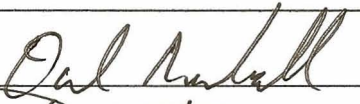




Survey Unit Release Record

Design #	EP-1.43A+B	Revision #	Original	Page 1 of 3
Survey Unit #(s)	1.43A+B			
Description	<p>1) Embedded Pipe (EP) Survey Unit 1.43A+B meets the definition of embedded pipe for Plum Brook Reactor Facility (PBRF).</p> <p>2) EP 1.43A+B is a Class 1, Group 1 survey unit as per the PBRF Final Status Survey Plan (FSSP) and Technical Basis Document (TBD)-06-004.</p> <p>3) Surveys in EP 1.43A+B were performed using a scintillation detector optimized to measure gamma energies representative of Co-60. Sample #EP3-1 from Survey Request (SR)-13 was referenced for this decision.</p> <p>4) Survey Instructions for this survey unit are incorporated into and performed in accordance with (IAW) the Babcock Services Incorporated (BSI)/LVS-002, Work Execution Package (WEP) 05-006. Survey instructions described in this document constitute "Special Methods" and the survey design used in the acquisition of survey measurements.</p> <p>5) Instrument efficiency determinations are developed in accordance with the BSI/LVS-002, WEP 05-006, these determinations are appropriate for the types of radiation involved and the media being surveyed.</p>			
Approval Signatures			Date:	
FSS/Characterization Engineer			10-25-07	
Technical Reviewer (FSS/Characterization Engineer)			10/30/07	
FSS/Characterization Manager	 R. Cass		10/31/07	

Form
 CS-09/1
 Rev 0

Survey Unit: 1.43A+B

1.0 History/Description

- 1.1 The subject pipe system is the 6" pipe system with 4" couplings, the system was accessed from the ring header in Quad A.
- 1.2 EP 1.43A+B consists of 6" diameter piping that is approximately 24 feet in length.

2.0 Survey Design Information

- 2.1 EP 1.43A+B was surveyed IAW Procedure #BSI/LVS-002.
- 2.2 100% of the 6" ID pipe was accessible for survey. The accessible 6" ID pipe was surveyed by static measurement at one foot increments, for a total of 24 survey measurements.
- 2.3 Surface area for the 6" ID piping is 1,459 cm² for each foot of piping, corresponding to a total 6" ID piping surface area of 35,024 cm² (3.5 m²) for the entire length of (approximately 24') of 6" piping. Since the system also contained 4" diameter coupling sections, this estimate is believed to slightly overstate the actual surface area.

3.0 Survey Unit Measurement Locations/Data

- 3.1 Pipe interior radiological survey forms are provided in Attachment 2 of this release record.

4.0 Survey Unit Investigations/Results

- 4.1 None

5.0 Data Assessment Results

- 5.1 Data assessment results are provided in the EP/Buried Pipe (BP) Survey Report provided in Attachment 1.
- 5.2 All measurement results are less than the Derived Concentration Guideline Level (DCGL) for radionuclide specific EP that corresponds to the 1 mrem/yr dose goal established in Table 3-3 of the FSSP.
- 5.3 When implementing the Unity Rule, provided in Section 3.6.3 of the FSSP, and applying the Nuclide Fraction (NF), provided in TBD-06-004, the survey unit that is constituted by EP 1.43A+B passes FSS.
- 5.4 Background was not subtracted from the survey measurements and the Elevated Measurement Comparison (EMC) was not employed for this survey unit.
- 5.5 Although both 4" and 6" diameter piping were surveyed, the actual piping ID associated with each individual measurement was not specified in the survey documentation. To compensate for this, the most conservative combination of detector geometry-efficiency was applied. For each measurement, this process was carried out by dividing the raw counts per minute by the efficiency value associated with the 6" ID pipe to determine

Survey Unit: 1.43A+B

the total Co-60 activity per foot of piping. These values were then divided by the 4" ID geometry factor to determine the area activity in dpm/100 cm².

5.6 Statistical Summary Table

Statistical Parameter	6" Pipe
Total Number of Survey Measurements	24
Number of Measurements >MDC	24
Number of Measurements Above 50% of DCGL	2
Number of Measurements Above DCGL	0
Mean	0.2609
Median	0.2057
Standard Deviation	0.1913
Maximum	0.8304
Minimum	0.0776

6.0 Documentation of evaluations pertaining to compliance with the unrestricted use limit of 25 mrem/yr and dose contributions from Embedded Pipe and radionuclides contributing 10% in aggregate of the total dose for both structural scenarios and soils.

6.1 A review of the survey results has shown that the dose contribution for EP 1.43A+B to be less than 1 mrem/yr. The dose contribution is estimated to be 0.261 mrem/yr based on the average of the actual gross counts measured.

7.0 Attachments

Attachment 1 – BSI EP/BP Survey Report

Attachment 2 – Pipe Interior Radiological Survey Form


Attachment 3 – DQA Worksheet

Attachment 4 – Disc containing RR for EP 1.43A+B & Spreadsheet

SECTION 7
ATTACHMENT 1
 2 **PAGE(S)**



BSI EP/BP SURVEY REPORT

Pipe ID	EP 1.43A+B	Survey Location	Quad A ring header -15'
Survey Date	12-Oct-06	2350-1 #	203488
Survey Time	14:10	Detector-Sled #	238367/101
Pipe Size	4", 6"	Detector Efficiency	0.000079
DCGL (dpm/100cm²)	2.41E+05	Pipe Area Incorporated by Detector Efficiency (in cm²)	1,459
Pipe Area Incorporated by Survey Data (m²)	3.5	Field BKG (cpm)	1.3
Routine Survey	X	Field MDCR (cpm)	6.9
QA Survey		Nominal MDC (dpm/100cm²)	10,856
Survey Measurement Results			
Total Number of Survey Measurements		24	
Number of Measurements >MDC		24	
Number of Measurements Above 50% DCGL		2	
Number of Measurements Above DCGL		0	
Mean		0.2609	
Median		0.2057	
Standard Deviation		0.1913	
Maximum		0.8304	
Minimum		0.0776	
Survey Technician(s)	STOCK		
Survey Unit Classification		1	
TBD 06-004 Piping Group		1	
SR-13 Radionuclide Distribution Sample		EP 3-1	
Measured Nuclide		Co-60	
Area Factor/EMC Used		No	
Pass/Fail FSS		Pass	
MREM/YR Contribution		<1	
COMMENTS: ACTIVITY VALUES NOT BACKGROUND CORRECTED			
RP Engineer Date			

EP 1.43A+B
4", 6" Pipe
TBD 06-004 Group 1

Measurement #	gcpm	ncpm	Co-60 activity (total dpm)	Co-60 activity (dpm/100cm2)	Cs-137 activity (dpm/100cm2)	Eu-152 activity (dpm/100cm2)	Eu-154 activity (dpm/100cm2)	Nb-94 activity (dpm/100cm2)	Ag-108m activity (dpm/100cm2)	Unity
1	33	33	417,722	42,937	1,702	40,730	10,828	1,253	299	0.256
2	44	44	556,962	57,249	2,269	54,307	14,437	1,671	399	0.341
3	17	17	215,190	22,119	877	20,982	5,578	645	154	0.132
4	25	25	316,456	32,528	1,289	30,856	8,203	949	227	0.194
5	45	45	569,620	58,550	2,321	55,541	14,765	1,709	408	0.349
6	12	12	151,899	15,613	619	14,811	3,937	456	109	0.093
7	10	10	126,582	13,011	516	12,342	3,281	380	91	0.078
8	15	15	189,873	19,517	774	18,514	4,922	570	136	0.116
9	21	21	265,823	27,323	1,083	25,919	6,890	797	190	0.163
10	42	42	531,646	54,647	2,166	51,838	13,781	1,595	381	0.326
11	35	35	443,038	45,539	1,805	43,198	11,484	1,329	317	0.272
12	105	105	1,329,114	136,617	5,415	129,595	34,452	3,987	952	0.815
13	107	107	1,354,430	139,219	5,518	132,064	35,108	4,063	970	0.830
14	28	28	354,430	36,431	1,444	34,559	9,187	1,063	254	0.217
15	33	33	417,722	42,937	1,702	40,730	10,828	1,253	299	0.256
16	29	29	367,089	37,732	1,495	35,793	9,515	1,101	263	0.225
17	27	27	341,772	35,130	1,392	33,325	8,859	1,025	245	0.210
18	19	19	240,506	24,721	980	23,451	6,234	721	172	0.147
19	26	26	329,114	33,829	1,341	32,090	8,531	987	236	0.202
20	20	20	253,165	26,022	1,031	24,685	6,562	759	181	0.155
21	25	25	316,456	32,528	1,289	30,856	8,203	949	227	0.194
22	26	26	329,114	33,829	1,341	32,090	8,531	987	236	0.202
23	14	14	177,215	18,216	722	17,279	4,594	532	127	0.109
24	49	49	620,253	63,754	2,527	60,478	16,077	1,860	444	0.380
									MEAN	0.261
									MEDIAN	0.206
									STD DEV	0.191
									MAX	0.830
									MIN	0.078

SECTION 7
ATTACHMENT 2
3 PAGE(S)

Pipe Interior Radiological Survey Form

Date: 10/12/06 Time: 1410
 Pipe ID#: 1.43B+A Pipe Diameter: MSP Access Point Area: QUAD A
 Building: CV Elevation: -15' System: RING HEADER

Type of Survey Investigation Characterization Final Survey Other
 Gross Co60 Cs

Detector ID# / Sled ID# 44-159 238367 / 101
 Detector Cal Date: 6/21/06 Detector Cal Due Date: 6/21/07
 Instrument: 2350-1 Instrument ID #: 203488
 Instrument Cal Date: 7/5/06 Instrument Cal Due Date: 7/5/07

From the Daily Pipe Survey Detector Control Form for the Selected Detector

Background Value 1.3 cpm
 MDCR_{static} 6.9 cpm
 Efficiency Factor for Pipe Diameter 0.00079 (from detector efficiency determination)
 MDC_{static} 10856 dpm/ 100 cm²
 Is the MDC_{static} acceptable? Yes No (if no, adjust sample count time and recalculate MDCR_{static})
 Comments: CONTINUATION EP3-1 COMPLETE

1.43A PWCR R RING ; 1.43B PWCR PRIMARY LOOP TO R RING

Technician Signature [Signature]

Pipe Interior Radiological Survey

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
1	1	1	33	33	N/A	N/A
2	2	↓	44	44	↓	↓
3	3		17	17		
4	4		25	25		
5	5		45	45		
6	6		12	12		
7	7		10	10		
8	8		15	15		
9	9		21	21		
10	10		42	42		

REFERENCE COPY



Pipe Interior Radiological Survey Form (Continuation Form)

Date: 10/12/06
 Pipe ID#: 1.43B Pipe Diameter: MSP Access Point Area: QUAD A
 Building: CV Elevation: -1.5' System: RH

Position #	Feet into Pipe from Opening	Count Time (min)	Gross Counts	Gross cpm	Net cpm	dpm/100cm ²
11	11	1	35	35	n/a	n/a
12	12	↓	105	105	↓	↓
13	13		107	107		
14	14		28	28		
15	15		33	33		
16	16		29	29		
17	17		27	27		
18	18		19	19		
19	19		26	26		
20	20		20	20		
21	21		25	25		
22	22		26	26		
23	23		14	14		
24	24		49	49		
			n/a			

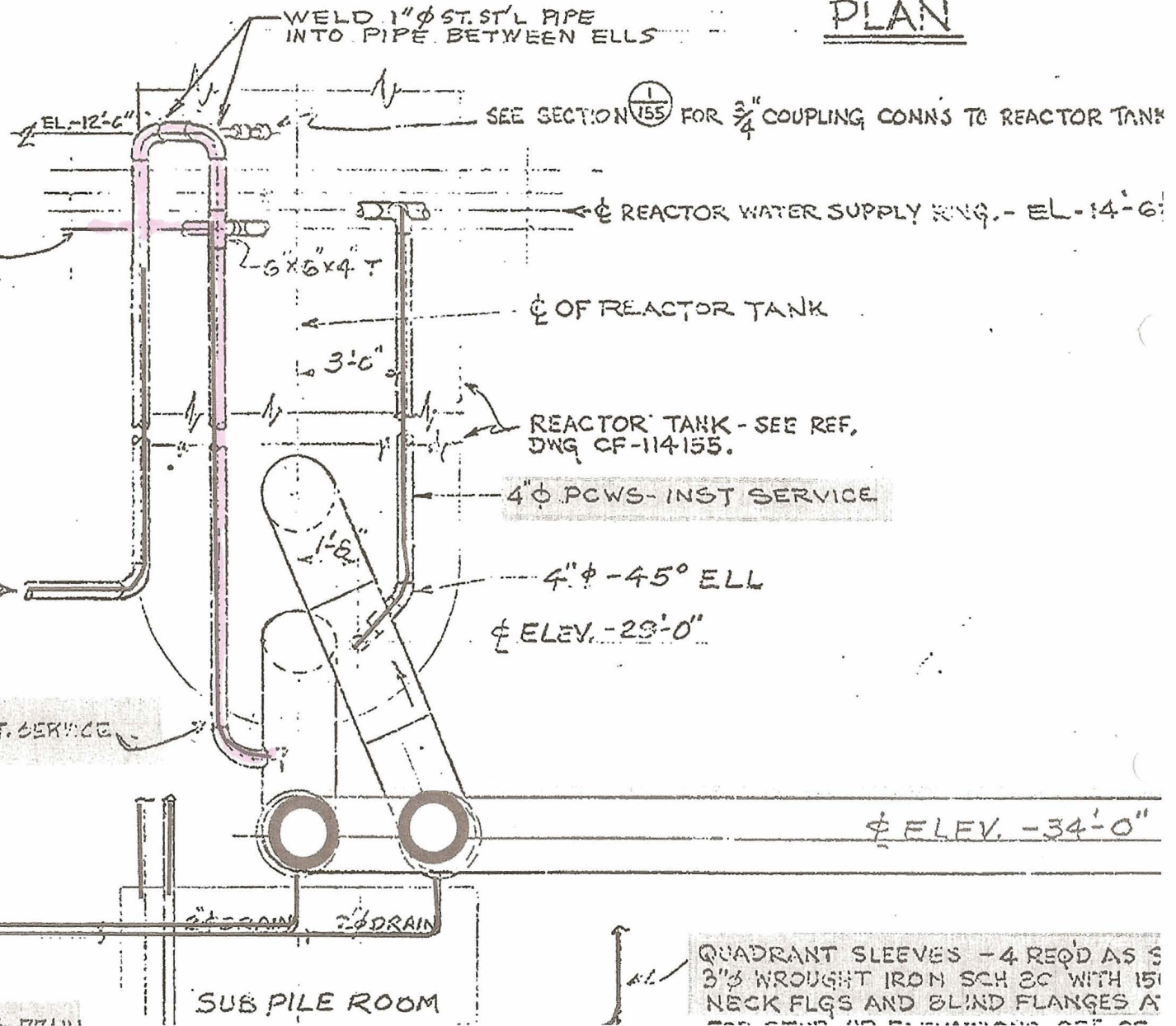


PF 00382

REF 1.43B

PLAN

SECTION 4
382
SCALE: $\frac{3}{4}'' = 1'-0''$



PRIMARY COOLING WATER
RETURN RING - EL-14'-11 1/2"
SEE DWG CF-114410

SEE SECTION 1
155 FOR 3/4" COUPLING CONNS TO REACTOR TANK

REACTOR WATER SUPPLY RING - EL-14'-6"

OF REACTOR TANK

REACTOR TANK - SEE REF,
DWG CF-114155.

4" PCWS - INST SERVICE

SEE CF-114401 FOR
CONTINUATION
6" HOT DRAIN - PIT

4" 45° ELL
ELEV. -29'-0"

6" PCWR - INST. SERVICE

ELEV. -34'-0"

SUB PILE ROOM

QUADRANT SLEEVES - 4 REQD AS 3
3" WROUGHT IRON SCH 20 WITH 15"
NECK FLGS AND BLIND FLANGES AT

PAGE
3

14

SECTION 7
ATTACHMENT 3
 1 **PAGE(S)**

DQA Check Sheet

Design #	EP 1.43A+B	Revision #	Original	
Survey Unit #	EP 1.43A+B			

Preliminary Data Review

Answers to the following questions should be fully documented in the Survey Unit Release Record	Yes	No	N/A
1. Have surveys been performed in accordance with survey instructions in the Survey Design?	X		
2. Is the instrumentation MDC for structure static measurements below the DCGL _W for Class 1 and 2 survey units, or below 0.5 DCGL _W for Class 3 survey units?			X
3. Is the instrumentation MDC for embedded/buried piping static measurements below the DCGL _W ?	X		
4. Was the instrumentation MDC for structure scan measurements, soil scan measurements, and embedded/buried piping scan measurements below the DCGL _W , or, if not, was the need for additional static measurements or soil samples addressed in the survey design?			X
5. Was the instrumentation MDC for volumetric measurements and smear analysis < 10% DCGL _W ?			X
6. Were the MDCs and assumptions used to develop them appropriate for the instruments and techniques used to perform the survey?	X		
7. Were the survey methods used to collect data proper for the types of radiation involved and for the media being surveyed?	X		
8. Were "Special Methods" for data collection properly applied for the survey unit under review?	X		
9. Is the data set comprised of qualified measurement results collected in accordance with the survey design, which accurately reflects the radiological status of the facility?	x		

Graphical Data Review

1. Has a posting plot been created?			X
2. Has a histogram (or other frequency plot) been created?			X
3. Have other graphical data tools been created to assist in analyzing the data?			X

Data Analysis

1. Are all sample measurements below the DCGL _W (Class 1 & 2), or 0.5 DCGL _W (Class 3)?	X		
2. Is the mean of the sample data < DCGL _W ?	X		
3. If elevated areas have been identified by scans and/or sampling, is the average activity in each elevated area < DCGL _{EMC} (Class 1), < DCGL _W (Class 2), or <0.5 DCGL _W (Class 3)?			X
4. Is the result of the Elevated Measurements Test < 1.0?			X
5. Is the result of the statistical test (S+ for Sign Test or W_r for WRS Test) ≥ the critical value?			X

Comments:

FSS/Characterization Engineer (print/sign)	<i>Dale Randall</i>	Date	10-26-07
FSS/ Characterization Manager (print/sign)	<i>R. Case</i>	Date	10/31/07

Form
CS-09/2
Rev 0

**SECTION 7
ATTACHMENT 4
1 DISC**