

**MOLYCORP, INC.**  
**SURFACE CONTAMINATION SURVEY and**  
**RELEASE PROCEDURE**

This procedure provides guidance to perform radiological surveys of potentially contaminated equipment. The objective of the procedure is the detection of surface contamination and the determination of the eligibility of equipment for unrestricted release based on the contamination survey. The types of monitoring outlined in the procedure include qualitative and quantitative measurements for contamination. Qualitative surveys are used to detect the existence of contamination, while quantitative surveys determine specific levels of contamination and the eligibility of items for unrestricted release.

Contamination of equipment occurs from the refining of lanthanide products which contained low levels of source material ( thorium, uranium, and associated decay products ). Surface contamination exists in residues, dust, and scale which may be contained in or on containers, piping, process equipment, etc. Each piece of potentially contaminated equipment will be surveyed prior to its release from the site for unrestricted use. Items which are identified through the survey as contaminated will be decontaminated, resurveyed, and released if clean or held for restricted release or disposal.

Instrumentation and Measurements Units - Portable alpha survey instruments capable of measuring counts per minute, such as the Eberline PRS-1 with an APB 100 probe, shall be used to conduct surveys for surface contamination. Calibration of the instrument shall occur on a regular frequency and be documented on the survey data log. Operational checks will be made and documented prior to the survey initiation.

Limits of contamination specified in Regulatory Guide 1.86, which is attached to this procedure, are expressed in terms of alpha activity (dpm/100cm<sup>2</sup>). Since the instrument readings are in counts per minute (cpm) conversions shall be recorded on the data log. The following equations shall be used to convert cpm to dpm/100cm<sup>2</sup> :

$$\text{dpm/100cm}^2 = \frac{(c/m - B/m)}{E} \times \frac{100}{A} \quad (\text{Surface Activity})$$

$$\text{dpm/100cm}^2 = \frac{(c - B)}{t \times E} \quad (\text{Removable Activity})$$

where:

c	Total integrated counts recorded (counts)
c/m	Total countrate (cpm)
t	Time period (minutes)
B	Background count
B/m	Background countrate
E	Instrument efficiency
A	Active surface area of the detector in cm <sup>2</sup>

Release Limits - The objective of the survey program is to determine contamination levels and to assess individual pieces of equipment's eligibility for unrestricted release. Regulatory limits for release of equipment are included in the Regulatory Guide attached to this procedure. The radionuclide associated with contamination at this site is thorium 232, therefore the regulatory limits for thorium 232, listed below, shall be used as the release criteria for survey purposes at this site.

Average Activity Limit <sup>a</sup>	1000 dpm/100cm <sup>2</sup>
Maximum Activity Limit <sup>b</sup>	3000 dpm/100cm <sup>2</sup>
Removable Activity Limit	200 dpm/100cm <sup>2</sup>

Qualitative and Quantitative Surveys - Both types of surveys will be used to detect and measure contamination existing on equipment designated for release from the site. Qualitative surveys may be used to give a general indication of contamination. Quantitative surveys will be conducted on all potentially contaminated items to demonstrate compliance with release limits. Documentation of the quantitative surveys will be retained for each item surveyed. All non-contaminated equipment and materials shall be documented as such prior to release from the site.

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<sup>a</sup> Measurements of average contamination shall not be averaged over more than one square meter. For objects of less surface area, the average shall be derived for each object.

<sup>b</sup> The maximum contamination level applies to an area of not more than 100cm<sup>2</sup>.

## Surface Contamination Survey Procedure:

### Equipment Required:

- Copy of the survey procedure
- Data Log Form
- Survey Instrument, calibrated and checked
- Wipe pads

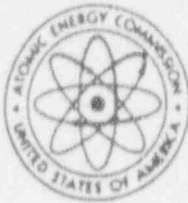
### Procedure:

1. On the log, record the following information: date of survey, survey operator, survey instrument data i.e. calibration date, efficiency, check source reading, etc.
2. During the survey, document on the log the following information: item description and identification number, measured total alpha activity (average and maximum), measured removable activity if wipe test are required, and fixed activity if calculated.
3. Measure the background alpha activity of the instrument. Typically this is 0 - 10 cpm. Investigate any discrepancy from typical background. Decontamination of the detector or repair of the instrument may be required.
4. The initial step of the survey is to measure (if practical) for total contamination. All surfaces of the item must be surveyed. This includes interior as well as exterior surfaces. Interior surfaces of piping, pumps, etc. may be determined by taking measurements at access points, provided contamination at these locations is likely to be representative of any interior contamination. Slowly sweep the item with the detector probe as close as possible to the surface and record the maximum and average activity on the data log. The maximum contamination reading applies to an area of not more than 100cm<sup>2</sup>. The average contamination reading applies to areas of not more than 1m<sup>2</sup>. Larger objects will have an average reading for each square meter, while objects smaller than one square meter will have the average reading derived from each object. Convert the measured activity to dpm/100cm<sup>2</sup>. This is the total contamination measurement. If the limits for removable, average and maximum contamination are not exceeded the equipment may be released from the site as is. If the removable limit is exceeded, but the average and maximum limits are met, the item will be swipe tested and the quantity of removable determined prior to release from the site. If the removable limit and either the average or maximum limit is exceeded, the item will be held for decontamination and resurvey.
5. Removable contamination surveys must be conducted on equipment which exceeds the limit for removable contamination. Using a wipe pad, swipe an area approximately 10 x 10cm. Count the activity of the wipe pad for one minute (longer count times may be used for greater accuracy) with the survey instrument. Record the counting results and convert to dpm/100cm<sup>2</sup>. Determine whether the

limit for removable activity is exceeded. Calculate the quantity of fixed contamination by subtracting the removable quantity from the total contamination. Compare all the survey results with the release limits. If all pass, the item may be released from the site. If any fail, the item should be held for decontamination.

6. Record all information on the data log and retain all survey information.

7. Items which are of a size which prevents survey or have surfaces which are inaccessible for survey and are potentially contaminated shall be considered to be contaminated above the release requirements and will be held for restricted release or appropriate disposal.



U.S. ATOMIC ENERGY COMMISSION

# REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

June 1974

## REGULATORY GUIDE 1.86

### TERMINATION OF OPERATING LICENSES FOR NUCLEAR REACTORS

#### A. INTRODUCTION

Section 50.51, "Duration of license, renewal," of 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires that each license to operate a production and utilization facility be issued for a specified duration. Upon expiration of the specified period, the license may be either renewed or terminated by the Commission. Section 50.82, "Applications for termination of licenses," specifies the requirements that must be satisfied to terminate an operating license, including the requirement that the dismantlement of the facility and disposal of the component parts not be inimical to the common defense and security or to the health and safety of the public. This guide describes methods and procedures considered acceptable by the Regulatory staff for the termination of operating licenses for nuclear reactors. The Advisory Committee on Reactor Safeguards has been consulted concerning this guide and has concurred in the regulatory position.

#### B. DISCUSSION

When a licensee decides to terminate his nuclear reactor operating license, he may, as a first step in the process, request that his operating license be amended to restrict him to possess but not operate the facility. The advantage to the licensee of converting to such a possession-only license is reduced surveillance requirements in that periodic surveillance of equipment important to the safety of reactor operation is no longer required. Once this possession-only license is issued, reactor operation is not permitted. Other activities related to cessation of operations such as unloading fuel from the reactor and placing it in storage (either onsite or offsite) may be continued.

A licensee having a possession-only license must retain, with the Part 50 license, authorization for special nuclear material (10 CFR Part 70, "Special Nuclear Material"), byproduct material (10 CFR Part 30, "Rules of General Applicability to Licensing of Byproduct Material"), and source material (10 CFR Part 40, "Licensing of Source Material"), until the fuel, radioactive components, and sources are removed from the facility. Appropriate administrative controls and facility requirements are imposed by the Part 50 license and the technical specifications to assure that proper surveillance is performed and that the reactor facility is maintained in a safe condition and not operated.

A possession-only license permits various options and procedures for decommissioning, such as mothballing, entombment, or dismantling. The requirements imposed depend on the option selected.

Section 50.82 provides that the licensee may dismantle and dispose of the component parts of a nuclear reactor in accordance with existing regulations. For research reactors and critical facilities, this has usually meant the disassembly of a reactor and its shipment offsite, sometimes to another appropriately licensed organization for further use. The site from which a reactor has been removed must be decontaminated, as necessary, and inspected by the Commission to determine whether unrestricted access can be approved. In the case of nuclear power reactors, dismantling has usually been accomplished by shipping fuel offsite, making the reactor inoperable, and disposing of some of the radioactive components.

Radioactive components may be either shipped offsite for burial at an authorized burial ground or secured

#### USAEC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the AEC Regulatory staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

Published guides will be revised periodically, as appropriate, to accommodate comments and to reflect new information or experience.

Copies of published guides may be obtained by request indicating the divisions desired to the U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Director of Regulatory Standards. Comments and suggestions for improvements in these guides are encouraged and should be sent to the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Chief, Public Proceedings Staff.

The guides are issued in the following ten broad divisions:

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|-----------------------------------|------------------------|
| 1. Power Reactors                 | 8. Products            |
| 2. Research and Test Reactors     | 7. Transportation      |
| 3. Fuels and Materials Facilities | 6. Occupational Health |
| 4. Environmental and Siting       | 9. Antitrust Review    |
| 5. Materials and Plant Protection | 10. General            |

from the site.

and/or shielding material. Means such as a remote-readout intrusion alarm system should be provided to indicate to designated personnel when a physical barrier is penetrated. Security personnel that provide access control to the facility may be used instead of the physical barriers and the intrusion alarm systems.

b. The physical barriers to unauthorized entrance into the facility, e.g., fences, buildings, welded doors, and access openings, should be inspected at least quarterly to assure that these barriers have not deteriorated and that locks and locking apparatus are intact.

c. A facility radiation survey should be performed at least quarterly to verify that no radioactive material is escaping or being transported through the containment barriers in the facility. Sampling should be done along the most probable path by which radioactive material such as that stored in the inner containment regions could be transported to the outer regions of the facility and ultimately to the environs.

d. An environmental radiation survey should be performed at least semiannually to verify that no significant amounts of radiation have been released to the environment from the facility. Samples such as soil, vegetation, and water should be taken at locations for which statistical data has been established during reactor operations.

e. A site representative should be designated to be responsible for controlling authorized access into and movement within the facility.

f. Administrative procedures should be established for the notification and reporting of abnormal occurrences such as (1) the entrance of an unauthorized person or persons into the facility and (2) a significant change in the radiation or contamination levels in the facility or the offsite environment.

g. The following reports should be made:

(1) An annual report to the Director of Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545, describing the results of the environmental and facility radiation surveys, the status of the facility, and an evaluation of the performance of security and surveillance measures.

(2) An abnormal occurrence report to the Regulatory Operations Regional Office by telephone within 24 hours of discovery of an abnormal occurrence. The abnormal occurrence will also be reported in the annual report described in the preceding item.

h. Records or logs relative to the following items should be kept and retained until the license is terminated, after which they may be stored with other plant records:

- (1) Environmental surveys,
- (2) Facility radiation surveys,
- (3) Inspections of the physical barriers, and
- (4) Abnormal occurrences.

#### 4. DECONTAMINATION FOR RELEASE FOR UNRESTRICTED USE

If it is desired to terminate a license and to eliminate any further surveillance requirements, the facility should be sufficiently decontaminated to prevent risk to the public health and safety. After the decontamination is satisfactorily accomplished and the site inspected by the Commission, the Commission may authorize the license to be terminated and the facility abandoned or released for unrestricted use. The licensee should perform the decontamination using the following guidelines:

a. The licensee should make a reasonable effort to eliminate residual contamination.

b. No covering should be applied to radioactive surfaces of equipment or structures by paint, plating, or other covering material until it is known that contamination levels (determined by a survey and documented) are below the limits specified in Table I. In addition, a reasonable effort should be made (and documented) to further minimize contamination prior to any such covering.

c. The radioactivity of the interior surfaces of pipes, drain lines, or ductwork should be determined by making measurements at all traps and other appropriate access points, provided contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces of premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement should be assumed to be contaminated in excess of the permissible radiation limits.

d. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated in excess of the limits specified. This may include, but is not limited to, special circumstances such as the transfer of premises to another licensed organization that will continue to work with radioactive materials. Requests for such authorization should provide:

- (1) Detailed, specific information describing the premises, equipment, scrap, and radioactive contaminants and the nature, extent, and degree of residual surface contamination.

(2) A detailed health and safety analysis indicating that the residual amounts of materials on surface areas, together with other considerations such as the prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

e. Prior to release of the premises for unrestricted use, the licensee should make a comprehensive radiation survey establishing that contamination is within the limits specified in Table I. A survey report should be filed with the Director of Licensing, U.S. Atomic Energy Commission, Washington, D.C. 20545, with a copy to the Director of the Regulatory Operations Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report should:

- (1) Identify the premises;
- (2) Show that reasonable effort has been made to reduce residual contamination to as low as practicable levels;
- (3) Describe the scope of the survey and the general procedures followed; and
- (4) State the finding of the survey in units specified in Table I.

After review of the report, the Commission may inspect the facilities to confirm the survey prior to granting approval for abandonment.

## 5. REACTOR RETIREMENT PROCEDURES

As indicated in Regulatory Position C.2, several alternatives are acceptable for reactor facility retirement. If minor disassembly or "mothballing" is planned, this could be done by the existing operating and maintenance procedures under the license in effect. Any planned actions involving an unreviewed safety question

or a change in the technical specifications should be reviewed and approved in accordance with the requirements of 10 CFR §50.59.

If major structural changes to radioactive components of the facility are planned, such as removal of the pressure vessel or major components of the primary system, a dismantlement plan including the information required by §50.82 should be submitted to the Commission. A dismantlement plan should be submitted for all the alternatives of Regulatory Position C.2 except mothballing. However, minor disassembly activities may still be performed in the absence of such a plan, provided they are permitted by existing operating and maintenance procedures. A dismantlement plan should include the following:

- a. A description of the ultimate status of the facility
- b. A description of the dismantling activities and the precautions to be taken.
- c. A safety analysis of the dismantling activities including any effluents which may be released.
- d. A safety analysis of the facility in its ultimate status.

Upon satisfactory review and approval of the dismantling plan, a dismantling order is issued by the Commission in accordance with §50.82. When dismantling is completed and the Commission has been notified by letter, the appropriate Regulatory Operations Regional Office inspects the facility and verifies completion in accordance with the dismantlement plan. If residual radiation levels do not exceed the values in Table I, the Commission may terminate the license. If these levels are exceeded, the licensee retains the possession-only license under which the dismantling activities have been conducted or, as an alternative, may make application to the State (if an Agreement State) for a byproduct materials license.

TABLE I  
ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDE <sup>a</sup>	AVERAGE <sup>b c</sup>	MAXIMUM <sup>b d</sup>	REMOVABLE <sup>b e</sup>
U-nat, U-235, U-238, and associated decay products	5,000 dpm $\alpha$ /100 cm <sup>2</sup>	15,000 dpm $\alpha$ /100 cm <sup>2</sup>	1,000 dpm $\alpha$ /100 cm <sup>2</sup>
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm <sup>2</sup>	300 dpm/100 cm <sup>2</sup>	20 dpm/100 cm <sup>2</sup>
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm <sup>2</sup>	3000 dpm/100 cm <sup>2</sup>	200 dpm/100 cm <sup>2</sup>
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm $\beta$ - $\gamma$ /100 cm <sup>2</sup>	15,000 dpm $\beta$ - $\gamma$ /100 cm <sup>2</sup>	1000 dpm $\beta$ - $\gamma$ /100 cm <sup>2</sup>

<sup>a</sup>Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

<sup>b</sup>As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

<sup>c</sup>Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

<sup>d</sup>The maximum contamination level applies to an area of not more than 100 cm<sup>2</sup>.

<sup>e</sup>The amount of removable radioactive material per 100 cm<sup>2</sup> 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.