

QUALITY ASSURANCE DOCUMENT

SMEAR SURVEY - SHIPPING PACKAGES  
CONTAINING RADIOACTIVE MATERIAL

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SMEAR SURVEY - SHIPPING PACKAGES  
CONTAINING RADIOACTIVE MATERIAL

1. Scope

1.1 This document describes procedures for the collection, counting, and documentation of nuclear radiation smear surveys taken on all shipping packages containing radioactive material arriving or leaving Battelle Columbus Laboratories (PCL).

2. Purpose

2.1 Smear surveys are taken on the external surfaces of all shipping containers to detect, measure and document non-fixed radioactive contamination to assure compliance with the Code of Federal Regulations and prevent the spread of radioactive contamination by removing detected contamination in excess of standard NS-MS-30.

3. References

- 3.1 NS-MS-30 - Standard for Non-Fixed Radioactive Contamination on External Surfaces of Shipping Containers.
- 3.2 NS-NS-18 - Smear Surveys Collection, Counting and Documentation.
- 3.3 10 CFR 20.205 - Procedures for Picking up, Receiving and Opening Packages. (See Appendix A)

4. Equipment

4.1 Use applicable equipment as listed in NS-NS-18, Section 4. (Appendix B)

5. Requirements

5.1 All shipping packages arriving at, or leaving BCL shall be smeared for non-fixed radioactive contamination.

5.2 This survey shall occur at the following times:

5.2.1 Within three (3) hours of receipt if received during normal working hours, or within eighteen (18) hours if received after normal working hours.

5.2.2 Immediately prior to its release to the intended carrier, except for conditions stated in 5.2.2.1.

5.2.2.1 If the packages intended for shipment have been smeared and documented before the intended shipping date and were immediately quarantined in a designated controlled storage area, the conditions of 5.2.2 will be considered to have been met.

## 6. Procedures

### 6.1 Smear Collection

6.1.1 Using 4.25-cm diameter circle of Whatman No. 2 filter paper, or its equivalent, wipe an area of approximately 300 sq. cm. (about the area of 1/2 of this page) using uniform pressure.

6.1.2 Take a sufficient number of smears from random locations on the package to yield a representative assessment of the contamination situation.

6.1.3 In addition, take smears from areas of high probability for radioactive contamination.

6.1.3.1 In the case of shipping casks or related packages, these areas shall be, but are not limited to, cover seals, vent holes, drain plugs and recessed corners.

### 6.2 Smear Counting

6.2.1 Verify proper function of the selected counting instrument

using the counting standards located near by, and for verification beyond this daily operational check, if it appears necessary for any reason (power failure, loss of counting gas, or other malfunction, for example).

6.2.1.1 Efficiency checks shall be performed and documented according to the schedule listed in Appendix B. In addition, take a background count for one minute to check for possible counter contamination since laboratory technicians also use certain counters for counting contaminated smears.

6.2.2 Count each smear sample for one minute for alpha and/or beta-gamma as appropriate.

### 6.3 Documentation

6.3.1 Document the resultant smear survey data using form HPS-S1-73 (Appendix C).

## 7. Follow-Up Action

### 7.1 Package Receiving

7.1.1 10 CFR 20.205 states if any smear exceeds 22,000 dpm/100cm<sup>2</sup>, on packages containing material in excess of Type A quantities, the receiver shall immediately notify the final delivering carrier and, by telephone and telegraph, mailgram, or facsimile, the appropriate Nuclear Regulatory Commission Inspection and Enforcement Regional Office.

7.1.2 If the conditions specified in 7.1.1 occur, the responsibility of such notification shall rest with the Manager of Nuclear Services or his designee.

### 7.2 Package Shipping

7.2.1 If any smear reveals radioactive contamination in excess of the BCL imposed limits of NS-MS-30, decontaminate the contaminated area and re-smear to assure compliance with NS-MS-30.

7.2.2 If subsequent smears reveal that contamination cannot be removed by standard decontaminating procedures, consult the cognizant supervisory personnel and take corrective action in accordance with the supervisors instructions.

APPENDIX A

Sections from 10 CFR

§ 20.205 Procedures for picking up, receiving, and opening packages.

(a) (1) Each licensee who expects to receive a package containing quantities of radioactive material in excess of the Type A quantities specified in paragraph (b) of this section shall:

(i) If the package is to be delivered to the licensee's facility by the carrier, make arrangements to receive the package when it is offered for delivery by the carrier; or

(ii) If the package is to be picked up by the licensee at the carrier's terminal, make arrangements to receive notification from the carrier of the arrival of the package, at the time of arrival.

(2) Each licensee who picks up a package of radioactive material from a carrier's terminal shall pick up the package expeditiously upon receipt of notification from the carrier of its arrival.

(b) (1) Each licensee, upon receipt of a package of radioactive material, shall monitor the external surfaces of the package for radioactive contamination caused by leakage of the radioactive contents, except:

(i) Packages containing no more than the exempt quantity specified in the table in this paragraph;

(ii) Packages containing no more than 10 millicuries of radioactive material consisting solely of tritium, carbon-14, sulfur-35, or iodine-125;

(iii) Packages containing only radioactive material as gases or in special form;

(iv) Packages containing only radioactive material in other than liquid form (including Mo-99/Tc-99m generators) and not exceeding the Type A quantity limit specified in the table in this paragraph; and

(v) Packages containing only radionuclides with half-lives of less than 30

days and a total quantity of no more than 100 millicuries.

The monitoring shall be performed as soon as practicable after receipt, but no later than three hours after the package is received at the licensee's facility if received during the licensee's normal working hours, or eighteen hours if received after normal working hours.

(2) If removable radioactive contamination in excess of 0.01 microcuries (22,000 disintegrations per minute) per 100 square centimeters of package surface is found on the external surfaces of the package, the licensee shall immediately notify the final delivering carrier and, by telephone and telegraph, mailgram, or facsimile, the appropriate Nuclear Regulatory Commission Inspection and Enforcement Regional Office shown in Appendix D.

TABLE OF EXEMPT AND TYPE A QUANTITIES

Transport group <sup>1</sup>	Exempt quantity limit (in millicuries)	Type A quantity limit (in curies)
I.....	.01	0.001
II.....	0.1	0.050
III.....	1	3
IV.....	.1	30
V.....	1	30
VI.....	1	1000
VII.....	25,000	1000
Special Form.....	1	20

(c) (1) Each licensee, upon receipt of a package containing quantities of radioactive material in excess of the Type A quantities specified in paragraph (b) of this section, other than those transported by exclusive use vehicle, shall monitor the radiation levels external to the package. The package shall be monitored as soon as practicable after receipt, but no later than three hours after the package is received at the licensee's facility if received during the licensee's normal working hours, or 18 hours if received after normal working hours.

(2) If radiation levels are found on the external surface of the package in excess of 200 millirem per hour, or at three feet from the external surface of the package in excess of 10 millirem per hour,

the licensee shall immediately notify by telephone and telegraph, mailgram, or facsimile, the director of the appropriate NRC Regional Office listed in Appendix D, and the final delivering carrier.

(d) Each licensee shall establish and maintain procedures for safely opening packages in which licensed material is received, and shall assure that such procedures are followed and that due consideration is given to special instructions for the type of package being opened.

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APPENDIX B

Nuclear Sciences Area Counting Instruments

<u>Location</u>	<u>Description</u>	<u><math>^{239}\text{Pu}</math> eff.</u>	<u><math>^{90}\text{Sr}</math> eff.</u>	<u>Other eff.</u>	<u>Eff. Check Frequency</u>
JN-1A HP Office	Beckman-Lo-Beta Automatic Alpha and Beta-Gamma Gas Flow Proportional Counter	~26%	~46%		Weekly
JN-1A HP Office	NMC-PC-11T Manual Simultaneous Alpha and Beta-Gamma Gas Flow Proportional Counter	~18%	~40%		Weekly
1B Operating Area	NMC-Hybrid Alpha and Beta-Gamma Gas Flow Proportional Counter	~19	~35		Weekly
JN-2 25 Area	BCL Design Solid State Alpha and Pancake GM Beta-Gamma Counter	~38%	~23%	~15% ( $\text{U}_3\text{O}_8$ )	Weekly
JN-3 Pu Lab Storage Area	BMI-1 Solid State Alpha Counter	~13%			Daily
JN-3 Room 3212	BMI-1 Solid State Counter	~13%			Daily
JN-3 Environmental Count Room 3219	NMC PC-3B Alpha and Beta- Gamma Gas Flow Proportional Counter	~37%	~59%		Weekly
JN-3 Emergency Control Center	NMC-Hybrid PCC-10A Gas Flow Proportional Counter	~36% Top in ~21% top out	~61% Top in ~43% Top out		Weekly

BATTELLE-COLUMBUS LABORATORIES

HEALTH PHYSICS SERVICES

SMEAR SURVEY REPORT

Building \_\_\_\_\_ Date \_\_\_\_\_ Area \_\_\_\_\_

Surveyor \_\_\_\_\_ Nature of Suspected Activity \_\_\_\_\_

Counted with  Solid State Alpha-1  Scintillation Detector  Gas Proportional Detector

Give exact location either by writing, attached floor plan, or sketch on back of this form.

Results of Survey

Efficiency of Detector:  $\alpha$  \_\_\_\_\_ By \_\_\_\_\_

Counted by \_\_\_\_\_

Background of Detector:  $\alpha$  \_\_\_\_\_ By \_\_\_\_\_

Date \_\_\_\_\_

Action Limits:  $\alpha$  \_\_\_\_\_ cpm,  $\beta\gamma$  \_\_\_\_\_ cpm

Action Limits:  $\alpha$  \_\_\_\_\_ dpm,  $\beta\gamma$  \_\_\_\_\_ dpm

Location	Alpha				Beta Gamma			
	Ctg. Time	c/m Gross	c/m Net	d/m/ <sup>2</sup> 100 cm	Ctg. Time	c/m Gross	c/m Net	d/m/ <sup>2</sup> 100 cm



Location	Ctg. Time	Alpha			Beta Gamma			d 10
		c/m Gross	c/m Net	d/m/ 2 100 cm	Ctg. Time	c/m Gross	c/m Net	

Sketch survey area here:



Remarks by Surveyor \_\_\_\_\_

Remarks by Counter Operator \_\_\_\_\_

Remarks by Health Physicist \_\_\_\_\_