Ga 4.(2)

JUN 10 1999 **ENGINEERING DATA TRANSMITTAL**

Page 1 of 1

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106029 105-AN Corrosion Probe	Cog. Eng.: G. L. Edgemon	N/A
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1	HNF-4306		0	Engineering Task Plan for the 241-AN-105 Multi-Function Corrosion Monitoring System	Q	2	1	1

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D OR N/A (See WHC-CM-3-5, Sec. 12.7)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
		Design Authority									
		Design Agent									
1	1	Cog. Eng. G. L. Edgemon		6/9/99	R1-30						
1	1	Cog. Mgr. D. B. Smet		6-9-99	R1-56						
1	1	QA W L Adams	W L Adams	6-9-99							
		Safety									
		Env.									

18.	19.	20.	21. DOE APPROVAL (if required)
G. L. Edgemon 6/9/99	S. H. Rifaey 6/10/99	D. B. Smet 6-10-99	Ctrl No. _____
Signature of EDT Originator / Date	Authorized Representative for Receiving Organization / Date	Design Authority/ Cognizant Manager / Date	○ Approved ○ Approved w/comments ○ Disapproved w/comments

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BD-7400-172-1

Engineering Task Plan for the 241-AN-105 Multi-Function Corrosion Monitoring System

G. L. Edgemon
Lockheed Martin Hanford Corporation
Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

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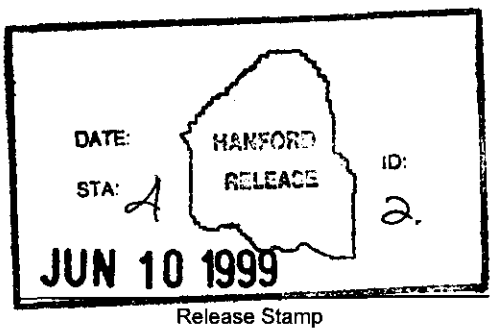
Abstract: ETP for 241-AN-105 corrosion monitoring system.

6/10/99
Release Approval Date



Release Stamp

Approved For Public Release

1.0 INTRODUCTION

This Engineering Task Plan (ETP) describes the activities associated with the installation of the corrosion probe assembly into riser WST-RISER-016 (formerly 15B) of tank 241-AN-105. The corrosion monitoring system utilizes the technique of electrochemical noise (EN) for monitoring waste tank corrosion. Typically, EN consists of low frequency (<1 Hz) and small amplitude signals that are spontaneously generated by electrochemical reactions occurring at corroding or other surfaces. EN analysis is well suited for monitoring and identifying the onset of localized corrosion, and for measuring uniform corrosion rates. A typical EN based corrosion-monitoring system measures instantaneous fluctuations in corrosion current and potential between three nominally identical electrodes of the material of interest immersed in the environment of interest. Time-dependent fluctuations in corrosion current are described by electrochemical current noise, and time-dependent fluctuations of corrosion potential are described by electrochemical noise. The corrosion monitoring system is designed to detect the onset of localized corrosion phenomena if tank conditions should change to allow these phenomena to occur.

In addition to the EN technique, the system also facilitates the use of the Linear Polarization Resistance (LPR) technique to collect uniform corrosion rate information. LPR measures the linearity at the origin of the polarization curve for overvoltages up to a few millivolts away from the rest potential or natural corrosion potential. The slope of the current vs. voltage plot gives information on uniform corrosion rates.

The system is manufactured by Hiline Engineering and Fabrication in Richland, Washington. The data collection software/hardware system is manufactured by Corrosion & Condition Control, Ltd, Dingwall, Ross shire, U. K. The design of the corrosion monitoring system has been reviewed by the Hanford Site Flammable Gas Equipment Advisory Board and is bounded by report FGEAB-97-040, Rev. 2.

2.0 SCOPE

2.1 Objective

The objective of this task is to remove the existing shield plug and install a corrosion probe assembly into riser WST-RISER-016 of tank 241-AN-105.

2.2 Deliverables

A remotely operable corrosion probe assembly will be installed into riser WST-RISER-016 of tank 241-AN-105. The deliverables will consist of the following:

2.2.1 Activity supporting documentation including an Engineering Task Plan, drawings, Acceptance Test Procedure, Structural Analysis, As Low As Reasonably Achievable Management Work Sheet, and Unreviewed Safety Question (USQ) screening (where required).

2.2.2 A corrosion probe assembly and all components necessary to operate the system.

3.0 DESCRIPTION

3.1 Physical Description

The remotely operated corrosion probe assembly will include all components required to record data within the tank waste and vapor space of tank 241-AN-105.

The majority of the in-tank portion of the corrosion probe assembly is constructed from 1-in. diameter Schedule XXS AISI 304L Stainless Steel (UNS 30403) pipe for extended service in the tank waste environment. The probe assembly is designed to fit through a nominal 4-inch diameter tank riser and is approximately 56 ft. in length.

The probe assembly has four two channel electrode arrays. The (eight) total channels will allow corrosion monitoring in the vapor space and the supernate phase of the tank. Each channel utilizes three nominally identical electrodes of either a C-ring (ASTM G-38) or pin type geometry constructed of ASTM A537-Class 1 tank steel. One electrode of each C-ring array will be pre-cracked by cyclic fatigue and strained beyond the proportional limit just prior to immersion in the waste to assist in monitoring stress corrosion cracking should it occur. The other electrodes will not be strained.

A 25-conductor full-shielded data cable extends through the length of the sealed pipe. At each electrode array, three conductors are removed from the shielding and attached to the three electrodes, one per electrode. A commercially available glass to metal seal is used to penetrate the probe assembly pipe wall while maintaining electrical isolation between the electrodes and the pipe wall. Electrodes are isolated from the glass to metal seal through the use of an ethylene propylene (EPDM) O-ring style gasket suitable for use in radioactive, high pH environments. The shielded cable terminates at the top of the probe assembly in a weather tight box.

Approximately 20 feet of data cable runs above ground from the top of the probe to the instrument housed on top of the tank. The corrosion monitoring instrument will be housed in a weathertight, climate-controlled enclosure near riser WST-RISER-016. The 20 foot data cable utilizes driven shields to protect the signal from external electrical interference and will use shunt-diode type intrinsic barriers to meet Class 1, Division 1 safety requirements for waste intrusive instrumentation. Approximately 300 feet of null modem cable runs from the instrument to a computer housed in the 241-AN-271 instrument building.

3.2 Procurement

The corrosion monitoring system, including in-tank probe has been procured as general service equipment.

3.3 Fabrication

HiLine Engineering and Fabrication Services, Richland WA will perform all fabrication of the corrosion probe assembly. See HNF-4285, Rev. 0, Design of Multi-Function Hanford Tank Corrosion Monitoring System for details.

3.4 Testing

Testing of the corrosion probe assembly will consist of the performance of an approved Acceptance Test Procedure prior to installation of the corrosion probe assembly. The Acceptance Test Procedure shall be generated in accordance with HNF-IP-0842, Volume IV, Section 2.5, Test and Evaluation.

3.5 Installation

Appropriate Operations personnel will complete installation with technical support from Life Extension Equipment Engineering personnel. Installation will not commence until all installation work package documentation is approved in accordance with HNF-IP-0842, Volume V, Section 7.1, TWRS Work Control.

4.0 SYSTEM FUNCTIONAL PERFORMANCE DESCRIPTION

4.1 Corrosion Probe Assembly

The corrosion probe assembly has been designed and fabricated to operate under the following conditions:

4.1.1 The probe will provide a minimum of two years of service.

4.1.2 The probe can be installed into the tank through a nominal 4-inch diameter riser.

4.1.3 The system will provide remote data acquisition and system control.

4.1.4 The probe assembly is to operate in temperature ranges of up to 100°C.

4.1.5 The liquid phase pH levels of operation will be from 7 to 14.

5.0 ORGANIZATIONAL RESPONSIBILITIES

Life Extension Equipment Engineering will be responsible for directing the corrosion probe assembly installation activity to completion within the guidelines specified within this task plan. Support organizations identified in this plan will provide ancillary support necessary to ensure successful completion of this activity. Functional responsibilities for the personnel and organizations will be as stated in this section.

5.1 Life Extension Equipment Engineering - (G. L. Edgemon, J. L. Castleberry)

Life Extension Equipment Engineering will be responsible for overall activity management. Activity management shall include the following:

5.1.1 Generation of an Engineering Task Plan

5.1.2 Provide activity management, coordination and direction on the installation of the corrosion probe assembly and related components.

5.1.3 Overall activity scheduling and budget development.

5.1.4 Assist in system acceptance test procedure (ATP).

5.1.5 Provide input on site design, as required.

5.1.6 Provide coordination with other activities tied to the corrosion probe assembly.

5.1.7 Serve as technical lead during field installation of corrosion probe assembly.

5.1.8 Perform the cognitive engineering functions associated with the corrosion probe assembly.

5.1.9 Provide input and interface with related systems or activities such as electrical, Operations, crafts, etc.

5.1.10 Provide guidance and direction on site work design and during corrosion probe assembly installation including the generation of ECN's.

5.1.11 Provide work package direction and assistance as required to ensure installation success.

5.1.12 Provide an ATP and perform as lead during performance of the ATP prior to installation.

5.1.13 Provide functional design criteria on the corrosion probe assembly to the ETP.

5.1.14 Will act as cognizant engineer for all structures, systems, and components provided by this activity.

5.1.15 Will accept primary engineering responsibility and ownership of the corrosion probe assembly after installation.

5.3 East Tank Farms Production Control - (W. D. Bancroft)

East Tank Farms Production Control will provide planner/scheduling support for the site preparation and installation of the corrosion probe assembly. The following are the major responsibilities of East Tank Farms Production Control and may not be all-inclusive.

5.3.1 Provide work instructions for craft personnel for the installation of ancillary equipment in the tank farm.

5.3.2 Provide the preparation, planning, scheduling and performance of the Job Control System work package for fieldwork plans and instrument installation activities.

5.4 East Tank Farms Operations Field Support - (D. L. Sparks)

East Tank Farms Operations Field Support will provide Operations support for the installation of the corrosion probe assembly. TWRS Operations will be responsible for the following:

5.4.1 Installation of the corrosion probe assembly into riser WST-RISER-016 of tank 241-AN-105.

5.4.2 Providing resources to complete the work packages and field installations as required.

5.4.3 Disposal of the shield plug to be removed from riser WST-RISER-016 of tank 241-AN-105.

5.5 Design Authority - (R. S. Nicholson)

The Design Authority will verify that the planned activities and equipment meet all associated Authorization Basis and other miscellaneous requirements. The Design Authority will also provide review and approval for activities. Specific technical information is to be obtained from the Life Extension Equipment engineer.

6.0 DOCUMENTATION

The following documentation in support of this activity has been completed prior to the generation of this Engineering Task Plan:

- H.P. Shrivastava, "Structural Evaluation of Second Generation Corrosion Probe Tree in Tank 241-AN-107," Fluor Daniel Northwest, Inc., Letter Report E61949-01, May 1997.
- G. L. Edgemon, "Design of Multi-Function Hanford Tank Corrosion Monitoring System", HNF-4285, Rev. 0, Lockheed Martin Hanford Corporation, April 1999.
- FGEAB-97-040, Rev. 2 on use of corrosion monitoring equipment in DSTs, May 1998

7.0 SCHEDULE

All hardware will be ready for installation by June 15, 1999. All site preparation work and a system Acceptance Test Procedure shall be completed prior to installation of the corrosion probe assembly. Activity will be complete upon successful installation of probe assembly.

8.0 COST ESTIMATE

Task	Responsible Organization	Funding Req'mts
1. Activity Lead	Life Extension Equipment Engineering	$25K
2. Safety Support	Safety	$.5K
3. Work Package	Production Control	$5K
4. Quality Assurance	Quality Assurance	$.5K
5. Quality Control	Quality Control	$.4K
6. Ops, HPT, Crane and Rigging Support	Ops, HPT, Crane and Rigging Organizations	$12.2K
7. Site Support -Crafts	East Tank Farms Crafts	$2K
TOTAL		$45.6K

9.0 QUALITY ASSURANCE

Quality Assurance will provide the appropriate reviews and support of documentation, test procedures, and work packages.

10.0 SAFETY ASSURANCE

Safety Assurance will provide the appropriate reviews and support of documentation, test procedures, and work packages.