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Radioactive Air Emissions Notice of Construction for HEPA Filtered Vacuum Radioactive Air Emission Units

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HEPA Filtered Vacuum Radioactive Air Emission Units

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TERMS

1		TERMS
2		
3		
4	ALARA	as low as reasonably achievable
5	ALARACT	as low as reasonably achievable control technology
6	APQ	annual possession quantity
7		
8	BARCT	best available radionuclide control technology
9		
10	DOE-RL	U.S. Department of Energy, Richland Operations Office
11		
12	EDE	effective dose equivalent
13		
14	HEPA	high-efficiency particulate air
15	HVU	HEPA Filtered Vacuum Unit
16		
17	MEI	maximally exposed individual
18		
19	NOC	notice of construction
20		
21	TEDE	total effective dose equivalent
22		
23	WAC	Washington Administrative Code
24	WDOH	Washington State Department of Health

METRIC CONVERSION CHART

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
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 yards	0.76456	cubic meters	cubic meters	1.308	cubic yards
Temperature			Temperature		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Force			Force		
pounds per square inch	6.895	kilopascals	kilopascals	1.4504 x 10 ⁻⁴	pounds per square inch

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Second Ed., 1990, Professional Publications, Inc., Belmont, California.

**RADIOACTIVE AIR EMISSIONS
NOTICE OF CONSTRUCTION
HEPA FILTERED VACUUM RADIOACTIVE AIR EMISSION UNITS**

1.0 INTRODUCTION

This notice of construction (NOC) requests a categorical approval for construction and operation of certain portable high-efficiency particulate air (HEPA) filtered vacuum radionuclide airborne emission units (HVUs). Approval of this NOC application is intended to allow operation of the HVUs without prior project-specific approval.

This NOC does not request replacement or supersedence of any previous agreements/approvals by the Washington State Department of Health (WDOH) for the use of vacuums on the Hanford Site. These previous agreements/approvals include the approved NOCs for the use of EuroClean HEPA vacuums at the T Plant Complex (routine technical meeting 12/10/96) and the Kelly Decontamination System at the Plutonium-Uranium Extraction (PUREX) Plant (routine technical meeting 06/25/96).

Also, this NOC does not replace or supersede the agreement reached regarding the use of HEPA hand-held/shop-vacuum cleaners for routine cleanup activities conducted by the Environmental Restoration Project. Routine cleanup activities are conducted during the surveillance and maintenance of inactive waste sites (Radioactive Area Remedial Action Project) and inactive facilities. HEPA hand-held/shop-vacuum cleaners are used to clean up spot surface contamination areas found during outdoor radiological field surveys, and to clean up localized radiologically contaminated material (e.g., dust, dirt, bird droppings, animal feces, liquids, insects, spider webs, etc.). This agreement, documented in the October 12, 1994 Routine Meeting Minutes, is based on routine cleanup consisting of spot cleanup of low-level contamination provided that, in each case, the source term potential would be below 0.1 millirem per year.

This application is intended to request sitewide approval for the new activities, and provide an option for any facility to use this approval, within the terms of this NOC. The HVUs used in accordance with this NOC will support reduction of radiological contamination at various locations on the Hanford Site.

Radiation Protection - Air Emissions, Washington Administrative Code (WAC) 246-247, require that WDOH approve a NOC application before construction or modification of any emission unit that would release airborne radioactivity. This includes changes in the isotopic makeup of the source term or replacement of emission control equipment, which might contribute to an increase in the offsite dose from a licensed facility.

Reduction of radiologically contaminated areas by HEPA vacuums is a current need. The U.S. Department of Energy, Richland Operations Office (DOE-RL) potentially could generate numerous monthly applications. The existing case-by-case NOC approval process delays efforts to complete such activities in an effective and timely manner, as WDOH requires review and approval of each NOC. The WDOH regulations allow facilities the opportunity to request a single categorical license that identifies limits and conditions of operations such as the specified HEPA filtered vacuum units. Under a categorical approval, cleanup activities could proceed without delay.

1 The DOE-RL will submit an annual report to the WDOH summarizing the log sheets maintained on any
2 of the HVUs that were used under the categorical approval. The report will supply information needed
3 to maintain oversight of the operations of HVUs on the Hanford Site.

4
5 This NOC includes a general description of the types of HVUs, tracking mechanisms, emissions control
6 systems, and individual facility (e.g., B Plant Complex, C Tank Farm, SX Tank Farm, T Plant Complex,
7 100-K East Basin, 100-K West Basin, 324 Building, 340 Complex, etc.) or activity [e.g.,
8 decontamination and decommissioning (D&D) of a building] possession limits for all radioactive
9 material potentially removed by HVUs. All emission estimates used in this NOC are based on
10 hypothetical worst-case data (no controls in place). These data are used to demonstrate how emission
11 estimates are calculated. The tracking mechanisms will be performed and monitoring will be conducted
12 in compliance with both federal and state regulations.

13
14 HVUs included in the scope of this application are described in Appendix A. Appendix A contains a list
15 of the types of HVUs for use on the Hanford Site that have been identified to date and includes the
16 model, flow rates, and characteristics. HEPA vacuum-assisted (shrouded) power tools are described in
17 Appendix B. HVUs included in the scope of this NOC must meet the requirements of the Hanford Site
18 onsite radiological control manual, Article 464 (DOE/RL-96-109). When other HVUs and shrouded
19 tools are placed in service, this information will be included in the annual report.

20
21 If a HVU is used for established routine work at an existing source whose facility stack is registered with
22 the WDOH, and the activity emissions are vented through that stack, the unit is not required to comply
23 with this application. The use of HEPA filtered vacuums that are described as part of an activity
24 identified in a separate, existing NOC also are excluded.

2.0 FACILITY LOCATION

25
26
27
28 U.S. Department of Energy, Richland Operations Office
29 Hanford Site
30 Richland, Washington 99352

31
32 The HVUs could be located at any facility located on the Hanford Site. These units are portable and are
33 used in various locations as needed.

3.0 RESPONSIBLE MANAGER (Requirement 2)

34
35
36
37 Mr. J. E. Rasmussen, Director
38 Environmental Assurance,
39 Permits, and Policy Division
40 U.S. Department of Energy, Richland Operations Office
41 P.O. Box 550
42 Richland, Washington 99352

4.0 TYPE OF PROPOSED ACTION (Requirement 3)

This proposed action involves the use of specified HVUs located and operated on the Hanford Site, and represents establishment of unregistered, portable and temporary, insignificant emission units.

For the purposes of estimating (modeling) offsite exposures for this application, all applicable HUV emissions at an individual facility (e.g., B Plant Complex, C Tank Farm, SX Tank Farm, T Plant Complex, 100-K East Basin, 100-K West Basin, 324 Building, 340 Complex, etc.) or activity (e.g., D&D of a building) will be considered as a single emission point for that facility.

5.0 STATE ENVIRONMENTAL POLICY ACT (Requirement 4)

The use of HVUs is categorically exempt from the SEPA process by reference in WAC 246-03-020.

6.0 PROCESS DESCRIPTION (Requirement 5 and 7)

HVUs are portable cleaners with exhaust flow rates ranging from 50 to 300 cubic feet per minute. The units control radionuclide emissions by providing filtered vacuuming for surfaces that radioactively are contaminated.

HVUs fall into two categories of use in this application, those used for the reduction of smearable contamination and those used to reduce fixed contamination. For smearable contamination, the use of HVUs is limited to reduction of contamination on hard surfaces (e.g., concrete, permanently installed metal equipment such as risers, ventilation system components, piping, etc.). Soil matrices are excluded from this NOC. Smearable contamination on these hard surfaces will not exceed limits established in DOE/RL-96-109. These limits, if exceeded, require the affected area to be posted as a high contamination area. The limits are 2,000 disintegrations per minute per 100 square centimeters ($\text{dpm}/100 \text{ cm}^2$) alpha (α) contamination and 100,000 $\text{dpm}/100 \text{ cm}^2$ beta/gamma (β/γ) contamination (refer to Appendix C).

An exception to these limits is restricted to spot surface contamination areas found during outdoor radiological field surveys, and to clean up localized, radiologically contaminated material (e.g., dust, dirt, bird droppings, animal feces, insects, spider webs, tumbleweed fragments, etc.). These types of materials could have β/γ contamination levels exceeding 1 million $\text{dpm}/100 \text{ cm}^2$, but are very localized (i.e., a few square meters, rather than hundreds of square meters) and could occur in contamination areas, buffer zones, and clean zones. This exception does not apply to areas normally posted as high contamination areas.

The second category of use is for reduction of fixed contamination, involving the removal and/or penetration of contaminated surfaces. This category of use includes using HVUs and associated shrouded tools for sanding, stripping, spalling, drilling, and cutting operations. Limits in areas of fixed contamination to ensure compliance with this NOC will be established before these tools are used (refer to Appendix D).

7.0 ANNUAL POSSESSION QUANTITY AND PHYSICAL FORM

(Requirements 8, 10, 11, and 12)

The annual possession quantity (APQ) that an HVU handles varies from activity to activity. In many cases, the exact inventory is unknown at the beginning of the activity. To assist operators of the HVUs to determine the requirements for compliance with federal and state regulations, facility APQs were derived for individual facilities (e.g., B Plant Complex, C Tank Farm, SX Tank Farm, T Plant Complex, 100-K East Basin, 100-K West Basin, 324 Building, 340 Complex, etc.) or activities (e.g., D&D of a building) within each of the major areas where HVUs could be operated.

The APQs were calculated for a maximum annual combined use of HVUs by an individual facility or activity. The assumption in calculating the APQs was that the 0.1 millirem per year criteria is used, as a beginning point and the source term that could be handled annually is back calculated very conservatively. The approach taken was to calculate the maximum area (at contamination levels of 2,000 dpm/100 cm² α contamination and 100,000 dpm/100 cm² β/γ contamination) that would have a dose potential of 0.05 millirem per year. The number of curies of plutonium-239/240 and strontium-90 that would be present in that maximum area was calculated, assuming that the entire area was at both those contamination levels. This process was used for each of the major areas to calculate the APQs, using the appropriate unit dose factors. The recommended dose assessment methodology, for comparison with individual facility APQs, and example calculations are found in Appendices C and D.

Table 1 lists the APQ that the HVUs theoretically could handle for combined smearable and fixed contamination at individual facilities in each of the major areas. To determine the APQs, a physical form of particulates was assumed. Further, because vacuuming was involved, a release fraction of 1 conservatively was assumed (for all material removed).

The APQs for the isotopes are shown in Table 1. The limits are noted annually for any individual facility within the listed area. The APQs in Table 1 are based on hypothetical worst-case source terms that all HVUs at an individual facility combined could handle during a year and remain below 0.05 millirem per year unabated dose.

When a user determines the source term (i.e., APQ) for HVU use, the user can conservatively estimate total activity by assuming that all α contamination is plutonium-239/240 and that all β/γ contamination is strontium-90. If specific isotopic information is available and used, the user will take into consideration all radionuclides that potentially would contribute 10 percent of the total effective dose equivalent (TEDE) to the maximum exposed individual (MEI) (i.e., cesium-137 or americium-241 could be the appropriate isotopes to use at certain facilities).

Table 1. Individual Facility Annual Possession Quantities by Area for High-Efficiency Particulate Air Filtered Vacuum Unit Operations.

Individual facility located in area	Annual possession quantity α contamination (as plutonium-239/240) (curies per year)	Annual possession quantity β/γ contamination (as strontium-90) (curies per year)
100 Areas	3.09 E-03	1.56 E-01
200 East Area	4.57 E-03	2.30 E-01
200 West Area	7.70 E-03	3.88 E-01
300 Area	2.29 E-04	1.16 E-02
400 Area	3.44 E-03	1.74 E-01

8.0 CONTROL SYSTEM (Requirement 6)

Annually the HVUs are field tested, requiring an aerosol test/efficiency test or equivalent pass/fail criteria of 99.95 percent for particles of 0.3 micron median diameter. In addition, the HVUs filtration systems are tested whenever the configuration is modified and/or the filtration system is opened.

A smear of the exhaust port will be conducted before and after each use of HVUs. If the exhaust port smear is positive, the unit will be tagged and removed from service.

(Note: For HVUs that are not in use, and the HEPA filter certification has expired, these HVUs will be required to have all HEPA filter testing completed before reactivation).

9.0 MONITORING SYSTEM (Requirement 9)

Each individual facility is responsible for tracking/recording the use of HVUs. As required by federal and state regulations, records will be maintained by the individual facility and kept for at least 5 years. Methods for using HVUs will be in place and personnel will become familiar with these before use.

The method used for monitoring is the log sheet, functionally equivalent to the one shown in Appendix E, used to track HVUs and the calculations (examples given in Appendices C and D) to determine maximum expected annual emissions. When implementing the use of HVUs, the responsible personnel (operators) log the following information. Additional information can be tailored for the individual facility, such as the Table 1 APQs, and curies to date.

- Location of operation and make and model of unit
- Date(s) of operations
- Purpose of operation (or work package number)
- Air emissions source constituents (if other than plutonium-239 and strontium-90)
- Area cleaned (in square meters)
- Maximum contamination level encountered or analysis results
- Potential radionuclide releases (in curies, per Appendices C and/or D)
- Results of smears on the exhaust port(s) positive (in dpm/100 cm²) or negative.

A copy of the log sheets will be maintained by the facility (at least 5 years) and a report submitted annually to the WDOH on or before June 30. The June 30 submittal will consist of a summary of HVU operations performed in accordance with this NOC from January through December of the previous year, and will be incorporated into the portable temporary radioactive air emissions units annual report. The estimated emissions from the units will be reviewed and summarized in the annual radionuclide air emissions report for the Hanford Site.

The recordkeeping is not in lieu of required monitoring for health, safety, DOE/RL, or contractor requirements. This recordkeeping is intended to document periodic confirmatory monitoring for the emission units. All associated emissions will be reported as part of the annual radionuclide air emissions report. This recordkeeping also supports the reduction of NOC applications and notification submittals required by federal and state regulations.

10.0 RELEASE RATES (Requirement 13)

This section provides information regarding the hypothetical emission release rates from the HVUs that would occur under normal use, but without the emission control systems (the HEPA filter) in place. Also included is the TEDE to the nearest facility receptor resulting from such unabated emissions.

10.1 UNABATED EMISSIONS

Table 1 lists the annual possession limits for HVU usage by an individual facility (e.g., B Plant Complex, C Tank Farm, SX Tank Farm, T Plant Complex, 100-K East Basin, 100-K West Basin, 324 Building, 340 Complex, etc.) or activity (e.g., D&D of a building) in each of the major areas on the Hanford Site. Because vacuuming operations are involved, a release fraction of 1 was used. The facility APQs shown in Table 1 are equal to the maximum unabated emissions for HVU usage by an individual facility in each of the major areas on the Hanford Site.

10.2 ABATED EMISSIONS

Table 2 lists the abated air emissions for HVU usage by facilities or activities in the major areas on the Hanford Site. HEPA filtration is the control equipment used on each of the units. A treatment factor of 2,000 (WHC-EP-0498) was used when calculating the control efficiency of the HEPA systems.

Table 2. Maximum Abated Emissions for High-Efficiency Particulate Air Filtered Vacuum Unit Operations at Facilities by Area.

Individual facility located in area	Annual unabated emissions α contamination (as plutonium-239/240) (curies per year)	Annual unabated emissions β/γ contamination (as strontium-90) (curies per year)	HEPA control treatment factor	Annual abated emissions α contamination (as plutonium-239/240) (curies per year)	Annual abated emissions β/γ contamination (as strontium-90) (curies per year)
100 Areas	3.09 E-03	1.56 E-01	2 E+03	1.55 E-06	7.80 E-05
200 East Area	4.57 E-03	2.30 E-01	2 E+03	2.29 E-06	1.15 E-04
200 West Area	7.70 E-03	3.88 E-01	2 E+03	3.85 E-06	1.94 E-04
300 Area	2.29 E-04	1.16 E-02	2 E+03	1.15 E-07	5.80 E-06
400 Area	3.44 E-03	1.74 E-01	2 E+03	1.72 E-06	8.70 E-05

11.0 OFFSITE IMPACT (Requirements 14 and 15)

Hanford Site air emissions from point sources resulted in an EDE of 1.2 E-03 millirem per year to the MEI in 1997 (DOE/RL-97-43). The EDE from all Hanford Site air emissions, including point sources, diffuse and fugitive sources, radon emissions, and thoron emissions, was determined to be 2.6 E-2 millirem per year to the MEI in 1997. The anticipated offsite dose impact as a result of the HVUs in conjunction with other operations on the Hanford Site will not result in a violation of the National Emission Standard of 10 millirem per year.

11.1 UNABATED DOSE

The unabated dose to the nearest receptor located at the Hanford Site boundary at each of the areas is shown in Table 3. The facility radioactive annual possession limits in Table 1 were used, along with the dose factors for each of the areas on the Hanford Site. The unit dose factors included were submitted previously to the WDOH (WHC-EP-0498). The information required to develop the unit dose factors from the U.S. Environmental Protection Agency approved Clean Air Assessment Package 1988 (CAP-88) computer code also was included in WHC-EP-0498. Note that because the mainframe version of CAP-88 was used in this NOC, rather than the PC version 1.0 of CAP-88, the APQs were cut in half for the 100, 200 East, 200 West, 300, and 400 Areas in Tables 1 through 4 to provide additional conservatism.

Table 3. Unabated Dose Estimates from High-Efficiency Particulate Air Filtered Vacuum Unit Operations at Facilities by Area.

Individual facility located in area	Annual unabated emissions α contamination (as plutonium-239/240) (curies per year)	Annual unabated emissions β/γ contamination (as strontium-90) (curies per year)	CAP88 unit Dose Factor (millirem per curie) 1st: α 2nd: β/γ	Annual unabated dose α contamination (as plutonium-239/240) (millirem per year)	Annual unabated dose β/γ contamination (as strontium-90) (millirem per year)
100 Areas	3.09 E-03	1.56 E-01	1.28 E+01 6.45 E-02	3.96 E-02	1.01 E-02
				Total dose:	4.97 E-02
200 East Area	4.57 E-03	2.30 E-01	8.67 E+00 4.38 E-02	3.96 E-02	1.01 E-02
				Total dose:	4.97 E-02
200 West Area	7.70 E-03	3.88 E-01	5.15 E+00 2.60 E-02	3.97 E-02	1.01 E-02
				Total dose:	4.98 E-02
300 Area	2.29 E-04	1.16 E-02	1.73 E+02 8.72 E-01	3.96 E-02	1.01 E-02
				Total dose:	4.97 E-02
400 Area	3.44 E-03	1.74 E-01	1.15 E+01 5.80 E-02	3.96 E-02	1.01 E-02
				Total dose:	4.97 E-02

11.2 ABATED DOSE

The abated dose to the nearest receptor located at the Hanford Site boundary for an individual facility or activity within each of the areas is shown in Table 4. The unit dose factors included in the table are described in Section 11.1.

Table 4. Abated Dose Estimates from High-Efficiency Particulate Air Filtered Vacuum Unit Operations at Facilities by Area.

Individual facility located in area	Annual abated emissions α contamination (as plutonium-239/240) (curies per year)	Annual abated emissions β/γ contamination (as strontium-90) (curies per year)	CAP88 unit dose factor (millirem per curie) 1st: α 2nd: β/γ	Annual abated dose α contamination (as plutonium-239/240) (millirem per year)	Annual abated dose β/γ contamination (as strontium-90) (millirem per year)
100 Area	1.55 E-06	7.80 E-05	1.28 E+01 6.45 E-02	1.98 E-05	5.03 E-06
				Total dose:	2.48 E-05
200 East Area	2.29 E-06	1.15 E-04	8.67 E+00 4.38 E-02	1.99 E-05	5.04 E-06
				Total dose:	2.49 E-05
200 West Area	3.85 E-06	1.94 E-04	5.15 E+00 2.60 E-02	1.98 E-05	5.04 E-06
				Total dose:	2.48 E-05
300 Area	1.15 E-07	5.80 E-06	1.73 E+02 8.72 E-01	1.99 E-05	5.06 E-06
				Total dose:	2.50 E-05
400 Area	1.72 E-06	8.70 E-05	1.15 E+01 5.80 E-02	1.98 E-05	5.05 E-06
				Total dose:	2.49 E-05

12.0 FACILITY LIFETIME (Requirement 17)

Environmental cleanup efforts on the Hanford Site are ongoing. Estimated lifetime of the HVUs ranges from 5 to 10 years, depending on type and frequency of use.

13.0 TECHNOLOGY STANDARDS (Requirement 18)

The potential TEDE received by the offsite hypothetical nearest receptor, resulting from the proposed HVU operations at each of the individual facilities (e.g., B Plant Complex, C Tank Farm, SX Tank Farm, T Plant Complex, 100-K East Basin, 100-K West Basin, 324 Building, 324 Complex, etc.) or activity (e.g., D&D of a building) is less than 0.1 millirem per year. For the purpose of estimating (modeling) offsite exposures for this application, all applicable HVU emissions at an individual facility will be considered a single emission point.

Control technology standards listed under WAC 246-247-110(18) have been considered and are discussed in the following paragraphs.

1 **ASME/ANSI AG-1, FC-1100**

2

3 This section of the Code provides minimum requirements for the performance, design, construction,
4 acceptance testing, and quality assurance for HEPA filters used in nuclear safety related air or gas
5 treatment systems in nuclear facilities. Many of the units included in this NOC meet industry standards
6 for asbestos work. HEPA filters that meet asbestos standards are required to remove 99.97 percent of
7 0.3 micron monodispersed particles, which is equivalent to the nuclear-grade HEPA filter standards. The
8 asbestos standards do not require compliance with radiation resistance or fire resistance standards found
9 in nuclear-grade HEPA filters. The asbestos standards do not require compliance with any design
10 standards, other than the previously mentioned performance standard for removal efficiency, but rely
11 instead on industry standards such as ANSI Z9.2-1979, "Fundamentals Governing the Design and
12 Operation of Local Exhaust Systems", and MIL-STD-282, "Filter Units, Protective Clothing, Gas-Mask
13 Components, and Related Products: Performance Test Methods". However the units included in this
14 NOC are attended continuously while in use, to ensure the units are not subjected to extremes of
15 temperature or radiation. For this application and the intended uses, the asbestos-grade HEPA filters are
16 proposed as adequate in lieu of the nuclear-grade HEPA filter standards.

17

18 **ASME/ANSI N509**

19

20 The HEPA filters do not fully comply with ANSI N509. Many of the units use cylindrical HEPA filters,
21 which are not addressed by this standard. Performance testing to demonstrate adequacy of design and
22 testing is addressed in the following discussion for ASME/ANSI N510.

23

24 **ASME/ANSI N510**

25

26 A system that is not compliant with ASME/ANSI N509 is by definition noncompliant with ASME/ANSI
27 N510. Documentation to show full compliance with the standards cannot be provided. However, the
28 HEPA filters are tested in-place to meet the intent of ASME/ANSI N510. The systems are tested
29 annually (or before startup if inactive for more than a year) as described in the current version of "In-
30 Place Testing of HEPA Filter Systems (Vacuum Cleaner)", 7-GN-062, Rev. 3, Change 0. This
31 procedure provides a safe, uniform method for determining leaks in the HVU system containing a HEPA
32 filter unit, and has been demonstrated to WDOH. The DOE approved challenge aerosol that is used in
33 this test procedure is used in accordance with ASME/ANSI N510. The test procedure determines aerosol
34 penetration as a result of leakage through or around the filter unit due to faulty installation, defects in the
35 filter unit mounting frame and housing, or defects and/or damage to the individual filter units. Although
36 this procedure is not strictly an N510 test, it is proposed as adequate to demonstrate the HEPA filtration
37 system is operating properly and meets the intent of N510. Hence, it is proposed that adherence to this
38 procedure adequately demonstrates that the HEPA filtration system is operating properly and is
39 compatible with the required standard.

40

41 **ANSI/ASME NQA-1**

42

43 Quality assurance is addressed by HNF-MP-599 Rev. 2, *Project Hanford Quality Assurance Program*
44 *Description* (Chapter 2, Section 3.3 and Chapter 7, Section 3.2) and by HNF-0528, *NESHAP Quality*
45 *Assurance Project Plan for Radioactive Airborne Emissions*, (all of Sections 2.0, 3.0, and 5.0) as a
46 compatible alternative to NQA-1.

47

1 **ANSI N13.1**

2
3 There are no sampling systems on these units. Therefore, the sampling criteria in ANSI N13.1 can not be
4 applied to these units. The methods discussed in Section 9.0 will be used to provide periodic
5 confirmatory measurements of low emissions.

6
7 **40 CFR 60, Appendix A**

8 **Test Methods 1, 1A, 2, 2A, 2C, 2D, 4, 5, and 17**

9
10 The units do not have a stack that can be tested using 40 CFR 60, Appendix A test methods. Therefore,
11 these methods cannot be applied to the HVUs addressed in this NOC. Instead, air flow measurements
12 are incorporated into the HEPA filter test procedure referenced in the previous section above addressing
13 ASME/ANSI N510.

14
15
16 **14.0 DISCUSSION OF AS LOW AS REASONABLY ACHIEVABLE CONTROL**
17 **TECHNOLOGY (Requirement 16)**

18 It is proposed that the HEPA filtration systems be approved, as described in Section 8.0 of the NOC, as
19 low as reasonably achievable control technology (ALARACT) for the support of reduction of radioactive
20 contamination at various locations on the Hanford Site. This discussion of ALARACT does not present
21 a detailed evaluation of all of the available radionuclide control technologies nor does it rank the relative
22 benefits with respect to the environment, economical, and energy impacts of each technology. The
23 WDOH has stated that HEPA filters generally are accepted as best available radionuclide control
24 technology (BARCT) for particulate radionuclide air emissions. HEPA filter units have been used
25 extensively on the Hanford Site to effectively control particulate radionuclide air emissions.

26
27
28 **15.0 REFERENCES**

29 7-GN-062, "In-Place Testing of a HEPA Filter SYSTEM (Vacuum Cleaner)", Ventilation and Balance,
30 Hanford Site, Richland, Washington.

31
32 Routine Technical Meeting, WDOH, June 25, 1996.

33
34 Routine Technical Meeting, WDOH, December 10, 1996.

35
36 DOE/RL-96-109, *Hanford Site Radiological Control Manual*, Hanford Radiological Control Forum,
37 Richland, Washington.

38
39 DOE/RL-97-43, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1997*,
40 U.S. Department of Energy, Richland Operations Office, Richland, Washington.

41
42 HNF-MP-599 Rev. 2, *Project Hanford Quality Assurance Program Description*, Fluor Daniel Hanford,
43 Richland, Washington.

- 1 HNF-0528, *NESHAP Quality Assurance Project Plan for Radioactive Airborne Emissions*, Fluor Daniel
- 2 Hanford, Richland, Washington.
- 3
- 4 WHC-EP-0498, *Unit Dose Calculation Methods Summary of Facility Effluent Monitoring Plan*
- 5 *Determinations*, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX A

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HIGH-EFFICIENCY PARTICULATE AIR FILTERED VACUUM UNIT LISTING

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Table A-1. HEPA Filtered Vacuum Cleaners Used on the Hanford Site.

Make	Model	Flowrate (cfm)	Remarks
Kelly Decontamination System			
Hako ^a Minuteman	X-839	85-130	
Hako Minuteman	X1000-15	100	
Hako Minuteman	MX-1000	100	
Hako Minuteman	X-1000	130	
Hako Minuteman	MX-100	130	Wet and dry
Nilfisk ^b	GS-80 or GM-80	87	
Nilfisk	GS-82 or GM-82	191	
Nilfisk	GS-83 or GM-83	208-286	
Nilfisk	VT-60	99	Wet and dry
Nilfisk	Explosion Proof	130	Explosion proof/dust ignition proof
Nilfisk			Portable back pack
Power Products	RADPAC ^c 35	110	Hand carried
Power Products	RADVAC ^c 1500	180	
Power Products	RADVAC 2000	180	Wet and dry
Power Products	RADVAC 3000-SX or 3000-NX	270	SX-(stainless) NX-(painted)
Power Products	RADVAC 3500-SX or 3500-NX	270	Same as 3000 with secondary collection
Power Products	RADVAC 5000-SX or 5000-NX	201	Pneumatic 106 cfm required
Power Products	RADVAC 5500-SX or 5500-NX	201	same as 5000 with secondary collection
Power Products	RADVAC 6000-SX or 6000-NX	194	Pneumatic 152 cfm required
Power Products	RADVAC 6500-SX or 6500-NX	194	same as 6000 with secondary collection
Power Products	RADVAC 7000-SX or 7000-NX	187	Pneumatic 187 cfm required
Power Products	RADVAC 7500-SX or 7500-NX	187	same as 7000 with secondary collection
Euroclean	UZ-930	77	
Euroclean	UZ-948	270	
Euroclean	UZ-848	105	
Euroclean	UZ-878A	100	

2

3 ^a Hako is a registered trademark of Hako-Werke GMBH & Co., Federal Republic of Germany.4 ^b Nilfisk is a registered trademark of A/S Fisker & Nielsen, Copenhagen, Denmark.5 ^c Rad Pac and Rad Vac are registered trademarks of Power Products and Services Co., Inc.

6 cfm = cubic feet per minute.

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APPENDIX B

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**HIGH-EFFICIENCY PARTICULATE AIR FILTERED VACUUM UNIT ASSOCIATED
TOOLS FOR RADIOACTIVE CONTAMINATION REMOVAL**

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Table B-1. High-Efficiency Particulate Air Filtered Vacuum Unit Associated Tools for Radioactive Contamination Removal.

TOOL	APPLICATIONS	REMARKS
DESCO Mini Die Grinder with fixed shroud 2" and 3"	Removal of hazardous and nonhazardous coatings, paint scuffing, surface cleaning and preparation, weld preparation	Pneumatic only
DESCO Bullgrinder with shroud 4" and 7"	Removal of hazardous and nonhazardous coatings, paint scuffing, surface cleaning and preparation, designed to clean right to a vertical surface	Pneumatic and electric
DESCO right angle grinder with floating shroud 3", 5" and 7"	Removal of hazardous and nonhazardous coatings, paint scuffing, surface cleaning and preparation, weld preparation	Pneumatic and electric
DESCO Mini Flush Plate 2.25" Hub 3 Hubs available Cutter Hub Hammer Hub Roto-Peen Hub	Removal of hazardous and nonhazardous coatings on structural steel and concrete, grinding, abrading, surface preparation and profiling	Pneumatic and electric
DESCO FX Tool 4.25" Hub 3 Hubs available Cutter Hub Hammer Hub Roto-Peen Hub	Removal of hazardous and nonhazardous coatings on structural steel and concrete, grinding, abrading, surface preparation and profiling	Pneumatic and electric
DESCO Floor Abrador (Descobrader Walk Behind) 5.25" and 10.25" 7 Hubs available 3 Cutter Hubs Hammer Hub Roto-Peen Hub BPH Hub Clean & Strip Hub	Removal of hazardous and nonhazardous coatings, rust and non-skid, mastic removal, surface profiling, cleaning and scarifying and grinding	Pneumatic and electric
DESCO Micro Needle Descaler 2 mm needles Hand held, straight shank	Removal of hazardous and nonhazardous coatings, paint, stucco and rust, lightweight, tight-fit applications	Pneumatic only
DESCO Needle Descaler 2mm, 3mm, and 4mm needles Hand held, straight shank	Removal of hazardous and nonhazardous coatings, paint, stucco and rust, cleaning of brick and stonework	Pneumatic and electric
DESCO Surface Preparation Tool (BPH Tool)	Removal of hazardous and nonhazardous coatings, weld preparation	Pneumatic and electric

TOOL	APPLICATIONS	REMARKS
Nilfisk Drill Shield Fits 1/2" and 3/4"	Dust free drilling into hazardous and nonhazardous materials	Shroud only (drill not included)
Nilfisk Sabre Saw	Dust free cutting of hazardous and nonhazardous materials	Electric only. Saw and shroud sold as one
Nilfisk Sawzall Shroud Fits Milwaukee 6511 and 6512	Dust free cutting of hazardous and nonhazardous materials.	Shroud only
Nilfisk Oscillating Saw (Cast Cutter)	Dust free cutting of hazardous and nonhazardous materials, Asbestos pipe lagging	Pneumatic and electric
Wheelabrator Blastrac*	Removal of coatings from concrete surfaces, surface preparation, scabbling	Shot blast type

1

2 * Wheelabrator and Blastrac are registered trademarks of Wheelabrator Corporation, LaGrange, Georgia.

APPENDIX C

FACILITY POSSESSION LIMITS - SMEARABLE CONTAMINATION

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FACILITY POSSESSION LIMITS - SMEARABLE CONTAMINATION

Dose Assessment Methodology

The potential total effective dose for each individual facility (e.g., B Plant Complex, C Tank Farm, T Plant Complex, SX Tank Farm, 100-K East Basin, 100-K West Basin, 325 Building, 340 Complex, etc.) or activity (e.g., D&D of a building) for all cumulative HVU usage must be less than 0.1 millirem for this NOC approval. Annual possession limits for each facility were calculated for the maximum activity of both alpha and beta/gamma contamination that could be handled by all HVU use at an individual facility (assuming contamination levels were 2,000 dpm/cm² α contamination and 100,000 dpm/100 cm² β/γ contamination) without exceeding a potential dose to the nearest receptor of 0.1 millirem per year. These values were listed in the text as APQs in Table 1.

Surface area will be used to determine activity and dose potential for smearable contamination. Fixed contamination is addressed in Appendix D. The APQs in Table 1 are based on the total amount of activity combined from both smearable and fixed contamination removal.

Calculation of Curie Content for Smearable Contamination.

Before using HVU equipment for vacuuming of hard surfaces with smearable contamination, estimates must be made of the curie content of the removable contamination and compared to the facility possession limits in Table 1. Please note that the APQs are an annual limit for all HVU use at an individual facility.

To estimate the radioactive contamination, smears must be taken of the surface to be vacuumed. The surface must be surveyed adequately to ensure that the area is not a high contamination area. To be conservative, the alpha contamination can be assumed to be plutonium-239, and beta/gamma contamination can be assumed to be strontium-90. To find the total number of curies for each isotope, use the following formula:

$$\begin{aligned} \text{Curies} &= \frac{\text{Surface area vacuumed (m}^2\text{)} * \text{highest contamination (dpm/100 cm}^2\text{)}}{(1 \text{ E-}04 \text{ m}^2/\text{cm}^2 * 2.22 \text{ E+}12 \text{ dpm/1 Ci)}} \\ &= \text{SA Vacuumed (m}^2\text{)} * \text{max contam. (dpm/100 cm}^2\text{)} * 4.5 \text{ E-}9 \text{ (Ci*cm}^2/\text{m}^2\text{*dpm)}. \end{aligned}$$

Example:

A proposed job involves vacuuming a hard surface in a contamination area of 500 m². The highest smear found was 1000 dpm/100 m² alpha contamination, and 50,000 dpm/100 cm² beta/gamma contamination.

$$^{239}\text{Pu} = 500 \text{ m}^2 * 1000 \text{ dpm/100 cm}^2 * 4.5 \text{ E-}9 \text{ Ci*cm}^2/\text{m}^2\text{*dpm} = 2.3 \text{ E-}5 \text{ Ci.}$$

$$^{90}\text{Sr} = 500 \text{ m}^2 * 50,000 \text{ dpm/100 cm}^2 * 4.5 \text{ E-}9 \text{ Ci*cm}^2/\text{m}^2\text{*dpm} = 1.1 \text{ E-}3 \text{ Ci.}$$

The curie amounts (estimated from any of the approaches suggested in Appendices C or D) will be added to the total curies to date for any other applicable HVU activity at a given individual facility, and compared to the annual possession limits in Table 1. If the total curies to date are less than the APQ, the

1 job could proceed. If the total would exceed the APQ, the job exceeds the scope of this NOC, and a
2 separate approval would be required.

3
4 HVUs also are approved for use in void reduction. The curie amounts can be estimated for these cases
5 with the following certain conservative assumptions.

6
7 • An example of this is when a glove bag is installed over equipment for repair or replacement. After
8 the work is complete, the equipment is decontaminated as required. A smear of the interior surface
9 of the glove bag is taken, and the estimated curie contamination on the surface of the glove bag can
10 be used in the previous equations to estimate potential curies released.

11
12 • A second example is when a HVU is used to remove excess air from plastic-wrapped, low-level
13 radioactive waste for disposal. An estimate of the curie content of the package is generated before
14 waste acceptance. Because the HVU is not being used to suck up contamination, but rather to leave
15 contamination in place, removing only excess air, a release factor of $1.0 \text{ E-}3$ is appropriate. The total
16 curie content of the waste, divided by 1,000, is a conservative estimate of potential curies released.

17
18 HVUs also are approved when a HVU is used to collect exhaust from a pipe that is being swiped with a
19 sponge type ball to verify that the pipe can be released as nonradiologically contaminated. The surface
20 area of the pipe and the contamination on the swipe can be used to estimate potential curies released.

APPENDIX D

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FACILITY POSSESSION LIMITS - FIXED CONTAMINATION REMOVAL

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FACILITY POSSESSION LIMITS - FIXED CONTAMINATION REMOVAL

Calculation of Curie Content for Fixed Contamination.

Before using HVU assisted shrouded tools for removal or penetration of fixed contamination, estimates must be made of the curie content in the fixed contamination surface and compared to the APQs in Table 1. Please note that the possession limits are an annual limit for all HVU use at an individual facility.

Alpha and Beta Contamination

To estimate the radioactive contamination, samples will be taken, composited, and analyzed for total alpha and beta before proceeding. Samples should be taken manually (by scraping, chipping, etc., using hand tools only) to the depth of removal for the proposed job and an appropriate surface area (e.g., 25 cm² each), representative of the area and depth of fixed contamination removal/penetration. Multiple samples could be used for large areas; suggested sampling guidance is provided in Table D-1. Note that the sample collection area must be included in the APQ calculation.

Table D-1. Sampling Guidance.

Surface area (square meters)	Number of samples (25 square centimeters)
less than 0.25	1
0.25 to 0.50	2
0.50 to 0.75	3
0.75 to 1.0	4
greater than 1.0	4/square meters

All the samples for a proposed job will be composited and analyzed for total alpha and beta. To be conservative, the alpha contamination can be assumed to be plutonium-239, and beta/gamma contamination can be assumed to be strontium-90 (facilities that have isotopic information indicating americium-241 to be significant should assume alpha contamination is americium-241, adjusting calculations with appropriate unit dose factors, e.g., multiply americium-241 curies by 1.5 to give equivalent plutonium-239 curies). To find the total number of curies for each isotope, use the following formula:

$$\text{Curies} = \frac{\text{Total area of fixed contamination removal (m}^2\text{)} * \text{Curies analyzed}}{(\text{number of samples}) * 25 \text{ cm}^2 * 1 \text{ E-04 m}^2/\text{cm}^2}.$$

Example:

A proposed job involves removal of fixed contamination in an area of 2 m². The analysis from the eight samples (25 cm²) taken resulted in a total alpha content of 2 E-7 Ci, and total beta/gamma content of 4 E-5 Ci.

$$^{239}\text{Pu} = \frac{2 \text{ m}^2 * 2 \text{ E-7 Ci}}{8 \text{ samples} * 25 \text{ cm}^2 * 1 \text{ E-04 m}^2/\text{cm}^2} = 2 \text{ E-5 Ci}.$$

$$^{90}\text{Sr} = \frac{2 \text{ m}^2 * 4 \text{ E-5 Ci}}{8 \text{ samples} * 25 \text{ cm}^2 * 1 \text{ E-04 m}^2/\text{cm}^2} = 4 \text{ E-3 Ci.}$$

The curie amounts (estimated from any of the approaches suggested in Appendices C or D) will be added to the total curies to date for any other applicable HVU activity at a given facility and compared to the APQs in Table 1. If the total curies to date are less than the APQ, the job could proceed. If the total would exceed the APQ, the job exceeds the scope of this NOC, and a separate approval would be required.

Gamma Contamination

For fixed contamination removal/penetration involving gamma contamination only, the previous method can be used. As an alternative, a gamma survey of the site will be sufficient. Unless the isotope is known, a conservative assumption is made that the contamination is cesium-137, but has the same potential offsite dose as strontium-90.

Using the appropriate efficiencies and detector areas for the survey instruments used, report the activity for direct contact readings in dpm/100 cm². Table D-2 lists the number of survey sites suggested for given surface areas.

Table D-2. Survey Guidance.

Surface area (square meters)	Number of survey sites (dpm/100 square centimeters)
less than 0.25	1
0.25 to 0.50	2
0.50 to 0.75	3
0.75 to 1.0	4
greater than 1.0	4/square meters

Take the average survey reading for a proposed job, and multiply the dpm/100 cm² value by 4.5 E-09 to get Ci/m². To find the total number of curies for ⁹⁰Sr, use the following formula:

$$\text{Curies} = \text{Total area of fixed contamination removal (m}^2\text{)} * \text{Average Ci/m}^2.$$

Example:

A proposed job involves removal of fixed contamination in an area of 2 m². The survey readings were 3,500; 2,000; 3,000; 1,000; 20,000; 4,000; 2,500; and 60,000 dpm/100 cm². The average reading is 12,000 dpm/100 cm², which equals 5.4 E-5 Ci/m². The total beta/gamma content could be conservatively estimated at of 1.1 E-4 Ci of ⁹⁰Sr.

The curie amounts (estimated from any of the approaches suggested in Appendices C or D) will be added to the total curies to date for any other applicable HVU activity at a given individual facility and compared to the annual possession limits in Table 1. If the total curies to date are less than the APQ, the job could proceed. If the total would exceed the APQ, the job exceeds the scope of this NOC, and a separate approval would be required.

APPENDIX E

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**EXAMPLE LOG SHEET FOR TRACKING HIGH-EFFICIENCY PARTICULATE AIR
FILTERED VACUUM UNIT USE AND ANNUAL POSSESSION QUANTITIES**

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Table E-1. Example Log Sheet for Operation of High-Efficiency Particulate Air Filtered Vacuums.

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