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Title

RADIOLOGICAL CHARACTERIZATION ACTIVITIES RESULTING IN THE UNRESTRICTED RELEASE OF THE 117-F FILTER BUILDING

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RADIOLOGICAL CHARACTERIZATION ACTIVITIES RESULTING IN THE UNRESTRICTED RELEASE OF THE 117-F FILTER BUILDING

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RADIOLOGICAL CHARACTERIZATION ACTIVITIES RESULTING IN THE UNRESTRICTED RELEASE OF THE 117-F FILTER BUILDING

1.0 PURPOSE

This document was prepared to ensure that radiological survey information related to the release for unrestricted use of the formerly contaminated (radioactive) 117-F Filter Building is clearly and meaningfully recorded. The phrase, "released for unrestricted use", as used in this report means that no further control for radiological protection of any individual is needed and surveillance need not be performed.

2.0 RELEASED FACILITY OR BUILDING

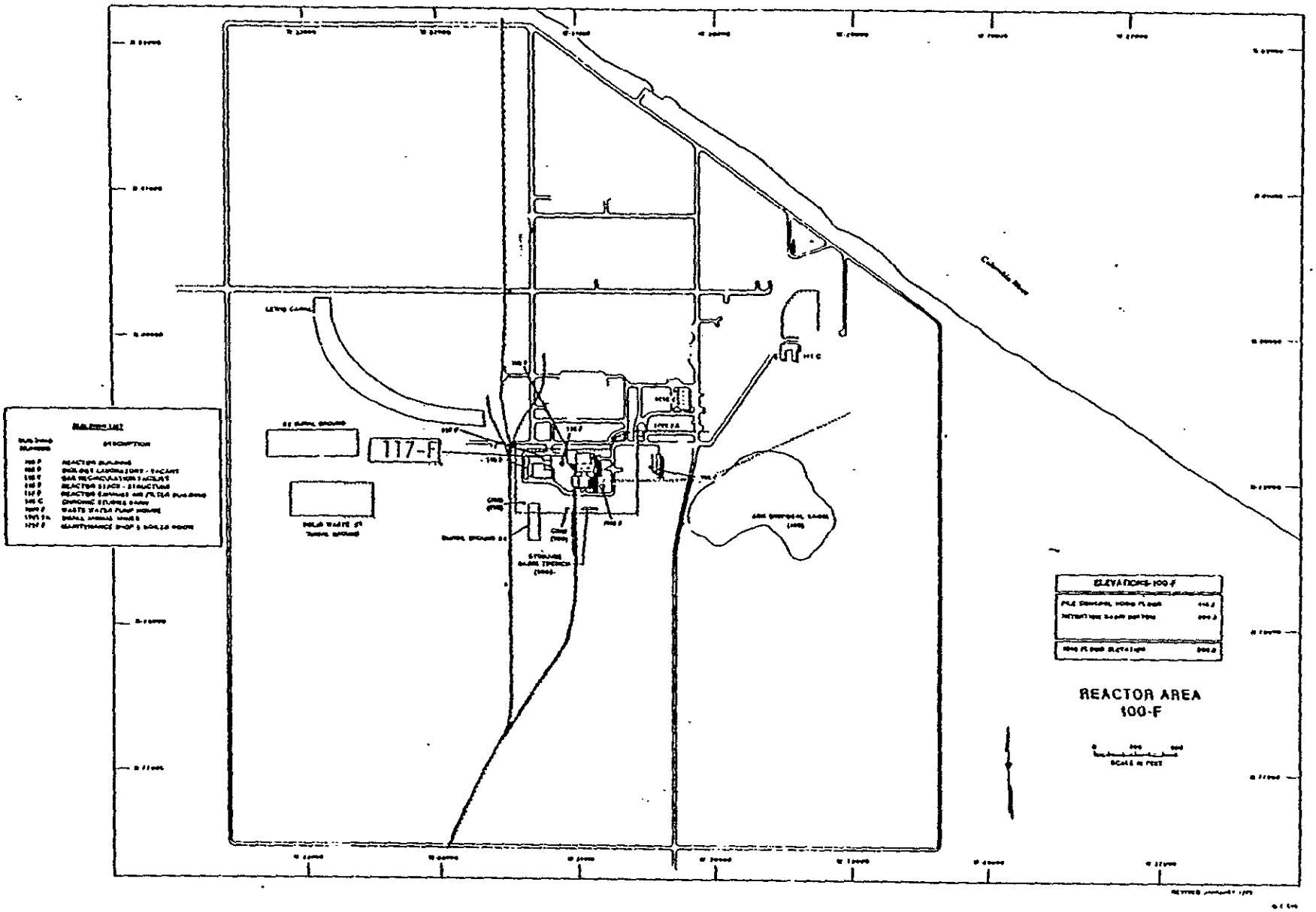
2.1 117-F Filter Building, 100-F Area

Included are the inlet and exhaust air ducts and exhaust fan pit. (See Figure 2.1, 100-F Reactor Area)

2.2 Located approximately 120 feet west of the northwest corner of the 105-F Reactor Building and 60 feet north of the north side of the 115-F Gas Recirculation Building. The exhaust fan pit is located on the north side of the 117-F Filter Building. The inlet and outlet air ducts are underground and join with the outlet duct of the 105-F Reactor Building and the 116-F stack inlet duct. (See Figure 2.2, 117-F Filter Building)

3.0 SURVEY RELEASE DATES

Decontamination efforts commenced in April 1983 and were completed in June 1983. Radiological surveys were conducted continuously during decontamination operations. Final radiological surveys were completed on June 28, 1983.



100-F REACTOR AREA

Figure 2.1

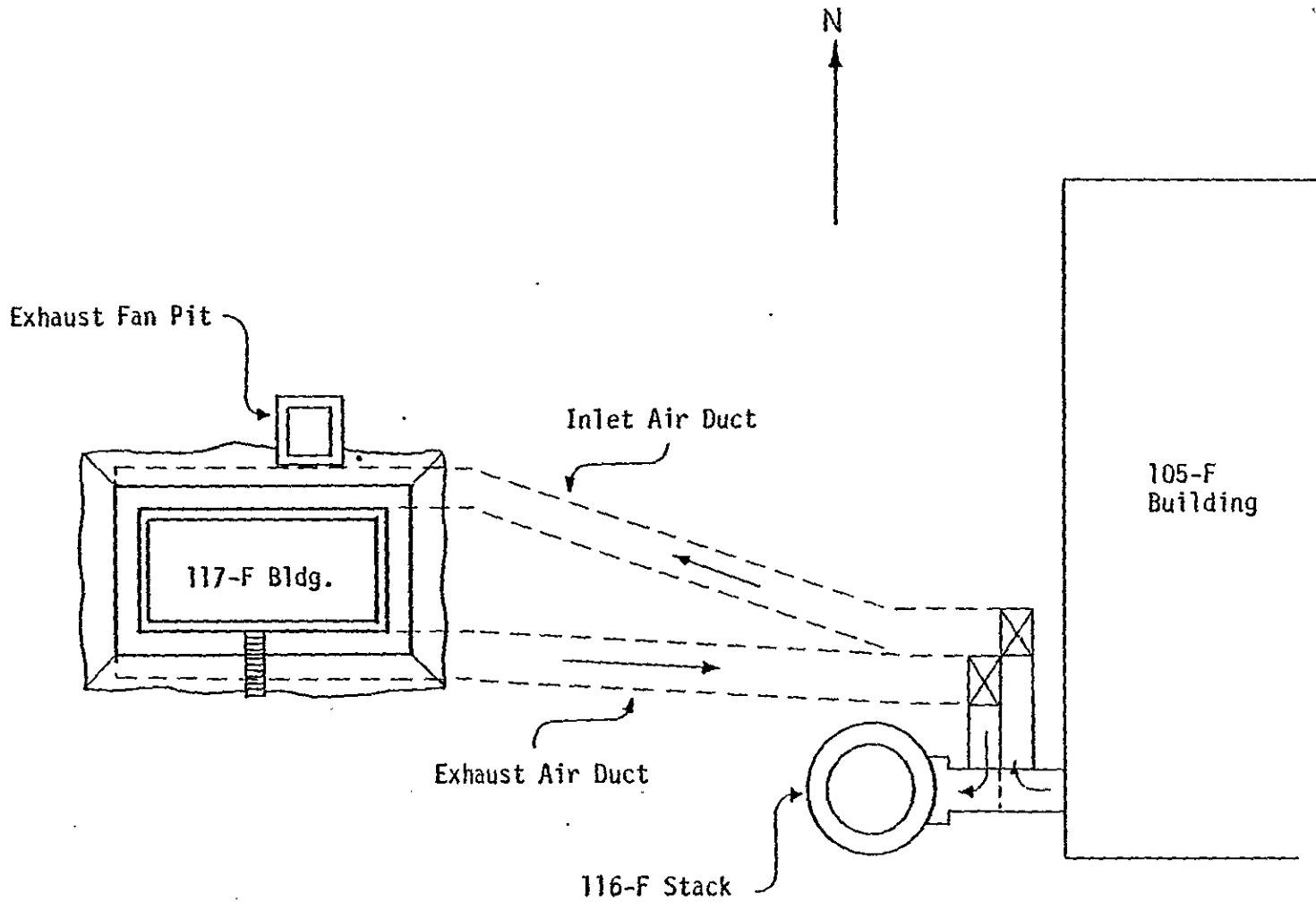


FIGURE 2.2
117-F Filter Building

4.0 FORMER USE OF THE 117-F FILTER BUILDING

The 117-F Filter Building housed the 105-F Reactor Building exhaust air filters and air control system. The 105-F Building exhaust gases (primarily ventilation) were directed to the 117-F Building where the air passed through "absolute" (particulate) and "halogen" (activated charcoal) filters and was then discharged to the atmosphere through a 200 foot high stack (116-F). The 117-F Filter Building contained two identical filter cells separated by a two story operating gallery. The 117-F Building is essentially identical to all 117 buildings in the 100-Area. The 117 Buildings are about 59 feet long, 39 feet wide and 35 feet high, 90% of which are underground.

Either filter cell could be isolated by filling the turning vane seal pits with water. Once a filter cell was isolated, the exhaust fan pit could be used to maintain a positive air flow into the filter cell during filter removal or maintenance. The discharge of the exhaust fan was directed into the inlet air duct which would pass through the operating filter cell. Even though this capacity was available, the exhaust fan system was never used.

5.0 REASON FOR RELEASE

All of the radioactive material and contaminants have been removed from the former 117-F Filter Building and shipped to the solid waste burial in the Hanford 200 Area.

6.0 REFERENCE AND RADIOLOGICAL CRITERIA FOR RELEASE

- "Radiological Criteria for Decontamination and Decommissioning of the Retired 100 Area, 117-Filter Buildings", a letter to R. A. Paasch from J. J. Dorian, dated May 18, 1983. (See Appendix I)
- UNI-M-3, "Radiation Practices Manual".
- UNI-M-30 REV1, "Radiation Control Manual".
- UNI-946, Radiological Characterization of the Retired 100 Areas

7.0 BASIS FOR EXTENT OF SURVEY

Initial radiological surveys, conducted in 1976 and tabulated in UNI-946, "Radiological Characterization of the Retired 100 Areas", established the contamination levels in the 117-F Filter Building. These surveys were general in nature. During decontamination operations, more detailed radiological surveys were conducted to accurately determine the extent of the contamination. During the final release survey, all surfaces were surveyed 100% for beta-gamma contamination. In addition, all surfaces were surveyed for alpha contamination. Micro-R-Meter readings were taken throughout the entire structure at the completion of decontamination operations.

Radiological survey data for unconditional release of the 117-F Filter Building is based on the limits set forth in UNI-M-30 REV1, Radiation Control Manual, Table 5-1. These limits are identified below:

	Dispersed Activity pCi/gm	Removeable Surface Contamination	Fixed Contamination
Alpha	1	500dpm/100cm^2	500dpm/100cm^2
Beta-gamma	20	200cpm/100cm^2	200cpm/probe

Since the majority of radioactivity was in the form of loose surface contamination, the majority of decontamination activities were accomplished by wiping, sweeping and vacuuming. Every effort was made to remove as much contamination as possible below the limits for unconditional release.

7.1 Inlet Air Duct

Based on the characterization data in UNI-946 and initial surveys conducted prior to decontamination efforts, the 117-F Filter Building Inlet Air Duct was the most severely contaminated portion

of the structure. Initial dose rates within the tunnel were less than one mrem/hour. The radioactivity in the inlet duct was in the form of loose surface contamination which had collected in the lower portions of the tunnel at the base of the walls, along the floor, on the turning vanes and in the floor gratings over the seal pits.

Decontamination efforts in the inlet duct consisted of basic cleaning techniques. Turning vanes were removed from their positions in the inlet duct and wiped down with Masslinn cloth.

The steel mesh floor gratings were removed and cleaned with Rad-Con foam and wiped down with dry rags. Floor gratings and turning vanes that did not meet release criteria after several decontamination attempts were packaged and shipped to the 200 Area radioactive waste burial site. The floor of the inlet duct was swept with Lay Dust sweeping compound which removed most of the loose dirt and dust.

The entire inner surface was then wiped down with Masslinn cloth which removed the remaining loose surface contamination. Portions of the inlet duct were wiped down a second time when surveys indicated contamination levels were still above release criteria. All components and surfaces of the inlet duct were released for unconditional use when radiological surveys verified loose surface contamination levels to be less than 200 counts per minute per 100 cm^2 beta-gamma and less than 500 dpm per 100 cm^2 alpha. For fixed contamination, components and surfaces were released for unconditional use when radiological surveys verified contamination levels to be less than 200 cpm per probe area for beta-gamma and less than 500 dpm per 100 cm^2 for alpha.

The inlet air duct was then marked off into two meter grids, totaling 116 grids. The surface area of each grid was surveyed 100% with a portable GM instrument for beta-gamma contamination. Low levels of alpha contamination were identified and documented in UNI-946, however, alpha contamination was not detectable with portable field instruments. Micro-R-Meter readings were taken adjacent to each grid. Micro-R-Meter readings in the inlet duct were equal to or less than the background (approximately 8μR/hr) established at the entrance to the 117-F Filter Building. A Masslinn smear was collected in each grid and monitored for both beta-gamma and alpha contamination. Masslinn smears were collected by smearing a one square meter section of surface and then monitoring the Masslinn with portable field instruments. All Masslinn smears were less than 200 counts per minute per m^2 beta-gamma and less than 500 dpm per m^2 alpha. Standard filter paper (technical) smears were collected adjacent to the Masslinn smears in 64% of the grids (74 smears). (Technical smears were collected in conformance with the requirements of Appendix I, Radiological Criteria for the Decommissioning and Decontamination of the 100 Area 117 Filter Building.) Technical smears were counted on gas proportional scalers located at the 108-F Radiation Monitoring Facility. Summary results of radiological surveys are presented in Table 9.1, final survey data for the 117-F Filter Building.

When construction of the 117-F Filter Building was completed, the entire inner surfaces of the inlet air duct, filter cells and exhaust air duct were painted with a thick coating of Amercoat 30, a vinyl base paint. The Amercoat 30 provided a very hard and smooth barrier that covered all concrete surfaces, except the seal pits. Decontamination efforts consisted mainly of wiping off the radioactive material that was loosely adhered to the paint. Concrete samples collected beneath the paint and analyzed on a Multi-channel Analyzer (MCA) verified that radioactive contamination

had not penetrated the paint.

Paint samples were collected from 42 grids along the walls and from every floor grid in the inlet air duct. The paint samples were collected from an area adjacent to the collection point of the Masslinn and filter paper smears. Approximately 100 cm^2 to 200 cm^2 area of paint was removed and analyzed using a Nuclear Data Multi-channel Analyzer (MCA) Room 50, 105 Building. Isotopic analysis results are tabulated in Table 9.2, Environmental Sampling Results. Concrete samples from behind the painted surfaces of the inlet duct were collected at selected locations and analyzed for gamma isotopes. (See Table 9.3, Concrete Samples) Further sampling of the inlet duct was not conducted based on the following:

- Loose contamination was easily removed.
- Fixed and removable contamination readings for each grid did not exceed limits set forth in UNI-M-30, Table 5.1 for unconditional release.
- Isotopic analysis verified only residual concentrations of gamma emitters.
- Results of isotopic analyses of concrete samples verified radionuclides had not penetrated through vinyl base paint.

Selected paint samples were sent to United States Testing Laboratory (UST) to determine residual concentrations of tritium, strontium-90 and carbon-14. (See Table 9.2 Paint Samples)

7.2 Filter Cells A and B

Air flow from the inlet air duct was deflected into two separate filter cells by turning vanes. (See Figure 7.1, 117-F Filter Building). The turning vanes were located in seal pits that could be filled with water to isolate the cell. Each filter

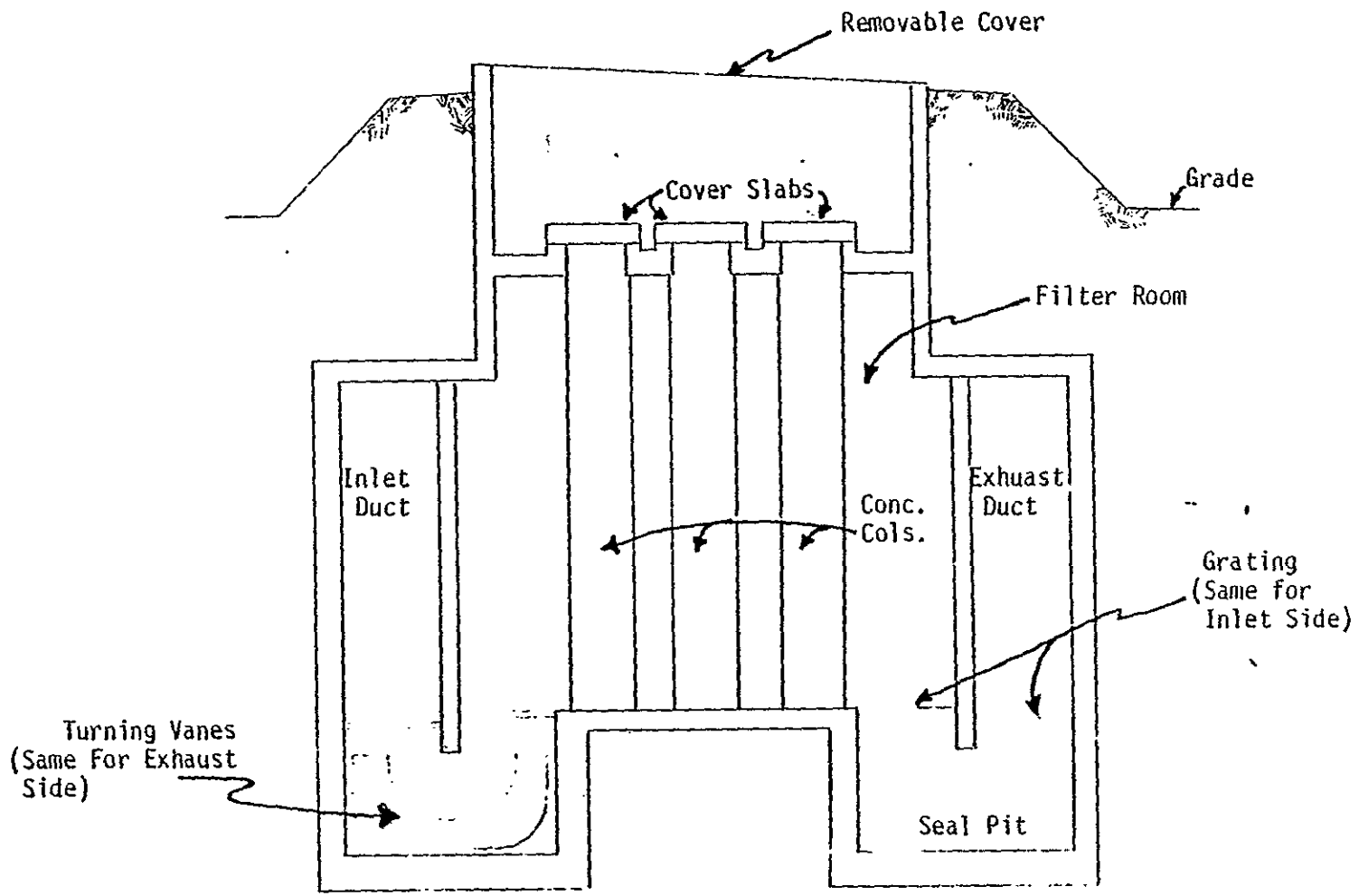


FIGURE 7.1
117-F FILTER BUILDING
SHOWING FILTER ROOMS

bank was constructed to contain three banks of filters. Each filter bank contained two berths which housed 24 filters per berth. At the start of decommissioning activities, only the upstream and center banks were found to contain filters. Contamination levels averaged about 2,500 counts per minute per filter as measured with portable beta-gamma detecting instruments. Each filter bank was dismantled and the individual filters were double wrapped in plastic and shipped to the 200 Area radioactive waste burial site. Initial surveys indicated that contamination within each cell was limited to the upstream half of each cell. (See Figure 7.2, Floor Plan Filter Rooms) Contamination was found to be concentrated on the inlet turning vanes, the walls and floor of the inlet seal pits, and on the floor of the filter cells between the filter banks.

The contamination was removed by using sweeping compound, vacuum cleaners and Masslinn cloth. The surface areas of the seal pits had not been painted with a protective cover as was the inlet duct. Several areas within the seal pit had to be chipped away using a hammer and chisel to remove the embedded contamination. Several floor drain openings and covers were also contaminated. The drain and openings were cleaned with wire brushes and vacuum cleaners. The drain covers were disposed of as contaminated waste. Drains were monitored by inserting a beta-gamma probe down the drain the length of the probe cord. Each drain was smeared by running a kotex sanitary napkin down the drain and monitoring it with portable alpha and beta-gamma instruments. All drains surveyed less than release limits as specified in UNI-M-30, Table 5.1.

The south end (down stream) of the filter cells (down stream of the filter banks) was essentially free of radioactive contamination.

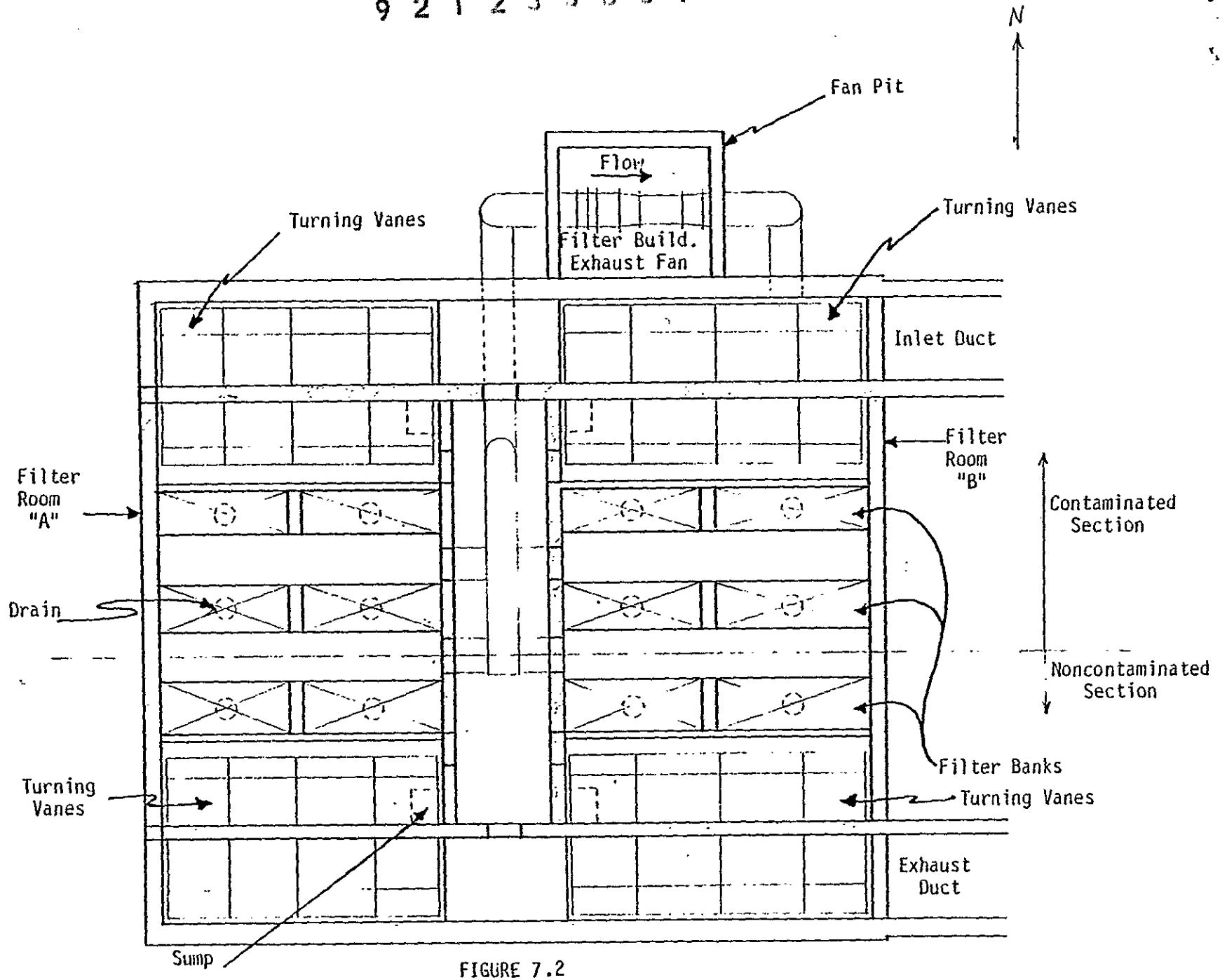


FIGURE 7.2
117-F FILTER BUILDING
FLOOR PLAN FILTER ROOMS

(See Figure 7.2, Floor Plan Filter Rooms.) Exhaust turning vanes and seal pits were surveyed and corresponded to the characterization data presented in UNI-946.

7.3 Exhaust Air Duct

Smearable contamination in the exhaust duct was less than the release limits for both beta-gamma and alpha contamination. However, small areas of contamination above release limits were found on most turning vanes. All turning vanes within the outlet duct were removed and wiped down with Masslinn cloth. Resurvey of the turning vanes verified they were less than the release limit. No further decontamination was attempted in the outlet duct. The outlet duct was then gridded into two meter by two meter sections. Final survey of the outlet duct involved surveying each grid with portable beta-gamma and alpha instruments. Masslinn and technical smears were then collected from every third grid and counted for both alpha and beta-gamma. Paint samples were collected from every third grid and analyzed for gamma emitters on the 100-N MCA.

7.4 Access Gallery

The Access Gallery was a space between the two filter cells which could be entered to service radiation monitoring equipment or other in-line instrumentation while the 117-F Filter Building was in service. (See Figure 7.3, 117-F Filter Building, East Elevation.) Access into spaces between filter banks could also be accomplished when a filter cell was out of service. The access was surveyed and found to be completely free of radioactive contamination.

7.5 Operating Gallery

The Operating Gallery was located below the Access Gallery. The

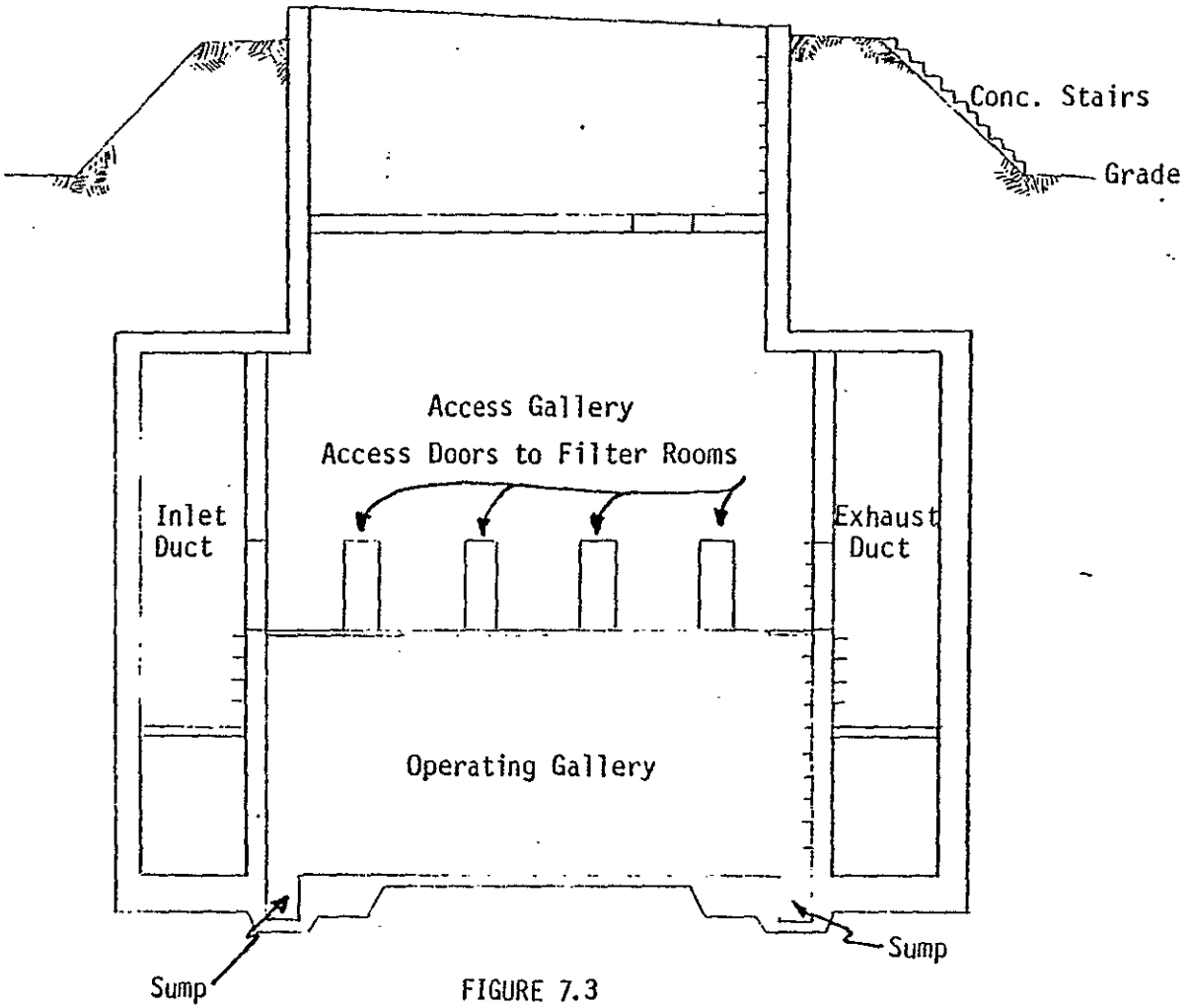


FIGURE 7.3
117-F FILTER BUILDING
SHOWING GALLERIES

Operating Gallery contained most of the piping and valving for the drain lines and exhaust fan system. The only radioactive contamination that was found in the Operating Gallery was in the sump at the north end. The sump was decontaminated with hammer and chisel and vacuum cleaner (See Figure 7.3, 117-F Filter Building Showing Galleries). All piping and valving in the Operating Gallery were opened and surveyed. The exhaust fan piping was found to be completely free of contamination. The Operating Gallery was then surveyed with portable instruments and all surfaces were less than 200 counts per minute per probe area for beta-gamma and less than 500 disintegrations per minute per probe area for alpha. (See Section 8.0, Radiological Instruments)

7.6 Filter Bank Access

Filter change-out was accomplished by removing the steel plate roof sections of the 117-F Filter Building to gain access to the filter bank covers. Each of the two berths, which comprised a filter bank, had its own concrete cover plug. Each berth of 24 filters could be removed, exchanged and replaced as required. The initial pre-decommissioning surveys indicated that there was no radioactive contamination in the filter bank access area. Final radiological surveys verified all surfaces in the filter bank access area to be free of radioactive contamination.

7.7 Exhaust Fan Pit

The Exhaust Fan Pit, which is located partially underground on the north side of the 117-F Filter Building, was designed to exhaust the open spaces in the filter cells during filter removal. Final radiological surveys verified that there was no radioactive contamination on any surface inside the fan pit. All supply piping, valving and exhaust piping of the exhaust fan system were surveyed for internal contamination and found to be less than the limits set

forth in UNI-M-30 REV1, Radiation Control Manual, Table 5-1. (See Appendix I)

8.0 RADIOLOGICAL INSTRUMENTS

8.1 Isotopic Analysis

8.1.1 Laboratory measurements for Co-60, Cs-137, Eu-152 and Eu-154 were made using the Nuclear Data, Model No. 60 Multi-Channel Analyzer (MCA) located in Room 50, at the 100-N Reactor Facility. The MCA was equipped with a 3" x 3" high purity germanium scintillation detector. The MCA is operated and maintained by the Radiation & Water Quality Control Section, 100-N Area. Calibration and Quality Control Procedures were conducted in accordance with UNI-M-76 REV1, "Effluent Radioanalytical Program".

8.1.2 Tritium, carbon-14 and strontium-90 analyses were performed by:

- United States Testing Company, Inc.
  2800 George Washington Way
  Richland, Washington 99352

8.2 Counting Instruments

Technical smears were counted for gross beta-gamma and alpha on the following instruments:

- Automatic System: Gamma Products, Inc.
  Model G4000, Gas Flow
  Proportional Counter

- Manual System: Nuclear Measurements Corp.
  Model DS-33P, Gas Flow
  Proportional Counter

8.3 Direct Survey

Portable beta-gamma detector: Eberline Instrument Corporation
Model BNW-1
With P-11 "Pancake" probe

Portable alpha detection: Eberline Instrument Corporation
Model E-140B with alpha
scintillator detector.

8.4 Micro-R-Meter

Ludlum Instrument, Inc.
Model 12S

Portable survey instruments were maintained and calibrated by the Instrument Calibration and Evaluation Section, Pacific Northwest Laboratories, located in the Hanford 300 Area.

9.0 SURVEY DATA

Radiological survey data is summarized in Table 9.1, "Final Radiation Survey Data for Unconditional Release of the 117-F Filter Building". The results of all final radiation and contamination surveys were reported as less than the limits specified in Table 5-1, UNI-M-30 REV1, "Radiation Control Manual".

The results of paint samples are summarized in Table 9.2, Isotopic Analysis, Paint Samples, 117-F Filter Building. Paint samples were collected by removing approximately 150 cm^2 of paint from the concrete surfaces inside the 117-F Filter Building. The average weight of the paint removed was 5 gms. Each paint sample included an average of 33 grams of concrete. The activity of each paint sample was computed by integrating the average sample weight into the total quantity of pico-curies of activity per sample. This yielded the total activity of

LOCATION/AREA	DIRECT SURVEYS				TECHNICAL SMEARS			
	INSTRUMENT		MAZZLIN		β γ		α	
	βγ	α	βγ	α	Avg.	Max.	Avg.	Max.
Inlet Tunnel	<200	<500	<200	<500	73	982	*	*
Access Gallery	<200	<500	<200	<500	+	+	*	*
Operating Gallery	<200	<500	<200	<500	+	+	*	*
Filter Room A	<200	<500	<200	<500	65	309	*	*
Filter Room B	<200	<500	<200	<500	47	309	*	*
Outlet Tunnel	<200	<500	<200	<500	+	+	*	*
Filter Access	<200	<500	<200	<500	+	+	*	*
Exhaust Fan Pit	<200	<500	<200	<500	+	+	*	*
	cpm	dpm	cpm	dpm	dpm/100cm^2			

+ Less than minimum detectable activity for instrument on day counted.

* Alpha not detected.

TABLE 9.1

FINAL RADIATION SURVEY DATA FOR UNCONDITIONAL

RELEASE AND USE OF THE 117-F BUILDING, 100-F AREA

LOCATION		C-14	Sr-90	Co-60	Cs-137	Eu-152	Eu-154	Total
INLET AIR DUCT								
WALLS	AVG.	2.5	4.5	0.4	5.3	1.5	*	14.2
	MAX.	6	10	2	8			
INLET AIR DUCT								
FLOOR	AVG.	1.5	2.4	1.7	2.2	9.4	1	18.2
	MAX.	6	10	8	6	37	5	
TOTAL ACTIVITY								
INLET AIR DUCT	AVG.	2.1	3.8	0.9	4.2	4.3	<1	15.7
	MAX.	6	10	8	8	37	5	
OUTLET AIR DUCT								
WALLS	AVG.	+	+	1	2	*	*	3
	MAX.			2	4			
OUTLET AIR DUCT								
FLOOR	AVG.	+	+	1	1	*	*	2
	MAX.			4	5			
	UNITS	pCi/gm						

* Not detected
\+ Not analyzed for isotope

TABLE 9.2

ISOTOPIC ANALYSIS
PAINT SAMPLES, INLET AND OUTLET AIR DUCTS
117-F FILTER BUILDING

each sample in pico-curies per gram. The radioactive isotopes identified in the 117-F Filter Building were H-3, C-14, Sr-90, Co-60, Cs-137, Eu-152 and Eu-154. Tritium (H-3) was not considered in the final analysis because it was such a small contributor to the overall characterization (≈ 5 pci/gm per sample). The franctional quantities of each radioactive isotope were totaled by building location to determine the average concentrations in pico-curies per gram. Average and maximum activities are reported by isotope in Table 9.2.

Twelve paint samples that had previously been analyzed for gamma emitters on the MCA (See Section 8.1.1) were sent to United States Testing Corporation in Richland, Washington, for C-14 and Sr-90 analysis. These paint samples were collected from the Inlet Air Duct and the average and maximum activities are reported in Table 9.2. Since only twelve paint samples were analyzed for C-14 and Sr-90, the average activity of C-14 and Sr-90 was added to the total concentration of all other paint samples from the Inlet Air Duct. The Inlet Air Duct was the most highly contaminated section of the 117-F Filter Building. The sum of the average activities of the respective fractions of C-14, Sr-90, Co-60, Cs-137, Eu-152 and Eu-154 totaled less than 20 pico-curies per gram. Since the activities of samples collected in the filter cells and outlet duct were much lower than the inlet duct, C-14 and Sr-90 analyses were not performed on samples from these locations.

The results of concrete samples are summarized in Table 9.3, "Isotopic Analysis, Concrete Samples, 117-F Filter Building". Six concrete samples were collected from the inlet duct at the same locations where the paint samples were collected and than analyzed on the MCA. The gamma spectrum analysis verified the concrete to be free of any radioactive contamination.

The seal pits contained the only surfaces within the 117-F Filter Building that were not coated with Amercoat 30. The inlet seal pit to

LOCATION	C-14	Sr-90	Co-60	Cs-137	Eu-152	Eu-154	Units
INLET AIR DUCT							
WALLS AUG.	+	+	*	*	*	*	PCi/gm
MAX.							
FILTER CELLS							
SEAL PITS							
AUG.	+	+	2	2	2	*	
MAX.			4	4	5		

+ Not analyzed for isotope.

* Not detected.

TABLE 9.3

ISOTOPIC ANALYSIS
CONCRETE SAMPLES, INLET AIR DUCT AND FILTER CELL SEAL PITS
117-F FILTER BUILDING

the filter cells was contaminated while the outlet seal pit from the filter cells was not.

After decontamination activities in the inlet seal pit were completed, four concrete samples were collected in the areas where the highest levels of radioactivity were encountered. These samples were analyzed on the MCA. The average total sample activity from the concrete seal pit was 6 pCi/gm. The results by isotope of this analysis is reported in Table 9.3.

10.0 SUMMARY

Radiological release for unrestricted use of the 117-F Filter Building was based on the results of surveys conducted after decontamination activities were completed. All surfaces, components and pipe penetrations were surveyed 100% for both alpha and beta-gamma radioactive contamination. Final survey results for fixed radioactive contamination were less than 200 cpm/probe area for beta-gamma and less than 500 dpm/100 cm^2 for alpha.

Paint and concrete samples were collected and analyzed to determine the isotopic inventory and concentrations of the residual radionuclides in the 117-F Filter Building. For the Inlet Air Duct, the average sum of the respective fractions of C-14, Sr-90, Co-60, Cs-137, Eu-152 and Eu-154 totaled less than 20 pci/gm. In addition, the remaining paint and concrete samples totaled less than 20 pci/gm.

Based on the results of the radiological surveys and isotopic analysis of paint and concrete samples, the 117-F Filter Building has been decontaminated and is released for unrestricted use.

APPENDIX I

UNC NUCLEAR INDUSTRIES

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UNI-2674

Memorandum

To R. A. Paasch

Date May 18, 1983

From J. J. Dorian

Subject: RADIOLOGICAL CRITERIA FOR DECONTAMINATION AND DECOMMISSSIONING OF THE RETIRED 100 AREA 117 FILTER BUILDINGS

The subject radiological criteria are attached. Should you have any questions or comments concerning these criteria, please contact me on 3-4932.

VRR:vmb

Attachments-4

cc: JF Beckstrom
PA Carlson
DS Cunningham
RJ Kobelski
BH Lueck
MW Marquard
WL Nees
EW Powers
VR Richards
RA Winship
JJD-file/lb

RADIOLOGICAL CRITERIA FOR THE DECONTAMINATION AND DECOMMISSIONING OF THE 100 AREA 117 FILTER BUILDINGS

INTRODUCTION

A 117 building houses the 105 building exhaust air filters, and air flow control system. Reactor building exhaust gases (primarily ventilation) were directed to the 117 building where the air passed through "absolute" (particulate) and "halogen" (activated charcoal) filters and was then discharged to the atmosphere through a 200 foot high stack (116 building). Each 117 building contains two identical filter cells seperated by a two-storied operating gallery almost entirely underground. The 117 buildings are about 59 feet long, 39 feet wide and 35 feet high. Underground concrete ventilation tunnels run from the reactor building to the 117 buildings, and from the 117 buildings to the stack. These tunnels are also contaminated.

The reactor ventilation tunnels for a given reactor are typically a few hundred feet long. Ventilation ducts are approximately 5 feet wide by 11 ½ feet high. Turning vanes are installed in the inlet and exhaust tunnels of a 117 building. These turning vanes assisted in deflecting air into or out of the filter cells.

PURPOSE

The objective of the Decontamination and Decommissioning effort for the 117 filter buildings is three-fold:

1) Dispose of all components, equipment and building segments in excess of unrestricted release criteria
2) Demolish the remaining structure and leave the debris in-situ.
3) Cover site with at least three feet of clean soil graded to blend with natural terrain.

A discussion of the unrestricted release criteria and the associated monitoring techniques to be used in given below.

Unrestricted Release Criteria

Sections of the 117 buildings are contaminated with Pu-239/240. Because of their long half-life, residual Pu-239/240 contamination represents a potential source of elevated radiation exposure for many years into the future. Unrestricted release limits for this radionuclide, therefore, are the most restrictive of any radioactive materials. However, based on previous radiological characterization (UNI-946) [1]the Pu concentrations should be below unrestricted release levels and if so, Sr-90 will become the most restrictive radioisotope.

Unconditional release levels for potentially contaminated materials are specified in Table 5-1 of UNI-M-30. Release limits applicable to the 117 building decontamination efforts are as follows:

	Disperal Activity (pCi/g)	Removable Surface Contamination	Fixed Contamination
Alpha	1	500 dpm/100 cm	500 dpm/100 cm^2
Beta Gamma	20	200 cpm/100 cm	200 cpm/probe[a]

For purposes of the 117 buildings decontamination, the above fixed and smearable contamination levels will be interpreted as:

- Alpha - not detectable with PAM probe
- Beta-Gamma - not detectable with a P-11 probe.

In addition to the qualitative smears usually taken during radiation surveys using maslin cloth or Kotex swabs, standard smears (per 100 cm^2) shall also be taken and counted with a proportioanl counter[b]. The amount of removable radioactive material per 100 cm^2 of surface should be determined by wiping the area of concern with dry filter paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe. To meet unrestricted release criteria specified in Regulatory Guide 1.86 for Pu-239/240 contamination, these smears must have alpha counts of less than or equal to 20 dpm. There is C-14 present in the 117 buildings and because this radioisotope is a very low energy beta emitter (156KEV) it will be necessary to establish a counting efficiency, using a C-14 source, for the proportional counter involved. This will allow documentation to the effect that the instrument has the capability of detecting C-14 activity.

Determining compliance with the dispersal activity limits (20 pCi/g for beta-gamma emitters and 1 pCi/g for alpha emitters) in areas potentially contaminated to these low of levels requires radioisotopic analyses. Credit should not be taken for coatings over alpha contamination. That is, the monitoring technique must be sufficient to determine, and the determination must be made, that the total contamination present in and under any coating does not exceed the unrestricted release values. All painted floor surfaces in potentially contaminated areas which cannot be practically characterized must be treated as contamination wastes.

The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain, or ductwork. Surfaces of premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or locations as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of release limits.

[a]Using a portable GM survey instrument with calibrated P-11 probe.

[b]Other appropriate instrumentation may be approved by E&OS

Radiological Sampling of the 117 Building

The initial radiological characterization[1] to identify the radionuclides involved and to determine their concentrations was completed in 1977. No special packaging requirements for burial, i.e., retrievable or normal shallow land burial were identified.

After the decontamination effort has been completed, the Radiation Control Technician (RCT) will complete a comprehensive survey to determine compliance with unrestricted release levels. A discussion of the sampling which should be performed at this time is given in the following section:

STATISTICAL METHODOLOGY FOR SAMPLING INTENDED TO ESTABLISH COMPLIANCE WITH UNRESTRICTED RELEASE CRITERIA

Based on a finite number of samples, the average and maximum values of radioactivity and radiation levels within the 117 buildings must be identified. The survey should allow estimates of average and maximum function values in relatively small regions. For measurements which reflect conditions over only a small area such as the size of a detector (direct alpha or beta measurements), experience has shown that it is desirable to report at least 30 measurements and at least n measurements in any area of 4n square meters, unless the region under consideration is extremely small (Reference 4).

The 117 buildings including the tunnels, consist of approximately 11,000 ft^2(1,000m^2) of potentially contaminated surface area of which approximately 6,000 ft^2 (550m^2) is tunnel surface area. These data imply that paint and/or concrete samples of the potentially contaminated surface areas be taken at approximately 250 locations.

The following measurements should also be performed for the immediate vicinity surrounding each of the sample locations: i.e., survey blocks with sides of approximatley 2 meters.

- Average and maximum alpha readings using a PAM[a]
- Average and maximum beta-gamma readings using a p-11 probe.
- Smear estimates of transferable contamination. (Proportional lab counter).

Alpha, Beta-Gamma Contamination Monitoring

Since alpha particles have short range in air, the distance from the probe window to the surface to be monitored with the PAM shall not exceed 0.5cm. When measuring for beta-gamma activity, the p-11 probe window shall be no more than 5cm from the surface. The probes should be moved fairly slow. Survey velocities should not exceed 5cm/sec., and when measuring for low-level contamination potentially present, the survey velocity should be approximately 0.5cm/sec. The probe shall be stationary for measurement when contamination is present.

[a]Other appropriate instrumentation may be approved by E&OS

Sample Packaging, Labeling, and Logging

Concrete and paint samples and technical smears (per 100 cm^2) shall be labeled as determined by the sampling locations which will be designated I for the inlet tunnel, E for the exhaust tunnel and either A or B for the filter cell areas. Suffixes of the following form shall be added to designate samples.

- F (floor)
- W (wall)
- O (overhead-ceiling)
- C (concrete)
- P (paint)
- S (smear)

Each sampling point will be numbered, using chalk or tape, to identify the sampling location. These location numbers will be the last digit of each sample identification number. The first concrete sample taken from the exhaust tunnel floor, therefore would be designated E-F-C-1.

The Environmental Control Technician will attach preprinted labels and log samples into the site characterization sample book in the same manner used during the past few years for the site characterization program.

References:

1. UNI-946, "Radiological Characterization of the Retired 100 Areas" (1978)

2. Radiation Control Manual, UNI-M-30 REV1, issued by the Environmental and Radiological Control Section of United Nuclear Industries, Inc. (UNI), March 1982.

3. AEC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors", dated June, 1974.

4. Letter, M. W. Tiernan to Hanford Contractors, "Radiological Criteria for Decontamination and Decommissioning of Property Contaminated with Radium", dated January 24, 1978.

5. ANSI N13.12, "Surface Radioactivity Guides for Materials, Equipment and Facilities to be Released for Uncontrolled Use", dated August 6, 1981.