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17-ESQ-0073

JUN 2 3 2017

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Addressees:

TRANSMITTAL OF NOTICE OF CONSTRUCTION APPLICATION/PERMIT REVISION REQUEST AND NOTIFICATION OF OFF-PERMIT CHANGE, PERMIT NUMBER 00-05-006, RENEWAL 2, FOR THE "OPERATION OF CANISTER STORAGE BUILDING, BUILDING 212-H"

This is in response to the May 25, 2017, (AIR 17-502) letter wherein the Washington State Departments of Health and Ecology provided final disposition for the potential violations of Federal, State, or Licensed requirements outlined in the "General Notice of Potential Violation." This letter transmits the Notice of Construction Application/Permit Revision Request (Attachment 1) to change the condition pertaining to the maximum flow rate contained in Emission Unit 435, associated with the "Operation of Canister Storage Building, Building 212-H," and the Notification of Off-Permit Change (Attachment 2). Additionally, Attachment 1 contains the stack qualification testing and comparitive analysis and a redline of the current license. Both attachments have been prepared in accordance with Washington Administrative Codes (WAC) 246-247, and WAC 173-401-724.

Attachment 1 is submitted to the Washington State Department of Health for approval of this requested change, consistent with its authority to administer and enforce the State Radioactive Air Emissions Regulations.

Attachment 2 is submitted to the Washington State Department of Ecology for its administration of the Hanford Site Air Operating Permit (AOP) and to the U.S. Environmental Protection Agency, Region 10, as part of the notification process for off-permit changes as outlined in the AOP.

If you have any questions, please contact me, or your staff may contact Brian J. Stickney, Acting Assistant Manager for Safety and Environment, on (509) 376-9079.

Sincerely,

Doug S. Shoop
Manager

ESQ:ETF

Attachments

cc w/attachs:
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ATTACHMENT 1

NOTICE OF CONSTRUCTION APPLICATION/PERMIT REVISION REQUEST

Consisting of 38 pages,
including this cover page

NOC Application/Permit Revision

NOTE: Any increase to abated or unabated potential to emit (PTE) is considered a modification and requires an Appendix A Application per Washington Administrative Code (WAC) 246-247.

Submittal Date: _____

☒ **License Revision**
WDOH Condition Number: 7

☐ **ALARACT Revision**
New ALARACT Rev. #: _____

☐ **Report of Closure**

PROJECT IDENTIFICATION

Project Title: Operation of Canister Storage Building, Building 212-H
Current WDOH NOC Number(s): 740
WDOH EU ID Number(s): 435
Current WDOH Approval Letter Number(s): AIR-15-613

DESCRIPTION OF CHANGE

Number of Attachments: *2*

WDOH will provide a new approval letter containing any new or modified conditions that result from the following proposed change.

The proposed change revises the maximum flow rate from 9000 CFM to 9,487 CFM, based on the stack sample location qualification testing over a broader range of flows than previously performed for the Canister Storage Building (CSB). The results are documented in CHPRC-03083 Revision 0 *Canister Storage Building Stack Qualification Testing and Comparative Analysis* included in this application as Attachment 1. Attachment 2 for Emission Unit 435 shows the changes proposed in a redlined version of the current license.

Enter original and proposed wording here:

EU 435 Condition 7 original wording:

7) TOTAL FLOW NOT TO EXCEED 9,000CFM

Total system flow shall not exceed 9,000 CFM (allowing for the tolerances of the measuring devices).

EU 435 Condition 7 proposed wording:

7) TOTAL FLOW NOT TO EXCEED 9,487 CFM

Total system flow shall not exceed 9,487 CFM (allowing for the tolerances of the measuring devices) unless requalification of the sample location is performed to allow for a higher flow. In no case may the total system flow exceed the lesser of the designed flow capacity of the HEPA filtered abatement system or the flow which the stack sampling was qualified at.

SIGNATURE

Licensee Name:	DOUG S. SHOOP
Licensee Title:	DOE RICHLAND OPERATIONS OFFICE MANAGER
Licensee Signature:	Doug S. Shoop
Date:	4/23/17

Attachment 1A

Notice of Construction Application/Permit Revision

Canister Storage Building Stack Qualification Testing and Comparative Analysis

CHPRC-03083
Revision 0

Canister Storage Building Stack Qualification Testing and Comparative Analysis

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

P.O. Box 1600
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

CHPRC-03083
Revision 0
EDC#: ECR-16-001183

Canister Storage Building Stack Qualification Testing and Comparative Analysis

Document Type: TR Program/Project: Waste and Fuels Management Project

S. N. Randall
CH2M HILL Plateau Remediation Company

Date Published
September 2016

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

P.O. Box 1600
Richland, Washington 99352

DATE:
Sep 30, 2016
HANFORD RELEASE

APPROVED
By G. E. Bratton at 12:56 pm, Sep 29, 2016

Release Approval Date Release Stamp

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Total pages: 25

CHPRC RECORD OF REVISION (ROR)	(1) Document Number CHPRC-03083

(2) Title
Canister storage Building Stack Qualification Testing and Comparative Analysis

Change Control Record

(3) Revision	(4) Description of Change – Replace, Add, and Delete Pages ADD ROW	Authorized for Release (5) DA/TA Date
0 RS	Initial Release	WJ Zeithaml 9/28/2016

A-6004-786 (REV 3)

Table of Contents

1 Executive Summary 1
2 Objective 2
3 Requirements[1] 2
4 Background 2
5 Methods 5
5.1 40 CFR 60 Appendix A Method 1 – Determining Velocity Traverses 5
5.2 40 CFR 60 Appendix A Method 2 – Requirements for Using a Pitot Tube 6
6 Data Treatment 7
6.1 Inputs 7
6.2 Variables 8
6.3 Equations 8
6.4 Raw Data 8
6.4.1 Flow Rate: Low 9
6.4.2 Flow Rate: Mid-Range 10
6.4.3 Flow Rate: High 11
7 Results 11
7.1 Flow Rate: Low 11
7.2 Flow Rate: Mid-Range 13
7.3 Flow Rate: High 14
7.4 Velocity Profile Conclusions 16
8 B-Plant Data 16
9 Comparisons 17
10 Summary 17
11 Conclusions 18
12 References 19

List of Tables, Figures and Equations

Table 1: Geometric Similarity of CSB to B-Plant 5
Table 2: List of Variables Used in Data Treatment and Comparative Analysis 8
Table 3: Run 1 (7800 cfm) Pitot Tube Raw Data 9
Table 4: Run 1 (7800 cfm) Surrounding Conditions during Data Collection 9
Table 5: Run 2 (8700 cfm) Pitot Tube Raw Data 10
Table 6: Run 2 (8700 cfm) Surrounding Conditions during Data Collection 10
Table 7: Run 3 (9500 cfm) Pitot Tube Raw Data 11
Table 8: Run 3 (9500 cfm) Surrounding Conditions during Data Collection 11
Table 9: Tabulated Average Velocity Values for Low Flow Rate 12
Table 10: Tabulated Average Velocity Values for Mid-Range Flow Rate 14
Table 11: Tabulated Average Velocity Values for High Flow Rate 15
Table 12: Reynolds Number Calculation for CSB 16
Table 13: B-Plant Values from PNNL-12017 Report[5] 16
Table 14: Reynolds Number Calculation for B-Plant 17
Table 15: Mean Velocity and Hydraulic Diameter Product for Two System Comparison 17

Figure 1: Canister Storage Building Ventilation Stack 296-H-212 Schematic 3
Figure 2: B-Plant Ventilation Stack 296-B-1 Schematic 4
Figure 3: Determining the minimum number of traverse points for a stack traverses with particulates present 6
Figure 4: Stack Traverse Diagram with Key Dimensions 6
Figure 5: Criteria of a Properly Constructed Type S Pitot Tube 7
Figure 6: Vendor Supplied Image of Pitot Tube 7
Figure 7: Velocity Profile for the Low Flow Rate 12
Figure 8: Average (Low) Velocity Values across the Stack, Mapped against 20% COV 13
Figure 9: Velocity Profile for the Mid-Range Flow Rate 13
Figure 10: Average (Mid-Range) Velocity Values across the Stack, Mapped against 20% COV 14
Figure 11: Velocity Profile for the High Flow Rate 15
Figure 12: Average (High) Velocity Values across the Stack, Mapped against 20% COV 16

Equation 1 $\frac{(Test\ Port\ Height - Last\ Flow\ Disturbance\ Height)}{Hydraulic\ Diameter} = Distance\ in\ Duct\ Diameters$ 5
Equation 2 $\rho = 1.325 * \frac{P_{bar}}{T_{stack}+460}$ 8
Equation 3 $V = 1096.2 * C * \sqrt{\frac{dp}{\rho}}$ 8
Equation 4 $Q = A * V$ 8
Equation 5 $COV = 100\% * V_{ave}\sigma_{vel}$ 8
Equation 6 $Re = \frac{\rho V_{ave} D_H}{\mu}$ 8
Equation 7 $\frac{(D_H * V_{ave})_{Comparison}}{(D_H * V_{ave})_{Tested}} \leq 6$ 8

1 Executive Summary

The Canister Storage Building (CSB) 296-H212 exhaust stack operates under Washington Department of Health (WDOH) FF-01 license with a stack volumetric flow limit of 9000 cubic feet per minute (cfm). In December 2014 CH2M Hill Plateau Remediation Company (CHPRC) reported an event where the licensed stack flow rate was exceeded. An investigation into the historic data resulted in the self-discovery of an inconsistency between the licensed maximum flow rate (9000 cfm) and the design validated (i.e. qualified) flow rate range (9050 to 9300 cfm) for the stack sampling and monitoring locations[12].

Pacific Northwest National Laboratory (PNNL) was assigned to evaluate similar stacks using existing empirical data and prepared a report to remedy this inconsistency. The report, PNNL-25209, *Stack Flow Rate Changes and the ANSI/N13.1-1999 Qualification Criteria: Application to the Hanford Canister Storage Building Stack*, was transmitted by CHPRC to DOE-RL for subsequent transmittal to WDOH on March 30, 2016, in letter reference CHPRC-1601326[2]. In response to the report, WDOH asked CHPRC to conduct field testing to supplement the report and evaluate the data using the five criteria in ANSI/HPS N13.1 -1999 for qualifying a candidate stack by comparison with others of similar design.

This report presents the CSB 296-H-212 stack as compared against B-Plant stack, 296-B-1. These stacks are shown to be geometrically similar. The five criteria for ANSI/HPS N13.1-1999 qualification by comparison to a previously qualified stack (B-Plant) are confirmed. It is determined that all five requirements are met and the CSB stack sampling and monitoring system is qualified for the flow range of 7771 to 9487 cfm.

2 Objective

The Canister Storage Building (CSB) 296-H-212 ventilation stack is operating at a volumetric exhaust flow rate of approximately 9,000 cfm. The Air Operating Permit[11] states that the "total system flow shall not exceed 9,000 cfm (allowing for the tolerances of the measuring devices)". It is known that this flow rate is outside of the current qualified range of is 9050 to 9300 cfm[12]. The purpose of this report is to qualify the stack velocity profile at the stack sampling location for lower flow rates than were previously field tested. This is done by comparing the CSB stack to a previously qualified stack (B-Plant) using the five criteria listed in ANSI/HPS N13.1 Section 5.2.2.2.

3 Requirements[1]

CSB is an established nuclear facility, therefore it is acceptable to evaluate the stack against one of similar design that has been previously qualified. A comparison stack (B-Plant) dimensions and sampling data are used because it meets the five criteria of ANSI/HPS N13.1 -1999 Section 5.2.2.2. The criteria are as follows:

1. The two stacks are geometrically similar by proportional critical dimensions. Critical dimensions can affect the contaminant mixing and/or the velocity profile.
2. A. The product of the hydraulic diameter times the mean velocity does not exceed a factor of six between the two stacks.
   B. The hydraulic diameter, at the sampling location, is a minimum of 250 mm. For circular stacks, the hydraulic diameter is equal to the internal diameter.
   C. The Reynolds number, for all tested flow rates that were evaluated of both stacks, must be greater than 10,000.
3. The coefficient of variation (COV) of the velocity profile across the center two-thirds of the stack at the test port is less than 20%.
4. The two stacks have no more than a 5% difference in the velocity COV.
5. The two stacks' sampling location is geometrically similar.

By meeting the five criteria above, the candidate stack is considered compliant with the requirements for nuclear facilities, and is qualified within the tested flow rate range.

4 Background

The comparison stack (B-Plant, 296-B-1) is selected based on recommendations in PNNL-25209, which contains a discussion of four stacks[2]. Analysis of the data, key dimensions, and layout lead to the conclusion that B-plant is an acceptable and the ideal candidate for comparison. Below in Figure 1 and Figure 2 are sketches of the two stacks – not to scale – with critical dimensions.

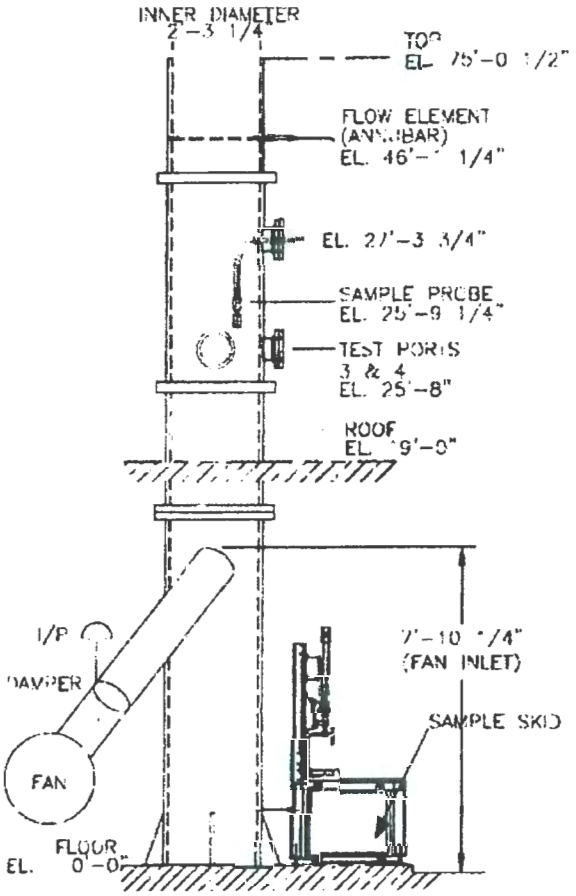

Figure 1: Canister Storage Building Ventilation Stack 296-H-212 Schematic[7]

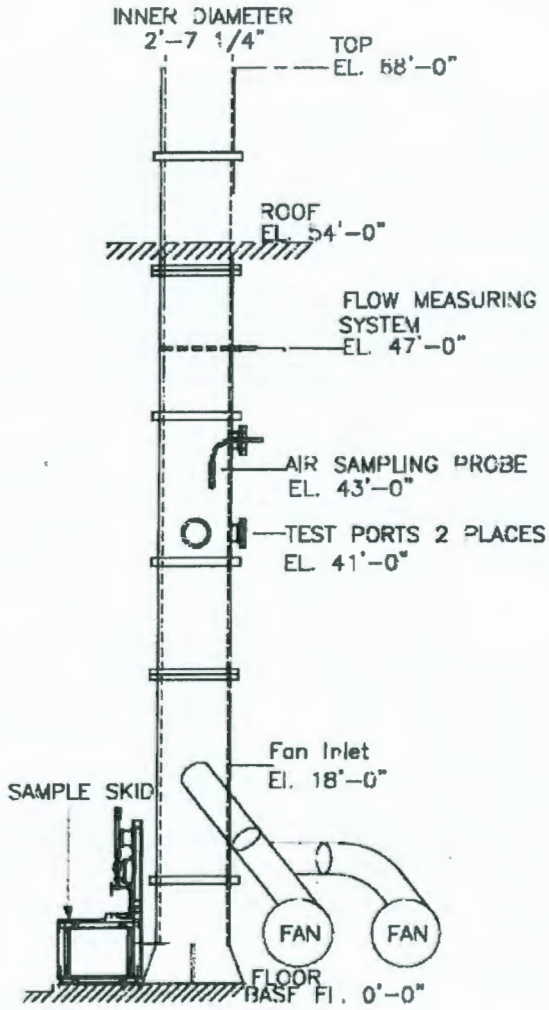

Figure 2: B-Plant Ventilation Stack 296-B-1 Schematic[6]

The ventilation stack for CSB has no bends or angles after the fan inlet to the stack (the last flow disturbance). The B-Plant stack reflects similar geometry. This is important to note, as bends and other disturbances affect velocity profiles and particle concentration distribution.

The hydraulic diameter in a circular duct is equal to the inner diameter. The diameter must be greater than 250 mm, which is equivalent to 0.82 feet. Both stacks exceed this requirement (criterion 2.B)[1].

Further, ANSI/HPS N13.1-1999 Section 5.2.2.2. requires analysis of critical dimensions and sampling locations to ensure geometric similarity between the two stacks[1].

To determine geometric similarity ratios are calculated relating B-Plant stack to CSB stack. The hydraulic diameter (inner diameter) is a key component and is compared directly. The distance from the test port location to the last flow disturbance (i.e. fan inlet) is another critical dimension. This distance is divided by the hydraulic diameter to get the distance from the test port to the fan inlet in duct diameters (see Equation 1).

Equation 1

$$\frac{(Test\ Port\ Height - Last\ Flow\ Disturbance\ Height)}{Hydraulic\ Diameter} = Distance\ in\ Duct\ Diameters$$

The same process is used to compare the sampling location distance from the fan inlet in duct diameters.

Table 1: Geometric Similarity of CSB to B-Plant

Ratios	CSB:B-Plant
D_H	1:1.15
Testing Port Location**	1:1.13
Sampling Location**	1:1.22

*** Distance measured in duct diameters*

Table 1 summarizes the critical dimension comparisons. The ratios are close to 1:1 with an average scale of B-Plant being a factor of 1.17 larger than CSB. This satisfies requirements 1 and 5 of the ANSI/HPS N13.1-1999 criteria[1].

5 Methods

The facility specific test procedure, 1S-15-05945[10], is written to ensure the requirements of 40 CFR 60 Appendix A Method 1 and 2 are met.

5.1 40 CFR 60 Appendix A Method 1 – Determining Velocity Traverses

The distance in duct diameters from the last flow disturbance to the sampling location must be calculated for 40 CFR 60 Appendix A Method 1. The distance in duct diameters that the sampling location is upstream from the next disturbance must be calculated as well. For CSB, the sampling location is 7.89 duct diameters downstream from the last flow disturbance and 21.7 duct diameters upstream from the next flow disturbance. The value for the upstream disturbance is greater than the minimum of two and therefore is disregarded. The downstream value is location on the graph provided in Figure 3: Determining the minimum number of traverse points for a stack traverses with particulates present[8]Figure 3 for 40 CFR 60 Appendix A Method 1 which shows that a 12 point traverse is acceptable under these circumstances.

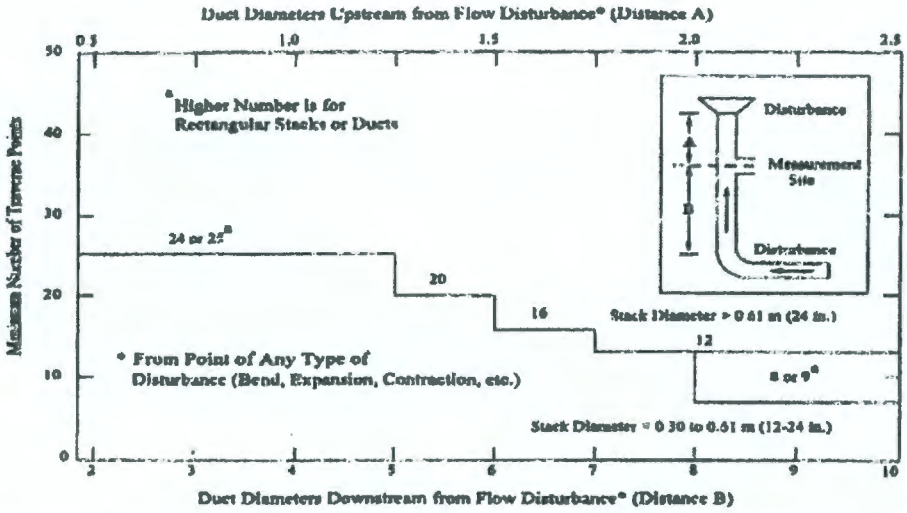

Figure 3: Determining the minimum number of traverse points for a stack traverses with particulates present[8]

The calculated traverse insertion distances within the stack are shown below in Figure 4.

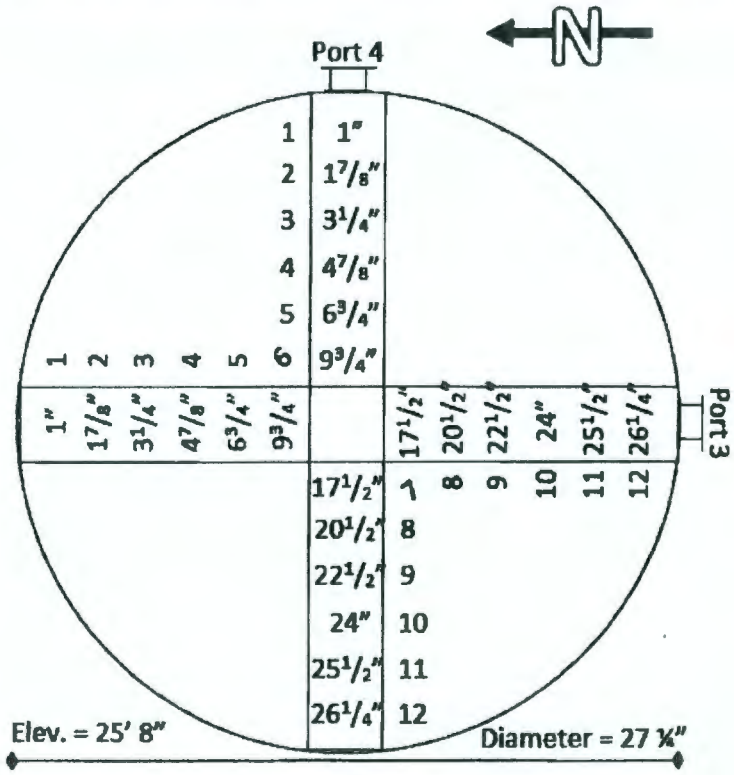

Figure 4: Stack Traverse Diagram with Key Dimensions

5.2 40 CFR 60 Appendix A Method 2 – Requirements for Using a Pitot Tube

At each point, a pitot tube will be used to measure the velocity pressure. The use of an S Type Pitot Tube is applicable in determining the average velocity and volumetric flow rate in a stack[9]. The pitot tube

does not need to be calibrated provided that the pitot tube is properly constructed, Figure 5. Before using a pitot tube for testing, it must be verified that it is not damaged.

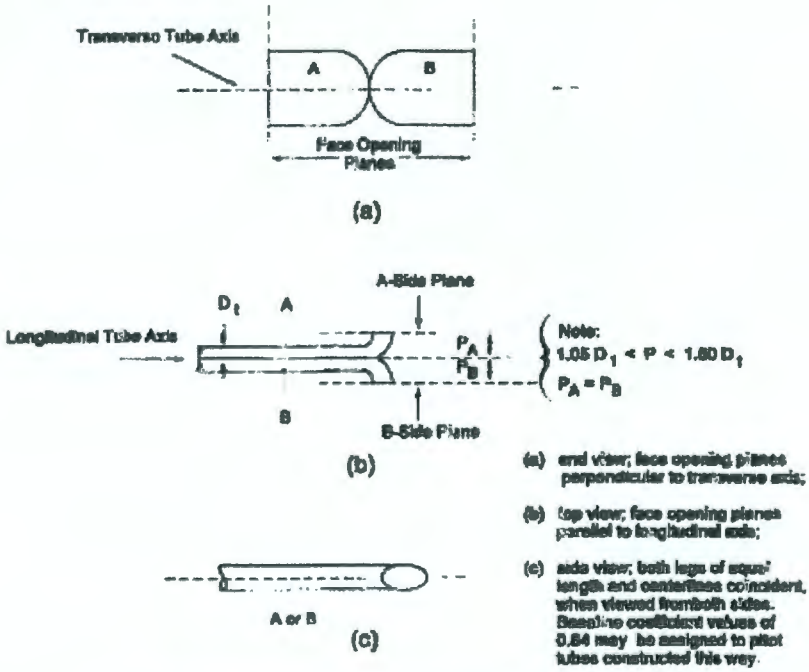

Figure 5: Criteria of a Properly Constructed Type S Pitot Tube[9]

This verification was present and completed in the Work Package 1S-15-05945 and can be referenced for further information[10]. The pitot tube is shown below in Figure 6.

Figure 6: Vendor Supplied Image of Pitot Tube[3]

This is a Dwyer Series 160S "S" type pitot tube. The critical dimensions of the tube were measured and verified to follow the vendor information. This validates the use of the pitot tube coefficient[3].

6 Data Treatment

6.1 Inputs

Data taken includes:

Dimensions from drawings in Figure 1 and Figure 2:

- Diameter [ft]

- Fan inlet height [ft]
- Sampling location height [ft]

Each Trial Run:

- Pitot Tube velocity pressure at each traverse insertion distance [in. water]
- Stack temperature [°F]
- Barometric pressure [in. Hg]
- Ambient temperature [°F]
- Time

6.2 Variables

Table 2: List of Variables Used in Data Treatment and Comparative Analysis

ρ	Density of fluid	lb_m/ft^3
P_{bar}	Barometric pressure	In. Hg
T	Temperature	°F
V	Velocity	ft/min
C	Pitot tube coefficient	0.84
Q	Flow rate [ACFM]	ft^3/min
A	Cross-sectional area of stack	ft^2
COV	Coefficient of variation	
σ	Standard deviation	
D_H	Hydraulic diameter	ft
μ	Fluid dynamic viscosity	lb_m/ft min

6.3 Equations

Equation 2

$$\rho = 1.325 * \frac{P_{bar}}{T_{stack}+460}$$

Equation 3

$$V = 1096.2 * C * \sqrt{\left(\frac{dp}{\rho}\right)}$$

Equation 4

$$Q = A * V$$

Equation 5

$$COV = 100\% * \frac{V_{ave}}{\sigma_{vel}}$$

Equation 6

$$Re = \frac{\rho\, V_{ave}\, D_H}{\mu}$$

Equation 7

$$\frac{(D_H * V_{ave})_{Comparison}}{(D_H * V_{ave})_{Tested}} \leq 6$$

6.4 Raw Data

The source of the raw data is found in Work Package 1S-15-05945[10].

6.4.1 Flow Rate: Low

Table 3: Run 1 (7800 cfm) Pitot Tube Raw Data

Traverse	Port 3			Port 4		
Trial	1	2	3	1	2	3
Point [in.]	Velocity Pressure [in. water]			Velocity Pressure [in. water]		
1	0.25	0.25	0.28	0.28	0.28	0.29
1 7/8	0.29	0.29	0.29	0.31	0.32	0.32
3 1/4	0.31	0.31	0.31	0.3	0.32	0.33
4 7/8	0.28	0.29	0.29	0.28	0.31	0.31
6 3/7	0.31	0.29	0.31	0.29	0.30	0.3
9 3/4	0.28	0.28	0.29	0.29	0.30	0.29
17 1/2	0.31	0.30	0.31	0.30	0.29	0.30
20 1/2	0.30	0.32	0.31	0.31	0.32	0.32
22 1/2	0.33	0.34	0.34	0.32	0.33	0.32
24	0.35	0.36	0.34	0.33	0.34	0.33
25 1/2	0.36	0.37	0.36	0.34	0.34	0.33
26 1/4	0.36	0.37	0.36	0.36	0.32	0.34

Table 4: Run 1 (7800 cfm) Surrounding Conditions during Data Collection

Trial	1	2	3
Date Time	08/02/16 0850	08/02/16 0900	08/02/16 0915
P_{bar} [" Hg]	29.227	29.232	29.233
T_{Stack} [°F]	82.6	82.6	82.6
T_{Amb} [°F]	74	74	75

6.4.2 Flow Rate: Mid-Range

Table 5: Run 2 (8700 cfm) Pitot Tube Raw Data

Traverse	Port 3			Port 4		
Trial	1	2	3	1	2	3
Point [in.]	Velocity Pressure [in. water]			Velocity Pressure [in. water]		
1	0.32	0.34	0.32	0.35	0.37	0.36
1 7/8	0.34	0.35	0.37	0.40	0.39	0.42
3 1/4	0.35	0.39	0.41	0.40	0.41	0.41
4 7/8	0.35	0.38	0.40	0.39	0.37	0.39
6 3/7	0.37	0.39	0.38	0.38	0.36	0.37
9 3/4	0.37	0.37	0.38	0.41	0.38	0.38
17 1/2	0.36	0.37	0.37	0.37	0.36	0.36
20 1/2	0.42	0.41	0.42	0.39	0.40	0.41
22 1/2	0.43	0.43	0.46	0.41	0.42	0.40
24	0.46	0.46	0.47	0.39	0.42	0.42
25 1/2	0.49	0.45	0.45	0.39	0.40	0.40
26 1/4	0.44	0.45	0.44	0.36	0.37	0.37

Table 6: Run 2 (8700 cfm) Surrounding Conditions during Data Collection

Trial	1	2	3
Date Time	08/02/16 0945	08/02/16 1000	08/02/16 1015
P_{bar} [" Hg]	29.234	29.235	29.232
T_{Stack} [°F]	82.4	82.8	82.6
T_{Amb} [°F]	76	76	76

6.4.3 Flow Rate: High

Table 7: Run 3 (9500 cfm) Pitot Tube Raw Data

Traverse	Port 3			Port 4		
Trial	1	2	3	1	2	3
Point [in.]	Velocity Pressure [in. water]			Velocity Pressure [in. water]		
1	0.38	0.4	0.39	0.43	0.42	0.41
1 7/8	0.44	0.43	0.44	0.45	0.47	0.46
3 1/4	0.45	0.45	0.45	0.48	0.47	0.47
4 7/8	0.45	0.46	0.47	0.47	0.47	0.45
6 3/7	0.43	0.42	0.44	0.42	0.46	0.45
9 3/4	0.42	0.44	0.46	0.44	0.45	0.44
17 1/2	0.45	0.45	0.44	0.44	0.45	0.45
20 1/2	0.47	0.48	0.47	0.47	0.46	0.46
22 1/2	0.5	0.5	0.48	0.48	0.48	0.47
24	0.52	0.51	0.52	0.47	0.47	0.48
25 1/2	0.52	0.54	0.51	0.46	0.46	0.45
26 1/4	0.49	0.48	0.47	0.41	0.43	0.44

Table 8: Run 3 (9500 cfm) Surrounding Conditions during Data Collection

Trial	1	2	3
Date Time	08/02/16 1045	08/02/16 1100	08/02/16 1115
P_{bar} [" Hg]	29.232	29.224	29.233
T_{Stack} [°F]	82.6	82.8	83
T_{Amb} [°F]	78	79	79

7 Results

For the three flow rates tested the measured velocity pressure is used to determine the average velocity of the three trials. The average velocity is graphed to visually show the velocity profile at each point in the traverse. The overall average is determined using the center 2/3^{rds} data and the uniformity of the velocity profile (coefficient of variation – COV) is calculated.

7.1 Flow Rate: Low

The velocity profile across the stack at the low flow rate is uniform. This is visually shown in Figure 7 and tabulated in Table 9. The calculated average flow rate is 7771 cfm.

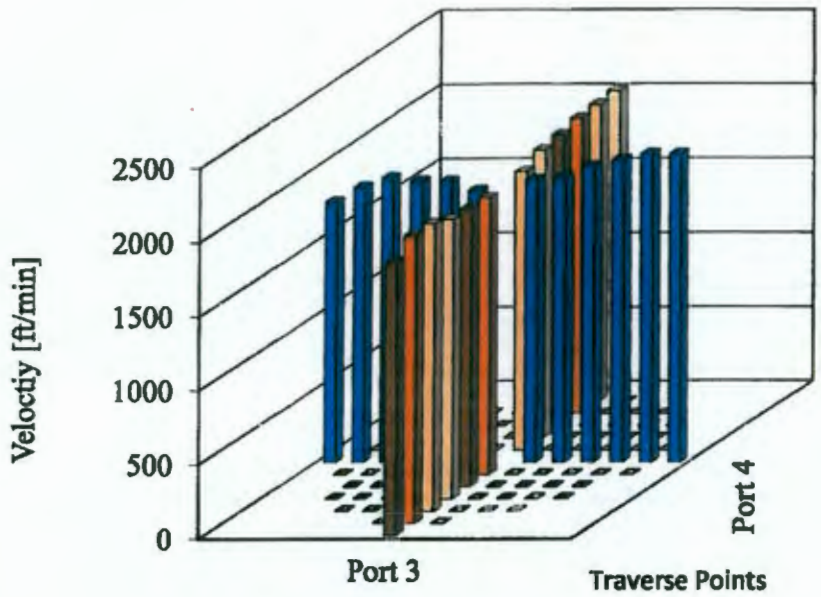

Figure 7: Velocity Profile for the Low Flow Rate

Table 9: Tabulated Average Velocity Values for Low Flow Rate

Point	Location [in.]	Average V [ft/min] Port 3	Average V [ft/min] Port 4	Average V [ft/min] Both Ports
1	1	1757	1834	1796
2	$1\,^{7}/_{8}$	1856	1939	1898
3	$3\,^{1}/_{4}$	1919	1939	1929
4	$4\,^{7}/_{8}$	1845	1887	1866
5	$6\,^{3}/_{7}$	1898	1877	1888
6	$9\,^{3}/_{4}$	1834	1867	1851
7	$17\,^{1}/_{2}$	1909	1877	1893
8	$20\,^{1}/_{2}$	1919	1939	1929
9	$22\,^{1}/_{2}$	2000	1960	1980
10	24	2039	1990	2014
11	$25\,^{1}/_{2}$	2077	2000	2039
12	$26\,^{1}/_{4}$	2077	2009	2043
Center $^{2}/_{3}$ Overall Average		1920	1917	1919

The profile shown in Figure 7 is uniform. This is further illustrated by Figure 8, which shows the average velocity flow in feet per minute (fpm) for both ports at each insertion point in black and the allowable COV band is in dotted vertical lines. The horizontal orange line is the overall calculated average (fpm) velocity flow using all data from the center 2/3rds of the stack.

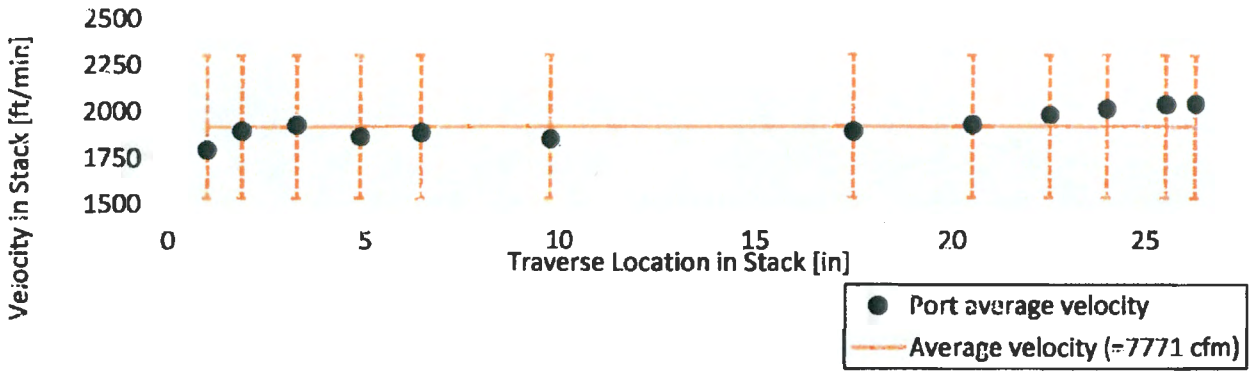

Figure 8: Average (Low) Velocity Values across the Stack, Mapped against 20% COV

The COV for the low flow rate is within the 20% requirement[1]. The calculated COV value at this flow rate is 3.1%.

7.2 Flow Rate: Mid-Range

The velocity profile across the stack at the mid-range flow rate is uniform. This is shown in Figure 9 and in Table 10. The calculated average flow rate is 8776 cfm.

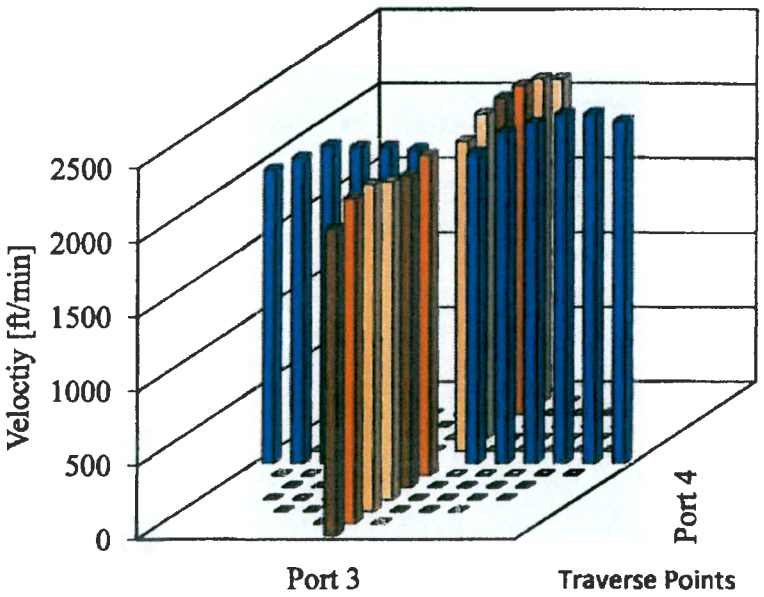

Figure 9: Velocity Profile for the Mid-Range Flow Rate

Table 10: Tabulated Average Velocity Values for Mid-Range Flow Rate

Point	Location [in.]	Average V [ft/min] Port 3	Average V [ft/min] Port 4	Average V [ft/min] Both Ports
1	1	1970	2068	2019
2	$1\,^{7}/_{8}$	2048	2188	2118
3	$3\,^{1}/_{4}$	2133	2198	2165
4	$4\,^{7}/_{8}$	2114	2134	2124
5	$6\,^{3}/_{7}$	2124	2096	2110
6	$9\,^{3}/_{4}$	2106	2152	2129
7	$17\,^{1}/_{2}$	2087	2077	2082
8	$20\,^{1}/_{2}$	2225	2180	2202
9	$22\,^{1}/_{2}$	2286	2207	2246
10	24	2346	2206	2276
11	$25\,^{1}/_{2}$	2345	2171	2258
12	$26\,^{1}/_{4}$	2295	2087	2191
Center $^{2}/_{3}$ Overall Average		2178	2156	2167

The profile shown in Figure 9 is uniform. This is confirmed by Figure 10, which shows the average (fpm) velocity flow for both ports at each insertion point in black and the allowable COV band is in dotted vertical lines. The horizontal orange line is the overall calculated average (fpm) velocity flow using all data from the center 2/3rds of the stack.

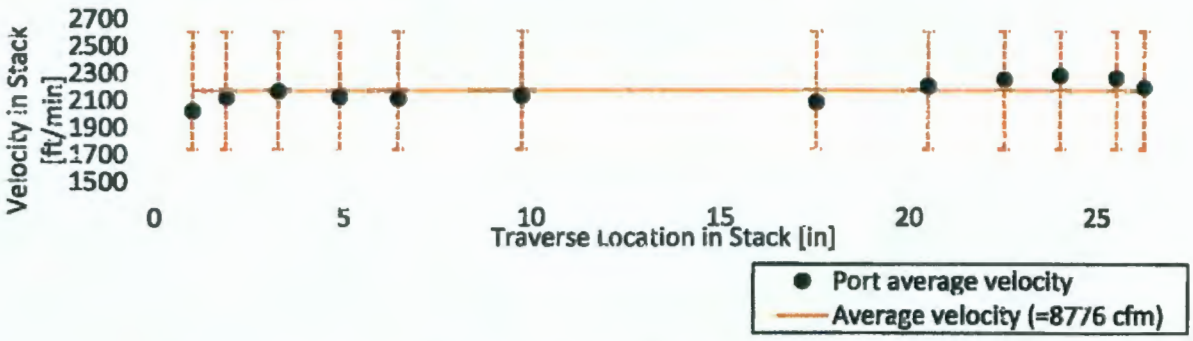

Figure 10: Average (Mid-Range) Velocity Values across the Stack, Mapped against 20% COV

It is apparent that the COV for the mid-range flow rate is within the 20% requirement[1]. The calculated COV value at this flow rate is 3.7 %.

7.3 Flow Rate: High

The velocity profile across the stack at the high flow rate is uniform. This is shown in Figure 11 and in Table 11. The calculated average flow rate is 9487 cfm.

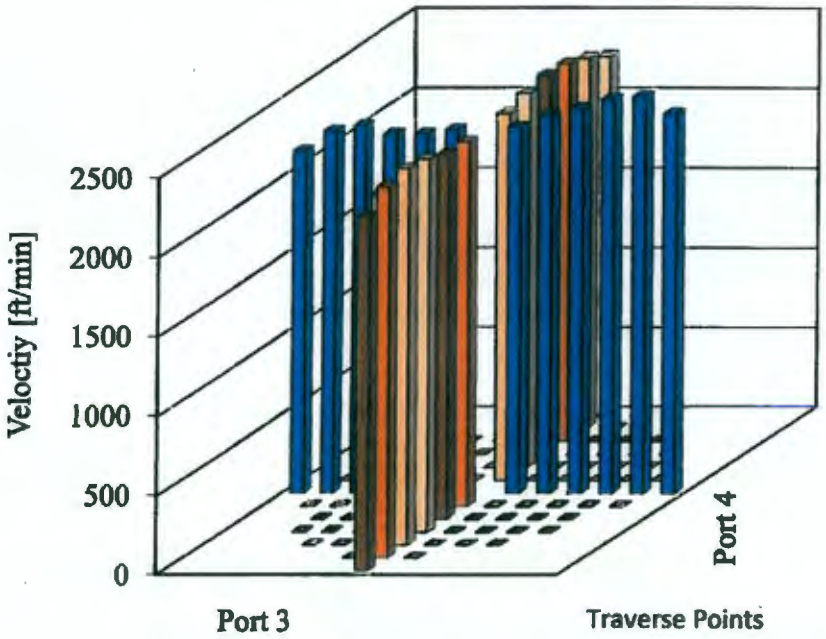

Figure 11: Velocity Profile for the High Flow Rate

Table 11: Tabulated Average Velocity Values for High Flow Rate

Point	Location [in.]	Average V [ft/min] Port 3	Average V [ft/min] Port 4	Average V [ft/min] Both Ports
1	1	2153	2234	2193
2	1 7/8	2278	2338	2308
3	3 1/4	2312	2372	2342
4	4 7/8	2338	2346	2342
5	6 3/7	2260	2295	2278
6	9 3/4	2287	2295	2291
7	17 1/2	2304	2304	2304
8	20 1/2	2372	2346	2359
9	22 1/2	2421	2380	2401
10	24	2478	2372	2425
11	25 1/2	2494	2330	2412
12	26 1/4	2388	2252	2320
Center 2/3 Overall Average		2346	2339	2343

The profile shown in Figure 11 is uniform. This is confirmed by Figure 12, which shows the average (fpm) velocity flow for both ports at each insertion point in black and the allowable COV band is in dotted vertical lines. The horizontal orange line is the overall calculated average (fpm) velocity flow using all data from the center 2/3rds of the stack.

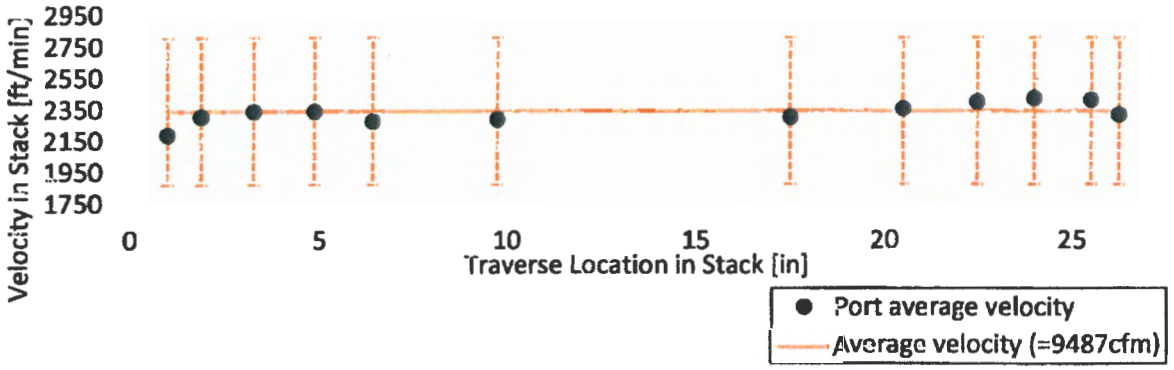

Figure 12: Average (High) Velocity Values across the Stack, Mapped against 20% COV

It is apparent that the COV for the high flow rate is within the 20% requirement[1]. The calculated COV value at this flow rate is 3.7 %.

7.4 Velocity Profile Conclusions

All three flow rates satisfy the third requirement of ANSI/HPS N13.1-1999[1].

Another requirement is the Reynolds (Re) number must be greater than 10,000. Following Equation 5, the hydraulic diameter, mean velocity, density and the dynamic viscosity are needed. The density is calculated by Equation 1. The dynamic viscosity at this temperature is $7.5*10^{-4}$ $lb_m/ft\ min$[4].

Table 12: Reynolds Number Calculation for CSB

D_h [ft][7]	v [ft/min]	Q [cfm]	ρ [lbm/ft³]	μ [lbm/ft min][4]	Re
2.27	1919	7771	0.07138	7.5E-04	4.3E+05
2.27	2167	8776	0.07139	7.5E-04	4.8E+05
2.27	2343	9487	0.07135	7.5E-04	5.2E+05

For all four flow rates, the Reynolds number exceeds the minimum requirement of 10,000 (Requirement 2.C).

8 B-Plant Data

The data regarding B-Plant is found in the PNNL-12017 report and can be found tabulated in Table 13[5].

Table 13: B-Plant Values from PNNL-12017 Report[5]

Mean Velocity [ft/min]	% COV
1705	2.5
1780	2.7
3590	4.2
3762	1.7

All four COVs are below 20%, satisfying requirement 3[1].

Given the data presented in Table 13 and using the above values for density and dynamic viscosity (Section 6.4), the values for Reynolds number can be calculated. The lowest density of the CSB data is used as it gives the approximate value for air in the surrounding area. By using the lowest density

recorded in current trials, it lowers the possibility of recording a Reynolds number too high and gives an approximate value for true conditions.

Table 14: Reynolds Number Calculation for B-Plant

D_h [ft][6]	v [ft/min]	Q [cfm]	ρ [lb_m/ft^3]	μ [lb_m/ft min][4]	Re
2.6	1705	9079	0.07135	7.5E-04	4.2E+05
2.6	1780	9479	0.07135	7.5E-04	4.4E+05
2.6	3590	19123	0.07135	7.5E-04	8.9E+05
2.6	3762	20038	0.07135	7.5E-04	9.4E+05

For all four recorded values, the Reynolds number exceeds the minimum requirement of 10,000 (Requirement 2.C.)[1].

9 Comparisons

The fourth requirement is that the difference between the COVs of the two systems does not exceed 5%[1]. The maximum COV for CSB is 3.7% and the minimum is 1.7% for B-Plant. The maximum difference between the two systems is 2%. This value is below 5%, therefore satisfies the requirement.

Part 2.A. of the ANSI/HPS N13.1-1999 criteria, involves the product of the mean velocity and the hydraulic diameter. Below in Table 15, the values and calculation is shown.

Table 15: Mean Velocity and Hydraulic Diameter Product for Two System Comparison

CSB Velocity [ft/min]	Hydraulic Diameter [ft]	Product
1) 1919	2.27	4357
2) 2167	2.27	4921
3) 2343	2.27	5320

B-Plant Velocity [ft/min]	Hydraulic Diameter [ft]	Product
1) 1705	2.6	4439
2) 1780	2.6	4635
3) 3590	2.6	9350
4) 3762	2.6	9796

Twelve ratios are calculated. For example, CSB 1 to B-Plant 1, 2, 3, and 4. This is repeated for all three CSB flow rates. The maximum factor in these comparisons is a value of 2. This is below the allowable factor of 6 and therefore satisfies requirement 2.A[1].

10 Summary

To summarize, all the requirements for the ANSI/HPS N13.1-1999 comparison are met. They are listed below and a short discussion follows each.

1. The two stacks or ducts are geometrically similar by proportional critical dimensions. Critical dimensions are components that can affect the contaminant mixing and/or the velocity profile.
    - Discussed in Section 4: Background and Table 1.

    The hydraulic diameter is a 1 to 1.15 ratio. The test port location (length is measured in duct diameters) is a 1 to 1.13 ratio. The two values are very close together. It can be concluded that the stacks are proportional in critical dimensions.

2. A. Between the two stacks, the product of the hydraulic diameter times the mean velocity is no more than a factor of six.
    - Discussed in Section 9: Comparisons and Table 15.

The maximum factor in a ratio comparisons is a value of 2.

B. The hydraulic diameter at the sampling location is a minimum of 250 mm.
- Discussed in Section 4: Background.

250 mm is equivalent to 0.82 feet. CSB is the smaller of the two stacks and has a diameter greater than two feet.

C. The Reynolds number, of both stacks, must be greater than 10,000.
- Discussed in 7.4: Velocity Profile Conclusions and Table 12.
- Discussed in Section 7: B-Plant Data and Table 14.

The smallest Reynolds number that is calculated for both stacks is $4.2 * 10^5$. This value is an order of magnitude larger than the requirement.

3. The coefficient of variation (COV) of the velocity profile across the center two-thirds of the stack is less than 20%.
   - Discussed in Sections 7.1 to 7.3: Flow Rates (Low, Mid-Range and High). Conclusion is presented in Section 7.4: Velocity Profile Conclusions.
   - Discussed in Section 8: B-Plant Data Table 13.

   The maximum COV for CSB stack is 3.7% and for the B-Plant is 5.0%.

4. The two stacks have no more than a 5% difference in the velocity COV.
   - Discussed in Section 9: Comparisons.

   The maximum difference between the stacks' COV is 2%.

5. The two stacks sampling location is geometrically similar.
   - Discussed in Section 4: Background Table 1.

   The sampling location is a 1 to 1.22 ratio from CSB to B-Plant. This value is comparable to the critical dimensions analysis done for requirement 1. It is concluded that this location is geometrically similar.

11 Conclusions

The Canister Storage Building stack 296-H-212 sampling and monitoring locations meets all the ANSI/HPS N13.1-1999 Section 5.2.2.2 requirements that are necessary to be qualified at flow rates between 7771 cfm to 9487 cfm.

12 References

1. ANSI/HPS N13.1-1999. (1999). *Health Physics Society Sampling and Monitoring Releases of Airborne Radioactive. Substances from the Stacks and Ducts of Nuclear Facilities: Comparison requirements and criteria.*

2. CHPRC-1601326. (2016). *Stack Flow Rate Changes and the ANSI/N13.1-1999 Qualification Criteria: Application to the Hanford Canister Storage Building Stack PNNL-25209.*

3. Dwyer. (n.d.). *Series 160S "S" Type Stainless Steel Pitot Tube Vendor Data Sheet.* Retrieved from Dwyer Manufacturing Excellence.

4. Engineering ToolBox. (n.d.). *Absolute (Dynamic) and Kinematic Viscosity of Air at Temperatures at Standard Atmospheric Pressure - Imperial Units.* Retrieved from Air - Absolute and Kinematic Viscosity.

5. Glissmeyer, A. M. (1998). *Airborne Effluent Monitoring System Certification for New B-Plant Ventilation Exhaust Stack.* U.S. Department of Energy.

6. Hanford. (1998). *Structural Exhaust Stack Sections & Details, W-059 B-Plant Canyon Ventilation upgrade, H-2-828920.* U.S. Department of Energy.

7. Hanford. (2000). *HVAC, Small Exhaust Stack Arrangement, SNF - Canister Storage Building, H-2-129422, H-2-120401.* U.S. Department of Energy.

8. Hanford. (2010). Standards of Performance for New Stationary Sources, Appendix A-1 Method 1, Sample and Velocity Traverses for Stationary Sources. *40 CFR 60*, Section 11, Figure 1-1, Table 1-2.

9. Hanford. (2010). Standards of Performance for New Stationary Sources, Appendix A-1 Method 2, Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube). *40 CFR 60*, Section 6, Figure 2-2.

10. Hanford. (2015). *Work Package 1S-15-05945, CSB - Stack Flow Testing: Test procedure and results.*

11. Hanford Site Air Operating Permit. (n.d.). *200E P-296H212 001. 296-H-212 (CSB). Emission Unit ID 435.*

12. Maughan, J. G. (1999). *PNNL-12166: Airborne Effluent Monitoring System Certification for New Canister Storage Building Ventilation Exhaust Stack.*

Attachment 1B

Notice of Construction Application/Permit Revision

Emission Unit 435 Redline

Emission Unit ID: 435

200E P-296H212 001

296-H-212 (CSB)

This is a MAJOR, ACTIVELY ventilated emission unit.

CANISTER STORAGE BLDG (CSB)

Emission Unit Information

Stack Height: 75.00 ft. 22.86 m. Stack Diameter 2.30 ft. 0.70 m.

Average Stack Effluent Temperature: degrees Fahrenheit. degrees Celsius.

Average Stack Exhaust Velocity: 34.50 ft/second. 10.52 m/second.

Abatement Technology BARCT WAC 246-247-040(3), 040(4)

state only enforceable: WAC 246-247-010(4), 040(5), 060(5)

Zone or Area	Abatement Technology	Required # of Units	Additional Description
	HEPA	2	double stage, operates in parallel, one HEPA at a time and one in backup mode
	Fan	2	operates in parallel, one fan at a time and one in backup mode

Monitoring Requirements

state enforceable: WAC 246-247-040(5), 060(5), and federally enforceable: 40 CFR 61 subpart H

Federal and State Regulatory	Monitoring and Testing Requirements	Radionuclides Requiring Measurement	Sampling Frequency
40 CFR 61.93(b)(4)(i) & WAC 246-247-075(2)	40 CFR 61, Appendix B, Method 114	Each radionuclide that could contribute greater than 10 percent of the potential-to-emit TEDE	Continuous

Sampling Requirements: The record filter is replaced monthly and analyzed quarterly (either destructive or non-destructive technique) using a gamma spectrometer calibrated to Cs-137.

Additional Requirements

Additional monitoring or sampling requirements established by this License will be listed in the Conditions and Limitations section, if applicable.

Operational Status: Activities at CSB involve surveillance and maintenance operations for the safe storage of radioactive containers holding SNF at the Hanford Site.

This Emission Unit has 1active Notice(s) of Construction.

Project Title	Approval #	Date Approved	NOC_ID
Operation of Canister Storage Building, Building 212-H (Replaces NOC 835)	AIR 15-613	6/29/2015	740

Conditions (state only enforceable: WAC 246-247-040(5), 060(5) if not specified)

1) The total abated emission limit for this Notice of Construction is limited to 1.64E-02 mrem/year to the Maximally Exposed Individual (WAC 246-247-040(5)).

2) This approval applies only to those activities described below. No additional activities or variations on the approved activities that constitute a "modification" to the emission unit, as defined in WAC 246-247-030(16), may be conducted.

The use of the Canister Storage Building (CSB) for storage of spent nuclear fuel (SNF) including Knock Out Pot (KOP) material. The CSB shall consist of load-in and load-out areas, mechanical and electrical support areas, a multi-canister Overpack (MCO) weld/sample station, and a sub grade vault storage area. The SNF and KOP material shall be received in MCOs that shall be shipped in a cask. Receipt of KOP and the remaining SNF MCOs will increase the number of unwelded MCOs at CSB from twelve to twenty-five.

The sub grade reinforced concrete vault area shall accommodate three equal-sized, below grade compartments with each compartment cooled by natural convection and having separate air inlet and exhaust plenums.
Because there is physical separation from the SNF source term to the air space in this below grade vault, there is no control technology or emission monitoring of the exhaust from this area. The physical separation shall consist of the following barriers: MCO and storage tube.

Over the vault shall be a structural steel and metal sided building with heating and ventilation systems, and a material handling machine for use in the handling and movement of MCOs. The air space above the operating deck shall be at a negative pressure with respect to atmosphere during all MCO handling, storage, and monitoring operations. The exhaust from this portion of the building ventilation system shall be filtered by testable high-efficiency particulate air (HEPA) filters and sampled before exhausting through a separate building operating area stack. An operating deck shall separate the sub grade vault from the above grade level working area.

A continuous air emission monitoring system (CAEMS) shall be installed in the process exhaust stack.

There shall be no more than 226 penetration holes in the operating deck in each of the three compartments in the vaulted area. MCOs containing the SNF shall be stored in the 226 vertical steel storage tubes in the north vault (also known as vault 1). Vaults 2 and 3 shall be used for the storage of sealed/immobilized high-level waste.

The steel storage tubes shall prevent migration of radiological contamination and shall be inserted through existing penetrations and extend from the operating deck to the floor of the vault. Access to the interior of the tubes shall be through penetrations in the operating deck. Each tube shall contain no more than two MCOs and be equipped with a shield plug that shall be vented to the operating deck but which can also be isolated.

The function of the MCO shall be to confine, contain, and maintain the SNF in a critically safe array to ensure safe operations and to support processing the 105 K Basins SNF at the Cold Vacuum Drying Facility, processing the Shipping port PWR SNF at the T Plant, and transport to the CSB.

A cover cap shall be welded on top of the MCO covering the MCO shield plug. This shall be performed at the sample and weld station located in the CSB, thus hermetically sealing the SNF contained in the MCO.

The sampling and weld station shall be located at the south end of the CSB operating area. This area shall consist of seven process pits, four feet in diameter and 19 feet 8 inches deep. Two of the pits shall be equipped for MCO gas sampling and for welding the cover caps on the MCOs. Weld inspection and helium leak checking of the seal weld shall also be accomplished here.

An exhaust enclosure shall be provided for confinement around the top of the MCO during sampling and welding. The function of the enclosure shall be to capture any potential airborne contamination. Airflow shall be into the enclosure. An exhaust duct shall run from the enclosure to a fan and through a testable

HEPA filter that shall exhaust into the building ventilation exhaust system for the CSB operating area upstream of the building exhaust testable HEPA filters.

The tube vent and purge cart will house the storage tube purge system, which shall monitor and maintain an inert gas environment around any MCO placed in the Overpack storage tubes and to monitor the atmosphere in any of the other storage tubes as required. The vent and purge cart may be driven to any of the 226 storage tubes.

The vent and purge cart equipment shall include inert gas supply cylinders, flexible steel hoses, an airtight sampling connection, a radioactive gas monitor, a hydrogen gas monitor and associated interlocks and alarms, a vacuum pump and its cooling unit, a HEPA filter, and an oxygen monitor and associated alarms.

The heating, ventilation, and air conditioning (HVAC) system shall provide contamination confinement and contamination control within the CSB. The HVAC system shall provide a controlled pressure gradient flow of air from outside the CSB inward through uncontaminated areas to potentially contaminated areas of the building and out through HEPA filters and a monitored exhaust.

3) The PTE for this project as determined under WAC 246-247-030(21)(a-e) [as specified in the application] is 3.64E+O1 mrem/year. Approved are the associated potential release rates (Curies/year) of:

Ag - 110	1.42E-09	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Ag - 110 m	1.07E-07	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Am - 241	1.87E+OO	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Am - 242	9.74E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Am - 242 m	9.79E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Am - 243	6.00E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Ba - 137 m	6.25E+01	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
C - 14	8.66E-01	gas	WAC 246-247-030(21)(a)
C - 14	6.90E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Cd - 113 m	1.77E-02	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Ce - 144	4.57E-03	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Cm - 242	8.09E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Cm - 244	7.19E-03	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Co - 60	1.98E-02	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Cs - 134	7.94E-02	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Cs - 135	3.87E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Cs - 137	6.59E+01	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Eu - 152	4.72E-03	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Eu - 154	5.35E-01	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Eu - 155	1.10E-01	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Fe - 55	1.83E-03	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Gd - 153	6.39E-10	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
H - 3	3.65E-02	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
H - 3	4.58E+01	gas	WAC 246-247-030(21)(a)
1 - 129	6.34E-06	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
1 - 129	7.96E-03	gas	WAC 246-247-030(21)(a)
In – 113 m	1.07E-12	Liquid/Particulate Solid	WAC 246-247-030(21)(a)

Kr - 85	7.38E+02	gas	WAC 246-247-030(21)(a)
Kr - 85	5.88E-01	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Nb - 93 m	1.23E-03	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Nb - 95	1.87E-17	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Nb - 95 m	6.25E-20	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Ni - 59	2.05E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Ni - 63	2.24E-02	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Np - 237	2.86E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Pd - 107	8.14E-05	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Pm - 147	2.31E+OO	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Pr - 144	4.51E-03	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Pr - 144 m	5.50E-05	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Pu - 238	5.55E-01	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Pu - 239	1.09E+OO	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Pu - 240	5.95E-01	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Pu - 241	3.34E+01	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Pu - 242	2.74E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Rh - 106	9.09E-03	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Ru - 106	9.09E-03	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Sb - 124	1.51E-23	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Sb - 125	1.67E-01	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Sb - 126	1.09E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Sb - 126 m	7.79E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Se - 79	4.31E-04	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Sm - 151	8.79E-01	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Sn - 113	1.07E-12	Liquid/Particulate Solid	WAC 246-247-030(21)(a)
Sn - 119 m	1.48E-06	Liquid/Particulate Solid	WAC 246-247-030(21)(a)

Sn - 121 m	3.98E-04	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Sn - 123	8.69E-11	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Sn - 126	7.79E-04	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Sr - 90	5.05E+01	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Tb - 160	1.38E-20	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Tc - 99	1.44E-02	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Te - 123 m	1.38E-16	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Te - 125 m	4.09E-02	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Te - 127	4.74E-12	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Te - 127 m	4.84E-12	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
U - 234	4.37E-03	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
U - 235	1.68E-04	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
U - 236	6.34E-04	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
U - 238	3.48E-03	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Y - 90	5.05E+01	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
y - 91	1.11E-19	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Zr - 93	2.00E-03	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)
Zr - 95	8.44E-18	Liquid/Particulate	Solid	WAC 246-247-030(21)(a)

The radioactive isotopes identified for this emission unit are (no quantities specified):

Ag - 11O m	Ag - 110	Am - 241	Am - 242 m	Am - 242
Am - 243	Ba - 137 m	C - 14	Cd - 113 m	Ce - 144
Cm - 242	Cm - 244	Co - 60	Cs - 134	Cs - 135
Cs - 137	Eu - 152	Eu - 154	Eu - 155	Fe - 55
Gd - 153	H - 3	1 - 129	In - 113 m	Kr - 85

Nb - 93 m	Nb - 95	Nb - 95 m	Ni - 59	Ni - 63
Np - 237	Pd - 107	Pm - 147	Pr - 144	Pr - 144 m
Pu - 238	Pu - 239	Pu - 240	Pu - 241	Pu - 242
Rh - 106	Ru - 106	Sb - 124	Sb - 125	Sb - 126
Sb - 126 m	Se - 79	Sm - 151	Sn - 113	Sn - 119 m
Sn - 121 m	Sn - 123	Sn - 126	Sr - 90	Tb - 160
Tc - 99	Te - 123 m	Te - 125 m	Te - 127 m	Te - 127

U - 234	U - 235	U - 236	U - 238	Y - 90
y - 91	Zr - 93	Zr - 95		

The potential release rates described in this Condition were used to determine control technologies and monitoring requirements for this approval. DOE must notify the Department of a "modification" to the emission unit, as defined in WAC 246-247-030(16). DOE must notify the Department of any changes to a NESHAP major emission unit when a specific isotope is newly identified as contributing greater than 10% of the potential TEDE to the MEI, or greater than 25% of the TEDE to the MEI after controls. (WAC 246-247-110(9)) DOE must notify the Department of any changes to potential release rates as required by state or federal regulations including changes that would constitute a significant modification to the Air Operating Permit under WAC 173-401-725(4). Notice will be provided according to the particular regulation under which notification is required. If the applicable regulation(s) does not address manner and type of notification, DOE will provide the Department with advance written notice by letter or electronic mail but not solely by copies of documents.

4) MONITORING REQUIREMENTS: Continuous Ambient Air Sampling

Continuous monitoring must be in place prior to operating. This will include continuous ambient air sampling for this project. The ambient air monitors shall be checked for operability at least once per week, and if an ambient air monitor is found not operating, the ambient air monitor shall be returned to service within seven working days from when it was found not operating. Notification to DOH per (WAC 246-247-080(5)) is required when an ambient air monitor is shut down for more than seven consecutive working days from time of discovery. At that time, i.e. when the ambient air monitor is shut down for more than seven consecutive days from time of discovery, operations involving the handling of spent nuclear fuel shall be suspended until the ambient air monitor is returned to service.

5) DIFFERENTIAL PRESSURE- Monitored and Recorded Daily

The differential pressure shall be monitored and recorded daily during operational rounds to determine impacts due to moisture. If the differential pressures are outside of the designed operating range, the cause will be determined and the department will be notified within 24 hours.

6) 25 UN-WELDED MCO's MAXIMIN

The total number of un-welded MCOs will not exceed 25.

7) TOTAL FLOW NOT TO EXCEED 9,487 CFM ~~TOTAL FLOW NOT TO EXCEED 9,000CFM~~

~~Total system flow shall not exceed 9,000 CFM (allowing for the tolerances of the measuring devices).~~

Total system flow shall not exceed 9,487 CFM (allowing for the tolerances of the measuring devices) unless requalification of the sample location is performed to allow for a higher flow. In no case may the total system flow exceed the lesser of the designed flow capacity of the HEPA filtered abatement system or the flow which the stack sampling system was qualified at.

8) ABATEMENT TECHNOLOGY - Ventilation

Ventilation systems used to control the release of particulate airborne radiological contamination from individual processes must include:

1. MHM cask extract ventilation and HEPA exhaust system.
2. Sampling/weld station ventilation and HEPA exhaust system.
3. Overpack storage tube purge system.
4. Temporary containment enclosure with HEPA exhaust system for contamination control.
5. The building HEPA filters are still required.
6. All controls must be ANSI N509/510 compliant

ATTACHMENT 2

NOTIFICATION OF OFF-PERMIT CHANGE

Consisting of 2 pages,
including this cover page

NOTIFICATION OF OFF-PERMIT CHANGE

Permit Number: 00-05-006, Renewal 2

This notification is provided to the Washington State Department of Ecology, Washington State Department of Health, and the U.S. Environmental Protection Agency as a notice of an off-permit change described as follows.

The following changes are allowed pursuant to WAC 173-401-724(1), WAC 173-401-724(2), and WAC 173-401-724(6):

1. Change is not specifically addressed or prohibited by the AOP terms and conditions;
2. Change does not weaken the enforceability of the existing AOP conditions;
3. Change is not a Title I modification or subject to the acid rain requirements under Title IV of the FCAA;
4. Change meets all applicable requirements and does not violate an existing permit term or condition;
5. Change has complied with applicable preconstruction review requirements established pursuant to RCW 70.94.152.

Description of the change:

The proposed changes revise the maximum flow rate from 9000 CFM to 9,487 CFM, based on the stack sample location qualification testing over a broader range of flows than previously performed for the Canister Storage Building (CSB). The results are documented in CHPRC-03083 Revision 0, *Canister Storage Building Stack Qualification Testing and Comparative Analysis*.

Date of change: (To be provided in the agency approval order.)

Effective upon approval.

Describe the emissions resulting from the change:

No radiological or chemical emissions increase or decrease is created by this revision.

Describe the new applicable requirements that will apply as a result of the change:
(To be provided in the agency approval order.)

The CSB stack sampling location has been qualified to allow for a new maximum flow rate. The stack flow rate cannot exceed this value without retesting for the desired change in flow rate limit. The total flow rate of the stack cannot exceed the design capacity of the HEPA filtered abatement system.