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Release Date: 11/14/94

**This document was reviewed following the
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TECHNICAL DESCRIPTION

OF

STACK 296-B-5

Prepared by: Tina M. Ridge
B Plant Environmental Engineering

November 1994

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1.0 BACKGROUND

1.1 Regulatory Basis

As a result of the Clean Air Act Amendments of 1990, the Environmental Protection Agency (EPA) promulgated new regulations known as National Emission Standards for Hazardous Air Pollutants (NESHAP). Of particular concern to facilities on the Hanford site is Title 40, Code of Federal Regulations, Chapter 40, Part 61, Subpart H (40 CFR 61, Subpart H), "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities". An effort is being made to bring each of the facilities on site into compliance with the applicable portions of 40 CFR 61, Subpart H.

Assessments of facility stacks and potential radionuclide emissions determined whether these stacks would be subject to the sampling and monitoring requirements of 40 CFR 61, Subpart H. The results of these assessments were forwarded to EPA in December 1993. Based on the assessment, Stack 296-B-5 is a minor stack. Therefore, 296-B-5 is not required to be in compliance with the sampling and monitoring requirements of 40 CFR 61, Subpart H.

1.2 B Plant/221 BB Description

B Plant Complex is located in the 200 East Area of the Department of Energy's Hanford Site. It is comprised of three main buildings: the 221-B Processing Building, the 271-B Service and Office Building, and the 225-B Waste Encapsulation and Storage Facility (WESF) Building (Figure 1). B Plant (221-B and 271-B) was constructed in 1943, while WESF was put into operation in 1974. There are currently no production activities at the B Plant Complex. However, B Plant is an operating facility required to ensure safe storage and management of its remaining radiological inventory and to support the safe storage of cesium and strontium capsules at WESF. B Plant processes pertain to treatment of low-level waste generated and generation of demineralized water.

B Plant is responsible for buildings that provide support to the main buildings. The 221-BB building is the liquid effluent support building for 221-B. 221-BB is located immediately south of the 221-B Building and directly above a vault which provides housing for two 1,514 liter (400 gallons) tanks, the BCS (B Plant Steam Condensate) tank and the BCP (B Plant Process Condensate) tank. The BCS and BCP are overflow receiver tanks for the steam condensate resulting from the operation of the low level waste concentrator. The building is a prefabricated clear-span shed-roof metal structure designed and constructed to be weather tight. 221-BB is exhausted by a 850 liters/s (1,800 cfm)-capacity, single stage HEPA filtration system via the 296-B-5

Figure 1. B Plant and Related Facilities

1.3 296-B-5

The 296-B-5 stack exhausts the 221-BB building. The stack is located east of the 221-B Building and is constructed out of 16 gauge sheet metal. The stack is 3.7 meters (12 feet) high and has a diameter of 40.6 centimeters (16 inches). The sampling and monitoring probes are located 76.2 centimeters (30 inches) from the top of the stack. Photographs of the system are provided in Appendix B.

The assessment of potential radionuclide emissions from the 296-B-5 stack resulted in an effective dose equivalent to the maximally exposed individual of less than 0.1 millirem per year. Therefore, the stack is not subject to the sampling and monitoring requirements of 40 CFR 61, Subpart H. However, the sampling and monitoring system must be in compliance with the Environmental Compliance Manual, WHC-CM-7-5.

WHC-CM-7-5 requirement for sampling and monitoring of a minor registered stack is periodic confirmatory measurements. Currently, 296-B-5 is sampled continuously with a record sampler and continuous air monitor (CAM).

2.0 DESCRIPTION OF 296-B-5 STACK FLOW AND MONITORING/SAMPLING SYSTEM

2.1 System Flow Configuration

The B Plant 296-B-5 stack exhausts gaseous effluents to the atmosphere from the 221-BB Building and the vault located under 221-BB.

The exhaust fan on Stack 296-B-5 is capable of delivering 850 liters/s (1,800 cfm) at rated conditions of 10.2 centimeters (4 inches) of static pressure and 21.1 degrees Celsius (70 degrees Fahrenheit). The fan is driven by a 480 volt (V), 3600 revolutions per minute (rpm), 1491 Watt motor. The most recent stack flow rate was approximately 463 liters/s (980 cfm).

2.2 Exhaust Filtering System

Before gaseous effluents are discharged from 296-B-5 to the atmosphere, the exhaust air is filtered using a single stage 8% NBS prefilter and a single stage high efficiency particulate air (HEPA) filter (Figure 2). The filter housing is located on the east wall of 221-BB. The filters were last replaced in June of 1993.

The filter system is efficiency tested as a unit annually. Testing of the Filter System indicates an efficiency of 99.998%. The full rated flow capacity of the filter is 850 liters/s (1,800 cfm).

Figure 2. Stack 296-B-5 Exhaust System

2.3 Stack Sampling and Monitoring System

The exhaust discharging through the 296-B-5 Stack is continuously monitored and sampled using a sampling and monitoring probe assembly located approximately 2.9 meters (9.5 feet) above the base of the stack. The sampling probes are connected by insulated and heat traced transport lines to the 296-B-5 monitoring cabinet which is east of the stack and houses the flow monitoring and radiation analysis equipment. Instrument controls, alarms and indicators are located within this structure, except for the high airborne radiation beacon and system failure bell, which are mounted on the exterior of the cabinet. Remote alarms and indicators are connected to the Facility Process Monitoring Control System (FPMCS) in the 271-B Building dispatcher's office and monitored 24 hours a day.

The stack sampling and monitoring probe assembly consists of 2 nozzles for the sampling probe and 2 nozzles for the flow monitor. The sampling and monitoring probes were designed for multinozzle isokinetic sampling. Drawings H-2-93287 and H-2-93288 show the probe assembly as it was installed in 1983.

The record sampling system operates continuously while air is being exhausted from the stack. The system has a switched receptacle linked to exhaust fan operation. A flow switch disrupts power to the receptacle when stack air flow ceases and restores power upon detection of resumed flow. The record sampler extracts its air sample at a rate of .63 liters/s (2 cfm). This rate can be manually adjusted by the flow control valve for the record sampling system. Air flow rates through the record filter are sensed, regulated, indicated and totalized in the monitoring cabinet. A low sample air flow rate activates an alarm switch that initiates local and remote alarm indicators. Details on the record sampler components are shown in Table 1.

The sample flow rate through the continuous air monitor (CAM) is .63 liter/s (2 cfm). The CAM flow rate can be manually adjusted at its flow control valve. The air flow through the CAM is regulated and equipped with a flow rate indicator. Local alarms are provided by the sample system for low sample flow rate. Alarms resulting from radiation analyzer malfunction or low sample flow rate are combined into one general alarm at the remote alarm panel in the dispatcher's office. The sample system has local alarms for high airborne radiation and system failure and a high temperature alarm for CAM circuit protection. Details on components of the beta/gamma radiation monitor are shown in Table 2.

Table 1. 296-B-5 Record Sampler Instrumentation

Component	Manufacturer/Model	Specifications/Operations
Record Filter Paper Holder	BGI Incorporated	47 mm filter paper (Gelman Sciences);
Flow Totalizer	Rockwell/MR-9	8.92 cm/hr at 34.5 kPa (5 psi); temperature compensated at 15.6 °C (60 °F).
Flowmeter	Dwyer ⁽¹⁾ /RMC	Pressure rating: 241 kPa (35 psi); temperature rating: to 54.4 °C (130 °F); accuracy: 2% of full scale; maintained at .63 liter/s (2 cfm).
Flow Switch	Chem-Tec ⁽²⁾ /500-316-BP	Maximum pressure : 9.44E-2 liter/s (.2 cfm) to 16.5 liters/s (35 cfm) at 103 kPa (15 psi), 21.2 liters/s (45 cfm) at 414 kPa (60 psi);
Flow Control Valve	Eberline/10552-CO2-RAP-1R	none provided on vendor information
Vacuum Pump	Gast ⁽³⁾ /0822 or 0823	Oilless, 373 Watt rating; capacity: 3.4 liters/s (7.2 cfm) at 0 kPa (0 " Hg) and 1725 rpm

Table 2. 296-B-5 Beta/Gamma Radiation Monitor Instrumentation

Component	Manufacture/Model	Specifications/Operating Ranges
Continuous Air Monitor (CAM)	Eberline/AMS-3 Beta-Gamma	Detector: a pancake G-M tube that is 4.4 centimeter (1.74 inches) diameter with a 1.4-2 mg/cm ² mica window; scale: logarithmic; range: 10-100 cpm; air flowmeter: 4.7-47.2 liters/s (10-100 cfm) maintained at 38 liters/m; temperature range: -7 to 49 °C (19.4 to 120 °F).
Flow Switch	Chem-Tec/5000-316-BP	Maximum pressure : 9.44E-2 liter/s (.2 cfm) to 16.5 (35 cfm) liters/s at 103 kPa (15 psi) , 21.2 liters/s (60 cfm) at 414 kPa (60 psi).
Flow Control Valve	Eberline/10552-CO2-RAP-1R	none provided on vendor information
Vacuum Pump	Gast/0822 or 0823	Oilless; 373 Watt rating; capacity: 3.4 liters/s (7.2 cfm) at 0 kPa (0 " Hg) and 1725 rpm

- (1) Dwyer is a registered trademark of Dwyer, Inc.
 (2) Chem-Tech is a registered trademark of Chem-Tech Equipment, Inc.
 (3) GAST is a registered trademark of GAST Manufacturing Corp.

2.4 Surveillance of Stack Sampling and Monitoring Instrumentation

The calibration and functional tests of the 296-B-5 stack sampling and monitoring instrumentation are tracked using the Component Based Recall System (CBRS) in place at B Plant. Currently, all stack monitoring instrumentation is on a 6 month calibration cycle. The calibration procedures being used are shown in Table 3. The calibrations are performed by B Plant Instrument Maintenance.

The air sample filter papers from the record sampler and the CAM are changed on a weekly basis and analyzed for gross alpha and gross beta. Surveillance of the monitoring system is performed by the Health Physics organization at B Plant according to their established procedures. A summary of all surveillance routinely performed on the 296-B-5 system is shown in Table 4.

Table 3. Calibration Procedures for 296-B-5 Monitoring Instrumentation

Instrument	CBRS Procedure	Issue Date	Calibration Frequency
Continuous Air Monitor	PSCP-3-002	03/01/91	6 month
Sample Flow Indicator	PSCP-7-001	08/18/89	6 month
Flow Totalizer	PSCP-4-007	09/29/89	6 month
Pressure Indicator	PSCP-4-091	06/09/92	6 month
Flow Alarm Switch	PSCP-6-029	12/13/90	6 month
Flow Control Valve	Uses Functional Test	N/A	6 month
Timer	None	N/A	replaced annually
Flow Transmitter	PSCP-6-085	12/17/90	6 month

Table 4. Routine Surveillance of 291-B-1 System

Surveillance	Frequency	Responsibility
Check of local CAM ratemeter	Each shift	Health Physics
Change and analysis of CAM filter	Weekly	Health Physics
Change and analysis of record sample filter	Weekly	Health Physics/ 222-S Laboratory
Stack flow measurement	Quarterly	Vent and Balance
Efficiency test of HEPA Filter System	Annually	Vent and Balance

Additional information and details can be found in the drawings provided in Appendix A of this report, as well as on the photographs in Appendix B.

3.0 REFERENCES

- American National Standards Institute, Inc., *Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities*, ANSI N13.1, 1969, New York, New York.
- Environmental Compliance Manual*, WHC-CM-7-5, Westinghouse Hanford Company, Richland, Washington.
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- Peterson, K. A. and R. L. Daubert, *Facility Effluent Monitoring Plan for the B Plant*, WHC-EP-0467, November 1991, Westinghouse Hanford Company, Richland, Washington.
- Sewell, R. G., *B Plant Safety Analysis Report*, SD-WM-SAR-013, July 1985, Rockwell Hanford Operations, Richland, Washington.

APPENDIX A. SYSTEM DRAWINGS

DRAWING NUMBER	TITLE	TYPE
H-2-60579	Heating and Ventilation Plan and Details	
H-2-92488	Generic Stack Sampler Monitor Modified Monitor Assembly	General
H-2-92492	Generic Stack Sampler/Monitor Local Alarm Assembly	General
H-2-92494	Generic Stack Sampler/Monitor Connection Box Assembly	General
H-2-92520	Generic Stack Beta Record Cabinet Split Entry Assembly General	General
H-2-93287*	Stack Monitor Installation 296-B-5	Support
H-2-93288	296-B-5 Stack Monitor Probe Assembly	Support
H-2-96551	IEFD B Plant Area Stack Monitor 296-B-5	Essential

* = Sheet 6 superseded by H-2-96551

APPENDIX B. PHOTOGRAPHS OF 296-B-5

1. Stack 296-B-5 Cabinet
2. Stack 296-B-5 Monitoring System
3. Stack 296-B-5