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RPP-50408, Rev. 1

INDEPENDENT QUALIFIED REGISTERED PROFESSIONAL ENGINEER INSPECTION/ASSESSMENT PLAN, REV. 0, for 242-A Pump Room Jumper D to 13A

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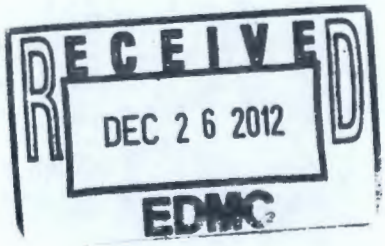
U.S. Department of Energy Contract DE-AC27-08RV14800

EDT/ECN: DRF UC:
Cost Center: Charge Code:
B&R Code: Total Pages: 18 19

JRR 10-15-12

Key Words: IQRPE, 242A Evaporator, Pump Room, D to 13A Jumper



Abstract: Washington Administrative Code 173-303-640 requires the Owners or operators of new tank systems or components obtain a written assessment, reviewed and certified (in accordance with WAC 173-303-810(13)(a)) by an Independent, Qualified Registered Professional Engineer (IQRPE), attesting the system has sufficient structural integrity and is acceptable for the storing/handling or treating of dangerous waste (i.e. an integrity assessment)

APPROVED
By Julia Raymer at 12:50 pm, Oct 15, 2012
Release Approval Date

DATE:
Oct 15, 2012
HANFORD RELEASE
Release Stamp

Approved For Public Release

Attached to:
1218403, 1218404, 1218405,
1218406, 1218407, 1218408, 1218409, 1218410, 1218411,
1218413, 1218414,

Tank Operations Contractor (TOC) **RECORD OF REVISION**	(1) Document Number: **RPP-50408**	Page 1

(2) Title:

INDEPENDENT QUALIFIED REGISTERED PROFESSIONAL ENGINEER INSPECTION/ASSESSMENT PLAN, REV. 1, for 242-A Pump Room Jumper D to 13A

Change Control Record

(3) Revision	(4) Description of Change – Replace, Add, and Delete Pages	Authorized for Release	
		(5) Resp. Engr. (print/sign/date)	(6) Resp. Mgr. (print/sign/date)
1 RS	A complete revision by the IQRPE to add clarity to the document following discussions with Ecology.	Will T. Olson 9/26/2012	Michael J. Sheridan 10.5.12

INDEPENDENT INTEGRITY ASSESSMENT REPORT, REV. 1

For

242-A Evaporator Feed Jumper D-13A Design and Fabrication

September 5, 2012

Prepared By

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For

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Project No. 11-6682

TABLE OF CONTENTS

242-A Evaporator Feed Jumper D-13A Design and Fabrication

1.0 INTRODUCTION

This Integrity Assessment Report on the 242-A Evaporator Feed Jumper D-13A Design and Fabrication was prepared by Meier Architecture • Engineering (Meier) at the request of the Tank Operating Contractor (TOC). WAC 173-303-640 requires the owners or operators of new tank systems or components obtain a written assessment, reviewed and certified (in accordance with WAC 173-303-810(13)(a)) by an independent, qualified, registered professional engineer (IQRPE), attesting the system has sufficient structural integrity and is acceptable for the storing/handling or treating of dangerous waste (i.e. an integrity assessment).

1.1. SYSTEM DESCRIPTION

The 242-A Evaporator is designed to reduce waste volume, which must be stored in Double-Shell Tanks (DST) at Hanford. This function is accomplished by concentrating Hanford tank waste through an evaporation process and returning the concentrated waste to the Hanford DST system. Thus, the 242-A Evaporator System interfaces with the Double Shell Tank (DST) system and must be compatible with the DST system design. The TOC is in the process of preparing a safe and effective system for the modification of the 242-A Evaporator feed piping in order to raise the design pressure of the feed piping and install a coriolis flow meter. Jumper assembly D to 13A has been redesigned to meet this goal. This new configuration requires analysis of the piping and structural supports against current standards.

Shown below in Figure 1 is an isometric view of the overall jumper assembly.

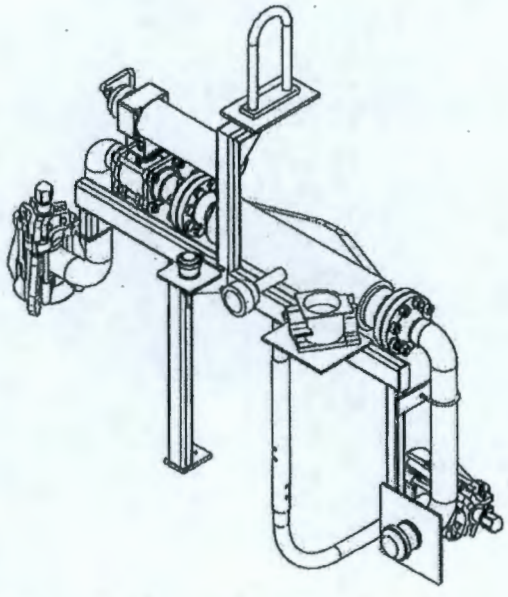


Figure 1: Overall Jumper Assembly

Double-wall containment of the waste is used throughout the system connected to jumper assembly D-13A. The primary containment of the waste is the jumper itself, along with the nozzles. The secondary containment of the waste is the 242-A pump room that the jumper will be installed inside. This type of design provides secondary containment in compliance with WAC 173-303-640(4)(f).

1.2. SCOPE

This Integrity Assessment Report (IAR) is based on an assessment performed in accordance with WAC 173-303-640(3) for the modifications. The components that will or may contain dangerous waste are:

1. The new jumper assembly D-13A.
2. The existing 242-A pump room as secondary containment for the new jumper.
3. The existing DST transfer system which mates with the new system component.
4. The existing 242-A jumpers which mate with the new system component.

This independent assessment takes credit for the following previously issued IQRPE reports: RPP-RPT-33306, *IQRPE Integrity Assessment Report for the 242-A Evaporator Tank System;* RPP-28538 *Volume 1: IQRPE Double-shell Tank System Integrity Assessment HFFACO M-48-14*, which is the main assessment document for the DST Farms and contains the assessment of DSTs, pits and vaults; RPP-25153, *Volume 3: IQRPE DST System Integrity Assessment - Waste Compatibility,* which assesses the compatibility of materials in contact, or potentially in contact with the tank farm's dangerous waste. The scope of this assessment addresses the design and testing of the jumper. This assessment does not repeat assessments performed under RPP-RPT-33306, RPP-28538 or RPP-25153. Additionally, a full corrosion assessment will not be required because the subject component is not directly buried in soil. Chemical corrosion of standard components was addressed in RPP-RPT-33306.

This assessment alone does not include installation, and therefore, does not qualify the jumper as "Fit for Use." An additional IQRPE Installation Assessment Report would be needed to qualify the jumper as "Fit for Use." See Section 2.10.

In order to comply with WAC 173-303-640, the IQRPE or a qualified representative will be on site to assess the various tank systems during the fabrication, installation, and testing processes. Ecology publication number 94-114 *Guidance for Assessing and Certifying Tank Systems that Store and Treat Dangerous Waste* has a list of recommended construction activities that should be inspected. This overall project requires the following construction activities to be inspected:

- Visual inspection and pressure testing
- Installation of piping, pumping, and other ancillary equipment (Future)
- Tightness testing prior to placing tank system in service (Future)

This project does not contain the following construction activities and therefore will not have related inspections:

- Placement of shop-fabricated tanks
- Erection of field-erected tanks Subgrade and foundation preparation
- Placement and compaction of backfill
- Placement of reinforcing steel and anchor bolts
- Concrete placement
- Installation of secondary containment liner or vault
- Installation of cathodic protection systems

The purpose of these inspections is to assure to the IQRPE that the tank systems have been properly fabricated, installed and tested. IQRPE inspections are not required by WAC 173-303-640 but are strongly recommended by Ecology's Guidelines 94-114 and consistent with generally accepted engineering practices.

1.3. COMMENTS ON CERTIFICATION

Section 5.0 contains a certificate attesting to the accuracy of the information presented in this report. The certificate is signed and sealed by Jay Ashbaugh, a Meier Independent Qualified Registered Professional Engineer (IQRPE), in accordance with WAC 173-303-640(3)(a) and WAC 173-303-810 (13)(a).

2.0 DESIGN ASSESSMENT

The systems described above in Section 1.1 and addressed in the following sections, are adequately designed to prevent failure caused by corrosion or by structural loads imposed by the systems intended service, provided operating procedures are maintained to eliminate the trapping of liquid between isolation valves. The system design complies with the requirements of WAC 173-303-640 and is satisfactory in "the foundation, structural support, seams, connections and pressure controls are adequately designed and the tank system has sufficient structural strength, compatibility with the waste(s) to be stored or treated, and corrosion protection to ensure it will not collapse, rupture, or fail." Documents and analyses reviewed below were performed according to generally acceptable engineering practices. Reviewed design documents are referenced in Section 6.0.

2.1.WASTE CHARACTERIZATION

The waste transported in the 242-A Evaporator Feed Jumper D-13A is comprised of the waste in the various DSTs. Listed below in Table 1 and Table 2, taken from RPP-25153, are the principal toxic chemicals for the DST solids and liquids. These are taken to be representative of all DSTs.

Table 1: Principal Toxic Chemicals for Double-Shell Tank Solids

Chemical	Formula	Concentration g/L
Sodium diuranate (solid)	$Na_2U_2O_7$	610
Sodium fluoride	NaF	1132
Silver carbonate	Ag_2CO_3	6.8
Zirconium dioxide	ZrO_2	1268

Sodium beryllium oxide	$Na_2Be_2O_3$	1.3
Lead hydroxide	$Pb(OH)_2$	5.8
Cobalt (II) cobalt (III) oxide	Co_3O_4	2.0
Nickel hydroxide	$Ni(OH)_2$	5.7
Cadmium oxide	CdO	0.4

Table 2: Principal Toxic Chemicals for Double-Shell Tank Liquids

Chemical	Formula	Concentration g/L
Sodium nitrite	$NaNO_2$	223
Sodium hydroxide	NaOH	257
Potassium hydroxide	KOH	21
Sodium nitrate	$NaNO_3$	187
Potassium nitrite	KNO_2	1.9

2.2. POTENTIAL FOR CORROSION

The system is designed to be resistant to the waste material for the design life of the system, approximately 50 years. RPP-RPT-33306 previously assessed the compatibility of the system materials in contact, or potentially in contact with the tank farm's dangerous waste. The standard materials analyzed and approved for service are; carbon steels A537 Class I, A515Gr60, A516Gr65, A53, A106, A312, D2996; stainless steels 304L, ASTM 106; Bronze; Compressed asbestos SBR, graphite; Teflon®[1]; Kynar®[3] Polyether ether ketone (PEEK). As discussed in RPP-25153, the primary containment metals of construction (carbon steel, stainless steel) are resistant to corrosion by a high pH, saturated or unsaturated high hydroxide/nitrite/nitrate salt solution. Secondary containment materials, other than carbon steel and stainless steel, are typically polymer film such as Amercoat®[2] Amerlock 400FD epoxy or polyurea. All materials used in the 242-A Evaporator Feed Jumper D-13A were found to be suitable for service under RPP-25153.

2.3. COATINGS

No new coatings were applied for this modification.

2.4. PRESSURE EFFECTS, JOINING AND LEAK TESTING

Static and dynamic analyses of the 242-A Evaporator Feed Jumper D-13A were conducted under RPP-CALC-48695 using AutoPIPE®[4]. The 242-A Evaporator Feed Jumper D-13A has been designed for adherence to ASME B31.3 piping code, which includes pressure requirements. This calculation applied the ASME B31.3 requirements to the design. Included in the design documents is a B31.3 compliance table. This table describes how the jumper design is acceptable under each B31.3 requirement.

[1] Teflon is a registered trademark of E.I. du Pont de Nemours and Company, Wilmington, Delaware.
[2] Amercoat and Amerlock are products of Ameron International, Pasadena, California.
3 Kynar is a registered trademark of Arkema, Inc., King of Prussia, Pennsylvania
4 AutoPIPE is a registered trademark of SSD, Inc., Berkeley, California

Design conditions taken into account in the calculations were an internal pressure of 400 psi and a design temperature of 200°F with an installation temperature of 40°F which contributed to thermal loads.

Stresses calculated were acceptable per the requirements of ASME B31.3 for each of the materials' basic allowable stress, found in RPP-CALC-48695. The calculations showed the piping had a maximum sustained stress of 5,067 psi, well within the allowable stress of 30,667 psi.

Pressure/Leak testing is conducted after the jumper is fabricated. Section 3.2 addresses inspection and requirements for leak testing.

2.5. SEISMIC AND LOAD EFFECTS

RPP-CALC-48695 applied seismic requirements as well as pressure requirements for the 242-A Pump Jumper C-13. The calculation addresses the structural integrity design of the piping and the dunnage, including lifting stresses. It took into account the weight of the pipe, weight of the contents of the pipe, pressure stress, thermal stress, and PC-2 Seismic Requirements. The 242-A Evaporator Feed Jumper D-13A has been designed for adherence to ASME B31.3 piping code which includes the above seismic and load requirements.

Stresses calculated were acceptable per the requirements of ASME B31.3 for each of the materials' basic allowable stress. The calculations showed the piping had a maximum occasional stress of 11,822 psi, well within the allowable stress of 40,787 psi.

The design and calculations confirmed the system complies with WAC 173-303-640(3)(f) by showing the "ancillary equipment (is) supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction."

2.6. MAINTENANCE

The 242-A Evaporator Feed Jumper D-13A jumper is a standard Hanford DST transfer system rigid jumper with fabrication and testing in accordance with RPP-14541, *Jumper Fabrication and Testing Specification for Tank Farms,* as was addressed in *RPP-28538 Volume 1: IQRPE Double-shell Tank System Integrity Assessment HFFACO M-48-14.* No additional maintenance requirements are necessary for this jumper.

2.7. STORAGE AND HANDLING

The storage and handling procedures for incoming materials are designed to prevent damage, immediate physical or long-term chemical, to the piping and other materials.

2.8. FREEZE PROTECTION

The 242-A Evaporator Feed Jumper D-13A is located indoors in the heated 242-A Evaporator Room therefore no additional freeze protection is necessary beyond that provided within the 242-A facility.

2.9. OFF NORMAL EVENTS

No technical evaluations of off normal events were performed specifically for this jumper. This IQRPE did not identify any potential waste leak paths that were not already mitigated by design.

2.10. OUTLYING ASSESSMENTS

This report does not fully qualify the jumper as "Fit for Use." An IQRPE review is still required to inspect the adequacy of installation efforts. At the time of this review fabrication of the jumper was not fully completed. An IQRPE must assess the completed jumper before installation takes place. This assessment includes but is not limited to: actuator and valve function, component connections, and a final leak test.

3.0 FABRICATION

All independent inspections were performed by Qualified Independent Inspectors (QII) with certifications from the International Code Council, American Welding Society or professional engineers registered in the State of Washington. See Section 6.0 for copies of all certification. All certifications held by the inspectors were current at the time of the inspections. All inspection sheets are included in Section 7.0 on page 15. Each inspection sheet has a Findings/Recommendations/Comments section. This section needs to be acknowledged by a WRPS project representative only if there is an uncorrected finding discovered by the inspector.

The purpose of these inspections was not to provide QA for the Project, but to assure to the IQRPE that the people, process, and product were all in place and performing in an acceptable manner.

3.1. WELDING

The 242-A Evaporator Feed Jumper D-13A was fabricated locally at Parsons Pasco Fabrication Facility. Welding operations were observed and approved by a Certified Weld Inspector. All welds inspected were found to be satisfactory. All welds were also verified for integrity through pressure testing described in Section 3.2. For documentation on IQRPE inspection see inspection sheet 001.

3.2. PRESSURE TESTING

A tightness/pressure test was conducted by Parsons. Fabrication pressure testing inspections were conducted by an independent inspector and approved by an IQRPE or by a certified non-destructive examination inspector. All pressure testing conducted was satisfactory. See inspection sheet 002.

Testing was conducted using hydrostatic or pneumatic methods and according to *RPP-14541, Rev 1, Jumper Fabrication and Testing Specification for Tank Farms*, which conforms to the requirements of ASME B31.3. Test pressures were determined using B31.3 guidelines. For

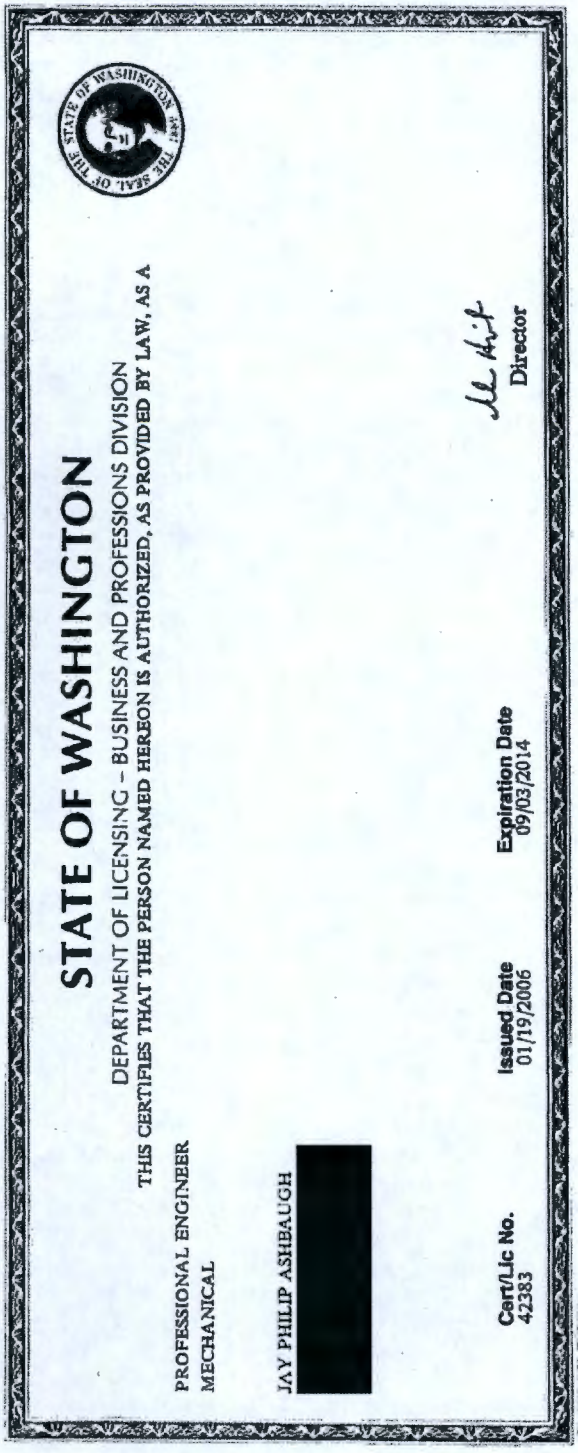
hydrostatic testing, the test pressure must be at least 50% above the design pressure. For pneumatic testing the test pressure must be at least 10% above the design pressure.

4.0 STRUCTURAL INTEGRITY ASSESSMENT CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

9/5/12

5.0 CERTIFICATES



STATE OF WASHINGTON

DEPARTMENT OF LICENSING – BUSINESS AND PROFESSIONS DIVISION

THIS CERTIFIES THAT THE PERSON NAMED HEREON IS AUTHORIZED, AS PROVIDED BY LAW, AS A

PROFESSIONAL ENGINEER
MECHANICAL

JAY PHILIP ASHBAUGH [redacted]

Cert/Lic No. 42383

Issued Date 01/19/2006

Expiration Date 09/03/2014

Director

PL-630-159 (R/2/04)

American Welding Society

Certifies that Welding Inspector

James T Hill

has complied with the requirements of AWS QC1,
Standard for AWS Certification of Welding Inspectors

06110051
CERTIFICATE NUMBER

November 1 2012
EXPIRATION DATE

Victor Y Matthews
PRESIDENT AWS

CHAIR, QUALIFICATION COMMITTEE

CHAIR, CERTIFICATION COMMITTEE

The American Society for Nondestructive Testing, Inc.

Be it known that

Jon D Elliott

has met the established and published Requirements for Certification by ASNT as

NDT Level III

in the following Nondestructive Testing Methods:

Method	Issue Date	Expiration Date
Magnetic Particle	3/07	3/12
Liquid Penetrant	3/07	3/12
Radiographic Testing	3/07	3/12
Ultrasonic Testing	3/07	3/12

24135
Certificate Number

ASNT President

Certification Management Council Chair

This certificate is the property of ASNT and is not official without ASNT's raised gold seal.

6.0 REFERENCES

H-14-107263
RPP-CALC-48695

WAC 173.303 Dangerous Waste Regulations as Amended.

RPP-28538, *Volume 1: IQRPE Double-shell Tank System Integrity Assessment HFFACO M-48-14.*

RPP-25153, *Volume 3: IQRPE DST System Integrity Assessment- Waste Compatibility.*

Ecology Publication 94-111 *Guidance for Assessing and Certifying Tank Systems that Store and Treat Dangerous Waste.*

RPP-14541, *Jumper Fabrication and Testing Specification for Tank Farms.*

7.0 INSPECTION REPORTS

Inspection Sheet 1

001

Cite WAC | Guidance

Tank Systems - Inspection Report

1

Date: 8/26/2011 Time: 1:00 P.M.

Location: 3005 E. Ainsworth St. Pasco, Wa

Inspected By: Jim Hill C.W.I.

(3) | 4

System or Component Inspected:

2

System or Component: 242-A Evaporator Jumper D to 13 A

Inspected For:

3

Items checked below were inspected to ensure compliance with the requirements of WAC 173-303-640, Tank Systems, and the Washington State Department of Ecology, Guidance for Assessing and Certifying Tank Systems that Store and Treat Dangerous Waste and related Codes and Standards

Cite WAC	Cite Guidance		Findings Repaired / Recommendation Dispositioned
			5
		Document Review	Date: Inspector Project:
(3)(c)(i)	4.1	Weld Breaks:	Date: Inspector Project:
(3)(c)(ii)	4.1	Punctures:	Date: Inspector Project:
(3)(c)(iii)	4.1	Scrapes of Protective Coatings:	Date: Inspector Project:
(3)(c)(iv)	4.1	Cracks:	Date: Inspector Project:
(3)(c)(v)	4.1	Corrosion:	Date: Inspector Project:
(3)(c)(vi)		Structural Damage or Inadequate Const / Install:	Date: Inspector Project:
	4.1	Reinforcing Steel and Anchor Bolts:	Date: Inspector Project:
	4.1	Placement of Concrete:	Date: Inspector Project:
	4.1	Subgrade and Foundation Prep:	Date: Inspector Project:
	4.1	Placement of Shop-Fabricated Tanks	Date: Inspector Project:
	4.1	Erection of Field-Erected Tanks:	Date: Inspector Project:
	4.1	Secondary Containment Liner or Vault:	Date: Inspector Project:
	4.1	Piping, Pumping, or Ancillary Equipment:	Date: Inspector Project:
(3)(d)	4.1	Backfill:	Date: Inspector Project:
(3)(e)	4.1 / 4.2	Tightness / Pressure Testing:	Date: Inspector Project:
(3)(f)		Ancillary Equip. Support and Protection:	Date: Inspector Project:
(3)(g)	4.3	Corrosion Protection Systems:	Date: Inspector Project:

4

Findings / Recommendations / Comments

Visual inspection a in-process examination on one 3" weld. Observe welding . Reviewed the documentation / welder's qualifications, purchase specification. Based upon the observations and review of the verification of fabrication the piping meets the requirements of the supplied drawings.

MEIER Enterprises, Inc.
8907 Gage Boulevard Kennewick, WA 99336
Phone: 509.735.1585 Fax: 509.783.5079

Inspection Sheet 2

002

Cite WAC	Guidance
(3)	4

1
Date: 7-21-11 Time: 1300
Location: Portons Big Pasco
Inspected By: Jan Elliott

2
System or Component: #2 Evaporator jumpers - Pressure tests

3
Items checked below were inspected to ensure compliance with the requirements of WAC 173-303-640, Tanks Systems, and the Washington State Department of Ecology, Guidance for Assessing and Certifying Tank System and Spill and Trail Containment, Waste, and related Codes and Standards

Cite WAC	Guidance		5
		☐ Document Review	Date: Inspector Project
(3)(c)(i)	4.1	☐ Weld Breaks:	Date: Inspector Project
(3)(c)(ii)	4.1	☐ Punctures	Date: Inspector Project
(3)(c)(iii)	4.1	☐ Scrapes of Protective Coatings:	Date: Inspector Project
(3)(c)(iv)	4.1	☐ Cracks:	Date: Inspector Project
(3)(c)(v)	4.1	☐ Corrosion:	Date: Inspector Project
(3)(c)(vi)		☐ Structural Damage or Inadequate Const. / Install:	Date: Inspector Project
	4.1	☐ Reinforcing Steel and Anchor Bolts:	Date: Inspector Project
	4.1	☐ Placement of Concrete:	Date: Inspector Project
	4.1	☐ Subgrade and Foundation Prep:	Date: Inspector Project
	4.1	☐ Placement of Shop-Fabricated Tanks:	Date: Inspector Project
	4.1	☐ Erection of Field-Erected Tanks:	Date: Inspector Project
	4.1	☐ Secondary Containment Liner or Vault:	Date: Inspector Project
	4.1	☐ Piping, Pumping, or Ancillary Equipment	Date: Inspector Project
(3)(d)	4.1	☐ Backfill:	Date: Inspector Project
(3)(e)	4.1 / 4.2	☒ Tightness / Pressure Testing:	Date: Inspector Project
(3)(f)		☐ Ancillary Equip. Support and Protection:	Date: Inspector Project
(3)(g)	4.3	☐ Corrosion Protection Systems	Date: Inspector Project

4
Jumper C-13 Hydrostatic test
Jumper D-13A Evaporator Feed Hydrostatic
Vacuum leakage tests

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