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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	4. Review	1. Approved	4. Reviewed no/comment
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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 C.C. Scaief	n/a			1	1	G.D. Johnson	G.D. Johnson	4/24/97	S7-14
1	1	Design Agent D.D. Tate	D.D. Tate	3/25/97	L6-37						
1	1	Cog.Eng. M.F. Erhart	M.F. Erhart	5/19/97	R1-51						
1	1	Cog. Mgr. ~~G.N. Hanson~~ R.L. Hall	R.L. Hall	5/19/97	R1-56						
1	1	QA L.D. Salsbery	L.D. Salsbery	5/8/97	B7-41						
1	1	Safety S.U. Zaman	S.U. Zaman	5/8/97	R3 68						
		Env.									

18.	19.	20.	21. DOE APPROVAL (if required)
Signature of EDT Originator — Date: 3/25/97	Authorized Representative for Receiving Organization — Date: 25 Mar 97	Design Authority/ Cognizant Manager — Date: 5/19/97	Ctrl. No. [] Approved [] Approved w/comments [] Disapproved w/comments

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TWRS HYDROGEN MITIGATION PORTABLE STANDARD HYDROGEN MONITORING SYSTEM PLATFORM DESIGN AND FABRICATION ENGINEERING TASK PLAN

B. L. Philipp
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U.S. Department of Energy Contract DE-AC06-96RL13200

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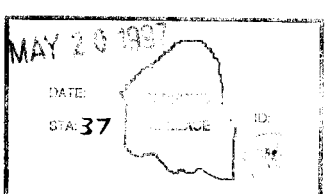
Key Words: Standard Hydrogen Monitoring System (SHMS)

Abstract:

Engineering task plan for a Standard-E cabinet arrangement Standard Hydrogen Monitoring System Portable Platform.



James Bishop 5-20-97
Release Approval Date

Release Stamp

Approved for Public Release

TWRS HYDROGEN MITIGATION
PORTABLE STANDARD HYDROGEN MONITORING SYSTEM PLATFORM
DESIGN AND FABRICATION ENGINEERING TASK PLAN

Prepared by

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&
D. D. Tate

SESC Remote Sensing & Sampling Equipment Engineering

March 1997

SGN Eurisys Services Corporation
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1.0 INTRODUCTION

The primary function of portable gas monitoring is to quickly determine tank vapor space gas composition and gas release rate, and to detect gas release events. Characterization of the gas composition is needed for safety analysis. The lower flammability limit, as well as the peak burn temperature and pressure, are dependent upon the gas composition. If there is little or no knowledge about the gas composition, safety analysis utilize compositions that yield the worst case in a deflagration or detonation. This conservative approach to unknowns necessitates a significant increase in administrative and engineering costs. Knowledge of the true composition could lead to reductions in the assumptions and therefore contribute to a reduction in controls and work restrictions. Also, knowledge of the actual composition will be required information for the analysis that is needed to remove tanks from the Watch List. Similarly, the rate of generation and release of gases is required information for performing safety analysis, developing controls, designing equipment, and closing safety issues. To determine release rate, both the gas concentrations and the dome space ventilation rates (exhauster flow rate or passive dome/atmosphere exchange rate) are needed.

Therefore, to quickly verify waste tank categorization or to provide additional characterization for tanks with installed gas monitoring, a temporary, portable standard hydrogen monitoring system is needed that can be used to measure gas compositions at both high and low sensitivities.

2.0 SCOPE

2.1 OBJECTIVE

This task plan details organizational responsibilities and requirements for the design, technical documents, fabrication, and testing of two portable SHMS platforms. The installation and operation of these SHMS platforms (either type E or E+) will be detailed under a separate engineering task plan. The portable SHMS platform will consist of a platform installed SHMS-E or SHMS-E+ system, with a portable gas bottle rack, portable pump stand, and potentially a portable generator stand.

The SHMS-E monitors Hydrogen using electro-chemical cells like a basic SHMS. A fully functional SHMS-E+ can measure gas concentrations in selectable ranges of approximately: Hydrogen (3-100,000 ppm); Nitrous Oxide (10-10,000 ppm); Ammonia (10-10,000 ppm) and Methane (10-4,000 ppm).

2.2 DELIVERABLES

The following items shall be prepared:

1. Drawings for system fabrication and installation:

   - Drawing index tree
   - Facility arrangement
   - Civil/structural
   - Electrical one-line and elementary diagrams
   - Piping and instrument diagram
   - Tubing routing

2. Supporting documents:

   - Test plans and procedures
   - Test reports
   - Design description

3. Vendor information file

4. As-built documentation drawings on task completion

5. Two fully-tested, and ready-to-mobilize full-feature portable SHMS platform systems.

Approved H-series drawings will be issued prior to portable SHMS platform mobilization on the selected tanks.

3.0 DESCRIPTION

3.1 PHYSICAL DESCRIPTION

The portable SHMS platform System design feature are as follows:

1. Portable platform with grounding strap

2. SHMS-E Design Features:
   - Dual Whittaker electrochemical cells to measure high hydrogen concentrations in the range of 2000-100,000 ppm.
   - Grab sample capability
   - Digital data logging
   - Network data transmission/archiving capabilities, as appropriate

2. SHMS-E+ Additional Design Features:
   - MTI gas chromatograph to measure low hydrogen concentrations, nitrous oxide, and methane concentrations

- B&K photoacoustic monitor to measure ammonia and methane concentrations

- Tracer gas injection, sampling, and possibly analysis capability for dome ventilation rate measurement.

The sample gas analytical system will provide local display of analyzed sample gases, as well as local data logging capabilities. Remote data logging capabilities may be provided. Functional requirements for the SHMS-E and SHMS-E+ are detailed in WHC-SD-WM-FDC-054, "Gas Continuous Monitoring System Functional Design Criteria."

3. Portable Bottle Rack

Either a separate or combined equipment platform with a bottle rack.

- Seismically qualified

4. Portable Pump Stand

Either a separate or combined equipment platform with a pump stand.

5. Portable Generator Stand

A separate, provisional generator platform.

- Grounding grid

3.2 ENGINEERING TASKS

1. Prepare the Functional Design Criteria.
2. Prepare specification for seismic design (as required) and system fabrication for the portable SHMS platform and auxiliary skids.
3. Develop Design documents with drawings.
4. Coordinate fabrication of the portable SHMS platform and auxiliary skids.
4. Prepare acceptance test procedures.
5. Conduct and witness testing, Prepare and release test reports.
6. Prepare and release design description.

The design and fabrication will be controlled in accordance with "Engineering Practice Guidelines," WHC-IP-1026, EPG-2.0, "Engineering System Design Control." Changes to the design documentation during fabrication will be by the ECN process initiated by the cognizant design engineer. The design drawings plus the ECNs issued during the fabrication will provide as-built documentation. Following fabrication, the system will be tested to verify compliance with the design.

Each portable SHMS platform and auxiliary skids will be assigned a generic tank farm characterization destination.

3.3 VERIFICATION

An informal specification review will be held prior to issuance, thus allowing interested parties to have input to the system design. Copies of the design review will be provided to the review team for information at the time the drawings are issued for fabrication. The fabrication will be subject to monitoring and inspection by the cognizant engineer or his designee. The fabrication will be inspected by the cognizant design engineer prior to verification testing.

The design will be verified by acceptance testing. Acceptance testing will be performed in the fabricator's shop and witnessed by the cognizant design engineer and the quality engineer. The cognizant design engineer may elect to have additional personnel witness the testing.

The SHMS-E+ and associated computer software are a part of another project. Testing of these elements will not need to be repeated.

3.4 PROCUREMENT

Two SHMS-E+ cabinets with pump stands and bottle racks and two sample gas conditioners, procured under another contract, will be government furnished to this fabrication activity. The material being provided to the fabrication contractor will be identified in the design. Procurements associated with the project of less than $5,000. and necessary overtime will be authorized by the Project Engineer with the concurrence of the Cognizant Manager. All procurements in excess of $5,000. will be authorized by the Program Manager or Cost Account Manager.

The remaining material will be purchased by the construction contractor.

3.5 FABRICATION

The portable SHMS-E+ platform and skids will be fabricated using engineering drawings controlled in accordance with WHC-IP-1026, "Engineering Practice Guidelines," EPG-2.0, "Engineering System Design Control."

4.0 ORGANIZATIONAL RESPONSIBILITIES

The task responsibilities are outlined in the following sections.

4.1 Flammable Gas Project

Program Manager: GD Johnson

- Plan and coordinate overall program.
- Approve engineering documentation.
- Approve design criteria.

4.2 Safety Upgrade Projects

Progect Manager: DW Crass

- Cost account manager
- Customer representative coordinating scope, cost, and schedule
- Approve engineering documentation.

4.3 Project Engineering Team - SGN Eurisys Services Corporation

Cognizant Manager: CE Hanson
Project Engineer: DD Tate
Cognizant Engineer: BL Philipp

- Provide cost and schedule estimates and weekly status to the program manager.
- Design, coordinate fabrication and assembly of the portable SHMS-E platforms.
- Coordinate component fabrication.
- Prepare acceptance test procedures and perform acceptance testing as required.
- Provide system fabrication and installation engineering support.
- Support preparation of system engineering installation requirements documents.
- Support installation design activities, as required.
- Support engineering documentation as-building, review, and release process.
- Prepare and coordinate a Memorandum of Understanding (MOU) defining the division of responsibilities associated with the portable SHMS-E Platform.
- Support preparation draft system maintenance and operations procedures.
- Support field operation and system maintenance.
- Support maintenance and operations system training.

4.4 Operations Cognizant Engineer for SHMS

Operations Cog. Manager: GN Hanson
Operations SHMS Cog. Engineer: MF Erhart

- Will act as the cognizant engineer or cognizant manager on behalf of Systems Engineering, as the design authority and customer for Waste Tank Upgrade Installation/Testing (WTUI/T) WTPE for all structures, systems, and equipment (SSE) provided for this project.
- Will advise, review, and approve applicable SSE: functional and design criteria, specification, description, training, operation, maintenance, and safety documents.
- Will define what is required for "Acceptance for Beneficial Use" (ABU).

4.5 TWRS Programs QA

QA Engineer: LD Salsberry

- Review and approve the fabrication and installation documents, work plans, and work instructions, as required.
- Perform the necessary surveillance and inspection activities to assure conformance to the appropriate documents and procedures throughout fabrication and installation.
- Review and concur with impact level and safety class designations.
- Support the system readiness review process.
- Provide acceptance documentation (green tag) for the system field installations.

4.6 TWRS Nuclear Safety

Manager: MN Islam
Safety Engineer: LS Krogsrud/SU Zaman

- Review and approve the fabrication and installation documents, work plans, work instructions, and test procedures and reports, when required.
- Review and concur with impact levels and safety class designations.
- Coordinate all required safety reviews, including industrial health and safety, fire safety, nuclear safety and radiological control.

5.0 SCHEDULE

Following are the task milestones:

Functional Design Criteria & Engineering Task Plan	April 30, 1997
Complete Design & preparation of H-series drawings	May 31, 1997
Complete shop fabrication of SHMS-E platforms	June 30, 1997
Complete verification testing	July 18, 1997
Complete design documentation	July 29, 1997
Task complete	July 31, 1997

These are the final completion dates for the design and fabrication. The design documents and drawings will be issued prior to fabrication.

6.0 COST ESTIMATE

	MANHOURS	ESTIMATED COST	CHARGE CODE
SESC Engineering Support			
Preliminary Design (ETP/FDC/Spec)	300	$25,000	N2047
Definitive Design (seismic Calc)	400	$30,000	N2064
Equipment Procurement			
2 SHMS-E + upgrades		$72,000	N2064
2 Radio modems		$20,000	N2064
Fabrication			
Fabrication		$25,000	N2064
Total Cost		$172,000	

7.0 QUALITY ASSURANCE

The design documents generated for this task will be prepared and verified in accordance with WHC-IP-1026, "Engineering Practice Guidelines," EPG-2.0, "Engineering System Design Control," and WHC-CM-3-5, "Document Control and Records Management Manual," Section 12.7, Rev.0, "Approval of Environmental, Safety, and Quality Affecting Documents". This task has been identified as Impact Level SQ in accordance with Section 12.7. The work associated with this task plan will meet the requirements of the Quality Assurance Project Plan as outlined in WHC-EP-550, "Project Plan for Mitigation," and WHC-CM-4-2, "Quality Assurance Manual."

8.0 SAFETY

The SHMS Platform has been classified as a non-safety related General Service system in accordance with the requirements of WHC-CM-4-46, "Safety Analysis Manual". Failure of the Portable SHMS Platform does not adversely effect the environment or the health and safety of the personnel operating the enclosure. General design and quality assurance requirements for Non-Safety items shall be followed. This Safety Classification is only for the platform and related hardware. The Safety Classification for the installed SHMS-E cabinet is defined in HNF-SD-WM-FDC-054, *Gas Characterization Monitoring System Functional Design Criteria*.

9.0 REFERENCES

1. WHC-SD-WM-FDC-054, "Gas Characterization Monitoring System, Functional Design Criteria."

2. WHC-CM-1-3, "Management Requirements and Procedures."
   - MRP 2.16, "Controlled Manual System, Paragraph 5.0, Requirements."

3. WHC-CM-3-5, "Document Control and Records Management Manual."
   - Section 12.7, Rev. 0, "Approval of Environmental, Safety, and Quality Affecting Documents."

4. WHC-CM-4-2, "Quality Assurance Manual."

5. WHC-CM-4-46, "Safety Analysis Manual."

6. WHC-CM-6-1, "Standard Engineering Practices."
   - EP-1.3, "Preparation of Engineering Drawings."
   - EP-1.7, "Engineering Document Approval and Release."
   - EP-2.2, "Engineering Document Change Control Requirements."
   - EP-3.3, "Vendor Information."
   - EP-4.1, "Design Verification Requirements."
   - EP-4.2, "Testing Practices."
   - EP-5.8, "Engineering Document Contents."

7. WHC-EP-550, "Project Plan for Mitigation."

8. WHC-IP-1026, "Engineering Practice Guidelines."
   - EPG-2.0, "Engineering System Design Control."

9. General
   - DOE Order 6430.1a,"General Design Criteria."
   - NFPA-70, "National Electrical Code."
   - ANSI/ISA-RP12.6, "Installation of Intrinsically Safe Systems for Hazardous Locations."

DISTRIBUTION SHEET

To	From	Page 1 of 1
DISTRIBUTION	B.L. Philipp SESC	Date 5/16/97
Project Title/Work Order TWRS Hydrogen Mitigation Portable Standard Hydrogen Monitoring System Platform Design and Fabrication Engineering Task Plan		EDT No. 619511 ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach. / Appendix Only	EDT/ECN Only
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D.D. Tate	L6-37	X			
M.F. Erhart	R1-51	X			
R.L. Schlosser	R1-56				X
L.D. Salsberry	B7-41	X			
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