APR 20 2000

ENGINEERING DATA TRANSMITTAL

Page 1 of 1
1. EDT 628745

2. To: (Receiving Organization) CHG Characterization Engineering		3. From: (Originating Organization) Characterization Engineering		4. Related EDT No.: N/A	
5. Proj./Prog./Dept./Div.: Characterization Project		6. Design Authority/ Design Agent/Cog. RN Dale/CG Linschooten/TR Farris		7. Purchase Order No.: N/A	
8. Originator Remarks: Supporting document submitted for review and approval prior to release This document encompasses the ETP, Functional Design Requirements and ABU.				9. Equip./Component No.: N/A	
				10. System/Bldg./Facility: 200G	
11. Receiver Remarks: ETN-99-0009 11A. Design Baseline Document? ☒ Yes ☐ No				12. Major Assm. Dwg. No.: N/A	
				13. Permit/Permit Application No.: N/A	
				14. Required Response Date: ASAP	
15. DATA TRANSMITTED					
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Design- nator
1	RPP-6134	N/A	0	ENGINEERING TASK PLAN FOR WATER SUPPLY FOR RMCS SPRAY WASH TRAILER.	S/Q
					(G) Reason for Trans- mittal
					(H) Origin- ator Dispo- sition
					(I) Receiv- er Dispo- sition

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)					
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BD-7400-172-2 (05/96) GEF097

ENGINEERING TASK PLAN FOR WATER SUPPLY FOR RMCS SPRAY WASH TRAILER

R.M. Boger

Prepared by CH2M HILL Hanford Group, Inc.

Richland, WA 99352

U.S. Department of Energy Contract DE-AC06-96RL13299
99RL-14047
99RL-13299
4-20-00

EDT/ECN: 628745

UC: 2000

Org Code: 74900

Charge Code: 102206ES10

B&R Code: EW313000

Total Pages: 17

Key Words: RMCS, SUPPORT TRUCKS, WATER SUPPLY, TRAILER, DRILL ROD,
SPRAY WASHERS, TANK FARM, CHARACTERIZATION PROJECT, ETN-99-0009.

Abstract: This ETP defines the task and deliverables associated with the design, fabrication and testing of an improved spray wash system for the Rotary Mode Core Sampling (RMCS) Spray Wash Trailer.

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4/20/00
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Approved For Public Release

**ENGINEERING TASK PLAN FOR WATER SUPPLY
FOR RMCS SPRAY WASH TRAILER**

Characterization Engineering
River Protection Project
CH2M HILL Hanford Group, Inc.
Richland, Washington

Prepared by
C. G. Linschooten

Numatec Hanford Corporation
Richland, Washington

April 2000

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ENGINEERING TASK PLAN FOR WATER SUPPLY FOR RMCS SPRAY WASH TRAILER

1.0 INTRODUCTION

When the drillstring and sampling equipment is removed from waste storage tanks by the core drilling truck, the components are washed. Washing is performed with one of five spray washers depending upon the component being removed:

1. The Cable Spray Washer item number H-2-690134-11 (LMHC 1996) cleans the sampler hoist cable as it is withdrawn from the drillstring carrying the Remote Latch Unit (RLU) and sampler. It also cleans the grapple hoist cable as it is withdrawn from the drillstring carrying the pintle rod and grapple. The Cable Spray Washer washing fluid is supplied at a maximum pressure of 500 psig (35 bars).
2. The Riser Sleeve drill string spray washer, item number H-2-690134-14 (LMHC 1996), has an array of washer nozzles at the bottom to wash the drill string as it is pulled out of the tank after sampling is complete. The washing fluid for the riser sleeve washer has a maximum pressure of 1200 psig (83 bars).
3. The Drill Rod Washer Manifold, item number H-2-690134-17 (LMHC 1996), washes the drill rod a second time as it is pulled out of the tank. (The drill rod may be washed twice since it was in direct contact with the waste and will be the most contaminated.) The washing fluid for the drill rod washer has a maximum pressure of 500 psig (35 bars).
4. The Riser Sleeve Spray Washer, item number H-2-690134-15 (LMHC 1996), cleans the riser sleeve as it is taken out of the riser after sampling is complete. The washing fluid for the riser sleeve spray washer has a maximum pressure of 500 psig (35 bars).
5. The Shielded Receiver Tube Spray Washer, item number H-2-690020-91 (LMHC 1994c), cleans the shielded receiver tube after the sampling operation is complete. The washing fluid for the shielded receiver tube spray washer has a maximum pressure of 500 psig (35 bars).

2.0 SCOPE

This Engineering Task Plan addresses all activities associated with procurement and testing of a trailer-mounted spray wash system for core sampling operations.

3.0 DESCRIPTION

3.1 PHYSICAL DESCRIPTION

3.1.1 SPRAY WASH SYSTEM

The spray wash system shall be a self contained, compact design and shall be trailer-mounted. The system shall include: the tank, electric motor driven pump, electrical switch gear, plumbing, and controls. The pump discharge shall be split into two spray wash supply lines--one high pressure supply line and one low pressure supply line. The high pressure supply line and low pressure supply line will each have its own hose reel. The pump shall be mounted in such a way that it will be easy to install and remove mechanical and electrical components. The trailer shall have a pintle trailer hitch with safety chains to be able to be towed by existing equipment.

3.2 DESIGN REQUIREMENTS

Design criteria shall be prepared and documented per RPP-PRO-1819 (LMHC 1998). The Design Compliance Matrix will be updated per Characterization Engineering Desk Instruction DI-CE-008-01 (Boger 1999a). The applicable Authorization Basis (AB) documents for the system are HNF-SD-WM-SAR-067 "TWRS Final Safety Analysis Report," (HNF 1999). HNF-SD-WM-TSR-006 (HNF 1999a) and WHC-SD-WM-SAD-035, Rev.0-b (LMHC 1997).

The overall safety classification of the spray wash system is General Service (GS).

3.2.1 INTERFACES

- 3.2.1.1 Spray Washer Power Supply. The electrical power shall be compatible with the existing available electrical power: 240 VAC, 60 Amp, single phase. The electrical connector shall be an RST-240/120-B HUBBELL 460B12W(male flanged inlet), 125/250 VAC, 60 Amp, 3P, 4W. The spray wash system is supplied with electrical power from an electrical distribution trailer (see drawings H-2-85340 [LMHC 1994] and H-2-85341 [LMHC 1994a]).
- 3.2.1.2 The tank fill opening shall be accessible without the use of ladders or stairs.
- 3.2.1.3 The end of the 400-psig (28 bars) spray wash supply hose will have a 3/8 Hansen Socket Quick Connect series 3-HK Socket, part number LL3-H21.
- 3.2.1.4 The end of the 1200-psig (83 bars) spray wash supply hose will have a 3/8 Hansen Plug Quick Connect series 3-HK Plug, part number LL3-K21.
- 3.2.1.5 The trailer hitch will be 2 3/4 inches (7 cm) minimum pintle hitch with safety chains.

3.2.2 PERFORMANCE CHARACTERISTICS

- 3.2.2.1 The trailer-mounted supply tank shall have a minimum capacity of 200 gallons (760 liters) and a maximum capacity of 300 gallons (1135 liters). The tank shall be

made of a material compatible with the washing fluid, which is 0.3 molar Lithium Bromide (LiBr) solution in water.

- 3.2.2.2 The pump discharge shall be divided into two spray wash supply lines.
- 3.2.2.3 A high pressure supply line shall supply 4 gpm (15 liters/min) spray wash fluid adjustable from 0 psig (0 bar) to 1200 psig (83 bars).
- 3.2.2.4 A low pressure supply line shall supply 4 gpm (15 liters) spray wash fluid adjustable from 0 psig (0 bar) to 400 psig. (28 bars).
- 3.2.2.5 Each spray wash line shall have a hose reel with 50 feet (15.2 m) of hose.
- 3.2.2.6 All wettable system components shall be made of a material compatible with 0.3 molar LiBr. solution in water at 130°F (55°C).
- 3.2.2.7 The entire spray wash system shall be protected from freezing.
- 3.2.2.8 The tank shall be designed to be freeze and thaw resistant.
- 3.2.2.9 The system shall be capable of measuring the total volume of fluid used for washing.
- 3.2.2.10 The system shall be capable of supplying 130°F +/- 10°F (55°C +/- 5°C) spray wash fluid at a minimum ambient temperature of 20°F (-7°C), at 8 GPM (30 liters/min) continuously for 5 minutes and a minimum of 150 gallons per hour (570 liters/hour).
- 3.2.2.11 The system shall have a temperature indication of +/- 5°F (+/-3°C) for the spray wash fluid.
- 3.2.2.12 The system shall have maximum start up time of 4 hours.
- 3.2.2.13 When the trailer is not connected to a pulling vehicle, the trailer shall be stable when one 250 lbs (115 kg) person is walking anywhere on the trailer.
- 3.2.2.14 The applicable design standard for electrical equipment shall be NFPA 70, the National Electric Code.

3.2.3 PHYSICAL CHARACTERISTICS

- 3.2.3.1 All handles, switches, and connections that must be operated or mated in the field must be operable by a person wearing two pairs of size 10 leather gloves.
- 3.2.3.2 The trailer shall have a single axle.
- 3.2.3.3 The reels shall be self retracting fixed reels with a hose guide.
- 3.2.3.4 The tank shall be capable of being filled with 4-gallon (15 liter) bottles or a hose.
- 3.2.3.5 The system shall be able to be easily drained completely.
- 3.2.3.6 All gauges shall be oriented for ease of reading.

3.2.4 RELIABILITY

- 3.2.4.1 The spray wash system shall be capable of being operated for at least 2000 hours before requiring replacement. The system shall be capable of being started at least 5000 times.

3.2.5 MAINTAINABILITY

3.2.5.1 All parts shall be readily accessible for field maintenance.

3.2.6 ENVIRONMENT

3.2.6.1 Operational environment:

3.2.6.2 The spray wash system shall operate reliably when exposed to summer heat (110°F) (44°C), intense direct sunlight, freezing rain, rain, snow, winter cold (20°F) (-7°C) and high winds of 30 mph (48 km/hour) and gusts up to 45mph (73 km/hour) with blowing dust.

3.2.6.3 Storage environment:

The components of the system shall be able to withstand storage temperature extremes from -20°F (-29°C) to 140°F (60°C).

The system shall withstand severe weather including freezing rain, rain, snow, intense direct sunlight, winds to 70 mph (113 km/hour), and blowing sand and dust.

3.2.7 TRANSPORTABILITY

3.2.7.1 The trailer shall be a compact design for optimum maneuverability.

3.2.7.2 The trailer shall meet all the applicable DOT requirements.

3.3 ENGINEERING TASKS

The engineering tasks contained in this task plan are the minimum necessary activities to provide a water supply system for the core sampling spray washers that is safe to deploy in the RPP tank farm facilities. The overall task is to procure and test a system that will meet the functions and requirements identified in this ETP. Characterization Engineering (CE) will complete the engineering tasks.

3.3.1 DESIGN

ECNs must be generated to accommodate necessary changes for the new system. The only anticipated ECNs relate to the Riser Sleeve hose quick connect.

3.3.2 PROCEDURES

Operation and maintenance procedures will be prepared and/or revised as required to support the operation and the maintenance of the new spray wash fluid supply system.

3.3.3 SPARES

A list of recommended spare parts will be provided for the spray wash fluid supply system.

3.4 DESIGN VERIFICATION

Independent design verification will be performed in accordance with HNF-IP-0842, Volume IV, Section 4.24 "Design Verification" (LMHC 1998a). Design reviews will be conducted per LMH-PRO-1819 (LMHC 1998). The safety classification of the RMCS Support Trucks is General Service (GS).

3.5 PROCUREMENT/FABRICATION TASKS

Procurement activities will be performed by CE.

3.6 INSTALLATION TASKS

The only installation task currently identified are the Hansen quick connect on the riser sleeve, assembly item number H-2-690134-14 (LMHC 1996), and the strainer assembly, item number H-2-690127-38 (LMHC 1994b).

3.7 PRE-OPERATIONAL AND OPERATIONAL TESTS

Testing will be documented and conducted per HNF-IP-0842, Volume IV, Section 4.28 "Testing Practices Requirements" (LMHC 1998a). An appropriate test/inspection report will be issued to document the results of acceptance and operational testing performed.

3.8 ACCEPTANCE FOR BENEFICIAL USE

An Acceptance for Beneficial Use (ABU) will be developed per HNF-IP-0842, Volume IV, Section 3.12, "Acceptance of Structures, Systems and Components for Beneficial Use" (LMHC 1998a), and Characterization Engineering Desk Instruction, DI-CP-004-02, "Acceptance for Beneficial Use (ABU)" (Boger 1999). The ABU is included as an Appendix to this ETP.

3.9 RISK ASSESSMENT

No potential risk can be identified to complete this task. Characterization Engineering and CPO are in concurrence to complete this task and the funding is available.

4.0 ORGANIZATION

4.1 CHARACTERIZATION FIELD ENGINEERING (CFE)

CFE will provide Cognizant Engineer support as required for this task. CFE will prepare or revise all operating and maintenance procedures, as required, to support the deployment of the new system.

Cognizant Manager: J. S. Schofield

Cognizant Engineer: R. N. Dale

4.2 CHARACTERIZATION ENGINEERING

CE will provide Design Authority support for this task. CE personnel will prepare all documentation associated with the development of the design requirements, procurement

specifications, and fabrication and testing of the new system. CE personnel and the cognizant engineer will witness all testing, and the Design Authority will approve the results of all testing.

Design Authority: G. P. Janicek
Project Manager: J. D. Criddle Jr.
Responsible Engineer: C. G. Linschooten

4.3 CHARACTERIZATION PROJECT OPERATIONS

Characterization Project Operations (CPO) will provide review of specifications and procedures associated with this task. The logistics of performing on-site testing will be the responsibility of CPO with the support of CE/CFE.

Operations Manager: M. R. Kembel
Core Sampling Manager: J. S. Lee

4.4 QUALITY ASSURANCE AND SAFETY

CH2M HILL Hanford Group, Inc. (CHG) will provide Quality Assurance (QA) and Safety support

QA Engineer: M. L. McElroy
Safety Engineer: C. D. Jackson

4.5 RADIATION ENGINEERING

Not applicable.

4.6 FLAMMABLE GAS EQUIPMENT ADVISORY BOARD

Not applicable.

5.0 SCHEDULE AND COST ESTIMATE

The CE Project Manager will maintain a detailed schedule for all tasks. A rough schedule is included in Appendix A. The scheduled completion of this task will be affected by the priorities assigned by CE and CPO based upon project commitments.

Estimated Cost:

Engineering	350-hrs
Procurement	\$50k

Engineering expenses will be charged to Cost Account Charge Number (CACN)102250/Code of Accounts (COA) B000. Quality Assurance, Safety, and RADCON will also be charged to CACN 102250 for this task. CPO and maintenance expenses are funded separately.

6.0 CONFIGURATION MANAGEMENT

A vendor information file will be established per LMH-PRO-1819 (LMHC 1998) to contain catalog cuts, performance specifications, and/or installation/operation instructions for components or systems supplied by the manufacturer. All modifications made to standard manufacturer products will be documented on H-2 series drawings.

7.0 QUALITY ASSURANCE

All work associated with this task will be in compliance with HNF-IP-0842, Volume XI, Quality Assurance Program, Section 1.1. (LMHC 1998a). QA oversight will be provided as defined in this ETP. QA will participate in the review of design, specification, and testing documents, witness testing as specified in the test procedures, and approve test results.

8.0 SAFETY AND AUTHORIZATION BASIS

All work associated with this task will be in compliance with HNF-IP-0842, Volume IX, Section 1.1, "RPP Safety Program Plan" (LMHC 1998). Safety will participate in the review of design, specification, and testing documents.

The AB for the system will be HNF-SD-WM-SAR-067, "TWRS Final Safety Analysis Report" (HNF 1999), HNF-SD-WM-TSR-006 (HNF 1999a), and WHC-SD-WM-SAD-035 (LMHC 1997). The applicable industry safety standards will be considered for all safety concerns associated with this task. The Unreviewed Safety Question (USQ) process will be used as required per HNF-IP-0842, Volume IV, Section 5.4, "Unreviewed Safety Questions" (LMHC-1998a).

9.0 SYSTEMS ENGINEERING

This activity is necessary to support the characterization of the waste in the underground waste storage tanks on the Hanford Site. This activity supports the Tank Farms task identified in the Work Breakdown Structure (WBS) as task number 1.1.1.1.3.1.9, Core Sampling Systems.

10.0 CLOSEOUT COSTS

If the task is no longer required, an estimate will be prepared before the task is closed. The amounts of all outstanding purchase agreements will be included as closeout costs.

11.0 REFERENCES

- Boger, R. M., 1999, "Acceptance for Beneficial Use (ABU)," Characterization Engineering Desk Instruction, DI-CP-004-02, Lockheed Martin Hanford Corporation, Richland, Washington.
- Boger, R. M., 1999a, "Design Compliance Matrix," Characterization Engineering Desk Instruction, DI-CE-008-01.
- HNF, 1999, HNF-SD-WM-SAR-067, Rev. 1C, "Tank Waste Remediation System Final Safety Analysis Report"(FSAR), January 1999, Lockheed Martin Hanford Corporation, Richland, Washington.
- HNF, 1999a, HNF-SD-WM-TSR-006, Rev. 1B, "Tank Waste Remediation System Technical Safety Requirements," including Addendum, January 1999, Lockheed Martin Hanford Corporation, Richland, Washington.
- LMHC, 1994, Drawing H-2-85340, Rev. 2, "Core Sampling Trailer One Line Diagrams," Lockheed Martin Hanford Corporation, Richland, Washington.
- LMHC, 1994a, Drawing H-2-85341, Rev. 1, "Core Sampling Trailer DT-B – Electrical," Lockheed Martin Hanford Corporation, Richland, Washington.
- LMHC, 1994b, Drawing H-2-690127, Rev. 2, "Core Sampling Misc. Equipment," Lockheed Martin Hanford Corporation, Richland, Washington.
- LMHC, 1994c, Drawing H-2-690020, Rev. 3, "Shielded Receiver Assembly (RMCST)," Lockheed Martin Hanford Corporation, Richland, Washington.
- LMHC, 1996, Drawing H-2-690134, Rev. 5 "Drill String Arrangements (RMCST)," Lockheed Martin Hanford Corporation, Richland, Washington.
- LMHC, 1997, WHC-SD-WM-SAD-035, Rev. 0-b, "A Safety Assessment of Rotary-Mode Core Sampling in Flammable-Gas Single-Shell Tanks: Hanford Site, Richland, Washington, August 1997," Lockheed Martin Hanford Corporation, Richland, Washington.
- LMHC, 1998, LMH-PRO-1819, latest revision, "Project Hanford Policy and Procedure System PHMC Engineering Requirements," Lockheed Martin Hanford Corporation, Richland, Washington.
- LMHC, 1998a, HNF-IP-0842, "RPP Administration (Procedures, Policies, Plans and Waivers)," latest revision, Lockheed Martin Hanford Corporation, Richland, Washington.

Appendix A. Schedule

Appendix B. Cold Weather Operating Parameters and Design Considerations.

Considered is an 80-gallon tank made of 1/8-inch-thick stainless steel plate with no insulation. The hose is to be 1/2-inch I.D, 50 feet long, not considering the rubber on the hose.

Preliminary calculations indicate that, when electrical power is disconnected from the spray wash fluid supply system, the water is at 130°F in the tank, and the outside temperature is 0°F, it takes approximately two days for the water to cool to 32°F and another four days to freeze solid in the tank. Hoses filled with 130°F water will most likely freeze solid in 8 to 12 hours. Therefore, all the hoses and the pump should be blown out after every shift, and the tank should be emptied when the tank is exposed to freezing conditions for longer than 3 days.

The tank and pump can be insulated with PVC foam panels to slow this process. The heater in the tank can be wired to accept 110 VAC. Powered by 110 VAC the heater puts out approximately 1900 watts and will keep the tank warm as long as the electric power is on and there is insulation. Alternately the tank and the pump can be heat traced to prevent freezing, which also requires electric power.

If the tank freezes solid, it is probable that the heater will be damaged. If the pump freezes, it will probably be ruined. If the hoses freeze, the integrity of the hoses might be lost.

Appendix C. Acceptance for Beneficial Use

DOCUMENTATION REQUIRED from Project WATER SUPPLY FOR RMCS SPRAY WASH TRAILER Prior to ACCEPTANCE FOR BENEFICIAL USE			
DESCRIPTION	RESPONSIBILITY	DESCRIPTION	RESPONSIBILITY
ENGINEERING		ADP	
☒ Engineering Task Plan (ETP)	CG LINSCHOOTEN	☐ Software Configuration Management Plan	N/A
☐ Activity Schedule	N/A	☐ System Requirements Specification	N/A
☐ Final Safety Analysis Report (FSAR)	N/A	☐ Software Design Description	N/A
☐ Technical Safety Requirements (TSR)	N/A	☐ Software Validation/Verification	N/A
☐ Safety Assessment (SA)	N/A	☐ _____	
☐ Safety Equipment List (SEL)	N/A	TRAINING	
☒ Design Criteria	CG LINSCHOOTEN	☐ Training Plan	N/A
☐ System Design Description (SDD)	N/A	☐ Training Manuals	N/A
☒ Test Plan/Specifications	CG LINSCHOOTEN	☒ Training to Operating Crews	RN DALE
☒ Acceptance Test Procedures (ATPs) and Final Test Reports	CG LINSCHOOTEN	☐ Training to Maintenance Crews	N/A
☒ Operational Test Procedures (OTPs) and Final Test Reports	CG LINSCHOOTEN	☐ Training Mock-Up	N/A
☐ Environmental Impact Statement	N/A	☐ _____	
☐ Environmental Report	N/A	OPERATIONS/MAINTENANCE	
☐ Environmental Permit	N/A	☐ Operating and Maintenance Manuals	N/A
☐ Hazardous Waste Disposal Plan/Procedures	N/A	☒ Operating Procedures	RN DALE
☐ Solid Waste Disposal Plan/Procedure	N/A	☐ Surveillance Procedures	N/A
☐ Stress/Seismic Analysis	N/A	☐ Calibration Procedures	N/A
☐ Stress/Design Report	N/A	☒ Preventative Maintenance Procedures	RN DALE
☐ Design Specifications/Report	N/A	☐ Repair/Maintenance Procedures	N/A
☐ Equipment Specifications	N/A	☐ Functional Check Procedures	N/A
☐ Procurement Specifications	N/A	☒ Preventative Maintenance Data Sheets	RN DALE
☐ Construction Specification	N/A	☐ _____	
☐ Essential Material Specifications	N/A	☐ _____	
☐ Final Design Drawings	N/A	☐ _____	
☐ Installation Drawings	N/A	QUALITY ASSURANCE	
☐ Installation Work Plan	N/A	☐ Inspection Plan	N/A
☐ As-built Drawings	N/A	☐ QA Program Plan	N/A
☐ Interface Control Drawings	N/A	☐ QA Project Plan	N/A
☐ IEFD Drawings	N/A	☐ _____	
☐ Systems Drawings	N/A	PROCUREMENT	
☐ Drawing Tree	N/A	☒ Vendor Information Files	CG LINSCHOOTEN
☐ Incorporate Outstanding Project Generated ECNs	N/A	☐ Comprehensive Equipment List	N/A
☒ NEC Inspection	CG LINSCHOOTEN	☒ Spare Parts List	AB COCKRELL
☐ _____		☒ Spare Parts in Stock	AB COCKRELL
☐ _____		☐ _____	
☐ _____			
☐ _____			