DOE/RL-97-05
Revision 2

Radioactive Air Emissions Notice of Construction Use of a Portable Exhauster at 244-AR Vault

United States
Department of Energy
Richland, Washington

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Revision 2

UC-630

Radioactive Air Emissions Notice of Construction Use of a Portable Exhauster at 244-AR Vault

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- Contains no classified or Applied Technology references
- Does not change the intent or meaning of the base document
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TERMS

BARCT	best available radionuclide control technology
CFR	*Code of Federal Regulations*
DCRT	double-contained receiver tank
DOH	Washington State Department of Health
EPA	U.S. Environmental Protection Agency
HEPA	high-efficiency particulate air
MEI	maximally exposed individual
NOC	notice of construction
SEPA	*State Environmental Policy Act of 1971*

METRIC CONVERSION CHART

The following conversion chart is provided to the reader as a tool to aid in conversion.

Into metric units | Out of metric units

If you know	Multiply by	To get	If you know	Multiply by	To get
	Length			**Length**	
inches	25.40	millimeters	millimeters	0.0393	inches
inches	2.54	centimeters	centimeters	0.393	inches
feet	0.3048	meters	meters	3.2808	feet
yards	0.914	meters	meters	1.09	yards
miles	1.609	kilometers	kilometers	0.62	miles
	Area			**Area**	
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.092	square meters	square meters	10.7639	square feet
square yards	0.836	square meters	square meters	1.20	square yards
square miles	2.59	square kilometers	square kilometers	0.39	square miles
square miles	259	hectares	hectares	0.00391	square miles
acres	0.404	hectares	hectares	2.471	acres
	Mass (weight)			**Mass (weight)**	
ounces	28.35	grams	grams	0.0352	ounces
pounds	0.453	kilograms	kilograms	2.2046	pounds
short ton	0.907	metric ton	metric ton	1.10	short ton
	Volume			**Volume**	
fluid ounces	29.57	milliliters	milliliters	0.03	fluid ounces
quarts	0.95	liters	liters	1.057	quarts
gallons	3.79	liters	liters	0.26	gallons
cubic feet	0.03	cubic meters	cubic meters	35.3147	cubic feet
cubic feet per minute	0.02832	cubic meters per minute			
cubic yards	0.76	cubic meters	cubic meters	1.308	cubic yards
	Temperature			**Temperature**	
BTU/hour	2.93 E-4	kilowatts			
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit

RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION USE OF A PORTABLE EXHAUSTER AT 244-AR VAULT

1.0 INTRODUCTION

This document serves as a notice of construction (NOC), pursuant to the requirements of Washington Administrative Code (WAC) 246-247-060, and as a request for approval to construct pursuant to 40 Code of Federal Regulations (CFR) 61.96, for the use of a portable exhauster at the 244-AR Vault during air jetting of accumulated liquids from the cell sumps into the tanks and to make transfers among the tanks within the vault when needed.

The 244-AR Vault is considered to be a double-contained receiver tank (DCRT) based on its functional characteristics, although it is not listed as one of the five designated DCRTs in the 200 Area Tank Farm systems. Process operations at the vault have been inactive since 1978 and the vault's two stacks have not operated since 1993. Since cessation of vault operations an extremely large amount of rain water and snow melt have accumulated in the cell sumps. The water level in the sumps is substantially above their respective operating levels and there is concern for leakage to the environment through containment failure due to corrosion from backed-up sump liquid.

Active ventilation is required to provide contamination control during air jetting operations within the vault. It has been determined that it would not be cost effective to repair the existing exhaust systems to an operational condition, thus, a portable exhauster will be used to support the intermittent operations.

2.0 FACILITY LOCATION (Requirement 1)

The 244-AR Vault is located west of the 241-A Tank Farm in the 200 East Area of the Hanford Site. Figure 1 shows the location of the 200 East Area within the Hanford Site. Figure 2 shows the location of the 244-AR Vault within the 200 East Area. The geodetic coordinates of the 244-AR Vault are as follows:

Latitude: 46°, 33", 12.29' North
Longitude: 119°, 31", 06.38' West

U.S. Department of Energy, Richland Operations Office
Hanford Site
200 East Area, 244-AR Vault
Richland, Washington 99352

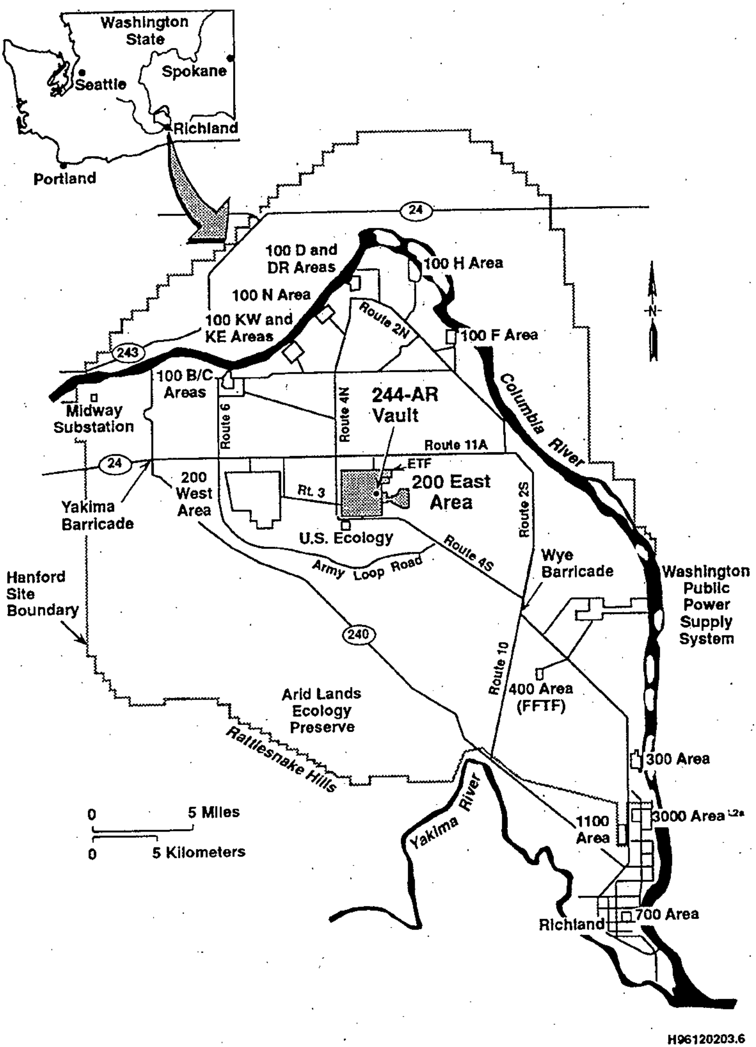

Figure 1. Hanford Site.

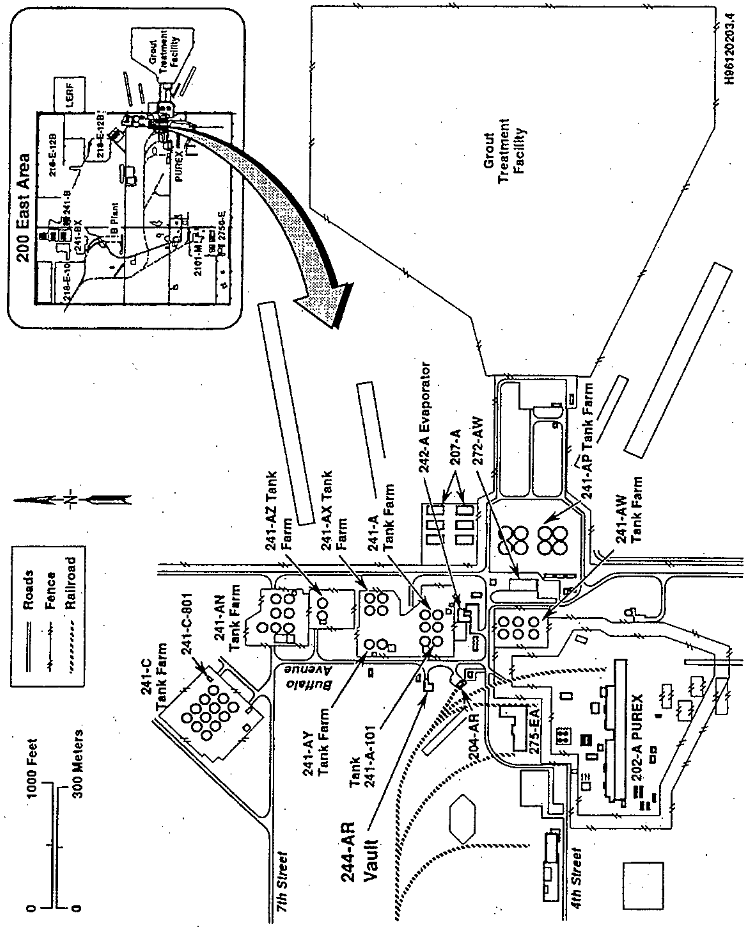

Figure 2. Location of the 244-AR Vault within the 200 East Area.

3.0 RESPONSIBLE MANAGER (Requirement 2)

The responsible manager's name and address are as follows:

Mr. M. J. Royack, Program Manager
Tank Waste Remediation System, Waste Storage Division
U.S. Department of Energy, Richland Operations Office
P.O. Box 550
Richland, Washington 99352
(509) 376-4420.

4.0 TYPE OF PROPOSED ACTION (Requirement 3)

The proposed action is a significant modification to an existing emission unit. The proposed modification is to install and operate a portable exhauster at the 244-AR Vault during air jetting of accumulated liquids from the cell sumps into the tanks, and to make transfers among the tanks within the vault when needed. The existing 244-AR stack identification numbers are 296-A-12 and 296-A-13. The portable exhauster emissions will be reported under stack identification 296-A-13.

5.0 STATE ENVIRONMENTAL POLICY ACT (Requirement 4)

This activity is categorically exempt from the State Environmental Policy Act process.

6.0 PROCESS DESCRIPTION (Requirements 5 and 7)

The original purpose of the 244-AR Vault, beginning in 1966, was to transfer waste from the PUREX Facility, A-Tank Farm, and AX-Tank Farm to B Plant. The facility was a transfer station and a temporary storage and waste acidification facility in support of the strontium and cesium removal that was accomplished at B-Plant. The vault has not transferred waste since April of 1978. It was then cleaned out with the exception of 2,271 liters of sludge. Some jetting of the sumps into the tanks occurred between 1978 and 1993. Operations in the vault have since been inactive except for entries for monitoring, minor maintenance and inspections.

The 244-AR Vault has two, non-operational stacks: the vessel vent stack (296-A-12) and the canyon stack (296-A-13). The vessel vent stack has not operated since February 1993. When operational, it had intermittently ventilated the four tanks within the vault during process operations. These tanks are held in cells and are separated from the vault canyon by non-airtight cover blocks. The cells are open to the canyon through a canyon-to-cell ventilation duct between Cell 3 and the canyon. The cells are also open to each other through ventilation duct between the cell walls. (Figure 3). The canyon stack has been inactive since July 1993. When operational, it had continuously ventilated the canyon and the three cells containing the tanks.

Since cessation of vault operations, an extremely large amount of rain water and snow melt have accumulated in the cell sumps. The water level in the sumps is substantially above their respective operating levels. The water level in Cell 1 Sump is higher than the drain line from the failed equipment storage caisson outside and directly adjacent to the cell (Figure 3). There is concern that the galvanized caisson, installed in 1965, could fail due to corrosion from backed up sump liquid. Also, the sump liquid level in Cell 3 is approximately 78 centimeters from a seal pot drain line penetration. This situation is not as great of a concern for containment failure as the galvanized caisson because the seal pot and the piping is constructed of stainless steel.

Active ventilation is required to air jet the accumulated liquids from the cell sumps into the tanks and to make transfers among the tanks within the vault. Air jetting will employ the existing steam operated systems modified to use compressed air. The best air jetting rate obtainable, with compressed air, is 6.4 liters per minute. Personnel entry into the facility is not required for air jetting operations, however, personnel entries will not be restricted during air jetting operations. Air jetting events will occur periodically, as liquid is detected in the sumps, in accordance with dangerous waste regulations.

The 244-AR Vault has its own ventilation/exhaust systems, however, due to high costs of bringing the systems back into operation after years of inactivity, a rotary mode core sampling (RMCS) portable exhauster will be used to maintain a negative pressure on the tanks during pumping. Three of the RMCS exhauster systems have been approved by the EPA and DOH for use during rotary core sampling of single-shell tank waste. The RMCS portable exhauster will be connected to an existing monitoring riser, for the vessel ventilation system, outside the vault (Figure 4). The riser will be equipped with a G-1 Series HEPA filter. Together, the riser HEPA filter and the RMCS exhauster make up the *temporary* vessel ventilation system. The valves/dampers isolating the vessel vent from the existing 244-AR filter banks are normally closed and will remain closed during operation of the portable exhauster. These valves will also isolate the existing facility filter banks from the portable exhauster. Once a jetting campaign is complete, the temporary vessel ventilation system will be physically isolated from the vault and the existing ventilation systems by ensuring valves MK-4-1, MK-4-3 and MK-4-4 are closed (Figure 4). As the exhauster operates, a negative pressure will be pulled on all four tanks through a common header at 5.7 cubic meters per minute. The tanks are not air tight, therefore, air infiltrates into the tanks from the cells and canyon through various equipment connections (instrumentation, jumpers, pumps, agitators, steam jets, etc.).

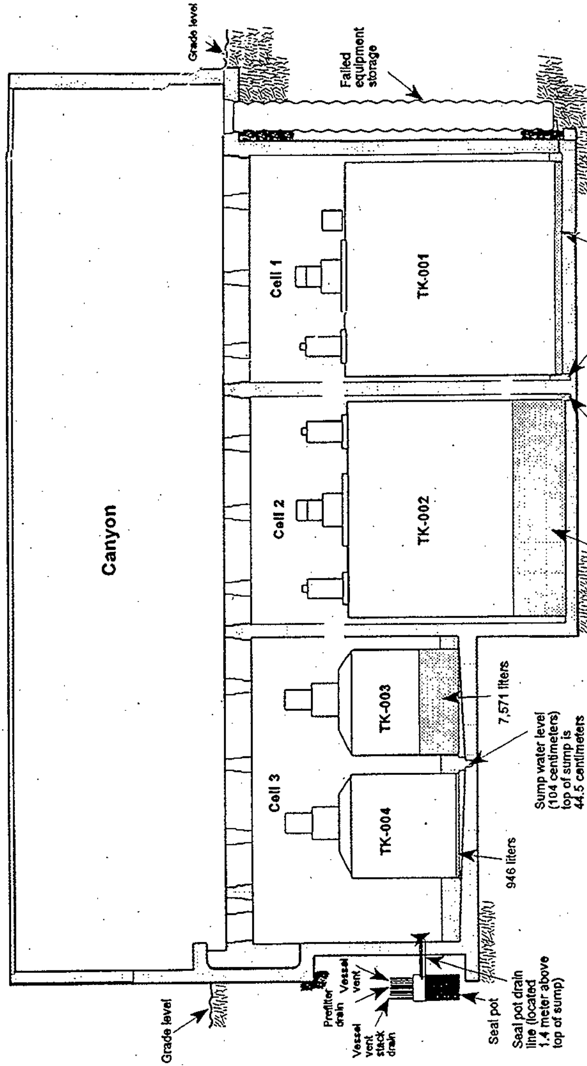

Figure 3. 244-AR Vault.

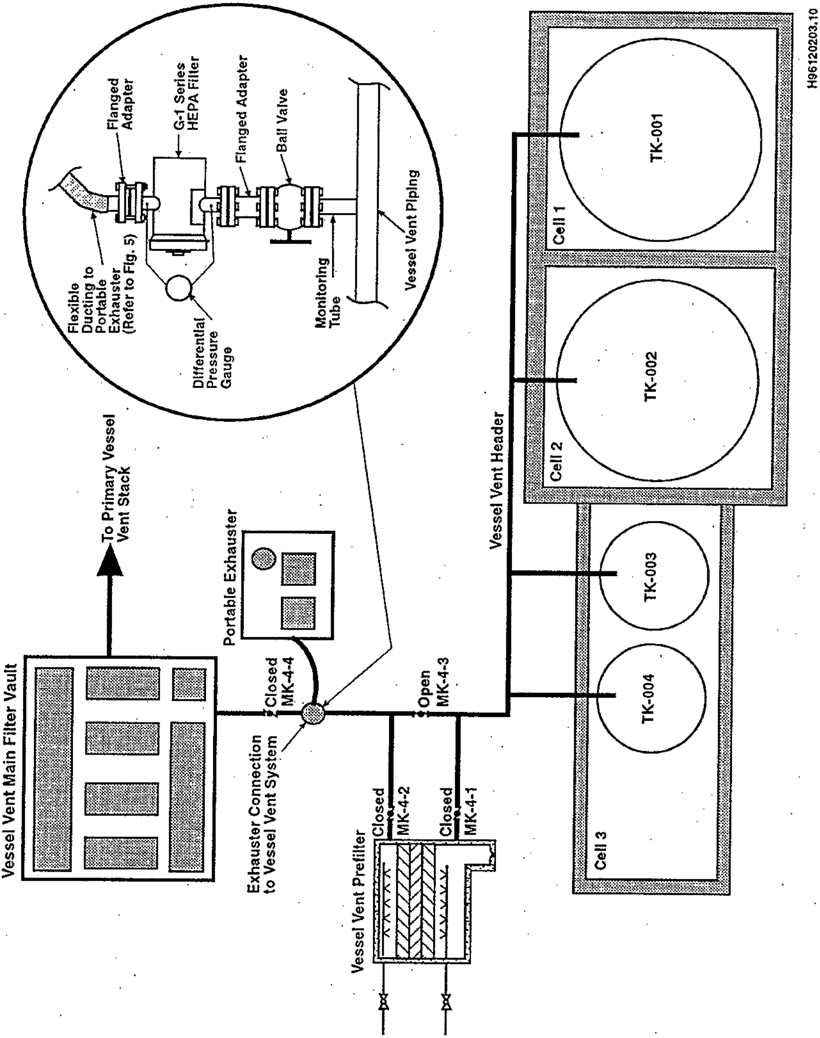

Figure 4. Portable Exhauster Connection Configuration.

7.0 ANNUAL POSSESSION QUANTITY AND PHYSICAL FORM

(Requirements 8, 10, 11, and 12)

Currently the 244-AR Vault contains 59,800 liters of liquid and sludge in its tanks, and 13,172 liters of liquid and settled particulates in its sumps. The inventory is comprised of the following three components and is quantified in Table 1.

1) 2,271 liters of liquid waste and sludge in tanks 002 and 004. This waste originated from double-shell tank 241-AX-104. It was transferred to 244-AR to be used as a radioactive waste sample for waste vitrification studies. The studies were never performed and the waste has been in the tanks since April 1978 (Appendix A).

This portion of the inventory comprises 98 percent of the curie content in the vault. Its predominant radionuclides are strontium and cesium. The values for strontium and cesium are based on the analysis of a sludge sample taken from Tank 004 in 1978. The sample was taken to determine the heat generation of the residual sludge in tank 241-AX-104. The results of the sample analysis and heat generation calculations are shown in Appendix B. The values in Table 1 have been decay corrected 18 years from the values presented in Appendix B. Values for the other radionuclides were estimated by the Tank Layering Model (TLM) for tank 241-AX-104. The model produced a solids composite inventory that is shown in Appendix C. Strontium and cesium values from Appendix C are not included in Table 1 because the values from the sludge sample (Appendix B) provide a more conservative estimate.

2) 57,538 liters of rain water, steam condensate and raw water pumped from the sumps into the tanks during facility operation.

The contribution to the radionuclide inventory of this component of the inventory was not quantified. Its radionuclide content is insignificant in comparison to the waste in Tanks 002 and 004 above. It significantly increased the volume in the tanks but not the radionuclide concentrations.

3) 13,172 liters of rain water and snow melt currently accumulated in the sumps, and surface contamination residing on the inside of the facility.

This portion of the inventory contributes 0.1 curie of strontium-90. It is calculated in Appendix D. This quantification is consistent with the NESHAPs designation quantification of curie content available for release from the Canyon Stack 296-A-13. The estimate is based on beta/gamma survey data taken May of 1987 and confirmed as still current in June of 1995. The survey data showed loose contamination, of which all is assumed to be strontium-90. The contamination is also assumed to be uniformly distributed over all ventilated surface areas. This estimate conservatively assumes that the entire 0.1 curie contained in the loose contamination is in the sump and available for release.

Table 1. Radionuclide Inventory for the 244-AR Vault.

Radionuclide	Physical form	Concentration (curies per liter)	Volume (liters)	Inventory (curies)	Percent of total inventory (%)	Comments
Sr-89/90*	Sludge/liquid	51.8	2,270	1.18 E+05	98.37	Contribution from tank contents. Data from tank 004 sludge sample. Refer to Appendix B.
Cs-137*	Sludge/liquid	0.85	2,270	1.93 E+03	1.61	
Tc-99	Sludge/liquid	1.69 E-04	2,270	3.84 E-01	0.00	Contribution from tank contents. Data from Tank Layering Model solids composite for 241-AX-104. Refer to Appendix C.
I-129	Sludge/liquid	3.20 E-07	2,270	7.26 E-04	0.00	
U-232	Sludge/liquid	6.04 E-12	2,270	1.37 E-08	0.00	
U-233	Sludge/liquid	1.62 E-13	2,270	3.68 E-10	0.00	
U-234	Sludge/liquid	1.00 E-07	2,270	2.27 E-04	0.00	
U-235	Sludge/liquid	4.19 E-09	2,270	9.51 E-06	0.00	
U-236	Sludge/liquid	2.35 E-09	2,270	5.33 E-06	0.00	
U-238	Sludge/liquid	9.84 E-08	2,270	2.23 E-04	0.00	
Np-237	Sludge/liquid	5.48 E-07	2,270	1.24 E-03	0.00	
Pu-238	Sludge/liquid	4.38 E-05	2,270	9.94 E-02	0.00	
Pu-239	Sludge/liquid	2.05 E-03	2,270	4.65 E+00	0.00	
Pu-240	Sludge/liquid	3.20 E-04	2,270	7.26 E-01	0.00	
Pu-241	Sludge/liquid	3.34 E-03	2,270	7.58 E+00	0.01	
Pu-242	Sludge/liquid	1.10 E-08	2,270	2.50 E-05	0.00	
Am-241	Sludge/liquid	7.15 E-05	2,270	1.62 E-01	0.00	
Am-243	Sludge/liquid	1.80 E-09	2,270	4.09 E-06	0.00	
Sr-90	Liquid/ particulate	N/A	13,172	0.1	0.00	Contribution from sumps and surface contamination in the facility. Data from smear samples. Refer to Appendix D
TOTAL				1.20 E+05	100.00	

* Decay corrected 18 years from data in Appendix B.

Shaded area indicates the radionuclides contributing 10 percent or more of the unabated total effective dose equivalent to the maximally exposed individual.

Review of historical records/data and interviews with operational personnel confirm that no transfers have been made to the facility and that no leaks have occurred from the facility's tanks into the sumps since 1978. Therefore, the sumps' current contents are presumed to be rain or raw water. Facility associated seal pots, filter vaults and stacks do drain back to Cell 3 Sump. This drainage, however, is not believed to contribute significantly to the radionuclide inventory and is adequately accounted for in the estimate.

Since 1978, the 244-AR Vault has been utilized, at times, as a central low point collection for secondary containment during waste transfers between other facilities. This would provide the opportunity for the 244-AR Vault to receive leakage from these waste transfer lines. By design any transfer line leakage is drained to either Tank 001 or Tank 002. Tank liquid level measurements are taken daily and have shown that no measurable increases or decreases, beyond the documented air jetting and transfers within the vault, have occurred since 1978. There is no data supporting the evidence that such leakage accumulation occurred. The radionuclide inventory for Tank 002 is bounded by the sludge sample analysis from Appendix B. If transfer line leakage has drained to the vault, it is sufficiently small enough (below instrumentation detection levels) that the total inventory estimate accounts for it.

8.0 CONTROL SYSTEM (Requirement 6)

A RMCS portable exhauster will be used to maintain a negative pressure on the tanks during air jetting. An additional standard tank farm G-1 Series high-efficiency particulate air (HEPA) filter will be used in conjunction with the RMCS exhauster system in providing active ventilation during air jetting events. These two components together make up the temporary vessel ventilation system.

During exhauster operation, the 244-AR facility ventilation system will be valved closed from the exhaust flow lines. Offgas will be pulled from all four tanks in the vault through a common header, it will flow through the G-1 HEPA filter before entering the RMCS exhauster system (Figure 5). The RMCS exhauster system consists of a heater, a prefilter followed by two HEPA filters, all in series, the exhaust fan and a stack. The heater will not be energized in this application.

The G-1 HEPA filter is 30.5 centimeters square by 29.2 centimeters deep. It is installed in a 55.9 centimeter diameter housing with fluid seals. Its fail rating is at a differential pressure (DP) of 10 inches of water. Operational procedures for air jetting limit the DP to 5 inches of water. A 5.7 cubic meter per minute flow rate corresponds to a DP of 1.25 inches of water. Its housing is flanged and is connected directly in-line upstream of the RMCS exhauster. The RMCS HEPA filters are 61 centimeters square by 29.2 centimeters deep and are rated for 28.3 cubic meters per minute flow. All the HEPA filters (G-1 and RMCS) are 99.95 percent efficient for the removal of particulates 3 microns and larger.

The G-1 HEPA is fully compliant with the requirements of ASME N509/510. The RMCS HEPAs are compliant with the intent of ASME N509/510, however, the physical design of the filter housing and the manufacturer's qualification of the fan motor rating differ slightly from the ASME standards. Therefore, an equivalency demonstration of the equipment is provided in Appendix E, ASME/ANSI N509 and N510 Equivalency Demonstration. In this application of exhausting the 244-AR vault, the first tier of HEPA filtration is provided by the G-1 series filter, the second tier is provided by the RMCS HEPA filters tested as one.

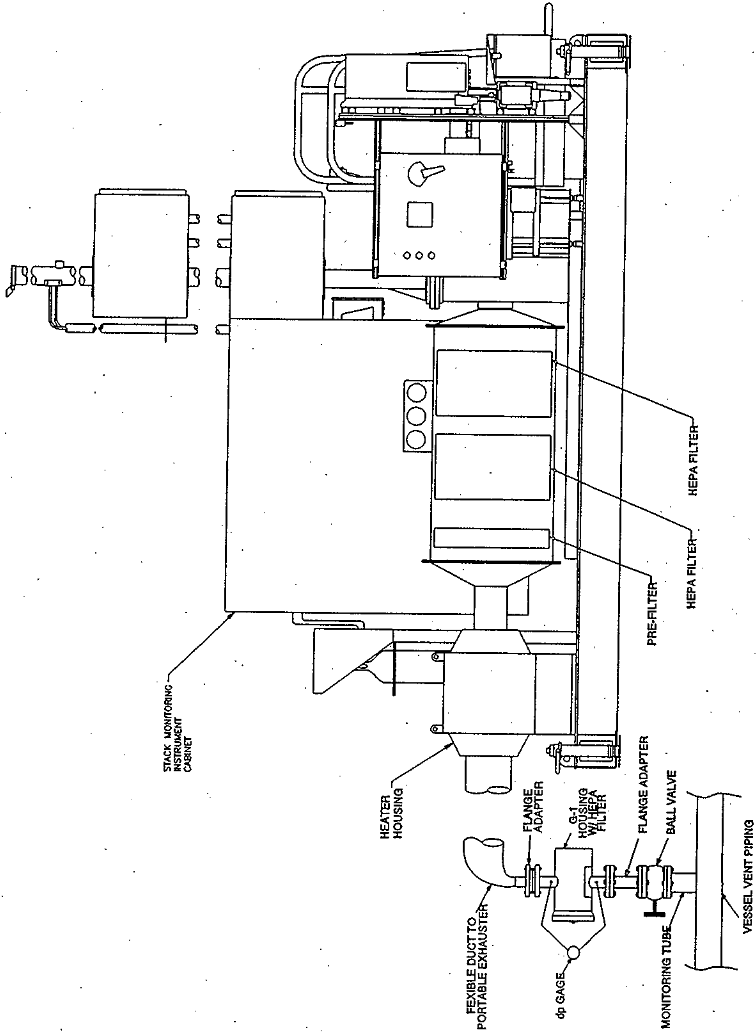

Figure 5. Exhaust System Design Drawing.

The fan is rated for 28.3 cubic meters per minute. In this application the flow is reduced to 5.7 cubic meters per minute by use of a variable speed drive that controls the fan motor revolutions per minute (RPM) to maintain a constant flow out the stack. The variable speed drive uses stack flow rate as an input variable, therefore, as the filters load, the fan RPM is increased to maintain constant flow.

The stack is circular, 10.2 centimeters in diameter and approximately 4.6 meters high from ground level. Exhaust temperatures are designed to be between 32 and 38 °C.

9.0 MONITORING SYSTEM (Requirement 9)

The potential unabated total effective dose for this application of a portable exhauster is greater than 0.1 millirem per year. Therefore, the exhauster stack will be equipped with sampling equipment designed and operated in accordance with 40 CFR 61, Subpart H and its referenced requirements.

9.1 EXHAUSTER SAMPLING AND MONITORING

The sampling and monitoring system is designed to collect particulate samples isokinetically for a monodispersed particle size distribution of 10 micrometers.

The sample probe, the Beta CAM probe and velocity measurement locations are in compliance with 40 CFR 60 Appendix A Method 1A. The stack flow measurements are obtained with automated, continuous flow instrumentation[1] which was certified accurate in accordance with 40 CFR 52 Appendix E as previously negotiated with the EPA (Leitch 1993).

Sample flow measurement accuracy is in compliance with 40 CFR 60 Appendix A Method 2A. Density compensations are made for temperature and pressure changes and sample flow is controlled proportionally to the stack flow as conditions vary. The record sample filter accumulates continuous samples for periodic laboratory analysis. The record sample housing can accommodate radioiodine absorber cartridges, however, one will not be used during this application of the exhauster. The record sampler and the CAM head are short coupled to the sample probe to minimize losses. An interlock is installed to shut down the exhaust fan if the Beta CAM detects an elevated emission event.

The sampler will operate continuously during exhauster operation, the CAM may operate continuously but does not have a requirement to do so. Both will

[1] Automated flow instrumentation is an application of total differential pressure, static differential pressure and temperature instrumentation that converts signal inputs into a mass flow output.

be calibrated and audited in accordance with the current tank farms procedures.

9.2 BUILDING SAMPLING AND MONITORING

Although no personnel entry is required for an air jetting campaign, standard procedures for air and surface monitoring are in place for entries undertaken with or without the use of an exhauster. These procedures ensure personnel and environmental exposures are kept ALARA.

In accordance with the Tank Farm Health and Safety Plan (HASP), prior to any entry into the 244-AR Vault, Immediate Danger to Life and Health (IDLH) samples will be taken. The samples measure oxygen, ammonia, organics, hydrogen, and toxic constituents. IDLH samples found to exceed the allowable levels required by the Tank Farm HASP are reported to the State of Washington Department of Ecology.

Investigative radiological surveys are required prior to entry into the vault, to determine the radiological conditions within. The found conditions are compared to past surveys for trending purposes, will be used to determine the personnel protective equipment needed and to what degree ALARA will be applied. Workers entering the canyon are required to be on mask because of the radiological hazards. Baseline smear samples were taken in the canyon and the air lock on 2-6-97. Along the floor, the overall average readings were 400,000 dpm beta and 400 dpm alpha. The general reading dose rates over the cover blocks were 30/90 mrad/h beta and 8/8 dpm gamma. The airlock readings were all < 1000 dpm beta and < 20 dpm alpha. Dose rates for the airlock reflected a maximum whole body count of <.5 MR per hour beta/gamma. The highest reading for contamination levels in the air lock was 4,000 dpm beta with an average of 2,000 dpm beta and < 20 alpha. Also, a portable air sampler was stationed in the canyon and air lock on January 21, 1997 to radiologically characterize the air in the canyon. The resulting data showed an alpha concentration of 6.8 E-13 microcuries per milliliter and a beta concentration of 5.3 E-10 microcuries per milliliter. These air concentrations are low and as trending has shown, are not expected to vary greatly. They correspond to an annual offsite dose of 3.2 E-11 millirem for every cubic meter of fugitive air emitted from the building.

Entries made with or without an exhauster in operation depend on these procedures and the use of the facility's air lock protocol to keep diffuse emissions to ALARA. Entries/activities undertaken without an exhauster in operation are limited to monitoring, minor maintenance, and inspections. Diffuse and fugitive emissions from this facility are accounted for in the annual air emissions report through the near-facility monitoring program and the environmental surveillance monitoring program.

10.0 RELEASE RATES (Requirement 13)

Emissions resulting from the use of a portable exhauster on the 244-AR Vault during air jetting of accumulated liquids from the cell sumps into the tanks and making transfers among the tanks within the vault are expected to be low to moderate.

The mechanism for increased emissions from this activity is the generation of aerosols by means of splashing at the surface due to incoming liquid, and particulates being picked up and swept into the head space as a result of active ventilation inside the tank. It should be noted that the original 2,271 liters of sludge has been covered/diluted with approximately 57,538 liters of water, and is not available at the surface for aerosol generation. Air jetting will occur at a rate less than 7.5 liters per minute. Liquid transferred into a tank from a sump or another tank will be entrained with air due to the jetting process. Jetting air pressures will be between 0.62 and .66 megapascals (90 to 95 pounds per square inch). The liquid will enter the tank partially atomized. The atomized portion is expected to condense on inside tank surfaces and/or slowly fall to the waste surface. The liquid portion will cascade down from the top of the tank. Cascade heights range from about 1 meter to about 4.5 meters. At an air jetting rate of 7.5 liter per minute and partial atomization the disturbance at the surface of the waste is expected to be minimal. The sludge, carrying 98 percent of the inventory, at the bottom of the tank will not be disturbed by liquid being introduced into the tank at 7.5 liters per minute. Also, the 5.7 cubic meters per minute flow rate provided by the portable exhauster is split among the four tanks. The actual flow rates at each tank have not been calculated. However, they can be assumed to be sufficiently low enough that the particulate dispersion at the surface of the waste, due to the increased air velocity, will also be minimal.

10.1 UNABATED EMISSIONS

The unabated emissions estimate includes contributions from the sludge in the tanks (Appendix B and C), and the liquid in the sumps, assumed contaminated by loose surface contamination inside the facility (Appendix D). The estimate very conservatively assumes that the entire radionuclide inventory in the sludge and in the sumps is available for release. The release fraction for particulates from 40 CFR 61 Appendix D (1.0 E-03) is used. The potential annual unabated emissions are shown in Table 2.

10.2 ABATED EMISSIONS

The abated emissions were calculated by dividing the unabated emissions by the overall decontamination factor (DF) of the filter system. The DF (DF = 1/1-efficiency) for each HEPA filter is 2,000. The overall DF is determined by multiplying the DFs for the individual components together. It is 4 E+06 for this filter system. The potential annual abated emissions are also shown in Table 2.

Table 2. Potential Annual Unabated and Abated Emissions.

Radionuclide	Inventory (curies)	Release fraction	Annual unabated emissions (curies per year)	Overall decontamination factor	Annual abated emissions (curies per year)	Comments
Sr-89/90	1.18 E+05	1.00 E-03	1.18 E+02	4.00 E+06	2.94 E-05	Contribution from tank contents. Data from tank 004 sludge sample. Refer to Appendix B.
Cs-137	1.93 E+03	1.00 E-03	1.93 E+00	4.00 E+06	4.82 E-07	
Tc-99	3.84 E-01	1.00 E-03	3.84 E-04	4.00 E+06	9.59 E-11	Contribution from tank contents. Data from Tank Layering Model solids composite for 241-AX-104. Refer to Appendix C.
I-129	7.26 E-04	1.00 E+00	7.26 E-04	1.00 E+00	7.28 E-04	
U-232	1.37 E-08	1.00 E-03	1.37 E-11	4.00 E+06	3.43 E-18	
U-233	3.68 E-10	1.00 E-03	3.68 E-13	4.00 E+06	9.19 E-20	
U-234	2.27 E-04	1.00 E-03	2.27 E-07	4.00 E+06	5.68 E-14	
U-235	9.51 E-06	1.00 E-03	9.51 E-09	4.00 E+06	2.38 E-15	
U-236	5.33 E-06	1.00 E-03	5.33 E-09	4.00 E+06	1.33 E-15	
U-238	2.23 E-04	1.00 E-03	2.23 E-07	4.00 E+06	5.58 E-14	
Np-237	1.24 E-03	1.00 E-03	1.24 E-06	4.00 E+06	3.11 E-13	
Pu-238	9.94 E-02	1.00 E-03	9.94 E-05	4.00 E+06	2.49 E-11	
Pu-239	4.65 E+00	1.00 E-03	4.65 E-03	4.00 E+06	1.16 E-09	
Pu-240	7.26 E-01	1.00 E-03	7.26 E-04	4.00 E+06	1.82 E-10	
Pu-241	7.58 E+00	1.00 E-03	7.58 E-03	4.00 E+06	1.90 E-09	
Pu-242	2.50 E-05	1.00 E-03	2.50 E-08	4.00 E+06	6.24 E-15	
Am-241	1.62 E-01	1.00 E-03	1.62 E-04	4.00 E+06	4.06 E-11	
Am-243	4.09 E-06	1.00 E-03	4.09 E-09	4.00 E+06	1.02 E-15	
Sr-90	0.1	1.00 E-03	1.00 E-04	4.00 E+06	2.50 E-11	Contribution from sumps and surface contamination in the facility. Data from smear samples. Refer to Appendix D

Shaded area indicates the radionuclides contributing 10 percent or more of the unabated total effective dose equivalent to the maximally exposed individual.

11.0 OFFSITE IMPACT (Requirements 14 and 15)

This section contains information regarding the effective dose equivalents to the maximally exposed individual (MEI) offsite resulting from unabated and abated emissions from operation of a portable exhauster on the 244-AR Vault during air jetting. The MEI is located 16 kilometers east of the 200 East Area. The potential unabated dose and potential abated dose are shown in Table 3. The unit dose factors included in the tables and the information required to develop the unit dose factors from the Clean Air Assessment Package 1988 computer code are included in *Unit Dose Calculation Methods Summary of Facility Effluent Monitoring Plan Determinations* (WHC 1991). This document has been previously submitted to the Washington State Department of Health. The meteorological data and stack height used to generate the unit dose factors are 1983 through 1987 and 10 meters respectively.

Table 3. Potential Annual Unabated and Abated Dose.

Radionuclide	CAP 88 unit dose factor (millirem per curie)	Annual unabated emissions (curies per year)	Annual unabated dose (millirem per year)	Percent of total dose (%)	Annual abated emissions (curies per year)	Annual abated dose (millirem per year)	Comments
Sr-89/90	4.38 E-02	1.18 E+02	5.15 E+00	98.15	2.94 E-05	1.29 E-06	Contribution from tank contents. Data from tank 004 sludge sample. Refer to Appendix B.
Cs-137	2.39 E-02	1.93 E+00	4.61 E-02	0.88	4.82 E-07	1.15 E-08	
Tc-99	1.09 E-03	3.84 E-04	4.18 E-07	0.00	9.59 E-11	1.05 E-13	Contribution from tank contents. Data from Tank Layering Model solids composite for 241-AX-104. Refer to Appendix C.
I-129	2.91 E-01	7.26 E-04	2.11 E-04	0.00	7.26 E-04	2.11 E-04	
U-232*		1.37 E-11	0.00 E+00	0.00	3.43 E-18	0.00 E+00	
U-233	3.23 E+00	3.68 E-13	1.19 E-12	0.00	9.19 E-20	2.97 E-19	
U-234	3.19 E+00	2.27 E-07	7.24 E-07	0.00	5.68 E-14	1.81 E-13	
U-235	2.96 E+00	9.51 E-09	2.82 E-08	0.00	2.38 E-15	7.04 E-15	
U-236	3.02 E+00	5.33 E-09	1.61 E-08	0.00	1.33 E-15	4.03 E-15	
U-238	2.84 E+00	2.23 E-07	6.34 E-07	0.00	5.58 E-14	1.59 E-13	
Np-237*		1.24 E-06	0.00 E+00	0.00	3.11 E-13	0.00 E+00	
Pu-238	8.02 E+00	9.94 E-05	7.97 E-04	0.02	2.49 E-11	1.99 E-10	
Pu-239	8.67 E+00	4.65 E-03	4.03 E-02	0.77	1.16 E-09	1.01 E-08	
Pu-240	8.66 E+00	7.26 E-04	6.29 E-03	0.12	1.82 E-10	1.57 E-09	
Pu-241	1.38 E-01	7.58 E-03	1.05 E-03	0.02	1.90 E-09	2.62 E-10	
Pu-242*		2.50 E-08	0.00 E+00	0.00	6.24 E-15	0.00 E+00	
Am-241	1.31 E+01	1.62 E-04	2.13 E-03	0.04	4.06 E-11	5.32 E-10	
Am-243*		4.09 E-09	0.00 E+00	0.00	1.02 E-15	0.00 E+00	
Sr-90	4.38 E-02	1.00 E-04	4.38 E-06	0.00	2.50 E-11	1.10 E-12	Contribution from sumps and surface contamination in the facility. Data from smear samples. Refer to Appendix D
TOTALS			5.25 E+00	100.00		2.13 E-04	

* No CAP 88 Unit Dose Factor available for 200 Areas.

Shaded area indicates the radionuclides contributing 10 percent or more of the unabated total effective dose equivalent to the maximally exposed individual.

The potential abated dose resulting from the activities presented in this application is 2.1 E-04 millirem per year. The dose resulting from all Hanford Site operations in 1995 was determined to be 2.9 E-03 millirems per year, excluding radon, for the MEI located at Sagemore Road farm (DOE/RL-96-37). The emissions originating from a portable exhauster operating on the 244-AR Vault, in conjunction with other current operations on the Hanford Site, will not result in a violation of the National Emission Standard of 10 millirems per year.

12.0 COST FACTORS AND FACILITY LIFETIME (Requirements 16 and 17)

The HEPA filtration system, as described in Section 8.0, is best available radionuclide control technology (BARCT) for this application as approved in previous BARCT analyses. As such, cost factors for construction, operation, and maintenance of the control technology components and system have not been provided.

The minimum design life of the exhauster is 10 years with the appropriate preventative maintenance. The exhauster will be operated continuously during an air jetting event. Air jetting events will occur periodically as liquid is detected in the sumps.

13.0 TECHNOLOGY STANDARDS (Requirement 18)

Operating a portable exhauster at the 244-AR Vault has a potential to emit radioactive particles in excess of 0.1 millirem per year TEDE to the MEI; therefore, its design must meet, as applicable, the technology standards listed under Requirement 18. Table 4 summarizes the compliance of emissions control equipment with the listed technology standards.

Table 4. Emissions Control Equipment Standards Compliance.

Standard	Does design comply Y/N	If not, what standard was used	Equivalency demonstration provided Y/N
ASME/ANSI AG-1	Y		N
ASME/ANSI N509	N	Refer to Section 8.0	Y Appendix E
ASME/ANSI N510	N	Refer to Section 8.0	Y Appendix E
ANSI/ASME NQA-1	Y		N
ANSI N13.1	Y		N
40 CFR 60, Appendix A Test Methods:			
1, 1A	Y		N
2, 2A, 2C, 2D	Y		N
4	N	Overall, the air sampling system shall meet the requirements of ANSI N13.1, ANSI N42.18, DOE/EP-0096, DOE/EH-0173T, 40 CFR 52, Appendix E and 40 CFR 60, Appendix A.	N Refer to Section 9.0
5, 17	N		N Refer to Section 9.0

14.0 REFERENCES

DOE/EH-0173T, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*, January 1991, U.S. Department of Energy, Assistant Secretary for Environmental Safety and Health.

DOE/RL-94-118, *Radioactive Air Emissions Program Notice of Construction for the Rotary Mode Core-Sampling Systems Three and Four*, May 1995, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-96-37, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1995*, June 1996, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Leitch, Jerry, 1993, Letter, Jerry Leitch, EPA to James D. Bauer, DOE-RL, "NESHAP Compliance Issues for WHC Emission Points", dated March 11, 1993, United States Environmental Protection Agency Region X, Seattle, Washington.

WHC, 1991, *Unit Dose Calculation Methods Summary of Facility Effluent Monitoring Plan Determinations*, WHC-EP-0498, Westinghouse Hanford Company, Richland, Washington.

WHC, 1996a, *Historical Tank Content Estimate for the Northeast Quadrant of the Hanford 200 East Area*, WHC-SD-WM-ER-349, Rev. 1a, dated September 26, 1996.

WHC, 1996b, *Tank Farm Stack NESHAP Designation Determination*, WHC-SD-WM-EMP-031, Rev. 2, dated January 19, 1996.

Internal Memo, R. E. Elder to J. D. Butler, et al., "CCIP Database Update for Second Quarter 1995", 33680-95-047, dated June 5, 1995, Westinghouse Hanford Company, Richland, Washington.

Internal Memo, J. S. Buckingham to G. D. Campbell, "Heat Generation of Residual Sludge in Tank 104 AX", 60120-78-040 J, dated June 15, 1978, Rockwell Hanford Company, Richland, Washington.

APPENDIX A

INTERIM SAFETY BASIS UPDATE FOR THE 244-AR FACILITY

This appendix contains only page 1 of 3 of the update form. Page 1 of 3 contains the pertinent information regarding the waste inventory in the 244-AR Vault. This form was completed in 1994.

[U]NREVIEWED SAFETY QUESTION SAFETY REVIEW FORM
(Per WHC-IP-0842, 15.9)

[R]EFERENCE DOCUMENT(S):

ECN No. 618316 PCA No. N/A

Work Pkg No. N/A Other (Specify) WHC-SD-WM-ISB-001, REV OF

TITLE: INTERIM SAFETY BASIS UPDATE FOR 244-AR FACILITY

BACKGROUND INFORMATION

The 244-AR facility was designed to process and handle either CAW waste from PUREX or NCAW waste from Tank Farms storage tanks (A/AX Farms). The waste was then transferred to B-Plant for cesium and strontium recovery. The 244-AR facility operated from 1968 to 1978. Upgrades were planned in 1984 and several projects were started to ready the facility to process NCRW waste. The projects were intended to enhance 244-AR's ventilation and instrumentation systems. In 1988, funding for the upgrades was cut and work on all projects ceased, even though most of the project upgrades were 80-90% complete. A small amount of NCAW waste (< 600 gallons) from AX farms has been stored in 244-AR for approximately 17 years. The NCAW waste, which accounts for the majority of the source term, was being saved for PNL Laboratory Vitrification studies for the Savannah River Plant. The waste was never shipped to PNL and therefore, remains stored in TK-002.

Operations conducts daily surveillances of the sumps and tanks liquid levels in 244-AR. HPT's routinely monitor the facility for potential contamination spreads, since a source term remains within the facility. Since the late 1980's, the K3 canyon exhauster and the K4 vessel ventilation system are the only ventilation systems that have been operated. The other two ventilation systems (K1 and K2) have remained shutdown. The four banks of HEPA filters associated with the canyon exhaust system have not been aerosol tested since June of 1992.

244-AR Vault has been sitting in disrepair for 8-10 years. Only the K3-9-2 exhauster was left running (until July 1993 when shutdown), with no supply ventilation system running (K2 system) as described by the SAR. The K4 system has been operated intermittently, but only during transfers. In addition, the high radiation and high differential pressure (DP) interlocks to shutdown the canyon exhauster have been disabled. All other ventilation systems were either not operated because of equipment problems or simply just left shut down to make it easier to manage 244-AR over the past 10 years. It should be emphasized that the existing HEPA filters needed to be replaced since at least 1 bank of the original HEPA filters was identified as failing prior to 1984. A temporary fix, installing the 3rd HEPA bank and very small 4th bank (six pack) were designed to service the facility until a new system (under project B-462a and B-551) could be installed.

In July 1993, the canyon exhauster was shutdown due to a vibrating motor bearing. The vibrating motor bearings posed a potential hazard to personnel because of noise and the possibility of flying parts. The motor bearings have been replaced but the fan remains shutdown due to problems found with SD-WM-SAR-018, part of the AUTHORIZATION BASIS documentation.

Currently, there is approximately 12,000 gallons of liquid waste contained within 244-A[R]. Most of the solution is contained in Tk-001, Tk-002, Tk-003 and Tk-004. However, there is approximately 900 gallons of solution in canyon cell #3 sump. Since the sump is secondary containment for the canyon vessels, the liquid should be jetted to one of the tanks as soon as possible. In order for jetting to occur, canyon as well as vessel ventilation system must be restarted.

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APPENDIX B

HEAT GENERATION OF RESIDUAL SLUDGE IN TANK 104 AX AND ANALYSIS OF 004 AR SLUDGE

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ate: . June 15, 1978 No: . 60120-78-040 J

O: (Name, Organization, Internal Address)
. G. D. Campbell
. Waste Process Engineering
. 2704-E Bldg., 200 East Area

FROM: (Name, Organization, Internal Address, Phone)
. J. S. Buckingham
. Chemical Sciences Group
. 222-S Bldg., 200 West Area
. 2-2487

ubject: . Heat Generation of Residual Sludge in Tank 104 AX

A sample of the residual sludge remaining in Tank 104 AX was analyzed. The sample contained 32.9 Ci/ℓ $^{89+90}Sr$, 1.7 Ci/ℓ ^{137}Cs, and 0.83 Ci/ℓ ^{155}Eu. The calculated heat generation was 0.2316 watts/ℓ. Unfortunately the amount of sample received for analyses was very small and there was a question as to how representative it was. To confirm the analyses a sample of 104 AX sludge which was sluiced to 004 AR was analyzed. The 004 AR material showed 77.9 Ci/ℓ $^{89+90}Sr$ and 1.26 Ci/ℓ ^{137}Cs. The difference between the two analyses is indeed enough to cast doubt on 104 AX sample. I suggest you use both analyses to calculate the heat impact on the tank and if the difference is significant try to get a more representative sample of the residual sludge. Analyses of the sludges are shown below:

Analysis of Residual 104 AX Sludge

$^{89+90}Sr$	32.9 Ci/ℓ	0.223 watts/ℓ
^{137}Cs	1.7 Ci/ℓ	0.008 watts/ℓ
^{155}Eu	0.83 Ci/ℓ	0.0006 watts/ℓ

Analysis of 004 AR Sludge

$^{89+90}Sr$	77.9 Ci/ℓ	0.530 watts/ℓ
^{137}Cs	1.26 Ci/ℓ	0.006 watts/ℓ

Please let me know your decision on taking another residual sludge sample.

JS Buckingham

J. S. Buckingham
Staff Chemist
Waste Chemistry Unit

JSB:rm

Information:
J. L. Deichman
F. M. Jungfleisch FMJ
O. R. Rassmussen
R. E. Smith
Process Aids (7)

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APPENDIX C

TANK LAYERING MODEL - SOLIDS COMPOSITE FOR TANK 241-AX-104

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Single-Shell Tank 241-AX-104 [1,2]							
TLM Solids Composite Inventory Estimate*							
Physical Properties							
Total TLM Waste	3.56E+04 kg			(7.00 kgal)			
Heat Load	3.03 kW			(1.04E+04 BTU/hr)			
Bulk Density	(1.34 g/cc)						
Void Fraction	0.807						
Water wt%	61.5						
TOC wt% C (wet)	0						
Radiological Constituents	**Ci/L**	**µCi/g**	**Ci**	**-95 CI (Ci/L)**	**-67 CI (Ci/L)**	**+67 CI (Ci/L)**	**+95 CI (Ci/L)**
Sr-90	16.6	1.23E+04	4.39E+05	14.9	16.1	16.8	16.9
Tc-99	1.69E-04	0.126	4.47	6.38E-05	1.16E-04	2.22E-04	2.73E-04
I-129	3.21E-07	2.39E-04	8.50E-03	1.21E-07	2.21E-07	4.21E-07	5.18E-07
Cs-137	0.629	468	1.67E+04	0.238	0.434	0.827	1.02
U-232	6.04E-12	4.49E-09	1.60E-07	2.28E-12	4.17E-12	7.93E-12	9.76E-12
U-233	1.62E-13	1.21E-10	4.30E-09	6.15E-14	1.12E-13	2.13E-13	2.62E-13
U-234	1.00E-07	7.48E-05	2.66E-03	3.80E-08	6.93E-08	1.32E-07	1.62E-07
U-235	4.19E-09	3.12E-06	1.11E-04	1.59E-09	2.90E-09	5.51E-09	6.78E-09
U-236	2.35E-09	1.75E-06	6.23E-05	8.91E-10	1.62E-09	3.09E-09	3.80E-09
U-238	9.84E-08	7.33E-05	2.61E-03	3.73E-08	6.80E-08	1.29E-07	1.59E-07
Np-237	5.48E-07	4.08E-04	1.45E-02	2.07E-07	3.78E-07	7.19E-07	8.85E-07
Pu-238	4.38E-05	3.26E-02	1.16	3.43E-05	4.14E-05	4.55E-05	4.71E-05
Pu-239	2.05E-03	1.53	54.4	1.61E-03	1.94E-03	2.13E-03	2.21E-03
Pu-240	3.20E-04	0.238	8.48	2.51E-04	3.02E-04	3.33E-04	3.44E-04
Pu-241	3.34E-03	2.49	88.6	2.62E-03	3.16E-03	3.47E-03	3.60E-03
Pu-242	1.10E-08	8.22E-06	2.92E-04	8.64E-09	1.04E-08	1.15E-08	1.19E-08
Am-241	7.15E-05	5.33E-02	1.90	2.71E-05	4.94E-05	9.40E-05	1.16E-04
Am-243	1.80E-09	1.34E-06	4.77E-05	6.81E-10	1.24E-09	2.37E-09	2.91E-09
Totals	**M**	**µg/g**	**kg**	**-95 CI (M or g/L)**	**-67 CI (M or g/L)**	**+67 CI (M or g/L)**	**+95 CI (M or g/L)**
Pu	3.44E-02 (g/L)	—	0.913	2.70E-02	3.25E-02	3.58E-02	3.71E-02
U	1.24E-03	220	7.81	4.69E-04	8.55E-04	1.63E-03	2.00E-03

*Unknowns in tank solids inventory are assigned by Tank Layering Model (TLM).

1. Letter Report, T. Duran, Los Alamos National Laboratory, Los Alamos, New Mexico, to J. Cammann, WHC, Richland, WA, HDW Model Rev. 4 Preliminary Inventory Estimate Tables for the Radionuclides, dated August 16, 1996.

2. Discrepancies that exist between the physical properties on the inventory estimates will be adressed in the HDW Model Rev 4.

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APPENDIX D

QUANTIFICATION OF RADIONUCLIDE INVENTORY IN THE 244-AR VAULT SUMPS

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APPENDIX D

QUANTIFICATION OF RADIONUCLIDE INVENTORY IN THE 244-AR VAULT SUMPS

The source term contained within the liquid in the 244-AR Vault sumps is estimated to be 0.1 curies of strontium-90, and is consistent with the Tank Farm Stack NESHAP Designation Determination for stack 296-A-13 (Attached). A conservative estimate is to assume that the entire 0.10 curies within the canyon area is now in the sump. The determination was derived using the methodology shown below.

Contained spaces that were ventilated by the 296-A-13 stack consist of the 244-AR Vault canyon and the three cells containing the four tanks. The dimensions and total area are shown below.

Table of Ventilated Surface Areas

Contained spaces	Width (cm)	Height (cm)	Depth (cm)	Total surface area (cm^2)
Canyon	2,865	1,097	549	1.1 E+07
Cell 1	640	998	640	3.4 E+06
Cell 2	640	998	640	3.4 E+06
Cell 3	975	640	366	2.4 E+06
Tank dimensions	Radius	Height	Bottom area	
Tank 1	305	602	2.9 E+05	1.4 E+06
Tank 2	305	602	2.9 E+05	1.4 E+06
Tank 3	145	305	6.6 E+04	3.4 E+05
Tank 4	145	305	6.6 E+04	3.4 E+05
Total bottom areas			7.1 E+05	-7.1 E+05*
Total combined area				2.3 E+07

* Adjustment to account for tank bottom surface not exposed.

Radionuclide inventory is based on beta/gamma levels found in survey data in Internal Memo 33680-95-047 from Radiological Engineering and ALARA, subject "CCIP Database Update for Second Quarter 1995", dated June 5, 1995 (Attached). These data showed loose surface beta/gamma contamination at 1 million disintegrations per minute (dpm) per 100 square centimeters. Conservatively, beta (Sr-90) is assumed to represent the radionuclide contamination uniformly distributed over all ventilated surface areas. Any concern regarding the depth of contamination is covered using this approach. The total curie (Ci) content available for release is as follows:

Total Vault Area * Contamination Level * Ci Disintegration Conversion Factor = Total Ci

2.3 E+07 cm^2 * 1.0 E+06 dpm/(100 cm^2) * 1 Ci/2.22E+12 dpm
= 0.10 Ci.

6.0 STACK 296-A-13

6.1 SYSTEM DESCRIPTION/CONFIGURATION

The 296-A-13 stack system ventilates the 244-AR Vault canyon and containment cells associated with the four 244-AR vessels. The 244-AR Vault is located near the 241-A Tank Farm in the 200 East area.

The 244-AR Vault is considered to be a double-contained receiver tank (DCRT) in the Hanford Site Tank Farm Facilities Interim Safety Basis (WHC-SD-WM-ISB-001) based on its functional characteristics, although it is not listed as one of the five DESIGNATED DCRTs in the 200 Area tank system. The 244-AR Vault was first used to transfer waste in 1966. As with the 296-A-12 stack (also part of this facility) this stack is currently not operating. Future uses of this Vault is undetermined at this time.

Contained spaces which are ventilated by the 296-A-13 consist of the 244-AR canyon with dimensions of 94 feet x 18 feet x 36 feet high, two cells with dimensions of 21 feet x 21 feet x 32.8 feet deep each containing one of the two large process tanks, and a cell with dimensions of 32 feet x 12 feet x 21 feet deep containing tanks 3 and 4.

Air is drawn in from the non-radiologically controlled 244-AR ventilation system and passes through a heater, pre-filter, and water scrubber system before entering the 244-AR canyon. The air then passes through the three containment cells and then through two HEPA filter banks before being exhausted at the 296-A-13 stack.

6.2 CALCULATION OF SOURCE TERM

Radionuclide inventory is based on beta/gamma levels found in survey data taken on 5/15/87 and reported on 11/01/94 in Internal Memo 33680-95-047 from Radiological Engineering and ALARA, subject "CCIP Database Update for Second Quarter 1995", dated June 5, 1995. This data shows loose surface beta/gamma contamination at 1 million disintegrations per minute per 100 square centimeters. Assuming worse case scenario, beta (Sr-90/Y-90) as the representative nuclides together with the contamination assumed to be uniformly distributed over all ventilated surface areas, the total curie content available for release from this stacks is shown in the following table.

NUCLIDE	TOTAL AREA (cm^2)	ACTIVITY (dpm /100 cm^2)	TOTAL ACTIVITY (Ci)
Sr-90	2.3×10^7	1,000,000	0.104
Y-90	2.3×10^7	1,000,000	0.104

Westinghouse Hanford Company | **Internal Memo**

From: Radiological Engineering and ALARA | 33680-95-047
Phone: 376-4187 T7-37
Date: June 5, 1995
Subject: CCIP DATABASE UPDATE FOR SECOND QUARTER 1995

To:	J. D. Butler	T4-03	B. D. Kostoff	S5-50
	D. A. De Lucchi	R1-51	J. L. Miller	T6-28
	D. R. Ekstrom	L6-52	L. A. Nelsen	N2-50
	M. F. Hackworth	T3-20	R. A. Schieffer	T1-27
	S. L. Hathaway	S6-62	S. C. Snyder	T5-03
	T. E. Hopkins	X3-65		
cc:	E. J. Adams	T4-03*	D. J. Newland	T7-37*
	O. D. Berglund	T7-37*	J. L. Shelor	R2-36*
	K. W. Gray	T5-57*	R. N. Smith	S6-65*
	M. Kaviani	X3-60*	R. L. Watts	L6-52*
	R. R. Loeffler	S5-66*	REE File:L8*	
	B. H. Lueck, Jr.	S7-81*	*w/o enclosure	
	T. D. Merkling	T7-37*		

Enclosed is the current CCIP quarterly update for your facility for the second quarter (April - June 1995). Any changes that you sent as a result of the informal cc:Mail request for April and May should already be incorporated. Please remember that both the "CCIP Data Gathering" and "CCIP Data Change" forms are available as Site Forms. Please be sure to use these Site Forms for any new sites, as well as any changes and/or updates to your data.

Please review the enclosed update sheets for accuracy and completeness, then sign and return them (even if no changes are made) along with any changes to me by **June 23, 1995**, at Mail Stop T7-37. All posted Radiological Areas should be included in the listing. The CCIP database has been modified to match the posting definitions found in the DOE Radiological Control Manual. We also encourage you to send CCIP data changes in as reduction activities take place. This will allow for an accurate indicator to the Company Performance Based Incentive associated to contaminated area reduction.

Robert E Elder

R. E. Elder, Senior Health Physicist
ALARA/CCIP Program Office

Enclosure

Quarterly CCIP Update

Thu, Jun 1, 1995 1:23 PM

CCIP ID	Location & Designation	CCIP Sizes				No Changes*
ETHP-035 ETHP	East Tank Farm (Indoor) 244-AR Canyon	ARA Size:	2,288 sq. ft.	RA Size:	2,288 sq. ft.	
		HCA Size:	0 sq. ft.	RCA Size:	0 sq. ft.	
		CA Size:	2,288 sq. ft.	URM Size:	0 sq. ft.	
Survey Date: 5/15/87		Soil CA	0 sq. ft.	RBA Size:	0 sq. ft.	
Report Date: 11/1/94		VHRA Size:	0 sq. ft.	FCA Size:	0 sq. ft.	
		HRA Size:	0 sq. ft.	RMA Size:	0 sq. ft.	
Area: 200 E		Max dpm, βγ 1,000,000		On Mask?	Yes	
Loose Surface Contamination? Yes		Max dpm, α 0		Source Term?	No	
☒ Active	Occupancy: NEVER	Task Description:		Survey Card/Report #:		
ETHP-036 ETHP	242-A Evap (Indoor) 242-A Evap.Room	ARA Size:	450 sq. ft.	RA Size:	0 sq. ft.	
		HCA Size:	450 sq. ft.	RCA Size:	0 sq. ft.	
		CA Size:	0 sq. ft.	URM Size:	0 sq. ft.	
Survey Date: 9/25/89		Soil CA	0 sq. ft.	RBA Size:	0 sq. ft.	
Report Date: 11/1/94		VHRA Size:	0 sq. ft.	FCA Size:	0 sq. ft.	
		HRA Size:	450 sq. ft.	RMA Size:	0 sq. ft.	
Area: 200 E		Max dpm, βγ 1,000,000		On Mask?	Yes	
Loose Surface Contamination? Yes		Max dpm, α 0		Source Term?	No	
☒ Active	Occupancy: QUARTER	Task Description:		Survey Card/Report #:		
ETHP-037 ETHP	242-A Evap (Indoor) 242-A Evap. Cond. Room	ARA Size:	0 sq. ft.	RA Size:	648 sq. ft.	
		HCA Size:	0 sq. ft.	RCA Size:	0 sq. ft.	
		CA Size:	648 sq. ft.	URM Size:	0 sq. ft.	
Survey Date: 11/29/89		Soil CA	0 sq. ft.	RBA Size:	0 sq. ft.	
Report Date: 11/1/94		VHRA Size:	0 sq. ft.	FCA Size:	0 sq. ft.	
		HRA Size:	0 sq. ft.	RMA Size:	0 sq. ft.	
Area: 200 E		Max dpm, βγ 50,000		On Mask?	No	
Loose Surface Contamination? Yes		Max dpm, α 0		Source Term?	No	
☒ Active	Occupancy: DAY	Task Description:		Survey Card/Report #:		
ETHP-038 ETHP	242-A Evap (Indoor) 242-A Evap. Load Out Room	ARA Size:	216 sq. ft.	RA Size:	216 sq. ft.	
		HCA Size:	0 sq. ft.	RCA Size:	0 sq. ft.	
		CA Size:	216 sq. ft.	URM Size:	0 sq. ft.	
Survey Date: 11/13/89		Soil CA	0 sq. ft.	RBA Size:	0 sq. ft.	
Report Date: 11/1/94		VHRA Size:	0 sq. ft.	FCA Size:	0 sq. ft.	
		HRA Size:	0 sq. ft.	RMA Size:	0 sq. ft.	
Area: 200 E		Max dpm, βγ 50,000		On Mask?	Yes	
Loose Surface Contamination? Yes		Max dpm, α 0		Source Term?	No	
☒ Active	Occupancy: MONTH	Task Description:		Survey Card/Report #:		

** √ for no changes; complete a CCIP Data Change Sheet for those locations that have changed.*

Page # 7

APPENDIX E

ANSI/ASME N509 AND N510 EQUIVALENCY DEMONSTRATION FOR THE TEMPORARY VESSEL VENTILATION SYSTEM

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APPENDIX E

ANSI/ASME N509 AND N510 EQUIVALENCY DEMONSTRATION FOR THE TEMPORARY VESSEL VENTILATION SYSTEM

SUMMARY

In early 1994, Section 246-247-120 was added to the Washington Administrative Code (WAC). This section includes the requirement that emission units with the potential-to-emit exceeding 0.1 millirem per year total effective dose equivalent (TEDE) to the maximally exposed individual (MEI) meet the technology standards of ASME N509 and ASME N510. If the potential to emit is below this value, the standards must be met only to the extent justified by a cost/benefit evaluation.

The temporary vessel vent (which will be an emission unit whose potential to emit exceeds 0.1 millirem per year) used to ventilate the tanks at the 244 AR Vault was not designed to comply with all the criteria contained in these consensus standards.

This document will identify both areas of compliance and non-compliance with N509 and N510. In those instances of non-compliance, a technically equivalent alternative is provided. The purpose of this document is to demonstrate that the protective function of the temporary vessel vent is not compromised by non-compliance with the letter of N509 and N510.

SYSTEM DESCRIPTION

Background

The 244 AR Vault has accumulated a large amount of rain water and snowmelt in the cell sumps. The water level is well above the sump operating level. There is concern that components within the vault could fail due to corrosion from the backed up sump liquid.

It is planned to use air jet pumping to transfer the accumulated water in the vault sumps. The vault is currently maintained at atmospheric pressure using air infiltration from various facility penetrations. Without active ventilation air jet pumping could cause the receiving tank to pressurize and force radioactive contaminants into the vault canyon through unfiltered pathways. Active ventilation is required during pumping to minimize contamination within the vault canyon. The function of the temporary exhauster is to remove the air and tank off gases generated during jet pumping at a fixed rate (200 cubic feet per minute (CFM)), extract it through HEPA filters and monitor the effluent.

The 244 AR Vault has its own vessel vent /exhaust system. The system has been inactive since February 1993. Restoration and upgrade of this system to comply with current standards is cost prohibitive. It was determined that a temporary arrangement could be used during jet pumping.

Description

The temporary vessel vent will tie into the original vessel vent header at a six-inch monitoring riser located outside of the 244-AR Vault. The original vessel vent system will be isolated downstream of the monitoring riser using the original system dampers. Existing vessel vent system dampers upstream of the monitoring riser will be used to isolate the riser and the temporary vessel vent in the event of a filter or fan failure. The temporary vessel vent is connected to the monitoring riser by a flexible connector.

In this application the temporary vessel vent is used to provide the motive force for air removal from the receiving tanks. The temporary vessel vent consists of the following; a six inch, 150 pound class, ball valve, a commercially available type G-1 HEPA filter housing, interconnecting ten inch flexible duct, and a self contained rotary mode core sampling (RMCS) exhauster. Air removed during air jet pumping will pass through the monitoring riser, the ball valve, the G-1 housing and filter, down the flexible duct to the RMCS exhauster which provides a second stage of HEPA filtration before releasing the effluent to the environment.

The six-inch ball valve is connected to the monitoring riser, upstream of the G-1 housing and filter. The valve is used as a radiological barrier only during installation and removal of temporary vessel vent system components. It is not used to divert flow or isolate non-contaminated areas during temporary vent operation.

The G-1 housing with HEPA filter is directly attached to the ball valve. This filter and housing will serve as the first stage of HEPA filtration for the temporary vessel vent. The G-1 housing is connected to the RMCS exhauster by approximately thirty five feet of flexible duct.

The RMCS exhauster is used to provide the motive force for the temporary vessel vent. It consists of a heater, filter housing, fan, and stack with particulate monitoring components all mounted on a common skid.

A data logger located in the exhauster instrumentation cabinet may be used to record operational variables. The data logger will also provide alarm indications in the event of mechanical failures.

Fan motor RPM is controlled by a variable speed drive that uses stack flow as the input variable. Thus, as filters load, or flow conditions change with the vault, RPM is increased to maintain constant flow. The fan shuts down in the following instances:

1. High filter differential pressure across either the monitoring riser HEPA filter or the exhauster mounted HEPA filters.

2. Excessive low pressure within the receiving tank.

3. Low stack flow (less than 150 CFM) and excessive stack flow (In excess of 250 cfm).

4. In addition to the automatic shutdowns, the exhauster is constantly manned when jet pumping is in progress. The individual on duty has radio contact with the jet pump operator. Jet pumping will cease if the exhauster fails to operate within its established envelope.

Figure 1 shows an outline drawing identifying the major components of the temporary vessel vent exhauster.

Applicability

The skid assembly and stack monitoring system are fully compliant with applicable federal and state requirements. The monitoring riser mounted HEPA filter is a commercially available Flanders G-1 series; it fully meets the requirements of N-509.

ASME N509 and N510 are applicable to the heater, the HEPA filter housing and the duct between the riser mounted HEPA and the exhauster. The heater housing is compliant with the applicable sections of N509 and N510.

The remainder of this document will address the conformance/non conformance of the RMCS exhauster portion of the temporary vessel vent to the applicable sections of N509 and N510.

N509 DISCUSSION

Each section of N509 will be examined for compliance/non compliance with respect to the vault exhauster filter train.

N509 Section 1; Scope

This section identifies the scope and applicability of N509 to nuclear air cleaning units. The RMCS exhauster was designed as a portable unit and does not meet the definition of an engineered safety feature as defined in Section 3 of ASME N509-1989. The benefits of applying N509 to a temporary arrangement are not immediately obvious when compared to the drawbacks (increased size, not immediately available, and cost).

N509 Section 2; Applicable Documents

Section 2 identifies documents that supplement N509. The temporary vessel vent meets the supplement requirements to the extent specified within this document.

N509 Section 3; Terms and Definitions

Section 3 provides definitions of terms used in N509.

N509 Section 4; Functional Design

Section 4 identifies the functional design criteria to be considered when designing nuclear air cleaning units. The RMCS portion of the vault exhauster filter train complies with the applicable paragraphs of Section 4, with the exception of:

Sub Section 4.4; Environmental Design Conditions

The variable frequency drive (VFD) installed on the RMCS portion of the temporary vessel vent does not meet the local Hanford environmental temperature extremes that may be encountered during operation.

Justification

The VFD controls exhaust fan speed (and therefore pressure within the receiving tanks) to control exhaust flow. The installed VFD has performed to design requirements when operated in both high and low temperature extremes over a period of three years. Additionally, the exhauster is constantly manned; the operator in attendance is able to stop the jet pumping if the exhauster fails.

The jet pump itself is interlocked with a receiving tank pressure switch. If pressure within the vault exceeds .25 inch water gage relative to atmosphere, the jet pump is shut down.

The conservative controls on exhauster and jet pump operation are provided as technical equivalency for the environmental non-qualification of the VFD.

Sub Section 4.11; Fire Protection

Neither the G-1 riser filter housing or the exhauster mounted housing has installed fire protection systems.

Justification

Paragraph 4.7.11 requires that if the results of the facility fire hazard analysis require a fire protection system be installed, it should be manually activated. The facility (244-AR Vault) has no requirement for a ventilation fire protection system.

Sub Section 4.13; Testability

There are no permanently installed filter testing manifolds in the temporary vessel vent filter train.

Justification

The riser mounted HEPA filter is considered the first filter used for emission control. The riser mounted filter housing meets the test requirements of N509/N510 and is tested by injecting the challenge agent directly upstream of the filter. The challenge agent is sampled at a port directly downstream of the filter. The challenge agent for the exhauster filter train (first HEPA in the skid mounted filter housing) is injected in the sample port of the riser mounted filter. This location will serve to adequately mix the filter challenge agent prior to striking the face of the HEPA filter in the exhauster. The challenge agent passes through both HEPA filters on the RMCS exhauster prior to being sampled downstream of the fan.

The testing methodology described above when used with the two HEPA filters separated by the field run length of duct is given as technical equivalent to having permanently mounted manifolds.

N509 Section 5; Components

Section 5 provides detailed criteria for the components of a nuclear air cleaning unit.

Sub Section 5.1, HEPA Filters

All HEPA filters used in the temporary vessel vent filter train meet the requirements of this sub section

Sub Section 5.2, Adsorber Designer

This section is not applicable - the temporary vessel vent does not employ adsorbers.

Sub section 5.3; Prefilters and Postfilters.

The temporary vessel vent does not use prefilters or postfilters

Justification:

Section 4.1*(a)* recommends that prefilters be used only when it is desired to increase HEPA filter life. The low particulate transport velocity (200 cfm in an eight inch duct) will preclude excessive particulate loading of the filters. Excessive riser HEPA filter differential pressure is an automatic shutdown feature of the temporary vessel vent.

Post filters are fitted to air cleaning units that employ adsorbers.

Sub Section 5.4, Moisture Separators

Is not applicable because the temporary vessel vent does not employ moisture separators.

Sub Section 5.5; Heaters

Discussion

The heater mounted on the RMCS exhauster portion of the temporary vessel vent is not energized in this application as it is between the two HEPA filters. The differential pressure across each HEPA filter is monitored and the exhauster is shut down if the pressure across either exceeds 5.5 inches of water (the filters fail at 10 inches of water).

However, the heater housing still acts as a confinement boundary and must meet the requirements of N509/510. The housing used on the RMCS exhauster is compliant with the Section 5.5 of N509.

Sub Section 5.6; Filter Housing:

The filter housing located at the riser is a commercially available Flanders Model G-1. This housing has been constructed, and tested to the requirements of N509/510.

The RMCS exhauster filter housing has three doors; one allows pre-filter change out; the other two allow HEPA filter change out. The doors do not have windows. There are no lights within the filter housing.

1. The HEPA filter mounting frame is seal welded to the housing as required by Paragraph 5.6.1; no caulking is used to achieve the seal. However the "shelf" that positions the HEPA filter against the mounting frame uses caulk along the shelf to frame joint to minimize internal contamination.

2. Door seals are flat neoprene fixed to the removable doors Paragraph 5.6.2(a)(3) requires gaskets to be attached to the doors with a "knife edge" seal.

Justification:

The RMCS exhauster filter housing doors are removable; no hinges are used. The housing has six protruding studs, (one each top and bottom, two on each side) doors are secured to the housing by captive extended nuts which bear on a lip around the outside perimeter of the door. The seal is achieved by compression of the neoprene gasket by the door. This arrangement meets the "or equivalent airtight construction" requirement of 5.6.2(a)(1).

Gasket arrangement meets the criteria of 5.6.2 (3). Gaskets are inspected and lubricated (to prevent adhesion to sealing surfaces) when the door is removed for filter change out. Gasket inspection during door removal and installation and the demonstrated ability to meet the leak test criteria of ASME N510, Section 6 are provided as technical justification for not meeting the requirements of paragraph 5.6.2 (a)(3).

Each compartment within the exhauster filter housing has a drain that meets the requirements of paragraph 5.6.2(c). Housing penetrations meet the requirements of paragraph 5.6.2(d).

The HEPA filter mounting frame has test port and pressure measurement penetrations. N509 Paragraph 5.6.3 states that there shall be no penetrations of component mounting frames

Justification:

On the RMCS exhauster filter housing the HEPA filter is clamped to a center frame member. The frame is built of 6" X 3" X 3/16" 304 stainless steel tube. It is penetrated on the three inch (non filter clamping) side in two locations, one roughly centered on the top, the other centered on the housing side opposite filter access doors. Penetrations are sealed with a stainless steel plug or terminate at a differential pressure instrument. The top penetration is ½" in diameter, the side 3/4". Both penetrations are re-enforced with the appropriate diameter schedule 10 stainless steel pipe seal welded in place. All other requirements of paragraph 5.6.3 are met.

The additional strength provided by the gusseted penetration and the completely seal welded frame design are given as technical justification for not meeting the no penetration requirement of paragraph 5.6.3.

The materials used and the protective coatings applied to the receiving tank exhauster filter housings meet the requirements of paragraph 5.6.4.

Subsection 5.7; Fans:

The pressure blower used in the RMCS exhauster was selected in accordance with the guidance given in paragraph 5.7.1. Fan balancing meets the requirements of paragraph 5.7.3. Drawings and documentation in accordance with paragraphs 5.7.4 and 5.7.5 respectively are provided.

1. The manufacturer did not conduct fan rating. Paragraph 5.7.2 requires the fan manufacturer to either test in accordance with Air Movement and Control Association (AMCA) 210 and the applicable special sections of AMCA 211A or rated and listed in accordance with AMCA 211A. This paragraph also offers the option of testing in accordance with the owners instructions to simulate, as closely as possible, actual operating conditions.

   Fan sound ratings are not provided. Paragraph 5.7.2 also requires the manufacturer to provide sound ratings obtained in accordance with AMCA 300 and reported in accordance with AMCA 301.

Justification:

Recall that in this application fan RPM is controlled to maintain a constant exhaust flow. The fan/control system is tested twice at the Hanford Site after assembly is complete. The first occurs during the operational test. A known restriction is placed on the housing to simulate filter loading. System response is verified by maintaining a constant stack flow.

In addition, this exhauster has been certified in accordance with 40 CFR 52, Appendix E. This flow verification requires the fan, variable speed drive assembly, and stack monitoring instruments to respond within specified accuracy limits to operational (filter loading) changes. The test is conducted over 140 hours of continuous operation.

This temporary exhauster is used exclusively outdoors. The fan and motor are completely covered with a stainless steel enclosure lined with one inch thick sound absorbent foam. The fan and motor combination are mounted to the frame using 1/4 inch thick rubber for further noise and vibration reduction.

The operational test and the flow verification are provided as technical equivalents to the rating requirements of paragraph 5.7.2.

The outdoor use and insulation of the fan and driver are provided as equivalents to the sound rating requirements of paragraph 5.7.2.

Subsection 5.8; Fan Drives.

The fan motor used on the exhauster complies with the applicable criteria of this section.

Subsection 5.9; Dampers:

There are a total of three dampers used on the temporary vessel vent filter train. The first is located at the vent header directly upstream of the riser HEPA filter. The RMCS exhauster filter housing uses two isolation dampers.

The RMCS exhauster filter housing dampers are butterfly valves; constructed to Class A requirements. The valves meet Class I leakage criteria. They are fully compliant with the applicable criteria of Subsection 5.9.

The ball valve at the riser is not constructed to any specific standard.

Justification

The riser mounted ball valve is used to isolate the HEPA filter mounted directly downstream of the valve. The valve is not used to divert flow, or isolate non contaminated areas. If the valve leaks, it does so directly into a HEPA filter. Any leakage would be filtered before reaching the atmosphere.

Subsection 5.10; Ducts:

Flexible duct is used between the riser mounted HEPA filter and the RMCS exhauster. The portable duct meets system pressure requirements. There has been no leak criteria defined for this section of duct.

Justification

The length of flexible duct under discussion is located between two HEPA filters. If the duct were to fail during operation it is at a negative pressure relative to atmosphere and any contamination would flow inward. As the duct is downstream of a HEPA filter, contamination would be minimal. The on-scene operator would detect a failed duct and jet pumping would be stopped.

The duct is inspected for rips or tears and good clamping at the termination points prior to the exhauster being energized.

These two features are given as technical equivalents to the duct requirements of Sub Section 5.10.

N509 Section 6; Packaging, Shipping, Receiving, Storage and Handling of Components

HEPA filters and the applicable components of the temporary vessel vent filter housings are shipped, received, and stored in accordance with this section.

N509 Section 7; Installation and Erection

The filter housings, at the riser and on the RMCS exhauster, fully comply with the applicable portions of this section.

N509 Section 8; Quality Assurance

The designing organizations and manufacturers of each of the components on the receiving tank exhauster have a quality assurance program that meets the requirements of ANSI/ASME NQA-1, 1989.

Section 8.2 summarizes documentation to be submitted to the owner. With the exceptions noted in the discussion of Section 5 above, all required documentation is provided.

N509 Section 9; Acceptance Testing

This section requires acceptance testing to be conducted in accordance with ASME N510. A full discussion of the temporary vessel vent acceptance testing and the use of ASME N510 in those tests follow.

NOTE:

Compliance with appendices A and D of N509 is shown to be mandatory. Appendix A is not applicable to the temporary vessel vent because it does not use adsorbents. Appendix D addresses sampling manifolds. The previous discussion of N509 Paragraph 5.6.3 describes the methodology used with the temporary vessel vent housings.

N510 DISCUSSION

The riser mounted HEPA filter housing was designed to fully comply with ASME N509. As such, it must fully comply with N510. The riser mounted HEPA filter housing complies with the testing requirements of N510.

The RMCS exhauster was not designed to fully comply with ASME N509. Subsection 1.2 of N510 states that the document may be used for technical guidance for testing air treatment systems designed to other criteria. The RMCS exhauster filter housing was tested to criteria developed using N510 for guidance.

Visual inspection criteria are taken directly from N510 Section 5. All paragraphs in section 5 are used except those that are not applicable (5.5.1.3 and 5.5.1.6 for example) and those that do not apply because of design differences (5.5.1.4(e)).

Housing leak and structural capability tests are conducted using the guidance contained in Section 6. The procedures used are taken directly from this section. Housing leak rate is tested using the pressure decay method. This test also serves as the damper by pass test (Section 12) as the housing is sealed for the test using only the isolation dampers.

Airflow distribution and air-aerosol mixing uniformity tests (part of Section 8 and all of Section 9) are not conducted as the temporary vessel vent uses filter banks containing single HEPA filters. Air flow capacity testing is described in the discussion of fans in N509 Subsection 5.7 above.

In place testing of HEPA filters is conducted in accordance with the guidance contained in Section 10 and is described in this document. Sections 11 and 13 are not applicable to the temporary vessel vent.

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