JAN 25 2000 (4) STA# 4

ENGINEERING DATA TRANSMITTAL

1. EDT 627889

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
CHG Characterization Field Engineering	Characterization Engineering	N/A
5. Proj./Prog./Dept./Div.:	6. Design Authority/Design Agent/Cog. Engr.:	7. Purchase Order No.:
Characterization Project	GP Janicek/DD Wanner	N/A

8. Originator Remarks: ESR-98-03
1) A NEPA review was conducted as shown by the signature from Environmental which signifies there concurrence.
2) Design Verification performed by Informal review per HNF-IP-0842 Vol IV, Section 4.24
3) The Design Criteria is addressed in WHC-SD-ETP-193, "In-Situ Vapor Sampling System Continuing Development."
4) The Safety Classification for the Carts is General Services (GS).

9. Equip./Component No.: N/A

10. System/Bldg./Facility: 200G

11. Receiver Remarks: 11A. Design Baseline Document? [X] Yes [] No

12. Major Assm. Dwg. No.: N/A

13. Permit/Permit Application No.: N/A

14. Required Response Date: N/A

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 Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	RPP-5275	N/A	0	Baseline Design Compliance Matrix for the Type 4 In-Situ Vapor Samplers (ISVS)	ESQ	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 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved 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
1	1	Design Authority GP Janicek 1/24/00	S7-12	1	1	CPO Eng. Mgr RM Boger 1/24/00	S7-12
1	1	Cog. Eng. DD Wanner 1/24/00	S7-12	1	1	CPO Mgr. JF Sickels 1-19-00	S7-03
1	1	Cog. Mgr. JS Schofield 1/24/00	S7-12				
1	1	QA ML McElroy 1-19-00	S7-07				
1	1	Safety CD Jackson 1/20/00	S7-34				
1	1	Env. LL Penn 1/20/00	S7-03				
1	1	Review JD Criddle Jr.	S7-12				
1	1	Proj. Mgr. JL Smalley 1/19/00	S7-12				

18. FR Reich 1/19/00
FR Reich
Signature of EDT Originator — Date

19. JS Schofield 1/24/00
JS Schofield
Authorized Representative For Receiving Organization — Date

20. JS Schofield 1/24/00
JS Schofield
Design Authority/ Cognizant Manager — Date

21. DOE APPROVAL (if required)
Ctrl No.
[] Approved
[] Approved w/comments
[] Disapproved w/comments

Baseline Design Compliance Matrix for the Type 4 In-Situ Vapor Samplers (ISVS)

R. M. BOGER
CH2M HILL Hanford Group, Inc., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

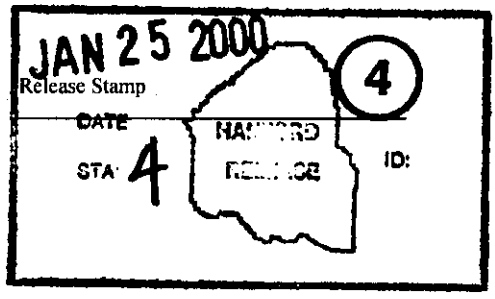
EDT/ECN: 627889 UC: 2000
Org Code: 74900 Charge Code: 102254/E100
B&R Code: EW3130000 Total Pages: 17

Key Words: Type 4 In-Situ Vapor Sampler (ISVS), vapor sampler, Design Compliance Matrix, DCM

Abstract:

The DOE has identified a need to sample vapor space and exhaust ducts in waste tanks that store radioactive waste. This document provides the Design Compliance Matrix (DCM) for the Type 4 In-Situ Vapor Sampling (ISVS) system that is used for completing this sampling function. The DCM identifies the design requirements and the source of the requirements for the Type 4 ISVS system. DCMs are a single-source compilation design requirements for sampling and sampling support equipment and support the configuration management of these systems.

Release Approval _____ Date 1/24/00



Approved for Public Release

Hanford NEPA Screening Form

For NEPA requirements, see HNF-PRO-452.
Answer questions YES or NO, and list NUMBER if applicable.

Work Item Title: Baseline Design Compliance Matrix Type IV ISVS

Work Package Number: ___ - ___ - ___ / ___

Project Description: (please limit to 6 lines)

Baseline Design Compliance Matrix for Type IV In-Situ Vapor Samplers (ISVS). Provides single-source complilation of current design requirements for sampling and sampling support equipment and configuration mangagement of these systems. No modification to requirements or planned work.

A INTEGRAL ELEMENTS

Will work threaten to violate environmental laws, regulations, permits, or safety requirements? ○ Yes ◉ No

Will work involve construction/expansion of waste treatment, storage, disposal facilities? ○ Yes ◉ No

Will hazardous substances be disturbed allowing uncontrolled/unpermitted releases? ○ Yes ◉ No

go to B.

B ECOLOGICAL RESOURCES

Will work affect Wetlands/Aquifers/ALE Reserve? ○ Yes ◉ No

Will work occur within 1/4 mile of Columbia River (Hanford Reach)? ○ Yes ◉ No

Will wildlife or natural habitat be disturbed? ○ Yes ◉ No

If all answers are NO, go to C; If any answer is YES, get Ecological Review. NUMBER: _____ then go to C.

C CULTURAL RESOURCES

Does the work require excavations or surface disturbing activities? Obtain permit if required. ○ Yes ◉ No

Does the work require building or equipment modifications to listed historic structures? ○ Yes ◉ No

If all answers are NO, and all conditions have been met and the SWCX applies, go to D; If any answer is YES, a Cultural Resources Review is required. List review NUMBER: _____ NOTE: If adverse impacts are identified, go to E.

D SITE-WIDE CATEGORICAL EXCLUSION (SWCX)

In evaluating potential environmental impacts, was Waste Minimization considered? See HNF-PRO-462. ○ Yes ◉ No

Is the work covered by a SWCX? ◉ Yes ○ No

If YES, list SWCX that applies: A1.0 Administrative print form and sign; If NO, Go to E

E SITE-WIDE CX DOES NOT APPLY

Does other DOE approved NEPA documentation apply for this activity? If yes provide applicable document number: ○ Yes ○ No

DOE/EA- _____ DOE/EIS- _____ Other- _____

If CX or EA preparation may be needed, contact WMH NEPA Team 372-2484 or 376-4373.

Signature

SWCX is not valid until any applicable Cultural/Ecological Resource Reviews are received and attached to this form.

Reviewer: _____ Phone: 372-2334
(Initiator, Cog. Engineer., Scheduler, Planner)

Concurrence: _____ Date: 1/20/00
(Manager, Env. Compliance Officer, WMH NEPA Team)

SWCX cannot be used if the action is part of an activity under review in an EA/EIS. MAINTAIN A COPY IN THE APPLICABLE PROJECT FILE OR WORK PACKAGE

A-6001-497 (3/98)

BASELINE DESIGN COMPLIANCE MATRIX FOR THE TYPE 4 IN-SITU VAPOR SAMPLERS

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

By F. R. Reich
COGEMA Engineering Corporation
Richland, Washington

January 2000

BASELINE DESIGN COMPLIANCE MATRIX FOR THE TYPE 4 IN-SITU VAPOR SAMPLERS

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BASELINE DESIGN COMPLIANCE MATRIX FOR THE TYPE 4 IN-SITU VAPOR SAMPLERS

1.0 BACKGROUND

Underground storage tanks on the Hanford Site, that store radioactive wastes, have been identified as facilities that can emit hazardous vapors. The Type 4 (sometimes referred to as Type IV) In-Situ Vapor Sampler (ISVS) system is a portable system that is designed for in-situ sampling of the vapor space in the radioactive waste storage tanks. The ISVS uses a "sorption" tube method of collecting vapors in situ. After samples are obtained with the sorption tubes, they are transported to a laboratory for vapor extraction and analysis. The ISVS cart contains mass flow sensors, temperature sensors, and flow totalizers that provide accurate volume and temperature measurements that are needed in establishing vapor concentrations.

2.0 PURPOSE

Characterization Engineering is chartered with supporting Characterization Project Operations through provision, maintenance, and modification of tank waste sampling and other equipment. The functional and design criteria for this equipment are varied in category, service, and application. Design Compliance Matrix (DCM) documents provide a single-source compilation of traceable, current design requirements for sampling and sampling support equipment and support the configuration management of these systems. A desk instruction for implementing the use of a DCM was issued (Boger 1999) to support all engineering design and design related activities performed on behalf of the Characterization Project.

3.0 SCOPE

This DCM document provides the base-line design requirements and the source of the requirements for the Type 4 ISVS sampling system that is used for vapor sampling in Hanford's radioactive waste tanks. Other system requirements are found in the System Design Document (Blanchard 1996a) and Engineering Task Plan (Blanchard 1996b). These documents should be consulted when making design changes to the Type 4 ISVS system. This DCM covers only the Type 4 ISVS system.

4.0 SYSTEM DESCRIPTION

The Type 4 ISVS system includes three major assemblies: sampling cart, tube bundle, and sampling head. The ISVS cart, shown in Figure 1, consists of an instrumentation cabinet, vacuum air pump components, a manifold, and various valves, flow meters, flow totalizers, rotameters, and filters mounted on a hand truck. A schematic of the cart's flow diagram (from drawing H-2-825313) is shown in Figure 2. A tube bundle (14 small-diameter tubes approximately 50 ft in length) connects the cart with the sampling head and provides a separate

sampling tube for the SUMMA™ canister sampler. The sampling head shown in Figure 3 (Figure 3 is considered a typical arrangement of sorption tubes and filters) contains particulate filters, tritium-trap filters, multiple sorption tubes, and a thermocouple. The selection and arrangement of the sorption tubes and filters is dependent upon the vapor sampling needs identified in the Data Quality Objective and Sampling Analysis Plan documents that define tank sampling requirements.

The tube-bundle is used to lower the sampling head through a riser into a tank's vapor space. As shown in Figure 2, the ISVS cart has 5 flow channels that can be operated simultaneously. One of these channels is reserved for the SUMMA™ canister sampler. The other four channels are used with the sorption tubes and tritium-trap particulate filters in the sampling head. The cart is designed so that each flow channel can have a different flow rate. Each of the 4 channels has a mass flow meter and a flow totalizer that measures the total flow through its sorption tube. The flow rate and total accumulated flow requirements are dependent upon the type of sorption tubes and/or filters in the sampling head. Flow total is needed to obtain a concentration reading for the filters and sorption tubes in the sampling head. The SUMMA™ canister flow channel is purged using a stopwatch and a calibrated rotameter. The purging is completed at a specific flow rate and over a defined time to ensure that the tube is filled completely with tank gases prior to taking a SUMMA™ canister sample. The gases that are pulled through the sorption tubes, filters, and SUMMA™ canister tubing are "scrubbed" by filters on the cart before they are released to the atmosphere. Thermocouples on the sampling head and in the cart's gas manifold are used to measure vapor temperature.

After sampling is completed, the tube bundle with the sampling head is removed from the tank. The sample head is disconnected from the tube bundle and the ends of the sorption and filter channels are capped. The sampling head is bagged out with protective plastic and then readied for shipment to the laboratory. The tube used with the SUMMA™ canister is separated from the tube bundle and disposed of as waste. The SUMMA™ tube in the tube bundle is replaced for each sampling campaign to prevent cross-contamination from the previous sampling. Since the sorption tubes are in front of their sampling tubes, there can be no cross-contamination, and the tube bundle can be reused.

Figure 1. Type 4 In Situ Vapor Sampling System Cart

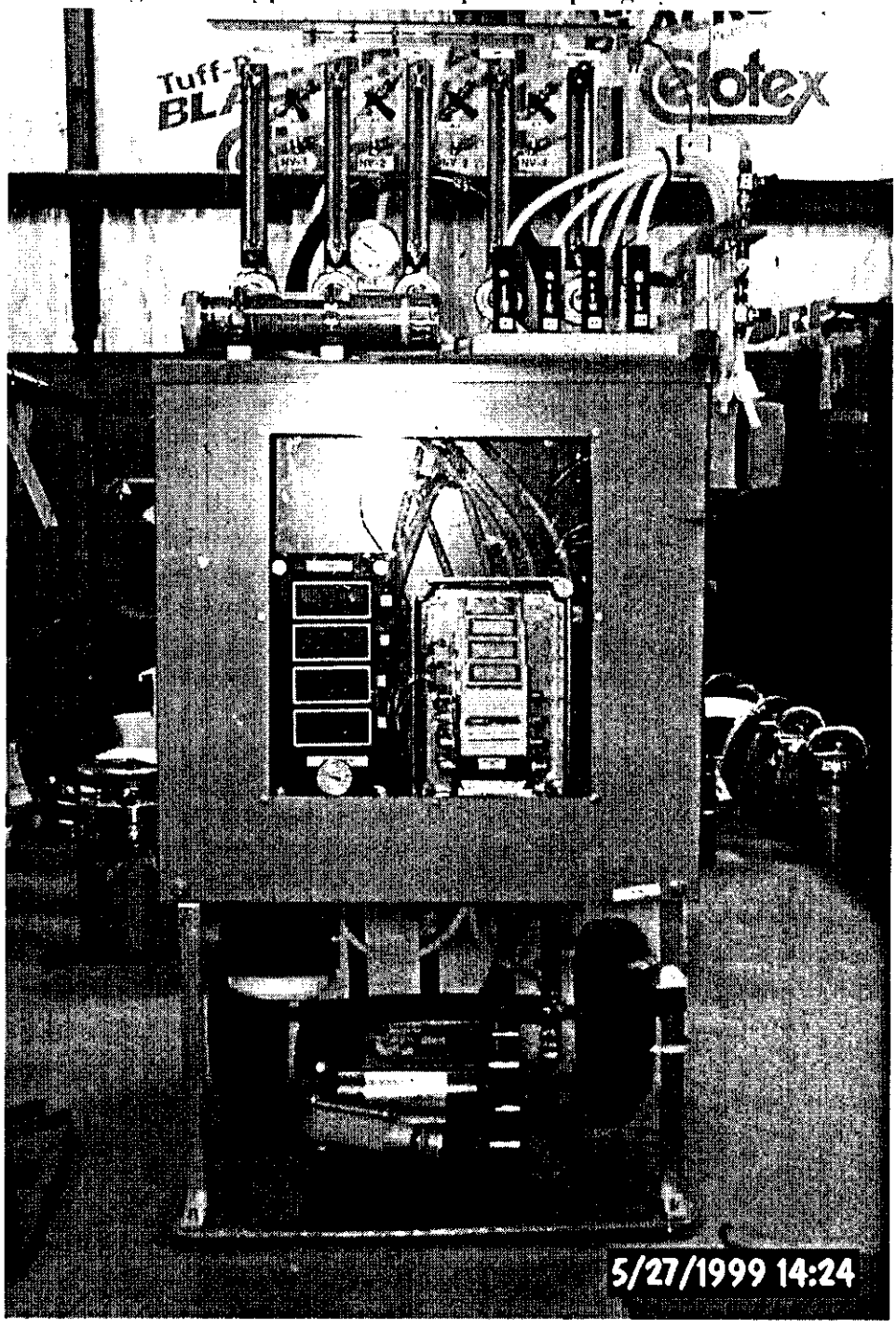


Figure 2. Type 4 In Situ Vapor Sampling System Cart

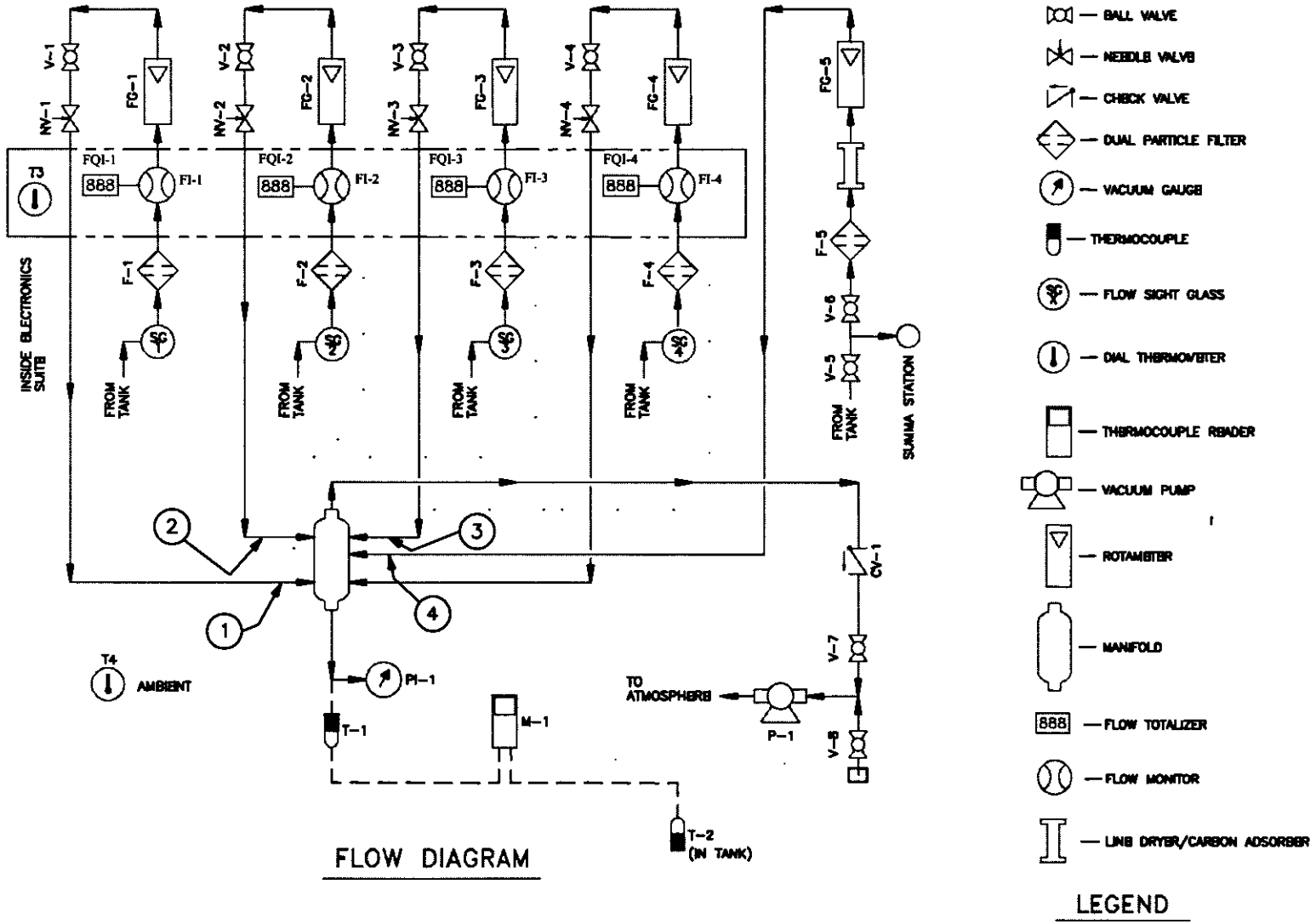
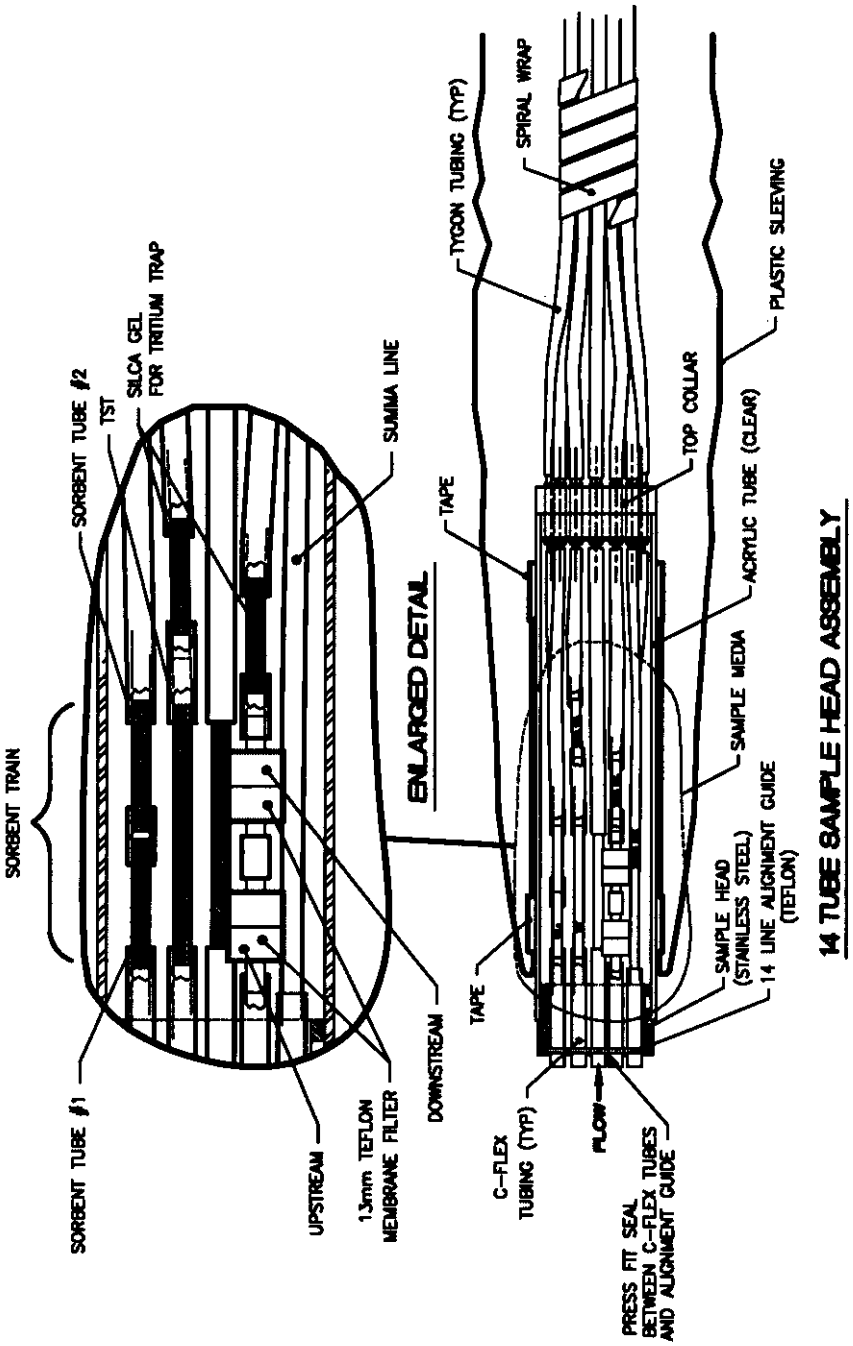


Figure 3. Typical Sampling Head Arrangement of Sorption Tubes and Particulate Filters.



5.0 RESPONSIBILITIES

This DCM, and any portion thereof, is considered to be a baseline requirements document. Any changes to the DCM will require Safety, Quality Assurance, and Environmental approval in addition to that of the assigned Design Authority. The assigned Design Authority is responsible for proper preparation and maintenance of the DCM and exercises ownership of it on behalf of Characterization Equipment Engineering and Characterization Project Operations management.

6.0 REQUIREMENTS

The Design Compliance Matrix for the Type 4 ISVS system is shown in Table 1. The functions and requirements identified in Table 1, Column 2, are defined in WHC-SD-WM-SDD-068 (Blanchard 1996a), and WHC-SD-WM-ETP-138 (DeFord 1996), and WHC-SD-WM-ETP-193 (Blanchard 1996b). These include functional requirements and constraints that are shown as safety, environmental, performance, interface, and design code requirements in Table 1.

6.1 FUNCTIONAL CHARACTERISTICS

The ISVS samplers are part of the tank waste sampling equipment. The equipment is moved from tank to tank to perform sampling operations and will be used year round. The gas volume withdrawn from a tank is sufficiently low that there is no impact on the tank dome space pressure or ventilation.

The ISVS sampler interfaces with a tank riser and may be powered with a portable electrical generator or plugged into a local power source.

The ISVS sampler components are exposed to the Hanford climate (FDNW 1997a), natural phenomena (FDNW 1997b), and the tank vapor chemistry (PNNL 1999). The ISVS sampler components must operate under these conditions, have the strength to withstand deployment loads, and be constructed of material that is compatible with the environment.

6.2 CONSTRAINTS

Constraints ensure that the ISVS equipment meets accepted safety envelopes, is in compliance with environmental regulations and pertinent design codes, and meets the operability standards considered important by the Design Authority.

6.2.1 SAFETY REQUIREMENTS

The safety class of the Type 4 ISVS cart is General Service. There are no safety class or safety significant items associated with this system. Operation and maintenance of the ISVS system is performed to approved procedures or work documents utilizing standard River Protection Project (RPP) safety practices.

6.2.2 ENVIRONMENTAL REGULATIONS

The pertinent environmental regulations limit radioactive and toxic air emissions. The governing radioactive air emission standard is Title 246-247 of the Washington Administrative Code (WAC). The governing toxic air pollutant standard is WAC 173-460. Specific requirements for control of radioactive emissions are presented in WAC 246-247 and for control of toxic air pollutants are presented in WAC 173-460. ALARA is the system operational exposure goal. The ISVS system has been approved by DOE for collecting vapor samples from tank wastes (LMHC 1999b).

6.2.3 MAJOR DESIGN CODES

The design codes of particular interest to ISVS sampler design is the National Electrical Code (NFPA 1998).

6.2.4 INSTRUMENT CALIBRATION REQUIREMENTS

The data quality requirements for the sample analysis and data obtained utilizing the Type 4 ISVS system are specified in HNF-SD-WM-DQO-021 (LMHC 1999a). Additional requirements may be specified in the individual tank sampling and analysis plan (TSAP). Table 8-3, *Chemical and Radiological Analytical Requirements* (LMHC 1999) specifies the criteria for the various analyses to be performed. All analyses listed are required to have a precision of ± 25% with an accuracy of 70%-130%. There are no instrumentation-specific requirements for the ISVS carts stated at this time. Therefore, the instrumentation is calibrated to values based on engineering of the manufacturer's accuracy and operational requirements (Table 2, Instrumentation Calibration Criteria).

6.3 SOLUTION TO REQUIREMENTS

For each requirement the DCM lists a system attribute that satisfies the requirement. Columns 7 and 8 in Table 1 describe the manner in which the Type 4 ISVS system fulfills the functional requirements and constraints that are found in Column 2.

6.4 VERIFICATION

Columns 9 and 10 in Table 1 provide confirmation information that is needed to confirm that the design solution adequately meets the system requirements.

7.0 REFERENCES

Blanchard, R. J., 1996a *System Design Description for the In –Situ Vapor Sampling System*, WHC-SD-WM-SDD-068. Rev. 0, July 1996, Westinghouse Hanford Company, Richland, Washington.

Blanchard, R. J., 1996b, *In-Situ Vapor Sampling System Continuing Development*, WHC-SD-WM-ETP-193, Rev. 0, May 1996, Westinghouse Hanford Company, Richland, Washington.

Boger, R. M. , *Desk Instruction - Design Compliance Matrix*, DI-CE-008-001, July 1999.

DeFord, D. K., 1996, *In-Situ Vapor Sampling Cart Development Engineering Task Plan*, WHC-SD-WM-ETP-128, Rev. 1A, January 1996, Westinghouse Hanford Company, Richland, Washington.

FDNW, 1997a, *Design Climate Data for Hanford Site*, SDC-5.1 GH-CLIM-01, June 1997.

FDNW, 1997b, *Design Load for Facilities*, SDC-4.1 GC-LOAD-01, June 1997.

LMHC, 1999a, *Data Quality Objectives for Regulatory Requirements for Hazardous and Radioactive Air Emissions Sampling and Analysis*, HNF-SD-WM-DQO-021, Rev., 1, 1999, Lockheed Martin Hanford Corporation, Richland, Washington.

LMHC, 1999b, *Control of Airborne Radioactive Emissions for Frequently Performed TWRS Work Activities (ALARACT Demonstrations)*, HNF-4327, Rev. 0,1999, Lockheed Martin Hanford Corporation, Richland, Washington.

NFPA 1998, *NFPA 70 National Electrical Code 1999Edition*, 1998, National Fire Protection Association, Inc., Quincy, Massachusetts.

PNNL 1999, *Tank Characterization Database*, Version 3.24, 1999, Pacific Northwest National Laboratory, Richland, Washington.

Tank Waste Information Network Systems (TWINS), (Tank waste data base found at web site: http://twins.pnl.gov:8001/data/data.asp)

WAC 246-247, 1995, *Radiation Protection--Air Emissions*, Washington Administrative Code, as amended.

H-2-825313 *Vapor Sampling Cart Assembly* (Latest Revision).

Table 1. Design Compliance Matrix for Type 4 In Situ Vapor Sampling System

DESIGN COMPLIANCE MATRIX - ISVS									
						SOLUTION		**VERIFICATION**	
Item #	Criteria	Source	Basis	Requirement Type	Notes/Assumptions/ Implications	Design Attribute	Config. Control Ref.	Engineering Evaluation Description	Verified By?
Enter Item No.	Enter functional or design criteria exactly as stated in the requirements source document.	Enter source doc.	Enter origin of requirements if other than Source	1 Performance 2 Ext. Interface 3 Safety 4 Environmental 5 Design Code 6 Other	Enter all additional information which amplifies, qualifies, justifies,...etc. the criteria statement.	Describe the manner in which the design purports to fulfill the criteria statement - be as specific as possible.	Provide ref. For design Attribute (drawing, procedure, spec....etc.)	Provide discussion on method, evidence, reasoning used, ...etc., to verify that the design complies with requirements - be specific - include any qualifications, if appropriate.	Person or group attesting to verify. (initialed)
1	Operate in the range of Tank Farm environmental conditions	WHC-SD-WM-SDD-068		1. Performance	Operate outdoors in all tank environmental weather conditions.	System design to handle the range of tank farm environmental conditions that include dust, moisture, and temperature. The operating temperature range for the ISVS is 0°C to 50°C (+32°F to 122°F), tank vapor and ambient temperature.		Work packages contain controls for weather conditions that are more restrictive than cart operating restrictions. Ventilation and heating capabilities are provided to the instrument enclosure that also provides weather protection. ISVS Operating Procedure requires enclosure temperature monitoring during sampling.	
2	Accurately sample tank headspace vapors and temperature	WHC-SD-WM-SDD-068	Tank Vapor Data Quality documents Vapor Sampling and Analysis Plans (HNF-SD-WM-TSAP-126, Rev. 0, etc.)	1. Performance	Sorption tube samplers and thermocouple placed inside tank vapor space for direct input and contact with vapor space materials. Collected vapors can be minimally biased with polymers used in system and in deployment. Accurate measurement of sampled total vapor mass required.	Flow mass sensors are not temperature sensitive. Flow rate controlled within ±5% over 50 to 500 sccm. Flow mass totalizers accurate to ±8% with flow variations up to ±15%. In situ thermocouple in sampling head. Stainless steel and low out-gassing polymer materials used in construction of sampling head. The acrylic housing and Teflon end piece prevent vapors from tape reaching sorption tube inlets. TSAP	H-2-825301, H-2-825313, H-2-825314	The performance of the sorption tube vapor sampling was verified by operational testing of the ISVS sampling system, (*Operability Test Report for the In Situ Vapor Sampling System*, WHC-SD-WM-OTR-196) Chain of custody initiated when samples retrieved from tank.	

DESIGN COMPLIANCE MATRIX - ISVS									
						SOLUTION		VERIFICATION	
Item #	Criteria	Source	Basis	Requirement Type	Notes/Assumptions/ Implications	Design Attribute	Config. Control Ref.	Engineering Evaluation Description	Verified By?
Enter Item No.	Enter functional or design criteria exactly as stated in the requirements source document.	Enter source doc.	Enter origin of requirements if other than Source	1 Performance 2 Ext. Interface 3 Safety 4 Environmental 5 Design Code 6 Other	Enter all additional information which amplifies, qualifies, justifies,...etc. the criteria statement.	Describe the manner in which the design purports to fulfill the criteria statement - be as specific as possible.	Provide ref. For design Attribute (drawing, procedure, spec....etc.)	Provide discussion on method, evidence, reasoning used, ...etc., to verify that the design complies with requirements - be specific - include any qualifications, if appropriate.	Person or group attesting to verify. (initialed)
3	Portable, manually deployable by a one to two operators in a 4 inch diameter riser.	WHC-SD-WM-SDD-068		1. Performance	Manually deployable without the use of cranes and other lifting devices.	ISVS system mounted on a manually deployable handcart. The sampling head is 2.5 inches in diameter which can be deployed in a 4 inch diameter riser. The tube bundle is less than 2.5 inches diameter.	H-2-825314	The ability to be deployed in a tank was verified by operational testing (*Operability Test Report for the In Situ Vapor Sampling System*, WHC-SD-WM-OTR-196).	
4	Sample tank dome vapors with in-situ sorbent tube samplers.	WHC-SD-WM-SDD-068		1. Performance		The type 4 ISVS uses a sorbent tube sampling head that is deployed (in-situ measurement) in the tank dome space.	H-2-8253301	The ability to in-situ sample in a tank was verified by operational testing (*Operability Test Report for the In Situ Vapor Sampling System*, WHC-SD-WM-OTR-196).	
5	ISVS to interface with Tank Farm utilities and resources	WHC-SD-WM-SDD-068		2. Ext. Interface.	Use electrical power from a portable Tank Farm approved electrical generator or Tank Farms utilities.	The ISVS requires single phase 110V, 60 Hz AC 5.0 amperes electrical power.	H-2-825314	The ability to interface with the tank farm was verified by operational testing (*Operability Test Report for the In Situ Vapor Sampling System*, WHC-SD-WM-OTR-196)	
6	Sample flammable gas Category 1, 2, & 3 waste tank vapor space	TSR-006, SAR-067		3. Safety	Vapor Sample Hanford SST, DST, IMUSTs, catch tanks, DCRT & aging waste tanks.	System components meet requirements for intrinsic safety or have been reviewed and approved by the FGEAB (FGEAB-97-008, Rev. 8).	ISVS Operating Procedure (TO-080-627), FGEAG Interpretation/ Recommendation Report FGEAB-97-008, Rev.8, H-2-825301, H-2-825313, and H-2-825314.	The Type 4 ISVS system (cart, bundle, and sampling head) is approved by the FGEAB for sampling vapors in Category 1, 2, and 3 tank dome space with no exceptions (FGEAB-97-008, Rev. 8).	

DESIGN COMPLIANCE MATRIX - ISVS									
						SOLUTION		VERIFICATION	
Item #	Criteria	Source	Basis	Requirement Type	Notes/Assumptions/ Implications	Design Attribute	Config. Control Ref.	Engineering Evaluation Description	Verified By?
Enter Item No.	Enter functional or design criteria exactly as stated in the requirements source document.	Enter source doc.	Enter origin of requirements if other than Source	1 Performance 2 Ext. Interface 3 Safety 4 Environmental 5 Design Code 6 Other	Enter all additional information which amplifies, qualifies, justifies,...etc. the criteria statement.	Describe the manner in which the design purports to fulfill the criteria statement - be as specific as possible.	Provide ref. For design Attribute (drawing, procedure, spec....etc.)	Provide discussion on method, evidence, reasoning used, ...etc., to verify that the design complies with requirements - be specific - include any qualifications, if appropriate.	Person or group attesting to verify. (initialed)
7	ISVS to be re-deployable with minimum generation of contamination and operator exposure	WHC-SD-WM-SDD-068		3. Safety/ ALARA	General Construction guidelines and Radiological Control Procedures for in situ tank farm tools. Tube bundle is re-usable, with exception of SUMMA™ Canister tube. Deployment must not add waste to sampled tank - all in situ components removed after completing a sampling campaign.	Tube bundle assembly deployed with protective plastic sheath. Vacuum pump exhausts tank vapors through particulate filter on cart prior to environmental release. In situ particulate filters (in sample head) used to measure/ indicate contamination prior to sorption tube processing.	H-2-825313 H-2-825301, and TO-080-627	Procedures to control contamination during deployment are identified in the ISVS operational procedure (Tank Farm Operating Procedure – Perform Vapor Sampling of Waste Tanks Using In Situ Vapor Sampling (ISVS) System, TO-080-627) and in the work packages (example: WS-97-00242/0 *Operations Special Procedure, 241-TX-102 Perform Type 4 Vapor Sample*)	
8	No environmental release of hazardous tank vapors & aerosols that exceed acceptable Tank Farm release limits	WHC-SD-WM-SDD-068	WAC 173-460, WAC 246-247,	4. Environmental	ISVS emissions shall be within acceptable limits.	Disposable protective plastic used over tube bundle assembly. Filter exhausted vapors before release. In-sltu Vapor Sampling (ISVS) approved for waste tank vapor sampling (HNF-4327, Rev. 0. ALARACT 8, *TWRS ALARACT Demonstration For Vapor Sampling*)	H-2-825313 and TO-080-627 (Tank Farm Operating Procedure) and associated work packages.	Procedures to control contamination during deployment are identified in the ISVS operational procedure (Tank Farm Operating Procedure – Perform Vapor Sampling of Waste Tanks Using In Situ Vapor Sampling (ISVS) System, TO-080-627) and in the work packages (example: WS-97-00242/0 *Operations Special Procedure, 241-TX-102 Perform Type 4 Vapor Sample*)	
9	Sampling apparatus to handle potentially	WHC-SD-WM-SDD-068		5. Design Code	1989 ASTM Standard Sec. 15 states: if metal is required for construction of the sampling apparatus,	All vapor and aerosol contacting components to be fabricated from corrosion resistant stainless steel and	H-2-825301 H-2-825313		

DESIGN COMPLIANCE MATRIX - ISVS									
						SOLUTION		**VERIFICATION**	
Item #	Criteria	Source	Basis	Requirement Type	Notes/Assumptions/ Implications	Design Attribute	Config. Control Ref.	Engineering Evaluation Description	Verified By?
Enter Item No.	Enter functional or design criteria exactly as stated in the requirements source document.	Enter source doc.	Enter origin of requirements if other than Source	1 Performance 2 Ext. Interface 3 Safety 4 Environmental 5 Design Code 6 Other	Enter all additional information which amplifies, qualifies, justifies,...etc. the criteria statement.	Describe the manner in which the design purports to fulfill the criteria statement - be as specific as possible.	Provide ref. For design Attribute (drawing, procedure, spec....etc.)	Provide discussion on method, evidence, reasoning used, ...etc., to verify that the design complies with requirements - be specific - include any qualifications, if appropriate.	Person or group attesting to verify. (initialed)
	chemically & radioactive hazardous vapors and aerosols.				a corrosion-resistant steel should be used. If flammable materials are to be sampled, stainless steel is required.	non-metallic materials			

Table 2. Instrumentation Calibration Criteria

Equipment Identification	Part Number	Manufacturer Calibration Specification	Calibration Accuracy
FG-1, FG-2, FG-3. FG-4	Rotameter, AALBORG #112-02	±2% full scale (fs)	N/A (flow indication only)
FG-5	Rotameter, AALBORG #102-05	±2% fs	±2% fs
PI-1	Vacuum Gage, ASHCROFT #2105-318	±3% fs	±3% fs
FI-1, FI-2, FI-3, FI-4	Mass Flow Meter, SIERRA #822-13-OV1-PV-V1	±1.5% fs (15-25 °C, 5-60 psia) 0.15% fs/°C 0.01% fs/psia	±2% fs (total error with totalizer below)
FQI-1, FQI-2, FQI-3, FQI-4	Mass Flow Totalizer, RED LION CONTROLS, #1MD13107	±0.1% fs	±2% fs (total error with above flow meter)
M-1	Thermocouple Meter BARNANT COMPANY, #BA600-1040	±0.4°C and ±0.1% of reading (> -150°C)	N/A