repair surfaces may be wiped visibly clean of dust, dirt and other surface contaminants using clean lint free rags.

4.3.6 Any remaining sharp edges, weld spatter, burrs or porosity exposed after surface preparation and before coating application shall be removed.

4.4 Application of Liquid Epoxy

4.4.1 Environmental Conditions

4.4.1.1 The application of the liquid epoxy repair materials shall be performed only when the environmental conditions meet the following requirements:

- The surface of the pipe shall be clean, dry and free of visible moisture.
- The surface temperature shall be minimum of 5ºF above the dew point
- The relative humidity shall not exceed 90%.
- The substrate and ambient temperature during coating application and curing shall be a minimum of 50ºF and a maximum of 110ºF or as defined by the coating manufacturer.

4.4.2 Liquid Epoxy Application

4.4.2.1 Full application of liquid epoxy coating shall be in accordance with the SELLERS approved procedures and the coating manufacturer's instructions and this specification. If there are any conflicts between the requirements, this specification shall take precedence.

4.4.2.2 Application of the coating repair material shall be performed only after acceptance of the surface preparation and uniform roughening of sound coating overlap area and verification of environmental conditions.

4.4.2.3 For repair work to provide a neat / uniform repair application mask an area approximately one to one and a half inches (1.0 - 1.5") inch beyond the repair bare areas (this will be within the feathered area as defined in Section 4.3.3.2). and apply the coating up to the tape. The tape is to be removed while the coating material is still wet and the coating allowed to flow onto the overlapped coating to provide a relatively smooth transition, not a sharp edge.

4.4.2.4 The liquid epoxy repair material must be in prepackaged units suitable in size for the repairs being performed or using a multi cartridge gun that automatically dispenses the correct ratio of prepackaged epoxy cure and resin components. Mixing of partial kits of material may be allowed if detailed mixing requirements for specific products are endorsed by the coating manufacturer and are accepted by the BUYER in an approved procedure, as further clarified in Section 6.3.2. Each component shall be premixed prior to being combined for use (cartridge or very viscous/stiff materials do not have to be premixed). The combined epoxy components must be thoroughly mixed, on a separate surface or in a suitable container, to a uniform appearance and consistency prior to application to the substrate.

4.4.2.5 The liquid epoxy material may be sprayed, rolled or brush applied in one (1) or more uniform coats to ensure achieving a dry film thickness as listed below. If the multiple coats are applied, the minimum and maximum drying times between coats shall be in accordance with the coating manufacturer's published data and shall be strictly observed.

4.4.2.6 FBE coated items and liquid applied epoxy coated items – As a minimum, liquid epoxy repair material shall be allowed to cure until fingernail hard prior to performing DFT readings and holiday testing. The dry film thickness of the epoxy repair patch over the prepared bare surface shall be as defined In Table 4, overlap areas will be plus the thickness of the existing coating. All defects must be repaired and retested including holiday testing.

Table 4 - Coating Material DFT Requirements

Coating Material	Applied for	DFT (mils)
Application to Carbon Steel		
Liquid Epoxy	Primary application	20.0 – 40.0
Liquid Epoxy	Touchup up of FBE and liquid epoxy	20.0 – 30.0
Scotchkote 323 & Scotchkote 323+	Touchup up of 3M FBE materials	25.0 – 45.0
Coal Tar Epoxy	Touchup Coal Tar Epoxy	16.0 – 24.0
Application to Stainless Steel		
Liquid Epoxy	Primary application for buried or insulated lines	8.0 – 14.0 (applied in 2 uniform coats at 4-7 per coat)
Liquid Epoxy	Primary application for lines embedded in concrete	4.0– 7.0
Liquid Epoxy	Touchup of Epoxy on SS	8.0 – 14.0

4.4.2.7 Coating defects such as voids, drips, overspray, loss of adhesion, bubbling, peeling, fisheyes or inadequate cure are not allowed. Runs and sags greater than 30 mils thickness (45 mils for 3M Scotchkote 323+) (this is above the specified coating thickness so this spot on a SS pipe will be 38-44 mils thick (spec 8-14 + 30 mils)) shall be sanded down followed by applying a thin seal coat of liquid epoxy.

4.5 Remedial Work

4.5.1 Repairs to the epoxy material shall be performed by blasting, grinding or sanding off the defective area and applying a repair patch. Work shall be performed in accordance with Section 4.0.

4.5.2 Pin holes or other defects to the substrate shall be opened up to visibly expose the bare metal, preparation of the overlap area to be per Section 4.3.3.2 above with coating application per Section 4.4.

4.5.3 Repair work shall be allowed to cure and shall be inspected per the requirements of the original coating application.

5 Tests and Inspections

5.1 General

5.1.1 All necessary testing and inspection instruments shall be properly calibrated and maintained. Such equipment shall be available for use by BUYER authorized personnel conducting surveillance of the work.

5.1.2 Any defects disclosed during inspection shall be repaired and re-inspected after correction.

5.1.3 Prior to using compressed or pressurized air, the quality of the air downstream of the separator shall be tested in accordance with the requirements of ASTM D4285, this test shall be performed at the beginning of each shift and at approximately four (4) hour intervals. All lines shall be tested individually prior to use.

5.1.3.1 The test shall also be made after any interruption of the air compressor operation. The air shall be used only if the test indicates no visible contamination, oil, or moisture is present. If contaminants are evident, the equipment deficiencies shall be corrected, and the air stream shall be re-tested. Moisture separators shall be bled continuously.

5.1.3.2 Surfaces which are determined to have been blown down or blasted with contaminated air, shall be recleaned or reblasted with clean air and abrasive. Coatings, which have been determined to have been applied using contaminated air, shall be removed and reapplied using clean air.

5.1.4 Inspection points shall be established as follows:

- Prior to start of work
- Immediately following the surface preparation
- Immediately prior to material application
- Following the application of each coat of liquid epoxy coating
- Following the sufficient curing of the coating perform visual inspections, DFT checks, and holiday testing of the coating
- Final inspection and sign-off, in accordance with the project requirements

5.1.5 The following lists the required inspection steps and frequencies:

Table 5 - Coating Inspection Frequency

Step #	Coating/Inspection Step	Required Frequency
1	Prior to start of work	100% Visual for damage or defects in the substrate material that may impact coating work.
2	Surface Preparation / Profile	100% Visual on all items and Profile check on first item of each method and a minimum of every 20 items thereafter per shift
3	Environmental	At the start of work and every 4 hours thereafter and with sudden changes in weather conditions
4	During Application	100% visual and periodic WFT measurements by applicator
5.1	Following Application: Visual	100% of all items following application and initial cure.
5.2	Thickness	Per Section 5.4.3 for full application and A minimum of one gage reading on each spot repair and one spot reading for each area coated
5.3	Holidays	All coated surfaces 100% inspected.

5.2 Environmental Conditions Inspection

5.2.1 Air temperatures (dry and wet bulb) shall be determined using liquid in glass thermometer or an electronic temperature gauge. Relative humidity shall be calculated in accordance with ASTM E337 or read from a psychrometric chart. Dew point temperatures shall be read from a psychrometric chart. Alternatively, electronic instruments dedicated for temperature, dew point and humidity testing may also be used. Surface temperature shall be determined using a bimetallic surface thermometer or electronic surface thermometer/probe. The use of an Electronic Temperature / Humidity / Dew Point device is acceptable if it has current in-date calibration that is traceable to NIST standards.

5.2.2 Prior to the application of coating, the environmental conditions shall meet the requirements of Section 4.4.1.

5.2.3 All jobsite inspection work will follow the quality program requirements of 24590-WTP-GPP-CON-7101, Construction Quality Control Program.

5.3 Surface Preparation Inspection

5.3.1 Prior to abrasive blasting or mechanical cleaning, surfaces to be coated shall be free of oil, grease, dirt or other contaminants and metal defects detrimental to coating performance. (Refer to Section 4.2)

5.3.2 Surface preparation cleanliness shall be in accordance with the written description of the specific SSPC standard. Visual standards SSPC-VIS 1 and/or VIS 3 may be used to supplement the written description; however, the written description supersedes the visual standard in any dispute.

5.3.3 The blasted surface profile for carbon steel surfaces shall be from 1.0-3.0 mils; for stainless steel surfaces the profile shall be > 0.75 mils as measured in accordance with ASTM D4417 method A (e.g. visual comparator such as Keane-Tator profile comparator) or method C (e.g. Testex Press-O-Film tape and a spring micrometer). The power tool cleaned surface shall be uniformly roughened. Power tool cleaned surfaces prepared to SSPC-SP 11 shall have a 1.0 mil minimum profile.

5.3.4 Grease free chalk shall be used to mark local areas which do not meet the specified requirements (crayons, marking pens and soap stone shall not be used). When marking stainless steel items, the marker shall conform to the requirements of 24590-WTP-3PS-NW00-T0002.

5.4 Liquid Epoxy Inspection

5.4.1 Surface cleanliness shall be visually verified immediately prior to application of the liquid epoxy.

5.4.2 Applied liquid epoxy material for repair shall be inspected to verify specified overlap defined in Section 4.4.2.3, the minimum dry film thickness defined in Table 4, no visual defects such as runs, sags, embedded particles and that the epoxy material has cured hard.

5.4.3 Dry Film Thickness (DFT) Determination

5.4.3.1 DFT shall be measured with a DFT gage such as an Electro-Physick “Mikrotest”, Positector 2000, Positector 6000 or approved equal. SSPC-PA 2 shall be used as a guide. The gage shall have a range that closely encompasses the thicknesses to be tested. DFT instruments shall be checked for visible damage and for accuracy each shift it is used. These accuracy checks shall be performed using certified coating thickness calibration standards for non-magnetic coating of steel traceable to NIST or approved alternative standards. The standards used shall be in a range that encompasses the actual thicknesses being tested.

5.4.3.2 The coating thickness determination procedures are based upon requirements of SSPC-PA 2. The SSPC-PA 2 “Gage Readings” and “Spot Measurements” are applicable. Specifically, a Gage Reading is a single instrument reading and a Spot Measurement is the average of at least three gage readings within a 1.5-inch diameter circle. Acquisition of more than three gage readings within a spot is permitted. Any unusually high or low gage readings that are not repeated consistently are discarded. The average of the acceptable gage readings is the spot measurement.

5.4.3.3 Locations of spot measurements, as a minimum, should be taken along accessible sections near the top and bottom axis of pipe that is to be holiday tested. Additional spot measurements in other circumferential locations are designated for larger diameter piping or as specified.

5.4.3.4 Coating Thickness Restriction level 2 (as defined in SSPC-PA 2) applies to this scope of work. That is spot average DFT readings cannot be less than specified and can be up to 20% greater than the specified maximum value, provided the overall average is within specification requirements.

5.4.3.5 Wet Film Thickness (WFT) readings may be substituted for DFT readings for applications to Stainless Steel and non-ferrous substrates (i.e. Aluminum, Copper, cobalt etc.). WFT shall be calculated based on the specified DFT and the coating material Volume Solids value as printed on the product data sheet, as follows:

$$WFT = \frac{DFT \times (100\% + \% \text{ thinner})}{\% \text{ Solids by Volume}}$$

Table 6 - Number and Locations of DFT Spot Measurements

Pipe Length	Diameter	Minimum Number of Spot Measurements	Interval Spacing**
Carbon Steel Piping			
Short Sections*	Any Diameter	6 randomly spaced (3 near top and 3 near bottom)	Equidistant
Up to 40 Foot	Up to 12 inches	8 randomly spaced (4 near top and 4 near bottom)	2 on each 10’ section
Up to 40 Foot	14 to 24 inches	10 randomly spaced (5 near top and 5 near bottom)	2 on each 8’ section
Up to 40 Foot	> 24 inches	12 randomly spaced (3 near top/3 near bottom/3 along each side @ 90º and 180º)	3 on each 10’ section
Longer than 40 Foot	Up to 12 inches	8 randomly spaced (4 near top and 4 near bottom)	2 on each 25% of the length
Longer than 40 Foot	14 to 24 inches	10 randomly spaced (5 near top and 5 near bottom)	2 on each 20% of the length
Longer than 40 Foot	> 24 inches	12 randomly spaced (3 near top / 3 near bottom / 3 along each side @ 90º and 180º)	3 on each 25% of the length
Holiday Repair Any Length	Any Diameter	1 spot reading at holiday (on bare substrate)	N/A

Pipe Length	Diameter	Minimum Number of Spot Measurements	Interval Spacing**
Carbon Steel Piping			
Girth Weld Coating Work	Up to 12 inches	Minimum 3 spots equidistant around circumference (on bare substrate) ***	Equidistant
Girth Weld Coating Work	> 12 inches	Minimum 4 spots equidistant around circumference	Equidistant
Stainless Steel Piping			
Each 15 foot section or portion thereof	Any	4 randomly spaced (2 near top and 2 near bottom)	Equidistant

* Short Sections = Less than 10-foot length or within 10 foot of valves, fittings, CP Connections or shrink sleeves.
** Equidistant if less than 10 feet apart.
*** Measurements to be taken only where new coating is applied direct to the substrate not where new coating overlaps existing coating.

5.5 Holiday Inspection

5.5.1 All applied liquid epoxy shall be 100% holiday tested per the applicable requirements of ASTM D5162, as summarized in Appendix B. No holidays are allowed.

5.5.2 All Pinholes or holidays detected shall be repaired in accordance with Section 4.5 of this Specification and retested for both film thickness and holidays.

6 Storage, Handling and Shipping

6.1 General

6.1.1 Liquid epoxy repair materials, thinners, cleaning solvents and other flammable materials shall be kept away from combustion sources and shall be stored in metal flammable material storage cabinets. Thinners and solvents shall be transported to the point of use in approved safety containers. Liquid epoxy repair materials may be transported to their point of use in their original prepackaged containers or cartons.

6.1.2 Coating materials shall be delivered in manufacturer's original unopened container or packaging. Each container or package shall be clearly identified with the manufacturer's name, product designation, batch or lot number, date of manufacture and shelf life expiration date.

6.1.3 Coating material shall be protected from moisture, direct sunlight and temperatures below 40ºF or above 100ºF unless otherwise allowed by the coating manufacturer's published instructions.

6.2 Shelf Life

6.2.1 Coating materials that are older than twenty-four (24) months from the date of manufacture or that exceed the manufacturer's shelf life, if less than twenty-four (24) months, shall not be used and shall be removed from the job site. Where the coating manufacturer's normal shelf life is greater than twenty-four (24) months, and the coating material can be shown to have been stored as specified herein, a one-time extension of three (3) months may be approved provided the criteria below are met. Coating materials that have not been stored or handled in accordance with this section may not have their shelf life extended.

6.2.1.1 The shelf life extension shall be based on coating manufacturer laboratory testing of retain samples taken at the time of manufacture or by testing a sample provided from the actual coating material in question. Where testing verifies an outdated coating material still complies with its original design criteria, it is acceptable for shelf life extension.

6.2.1.2 New expiration date stickers, provided by the coating manufacturer, shall be affixed to each container prior to release from HOLD. The stickers shall include the product number, batch/lot number, the new expiration date and be suitably marked to indicate that they came from the coating manufacturer.

6.2.1.3 A new Product Identity Certification Record (PICR) (see Appendix A) shall be provided by the coating manufacturer that includes the test results and specifically indicates it was provided to document shelf life extension including new expiration date.

6.3 Material Use

6.3.1 Coating material containers where the airtight seal has been broken or any of the contents are lost, shall not be used, except as noted below. Epoxy repair materials supplied in cartridge form may have ends capped and may be reused.

6.3.2 Coating material containers shall not be opened except for immediate use. If containers are sufficiently large, where minimal use of coating material is expected to result in considerable waste, kits may be sub-divided. Procedures for preparation of smaller kits, for each product, must be approved by Engineering on a case by case basis.

6.3.3 Unused material containers shall be returned to storage as soon as possible at the end of each workday. Materials left out for more than ten (10) hours in a storage area without environmental controls (temperature, direct sunlight, etc.) shall not be used and shall be removed from the job site.

7 Quality Assurance

7.1 General

7.1.1 The SELLER shall control the quality of items and services to meet the requirements of this Specification, applicable codes and standards, and associated procurement documents. The SELLER shall prepare and maintain documentation to provide evidence of compliance with approved procedures and this Specification. A copy of the documentation shall be included in the shipping documentation.

7.1.2 The SELLER, including any lower-tier organizations engaged by him shall be subject to surveillance inspection by the BUYER representative until completion or termination of the procurement. This surveillance inspection does not relieve the SELLER from the responsibility for conformance to the requirements of procurement documents and procedures.

7.1.3 The BUYER representative shall be provided with a schedule and shall be notified of all required inspection points prior to the scheduled date for coating activities.

7.1.4 All pre-established witness and hold points shall be witnessed by the BUYER unless a written waiver has been issued.

7.1.5 The BUYER representative shall be the final authority on the acceptability of surface preparation and material application. Any coating which, in the BUYER representative's judgement, has not been applied in conformance with this Specification, shall be rejected.

7.1.6 All coating materials shall be provided with a complete PICR as provided in Appendix A of this specification in accordance with Section 9.2.

7.1.7 All personnel shall receive training in the specific project coating requirements and the associated approved work procedures that are relevant to their individual work assignments.

7.1.8 The SELLER's coating inspectors shall have previous experience in multi-component epoxy coating. All training shall include the specific project coating requirements, ASTM, SSPC standards and other relevant standards including the approved work procedures.

8 Configuration Management

8.1 General

8.1.1 Configuration management is maintained by conformance to standards and procedures. The BUYER shall be promptly notified by SDDR of any potential deviation or conflict with the requirements. Work shall not proceed until a resolution is accepted and proper documentation is provided to the BUYER.

9 Documentation and Submittals

9.1 General

9.1.1 The SELLER shall provide completed Coating Manufacturer's Identity Certification Record (Appendix A) for every batch of coating material used.

9.1.2 The SELLER shall provide a record of all required daily inspections (Example – Appendix C) that includes pre-surface preparation, compressed air cleanliness, environmental conditions, surface preparation and roughness, location of field repairs coated, coating application, visual inspection, dry film thickness, holiday testing and all touchup / repair of coating. This record shall include the coating and thinner materials used and the ID of the items coated to provide traceability.

9.1.3 All quality documentation shall be available for review by the BUYER representative within 24 hours from the time it is generated.

9.1.4 SELLER documentation forms or the way that the actual work will be documented shall be provided by the SELLER as part of the procedure's submittal for review by the BUYER. All original documentation generated during the coating work shall be submitted as defined in the MR and clarified below.

9.1.5 Requested deviations from a specification requirement shall be documented on a Supplier Deviation Disposition Request (SDDR) form and submitted for resolution by the BUYER. Unplanned discrepancies are to be documented on a Non Conformance Report (NCR) as applicable, for resolution by the BUYER.

9.1.6 A safety program shall be prepared by the SELLER and approved by the BUYER prior to commencing any coating work at the WTP project site.

9.2 Submittals

9.2.1 With the quotation:

9.2.1.1 The SELLER shall provide an overview of the services to be provided, including degree of surface preparation to be performed, coating material(s) to be applied, including DFT, inspections to be performed, and documentation to be generated. The proposal shall also include any other details to fully describe the scope of work.

9.2.1.2 The SELLER shall identify the specific coating products by manufacturer and catalog number/name and shall submit the coating manufacturer's latest published Product Data Sheet.

9.2.1.2.1 Conflicts, if any, between the SELLER's normal procedures, the coating manufacturer's recommendations and this Specification shall be brought to the attention of the BUYER for resolution.

9.2.1.2.2 The proposed coating shall be one of the approved materials listed in Section 3.2. Alternate materials may be considered if properly submitted for BUYER evaluation and written approval. The burden of proof to justify equality resides with the SELLER and shall include case histories and customer contacts, that include names and phone numbers to verify satisfactory past performance.

9.2.1.3 The SELLER shall supply a list of previous project case histories where they applied a two component coating similar to the materials specified herein. This list shall include the type of item coated, the project name, a project client contact name and phone number if possible, for verification.

9.2.2 Following Award / As defined in the MR:

9.2.2.1 SELLER shall submit a detailed written procedure that addresses material receiving, marking, storage, handling, surface preparation, environmental control, application, curing, inspection, testing, touch-up/repair, and proposed documentation forms. The procedure and documentation forms shall be submitted for the BUYER approval prior to the start of coating work.

9.2.2.2 The SELLER shall submit a daily inspection record as part of the work procedures that includes the required elements provided in Appendix C. (Refer to Section 7.1.1)

9.2.2.3 The SELLER shall provide records of personnel training and certification. (Refer to Section 1.5).

9.2.2.4 The SELLER shall submit a current copy of the Product Data Sheet, application instructions and SDS for each coating product to be applied.

9.2.2.5 The SELLER shall submit original coating manufacturer's Product Identity Certification Records (PICR) for every batch of coating material intended for use (Appendix A).

9.2.3 Final Documentation

9.2.3.1 The final documentation package shall have a cover page that identifies the project, contract number and the report issue date. The report shall contain a table of contents and organized sections that contain the original documents generated during the work.

9.2.3.2 There shall be a letter of certification signed by management certifying the work performed complied with all the contract quality requirements

Appendix A

Coating Manufacturer's Product Identity Certification Record

Appendix A
Coating Manufacturer's Product Identity Certification Record

Project Name: _____ Coating Applicator: _____
Project Number: _____ Purchase Order No: _____
Project Location: _____ Contract Number: _____
Coating Manufacturer: _____ Generic Coating Type: _____
Product Name: _____ Product Number: _____

(For multi-component products, provide data for all components on one or more Appendix F forms).
(Provide the standard range and actual batch values for each test)

TEST RESULTS		**Component A Batch No.**		**Component B Batch No.**	
Test	**Method Used**	**Standard Range**	**Batch Actual**	**Standard Range**	**Batch Actual**
Weight per Gallon					
Viscosity					
Flash Point (Typical)					
% Solids by Volume (Typical)					
Cure to recoat time @ 50F, 70F, & 90F (typical)					
Batch Size					
Date of Mfg.					
Shelf Life					
Expiration Date					

COMMENTS:

I hereby certify that the material described above was inspected and/or tested and found to comply with our company Quality Assurance requirements, effective at the time of manufacturing, prior to being released for shipment. These materials will meet or exceed the performance characteristics listed on the applicable product data documentation in effect at the time of manufacture.

Signed: _____ Date: _____
Title: _____ Company: _____

Appendix B

Procedure for Holiday Testing

Appendix B
Procedure for Holiday Testing

1. General Requirements

1.1. Holiday testing is to be performed based on the thickness of the coating that was applied, i.e. original application, girth weld coating application or holiday repair material. The thickness is to be determined where the coating is applied to the substrate only; every effort should be made to only measure the coating as applied direct to the substrate. If the DFT of the adjacent applied coating is taken into account an excessive voltage may be selected that can damage the newly applied material. In order to minimize the potential for damage holiday test voltage is to be selected based only on the newly applied coating material. Previously applied coatings have been tested by that applicator and are understood to be acceptable.

1.2. The high voltage holiday detection equipment shall be a Tinker and Razor Model AP-W holiday detector, or an approved equal with an audible alarm. The liquid epoxy repairs onto stainless steel need only be tested using a Low Voltage Wet Sponge Holiday Detector. Holiday testing instrument calibration and use shall meet the requirements of ASTM D5162.

2. Procedures for Coating Thickness Determination

2.1. Average coating thickness shall be determined as defined in main specification Section 5.4.3. Coating thickness values obtained shall be rounded to the nearest whole number for determining the required holiday test voltage.

3. Holiday Testing of Epoxy Coatings

3.1. Using the average DFT value as determined in Section 2.1 above select the holiday test method and voltage as defined below.

3.2. Thin film FBE and liquid epoxy coatings, with a DFT less than 20 mils, are to be holiday tested per the requirements of ASTM D5162, Method A (Low Voltage Wet Sponge Testing). A wetting agent such as kodaks Photoflow 200 is to be added to the test water at a rate of ½ oz / gallon.

3.3. Thick film coatings, coatings that are greater than 20 mils DFT, are to be tested in accordance with ASTM D5162 Method B (High Voltage Spark Test), Table B-1 below lists test voltages. Values in the table are rounded to the nearest 100V and are consistent with Method B of ASTM D5162. Values were selected based on prior specification requirements, and the lower value from the provided table or the calculation as discussed in ASTM D5162. This provides a voltage that is expected to not damage the applied coating; but is sufficient to bridge the air gap present in the pinhole within the full specified DFT range.

Note: When using certain holiday test equipment, typically older models, it may be necessary to use a slightly higher voltage than listed in Table B-1. Some equipment cannot be adjusted in 100 volt increments therefore; the next higher available setting should be selected.

3.4. An alternate method to calibrate spark test equipment is to adjust the test instrument to the proper voltage for the maximum coating thickness being tested. In selecting the inspection voltage, it is important to provide sufficient voltage to beak the air gap the exists at the holiday. The air gap will vary depending on the total applied film thickness. The voltage required to break a given air gap may also vary due to atmospheric conditions such as relative humidity and air pressure. Ensure that the voltage is high enough to break the air gap equivalent to the highest coating film thickness by separating the exploring electrode from the bare metal substrate using a nonconductive spacer equal to the maximum coating thickness. A sheet of plastic film with a created pinhole may be used for this purpose. The voltage is set high enough to conduct the holiday test only if the spark will jump the gap formed by the spacer. A hole is to be deliberately made in the plastic sheet to simulate a defect in a coating. Excessive voltage may cause a holiday to form in the coating film. This test is intended to isolate and identify defects in the coating and pipe while maintaining the integrity of the coating.

4. Holiday Testing of Previously Buried or Exposed Coatings/Linings

4.1. Holiday Testing is intended for use with new coatings/linings applied to metal substrates. Its use on coatings that have been previously buried or exposed to immersion conditions has often resulted in damage to the coating and has produced erroneous detection of discontinuities due to permeation or moisture adsorption of the coating. Deposits may also be present on the surface causing telegraphing (current traveling through a moisture path to a discontinuity, giving an erroneous indication) or current leakage across the surface of the coating due to contamination. The use of a high voltage tester on previously exposed coatings has to be carefully considered because of possible spark through, which will damage an otherwise sound coating. Although a low voltage tester can be used without damaging the coating, it may also produce erroneous results.

4.2. In situations where it may be necessary to check for holiday on piping that has been previously buried, clean the surface and allow to dry-out for a minimum of 3 days. It will be necessary to determine the appropriate test voltage for the measured coating thickness being tested and then set the equipment to a test voltage that is 1,000 volts lower, to compensate for the possible presence of retained moisture. This adjustment is based upon test data from the Epoxy Coating Manufacturer's test data (3M Corrosion Protection Product Division – CPPD Austin R&D) for dielectric failure voltage and moisture absorption of the coating.

Table B-1
Holiday Detection Spark Test Voltages for Coatings *

DFT	Voltage	DFT	Voltage	DFT	Voltage	DFT	Voltage
20	2,500	38	3,200	56	7,500	74	10,000
21	2,500	39	3,300	57	7,500	75	10,800
22	2,500	40	5,500	58	7,500	76	10,800
23	2,500	41	5,500	59	8,000	77	10,800
24	2,600	42	5,500	60	8,000	78	10,800
25	2,600	43	5,500	61	8,000	79	11,100
26	2,700	44	6,000	62	8,000	80	11,200
27	2,700	45	6,000	63	8,500	81	11,300
28	2,800	46	6,000	64	8,500	82	11,300
29	2,800	47	6,000	65	8,500	83	11,400
30	2,900	48	6,500	66	8,500	84	11,500
31	2,900	49	6,500	67	9,000	85	11,500
32	3,000	50	6,500	68	9,000	86	11,600
33	3,000	51	6,500	69	9,000	87	11,700
34	3,100	52	7,000	70	9,000	88	11,700
35	3,100	53	7,000	71	10,000	89	11,800
36	3,200	54	7,000	72	10,000	90	11,900
37	3,200	55	7,000	73	10,000		

*Based on ASTM D5162-15, "Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates"

Table B-1 Notes:

1. The surfaces must be clean, dry and fee of oil, dirt and other contaminants.
2. Sufficient drying or curing of the coating is to be allowed prior to holiday testing. The length of time required shall be a minimum of 1 days, or as defined by the coating manufacturer. This is to ensure that solvents retained in the coating film do not produce erroneous indicators.
3. Coatings that contain electrically conductive fillers or pigments are not suitable for wet sponge or high voltage holiday testing.
4. Cathodic Protection Systems should not be in operation when spark testing is performed.

Appendix C

Inspection Form

Daily Work Inspection Form

REPORT NO: _____ ^DATE: _____ SHIFT: _____
^PROJECT: _____ DAY: M T W T F S S
SPEC NO/REV: _____ ^EQUIPMENT/AREA: _____
^SELLER: _____ SUBSTRATE: STEEL / CONCRETE / OTHER:

^ENVIRONMENTAL CONDITIONS:

WORK ACTIVITY	TIME	DRY BULB TEMP. °F	^[1]WET BULB TEMP. °F	RH %	DEW POINT °F	SURFACE TEMP. °F	BLOTTER TEST

PRE-SURFACE PREPARATION:

SURFACE DEFECTS: Yes / No	DEFECTS ADDRESSED: Yes / No / N/A
^SP-1 COMPLETE:	MASKING / PROTECTION COMPLETE:

SURFACE PREPARATION:

CLEANLINESS SPEC:	^CLEANLINESS ACTUAL:	ABRASIVE TYPE:
PROFILE SPEC:	^PROFILE ACTUAL:	SIZE:
METHOD:		STORAGE:

MATERIALS & MIXING:

^PRODUCT(S):		PROPERLY STORED:	EXPIRATION DATE:
^ BATCH NO(S):	A:	B:	C:
^THINNER:		BATCH NO.:	THINNING RATIO:
BATCH MIX TIME(S):		MIXED TEMPERATURE:	
INDUCTION TIME:		POT LIFE:	

APPLICATION:

^COAT:	PRIMER	PRIMER T.U.	SECOND	SECOND T.U.	THIRD	THIRD T.U. OTHER
^ APPLICATION		START TIME:		FINISH TIME:		
^[2]WFT:		TIME TO RECOAT* (Min/Max):		TIME TO FULL CURE*:		
APPLICATION METHOD:		EQUIPMENT:				

* Based on ambient temp during / following application

APPLIED COATING:

^VISUAL INSPECTION (IMPERFECTIONS FOUND): Y / N	TYPE OF IMPERFECTION:	
DRY FILM THICKNESS: SPEC:	^ACTUAL:	EQUIP. USED:
^[3]HOLIDAY TEST: VOLTAGE:	# FOUND:	EQUIP. USED:
TOUCH-UP AND REPAIR COMPLETE: Y / N / N/A	FINAL CURE CHECKED:	

COMMENTS (List test method or other data to explain work performed/condition found)**:** _____

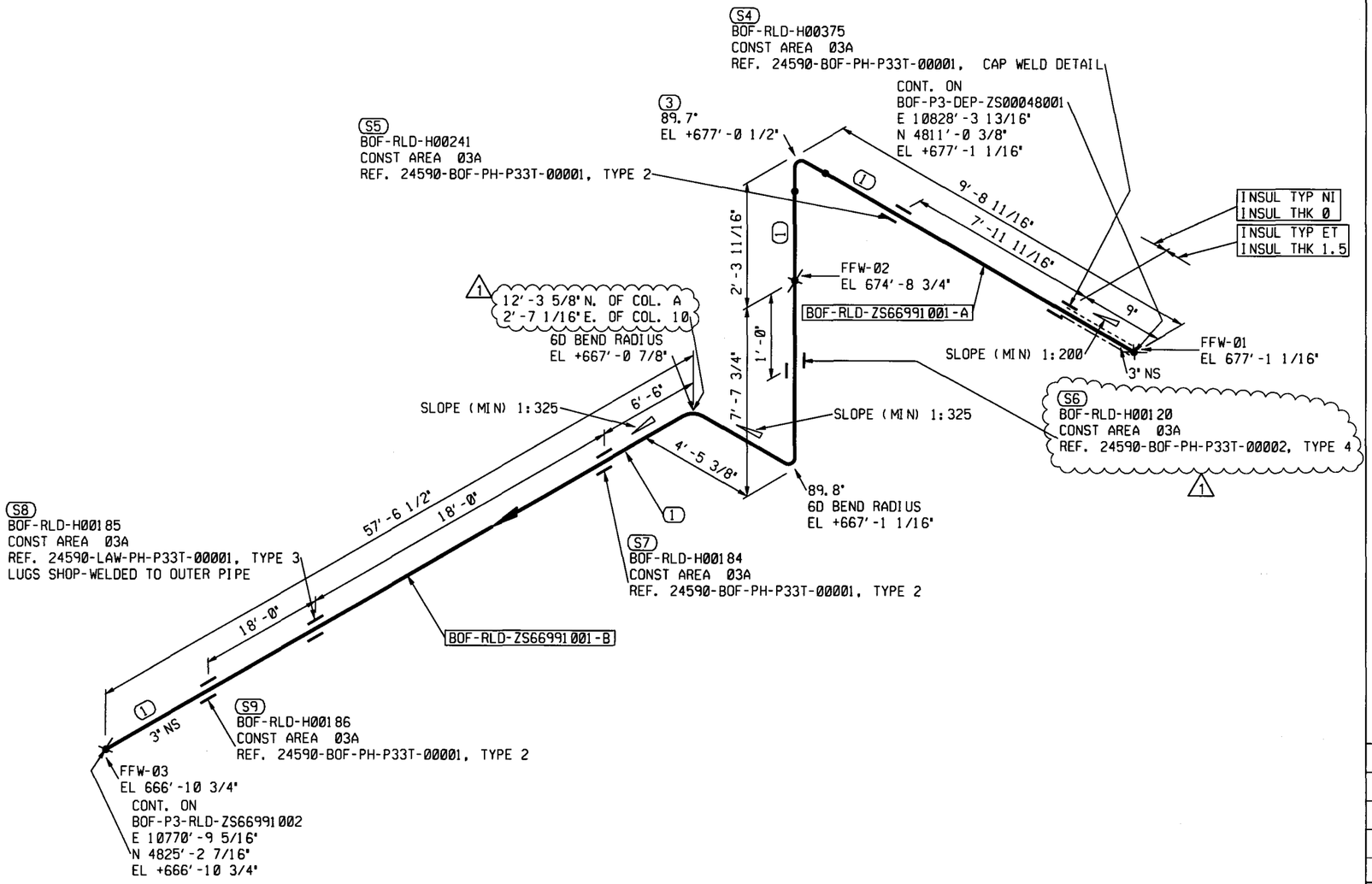
_____

_____

(*Use reverse side or attach extra pages as needed*) _____ / _____ / _____
INSPECTOR'S PRINTED NAME / SIGNATURE / DATE

Note: while documentation of a data point may not be required for submittal in accordance with this form the supplier is expected to be able to prove that all requirements of this specification have been met.

^ Mandatory data entry. Other entries should be completed where information is available.
^1 Wet bulb not required when accepted equipment automatically calculates dew point and humidity.
^2 Required only for application to concrete substrates, may be used as a substitute for DFT on non-ferrous substrates.
^3 Required only when applying coatings for immersion service and underground applications



SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	75'0"	PPPC0B0G0X02
2	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	4'9"	PPPC0B0G0X02
	FITTINGS			
3	TRIMMED ELBOW 89.72 DEG., EL - 90, LR, BW, A403WP316/316L-S, SCH40S	3	1	PFQNV60G160G

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
4	PIPE SUPT, BOF-RLD-H00375, WELDED PIPE ATTCHMT		1	
5	PIPE SUPT, BOF-RLD-H00241, WELDED PIPE ATTCHMT		1	
6	PIPE SUPT, BOF-RLD-H00120, WELDED PIPE ATTCHMT		1	
7	PIPE SUPT, BOF-RLD-H00184, WELDED PIPE ATTCHMT		1	
8	PIPE SUPT, BOF-RLD-H00185, WELDED PIPE ATTCHMT		1	
9	PIPE SUPT, BOF-RLD-H00186, WELDED PIPE ATTCHMT		1	

DOUBLE CONTAINED PIPE INNER CORE SEE SHEET 051 FOR OUTER JACKET

ISSUED BY RPP-WTP PDC

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
1	1/24/18	REV SUPT NOTE, CLINE	SH	DSS	CF	DWK	JMC
0	6/1/16	ISSUED FOR CONSTRUCTION	JS	KK	CC	SH	JMC

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 25G

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-3 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991001 | REV 1

NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DIRECT FEED LAW SCOPE

PAINT CODE	N/A
INSULATION TYPE	ET
INSULATION THK.	1.5

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. SEE APPLICABLE P&ID REV.
SEISMIC CAT. SC-IV

CM QUALITY LEVEL

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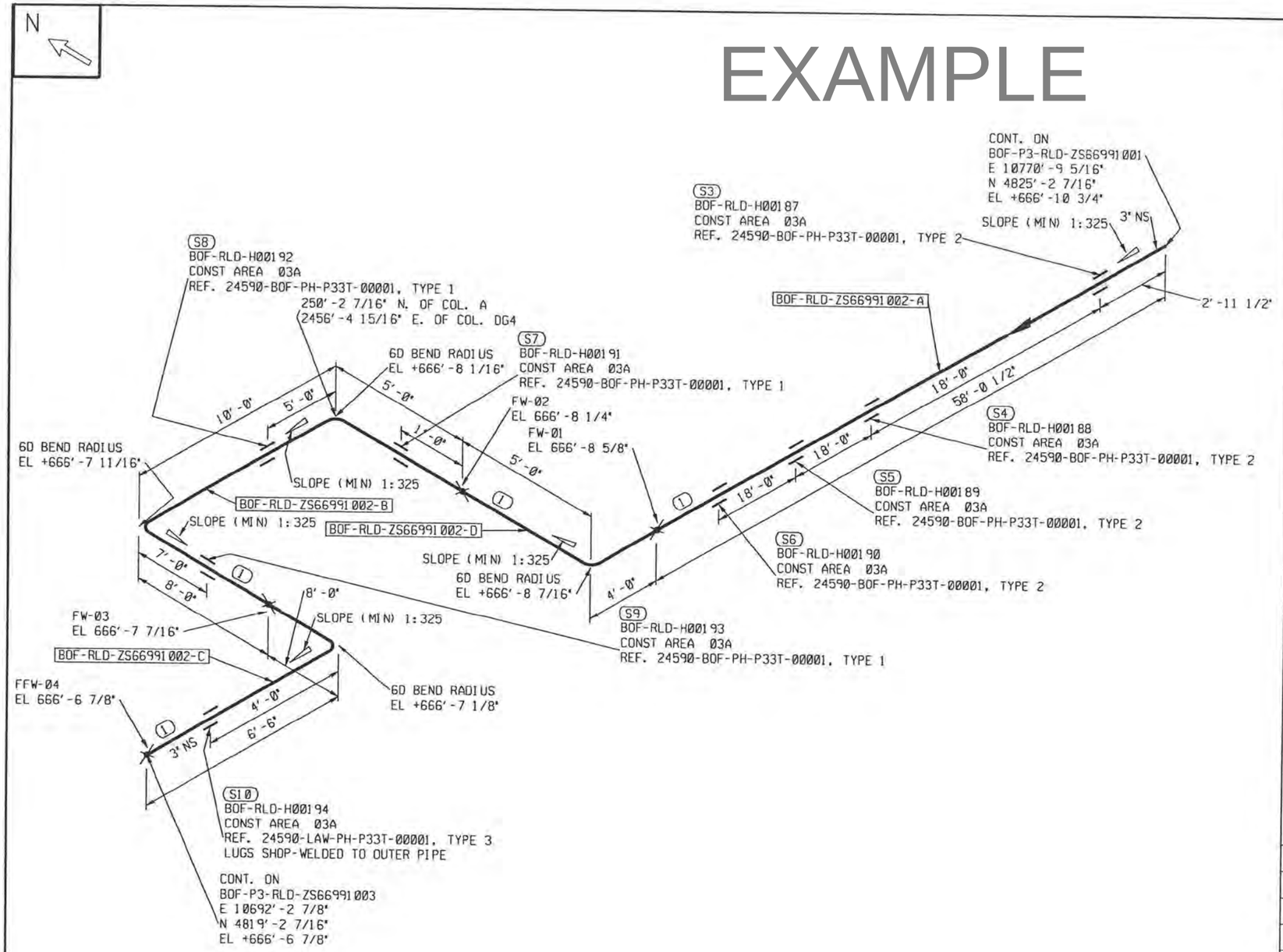
R11874321



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	92'7"	PPPC0B0G0X02
2	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	9'5"	PPPC0B0G0X02

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
3	PIPE SUPT, BOF-RLD-H00187, WELDED PIPE ATTCHMT		1	
4	PIPE SUPT, BOF-RLD-H00188, WELDED PIPE ATTCHMT		1	
5	PIPE SUPT, BOF-RLD-H00189, WELDED PIPE ATTCHMT		1	
6	PIPE SUPT, BOF-RLD-H00190, WELDED PIPE ATTCHMT		1	
7	PIPE SUPT, BOF-RLD-H00191, WELDED PIPE ATTCHMT		1	
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9	PIPE SUPT, BOF-RLD-H00193, WELDED PIPE ATTCHMT		1	
10	PIPE SUPT, BOF-RLD-H00194, WELDED PIPE ATTCHMT		1	

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DOUBLE CONTAINED PIPE INNER CORE SEE SHEET 052 FOR OUTER JACKET

Reviewed
No Comments
By: Christine Chang - ichang2
Org Name: Pipe Stress & Support-Reston
Placed: May 13, 2016, 1:27 pm

R11777056

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/13/16	ISSUED FOR CONSTRUCTION	TE	KK		SH	JMc

REVISION HISTORY

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-3 | PIPE SPEC: W31A

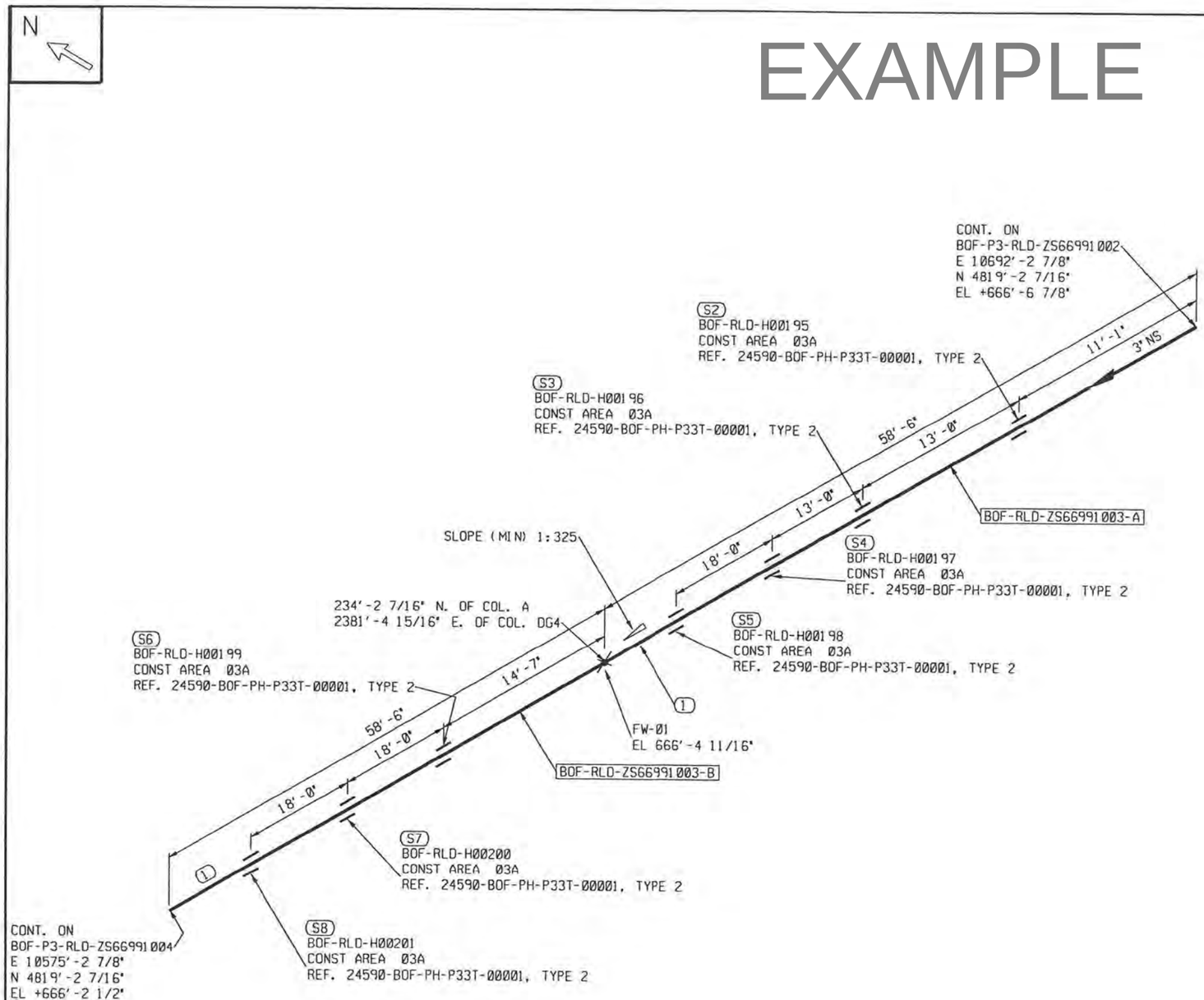
DWG No. 24590-BOF-P3-RLD-ZS66991002 | REV 0

ISSUED BY
RPP-WTP PDC

DIRECT FEED LAW SCOPE

CM QUALITY LEVEL

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO	
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID REV.	
INSULATION THK.	0	SEISMIC CAT.	SC-IV



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	117'0"	PPPC0B0G0X02

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
2	PIPE SUPT, BOF-RLD-H00195, WELDED PIPE ATTCHMT		1	
3	PIPE SUPT, BOF-RLD-H00196, WELDED PIPE ATTCHMT		1	
4	PIPE SUPT, BOF-RLD-H00197, WELDED PIPE ATTCHMT		1	
5	PIPE SUPT, BOF-RLD-H00198, WELDED PIPE ATTCHMT		1	
6	PIPE SUPT, BOF-RLD-H00199, WELDED PIPE ATTCHMT		1	
7	PIPE SUPT, BOF-RLD-H00200, WELDED PIPE ATTCHMT		1	
8	PIPE SUPT, BOF-RLD-H00201, WELDED PIPE ATTCHMT		1	

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE INNER CORE SEE SHEET 053 FOR OUTER JACKET

Reviewed
No Comments
By: Christine Chang - lchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 13, 2016, 1:27 pm

R11777057

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/13/16	ISSUED FOR CONSTRUCTION	JF	VK		SH	JH

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-3 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991003 | REV 0

ISSUED BY
RPP-WTP PDC

DIRECT FEED LAW SCOPE

CM QUALITY LEVEL

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO			
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID	REV.		
INSULATION THK.	0		SEISMIC CAT.	SC-IV	

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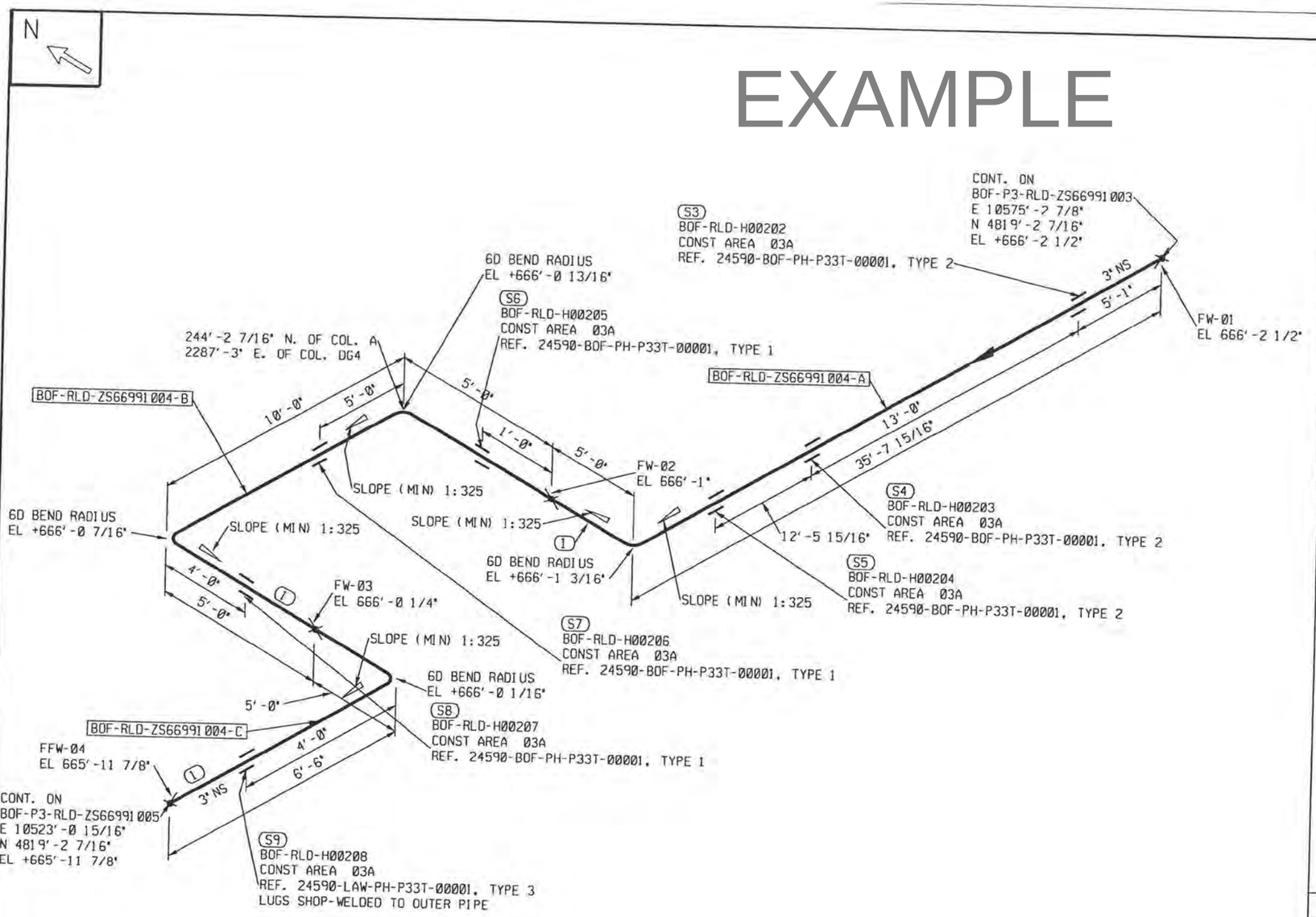

NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-PO-50-00001001.

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
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2	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	9'5"	PPPC0B0G0X02

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
3	PIPE SUPT, BOF-RLD-H00202, WELDED PIPE ATTCHMT		1	
4	PIPE SUPT, BOF-RLD-H00203, WELDED PIPE ATTCHMT		1	
5	PIPE SUPT, BOF-RLD-H00204, WELDED PIPE ATTCHMT		1	
6	PIPE SUPT, BOF-RLD-H00205, WELDED PIPE ATTCHMT		1	
7	PIPE SUPT, BOF-RLD-H00206, WELDED PIPE ATTCHMT		1	
8	PIPE SUPT, BOF-RLD-H00207, WELDED PIPE ATTCHMT		1	
9	PIPE SUPT, BOF-RLD-H00208, WELDED PIPE ATTCHMT		1	

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE INNER CORE SEE SHEET 054 FOR OUTER JACKET

Reviewed No Comments
By: Christine Chang - lchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 13, 2016, 1:27 pm

R11777058

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/13/16	ISSUED FOR CONSTRUCTION	[illegible]	VK		SH	VL

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-3 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991004 | REV 0

ISSUED BY
RPP-WTP PDC

DIRECT FEED LAW SCOPE

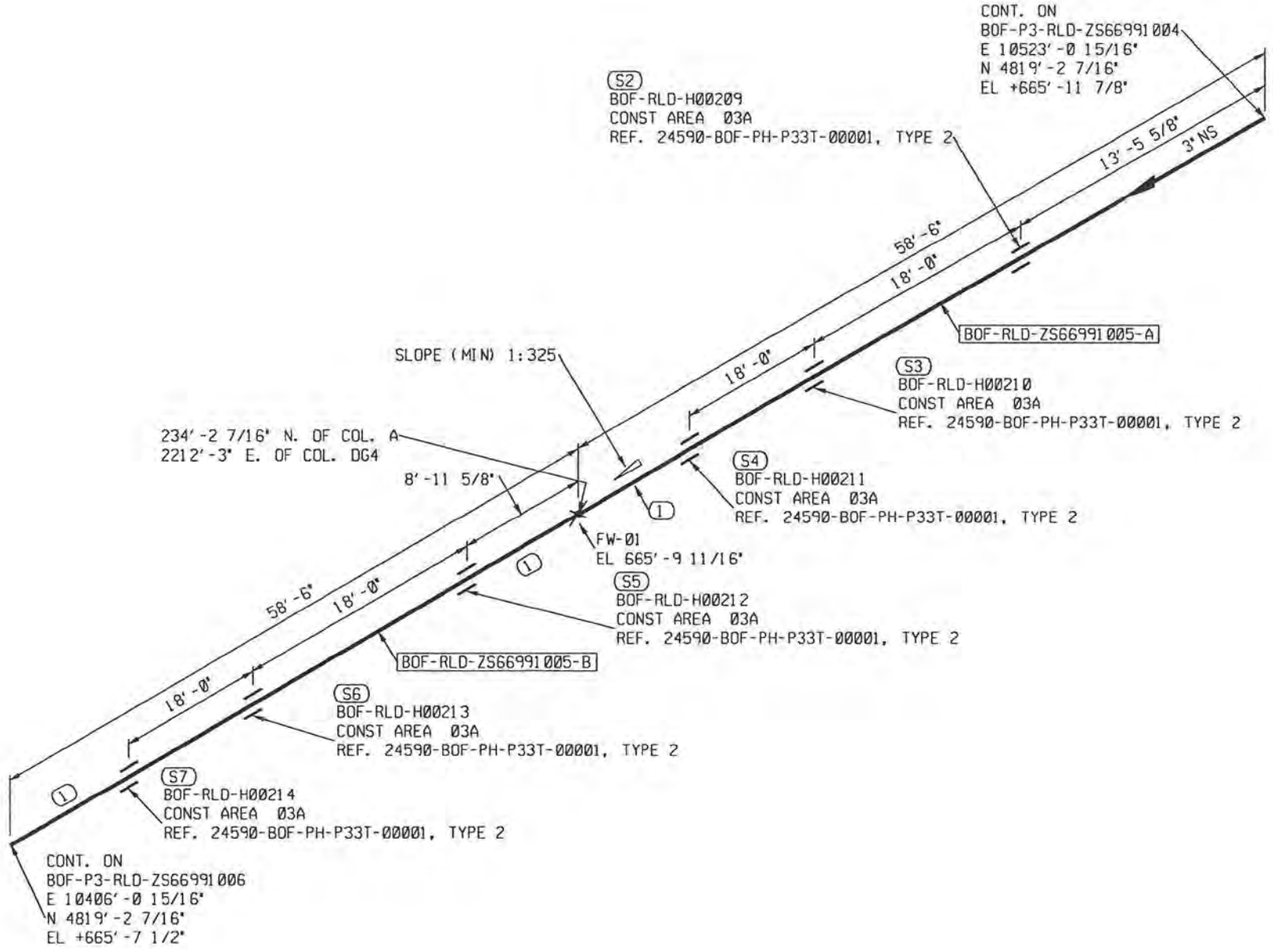
CM QUALITY LEVEL

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO		
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID REV.		
INSULATION THK.	0		SEISMIC CAT.	SC-IV

LENGTH (FT.)72.16 (FOR INFO ONLY) JSM Created: MAY-11-2016 16:05 Iso Created: MAY-11-2016 16:06 PCF File: 24590-BOF-P3-RLD-ZS66991004 PLOTTED BY: wjengel PLOT DATE: 5/12/2016 10:57:57 AM SHT. 1 OF 1

ISO TYPE: BOF_xFINAL C:\Users\wjengel\Desktop\temp\24590-BOF-P3-RLD-ZS66991004.DGN

EXAMPLE



SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	117'0"	PPPC0B0G0X02

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
2	PIPE SUPT, BOF-RLD-H00209, WELDED PIPE ATTCHMT		1	
3	PIPE SUPT, BOF-RLD-H00210, WELDED PIPE ATTCHMT		1	
4	PIPE SUPT, BOF-RLD-H00211, WELDED PIPE ATTCHMT		1	
5	PIPE SUPT, BOF-RLD-H00212, WELDED PIPE ATTCHMT		1	
6	PIPE SUPT, BOF-RLD-H00213, WELDED PIPE ATTCHMT		1	
7	PIPE SUPT, BOF-RLD-H00214, WELDED PIPE ATTCHMT		1	

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE INNER CORE SEE SHEET 055 FOR OUTER JACKET

Reviewed
No Comments
By: Christina Chang - lchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 13, 2016, 1:28 pm

R11777059

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/18/16	ISSUED FOR CONSTRUCTION	TE	KK		SH	

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-3 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991005 | REV 0

ISSUED BY
RPP-WTP PDC

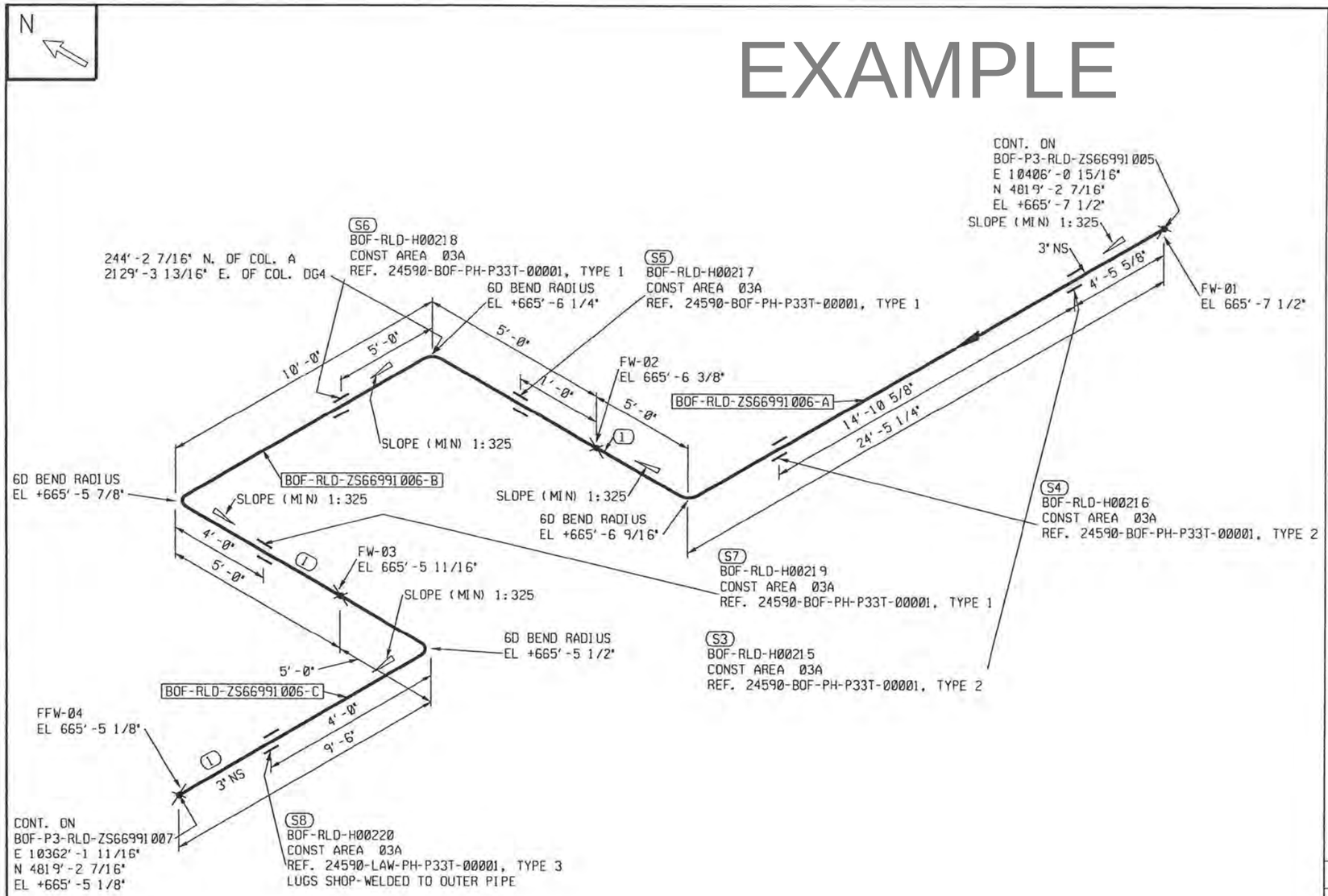
CM QUALITY LEVEL

DIRECT FEED LAW SCOPE

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO		
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID REV.		
INSULATION THK.	0		SEISMIC CAT.	SC-IV

NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	52'0"	PPPC0B0G0X02
2	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	9'5"	PPPC0B0G0X02

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
3	PIPE SUPT, BOF-RLD-H00215, WELDED PIPE ATTCHMT		1	
4	PIPE SUPT, BOF-RLD-H00216, WELDED PIPE ATTCHMT		1	
5	PIPE SUPT, BOF-RLD-H00217, WELDED PIPE ATTCHMT		1	
6	PIPE SUPT, BOF-RLD-H00218, WELDED PIPE ATTCHMT		1	
7	PIPE SUPT, BOF-RLD-H00219, WELDED PIPE ATTCHMT		1	
8	PIPE SUPT, BOF-RLD-H00220, WELDED PIPE ATTCHMT		1	

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE INNER CORE SEE SHEET 056 FOR OUTER JACKET

Reviewed
No Comments
By: Christine Chang - cchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 13, 2016, 1:28 pm

R11777060

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/10/16	ISSUED FOR CONSTRUCTION	TF	KK		SH	JM

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-3 | PIPE SPEC: W31A

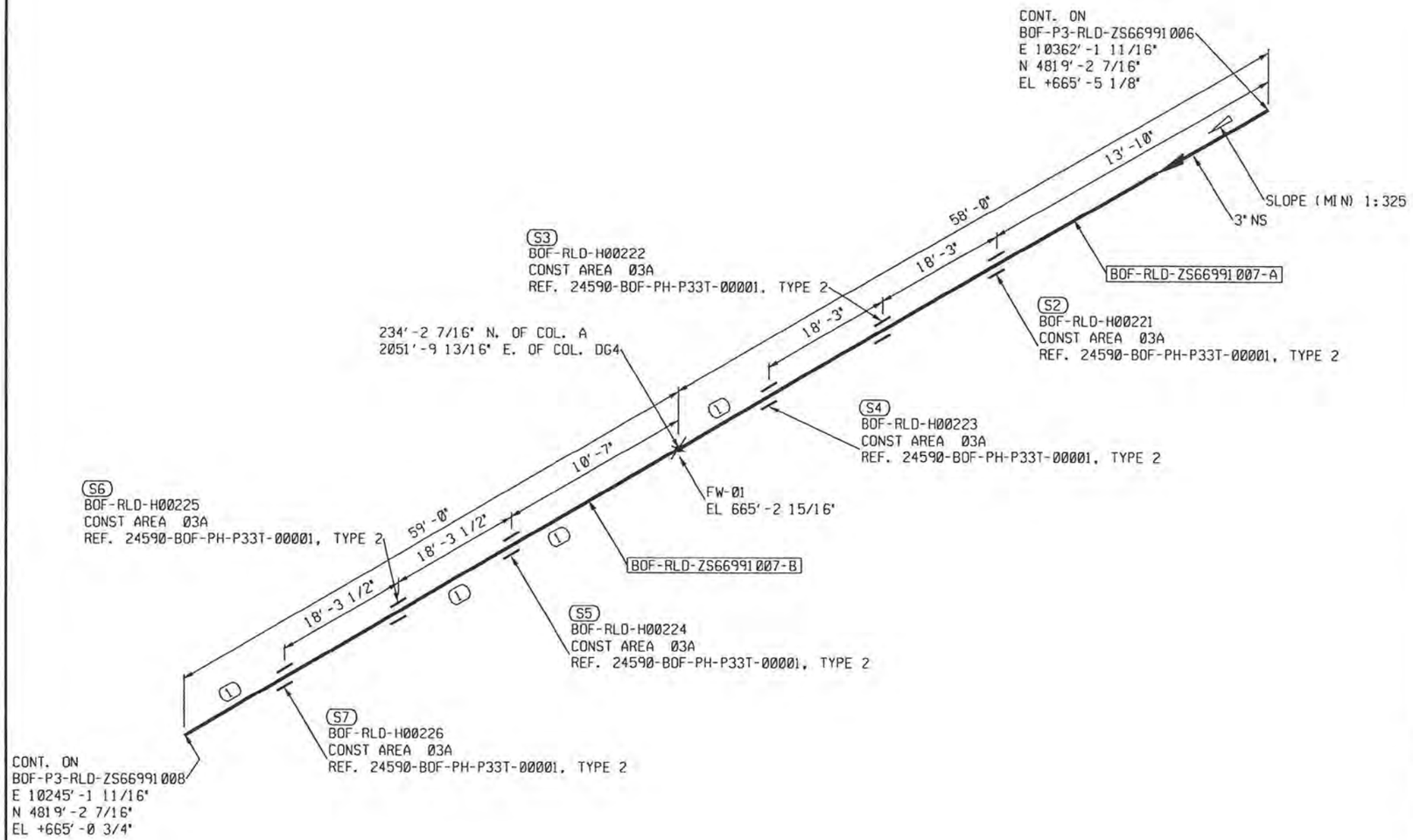
DWG No. 24590-BOF-P3-RLD-ZS66991006 | REV 0

ISSUED BY
RPP-WTP PDC

CM
QUALITY LEVEL

DIRECT FEED LAW SCOPE

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO		
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID REV.		
INSULATION THK.	0		SEISMIC CAT.	SC-IV



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	117'-8"	PPPC0B0G0X02

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
2	PIPE SUPT, BOF-RLD-H00221, WELDED PIPE ATTCHMT		1	
3	PIPE SUPT, BOF-RLD-H00222, WELDED PIPE ATTCHMT		1	
4	PIPE SUPT, BOF-RLD-H00223, WELDED PIPE ATTCHMT		1	
5	PIPE SUPT, BOF-RLD-H00224, WELDED PIPE ATTCHMT		1	
6	PIPE SUPT, BOF-RLD-H00225, WELDED PIPE ATTCHMT		1	
7	PIPE SUPT, BOF-RLD-H00226, WELDED PIPE ATTCHMT		1	

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE INNER CORE SEE SHEET 057 FOR OUTER JACKET

R11777061

Reviewed
No Comments
By: Christine Chang - lchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 13, 2016, 1:26 pm

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/19/16	ISSUED FOR CONSTRUCTION	JF	KK		SH	MC

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

ISSUED BY
RPP-WTP PDC

DIRECT FEED LAW SCOPE

CM QUALITY LEVEL

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO		
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID REV.		
INSULATION THK.	0		SEISMIC CAT.	SC-IV

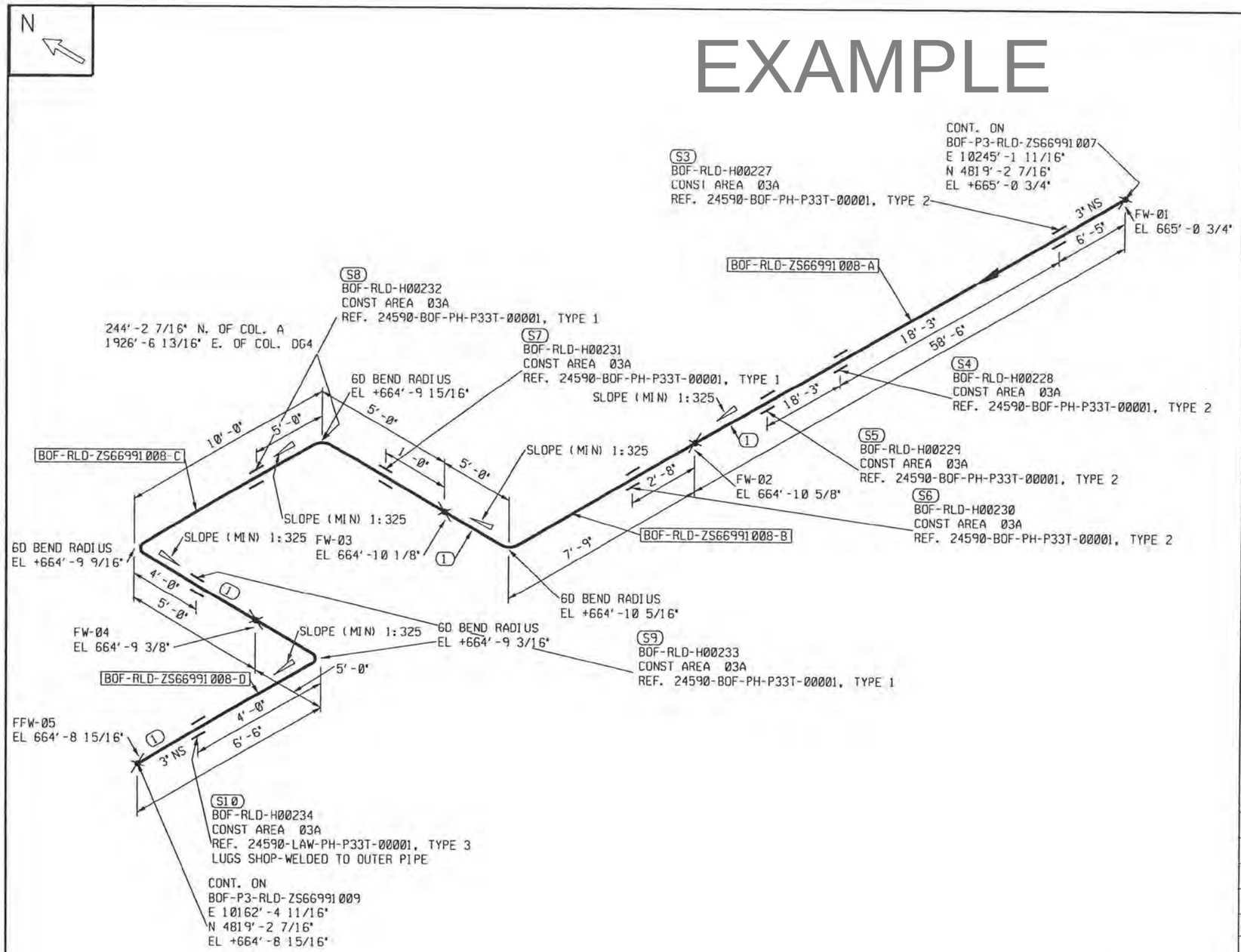
P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-3 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991007 | REV 0

EXAMPLE



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	90'-9"	PPPC0B0G0X02
2	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	9'-5"	PPPC0B0G0X02

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
3	PIPE SUPT, BOF-RLD-H00227, WELDED PIPE ATTCHMT		1	
4	PIPE SUPT, BOF-RLD-H00228, WELDED PIPE ATTCHMT		1	
5	PIPE SUPT, BOF-RLD-H00229, WELDED PIPE ATTCHMT		1	
6	PIPE SUPT, BOF-RLD-H00230, WELDED PIPE ATTCHMT		1	
7	PIPE SUPT, BOF-RLD-H00231, WELDED PIPE ATTCHMT		1	
8	PIPE SUPT, BOF-RLD-H00232, WELDED PIPE ATTCHMT		1	
9	PIPE SUPT, BOF-RLD-H00233, WELDED PIPE ATTCHMT		1	
10	PIPE SUPT, BOF-RLD-H00234, WELDED PIPE ATTCHMT		1	

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE INNER CORE SEE SHEET 058 FOR OUTER JACKET

Reviewed
No Comments
By: Christine Chang - kchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 13, 2016, 1:29 pm

R11777062

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/9/16	ISSUED FOR CONSTRUCTION				SH	SH

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-3 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991008 | REV 0

ISSUED BY
RPP-WTP PDC

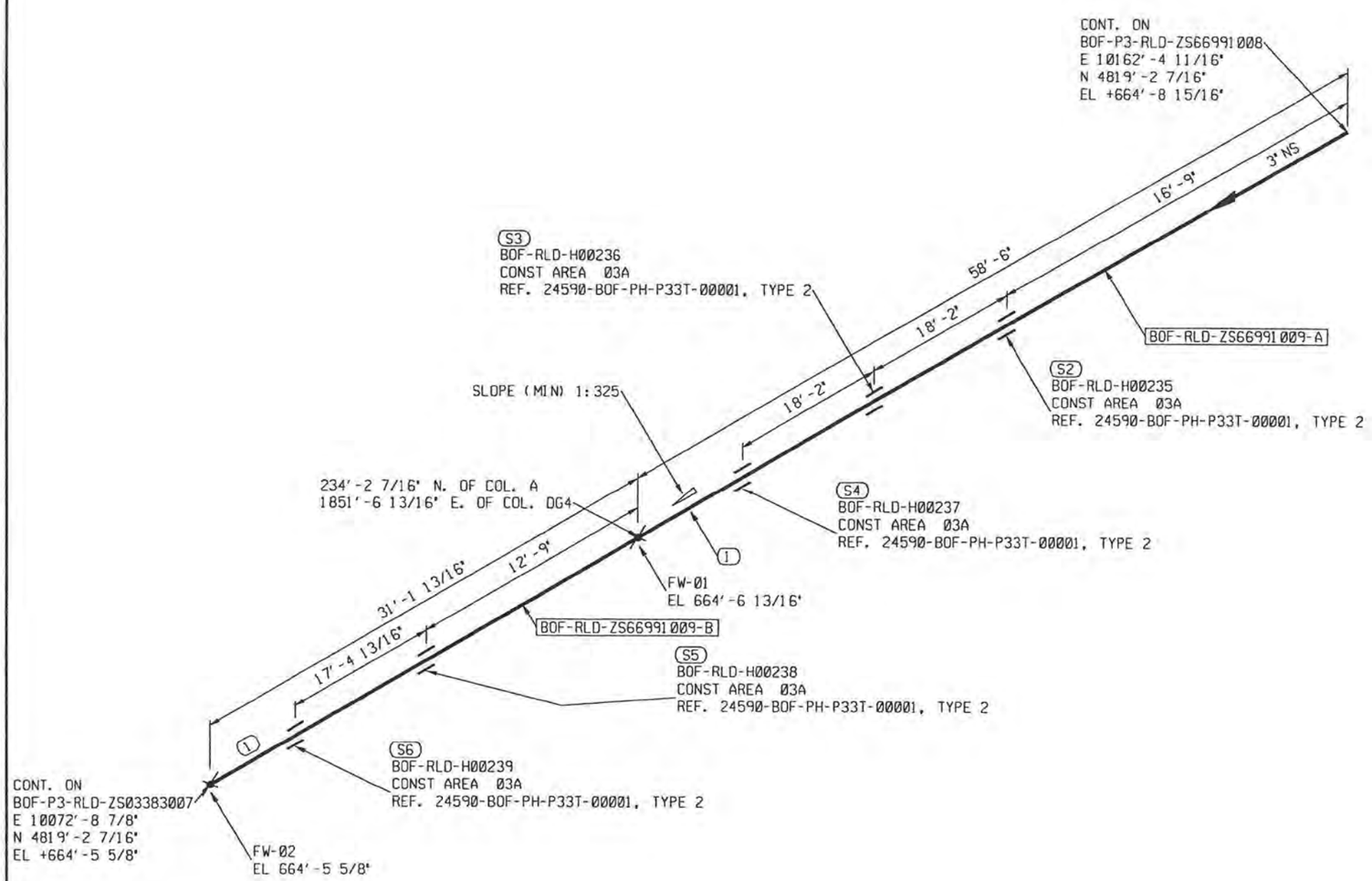
DIRECT FEED LAW SCOPE

CM QUALITY LEVEL

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO	
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID REV.	
INSULATION THK.	0	SEISMIC CAT.	SC-IV

ISO TYPE: BOF_xFINAL C:\Users\wjengel\Desktop\temp\24590-BOF-P3-RLD-ZS66991008.DGN

LENGTH (FT.)02.75 (FOR INFO ONLY) JSM Created: MAY-11-2016 16:05 Iso Created: MAY-11-2016 16:06 PCF File: 24590-BOF-P3-RLD-ZS66991008 PLOTTED BY: wjengel PLOT DATE: 5/12/2016 10:58:01 AM SHT. 1 OF 1



SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	3	89'-8"	PPPC0B0G0X02

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
2	PIPE SUPT, BOF-RLD-H00235, WELDED PIPE ATTCHMT		1	
3	PIPE SUPT, BOF-RLD-H00236, WELDED PIPE ATTCHMT		1	
4	PIPE SUPT, BOF-RLD-H00237, WELDED PIPE ATTCHMT		1	
5	PIPE SUPT, BOF-RLD-H00238, WELDED PIPE ATTCHMT		1	
6	PIPE SUPT, BOF-RLD-H00239, WELDED PIPE ATTCHMT		1	

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE INNER CORE SEE SHEET 059 FOR OUTER JACKET

Reviewed
No Comments
By: Christine Chang - lchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 13, 2016, 1:29 pm

R11777063

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/10/16	ISSUED FOR CONSTRUCTION	TF	KK		SH	

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-3 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991009 | REV 0

ISSUED BY
RPP-WTP PDC

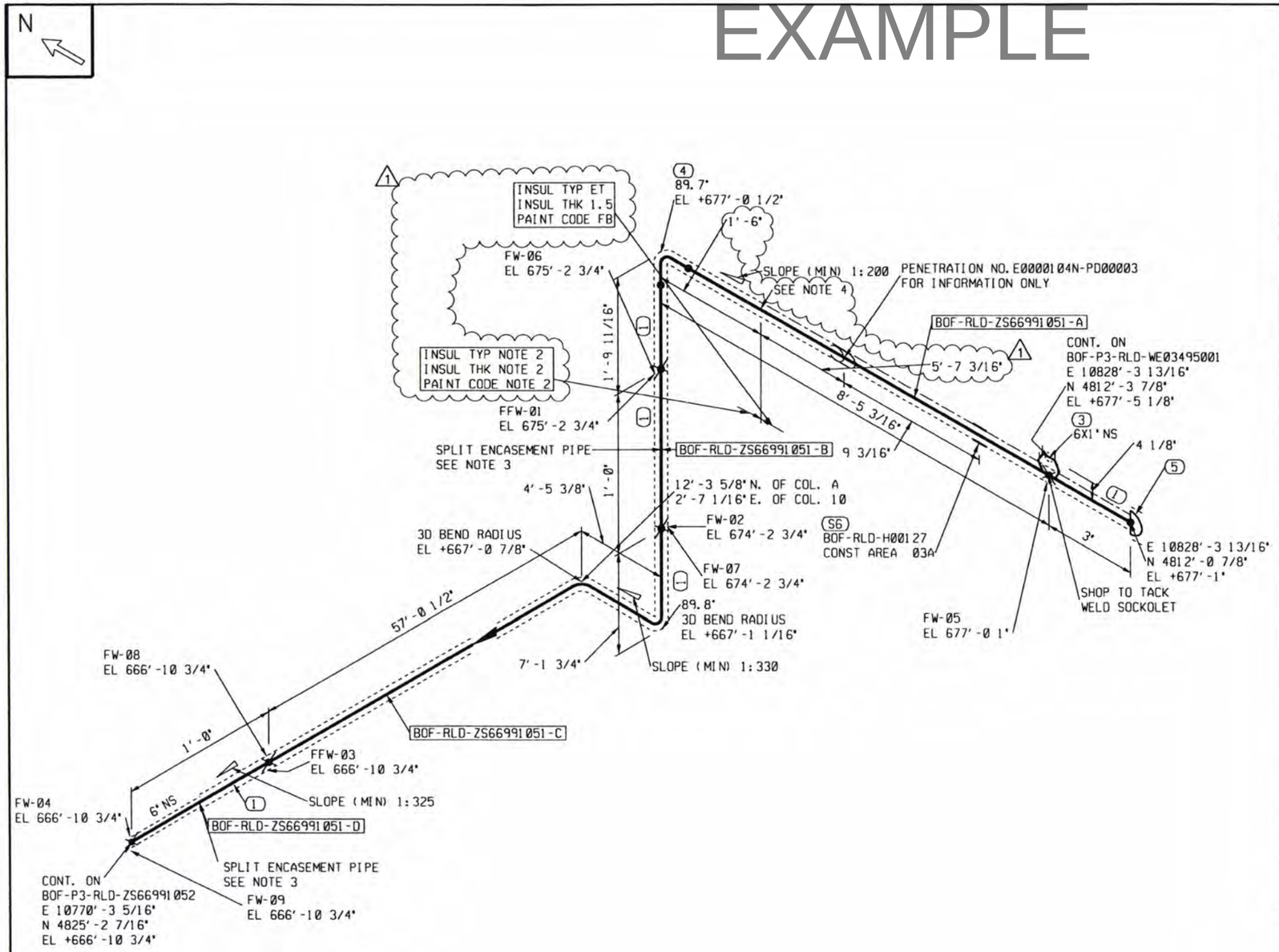
DIRECT FEED LAW SCOPE

CM QUALITY LEVEL

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO	
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID REV.	
INSULATION THK.	0	SEISMIC CAT.	SC-IV

NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-PO-50-00001001.



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.
2. FOR ALL COATINGS, INSULATION AND HDPE REQUIREMENTS REFER TO SECTION 5 OF 24590-WTP-3PS-PX04-T0002.
3. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.
4. FIELD TO INSTALL ET WIRE 36" BELOW GRADE, RE-INSTALL HDPE OUTER JACKET AND INSULATION TO LIMITS SHOWN. INSURE WATER TIGHT SEAL. (1)
5. FOR ALL EXPOSED CARBON STEEL, OUTSIDE PIPE SURFACE, COAT WITH APPROVED LIQUID EPOXY.

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DIRECT FEED LAW SCOPE (1)

PAINT CODE	FB, NOTE 2	CONTENT APPLICABLE TO ALARA?	X YES	NO
INSULATION TYPE	ET, NOTE 2	ADR NO. SEE APPLICABLE P&ID	REV.	
INSULATION THK.	1.5, NOTE 2		SEISMIC CAT.	SC-IV

CM QUALITY LEVEL

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A106-B, SMLS, STD WT, BBE	6	74'2"	PPPCH2050104
2	PIPE, A106-B, SMLS, STD WT, BBE	6	4'9"	PPPCH2050104
	FITTINGS			
3	SOCKOLET, A105, CL3000	6X1	1	PFLSGZX01PNN
4	TRIMMED ELBOW 89.72 DEG., EL - 90, SR, BW, A234-WPB, STDWT	6	1	PFQNG5053C0K
5	CAP, BW, A403WP316•, SCH40S	6	1	PFCCV60G1D0K

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
6	PIPE SUPT, BOF-RLD-H00127		1	

DOUBLE CONTAINED PIPE OUTER JACKET SEE SHEET 001 FOR INNER CORE

Reviewed
No Comments
By: Christine Chang - lchang2
Org Name: Pipe Stress & Support - Reston
Placed: May 02, 2017

(1) REV 1 NOTE:
REV DIMS, PAINT CODE, NOTES, INSUL BREAK LOCATION

ISSUED BY
RPP-WTP PDC

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
1	5/15/17	SEE REV 1 NOTE	JFT	ZB		SH	JMC
0	6/2/16	ISSUED FOR CONSTRUCTION	JFT	ZB	IC	SH	JMC

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 25G

BALANCE OF FACILITIES ISOMETRIC

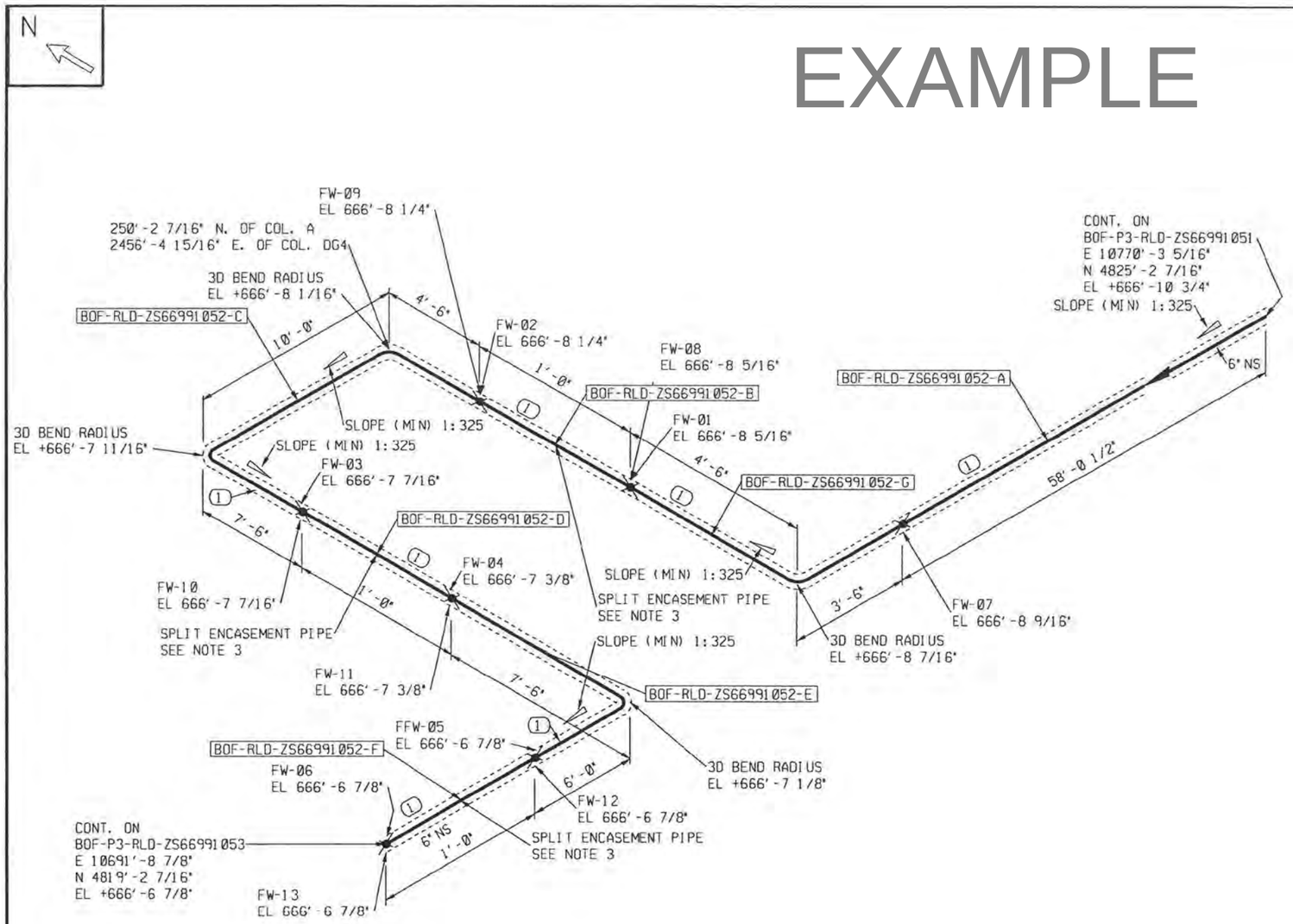
LINE No. RLD-ZS-66991-W31A-6 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991051 | REV 1

ISO TYPE: BOF_xFINAL c:\work\mmuhi\dms06947\24590-BOF-P3-RLD-ZS66991051.DGN

LENGTH (FT.)81.76 (FOR INFO ONLY) JSM Created: MAY-01-2017 12:27 Iso Created: MAY-01-2017 12:28 PCF File: 24590-BOF-P3-RLD-ZS66991051 PLOTTED BY:mmuhi PLOT DATE: 5/1/2017 2:49:13 PM SHT. 1 OF 1

EXAMPLE



SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A106-B, SMLS, STD WT, BBE	6	92' 7"	PPPCH20501104
2	PIPE, A106-B, SMLS, STD WT, BBE	6	9' 5"	PPPCH20501104

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE OUTER JACKET SEE SHEET 002 FOR INNER CORE

Reviewed
No Comments
By: Christine Chang - lchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 17, 2016, 1:21 pm

R11777064

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/16/16	ISSUED FOR CONSTRUCTION	#	KK		SH	

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-6 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991052 | REV 0

NOTES:

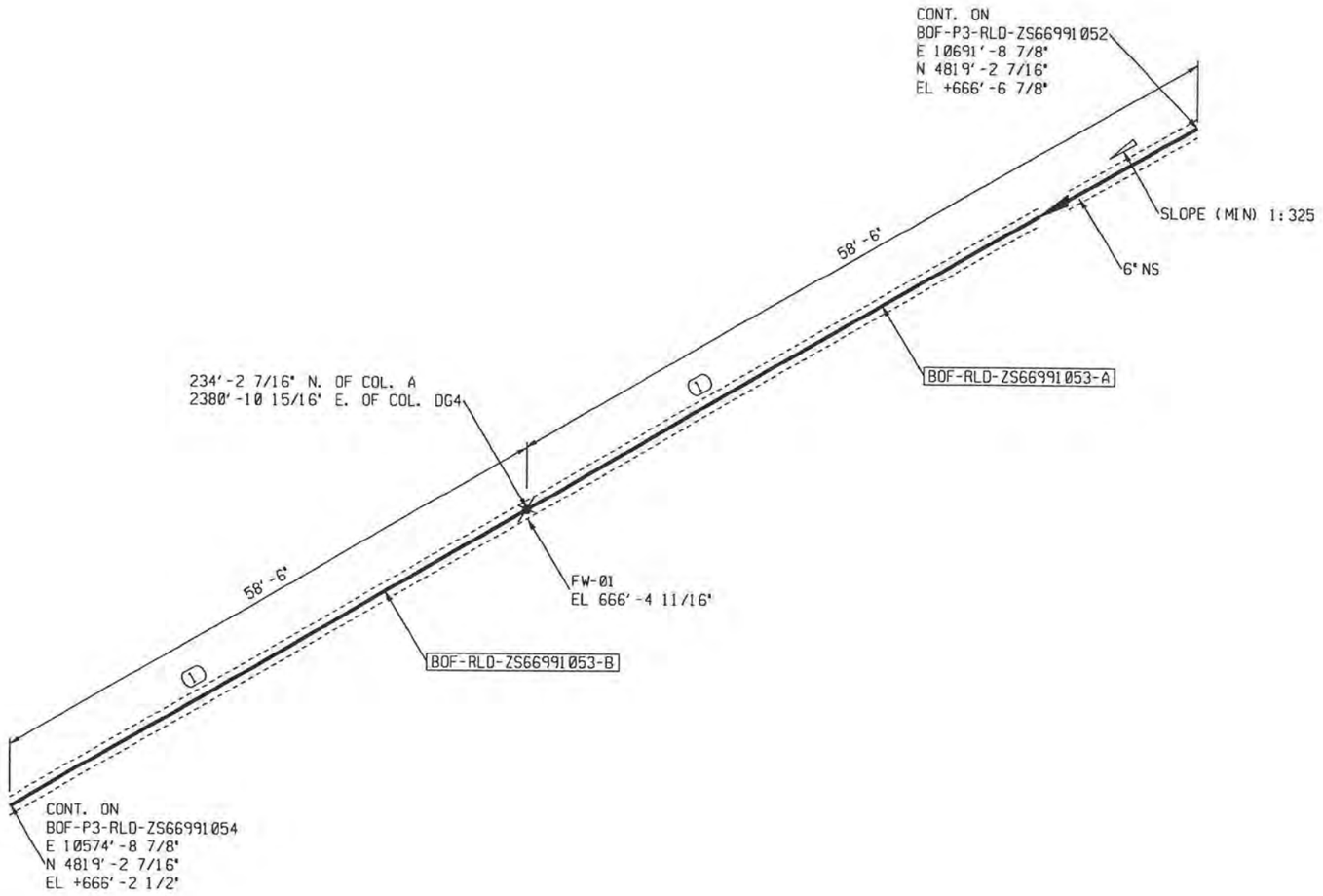
1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-PO-50-00001001.
2. FOR ALL COATINGS, INSULATION AND HDPE REQUIREMENTS REFER TO SECTION 5 OF 24590-WTP-3PS-PX04-T0002.
3. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

ISSUED BY
RPP-WTP PDC

DIRECT FEED LAW SCOPE

CM QUALITY LEVEL

PAINT CODE	SEE NOTE 2	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO		
INSULATION TYPE	SEE NOTE 2	ADR NO. SEE APPLICABLE P&ID REV.		
INSULATION THK.	SEE NOTE 2		SEISMIC CAT.	SC-IV



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-PO-50-00001001.
2. FOR ALL COATINGS, INSULATION AND HDPE REQUIREMENTS REFER TO SECTION 5 OF 24590-WTP-3PS-PX04-T0002.
3. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

ISSUED BY
RPP-WTP PDC

DIRECT FEED LAW SCOPE

CM QUALITY LEVEL

PAINT CODE	SEE NOTE 2	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO	
INSULATION TYPE	SEE NOTE 2	ADR NO. SEE APPLICABLE P&ID REV.	
INSULATION THK.	SEE NOTE 2	SEISMIC CAT.	SC-IV

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A106-B, SMLS, STD WT, BBE	6	117'0"	PPPCH2050104

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE OUTER JACKET SEE SHEET 003 FOR INNER CORE

Reviewed
No Comments
By: Christine Chang - ichang2
Org Name: Pipe Stress & Support-Reston
Placed: May 13, 2016, 1:31 pm

R11777065

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/12/16	ISSUED FOR CONSTRUCTION	TF	EK		SH	JWL

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

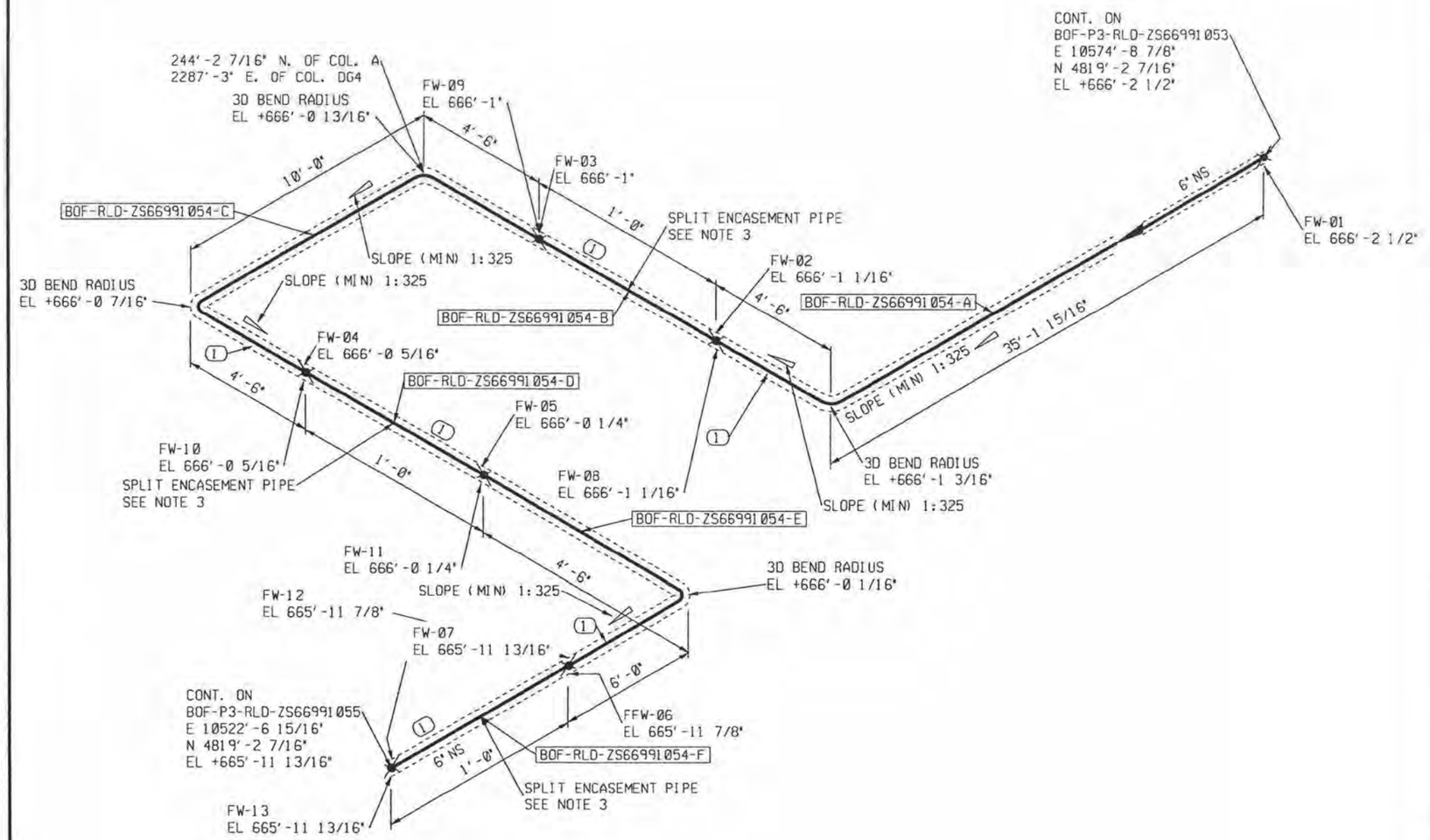
LINE No. RLD-ZS-66991-W31A-6 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991053 | REV 0

ISO TYPE: BOF_xFINAL c:\work\mmuhi\dms06947\24590-BOF-P3-RLD-ZS66991053.DGN

COMPUTER GENERATED - MANUAL CHANGES NOT PERMITTED

EXAMPLE



SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A106-B, SMLS, STD WT, BBE	6	60'2"	PPPCH2050104
2	PIPE, A106-B, SMLS, STD WT, BBE	6	9'5"	PPPCH2050104

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE OUTER JACKET SEE SHEET 004 FOR INNER CORE

Reviewed
No Comments
By: Christine Chang - kchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 17, 2016, 1:21 pm

R11777066

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
D	5/18/16	ISSUED FOR CONSTRUCTION	TT	KK		SH	VK

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-6 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991054 | REV 0

NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.
2. FOR ALL COATINGS, INSULATION AND HDPE REQUIREMENTS REFER TO SECTION 5 OF 24590-WTP-3PS-PX04-T0002.
3. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

ISSUED BY
RPP-WTP PDC

DIRECT FEED LAW SCOPE

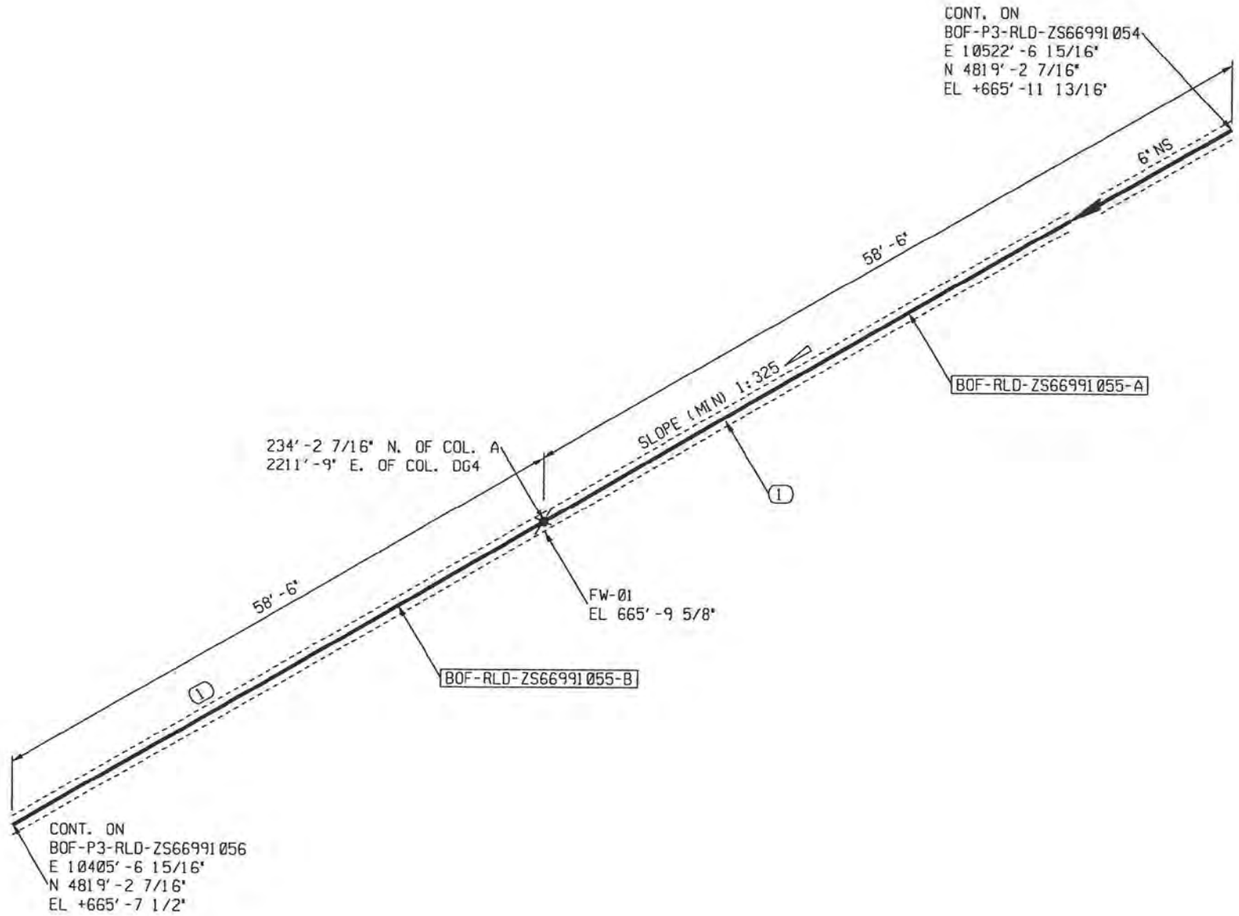
CM QUALITY LEVEL

PAINT CODE	SEE NOTE 2	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO	
INSULATION TYPE	SEE NOTE 2	ADR NO. SEE APPLICABLE P&ID REV.	
INSULATION THK.	SEE NOTE 2	SEISMIC CAT.	SC-IV

ISO TYPE: BOF_xFINAL C:\Users\wjengel\Desktop\temp\24590-BOF-P3-RLD-ZS66991054.DGN

LENGTH (FT.)72.16 (FOR INFO ONLY) JSM Created: MAY-16-2016 11:07 Iso Created: MAY-16-2016 11:08 PCF File: 24590-BOF-P3-RLD-ZS66991054 PLOTTED BY: wjengel PLOT DATE: 5/16/2016 1:04:50 PM SHT. 1 OF 1

N



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-PO-50-00001001.
2. FOR ALL COATINGS, INSULATION AND HDPE REQUIREMENTS REFER TO SECTION 5 OF 24590-WTP-3PS-PX04-T0002.
3. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

ISSUED BY
RPP-WTP PDC

DIRECT FEED LAW SCOPE

CM QUALITY LEVEL

PAINT CODE	SEE NOTE 2	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO	
INSULATION TYPE	SEE NOTE 2	ADR NO. SEE APPLICABLE P&ID REV.	
INSULATION THK.	SEE NOTE 2		SEISMIC CAT. SC-IV

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A106-B, SMLS, STD WT, BBE	6	117'0"	PPPCH2050104

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE OUTER JACKET SEE SHEET 005 FOR INNER CORE

Reviewed
No Comments
By: Christine Chang - ichang2
Org Name: Pipe Stress & Support-Reston
Placed: May 13, 2016, 1:32 pm

R11777067

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/18/16	ISSUED FOR CONSTRUCTION		KK		SH	MC

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

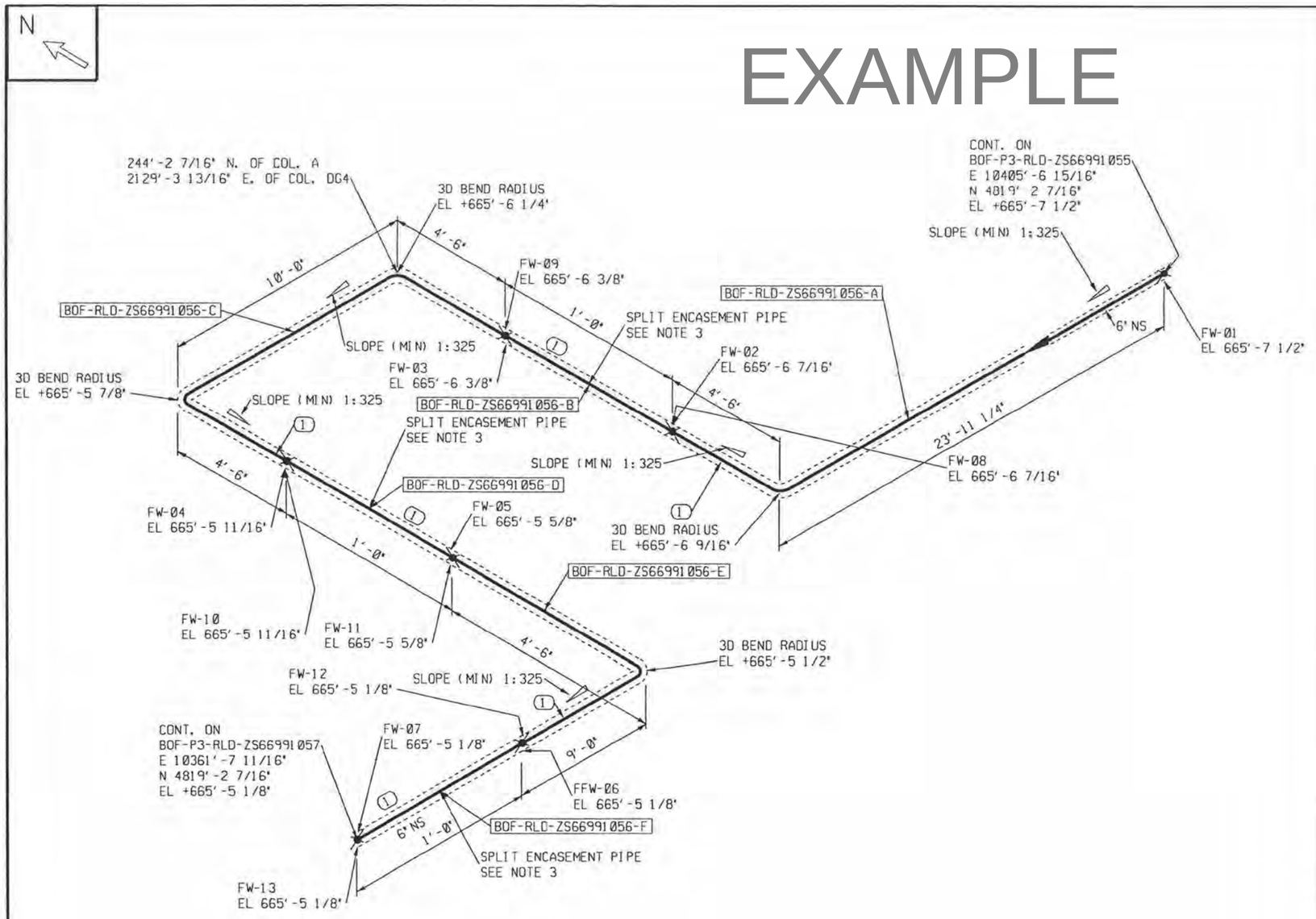
LINE No. RLD-ZS-66991-W31A-6 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991055 | REV 0

ISO TYPE: BOF_xFINAL c:\work\mmuhi\dms06947\24590-BOF-P3-RLD-ZS66991055.DGN

LENGTH (FT.)117.00 (FOR INFO ONLY) JSM Created: MAY-12-2016 07:26 Iso Created: MAY-12-2016 07:27 PCF File: 24590-BOF-P3-RLD-ZS66991055 PLOTTED BY:mmuhi PLOT DATE: 5/12/2016 8:14:00 AM SHT. 1 OF 1

EXAMPLE



SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A106-B, SMLS, STD WT, BBE	6	52'0"	PPPCH2050104
2	PIPE, A106-B, SMLS, STD WT, BBE	6	9'5"	PPPCH2050104

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE OUTER JACKET SEE SHEET 006 FOR INNER CORE

Reviewed
No Comments
By: Christine Chang - tchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 17, 2016, 1:21 pm

R11777068

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/8/16	ISSUED FOR CONSTRUCTION	TF	KK		SH	MK

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-6 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991056 | REV 0

NOTES:

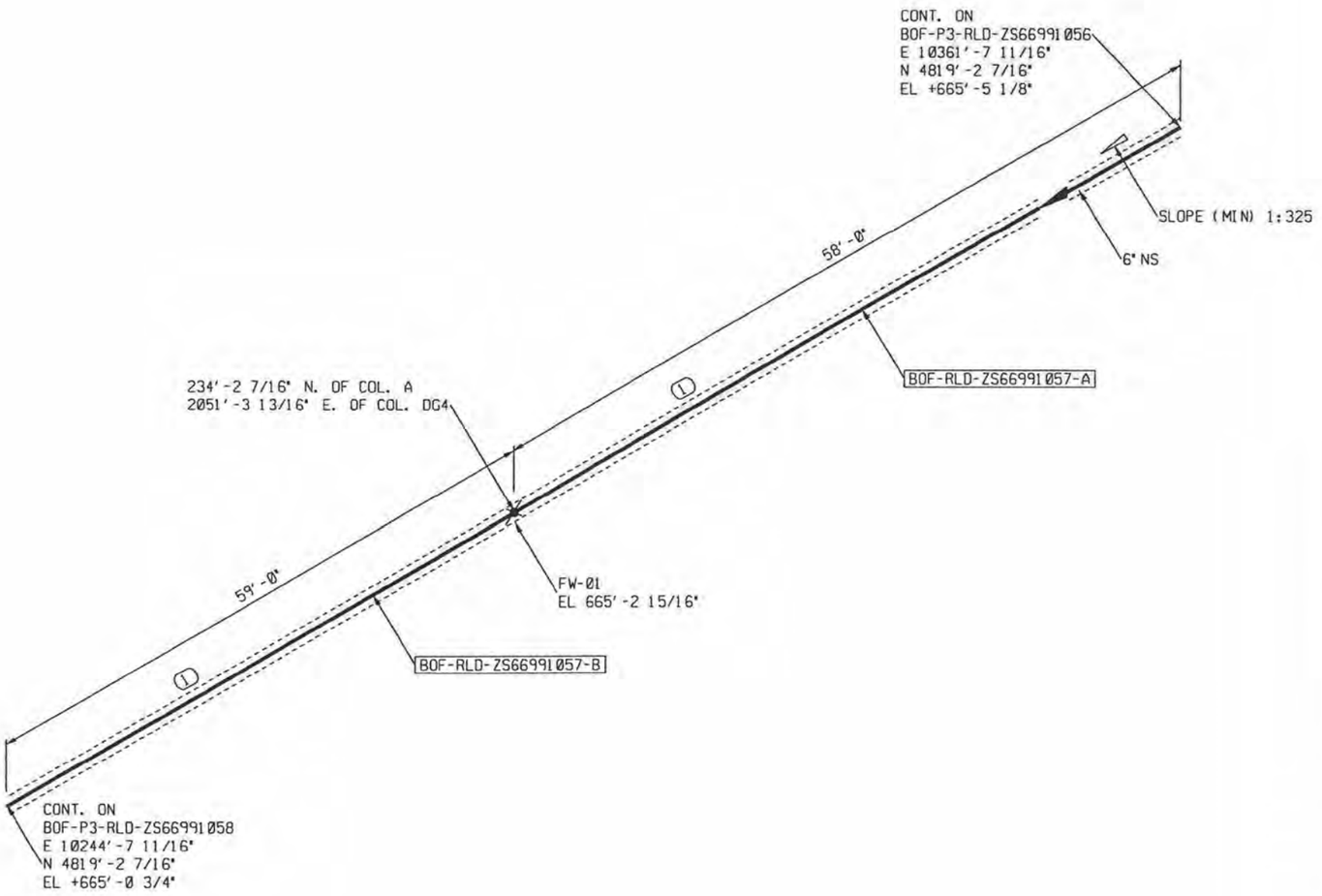
1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.
2. FOR ALL COATINGS, INSULATION AND HDPE REQUIREMENTS REFER TO SECTION 5 OF 24590-WTP-3PS-PX04-T0002.
3. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

ISSUED BY
RPP-WTP PDC

DIRECT FEED LAW SCOPE

CM QUALITY LEVEL

PAINT CODE	SEE NOTE 2	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO	
INSULATION TYPE	SEE NOTE 2	ADR NO. SEE APPLICABLE P&ID REV.	
INSULATION THK.	SEE NOTE 2	SEISMIC CAT.	SC-IV



SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A106-B, SMLS, STD WT, BBE	6	117'0"	PPPCH2050104

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE OUTER JACKET SEE SHEET 007 FOR INNER CORE

Reviewed
No Comments
By: Christine Chang - tchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 13, 2016, 1:32 pm

R11777069

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/10/16	ISSUED FOR CONSTRUCTION	KF	KK		SH	JMC

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-6 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991057 | REV 0

NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-PO-50-00001001.
2. FOR ALL COATINGS, INSULATION AND HDPE REQUIREMENTS REFER TO SECTION 5 OF 24590-WTP-3PS-PX04-T0002.
3. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

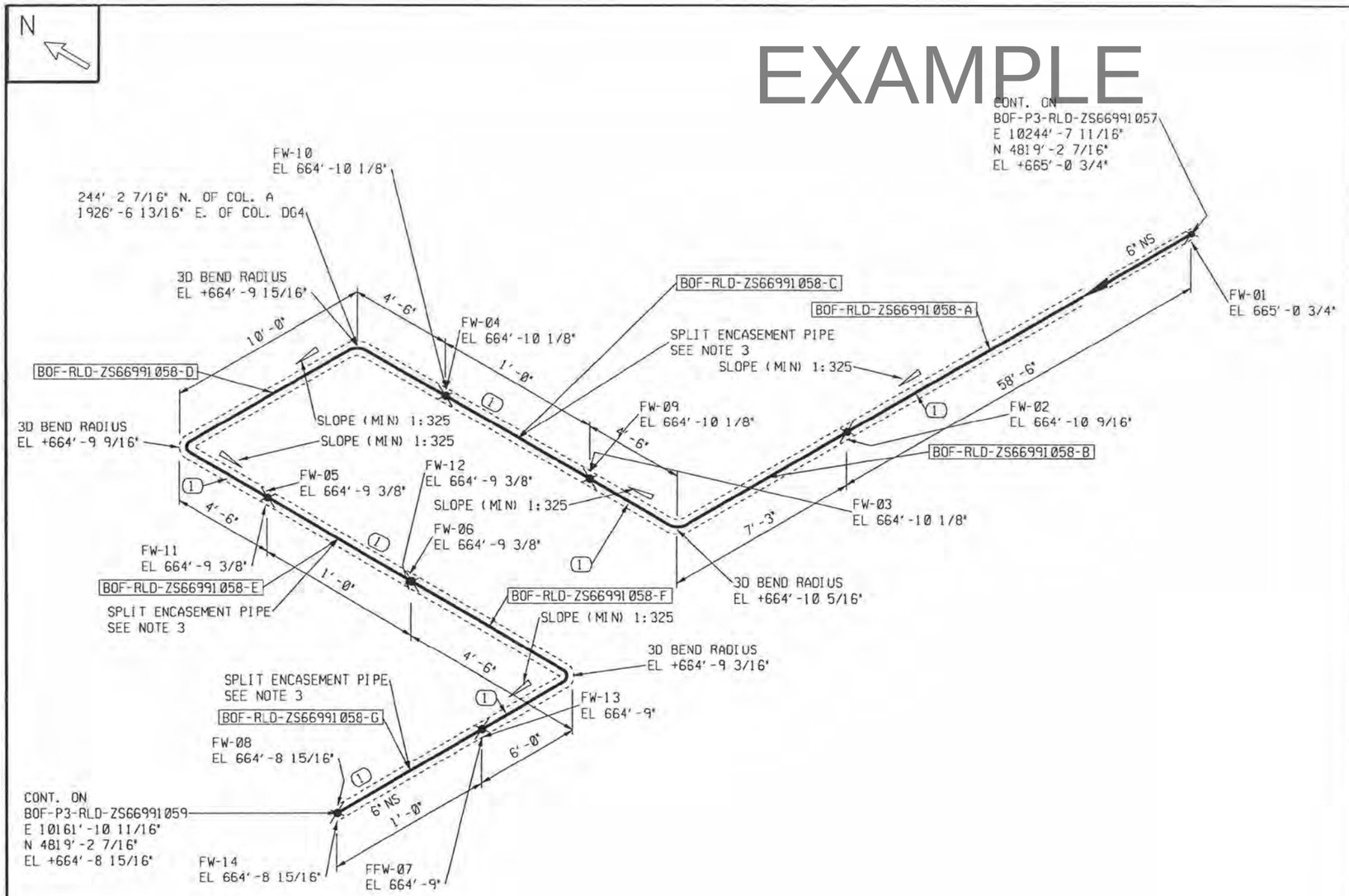
ISSUED BY
RPP-WTP PDC

DIRECT FEED LAW SCOPE

CM QUALITY LEVEL

PAINT CODE	SEE NOTE 2	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO			
INSULATION TYPE	SEE NOTE 2	ADR NO. SEE APPLICABLE P&ID	REV.		
INSULATION THK.	SEE NOTE 2		SEISMIC CAT.	SC-IV	

ISO TYPE: BOF_xFINAL c:\work\mmuhi\dms06947\24590-BOF-P3-RLD-ZS66991057.DGN



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.
2. FOR ALL COATINGS, INSULATION AND HDPE REQUIREMENTS REFER TO SECTION 5 OF 24590-WTP-3PS-PX04-T0002.
3. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

ISSUED BY
RPP-WTP PDC

DIRECT FEED LAW SCOPE

PAINT CODE	SEE NOTE 2	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO			
INSULATION TYPE	SEE NOTE 2	ADR NO. SEE APPLICABLE P&ID REV.			
INSULATION THK.	SEE NOTE 2		SEISMIC CAT.	SC-IV	

CM QUALITY LEVEL

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A106-B, SMLS, STD WT, BBE	6	90'9"	PPPCH2050104
2	PIPE, A106-B, SMLS, STD WT, BBE	6	9'5"	PPPCH2050104

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE OUTER JACKET SEE SHEET 008 FOR INNER CORE

Reviewed
No Comments
By: Christine Chang - lchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 17, 2016, 1:21 pm

R11777070

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/18/16	ISSUED FOR CONSTRUCTION	TF	KK		SH	SH

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

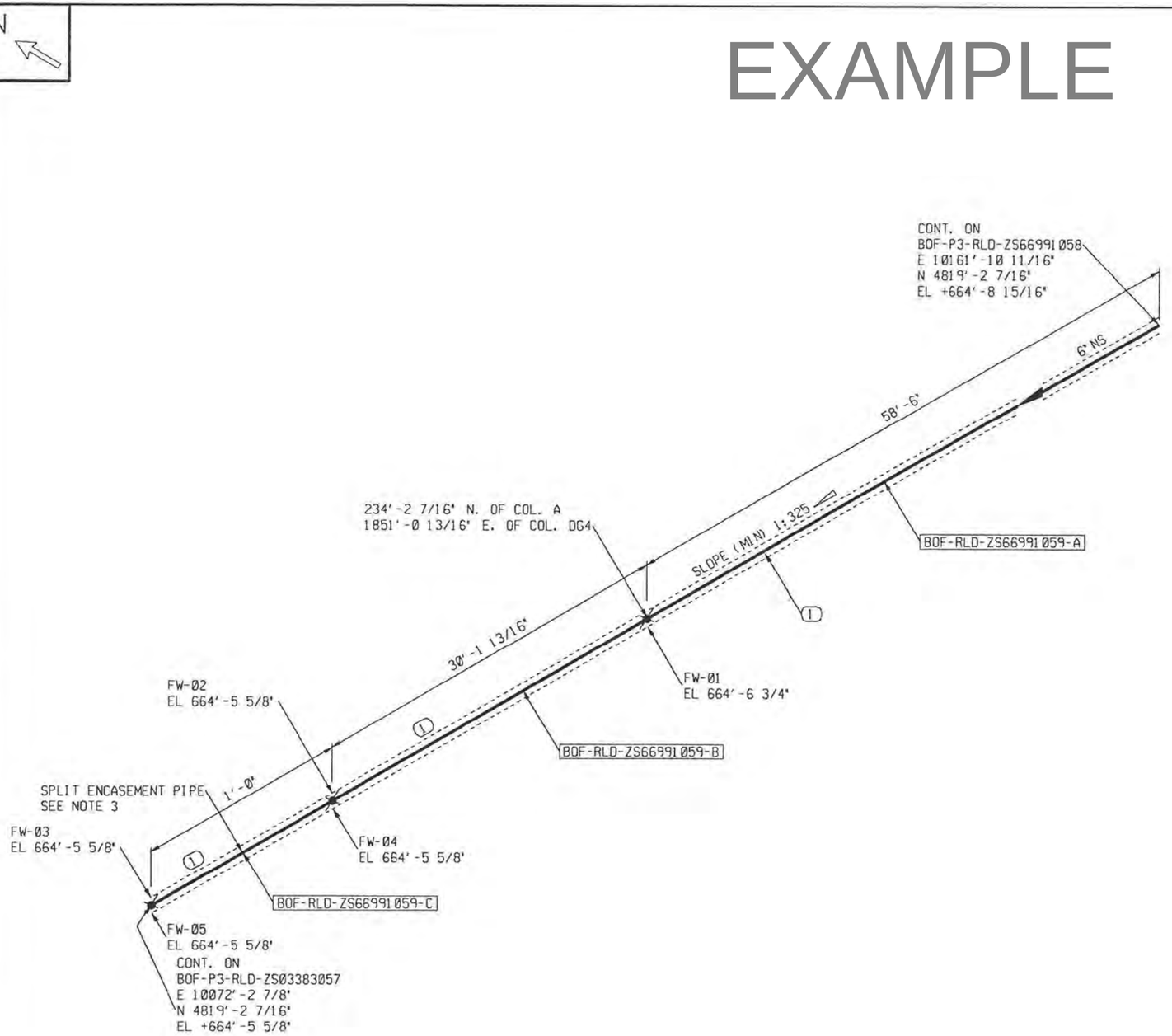
LINE No. RLD-ZS-66991-W31A-6 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991058 | REV 0

LENGTH (FT.)102.75 (FOR INFO ONLY) JSM Created: MAY-16-2016 11:07 Iso Created: MAY-16-2016 11:08 PCF File: 24590-BOF-P3-RLD-ZS66991058 PLOTTED BY: wjengel PLOT DATE: 5/16/2016 1:04:53 PM SHT. 1 OF 1

ISO TYPE: BOF_xFINAL C:\Users\wjengel\Desktop\temp\24590-BOF-P3-RLD-ZS66991058.DGN

EXAMPLE



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.
2. FOR ALL COATINGS, INSULATION AND HDPE REQUIREMENTS REFER TO SECTION 5 OF 24590-WTP-3PS-PX04-T0002.
3. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A106-B, SMLS, STD WT, BBE	6	89'8"	PPPCH2050104

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

DOUBLE CONTAINED PIPE OUTER JACKET SEE SHEET 009 FOR INNER CORE

Reviewed
No Comments
By: Christine Chang - tchang2
Org Name: Pipe Stress & Support-Reston
Placed: May 17, 2016, 1:22 pm

R11777071

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
0	5/18/16	ISSUED FOR CONSTRUCTION	TF	KK		SH	JM

REVISION HISTORY

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-PTF-M6-PWD-00058002 | CONST. WORK AREA: 03A

BALANCE OF FACILITIES ISOMETRIC

LINE No. RLD-ZS-66991-W31A-6 | PIPE SPEC: W31A

DWG No. 24590-BOF-P3-RLD-ZS66991059 | REV 0

ISSUED BY
RPP-WTP PDC

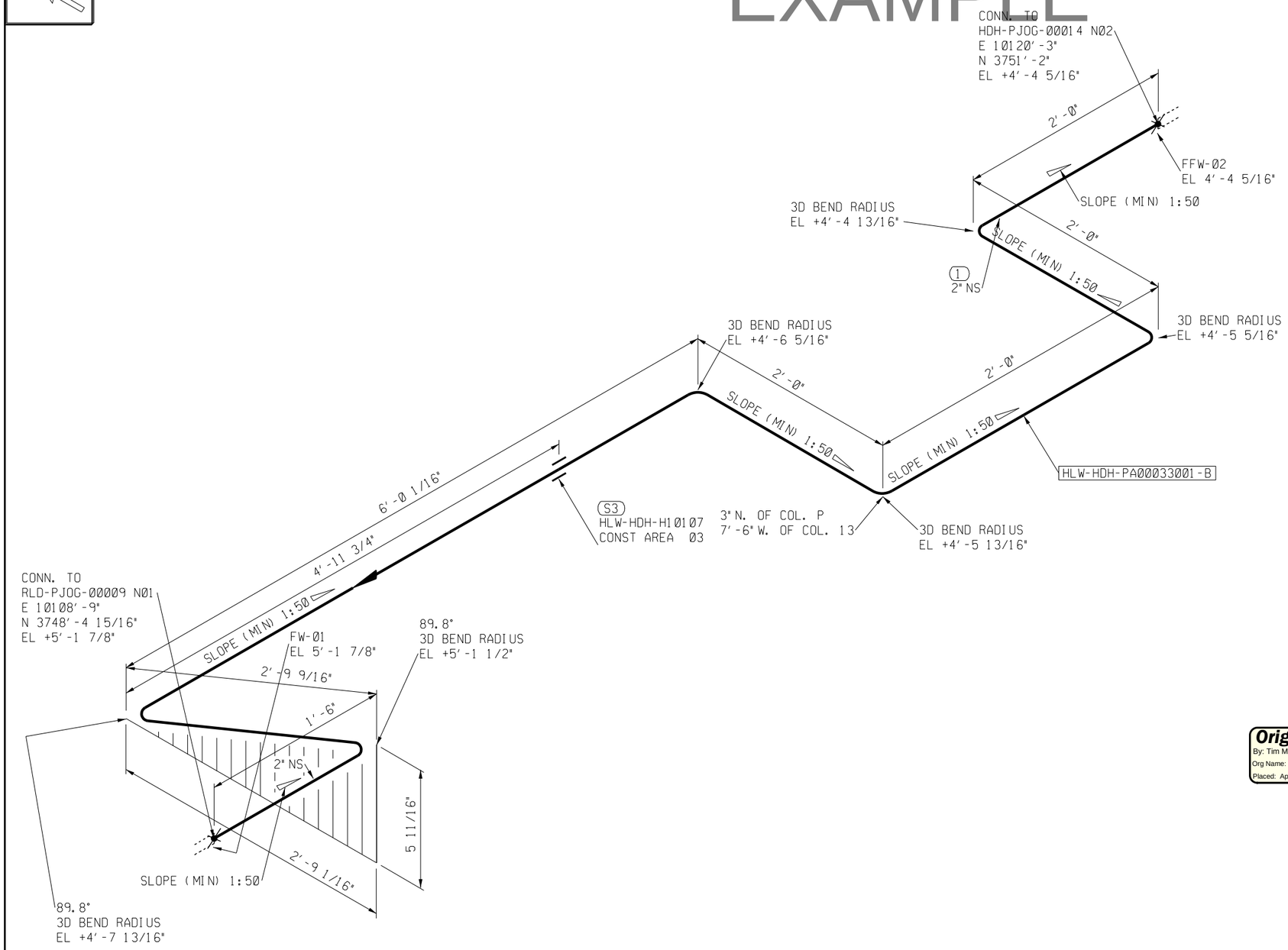
DIRECT FEED LAW SCOPE

CM QUALITY LEVEL

PAINT CODE	SEE NOTE 2	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO		
INSULATION TYPE	SEE NOTE 2	ADR NO. SEE APPLICABLE P&ID REV.		
INSULATION THK.	SEE NOTE 2		SEISMIC CAT.	SC-IV

N

EXAMPLE



SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	2	12'4"	PPPC0B0G0X00
2	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	2	4'9"	PPPC0B0G0X00

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
3	PIPE SUPT, HLW-HDH-H10107, WELDED PIPE ATTCHMT		1	

DOUBLE CONTAINED PIPE INNER CORE SEE SHEET 051 FOR OUTER JACKET

PLACE SPOOL A IN DRM

NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.
2. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

REV 1 NOTE:
INCORPORATED 24590-WTP-EIE-MS-14-0003 REV.0
COMPLETE REV., CHANGES NOT IDENTIFIED

Originator	Checked	Reviewed No Comments	Reviewed No Comments
By: Tim McGee - tamcgee	By: Scott Sheldon - dssheldo	By: Chi-Kei Fan - cfan	By: Les Leyland - LALEYLAN
Org Name: Plant Design	Org Name: HLW Plant Design	Org Name: Plant Design	Org Name: Plant Design
Placed: Apr 23, 2021	Placed: Apr 26, 2021	Placed: May 07, 2021	Placed: Apr 26, 2021

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
1	5-11-21	SEE REV. 1 NOTE					JMC
0	9/16/10	ISSUED FOR CONSTRUCTION	RP	ZB	KM	LHS	PM

REVISION HISTORY

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-HLW-M6-HDH-00002002 | CONST. WORK AREA: 03

HLW VITRIFICATION BUILDING ISOMETRIC

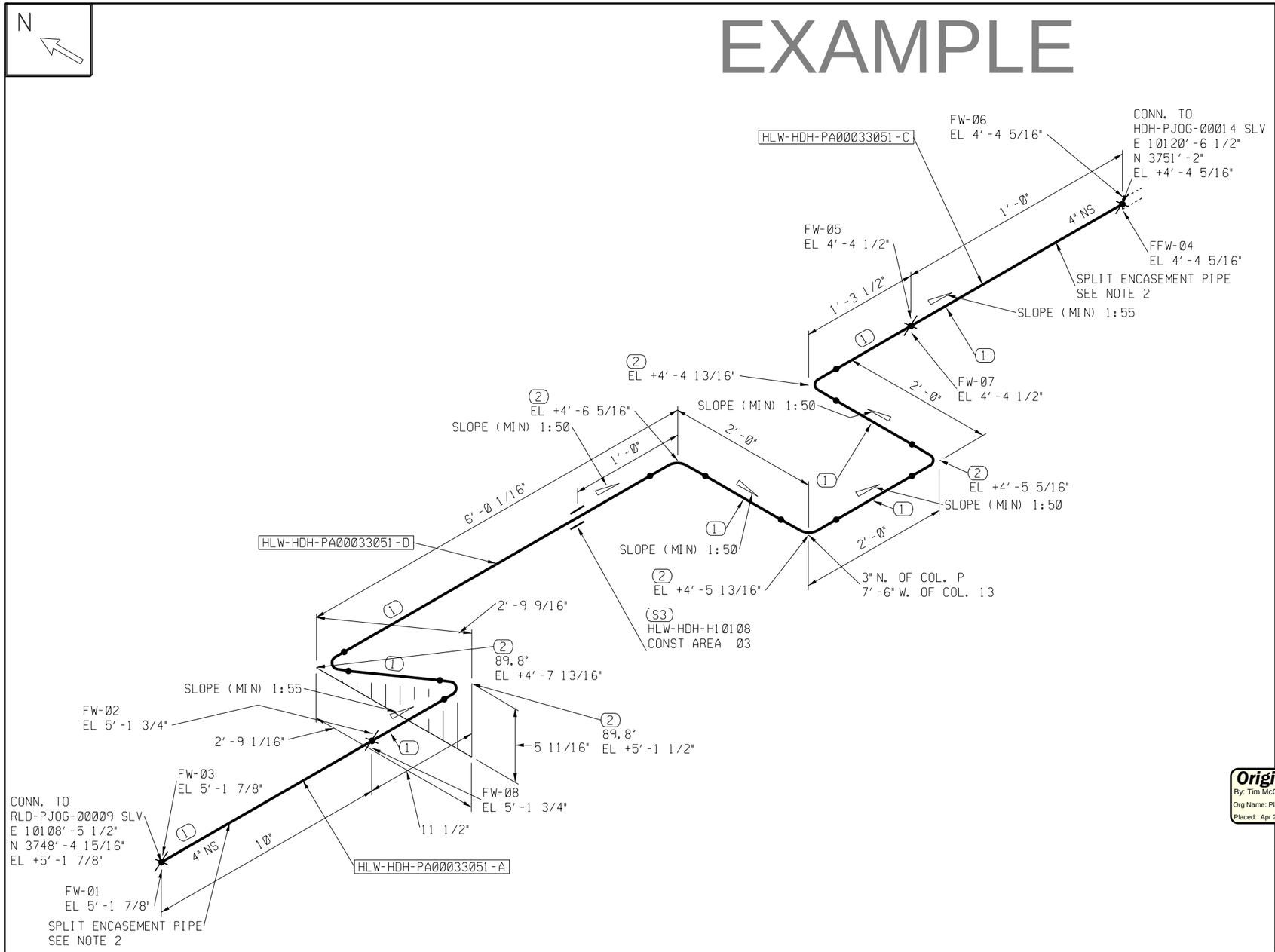
LINE No. HDH-PA-00033-W31A-2 | PIPE SPEC: W31A

DWG No. 24590-HLW-P3-HDH-PA00033001 | REV 1

CM QUALITY LEVEL

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO	
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID REV.	
INSULATION THK.	0	SEISMIC CAT.	SC-III

EXAMPLE



SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	4	12'11"	PPPC0B0G0X03
	FITTINGS			
2	EL - 90, LR, BW, A403WP316/316L-S, SCH40S	4	6	PFQNV60G160H

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
3	PIPE SUPT, HLW-HDH-H10108		1	

DOUBLE CONTAINED PIPE OUTER JACKET SEE SHEET 001 FOR INNER CORE

PLACE SPOOL B IN DRM SHOP TO PROVIDE SPOOL D ONLY

REV 1 NOTE:
INCORPORATED 24590-WTP-EIE-MS-14-0003 REV.0
COMPLETE REV., CHANGES NOT IDENTIFIED

Originator	Checked	Reviewed No Comments	Reviewed No Comments
By: Tim McGee - tamcgee	By: Scott Sheldon - dssheldo	By: Chi-Kei Fan - cfan	By: Les Leyland - LALEYLAN
Org Name: Plant Design	Org Name: HLW Plant Design	Org Name: Plant Design	Org Name: Plant Design
Placed: Apr 27, 2021	Placed: Apr 27, 2021	Placed: May 26, 2021	Placed: Apr 27, 2021

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
1	5-26-21	SEE REV 1 NOTE					JMc
0	9/16/10	ISSUED FOR CONSTRUCTION	RP	ZB	KM	LHS	PM

REVISION HISTORY

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-HLW-M6-HDH-00002002 | CONST. WORK AREA: 03

HLW VITRIFICATION BUILDING ISOMETRIC

LINE No. HDH-PA-00033-W31A-4 | PIPE SPEC: W31A

DWG No. 24590-HLW-P3-HDH-PA00033051 | REV 1

NOTES:

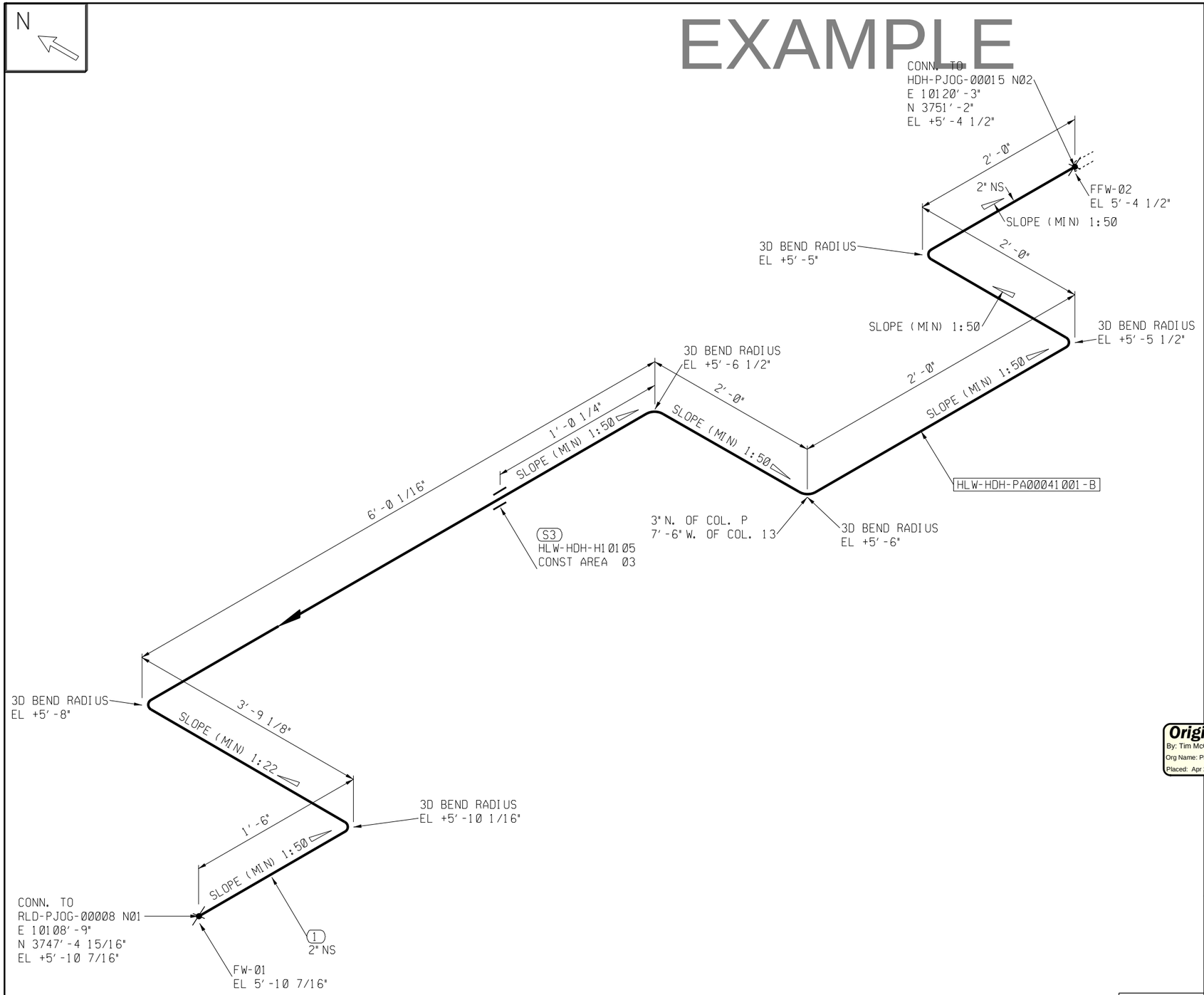
1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.
2. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

CM QUALITY LEVEL

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO		
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID REV.		
INSULATION THK.	0		SEISMIC CAT.	SC-III

EXAMPLE



NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.
2. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	2	13'4"	PPPC0B0G0X00
2	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	2	4'9"	PPPC0B0G0X00

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
3	PIPE SUPT, HLW-HDH-H10105, WELDED PIPE ATTCHMT		1	

DOUBLE CONTAINED PIPE INNER CORE SEE SHEET 051 FOR OUTER JACKET

PLACE SPOOL A IN DRM

REV 1 NOTE:
INCORPORATED 24590-WTP-EIE-MS-14-0003 REV.0
COMPLETE REV., CHANGES NOT IDENTIFIED

Originator	Checked	Reviewed No Comments	Reviewed No Comments
By: Tim McGee - tamcgee	By: Scott Sheldon - dssheldo	By: Chi-Kei Fan - cfan	By: Les Leyland - LALEYLAN
Org Name: Plant Design	Org Name: HLW Plant Design	Org Name: Plant Design	Org Name: Plant Design
Placed: Apr 23, 2021	Placed: Apr 26, 2021	Placed: May 07, 2021	Placed: Apr 27, 2021

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
1	5-11-22	SEE REV 1 NOTE					JMc
0	9/16/10	ISSUED FOR CONSTRUCTION	RP	ZB	KM	LHS	PM

REVISION HISTORY

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-HLW-M6-HDH-00002002 | CONST. WORK AREA: 03

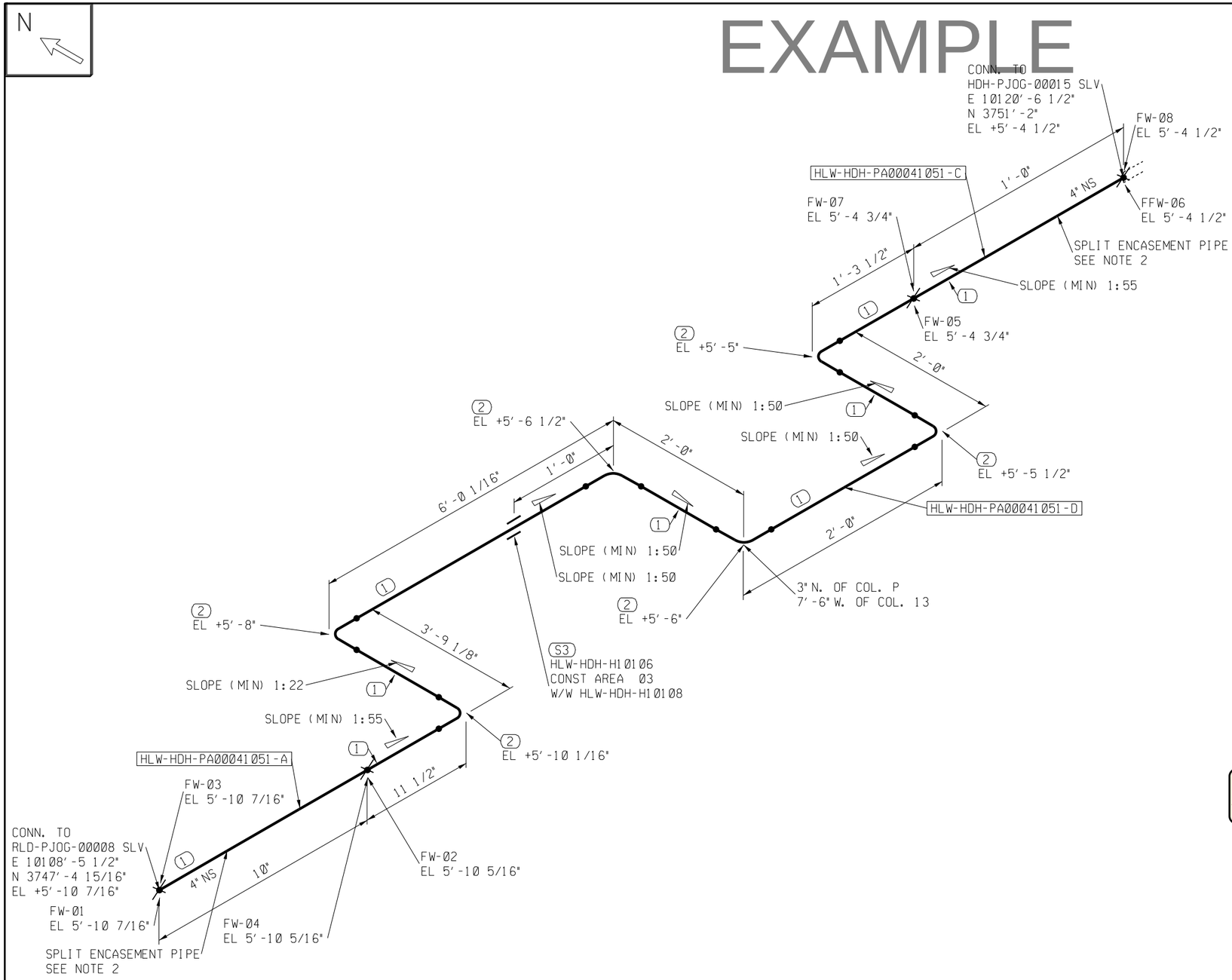
HLW VITRIFICATION BUILDING ISOMETRIC

LINE No. HDH-PA-00041-W31A-2 | PIPE SPEC: W31A

DWG No. 24590-HLW-P3-HDH-PA00041001 | REV 1

CM QUALITY LEVEL

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO	
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID REV.	
INSULATION THK.	0		SEISMIC CAT. SC-III



SHOP MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	PIPE			
1	PIPE, A312TP316/316L, SMLS, SCH40S, BBE	4	13'11"	PPPC0B0G0X03
	FITTINGS			
2	EL - 90, LR, BW, A403WP316/316L-S, SCH40S	4	6	PFQNV60G160H

FIELD MATERIALS

PART NO	COMPONENT DESCRIPTION	N.S. (INCHES)	QTY	BECHTEL STK CODE
	SUPPORTS			
3	PIPE SUPT, GU-G-4		1	

DOUBLE CONTAINED PIPE OUTER JACKET SEE SHEET 001 FOR INNER CORE

PLACE SPOOL B IN DRM SHOP TO FABRICATE SPOOL D ONLY

REV 1 NOTE:
INCORPORATED 24590-WTP-EIE-MS-14-0003 REV.0
COMPLETE REV., CHANGES NOT IDENTIFIED

Originator	Checked	Reviewed No Comments	Reviewed No Comments
By: Tim McGee - tamcgee	By: Scott Sheldon - dssheldo	By: Chi-Kei Fan - cfan	By: Les Leyland - LALEYLAN
Org Name: Plant Design	Org Name: HLW Plant Design	Org Name: Plant Design	Org Name: Plant Design
Placed: Apr 26, 2021	Placed: Apr 26, 2021	Placed: May 07, 2021	Placed: Apr 27, 2021

REV	DATE	DESCRIPTION	DRN	CHKD	STRESS	RVWD	APVD
1	5-11-21	SEE REV 1 NOTE					JMc
0	9/16/10	ISSUED FOR CONSTRUCTION	RP	ZB	KM	LHS	PM

REVISION HISTORY

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID: 24590-HLW-M6-HDH-00002002 | CONST. WORK AREA: 03

HLW VITRIFICATION BUILDING ISOMETRIC

LINE No. HDH-PA-00041-W31A-4 | PIPE SPEC: W31A

DWG No. 24590-HLW-P3-HDH-PA00041051 | REV 1

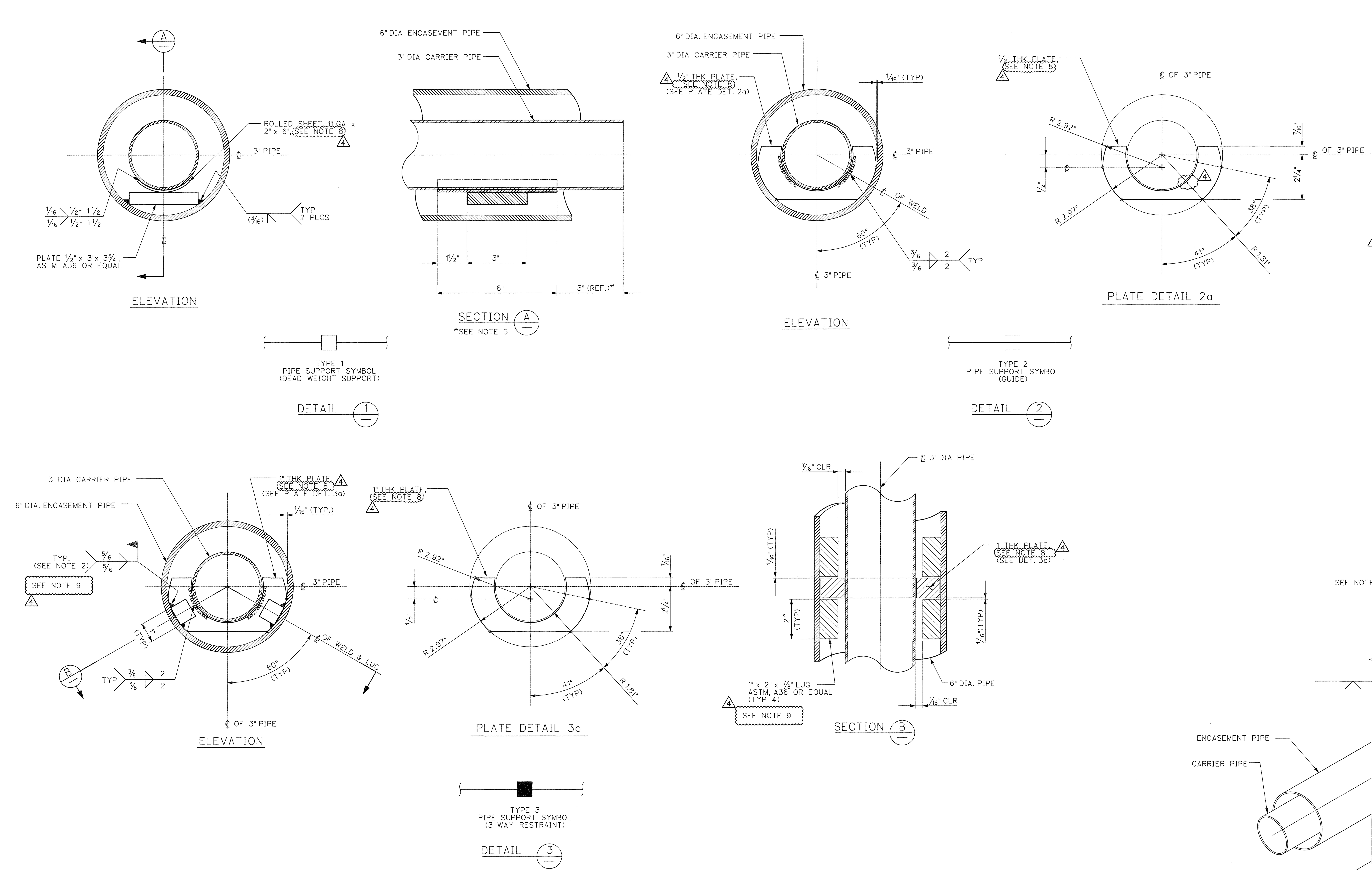
NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE DWG. 24590-WTP-P0-50-00001001.
2. SEE 24590-BOF-PH-P33T-00001 FOR DUAL CONTAINED PIPE FABRICATION DETAILS.

CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING

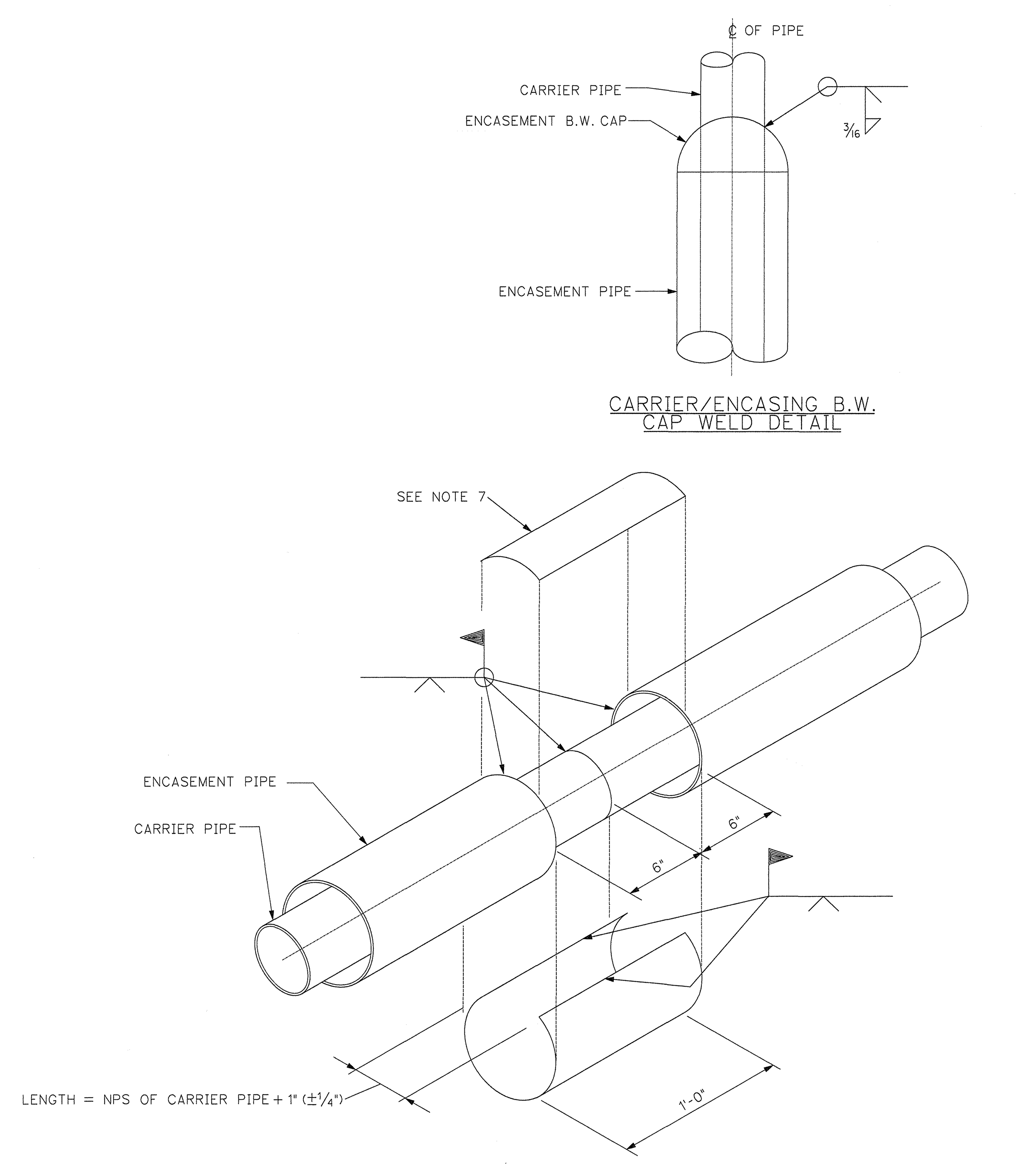
CM QUALITY LEVEL

PAINT CODE	N/A	CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO		
INSULATION TYPE	NI	ADR NO. SEE APPLICABLE P&ID REV.		
INSULATION THK.	0		SEISMIC CAT.	SC-III



NOTES:

1. ALL DIMENSIONS ARE IN INCHES.
2. HOLD BACK WELD FOR LUG (DETAIL 3) AND GRIND ANY EXCESS WELD TO ACHIEVE THE 1/16" GAP BETWEEN LUG AND PLATE.
3. FABRICATION TOLERANCE FOR COAXIAL PIPE SUPPORT SHALL BE IN ACCORDANCE WITH MSS-SP-89.
4. ALLOW TO ROTATE ±15° TOLERANCE FOR INTERNAL CO-AXIAL TYPE 2 SUPPORTS.
5. FOR ISOMETRICS WITH DFLAW SCOPE, THE LENGTH OF THE ROLLED SHEET (11 GAUGE STEEL) IS TO BE 30" AND CENTERED ON THE 1/2" PLATE STEEL. INSTANCES WHERE THE 30" PLATE ENCROACHES ON THE CARRIER PIPE FIELD WELD OR BEND RADIUS, THE DETAIL 1 SUPPORT IS TO BE INSTALLED TO ALLOW 3" (NOMINAL) CLEARANCE AWAY FROM THE CARRIER PIPE FIELD WELD OR BEND RADIUS.
6. FOR ISOMETRICS WITH DFLAW SCOPE, SEE 24590-BOF-CS-80-00152 FOR COATING FIELD HDPE/INSULATION.
7. FOR ISOMETRICS WITH DFLAW SCOPE, THIS PORTION OF THE ENCASEMENT PIPE IS TO BE ABOVE THE CARRIER PIPE WHEN THE PIPING IS INSTALLED IN THE HORIZONTAL POSITION.
8. MATERIAL WELDED TO PIPE SHALL BE SAME MATERIAL AS PIPE OR EQUAL. FOR STAINLESS STEEL PIPE USE A240 GR. TP 304L, FOR HASTALLOY PIPE B619 (N06022) USE B575 (N06022) AND FOR B675 (N08367CL1) USE B688 (N08367).
9. FOR ISOMETRICS WITH DFLAW SCOPE, THE LENGTH OF THE 1" x 7/8" LUG MAY BE INCREASED FROM 2" TO 3" TO FACILITATE FABRICATION. MINIMUM 2" LUG WELD LENGTH IS REQUIRED.



TYPICAL SPLIT ENCASEMENT (SAW CUT)

SCALE: NONE
SEE NOTE 6

Originator — By: Dilip Gheewala - dhgheewa; Org Name: Plant Design; Placed: May 09, 2017
Checked — By: suresh shah - sshah; Org Name: Bechtel; Placed: May 09, 2017
Reviewed No Comments — By: Christine Chang - lchang2; Org Name: Pipe Stress & Support - Reston; Placed: May 10, 2017

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
4	ADDED NOTES 8 & 9 AND REVISED AS NOTED				210	5/31/17
3	REVISED DETAIL 1, TYPICAL SPLIT ENCASEMENT (SAW CUT), AND ADDED NOTES 5, 6, 7, AND CAP WELD DETAIL. REMOVED NORTH ARROW.	MA	YK	TMT	RO	06/01/16
2	ADDED NOTE 4 PER 24590-WTP-NCR-CON-05-0346	VKD	NAA	AJM	KM	3/23/06
1	ISSUE FOR CONSTRUCTION UPDATED WITH FABRICATION INFORMATION INCORPORATED DCN 24590-BOF-PHN-P33T-00001	JW	CU	WS	MM	9/18/03
0	ISSUED FOR FABRICATION	IT	AC	WL	MM	05/11/03

REVISION HISTORY

Q
QUALITY DESIGNATOR

ISSUED BY RPP-WTP PDC
ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	200A

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

	BY	DATE
ORIGINATOR	I.TROYANOVSKY	05/08/03
CHECKER	A.CHOW	05/08/03
APPROVER	M.MYATT	05/11/03
REVIEWER	W.LOWE	05/08/03

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-PTF-ADR-M-02-004 REV: 0
N/A

PIPE SUPPORT AND FABRICATION DETAILS

SCALE: NONE
24590-BOF-PH-P33T-00001
REV 4

'E' SIZE - 44x34
COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

R11836153

5/9/2017 2:39:05 PM

FORM E_SDN.DGN 02/2009

PLOTTED BY: dhgheewa K:\PPE SUPPORT AND FABRICATION DETAILS\24590-BOF-PH-P33T-00001_4.dgn

GENERAL NOTES

1. GENERIC SYMBOLS AS SHOWN ON THIS DRAWING ARE APPLICABLE FOR ALL BUILDINGS.
2. BASED ON RPP-WTP SITE GENERAL ARRANGEMENT PLAN (24590-BOF-C2-C12T-00002), 1ST FLOOR ELEVATIONS(FT.): PTF = 678'-0" HLW = 682'-0" LAW = 681'-0" LAB = 677'-0"
3. DELETED
4. FOR PIPING SPECS. S11E, S11B, W11B, AND S32B THE SUBSTITUTION OF STUB-INS FOR LATERALS ARE NOT PERMITTED FOR ANY LABORATORY PIPING SYSTEM UNLESS SPECIFIED ON THE ISOMETRIC.
5. DELETED
6. SEE 24590-WTP-PW-P30T-00001 FOR FIELD WELD FABRICATION REQUIREMENTS FOR BUTT WELDS UNLESS NOTED OTHERWISE ON THE ISOMETRIC. THIS DRAWING DOES NOT APPLY WHEN THE BUTT WELD IS AT A FITTING, eg. ELL, REDUCER, TEE, IN LINE VALVE, ETC.
7. TO ACCOMMODATE FOR FIELD FIT-UP REQUIREMENTS THE SHOP SPOOL FABRICATOR IS TO ADD 6" TO THE DIMENSION SHOWN FOR ONLY ONE OF THE TWO SPOOLS THAT MAKE UP THE JOINT. THE SPOOL WITH THE ADDITIONAL 6" SHALL HAVE A PLAIN END FOR THE FIELD TO PREP AS REQUIRED, DESIGNATED AS FFW-XX. WHERE SPOOLS ARE SHIPPED WITH BEVELED ENDS, FIELD MAY UTILIZE OR REMOVE WHEN NECESSARY.
8. MULTI SHEET ISOS ARE USED IN CASES WHERE A SINGLE SPOOL CAN NOT BE SHOWN ON ONE SHEET. THESE HAVE A SHEET NUMBER SUCH AS 101 OR 201 INSTEAD OF THE STANDARD 001 OR 002. THESE ISOMETRICS WILL HAVE A REFERENCE ISO INDEX AND THE STATEMENT "MULTI SHEET ISO" SHOWN ABOVE THE TITLE BLOCK ON EACH SHEET OF THE MULTI-SHEET ISOMETRIC SERIES. THERE IS NO WELD JOINT AT THE DRAWING CONTINUATION REFERENCE POINT(S) OF A PARTIAL SPOOL THAT IS SHOWN ON A MULTI-SHEET ISOMETRIC. EXAMPLE: NO WELD BETWEEN SHEET 101 AND 201. A SPOOL PIECE MARK WILL BE SHOWN ONLY ON THE FIRST SHEET OF THE MULTI-SHEET ISOMETRICS. THIS NOTE IS NOT RETROACTIVE. ISSUED MULTI SHEET ISOS WILL NOT BE REVISED DUE TO REVISIONS OF THIS NOTE.
9. THE DESIGNATION SHOWN ON PIPING ISOMETRICS REQUIRING SLOPE AND INDICATING A MINIMUM (i.e. MIN.) REQUIREMENT, IS INTENDED FOR THE FIELD INSTALLATION AND NOT FOR SHOP FABRICATION OF SPOOLS. THE PIPE SHOP FABRICATOR SHALL BUILD TO THE SLOPE INDICATED ON THE ISOMETRIC.
10. PIPE SPOOL FABRICATORS ARE ALLOWED TO MITER PIPE/AND OR FITTING ENDS ANGULARITY BY A MAXIMUM OF 2 DEGREES TO ACHIEVE SLOPE REQUIREMENTS FOR WELDED CONNECTIONS.
11. ISOMETRIC DRAWINGS REPRESENT THE FINAL INSTALLED CONFIGURATION. WHERE SPOOLS CONTAINING VALVES ARE REQUIRED TO BE FABRICATED AND SHIPPED TO SUPPORT SCHEDULE, CONSTRUCTION MAY CHOOSE TO INSTALL THE VALVES IN THE FIELD. IN THESE CASES, VALVES SHOWN ON THE ISOMETRICS WILL NOT BE INSTALLED BY THE SUPPLIER AND THE PIPE WILL BE SPOOLED THROUGH IN PLACE OF THE VALVE. THE WELDS SHOWN AS SHOP WELDS WILL BE FIELD WELDS IN THESE CASES AND THE VALVES WILL BE FIELD MATERIAL INSTEAD OF SHOP MATERIAL. THIS PROCESS SHALL ONLY BE REQUIRED IF VALVES ARE NOT AT FABRICATORS SHOP. REVISION OF THE ISOMETRICS FOR THESE CASES IS DECIDED ON A CASE BY CASE BASIS. APPROVAL OF SPOOL THROUGH METHODOLOGY WILL BE APPROVED THROUGH THE FACILITY PEM.
12. FOR VENTS AND DRAINS, PRESSURE CONNECTIONS AND TEMPERATURE CONNECTIONS, SEE PIPING ASSEMBLY DETAILS; DOCUMENT NO. 24590-WTP-3PB-P000-T0001.
13. BOTH STANDARD AND ENGINEERED PIPE SUPPORTS ARE TAGGED AND LOCATED IN THE BODY OF THE ISO. THE TAG CORRELATES TO A SPECIFIC LINE ITEM IN THE BILL OF MATERIALS OF THE ISO. THE BILL OF MATERIALS LISTS THE ASSOCIATED STOCK CODE(S) FOR STANDARD SUPPORTS (E.G. GU-E-3-REFER TO STANDARD DETAIL DRAWINGS IN SPECIFICATION 24590-WTP-3PS-PH01-T0002), AND TAG NUMBER FOR ENGINEERED SUPPORTS (E.G.,PTF-FRP-H2516 - SEE DRAWING 24590-PTF-FRP-H2516 REQUIRED FOR THAT ISO. IN SOME INSTANCES, WHERE STANDARD SUPPORTS ARE USED, THE "S.A." AND "P.A." ORIENTATION IS PROVIDED ON THE ISO TO AIDE CONSTRUCTION IN PROPER PLACEMENT OF THE SUPPORT. EXAMPLE: "S.A. IS NORTH AND BELOW "P.A." "S.A." INDICATES SUPPORT ATTACHMENT "P.A." INDICATES PIPE ATTACHMENT
14. WHERE ORIFICE FLANGES ARE SHOWN ON THE ISOMETRIC, SINGLE INSTRUMENT TAPS SHALL BE UTILIZED ON EACH FLANGE IN ACCORDANCE WITH THE PIPING ASSEMBLY DETAILS; DOCUMENT NO. 24590-WTP-3PB-P000-T0001. FOUR TAPS ARE TYPICALLY PROVIDED WITH EACH INDIVIDUAL FLANGE AND ALL PORTS NOT UTILIZED ARE TO HAVE BULL PLUGS INSTALLED BY THE FIELD. THE REQUIRED PLUG AND B31.3 SOCKET WELD SIZE IS PREDICATED ON THE SOCKET WELD SIZE AND THICKNESS OF THE SAME SIZE PIPE LISTED IN THE ASSOCIATED PIPE CLASS SHEET & ISOMETRIC. FOR INSTANCE, FOR A 1/2" BULL PLUG, USE THE 1/2" PIPE WALL THICKNESS WITHIN THE SAME PIPE CLASS TO DETERMINE THE WELD SIZE FOR A 1/2" SOCKET WELD FITTING PER B31.3. ORIFICE TAP ORIENTATION IS TO BE CALLED OUT ON THE ISOMETRIC.
15. DELETED.
16. DELETED
17. FOR PENETRATION NUMBERING SEE DESIGN GUIDE 24590- WTP-GPG-CSA-002.
18. COMPONENT DESCRIPTIONS SHOWN IN THE BILL OF MATERIAL ARE FOR GENERAL INFORMATION ONLY. COMPONENT DESCRIPTIONS SHOWN IN THE BILL OF MATERIALS ARE PROCURED BY THEIR STOCK CODES WITH DETAILED PROCUREMENT DESCRIPTIONS AND REQUIREMENTS GOVERNED BY THE APPROPRIATE PROCUREMENT DOCUMENTS.
19. FOR ALL BUTTERFLY VALVE BOLTING, SEE DOCUMENT 24590-WTP-POX-50-00001. THIS DOCUMENT SHALL SUPERCEDE ALL BOLTING REQUIREMENTS FOR BUTTERFLY VALVES SHOWN ON ISOMETRICS. THIS ALSO APPLIES TO BUTTERFLY VALVES WITH CONTROLLED OPERATORS. PERMANENT BOLTING AND GASKET MATERIALS, SUPPLIED BY THE VENDOR AT PROJECT INTERFACE POINTS, MAY BE USED IN LIEU OF THESE SAME MATERIALS PROVIDED BY AN IFC PIPING ISOMETRIC DWG. THE FIELD SHALL VERIFY SIZE, STRENGTH, MATERIAL TYPE, AND QUALITY LEVEL MEETS OR EXCEEDS THAT DETERMINED BY THE PROJECT PRIOR TO USE. REVISION OF THE ISOMETRICS FOR THESE CASES IS NOT REQUIRED.
20. PAINT CODES "NA", "N/A", "NI", AND "NONE" INDICATE THAT NO COATING IS REQUIRED.
21. THE BOLTING SPECIFIED FOR RELIEF VALVES ON THE ISOS IS SUPERSEDED BY 4.7.3.18 OF 24590-WTP-3PS-PS02-T0003
22. INSTRUMENT VALVES (TAGGED C&I) SIZED ON C&I BOUNDING DIMENSIONS WILL HAVE A FW PLACED ON THE SPOOL ON ONE END OF THE VALVE AND A FFW ON THE SPOOL ON THE OPPOSITE END OF THE VALVE. IN ADDITION IF FLANGED COMPONENT IS USED PLACE NOTE ON ISO TO TACK WELD FLANGE IN PLACE.
23. DIMENSIONAL DATA FROM THE APPLICABLE CODE OR STANDARD AS SPECIFIED BY THE PIPE MATERIAL CLASS FOR THE VALVE CONFIGURATION I.E. GATE, GLOBE, BALL ETC, WILL BE USED WHEN NO BOUNDING DIMENSIONAL DATA IS AVAILABLE FOR VALVES. A FW WILL BE PLACED ON THE SPOOL ON ONE END OF THE VALVE AND A FFW ON THE SPOOL ON THE OPPOSITE END OF THE VALVE. IN ADDITION IF FLANGED COMPONENT IS USED PLACE NOTE ON ISO TO TACK WELD FLANGE IN PLACE.
24. WHERE DESIGNATIONS FOR TP AND PP ARE SHOWN ON PIPING ISOMETRICS, CONSTRUCTION TO INSTALL 1/2-INCH NPT PLUG INTO 1/2-INCH, THREADED BRANCH TO MAINTAIN PRESSURE BOUNDARY. ANY ADDITIONAL FITTINGS TO MAINTAIN SPECIFIED DIMENSIONAL TOLERANCES FOR PIPE INSULATION WILL BE PER ENGINEERING APPROVAL.
25. FOR ALL GASKETS, SEE DOCUMENT 24590-WTP-P0X-50-00003.
26. MATERIAL IS CALLED OUT FOR WIRE MESH CAPS (BIRD SCREEN) PER STOCK CODE ON THE ISOMETRIC DRAWINGS AND FOUND IN THE LONG DESCIPTION OF THE ASSOCIATED PIPE CLASS. TACK WELD BIRD SCREEN A MINIMUM OF APPROXIMATELY 30 DEGREE INTERVALS AROUND THE CIRCUMFERENCE OF THE PIPE.
27. COMPONENTS DOWNSTREAM OF VENT AND DRAIN ISOLATION VALVES ARE QUALITY LEVEL CM UNLESS OTHERWISE NOTED.
28. FOR FIELD FABRICATED CS AND SS PIPING, 3D BENDS DENOTED ON PIPING ISOMETRIC DRAWINGS FOR PIPE SIZES 4" AND LESS, ARE CONSIDERED MINIMUM BEND RADIUS. IT IS ACCEPTABLE TO USE THE NEXT LARGER BEND RADIUS AVAILABLE UP TO, AND INCLUDING, 5D BENDS. ALL OTHER PIPE BEND DIMENSIONAL TOLERANCES SHALL BE MAINTAINED

REV 7 NOTE:
INCORPORATED 24590-WTP-FC-P-11-0319, 24590-WTP-FC-P-12-0080, 24590-WTP-FC-P-13-0398 W/ MODIFICATIONS, 24590-WTP-FC-P-16-0152, 24590-WTP-FC-P-19-1262 REV 0, 24590-WTP-P0N-50-00002, 24590-WTP-P0N-50-00003, 24590-WTP-P0N-50-00005, 24590-WTP-P0N-50-00007 W/ MODIFICATIONS, REVISED NOTES, REFERENCE DRAWINGS, DWG INDEX

DRAWING INDEX

DWG NO	TITLE
24590-WTP-P0-50-00001001	WTP GENERAL NOTES & ISOMETRIC SYMBOL LEGEND
24590-WTP-P0-50-00001002	WTP GENERAL NOTES & ISOMETRIC SYMBOL LEGEND

REFERENCE DRAWINGS

DWG NO	TITLE
24590-WTP-PW-P30T-00001	WTP END PREP DETAIL FOR FIELD BUTT WELDS
24590-WTP-POX-50-00001	BUTTERFLY VALVE BOLTING CHART
24590-WTP-3PS-PS02-T0003	FIELD FABRICATION AND INSTALLATION OF PIPING
24590-WTP-POX-50-00003	GASKET CROSS-REFERENCE LIST
24590-WTP-3PS-PH01-T0002	INSTALLATION OF PIPE SUPPORTS

Originator By: Wes Houlett - dwhoule1 Org Name: Bechtel Placed: Aug 12, 2021

Reviewed No Comments By: Les Leyland - LALEYLAN Org Name: Plant Design Placed: Aug 13, 2021

Checked By: Scott Sheldon - dssheldo Org Name: HLW Plant Design Placed: Aug 12, 2021

ISSUED BY RPP-WTP PDC

DESIGN CHANGES INCORP BY REF	
DOCUMENT NO.	REV.
24590-WTP-FC-P-19-0092	N/A
24590-WTP-SDDR-PL-17-00050	N/A

ISSUE STAMP

CONTRACT No: DE-AC27-01RV14136

CONTENT APPLICABLE TO ALARA? [ ] YES [X] NO
ADR NO. REV:
SAFETY SCREEN REQUIRED? [ ] YES [X] NO E&NS INITIAL IF YES ____

REV	REVISION	ORG	CHKD	RVWD	APVD	DATE
7	SEE REV 7 NOTE				JMc	8-18-21
6	REVISED NOTE 18; ADDED NOTES 21, 22 & 23 & INCORP 24590-WTP-P0X-50-00002	KC	DSS	PM	JLC	12/2/08
0	ISSUED FOR CONSTRUCTION	JFH	WJC	JW	MM	1/21/05

PROJECT No.	24590
SITE:	HANFORD
AREA:	200E
BUILDING No.	N/A
SCALE:	NTS

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

WTP GENERAL NOTES AND ISOMETRIC SYMBOL LEGEND

24590-WTP-P0-50-00001001 REV. 7