



NAVFAC

Naval Facilities Engineering Command

ENGINEERING SERVICE CENTER

Prepared for

NAVAL FACILITIES ENGINEERING COMMAND ENGINEERING SERVICE CENTER

Port Hueneme, California

Technical Submission for Project

Project Title: CLEAN, INSPECT, AND REPAIR STORAGE TANKS 5 & 17
Location: PEARL NAVAL BASE – REDHILL COMPLEX, Pearl Harbor, HI
Task Order No.: N62583-09-D-0002/0003
WGS Project Number: 54118
Date: Nov 02, 2012

TANK 5 & 17 CLEANING, INSPECTION AND REPAIRS PROJECT

TANK 17 INSPECTION REPORT

Submitted By:

Wentros Government Services, LLC
2087 S 71st Street
Tulsa, OK 74136

Rev	Date	Description	Reviewed	Approved
A	11/02/2012	Preliminary Final for Review and Approval	TF	TDA
B				
0				
1				
2				

Table of Contents

Item No.	Item Description
1	Tank 17 Inspection Report
2	Appendix A - NDE Report
3	Appendix B - Checklist
4	Appendix C - Drawings and Sketches
5	Appendix D - Photographs
6	Appendix E - Engineering / Calculations
7	Appendix F - Misc
8	
9	
10	



WILLBROS GOVERNMENT SERVICES (U.S.), LLC

A WILLBROS COMPANY

Project Client:

**NAVAL FACILITIES ENGINEERING COMMAND
ENGINEERING SERVICE CENTER**

Port Hueneme, California



Technical Data & Submittal for Project:

Project Title: CLEAN, INSPECT, AND REPAIR STORAGE TANKS

Location: PEARL HARBOR NAVAL STATION, OAHU, HI

Task Order No.: N62583-09-D-0132/0003

WGS Project Number: 54118

Date: Nov 09, 2012

**PRELIMINARY FINAL DRAFT TANK INSPECTION
& INTEGRITY REPORT**

REDHILL COMPLEX TANK 17

Submitted By:

Willbros Government Services, LLC

2087 E. 71st Street

Tulsa, OK 74136

Rev	Date	Description	Reviewed	Approved
A	11/09/12	Issue Data for Review and Approval	TF	TDA
B				
C				
0				
1				

	Distribution is limited to US Government agencies and their contractors; administrative/operational use within the context of this project or specific equipment. Other request shall be referred to the Naval Facilities Engineering Service Center for information needed. This report is confidential and shall be maintained to this extent.
--	--



Statement of Compliance

All work performed on this tank under this contract have been performed within the required project scope of work, specifications and regulations. All data provided has been obtained during the inspection, reviewed and verified to determine the existing condition of each item or component. Within the limits stated in this report to the extent visible, accessible or able to evaluate from the activities performed.

Environmental Waste Disposal performed by:

PACIFIC COMMERCIAL SERVICES

NDE Inspection & Testing performed by:

TESTEX / ANTEC SERVICES

Tank Strapping & Calibration to be performed by:

GAUGE POINT CALIBRATIONS SERVICES

Performed / Reviewed By	Date
Tim Anderson - Approval on File	
SME / API653 Tank Inspector - #494 /37258, API570 / API510 Insp.	11/09/2012
Thomas Fulton - Approval on File	
SME Tank Engineer – Thomas Fulton, P.E.	11/09/2012
Rick Grossman - Approval on File	
SME Tanks / Program Manager	11/09/2012



General Statement and Conditions

The information referenced in this inspection and engineering report is based solely upon the area or areas agreed upon and contracted for inspection; on the date of the inspection and under those present, known, same, accessible and current conditions. This report was prepared using retrievable data from those areas that were properly cleaned and prepared and made available and accessible during the inspection. Areas outside the scope of work which was not contracted for inspection and areas that were not cleaned and made available and / or accessible are not included in this report.

The methods, standards and regulations used by Willbros Government Services, LLC (Willbros) during the inspection and in preparing this engineering report comply with the most current and widely accepted industry standards and regulations, in which these standards and regulations make no representation, warranty or guarantee. The professional opinions and recommendations stated in this report, including predictability of life, maximum length of time for re-inspection, suitability for product storage, and safe fill height are conclusive approximations and are intended to serve mainly as guidelines in accordance with industry codes, standards and / or practices for obtaining the utmost in spill prevention and environmental protection. The listed recommendations may not necessarily be mandatory actions, but corrective actions that Willbros suggests that would better preserve the owners'/operators' facility components and may contribute to a safer and more convenient operation. Failure to comply with these could result in, but may not be limited to, reduction of service life, tank operational mishap, legal consequences and/or fines for owners/operators. It is best advised that the recommended repairs, corrective actions and procedures be fully and accurately reviewed and complied with in order to meet the required and applicable federal, state and local regulations, and to have the necessary repairs and up-grades performed prior to making any change in service, product and/or current conditions.

Some recommendations and requirements are necessary to bring the component(s) into compliance with federal, state, and local regulations. Willbros recommends re-inspection after any corrective action, repair or review when there is a change in service or conditions. Any change in facility conditions that are applicable to this inspection report, such as, but not limited to, environmental anomalies or conditions, a change in service or usage could result in outdating this report. The predictability of any component in this report is a result of following the procedures in the applicable industry standard. Willbros accepts absolutely no responsibility or liability for any mishap or failure, including any subsequent clean-up costs, loss of production or service, loss of profits, incurred or associated cost impacts or any legal ramifications, resulting from owners'/operators' failure to perform the required repairs, inspections and re-inspections, as applicable.



TABLE OF CONTENTS

Administrative Section

- i. Inspection Report Cover 1
- ii. Statement of Compliance 2
- iii. General Statement and Conditions 3
- iv. Table of Contents 4
- v. List of Tables, Figures and Appendices 6
- vi. List of Acronyms and Abbreviations 7

Project Report Sections

- 1.0 Executive Summary 8
 - 1.1 Summary of Inspection Findings 8
 - 1.2 Summary of Recommendations 9
- 2.0 Suitability for Service Statement 11
- 3.0 Project References 12
 - 3.1 American Petroleum Institute (API) 12
 - 3.2 American Society of Mechanical Engineers (ASME) 12
 - 3.3 Code of Federal Regulations (CFR) 12
 - 3.4 Military Handbooks 12
 - 3.5 National Association of Corrosion Engineers (NACE) 12
 - 3.6 National Fire Protection Association (NFPA) 12
 - 3.7 Steel Tank Institute (STI) 12
 - 3.8 Safety 12
 - 3.9 Unified Facilities Criteria (UFC) 13
 - 3.10 Unified Facilities Guide Specification (UFGS) 13
- 4.0 Tank Data 14
 - 4.1 Project Data 14
 - 4.2 Tank Description 14
 - 4.3 Service Description 14
 - 4.4 Component / Part Description 14
 - 4.5 Joint Type Description 15
 - 4.6 Tank History 15
 - 4.6 Project Inspection Description 15
 - 4.7 Project Inspection Equipment Description 15
- 5.0 Project Scope of Work and Inspection Methodology 16
 - 5.1 Introduction and Background 16
 - 5.2 Project Implementation 16
 - 5.3 Project Specifications 16
 - 5.4 Project Permits and Environmental Responsibilities 16
 - 5.5 Tank Inspections and Methodologies 16
 - 5.5.1 Historical Record Review 17
 - 5.5.2 General Tank Overview 18
 - 5.5.3 Bottom and Lower Dome Inspection 18
 - 5.5.4 Shell and Extension Inspection 18
 - 5.5.5 Upper Dome / Roof Inspection 19
 - 5.5.6 Tank Foundation Inspection 19



Willbros Government Services, LLC – Redhill Tank 17 Preliminary Draft Inspection Report

5.5.7	Tank Appurtenances.....	19
5.5.8	Inspection Checklist.....	20
5.5.9	Tank Calibrations.....	20
5.5.10	Technologies and Equipment.....	20
6.0	Inspection Results and Findings.....	21
6.1	Summary of Inspection Findings.....	21
6.2	Historical Record Review.....	22
6.3	General Tank Overview.....	23
6.4	Bottom and Lower Dome.....	23
6.5	Shell and Extension.....	24
6.6	Upper Dome / Roof.....	25
6.7	Tank Tower and Structures.....	25
6.8	Tank Foundation Inspection.....	26
6.9	Tank Appurtenances.....	26
6.10	Tank Coatings.....	26
7.0	Recommendations.....	147
7.1	Mandatory.....	147
7.2	Short Term.....	147
7.3	Long Term.....	147
8.0	Report Appendices.....	Appx
8.1.1	Appendix A – NDE Inspection and Testing Data.....	A-1
8.1.1	LFET Low Frequency Electromagnetic Testing.....	A
8.1.2	BFET Balanced Field Electromagnetic Testing.....	A
8.1.3	UT-LW Ultrasonic Longitudinal Wave Testing.....	A
8.1.4	MT Magnetic Particle Testing – Dry Particle.....	A
8.1.5	UT-SW Ultrasonic Shear Wave Testing.....	A
8.1.2	Appendix A – Pressure Test Data.....	A-2
8.1.3	Appendix A – Coating Test Data.....	A-3
8.2	Appendix B – Project Checklist.....	B
8.2.1	Appendix B – Tank Summary Sheet.....	B-1
8.2.2	Appendix B – Tank Inspection Checklist.....	B-2
8.2.3	Appendix B – Tank Indication Log.....	B-3
8.3	Appendix C – Drawings / Sketches.....	C
8.3.1	Appendix C – Project Drawings.....	C-1
8.3.2	Appendix C – Inspection Drawings.....	C-2
8.4	Appendix D – Photographs.....	D-1
8.5	Appendix E – Engineering / Calculations.....	E
8.5.1	Appendix E – Tank Engineering Summary.....	E-1
8.5.2	Appendix E – Tank Engineering / Calculations.....	E-2
8.5.3	Appendix E – Tank Engineering RSOL.....	E-3
8.6	Appendix F – Misc.....	F-1



LIST OF TABLES

Number	Title	
Table 6-1	Tank Inspection Data - Lower Dome.....	29
Table 6-2	Tank Inspection Data – Shell	50
Table 6-3	Tank Inspection Data – Shell Extension	101
Table 6-4	Tank Inspection Data - Upper Dome.....	117
Table 7-1	Summary of Tank Repairs.....	148

LIST OF FIGURES

Number	Title	
Figure 6-1	Tank Pads.....	43

LIST OF APPENDICES

Appendix A – INSPECTION AND TESTING DATA

Appendix B – PROJECT CHECKLIST

Appendix C – DRAWINGS / SKETCHES

Appendix D – PROJECT PHOTOGRAPHS

Appendix E – ENGINEERING / CALCULATIONS

Appendix F - MISC



LIST OF ACRONYMS AND ABBREVIATIONS

API	American Petroleum Institute
ASME-BPV	American Society of Mechanical Engineers – Boiler & Pressure Vessel Code
ASNT	American Society of Non-Destructive Testing
AWS	American Welding Society
BMP	Best Management Practice
CO	Contracting Officer
CP	Cathodic Protection
DBB	Double Block and Bleed Valve
DO	Delivery Order
DOT	Department of Transportation
EPP	Environmental Protection Plan
FFD	Federal / Naval Fire Department
F-76	Diesel Fuel Marine
FHWA	Federal Highway Administration
FISC	Fleet and Industrial Supply Center
FLC	Fleet Logistics Center (Previously FISC)
FLD	Field Operating Procedure
FORFAC	Fuel Oil Reclamation Facility
HSO	Health and Safety Officer
HASP	Health and Safety Plan
HPV	High Point Vent
JP-5	Jet Propellant Grade 5
JP-8	Jet Propellant Grade 8
LOTO	Lockout Tagout
LPD	Low Point Drain
NAVFAC	Naval Facilities Engineering Command
NAVFAC ESC	Naval Facilities Engineering Service Center
NAVSTA	Naval Station
NDE	Non-Destructive Examination
NPDES	National Pollution Discharge Elimination System
NTR	Navy Technical Representative
PM	Project Manager
POC	Point of Contact
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
SSHEP	Site Specific Health & Environmental Plan
SM	Site Manager
SOW	Statement or Scope of Work
TO	Task Order
USACE	U.S. Army Corp of Engineers
USN	U.S. Navy
UST	Underground Storage Tank
VS	Valve Station
WDP	Waste Disposal Plan
WP	Work Plan



Section 1.0 – Executive Summary

Willbros Government Services (Willbros) completed the modified API 653 inspection of the Tank 17 (TK17) on Nov 7, 2012 to verify the tank's current condition; integral and structural components; and coating integrity. Tank 17 is a vertical underground storage tank (UST) located in the Redhill Complex of the Pearl Harbor Naval Station, Oahu HI. Tank 17 is 100 ft. dia. x 250 ft. high; upper and lower dome sections (50 ft. radius each), carbon steel tank which has been externally reinforced during construction with a concrete / gunite lining.

Willbros performed all preliminary activities required to perform the SOW including (LOTO) Lock-Out & Tag Out on the tank and ancillary piping systems. Willbros removed the tank's isolation skin valves and installed mechanical blinds. Willbros cleaned the tank by high pressure washing all internal surfaces. Residual fuel was transferred to FLC operations; unusable fuel and wash rinsate were transported to a regulated waste disposal site for processing and disposal.

Subcontractors performed (NDE) non-destructive examination and testing inspection on 100% of the tank's welds, shell, upper and lower dome surfaces to determine the remaining wall thickness and condition of each section or component. During the NDE examinations and inspection all relevant indications observed were identified, recorded and photographed as necessary to document the condition of each relevant indication in the tank. These areas were inspected by certified ASNT Level II NDE Inspection Technicians.

Willbros performed hydrostatic pressure testing on the tank's nozzles and ancillary piping to the first isolation flange on the tank. Willbros performed a visual inspection of the tank's welds, shell, upper and lower dome, nozzles and structural surfaces to determine the actual condition and integrity of each section or component. During the visual inspection all relevant indications observed were identified, recorded and photographed as necessary to document the condition of each relevant indication in the tank. These areas were inspected by a certified API 653 Tank Inspector and ASNT Level II NDE Inspection Technician.

1.1 Summary of Inspection Findings

Willbros and subcontractors performed a thorough API 653 modified inspection and NDE examination and testing of Tank 17 surfaces and components. During the inspection there were (6575) various types of non-relevant and relevant indications and discontinuities found throughout the tank. These indications varied in type, cause and severity. The following indications and discontinuities were found in various locations in the tank. The repair indications and discontinuities are identified in the Table 7-1 of this report. Repair considerations and recommendations for each relevant indications or defect that has been reviewed are listed in Table 7-1 for each repair type, size and classification for mandatory, short term and long term intervals.

1.1.1 Summary of Indications and Flaws

- Gouges – Ranging in various depths and sizes. Typical depths ranged from 0.020" to 0.230" in depth, with various diameters and configurations.
- Corrosion Areas and Pits – Ranging in various depths and sizes. Typical depths ranged from 0.015" to 0.210" in depth, with various diameters and configurations.
- Holes – There were (42) holes and leaks were found in the shell extension and the upper dome.
- Weld Discontinuities and Defects
 - Porosity – Ranging in various sizes. Typical sizes ranged from 0.020" to 0.3125" in diameter.
 - Undercut – Ranging in various depths and sizes. Typical depths ranged from 0.015" to 0.200" in typically a 0.250" nominal plate thickness.
 - Lack of Fusion and Cold Lap - Ranging in various sizes. Typical sizes ranged from 0.25" to 18"+ in length.
 - Slag Inclusions - Ranging in various sizes. Typical sizes ranged from 0.25" to 1.0"+ in length.
 - Crack – A crack was found at a tee junction on a weld seam.



- Underfill – Areas were observed in the vertical and horizontal welds where the weld reinforcement was less than base metal thickness.
- Excess Weld Reinforcement - Areas were observed in the vertical and horizontal welds where the weld reinforcement was more than allowed per code from base metal surface to the top of the weld.
- Weld Sizes - Areas were observed in the vertical and horizontal welds where the weld pass size and reinforcement exceeded the weld widths, configurations and sizes relative to the base metal thickness.
- Weld Arc Gouges – Arc pull, wash outs or gouges were found ranging in various depths and sizes. Typical depths ranged from 0.025" to 0.250" in depth, with various diameters and configurations.
- Torch Gouges – Several areas were found where a torch gouged or cut into the weld seam, base metal. These areas have excessive wall loss that is near complete thru wall openings, leaks or equivalent holes in the upper dome.
- Leaks – Areas were observed leaking in the shell extension rings, upper dome & telltale system. These were primarily along the weld seams and has leaking product in the shell extension rings thru the upper dome.
- Un-welded Seams – Several plate weld seams and joints were found tacked, but not welded in the upper dome. Some are small areas that have been skipped and not completely welded.
- Dents – Ranging in various depths and sizes. Typical depths ranged from 0.125" to 1.0" in depth, with various diameters and configurations.
- Pressure Testing Failures –
 - Sample Lines – Failed and leaked at various joint connections and completely corroded in areas on the four (4) lines.
- Tower Structure - Bolts were found missing or incorrect length, (74) missing bolts were replaced in the tower and catwalk structures. Some angle structural members were damaged and missing. These were replaced or repaired as needed.
- Coating – The overall coating is in fair condition. The coating has small areas that have disbonded, flaked or deteriorated over the majority of internal surface areas. The lower dome and floor are in poor condition.
- Detailed list of indications and repairs are provided for each component in the appropriate section as listed in component Tables 6-1 thru 6-4, the Master Indication Log in Appendix B-3 and Table 7-1 Summary of Tank Repairs.

1.2 Summary of Recommendations

Willbros and subcontractors found (6575) various indications and discontinuities during the API 653 modified inspection and NDE examination of Tank 17 surfaces and components. Most of these indications and discontinuities are relatively small in overall size and repair(s) that will be required. The indications found varied in type, cause and severity as listed in Section 1.1. Due to the types of indication or flaw sizes, depths and conditions found in Tank 17; it was found not suitable to return to service until all of the items identified as relevant repairs are repaired for the intended service and operational interval. The following table listed in Section 7.0 describes the repairs by type, size, classification and action to be taken. Reference the following Table 7-1 Summary of Tank Repairs for the complete list of repairs for each plate, location and extent along with the associated repair(s) required by classification type.

Mandatory Repairs – Immediate repairs required before returning tank to service.

- Holes / Leaks - Repair (42) areas that were found with thru wall holes or leaking weld seams.
 - Repair holes found thru the component walls.
 - Repair weld leaks were found in the weld seams and the telltale system.
- Wall Loss Areas - Repair (203) areas where pits, gouges or corrosion is below the minimum thickness (t_{min}) required for the desired or required operational service interval.
 - Repair pits, gouges or delaminations.
 - Repair corrosion areas.



Willbros Government Services, LLC – Redhill Tank 17 Preliminary Draft Inspection Report

- Repair areas where the torch gouged into the weld seam or plates to excessive depths, completely open joint connection, leak or hole equivalent.
- Weld Discontinuities or Defects – Repair (2093) weld seams and joints locations which exceed the allowable code limits for each relevant discontinuity type.
 - Weld Discontinuities – Porosity, slag inclusions, crack, lack of fusion, underfill and undercut.
 - Un-welded and incomplete weld seams / joints.
- Associated Piping - Repair or replace the sample lines that failed during hydrotesting.
- Dents and Bulges – Repair (80) areas that have excessive mechanical damage and distortion.
- Patch Plates – Remove and replace (6) patch plates which don't meet code or comply with code or acceptable good engineering practices.
- Detailed list of indications and repairs are provided for each component in the appropriate section as listed in component Tables 6-1 thru 6-4, the Master Indication Log in Appendix B-3 and Table 7-1 Summary of Tank Repairs.

Short Term Repairs – Repair indications or flaws found that have the criteria which exceeds the intended (10yr) service and operational interval.

- Repair areas (313) where pits, gouges, delamination or corrosion is below the minimum thickness (t_{min}) required for this interval.
- Repair coating in areas required to eliminate corrosion cells on internal surfaces, extend component service life and inspection intervals.
- Detailed list of indications and repairs are provided for each component in the appropriate section as listed in component Tables 6-1 thru 6-4, the Master Indication Log in Appendix B-3 and Table 7-1 Summary of Tank Repairs.

Long Term Repairs - Repair indications or flaws found that have the criteria which exceeds the intended (20yr) service and operational interval.

- Repair areas (299) where pits, gouges, delamination or corrosion is below the minimum thickness (t_{min}) required for this interval.
- Repair coating in areas required to eliminate corrosion cells on internal surfaces, extend component service life and inspection intervals.
- Detailed list of indications and repairs are provided for each component in the appropriate section as listed in component Tables 6-1 thru 6-4, the Master Indication Log in Appendix B-3 and Table 7-1 Summary of Tank Repairs.



Section 2.0 – Suitability for Service Statement

Suitability for Service Statement For Redhill Complex UST Tank 17 – Pearl Harbor, HI

The tank's integral structural components and associated ancillary equipment were not suitable for continued normal long term service operation and requires some tank repairs. The repairs and action will need to include the mandatory repairs and any repairs required for the next desired or required operational interval. After the required repairs and action is completed, the repairs / items will need to be re-inspected and tested for compliance with code requirements. **Once all the repairs and action are completed, inspected and approved; then the next inspection intervals can be determined.**

The next API-653 internal inspection should be conducted in xxxx (0) years, or by 11/07/20XX to meet code and Hawaii state requirements. [1/2 of the shell life based on the tank having greater than 0 years remaining shell life].

API-653 Inspector:

Tim D. Anderson – Approval on file (Sign final report copy)

Tim D. Anderson; API-653 # 494 / 37258

Professional Engineer's Review:

Thomas Fulton P.E. – Oklahoma P.E. Registration Number



Section 3.0 – Project References and Specifications

Willbros reviewed the project SOW and listed the applicable requirements for reference and utilization in the development and execution of the project activities to ensure compliance with all relevant regulations, project requirements including the following codes and specifications:

3.1 American Petroleum Institute (API)

- 3.1.1 API Recommended Practice 574, *Inspection Practices for Piping System Components*, Latest Edition.
- 3.1.2 API Recommended Practice 575, *Inspection of Atmospheric and Low-Pressure Storage Tanks*, Latest Edition.
- 3.1.3 API Standard 650, *Welded Steel Tanks for Oil Storage*, Latest Edition.
- 3.1.4 API Recommended Practice 651, *Cathodic Protection of Aboveground Petroleum Storage Tanks*, Latest Edition.
- 3.1.5 API Recommended Practice 652, *Lining of Aboveground Petroleum Storage Tanks*, Latest Edition.
- 3.1.6 API Standard 653, *Tank Inspection, Repair, Alteration and Reconstruction*, Latest Edition.
- 3.1.7 API/ANSI Standard 2015, *Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks*
- 3.1.8 API/ANSI RP 2016 *Guidelines and Procedures for Entering and Cleaning Petroleum Storage Tanks*
- 3.1.9 API Standard 2550, *Measurement and Calibration of Upright Cylindrical Tanks*

3.2 American Society of Mechanical Engineers (ASME)

- 3.2.1 ASME B31.3, *Process Piping*, Latest Edition.
- 3.2.2 ASME B31.4, *Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids*, Latest Edition.
- 3.2.3 ASME VII Non-Destructive Examination, Latest Edition.
- 3.2.4 ASME IX Welding and Brazing, Latest Edition.

3.3 Code of Federal Regulations (CFR)

- 3.3.1 29 CFR 1910, *Permit-Required Confined Spaces for General Industry*.
- 3.3.2 40 CFR 112, *Oil Pollution Prevention*.

3.4 Military Handbooks (MIL-HDBK)

- 3.4.1 MIL-HDBK 1022A, *Department of Defense Handbook: Petroleum Fuel Facilities*, 01 November 1999.
- 3.4.2 MIL-HDBK 201B, *Military Standardization Handbook: Petroleum Operations*.

3.5 National Association of Corrosion Engineers (NACE)

- 3.5.1 NACE Recommended Practice, RP0184-97, *Repair of Lining Systems*.
- 3.5.2 NACE Recommended Practice, RP0193, *External Cathodic Protection of On-Grade Metallic Storage Tank Bottoms*.
- 3.5.3 NACE Recommended Practice, RP0288-94, *Inspection of Linings on Steel and Concrete*.

3.6 National Fire Protection Association (NFPA)

- 3.6.1 NFPA-30, *Flammable and Combustible Liquids Code*.

3.7 Steel Tank Institute (STI)

- 3.7.1 STI SP001, *Standard for the Inspection of Aboveground Storage Tanks*.

3.8 Safety

- 3.8.1 EM 385-1-1, *U.S. Army Corps of Engineers Safety and Health Requirement, Appendix A Minimum Basic Outline for Accident Prevention, and sections*.



3.9 Unified Facilities Criteria (UFC)

3.9.1 UFC 3-460-01, *Petroleum Fuel Facilities*.

3.10 Unified Facilities Guide Specification (UFGS)

3.10.1 UFGS 09970, Epoxy/Fluoropolyurethane Interior Coating Of Welded Steel Petroleum Fuel Tank

3.10.2 UFGS 09971, Exterior Coating System for Welded Steel Petroleum Storage Tanks

3.10.3 UFGS 09973, Interior Coating System for Welded Steel Petroleum Storage Tanks

3.10.4 UFGS 01351, Safety, Health, and Emergency Response

3.10.5 UFGS 13205, Steel Tanks with Fixed Roofs