GENERAL DIRECT ASSESSMENT
STATEMENT OF WORK TALKING POINTS

Section 5.3.1 – Scoping Meetings for Destructive Testing

1.0 BACKGROUND

On December 9, 2013, the Navy placed one of the tanks (Tank No. 5) at the Red Hill Bulk Fuel Storage Facility back into service after it had undergone routine scheduled maintenance. The maintenance work consisted of cleaning, inspecting, and repairing multiple sites within the tank. Upon placing Tank No. 5 back into service, the Navy commenced filling the tank with JP-8 fuel. On January 13, 2014, Navy discovered a loss of fuel from Tank No. 5 and immediately notified the State of Hawaii Department of Health (DOH) and the United States Environmental Protection Agency (EPA).

In response to the fuel release reported by the Navy, an Administrative Order on Consent (AOC) between the Navy, Defense Logistics Agency (DLA), EPA, and the DOH [1] provides for the performance by the Navy and DLA of a release assessment, response(s) to release(s), and actions to minimize the threat of future releases in connection with the field-constructed bulk fuel underground storage tanks (USTs), at the Red Hill Bulk Fuel Storage Facility located near Pearl Harbor, on the island of Oahu in the State of Hawaii.

2.0 PURPOSE AND SCOPE

The purpose of the deliverables to be developed and work to be performed in accordance with AOC-SOW Section 5.3 is to verify the findings of the Corrosion and Metal Fatigue Practices Report through the use of destructive testing on at least one tank at the Facility.

3.0 AOC-SOW REQUIREMENT

Within ninety (90) days from the final Destructive Testing Scoping Meeting, Navy and DLA shall submit a Destructive Testing Scope of Work, including a plan for implementation and a proposed schedule, to the Regulatory Agencies for approval. The Scope of Work shall detail planned destructive testing to be conducted on at least one (1) tank at the Facility. Once approved by the Regulatory Agencies, Navy and DLA shall implement the Scope of Work in accordance with the approved schedule.

Within twenty-four (24) months from the Regulatory Agencies' approval of the Destructive Testing Scope of Work, Navy and DLA shall submit the Destructive Testing Results Report to the Regulatory Agencies for approval.

4.0 COUPONS FOR TESTING

4.1 Planned Coupons

Proposed location is Tank 17 which is anticipated to be out of service at the time required to comply with the AOC

Removal of 5 coupons is planned. Locations for selection of coupons for testing will be based on data from previous visual and NDE inspections of the tanks for selection of target areas based on reported reductions in wall thickness, corrosion, and cracking.

- Upper Dome just above spring line
- 2 from Barrel. Coupons will be from opposite sides of the Barrel, one from the upper part of the Barrel and one from the lower part. The lower coupon shall be taken from just above a horizontal butt welded joint between the 19.6' x 5.0' shell plates.
- Lower dome. Coupon to be taken from the sloping plate in the second course up from the flat bottom plate just above a horizontal butt welded joint.
- Lower dome – ½" bottom plate

4.2 Plate Sections Removed During Repairs

If repairs occurring during the timeline of the report.

5.0 PROCEDURES AND TESTS

5.1 On-site

5.1.1 Characterization of the Exterior and Interior Steel Coupon

See Table 1.

5.1.2 Exterior Concrete Containment

Test immediately upon removal of coupon. Note condition of concrete.

Observations/measurements of the void space between the concrete and the liner in the area surrounding the coupon site. Check to determine if the material behind the coupons taken from the Lower Dome is grout or concrete.

Temperature at the concrete/liner interface. Note presence of moisture. Also measure pH of exposed medium (if wet).

Measure the structures-to-electrolyte potential of the steel liner-to-concrete/exposed medium at several locations around the circumference of the coupon site.

Measure concrete bulk resistivity, pH, and moisture content at the liner/concrete interface, take cores of concrete if feasible.

Test any contaminants at the coupon site, chlorides, sulfates/sulfides, biological materials. Note evidence of petroleum releases.

5.2 Laboratory Analysis

Petrographic and analysis of concrete cores taken.

Metallurgical analysis of the coupons. Determine the physical and mechanical characteristics of the liner steel and weldments.

Characterization of the exterior and interior of the steel coupon

Table 1. Characterization of Steel Coupon

COUPON SPECIFICS		
Coupon Location		
Coupon Dimensions		
Coupon Thickness		
Locations of Welds (If Any)		
VISUAL EXAMINATION		
Checks	**Observations**	
	Exterior	Interior
Deposits, Coatings, Debris		
Scale		
Biological Materials		
Wet or Dry		
Smell		
Presence of Petroleum Product Between Steel and Concrete Surface, and on or Above the Leg of the Angle Backer Bar Embedded in the Concrete.		
Presence of Corrosion		
Isolated pitting		
Isolated pitting within areas of general corrosion		
Linked pitting within areas of general corrosion		
General metal loss with some deeper pits		
General metal loss with no pitting		
Selective attack at welds		
Pit surface and cross section morphology		
Severity of Corrosion		
Maximum wall loss		
Profile of wall loss		
Maximum/average pit depth		
Maximum/average pit diameter		
Pit length vs pit width		
Depth to diameter ratio		

6. REPAIR OF COUPON SITES

Repair in accordance with repair contract SOW for repairs.

7. IMPLEMENTATION PLAN

7.1 Method of Accomplishment

Primarily by the Inspection/Repair Contractor.

Some NAVFAC EXWC involvement with examination??

7.2 Proposed Schedule

Tank Inspection/Repair Contract Awarded 31 August 2016.

Tank 17 NDE:

Coupon removal and examination:

Laboratory Analysis:

Destructive Testing Report:

8. REPORT CONTENT

Description of examination and test procedures (reference appropriate criteria or standards)

Narrative explanation of results

- Correlation with NDE test data
- Records of on-site visual examinations and tests
- Analysis of corrosion rate calculation procedures and recommendations for improvement

Evaluation of results against current corrosion mitigation practices and recommendations for modifications/improvements to TIRM and TUA.

APPENDIX A

GLOSSARY

ACRONYMS

A-E or A/E	Architect-Engineer
ANSI	American National Standards Institute
AOC	Administrative Order on Consent
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
CSE	Copper-copper sulfate (reference) electrode
DLA	Defense Logistics Agency
DoD	Department of Defense
DOH	(State of Hawaii) Department of Health
EPA	Environmental Protection Agency
pH	A measure of hydrogen ion activity
POL	Petroleum, Oil and Lubricants
NACE International	National Association Corrosion Engineers International
NAVFAC	Naval Facilities Engineering Command (NAVFACENGCOM)
NAVFAC EXWC	NAVFAC Engineering and Expeditionary Warfare Center
NDE	Non Destructive Evaluation
O&M	Operation and Maintenance
RFP	Request for Proposal
SCE	Silver-silver chloride (reference) electrode
S/E	Structure-to Electrolyte
SOW	Statement of Work
TIRM	Tank Inspection Repair and Maintenance
TUA	Tank Upgrade Alternatives
UFC	Unified Facilities Criteria

UFGS	Unified Facilities Guides Specifications.
U.S.	United States
UST	Underground Storage Tank

DEFINITION OF TERMS

Anode: The electrode of an electrochemical cell at which oxidation occurs. (The anode is usually the electrode where corrosion occurs and metal ions enter the solution).

Bimetallic corrosion: (See galvanic corrosion).

Cathode: The electrode of an electrochemical cell at which reduction occurs.

Coating: A dielectric material applied to a structure to separate it from its environment.[1]

Conductivity: The measurement of a material's ability to conduct electrical current.

Corrosion: The deterioration of a material or its properties due to a reaction of that material with its chemical environment.

Corrosion potential: The potential of a corroding metal surface relative to a reference electrode under specific conditions in an electrolyte.

Corrosion rate: The rate at which corrosion proceeds.[1]

Crevice Corrosion: Localized corrosion resulting from a concentration cell formed between two metal surfaces or between a metal and non-metallic surface.

Electrode: A conductor used to establish electrical contact with an electrolyte and through which current is transferred to or from an electrolyte.[1]

Electrolyte: A chemical substance or mixture containing ions that migrate in an electric field. Examples are soil and seawater.

Galvanic cell: A corrosion cell in which anode and cathode are dissimilar conductors, producing corrosion because of their innate difference in potential.

Galvanic corrosion: Corrosion resulting from the coupling of dissimilar metals in an electrolyte.

Holiday: A discontinuity in a coating that exposes the metal surface to the environment.

pH: A measure of hydrogen ion activity defined by: $pH = \log_{10} (1/aH^+)$ where aH^+ = hydrogen ion activity = molal concentration of hydrogen ions multiplied by the mean ion activity coefficient (= 1 for simplified calculations).

Pitting:

Polarization: The deviation from the open circuit potential of an electrode resulting from the flow of current.

Reference electrode: A reversible electrode with a potential that may be considered constant under similar conditions of measurement.

Resistivity: The measurement of a material's ability to oppose the flow of electric current.

Rust: A reddish-brown corrosion product of iron that is primarily hydrated iron oxide.

Structure-to-electrolyte potential (also structure-to-soil potential): The potential difference between a buried metallic structure surface and electrolyte that is measured with reference to an electrode in contact with the electrolyte. See also pipe-to-soil potential.

Structure-to-structure voltage (also structure-to-structure potential): Difference in voltage between metallic structures in a common electrolyte.

Uniform corrosion: Corrosion attack of a metal that is essentially the same at all exposed areas of its surface.

Voltage: An electromotive force, or a difference in electrode potentials expressed in volts.