GPU Nuclear

GPU Nuclear Corporation
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609 971-4000
Writer's Direct Dial Number:

July 19, 1984

Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Crutchfield:

Subject: Oyster Creek Nuclear Generating Station
Docket No. 50-219
NUREG-0737 Item II.B.3
Post Accident Sampling System

The purpose of this submittal is to advise you of some recent modifications we have implemented in our Post Accident Sampling System (PASS). Contrary to our response to criterion 11 (item 7) contained in your correspondence of June 30, 1982 concerning ventilation, we will not install a dedicated PASS exhaust filtration system. Based on the attached calculations we conclude that the doses at the site boundary, due to a release of post accident sampling material, will be less than 1% of the allowable 10 CFR 100 limits.

Therefore, the new dilution and sample preparation laboratory fume hood will be connected to the new Chemistry Laboratory Exhaust System. The exhaust from the PASS fume hood is filtered by means of a prefilter and absolute filter, then discharged to the atmosphere. Exhaust from this system is not monitored for radioactive releases. However, the PASS station itself will continue to be provided with a ducted connection to the Reactor Building.

In addition to supplying you with justification for this modification we are providing you with additional information pertaining to criteria 4, 9, and 10 of the above referenced correspondence.

Should you have any further questions, please contact Brenda Hohman, Oyster Creek Licensing Engineer at (609)971-4642.

Very truly yours,

Peter B. Fiedler
Vice President and Director
Oyster Creek

PBF/dam
Attachments

ATTACHMENT

Criterion: (4) Pressurized reactor coolant samples are not required if the licensee can quantify the amount of dissolved gases with unpressurized reactor coolant samples. The measurements of either total dissolved gases of H_2 gas in reactor coolant samples is considered adquate. Measuring the O_2 concentration is recommended, but is not mandatory.

Clarification: Discuss the method whereby total dissolved gas or hydrogen and oxygen can be measured and related to reactor coolant system concentrations. Additionally, if chlorides exceed 0.15 ppm, verification that dissolved oxygen is less than 0.1 ppm is necessary. Verification that dissolved oxygen is $\geq$ 0.1 ppm by measurement or a dissolved hydrogen residual of $\geq$ 10 cc/kg is acceptable for up to 30 days, consistent with ALARA, direct monitoring for dissolved oxygen is recommended.

Discussion: As you are aware, several PASS design modifications submitted by General Electric have been under review by the NRC. The latest modification redesigned the PASS dissolved gas sampling capability. It is our understanding that the NRC has approved this modification as of July 17, 1984. (Refer to letter dated July 17, 1984 W. Johnston, NRC to G. G. Sherwood, G.E.) It is our intention to comply with the specifications stated in this letter.

Criterion: (9) The licensee's radiological and chemical sample analysis capability shall include provisions to:

(b) Restrict background levels of radiation in the radiological and chemical analysis facility from sources such that the sample analysis will provide results with an acceptably small error (approximately a factor of 2). This can be accomplished through the use of sufficient shielding around samples and outside sources, and by the use of a ventilation system design which will control the presence of airborne radioactivity.

(c) State the predicted background radiation levels in the counting room, including the contribution from samples which are present. Also provide data demonstrating what the background radiation levels and radiation effect will be on a sample being counted to assure an accuracy within a factor of 2.

Response: We have retained a contractor to perform calculations to ascertain predicted background radiation levels in the counting room. The counting room as mentioned above, is not the same room in which the PASS is located. Therefore, separate calculations will have to be performed. It is expected, however, that background radiation levels will not significantly affect the sample being counted so that accuracy within a factor of 2 can be assured.

Criterion: (10) Accuracy, range, and sensitivity shall be adequate to provide pertinent data to the operator in order to describe radiological and chemical status of the reactor coolant systems.

Clarification: The recommended ranges for the required accident sample analyses are given in Regulatory Guide 1.97, Rev. 2. The necessary accuracy within the recommended ranges are as follows:

1) - Hydrogen or Total Gas: monitored to estimate core degradation and corrosion potential of the coolant.

An accuracy of ± 10% is desirable between 50 and 2000 cc/kg but ± 20% can be acceptable. For concentration below 50 cc/kg the tolerance remains at ± 5.0 cc/kg.

2) - Oxygen: monitored to assess coolant corrosion potential.

For concentrations between 0.5 and 20.0 ppm oxygen the analysis should be accurate within ± 10% of the measured value. At concentrations below 0.5 ppm the tolerance band remains at ± 0.05 ppm.

Response: 1) Dissolved Hydrogen

Dissolved hydrogen concentrations can be measured by gas chromatography. An accuracy of ± 10% can be expected over the range of concentrations from 50 to 2000 cc/Kg. Below 50 cc/Kg, the accuracy will be ± 5.0 cc/Kg. Gas chromatography has been successfully demonstrated for the determination of hydrogen in TMI-2 post-accident gas samples. To provide expedient results the Gas chromatograph at Oyster Creek will be located in or near the PASS room which will minimize sample transport times.

2) Dissolved Oxygen

Dissolved oxygen can be measured indirectly using the residual hydrogen method of analysis. Using this method, dissolved oxygen concentration is verified to be less than 0.1 ppm by measurement of positive hydrogen residuals of greater than 10 cc/Kg.

Burns and Roe, Inc.

800 Kinderkamack Road ■ Oradell, New Jersey 07649 ■ Tel. N.J. (201) 265-2000-N.Y. (212) 563-7700

Telex 13-4224 ■ TWX 710-990-6623

Subject: W.O. 3731-17
GPU Nuclear Corporation
Oyster Creek Nuclear Generating Station
P.A.S.S. Phase II - Mechanical
B/A Number 402048

Main Office
550 Kinderkamack Road
Oradell, New Jersey 07649
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Attachment: (a) BRI Calculation 15.33-013 Rev. 0

May 14, 1984
BG-3731-4-379

Mr. D.N. Grace
Manager-Oyster Creek Engineering Projects
GPU Nuclear Corporation
100 Interpace Parkway
Parsippany, N.J. 07054
Attention: Mr. D.E. Miller

Dear Mr. Grace:

Attached for your use is Calculation 15.33-013, "Site Boundary Dose Due to Release of Post-Accident Sampling Material". The purpose of this calculation is to determine the site boundary dose following a design basis accident.

This accident is postulated to be the spilling of a 10ml liquid or gas sample which is released to the environment through the Office Building North End HVAC System (Chem Lab Exhaust). The duration of the release is fifteen minutes and the sample is assumed to have been taken one hour after reactor shutdown. The exhaust system has a commercial grade HEPA filter, but no charcoal filter. The source term is based on information supplied by General Electric for the Peach Bottom Reactors 2/3. This data is scaled for Oyster Creek using reactor thermal power and primary coolant or drywell and torus volumes as scaling factors.

As shown below, the calculated doses at the site boundary are approximately 1% of the allowable 10CFR100 limits. Therefore, sample dilution is not required to limit off-site dose to meet 10CFR100.

	Liquid Sample	Gaseous Sample	10CFR100 Limit
WHOLE BODY DOSE	3.82 mr	0.0903 mr	25 Rem
Gamma - Body	2.55 mr	0.030 mr	
Beta - skin	1.27 mr	0.0603 mr	
THYROID INHALATION DOSE	2.84 Rem	33.5 mr	300 Rem

In addition to the above analysis, Burns and Roe made an estimate of the direct dose rate from the postulated reactor coolant sample. This dose rate is on the order of 1000R per hour at a distance of 10cm. Data of this nature should be useful in planning sampling operations and procedures.

If you have any questions regarding this matter, please contact me.

Very truly yours,

R.S. Gagliardo
Project Manager

RSG:DD:ga
Attachment

cc: J. Mancinelli, O.C. Site, w/att.
ED&CC w/original

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W.O. No. 3731-0.E Calc No. 14.33.012 Sheet 1 Cont. on Sheet 2

Title Site Boundary Dose due to Release of Post-Accident Sample Station

Conclusion Statement

The check was done in accordance with Eng. Standard PDI5105 #1. The results are found satisfactory.

Purpose The purpose of this calculation is two fold

1. To determine the site boundary dose as the result of opening a liquid sample or a gaseous sample
2. How much dilution of the sample is needed in order to keep the site boundary dose within the dose limits set by 10 CFR part 100; or no dilution is needed.

References 1. Telecon communication between [illegible] dated 2/15/82 subject "PASS Containment Leak Rate Test"

2. GE-CPRE Transmittal 80-1P-041, DRF D00-2, subject "Post-Accident Sampling Station, Activity Source Terms", by H.P. Hilsmeier, March, 1981

Results + Conclusion

Site boundary dose during 15-minute release (see sheet 11)

	Liquid Sample (ml)	Gaseous Sample (10 min)	10 CFR-100 Limit
Whole Body dose (γ-body + β-skin)	3.82 mR	0.0903 mR	25 Rem
Thyroid inhalation	2.84 Rem	33.5 mR	300 Rem

The calculated doses are a minimum fraction of the 10 CFR-100 limits hence no dilution is necessary.

Rev. No.	Description of Revision	Type (Prelim Design, Final Design, Study)	Originator Signature/Date	Checker Signature/Date	Approver Signature/Date
	This calc supplements Calc #T-2342 - same subject matter.				
0	Original Issue	Final	[signature] 3/24/84	E. Esmaili 4/11/84	C. Jeh 4/12/84

Procedure:

The problem is as follows:

1. The liquid/Gas sample is spilled and released to the environment through the nearby hood of the sampling station.
2. The sample size, both liquid or gas, is 10 ml and the release to environment will be completed within 15 minutes. The sample is taken one hour after accident.
3. A HEPA filter is available to attenuate the release, but no charcoal filter

Computational Procedures:

1. The magnitude (intensity) of the sample sources (liquid & gaseous) will be based on the data of Peach Bottom Reactors 2/3 (Ref. 2), scaled to Oyster Creek case by 2 factors (1) reactor thermal power and (2) Volume of primary coolant (liquid sample) or size of torus-drywell air volume (gaseous sample).
2. The sample size is 10 ml, released in 1/4 minute. Hence the time rate of release in Curies per second (Ci/sec) from the hood to environ, can be determined, isotope by isotope (nuclide).

3. Determine the nuclide concentrations at site boundary atmosphere by using the procedure prescribed in Reg Guide 1.3, i.e. multiply the nuclide release rates obtained in step 2 by the dispersion factor 7/Q, for Oyster Creek Site Boundary.

4. Convert the nuclide concentration, obtained in step 3, into dose (whole body gamma, beta skin & thyroid doses) by using dose conversion factors from Reg. Guides 1.109 (for Whole-Body) & 1.25 (for Thyroid dose)

5. Compare the total dose (whole body & thyroid) from all nuclides, with the dose limits as prescribed in the NRC 10CFR-100, i.e. 25 Rem whole body and 300 thyroid inhalation dose, to see whether the calculated doses are a small fraction of the above limiting values.

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W.O. No. 3731-06 Date 3/26/84 Book No. _____ Page No. _____
Drawing No. _____ Calc. No. 15.33.013 Sheet 4 Cont. on Sheet 5
By E. Fehr Checked E. Esmaili 4/11/84 Approved _____
Title Site Boundary Dose due to Release of Post-accident Sampling Facilities

The Scaling Factor from Peach Bottom 2/3 activity concentrations (See Table A2-1, Ref. 2) to Oyster Creek's (one Hour after shutdown

Liquid Sample

$$\text{Scaling Factor} = \frac{\text{Oyster Creek Rated Power}}{\text{Peach Bottom 2/3 Rated Power}} \times \frac{\text{Peach Bottom 2/3 Reactor Water Inventory}}{\text{Oyster Creek Reactor Water Inventory}}$$

$$= \frac{1933 \text{ MWt}}{3293 \text{ MWt}} \times \frac{589.8 \text{ Kilo-Lbs}}{452.8 \text{ Kilo-Lbs}} = .587 \times 1.3025 = 0.765$$

Gaseous Sample

$$\text{Scaling Factor} = \frac{\text{Oyster Creek Rated Power}}{\text{Peach Bottom 2/3 Rated Power}} \times \frac{\text{Peach Bottom Drywell + Torus Air Volume}}{\text{Oyster Creek Drywell + Torus Air Volume}}$$

$$= .587 \times \frac{175800 + 127700 \text{ ft}^3}{180000 + 126400 \text{ ft}^3} = .587 \times .9905 = 0.581$$

Dispersion Factor χ/Q at Oyster Creek Site Boundary

The site boundary distance ("minimum Exclusion" line) is 454 meters*

From Reg. Guide 1.3, assuming ground level release

$$\chi/Q = 2.5 \times 10^{-3} \text{ sec/m}^3 \text{ at } 454 \text{ meters}$$

* From the Report "Oyster Creek Radwaste Modification, Conformance to 10CFR50, Appendix I".

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W.O. No. 3731-06 Date 3/26/86 Book No. _____ Page No. _____
Drawing No. _____ Calc. No. 15.32.01 Sheet 5 Cont. on Sheet 6
By G. Hsu Checked E. Esmaili 4/11/86 Approved _____
Title Site Boundary Dose Due to Release of Post-Accident Sampling Naturals

Table 1 Liquid Sample, Whole Body Dose

Column 1	2	3	4	5	6	7	8 (See No Exclusions)
Nuclide	HALF Life	Peach Bottom 2/3 PRIMARY Coolant Curies/gm	Oyster Creek Liquid Sample 10 ml, Ci/10 ml	Release Rate to ENVIRON Ci/sec	Concentration at Site Boundary Ci/m³	Dose in 15-Minute Release, mRem gamma Body	Beta-Skin
Kr-83m	1.86h	0.037	0.283	3.14(-4)	7.84(-7)	1.69(-6)	---
Kr-85	10.7Y	0.004	0.0306	3.40(-5)	8.50(-8)	3.90(-5)	3.25(-3)
Kr-85m	4.48h	0.072	0.551	6.12(-4)	1.53(-6)	5.11(-2)	6.37(-2)
Kr-87	76m	0.093	0.711	7.90(-4)	1.975(-6)	3.33(-1)	5.48(-1)
Kr-88	2.8h	0.176	1.35	1.50(-3)	3.75(-6)	1.57(0)	2.53(-1)
Xe-131m	12d	0.002	0.0153	1.70(-5)	4.25(-8)	1.11(-4)	5.77(-4)
Xe-133	5.29d	0.68	5.2	5.78(-3)	1.45(-5)	1.22(-1)	1.27(-1)
Xe-133m	2.33d	0.028	0.214	2.38(-4)	5.95(-7)	4.26(-3)	1.69(-2)
Xe-135	9.17h	0.127	0.972	1.08(-3)	2.70(-6)	1.39(-1)	1.43(-1)
Xe-135m	15.3m	0.093	0.689	7.66(-4)	1.92(-6)	1.71(-1)	3.89(-2)
Xe-138	14.2m	0.030	0.230	2.56(-4)	6.40(-7)	1.61(-1)	7.5(-2)
						2.552(0)	1.27(0)

Whole-Body Dose = Gamma Body Dose + Beta Skin Dose = 2.552 + 1.27
= 3.82 mRem

Notes

1. Columns 1 to 3 are data from Ref. 2, Table 3, the reactor coolant source intensity of Peach Bottom Reactor 2/3, one hour after reactor shutdown. Noble gases are the dominating contributors of whole body immersion dose. Hence halogens are not listed in Column 1.
2. Column 4 is the source of Oyster Creek liquid sample for 10 ml, after applying the scaling factor to Column 3 data. Use coolant sample density of 1 gm/cc.

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W.O. No. 3731-06 Date 3/21/84 Book No. _____ Page No. _____
Drawing No. _____ Calc. No. _____ Sheet 6 Cont. on Sheet 7
By E. Jaly Checked E. Esmaili 4/11/84 Approved _____
Title Site Boundary Dose Due to Release of Post-Accident Sampling Materials

Notes continued

3. Divide the Column 4 numbers by the 15 minutes (900 sec.) release period to obtain the release rate of Column 5.
4. Multiply the Column 5 number by the dispersion factor (χ/Q) shown in previous sheet, to obtain column 6 numbers — concentration at site boundary
5. Columns 7 & 8 are the results of multiply the Column 6 numbers by the two kind of dose conversion factors, Gamma-body and Beta-skin, from Reg. Guide 1.109, Table B-1, for a dose receiving period of 15 minutes. The Table B-1 is included as the next sheet of this Calc.

Calc # 1533.013

sheet 7

3731-06

checker E E. 4/11/84

TABLE B-1

DOSE FACTORS FOR EXPOSURE TO A SEMI-INFINITE CLOUD OF NOBLE GASES

Nuclide	β-air* (DF_i^β)	β-Skin** (DFS_i)	γ-Air* (DF_i^γ)	γ-Body** (DFB_i)
Kr-83m	2.88E-04***	---	1.93E-05	7.56E-08
Kr-85m	1.97E-03	1.46E-03	1.23E-03	1.17E-03
Kr-85	1.95E-03	1.34E-03	1.72E-05	1.61E-05
Kr-87	1.03E-02	9.73E-03	6.17E-03	5.92E-03
Kr-88	2.93E-03	2.37E-03	1.52E-02	1.47E-02
Kr-89	1.06E-02	1.01E-02	1.73E-02	1.66E-02
Kr-90	7.83E-03	7.29E-03	1.63E-02	1.56E-02
Xe-131m	1.11E-03	4.76E-04	1.56E-04	9.15E-05
Xe-133m	1.43E-03	9.94E-04	3.27E-04	2.51E-04
Xe-133	1.05E-03	3.06E-04	3.53E-04	2.94E-04
Xe-135m	7.39E-04	7.11E-04	3.36E-03	3.12E-03
Xe-135	2.46E-03	1.86E-03	1.92E-03	1.81E-03
Xe-137	1.27E-02	1.22E-02	1.51E-03	1.42E-03
Xe-138	4.75E-03	4.13E-03	9.21E-03	8.83E-03
Ar-41	3.28E-03	2.69E-03	9.30E-03	8.84E-03

* $\frac{\text{mrad-m}^3}{\text{pCi-yr}}$

** $\frac{\text{mrem-m}^3}{\text{pCi-yr}}$

*** 2.88E-04 = 2.88×10^{-4}

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W.O. No. 3731-06 Date 3/24/84 Book No. _____ Page No. _____
Drawing No. _____ Calc. No. 15.33.01 Sheet 8 Cont. on Sheet 9
By C. Fei Checked E. Esmaili 4/11/84 Approved _____
Title Gale Secondary Loss, due to Release of Post-Accident Sampling Materials

Table 2 Liquid Sample, Thyroid Inhalation Dose

Column 1 Nuclide	2 Half life	3 Peach Bottom 2/3 Primary Coolant Curies/gm	4 Oyster Creek Liquid Sample μCi/10 ml	5 Release Rate to Environ Ci/sec	6 Concentration at Int. Boundary Ci/m³	7 Thyroid Dose mRad
I-130	12.4h	.0062	.0474	5.27(-5)	1.32(-7)	6.50(-3)
I-131	8.04d	.162	1.24	1.38(-3)	3.45(-6)	1.77(-0)
I-132	2.29h	.236	1.81	2.01(-3)	5.03(-6)	9.34(-2)
I-133	20.8h	.332	2.54	2.82(-3)	7.05(-6)	9.79(-1)
I-134	52.6m	.262	2.00	2.22(-3)	5.55(-6)	4.82(-2)
I-135	6.56h	.288	2.20	2.44(-3)	6.10(-6)	2.63(-1)
					Σ	3.16 mR/

900 sec × 3.16 mR/sec = 2.84 Rem

Note

1. Columns 1 to 6, obtained same way as for noble gases
2. Column 7 numbers = (Column 6 numbers) × (Breathing rate) × (Dose Conversion factor)

   Breathing rate = 3.47×10^{-4} m³/sec, Sec Reg Guide 1.3

   Dose conversion factor (From Reg Guide 1.25):

I-131	1.48×10^6	Rad/Curie Inhaled
-132	5.35×10^4	" "
-133	4.0×10^5	" "
-134	2.5×10^4	" "
-135	1.24×10^5	" "
-130	1.62×10^5	" "

3. The iodines are the dominating contributor of Thyroid inhalation dose.
4. Use of HEPA filter unit can reduce the thyroid dose by 5%, since only 5% of iodines are particulates. HEPA has no effect on Noble gas

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W.O. No. 3731-06 Date 3/26/84 Book No. _____ Page No. _____
Drawing No. _____ Calc. No. 1533.01 Sheet 9 Cont. on Sheet 10
By [illegible] Checked E. Esmaili 4/11/84 Approved _____
Title Site Boundary Dose due to Release of Post-Accident Sampling Gaseous

Table 3 Gaseous Sample, Whole Body Dose

Column 1	2	3	4	5	6	7	8
Nuclide	Half Life	Peach-Bottom 2/3 Drywell & Torus Atmos Curie/cc	Oyster Creek Gas Sample Ci/10 ml	Release Rate To Environ Ci/sec	Concentration at Site Boundary Ci/m³	Dose in 15 Mins γ-Body mr	Dose in 15 Mins β-Skin mr
Kr-83m	1.86 h	.00116	.00674	7.49(-6)	1.87(-8)	4.03(-9)	—
Kr-85	10.7 Y	.00312	.00697	7.74(-7)	1.94(-9)	8.91(-7)	7.41(-
Kr-85m	4.48 h	.00224	.0130	1.44(-5)	3.6(-8)	1.20(-3)	1.5(-3
Kr-87	76 m	.00290	.0168	1.87(-5)	4.68(-8)	7.90(-3)	1.30(-
Kr-88	2.8 h	.00548	.0318	3.53(-5)	8.83(-8)	3.70(-2)	5.97(-
Xe-131m	12 d	.00006	.00349	3.88(-7)	9.70(-10)	2.53(-6)	1.32(-
Xe-133	5.29 d	.0212	.123	1.37(-4)	3.43(-7)	2.88(-3)	2.99(-
Xe-133m	2.23 d	.00388	.00571	5.68(-6)	1.42(-8)	1.02(-4)	4.03(-
Xe-135	9.17 h	.00394	.0229	2.54(-5)	6.35(-8)	3.28(-3)	3.37(-
Xe-135m	15.3 m	.00280	.0163	1.81(-5)	4.53(-8)	4.03(-3)	9.19(-
Xe-138	14.2 m	.00395	.0542	6.13(-6)	1.53(-8)	3.55(-3)	1.80(-
						6.025(-2)	3.004(-

Total 0.0903 mr

Note Same notes for liquid sample applicable to this sheet.

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W.O. No. 3731-06 Date 3/26/84 Book No. _____ Page No. _____
Drawing No. _____ Calc. No. 15.3.313 Sheet 16 Cont. on Sheet 17
By C. Teh Checked E. Esmail 4/11/84 Approved _____
Title Site Boundary Dose due to Release of Post-Accident Sampling Materials

Table 4 Gaseous Sample, Thyroid Inhalation Dose

Column 1	2	3	4	5	6	7
Nuclide	Half Life	Peach Bottom 2/3 Drywell + Torus Atmos., Curies/cc	Oyster Creek gas Sample Ci/10 ml	Release Rate to Environ, Ci/sec	Concentration at Site Boundary, Ci/m³	Thyroid Dose mr/sec
I-130	12.4h	0.0001	0.000581	6.46(-7)	1.61(-9)	7.93(-5)
I-131	8.04d	0.00251	0.0146	1.62(-5)	4.05(-8)	2.08(-2)
I-132	2.29h	0.00366	0.0213	2.37(-5)	5.92(-8)	1.10(-3)
I-133	20.8h	0.00518	0.0301	3.34(-5)	8.35(-8)	1.16(-2)
I-134	52.6m	0.00407	0.0236	2.62(-5)	6.55(-8)	5.68(-4)
I-135	6.56h	0.00448	0.0260	2.89(-5)	7.22(-8)	3.11(-3)
						3.72(-2) mr/

$900 \text{ sec} \times 3.72 \times 10^{-2} \text{ mr/} = 33.5 \text{ mr}$

Note For Column 1 to 6, See Notice to Liquid Sample (whole body dose) in sheet
For Column 7, see notes to Liquid Sample (Thyroid dose) in sheet.

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W.O. No. 3731-06 Date 3/26/84 Book No. _____ Page No. _____
Drawing No. _____ Calc. No. 15.3.3.013 Sheet 11 Cont. on Sheet 11
By C. Jain Checked E Esmaili 4/11/84 Approved _____
Title Site Boundary Dose due to Release of Part-4 accident samples & Maintenance

Table 5

The site Boundary Dose during the 15-minute Release Period

	Liquid Sample (10 ml)	Gaseous Sample (10 ml)	10 CFR 10 Limits
Whole Body Dose (gamma total Body + Beta Skin)	3.82 milli-Rem	0.0903 milli-Rem	25 Rem
Thyroid Inhalation Dose	2.84 Rem	33.5 Milli-Rem	300 Rem

The sample spilling doses are a miniscule fraction of the 10CFR-100 dose limits, without dilution of sample source terms based on Peach Bottom 2/3 source data. Therefore no dilution is necessary

Note The population center radius doses will even be smaller since the accidental release period is the same as the site boundary case (15 minutes), but the distance of population center radius is larger.