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December 20, 2004
NE04 - 1201

Judith Joustra
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Nuclear Materials Safety Branch 2
Division of Nuclear Materials Safety
U.S. Nuclear Regulatory Commission, Region 1

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J-8

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Subject: Docket No. 03030941
Control No. 135198
License No. 37-28329-01

Dear Ms. Joustra,

This is in reference to your letter dated October 05, 2004 requesting additional information for License No. 37-28329-01 renewal application. A response to each item is addressed in the body of this letter and/or attached to this letter.

1. Regarding item 1. of your letter, Procedure AD-2.02 has been changed reflecting the release criteria for volumetrically contaminated materials with radioactivity above environmental background will be disposed of in accordance with 10 CFR 20.2001.
2. Additionally the erroneously referenced section E.4 in procedure AD-2.02 has been corrected to section E.2 which provides airborne radioactivity levels.

Additional changes were made to the referenced procedure to further clarify or correct references which were identified during the Philotechnics review process. A copy of this procedure is provided for your reference.

3. In response identifying an incorrect method of estimating isotopic activities when the particle emission yield is less than one. The impact of the calculation difference on compliance was evaluated for release records over the past four years (2000-2004). Releases were found to meet the monthly average release limits for discharges to sewers.

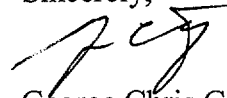
Releases were evaluated by sorting releases by client, by laundry stream for clients with more than one laundry stream, and by gross beta and gross alpha activity. The releases with the greatest gross beta and gross alpha activity were identified in this manner for each client and laundry stream. Releases with the greatest activity were then evaluated as upper bound cases for each combination of client, laundry stream,

and type of activity (i.e., alpha and beta) using the proper correction for isotope yield. A sum of fractions calculation was performed to demonstrate the releases met the monthly average limit for release to sewers.

As part of this evaluation, the proportion of laundry discharge volume to total facility discharge was also examined. It was determined that laundry water usage is approximately 55% of the total facility water utilization. All facility drains flow to a single common discharge point. Therefore there is an additional margin of compliance of approximately 1.8 since compliance calculations were made on individual batches of laundry water without consideration of additional dilution provided by effluents from non-laundry sources.

Further steps are being taken to prepare a new database incorporating the corrections into our database as well as appropriate changes to procedure RM-4.11.

Sincerely,



George Chris Getty
Radiation Safety Officer/Manager
Philotechnics Ltd

Cc: William Button Vice President

Philotechnics, Ltd.

RADIOLOGICAL CONTROLS PROGRAM

PROCEDURE NO.: AD-2.02

Rev. 1

October 2004

Prepared By: Chris Getty Date: 10/19/04
Technical Approval: *A. J. Rehner* Date: 11/4/04
Quality Assurance Review: *James W. Thurston* Date: 11/11/04
Radiation Safety Officer Approval: *FCJ* Date: 11/22/04

Revision Summary

Revision Number	Description of Change	Pages Affected
0	Change document number from PA05 to AD-2.02; Apply formatting in accordance with AD-1.01; Add annual review sheet; Delete section H and emergency call sequence.	All
1	Replace references to 10 CFR 71 to 49 CFR 173 to better reflect transportation requirements. Clarify probe size used. Change release criteria to reflect that volumetrically contaminated materials with radioactivity above environmental background will be disposed of in accordance with 10 CFR 20.2001	6 & 9, 8, 10,

ANNUAL REVIEW STATUS

Name	Date	Status	Changes
		<input type="checkbox"/> Accept <input type="checkbox"/> Change	
		<input type="checkbox"/> Accept <input type="checkbox"/> Change	
		<input type="checkbox"/> Accept <input type="checkbox"/> Change	
		<input type="checkbox"/> Accept <input type="checkbox"/> Change	

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A. OVERVIEW

This procedure outlines the Radiological Controls Program which Philotechnics shall implement in the performance of routine operations by Radiological Control Personnel. These operations, which are required by 10 CFR 20.1501, include:

- Radiation Surveys
- Contamination Surveys
- Environmental Monitoring
- Air Sampling or Continuous Air Monitoring

B. PERSONNEL REQUIREMENTS

1. All personnel who handle radioactive material and enter CSCA's and radiation areas shall, as a minimum, be qualified as Radiation Workers (RW).
2. Personnel who monitor laundered clothing shall be qualified as Clean Monitors.
3. Radiological Control Personnel (RCT) and Radiological Monitors (RM), shall be responsible for conducting surveys and air monitoring specified by this procedure. RCT's shall support work crews and ensure the radiological safety of these workers.

C. RADIATION SURVEYS

1. Survey Techniques
 - a. Radiation surveys are conducted with an Eberline E-520/HP-270 beta-gamma detection instrument or equivalent. (i.e., ESP-1/HP-270, RO-2, etc.)
 - b. General area radiation surveys are performed by scanning slowly from side to side, with the detector held at approximately waist level, and occasionally held above the head and below the waist, noting the highest reading obtained. If the reading is significantly higher than the waist level reading, record this on the survey map, noting location of highest reading. Unless noted as such, general area surveys are normally recorded as waist level, with window closed.
 - c. Contact radiation surveys are performed by moving the detector to a distance of within 1/2 inch of the source. Gamma readings and locations

will be recorded on the survey map. Beta radiation may be detected by taking readings with both open window and closed window, and then comparing the readings. A noticeable difference would indicate the presence of beta. More accurate readings should then be made using the RO-2, etc. The beta readings, when present, will be recorded separately on the survey map.

- d. Neutron radiation surveys are not required for work at the Clairton Facility.

2. Survey Frequencies

Radiation surveys are performed as necessary to ensure personnel do not exceed radiation exposure limits and to meet requirements for posting radiation areas. These surveys are performed to determine whether abnormal radiation levels exist and to determine the extent and magnitude of radiation levels. The following surveys shall be the minimum performed:

- a. Radiation surveys shall be performed to control radiation exposure whenever operations are performed that might be expected to change existing radiation levels. Examples of such operations include accumulation of waste, movement or removal of temporary shielding, and relocation of highly radioactive materials.
- b. Temporary boundaries (e.g., rope boundaries) of radiation areas shall be surveyed daily to ensure radiation areas do not extend beyond posted boundaries.
- c. Gamma surveys shall be performed at least weekly in occupied posted radiation areas and high radiation areas, in all occupied areas of radiological facilities, and in radioactive material storage areas.
- d. Beta-gamma surveys of ventilation filters shall be performed whenever work is performed on these filters.
- e. Other surveys shall be performed in order to control personnel exposure to gamma and beta radiation. Such surveys shall include:
 - Gamma survey during initial entry into an enclosed space containing potentially radioactive piping;

- Gamma surveys in spaces where significant radiation levels might exist from an adjacent operation; and
 - Beta, as well as gamma, (use of open window G-M detectors is acceptable) measurements when personnel might come in contact with contaminated surfaces.
- f. Surveys shall be conducted when performing operations which could result in personnel being exposed to small intense beams of radiation. These operations include removing shielding, opening shipping/storage containers of radioactive equipment, etc. When surveying areas or equipment where intense small beams of radiation could be present, the instrument shall be used with an audible response. An audible response is necessary since the visible meter response is usually considerably slower. The detector shall be moved slowly enough so that the instrument has a chance to give an audible increase for a large radiation level increase. If an audible increase is noted, the detector shall be moved to the location producing maximum response and the meter read. If general dose rates are high, such that a change in audible response is not detectable, slower surveys must be performed so that beams will be detectable by observing the meter. The speed of moving the detector is determined by considering the size of the detector, the instrument response time, the possible intensity of the beam, and the general dose rates in the area. Particular attention shall be given to thoroughly scanning suspected areas, such as portable shield sections and areas which are or are likely to be occupied. For equipment with complex shield design, surveyors shall be briefed on the equipment design so that areas most likely to have small beams can be given special attention.
- g. Radiation surveys shall be performed on all packages being shipped from or received by Philotechnics to verify that radiation levels do not exceed those found in 49 CFR 173.441.
- h. Radiation surveys shall be performed in order to assess the extent and magnitude of a radiation condition in the event of an accident which might cause abnormal radiation levels.
- i. Radiation surveys may also be required as called for in Radiological Work Procedures or Permits.

D. CONTAMINATION SURVEYS**1. Basic Survey Techniques**

- a. Direct probe contamination surveys shall be sufficient if the surface is accessible by probe and if indicated readings are less than the limits provided in D.2.b and D.3.b.
- b. If contamination is indicated during a direct probe survey, swipes shall also be taken to determine if activity is loose.
- c. If a potentially contaminated surface is inaccessible by probe, swipes should still be taken of the inaccessible surface, if possible.
- d. If the beta-gamma radiation level is greater than 0.1 mr/hr, low levels of fixed beta-gamma contamination may not be readily discernable, but swipes shall still be taken to determine loose activity levels.
- e. Dry swipes shall be made over an area of 100 cm² wherever possible. If size or shape of an object does not allow the standard 100 cm² swipe, then a swipe of optimum size shall be made, and this reading shall be noted as pCi/swipe.
- f. Swipes should be taken to areas of low background for counting to facilitate counting accuracy and to minimize personnel exposure.
- g. Swipes must be kept under the control of Radiological Control Personnel. Clean swipes shall be placed in clean waste; contaminated swipes shall be disposed of as radioactive waste.
- h. Areas where loose surface contamination exceeds the limits in D.2.b and D.3.b shall be designated as CSCA until such surfaces are adequately decontaminated or covered.
- i. Loose contamination above limits found in other than radiological restricted areas shall require implementation of **SPILL ACTIONS** as described in Section J.

2. Beta-Gamma Survey Techniques

- a. Contamination surveys are conducted with an Eberline E-140N/HP-210 beta-gamma detection instrument or equivalent. (i.e., ESP-1/HP-210, E-120/HP-260, etc.)
- b. The loose beta-gamma contamination limit for non-radiological controlled areas is <450 pCi/100 cm². The fixed contamination limit for non-radiological controlled areas is <450 pCi/probe (based upon 20 cm² probe area) above background.
- c. All beta-gamma contamination survey results shall be reported as equivalent Cs-137 based on calibration sources.
- d. Contamination surveys are performed by slowly scanning the surface with the detector within 1/2 inch of the surface. If the background is <100 CPM, this scanning rate shall not exceed 2 inches/second. If the background is between 200 and 300 CPM, this scanning rate shall not exceed 1 inch/second. If the background is >300 CPM or if readings above the limit in Step D.2.b are found, then swipes shall be used to determine the levels of loose activity.

3. Alpha Contamination Survey Techniques

- a. Alpha contamination surveys are conducted with a Ludlum Model 3, using a Ludlum Model 43-5 alpha scintillation detector or equivalent. (i.e., ESP-1/AC 3-7, Model 18/43-1, etc.)
- b. The loose contamination limit for a non-radiological controlled area is <50 pCi/100 cm². The fixed contamination limit is <50 pCi/probe.
- c. All alpha contamination survey results shall be reported as equivalent Th-230, based on calibration sources.
- d. Because of the lower allowable limits for alpha contamination, special survey techniques are required. The detector shall be held within 1/4 inch from surface for a period of 5 seconds. If any counts are detected, using the audible function of the instrument, the detector must be held for an additional 10 seconds; if a second count is detected during this period, counting must be performed for a full 60 seconds. When counting is completed, the detector may be moved to another location for counting,

scanning between points at a rate of 1 inch/second. If readings above the limit of D.3.b are found, then swipes shall be used to determine the levels of loose activity.

4. Survey frequencies
 - a. Surveys shall be performed at least every shift in the vicinity of contamination control points when in use.
 - b. Surveys shall be performed at least daily in occupied areas surrounding Controlled Surface Contamination Areas, and particularly in the vicinity of exits from CSCA. Surveys shall be performed at least daily in occupied CSCA.
 - c. Surveys shall be performed weekly in all radioactive material storage areas.
 - d. Surveys shall be performed monthly on a revolving basis in work and storage areas of the facility where radioactive materials are not stored or worked on.
 - e. Surveys shall be performed upon initial entry into an enclosed space containing potentially radioactive piping.
 - f. Contamination surveys shall be taken in plena downstream of high efficiency particulate air filters during routine filter replacement or at least annually.
 - g. Surveys shall be performed on all material being removed from Controlled Surface Contamination Areas.
 - h. Contamination surveys shall be performed on all packages being shipped from or received by Philotechnics to verify that contamination levels do not exceed those found in 49 CFR 173.443.
 - i. Surveys shall be performed during decontamination of equipment or area surfaces.
 - j. Surveys shall be performed where spills or airborne casualties have occurred in order to determine Anti-C requirements and the adequacy of CSCA boundaries.

- k. Contamination surveys may be required as called for in radiological work procedures or permits.

5. Personnel Frisking

- a. All personnel shall frisk or be frisked for contamination prior to leaving any radiological controlled area. This consists normally of a whole body frisk for both alpha and beta-gamma contamination. Frisking of only hand and feet shall **NOT** satisfy this requirement.
- b. Visitors and other personnel who are not qualified Radiation Workers or Clean Monitors shall be frisked by Radiological Control Personnel.
- c. Contamination limits as given in D.2.b and D.3.b shall apply during frisking of personnel. Swipes shall **NOT** be made on personnel.
- d. Low background frisking areas should be established to facilitate counting accuracy and to minimize personnel exposure. Scanning rates as given in Step D.2.d and D.3.d shall apply during frisking of personnel. If low background frisking areas are not readily available, an extended CSCA may be provided for personnel to follow to reach an area with lower background.
- e. Personnel contamination above the limits of D.2.b or D.3.b shall require immediate notification of Radiological Control Personnel. Records of personnel contamination shall be kept in the individual's exposure record

6. Release of Items or Areas for Uncontrolled Use.

Potentially contaminated items or areas shall meet the following criteria prior to release for Uncontrolled Use.

- a. Potentially contaminated items or areas shall meet the criteria of Attachment 1 prior to release for Uncontrolled Use.
- b. Easily divisible solid material such as soil, dried sludge, etc., that contain measurable radioactivity above environmental background will not be released and will be disposed of as licensed material.

E. ROUTINE AIR SAMPLING

1. Sampling Frequencies

- a. Personnel air monitoring surveys shall be performed any time personnel are required to wear a respirator. Additionally, the RSO may require that personnel wear air-monitoring equipment for quality assurance purposes.
- b. General area monitoring shall be performed routinely, (at least once a month), to ensure that engineering controls in place in the sorting room are functioning properly.
- c. Before initially entering tanks or voids containing potentially radioactive piping.
- d. Whenever airborne radioactive levels above the applicable limits are suspected.
- e. Air monitoring may be required as called for in radiological work procedures or permits.

2. Applicable Concentration Limits

- a. The airborne concentration values provided in 10 CFR 20 Appendix B, Table II, Column 1, will apply if airborne radioactivity which is not naturally occurring is identified.
- b. If the specific isotope of concern is not known, then the isotope with the most restrictive concentration limit of all present isotopes shall be used for field counting purposes.
 - For beta-gamma emitters in the CSCA, Strontium 90 is normally the most restrictive isotope.
 - For alpha emitters in the CSCA, Thorium 232, if present, may be the most restrictive isotope. Note that the presence of transuranic isotopes may change this, if noted on receipt documents.
- b. Investigation shall be made as to the cause and possible corrective actions for airborne radioactivity which is found to exceed the applicable concentration limit.

3. Controlling Exposure to Airborne Activity

- a. Containments, ventilation, and other engineering controls will be used whenever practical.
- b. Air purifying respirators will not normally be used, but will be available for emergency use whenever the limits of E.2 are exceeded.
- c. When work is in progress which could cause airborne radioactivity, such work areas shall be provided with HEPA filtered exhaust system. Areas such as containment tents, glove boxes, and work benches with hoods shall always provide for negative air flow rates in order to maintain the airflow away from the worker.

F. ENVIRONMENTAL MONITORING

1. Air Sampling Techniques

- a. Environmental air sampling shall consist of a fixed filter isokinetic sample probe installed in the exhaust duct of a HEPA filtered ventilation system.
- b. Samples shall normally be changed monthly, although samples may be changed more frequently as instructed by the RSO.
- c. Great care shall be taken to avoid contamination of the filter or probe while servicing the filter for use. Such contamination would be falsely interpreted as an environmental discharge.
- d. The elapsed operating time shall be recorded when samples are removed in order to calculate the discharge volume based on exhaust flow rates as well as to calculate the sample volume based on the flow rate of the sampling pump.

2. Radiation Monitoring Techniques

- a. Environmental radiation levels shall be monitored by performing a monthly radiation survey at the outer perimeter of the radiological controlled area and all other areas containing radioactive materials.
- b. These surveys are conducted with a Ludlum Model 12S or equivalent (i.e., Model 19, ESP-1/SPA-3, etc.)

- b. These surveys are conducted with a Ludlum Model 12S or equivalent (i.e., Model 19, ESP-1/SPA-3, etc.)
 - c. Environmental surveys are performed by scanning slowly along the outer perimeter of the overall area, with the instrument held at approximately waist level, and occasionally held above the head and below the waist, noting the highest reading obtained as measured in uR/hr. If the reading is significantly higher than the waist level reading, record this on the survey map, noting the location of the highest reading. Unless noted as such, environmental radiation surveys are recorded as waist level.
 - d. In addition to the routine surveys described above, area environmental TLD badges shall also be located at the outer perimeter of the restricted area.
3. Discharge Water Monitoring Techniques
- a. Used water shall pass through a series of increasingly fine filters in order to effectively remove insoluble material prior to sampling for discharge. A water sample shall be obtained from each final holding tank after this filtering and analyzed prior to authorization by the RSO for discharge of that batch of water to the sanitary sewerage.
 - b. Water samples may also be obtained from the initial holding tank, prior to filtration, for comparison with the final samples in order to determine the effectiveness of the filtration system.
 - c. If water has been sampled and the need for additional treatment prior to discharge is indicated, additional samples shall be taken after treatment and prior to authorization by the RSO for discharge of that batch of water to the sanitary sewerage.
 - d. Water samples from the intake (city) water shall be taken at least monthly when in operation in order to determine the natural background levels of radioactivity in the water being used.
 - e. Water samples shall normally consist of a 500 ml sample taken representatively from the source. A 50 ml sample is drawn off the larger container into a beaker or flask after thorough mixing. The 50 ml is then gently evaporated to 5 ml and transferred to a planchet along with a few ml of clean water used to wash the beaker, assuring transfer of the entire

sample. The sample on the planchet is then evaporated to dryness before counting in the laboratory for both alpha and beta-gamma activity.

- f. A batch of water may be authorized by the RSO for discharge to the sanitary sewerage only if it meets the concentration criteria for readily soluble material of 10 CFR 20.2003 and if the total quantity of all radioactive materials combined does not exceed 0.1 times the annual limits of 10 CFR 20.2003(a)(4). The total volume of water shall be recorded along with the sample results, and date of discharge.
- g. A composite sample shall also be analyzed at least quarterly, consisting of 20 ml from each discharge sample. A part of this composite sample shall be sent to an independent laboratory for radioanalysis as a quality assurance check.

G. AREA POSTINGS

1. High Radiation Area: Accessible areas where a major portion of the body could receive a dose in excess of 100 mrem in one hour shall be designated as high radiation areas. Major portions of the body include any portion of the head and trunk. Such areas shall be posted and locked or guarded. The requirements to lock or guard a posted high radiation area does not apply to tanks or voids posted as high radiation areas if entry requires the removal of complex closures. Positive controls shall be established in each individual entry into a high radiation area and shall be established in such a way that no individual is prevented from leaving the high radiation area. Prior to locking a high radiation area, the area shall be inspected to ensure that no personnel remain inside. No loitering or entry by unauthorized personnel shall be allowed in these spaces. Signs shall contain the conventional three-bladed symbol on yellow background and the words **"CAUTION HIGH RADIATION AREA."**
2. Radiation Area: Accessible areas where a major portion of the body could receive a dose from 5 mrem to 100 mrem in one hour shall be posted as radiation areas. Major portions of the body include any portion of the head and trunk. To mark such areas, signs shall be conspicuously posted; signs shall contain the conventional three-bladed symbol on yellow background and the words **"CAUTION RADIATION AREA"**; signs are permitted to state the general area radiation level. No loitering is allowed in these areas.
3. Airborne Radioactivity Area: Areas where airborne radioactivity exists which exceeds or could exceed the Philotechnics concentrations above natural background levels as described in E.2. An area may also be posted as an

Airborne Radioactivity Area if failure of precautionary measures could result in concentrations above natural background levels in excess of those in E.4. To mark such areas, signs shall be conspicuously posted at all physical entrances to the area; signs shall contain the conventional three-bladed symbol on yellow background and the words **"CAUTION AIRBORNE RADIOACTIVITY AREA"**.

4. Radioactive Materials Area: Areas where radioactive materials other than natural activity is worked with and/or stored. Signs shall be conspicuously posted, containing the conventional three-bladed symbol on yellow background and the words **"CAUTION RADIOACTIVE MATERIALS"**.
5. Controlled Surface Contamination Area: Areas where loose surface contamination exists or could possibly exist which exceeds or could exceed the limits of D.2.b and/or D.3.b. Access to this area is physically restricted to designated control points, where all personnel or objects must be frisked prior to exit to assure that loose contamination is not spread beyond the area boundaries. Anti-Contamination clothing to some degree shall be required for entry to a CSCA. The degree of protective clothing could range from shoe covers and gloves for loose contamination levels at or near the limits of D.2.b or D.3.b to full protection (shoe covers, gloves, hood, and coverall) for greater levels of contamination. Greater levels of loose contamination can also present a risk of suspension in air and, thus, may also be considered for use of respiratory protection or other engineering controls as a precautionary measure. Aprons or plastic suits should be considered to protect against splashing if that hazard also exists. Signs shall be conspicuously posted, containing the conventional three-bladed symbol on yellow background and the words **"CAUTION CONTAMINATED AREA"** or **"CAUTION CONTROLLED SURFACE CONTAMINATION AREA"**.
6. Radiological Controlled Area: Areas where no loose surface contamination is known to exist, but where access to the area is restricted similar to the Controlled Surface Contamination Area in order to assure that loose contamination is not spread beyond the area boundaries. An RCA may also contain one or more CSCA's, providing controlled access between them. Although protective clothing is not mandatory, shoe covers and/or gloves may be specified for entry to this area. Signs shall be conspicuously posted, containing the conventional three-bladed symbol on yellow background and the words **"CAUTION, CONTROLLED AREA"** OR **"CAUTION, RADIOLOGICALLY CONTROLLED AREA"**.

H. EMERGENCY PROCEDURES

1. Depending on the extent and type of emergency, notification of any or all of the following shall be made. Specific instructions are found in Procedure ER-3.01.

Fire	(412) 233-5511 or 233-5522
Police	(412) 233-6211 or 461-2235
Ambulance	(412) 233-2000
Jefferson Hospital	(412) 469-5000
Sanitary Authority	(412) 233-3246

2. For any emergency involving radioactive materials, NRC Operations Center should also be contacted at (301) 816-5100.
3. In case of spill or other spread of contamination, including airborne radioactivity, the following procedure should be followed:
 - S** Stop the source, if possible, to prevent extensive contamination of area. Restrict discharge points such as drains, sewers, etc.
 - W** Warn others in immediate area, and make notifications as appropriate in J.1 and J.2.
 - I** Isolate the contaminated area and verify extent of the emergency. Restrict access to allow only properly attired emergency response personnel.
 - M** Minimize exposure to unnecessary personnel, especially those who are unmonitored. Obtain air samples to determine if personnel have been exposed to airborne radioactivity.
 - S** Secure all sources of unfiltered ventilation to prevent spread of airborne radioactivity by common paths such as doors, windows, ventilation systems, HVAC, etc.
4. Once the immediate emergency situation has been controlled, decontamination and recovery efforts shall begin immediately.
5. If the emergency includes a threat of personnel injury then that situation shall receive priority over other radiological conditions.
6. Emergency clothing and instruments shall be made available to all qualified emergency response personnel.

7. Philotechnics supervisory personnel shall assist outside response personnel (fire, police, medical, etc.) in order to maintain contamination and exposure control.

I. RECORDS

All original copies of records required by this procedure shall normally be completed in black ink and shall be signed by the person who performed or supervised the performance of the work as described on the report. All survey reports shall be independently reviewed by the Radiation Safety Officer or by radiological control personnel prior to final disposition and signed by the reviewer.

J. ATTACHMENTS

Attachment 1 - Acceptable Surface Contamination Levels

Attachment 1
ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES ^a	AVERAGE ^{bcf}	MAXIMUM ^{bdf}	REMOVABLE ^{bef}
U-nat, ²³⁵ U, ²³⁸ U, and associated decay products	5000 dpma/100 cm ²	15,000 dpma/100 cm ²	1000 dpma/100 cm ²
Trans-U, ²²⁶ Ra, ²²⁸ Ra, ²³⁰ Th, ²²⁸ Th, ²³¹ Pa, ²²⁷ Ac, ¹²⁵ I, ¹²⁹ I	100 DPM/100 cm ²	300 dpm/100 cm ²	20 dpm/100 cm ²
Th-nat, ²³² Th, ⁹⁰ Sr, ²²³ Ra, ²²⁴ Ra, ²³² U, ¹²⁶ I, ¹³¹ I, ¹³³ I	1000 dpm/100 cm ²	3000 dpm/100 cm ²	200 dpm/100 cm ²
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ⁹⁰ Sr and others noted above.	5000 dpmβy/100 cm ²	15,000 dpmβy/100 cm ²	1000 dpmβy/100 cm ²

^aWhere surface contamination by both α and β-γ emitting nuclides exists, the limits established for α and β-γ emitting nuclides should apply independently.

^bAs used in this table, *dpm* means the rate of emission by radioactive material as determined by correcting the cpm observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

^cMeasurements of average contaminant should not be averaged over 1 m². For objects of less surface area, the average should be derived for each such object.

^dThe maximum contamination level applies to an area of not more than 100 cm².

^eThe amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

^fThe average and maximum radiation levels associated with surface contamination resulting from β-γ emitters should not exceed 0.2 mrad/hr @ 1 cm and 1.0 mrad/hr @ 1 cm, respectively, measured through not more than 7 mg/cm² of total absorber