DOE/RL-97-50
UC-630

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

Date Published
October 1997

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

Approved for Public Release

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DISCLM-5.CHP (8-91)

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Document Number:	DOE/RL-97-50, Rev. 0
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APPENDICES

TABLES

TERMS

ALARA	as low as reasonably achievable
ALARACT	as low as reasonably achievable control technology
APQ	annual possession quantity
BARCT	best available radionuclide control technology
DOE-RL	U.S. Department of Energy, Richland Operations Office
EDE	effective dose equivalent
HEPA	high-efficiency particulate air
HVU	HEPA Filtered Vacuum Unit
MEI	maximally exposed individual
NOC	notice of construction
TEDE	total effective dose equivalent
WAC	Washington Administrative Code
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	1.4504×10^{-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 and the Kelly Decontamination System at the Plutonium-Uranium Extraction (PUREX) Plant.

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 on the site 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 the WDOH approve an 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.

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

This NOC includes a general description of the types of HVUs, tracking mechanisms, emissions control systems, and 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., decontamination and decommissioning (D&D) of a building] possession limits for all radioactive material potentially removed by HVUs. All emission estimates used in this NOC are based on hypothetical worst-case data (no controls in place). These data are used to demonstrate how emission estimates are calculated. The tracking mechanisms will be performed and monitoring will be conducted in compliance with both federal and state regulations.

HVUs included in the scope of this application are described in Appendix A. Appendix A contains a list of the types of HVUs for use on the Hanford Site that have been identified to date and includes the model, flow rates, and characteristics. HEPA vacuum-assisted (shrouded) power tools are described in Appendix B. HVUs included in the scope of this NOC must meet the requirements of the Hanford Site Radiological Control Manual (HSRCM), Article 464. When other HVUs and shrouded tools are placed in service, this information will be included in the annual report.

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

2.0 FACILITY LOCATION

U.S. Department of Energy, Richland Operations Office
Hanford Site
Richland, Washington 99352

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

3.0 RESPONSIBLE MANAGER (Requirement 2)

Mr. J. E. Rasmussen, Division Director
Office of Environmental Assurance,
Policy, and Permits
U.S. Department of Energy, Richland Operations Office
P.O. Box 550
Richland, Washington 99352

4.0 TYPE OF PROPOSED ACTION (Requirement 3)

This proposed action serves involves 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 HVU 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 are radioactively contaminated.

HVUs fall into two categories of use for 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 surfaces, 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 the Radiation Control Manual (HSRCM-1, Rev. 2). 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 (dpm/100 cm^2) alpha (α) contamination and 100,000 dpm/100 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 dpm/100 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 cm^2 α contamination and 100,000 dpm/100 cm^2 β/γ contamination) that would have a dose potential of 0.1 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. Please note the limits are on an annual basis 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 0.1 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 would potentially contribute 10 percent of the total effective dose equivalent (TEDE) to the maximum exposed individual (MEI) (i.e. cesium-137 or americium-241 may 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.

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 Area	7.55 E-04	3.81 E-02
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	8.41 E-04	4.24 E-02

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.

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. Procedures for using HVUs will be in place and employees will become familiar with them 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 cm^2) 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 March 15. The March 15 submittal will consist of a summary of HVU operations performed in accordance with this NOC from January through December of the previous year. 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 total effective dose equivalent (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 an individual facility or activity in each of 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.

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 Area	7.55 E-04	3.81 E-02	2 E+03	3.78 E-07	1.91 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	8.41 E-04	4.24 E-02	2 E+03	4.21 E-07	2.12 E-05

11.0 OFFSITE IMPACT (Requirements 14 and 15)

Hanford Site air emissions from all point sources resulted in an EDE of 2.0 E-3 millirem per year to the MEI in 1996 (DOE/RL-96-37). The EDE from all Hanford Site air emissions, including point sources, diffuse and fugitive sources, radon emissions, and thoron emissions, was determined to be 3.9 E-2 millirem per year to the MEI in 1996. The anticipated offsite dose impact as a result of the HVUs in conjunction with other operations on the Hanford Site will remain well below 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 for an individual facility 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 "Unit Dose Calculation Methods Summary of Facility Effluent Monitoring Plan Determinations" (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 200 East, 200 West, and 300 Areas in Tables 1 through 4 to provide additional conservatism.

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

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 Area	7.55 E-04	3.81 E-02	1.28 E+02 6.45 E-02	9.66 E-02	2.46 E-03
				Total Dose:	9.91 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	8.41 E-04	4.24 E-02	1.15 E+02 5.80 E-02	9.67 E-02	2.46 E-03
				Total Dose:	9.92 E-02

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

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	3.78 E-07	1.91 E-05	1.28 E+02 6.45 E-02	4.84 E-05	1.23 E-06
				Total Dose:	4.96 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	4.21 E-07	2.12 E-05	1.15 E+02 5.80 E-02	4.84 E-05	1.23 E-06
				Total Dose:	4.96 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 each of the activities (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. The HVUs have been designed and constructed in conformance with ASME/ANSI AG-1 and ASME/ANSI N509. Testing and maintenance of HEPA filters are conducted using applicable methods prescribed by ASME/ANSI N510, Nuclear

Air Cleaning Handbook, and ACGIH 1988. Other control technology standards related to sampling systems are not applicable.

14.0 DISCUSSION OF AS LOW AS REASONABLY ACHIEVABLE CONTROL TECHNOLOGY

(Requirement 16)

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

15.0 REFERENCES

DOE/RL-97-43, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1996*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

HSRCM-1, Rev.2, *Hanford Site Radiological Control Manual*, Hanford Radiological Control Forum, Richland, Washington.

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

APPENDIX A

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 & Dry
Nilfisk[b]	GS-80	87	
Nilfisk	GS-82	191	
Nilfisk	GS-83	208-286	
Nilfisk	VT-60	99	Wet & Dry
Nilfisk	Explosion Proof	130	Explosion Proof/Dust Ignition Proof
Power Products	Rad Vac[c] 2000	180	
Euroclean	UZ-930	77	
Euroclean	UZ-948	270	
Euroclean	UZ-848	105	
Euroclean	UZ-878A	100	

[a] Hako is a registered trademark of Hako-Werke GMBH & Co., Federal Republic of Germany.

[b] Nilfisk is a registered trademark of A/S Fisker & Nielsen, Copenhagen, Denmark.

[c] Rad Vac is registered trademark of Power Products and Services Co., Inc.

CFM = cubic feet per minute.

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APPENDIX B

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 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 (Walk behind) 5.25" and 10.25" 4 Hubs available Cutter Hub Hammer Hub Roto-Peen Hub BPH Hub	Removal of hazardous and nonhazardous coatings, rust and non-skid, VAT mastic removal, surface profiling, cleaning and scarifying and grinding	Pneumatic and electric
DESCO Needle Descaler 2mm and 3mm needles Hand held, straight shank 4' and 6'	Removal of hazardous and nonhazardous coatings, paint, stucco and rust. Brick and stonework cleaning.	Pneumatic only
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
DESCO Surface Preparation Tool (BPH Tool)	Removal of hazardous and nonhazardous coatings, weld preparation	Pneumatic and electric
Wheelabrator Blastrac*	Removal of coatings from concrete surfaces, surface preparation, scabbling	Shot blast type

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

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APPENDIX C

FACILITY POSSESSION LIMITS - SMEARABLE CONTAMINATION

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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/cm^2 α contamination and 100,000 dpm/100 cm^2 β/γ contamination) without exceeding a potential dose to the nearest receptor of 0.1 millirem per year. These values were listed 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 combined 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 adequately surveyed 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:

$$\text{Curies} = \frac{\text{Surface area vacuumed (m}^2\text{) * highest contamination (dpm/100 cm}^2\text{)}}{\text{(1 E-04 m}^2\text{/cm}^2\text{ * 1 dpm/2.22 E-12 Ci)}}$$

$$= \text{SA Vacuumed (m}^2\text{) * max contam. (dpm/100 cm}^2\text{) * 2.22E-8 (Ci*cm}^2\text{/m}^2\text{*dpm).}$$

Example:

A proposed job involves vacuuming a hard surface in a contamination area of 500 m^2. The highest smear found was 1000 dpm/100 cm^2 alpha contamination, and 50,000 dpm/100 cm^2 beta/gamma contamination.

$$^{239}\text{Pu} = \text{500 m}^2\text{ * 1000 dpm/100 cm}^2\text{ * 2.22E-8 Ci*cm}^2\text{/m}^2\text{*dpm = 1.1 E-4 Ci.}$$

$$^{90}\text{Sr} = \text{500 m}^2\text{ * 50,000 dpm/100 cm}^2\text{ * 2.22E-8 Ci*cm}^2\text{/m}^2\text{*dpm = 5.6 E-3 Ci.}$$

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 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.

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

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

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

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

APPENDIX D

FACILITY POSSESSION LIMITS - FIXED CONTAMINATION REMOVAL

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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 cm^2 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 each)
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 meter

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:

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

Example:

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

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

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

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 is 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. The gamma survey must be able to account for the contamination to the full depth of removal. 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 cm^2. 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 cm^2 value by 4.5 E-09 to get Ci/m^2. To find the total number of curies for ^{90}Sr, use the following formula:

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

Example:

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

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.

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APPENDIX E

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.

Location/type of radiological area	Date(s) of operation	Purpose of operation (or work package number)	Source constituents (if known)	Area cleaned (m^2)	Maximum contamination level encountered or analysis results ($dpm/100 cm^2$) for area cleaned		Potential curies released		Exhaust smear (positive, $dpm/100 cm^2$, or negative)	
Make and model number					Alpha	Beta	Alpha	Beta	Before	After

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