



NIST

UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899

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United States Nuclear Regulatory Commission
Washington, D. C. 20555

Ref: Docket No. 70-398
License No. SNM-362

Dear Mr. Bidinger:

Enclosed are copies of revised pages for our Materials License Document for License Number SNM-362, with the revision date of 06/12/91 shown and with changes from the original submission marked in the margins. This submission should totally replace our submission of May 28, 1991. The replacement is in response to communications between Dr. Soong of your office and Mr. Hobbs of the NIST Health Physics group. A revised Table of Contents and a copy of the USNRC's August, 1987 document entitled "Guidelines for decontamination of facilities and equipment prior to release for unrestricted use or termination of licenses for byproduct, source, or special nuclear material" are also enclosed, the latter as a page-numbered attachment to Part I, Chapter 1.

We hope this submission is satisfactory for your review needs. Should you have further questions, please contact Mr. T. Hobbs, Chief of the NIST Health Physics office, on 975-5800, or Mr. L. Slaback, Supervisory Health Physicist, on 975-5810.

Sincerely,

L. E. Pevey, Chief
Occupational Health and Safety Division
(Materials License Manager)

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Attachment 1	NIST: Site Plan View, Topographic View, Building Floor Plans
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general purpose laboratories, i.e., Buildings 220 through 226.

- materials and equipment irradiations - SRL
- source preparations - SRL, SPL, GPL
- source calibrations - SRL, SPL, GPL
- instrument calibrations - SRL, SPL, GPL
- sample assays - SRL, SPL, GPL
- source characterizations - SRL
- instrument and device characterizations - SRL, SPL, GPL
- reference or counting source uses - ADM, SRL, SPL, GPL
- radiochemistry - SRL, SPL, GPL
- general research and development - ADM, SRL, SPL, GPL
- sources incorporated into devices or equipment - ADM, SRL, SPL, GPL
- miscellaneous, e.g., static elimination - ADM, SRL, SPL, GPL

1.8 Exemptions and Special Authorizations

a. We request exemption from the requirement to maintain criticality monitors or conduct criticality reviews because all SNM except for PuBe sealed sources are controlled to maintain a minimum separation of three feet between each 300 grams of plutonium or U-233 or uranium containing greater than 20% U-235 or combination of these. Each room or area involving SNM operations is the responsibility of a single person who controls the movement of materials for that area according to written procedures to insure that the material quantity limits are maintained.

b. We request that radioactive material use may be authorized for an off-site location subject to the following provisions:

- the proposal is reviewed and approved by Health Physics and, if required, by the Radiation Safety Committee.
- the radioactive material is controlled by an authorized individual, who possesses written operating instructions while engaged in the project.
- the radioactive material is an integral part of a measurement instrument or a contained source, such as a check or reference source.
- the total quantity of radioactive material for a single authorized use may not exceed ten times the activity listed in 10CFR20, Appendix C, or, for those radionuclides not listed in Appendix C, may not exceed one microcurie of activity.

c. We request permission to dispose of radioactive materials as ordinary trash when the conditions specified in 10CFR35.92 are met. Short-lived radioactive material with long-lived daughter radioactive nuclides will not be considered for this disposal mechanism.

d. We request authority to release contaminated equipment to uncontrolled areas in accordance with the USNRC's August, 1987 "Guidelines for decontamination of facilities and equipment prior to release for unrestricted use or termination of licenses for byproduct, source, or special nuclear material." A copy of the guidelines is attached to this chapter.

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT
PRIOR TO RELEASE FOR UNRESTRICTED USE
OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE,
OR SPECIAL NUCLEAR MATERIAL

U.S. Nuclear Regulatory Commission
Division of Industrial and
Medical Nuclear Safety
Washington, DC 20555

August 1987

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.
2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.
3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that 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 shall be presumed to be contaminated in excess of the limits.
4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to, special circumstances such as razing of buildings, transfer of premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:
 - a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.
 - b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of the survey report shall be filed with the Division of Industrial and Medical Nuclear Safety, U. S. Nuclear Regulatory Commission, Washington, DC 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

- a. Identify the premises.
- b. Show that reasonable effort has been made to eliminate residual contamination.
- c. Describe the scope of the survey and general procedures followed.
- d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1
ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES ^a	AVERAGE ^{b c f}	MAXIMUM ^{b d f}	REMOVABLE ^{b e f}
U-nat, U-235, U-238, and associated decay products	5,000 dpm α /100 cm ²	15,000 dpm α /100 cm ²	1,000 dpm α /100 cm ²
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm ²	300 dpm/100 cm ²	20 dpm/100 cm ²
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	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 Sr-90 and others noted above.	5000 dpm $\beta\gamma$ /100 cm ²	15,000 dpm $\beta\gamma$ /100 cm ²	1000 dpm $\beta\gamma$ /100 cm ²

^aWhere surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

^bAs 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.

^cMeasurements 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.

^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 beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

to be followed, including participants, frequency and type of bioassay measurements and dose assessments, and actions levels and actions to be taken. Bioassay programs will be established similar to those described in Regulatory Guide 8.11 for uranium, Regulatory Guide 8.20 for iodine, Regulatory Guide 8.26 for fission and activation products, and the HPSSC draft standard for plutonium. If the Health Physics group determines that the proposed work requires air sampling, the airborne concentration of radioactivity in the worker's breathing zone air will be determined after each working day.

3.2.5 Local Emergency Actions

Emergency evacuation is required for unexpected or inadvertent situations that could cause radiation doses in excess of the applicable whole-body radiation exposure limits and that cannot be controlled with prompt and appropriate actions. Health Physics review is required for such situations to determine work times for necessary actions.

3.2.6 Sealed Source Control

- A. 1. Each sealed source containing more than 100 microcuries of beta and/or gamma emitting material or more than 10 microcuries of alpha emitting material, other than Hydrogen-3, with a half-life greater than 30 days and in any form other than gas, shall be tested for leakage and/or the contamination at intervals not to exceed 6 months. In the absence of a certificate from a transferor indicating that a test has been made within 6 months prior to the transfer, a sealed source received from another person shall not be put into use until tested.
2. The periodic leak test required by this section does not apply to sealed sources that are stored and not being used. Prior to any use or transfer to another person, the source shall be leak tested within 6 months prior to the date of use or transfer.
- B. The test shall be capable of detecting the presence of 0.005 microcuries of radioactive material on the test sample. The sample shall be taken from the sealed source or appropriate accessible surfaces of the container or from the device where the sealed source is mounted or stored in which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the USNRC.

If the test reveals the following:

1. The presence of 0.005 microcuries or more of removable contamination from the sealed sources other than described below, or
2. The presence of 0.05 microcuries or more of removable contamination from the teletherapy sealed source, or
3. An indication that the irradiator sealed source which is stored in the water pool for shielding purposes is leaking, then

NIST shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired by a person appropriately licensed to make such repairs or to be disposed of in accordance with USNRC regulations.

Within 5 days after determining that any source has leaked, NIST shall file a report with the Division of Industrial and Medical Nuclear Safety, USNRC, Washington, D. C. 20555, describing the source, test results, extent of contamination, apparent or suspected cause of source failure, and corrective action taken. A copy of the report shall be sent to the Administrator of the NRC Regional Office for Region I.

CHAPTER 4 - ENVIRONMENTAL PROTECTION

4.1 Effluent Control Systems

Health Physics monitors airborne effluents to provide an assessment of radioactivity concentrations at the discharge point at least once in each quarter for continuing operations or at least once for short-term operations, to establish that releases are less than 10% of the concentration given in 10CFR20, Appendix B, Table II, averaged over a calendar quarter. Should the concentration exceed that value, continuous monitoring will be initiated. Where effluent monitoring is required, air sampling arrangements shall be designed to assure that air samples taken will be representative of the actual release for the sampling period. Measurement of air sampling media will be with a lower limit of detection of no greater than 5% of the concentration given in 10CFR20, Appendix B, Table II, for the major radionuclide(s) involved in the process being monitored.

No liquid releases from NIST are permitted under this license that could exceed regulatory limits. Liquid wastes that could exceed the limits normally are either drained to tanks for discharge to the sanitary sewer with appropriate dilution or are collected in specially marked containers for solidification and disposal as solid waste. Building 235 waste holdup tanks are equipped with remote readout level monitors, and Health Physics inspects the level monitors for the Building 245 holdup tanks quarterly, documenting the inspection. Health Physics assays the contents of the tanks for radioactivity concentrations prior to discharge.

Health Physics collects solid radioactive wastes from the laboratories and prepares them for transfer to disposal agents normally acting by contracted service. A solid waste compactor may be used for reducing the volume of solid waste in a package.

Radioactive wastes with half-lives less than 65 days may be stored in the Radioactive Waste Annex to Building 235 or an equivalent secured area. Short-lived wastes held for decay-in-storage are surveyed at least weekly and the results are documented. After at least 10 half-lives have elapsed for the radionuclide under consideration, the waste is taken to a low background area and any shielding around the material is removed. An assay of activity is performed using a low-level GM-type survey meter on its most sensitive scale or a technique of at least equivalent sensitivity. When the assay shows that the activity level cannot be distinguished from background levels, the waste may be disposed of as normal trash. Records of these decay-in-storage disposals will be maintained.

4.2 Environmental Monitoring

Health Physics maintains a listing of the locations of environmental monitoring stations and the specific monitoring techniques used at those sites, e.g., the numbers and locations of thermoluminescent dosimeters on the fence and on the buildings on site or the on-site grass plots used for vegetation sampling.

Quarterly changes of thermoluminescent dosimeters or equivalent integrating monitors about the site and off-site provide measurements of ambient radiation levels. These are maintained under the Health Physics quality assurance program. Quarterly sampling of vegetation or soil, seasonally dependent, and of surface water, and assays under the Health Physics quality assurance program demonstrate radioactive material control. Sampling locations include on-site and off-site stations so that potential NIST contributions to the environment can be evaluated.

4.3 Nonradiological Hazards

Nonradiological hazards are the responsibility of the Safety Office of the Occupational Health and Safety Division. Regulatory oversight by agencies such as OSHA, EPA, and the state

Department of the Environment assure that toxic material control is adequate for regulatory compliance. Each laboratory or work area is equipped with an appropriate fire extinguisher if necessary and with either combination rate-of-rise/fixed temperature or smoke detectors that provide signals to a central fire response facility.

CHAPTER 5 - SPECIAL PROCESS COMMITMENTS

5.1 Special Nuclear Material Accounting and Control

Accounting and control of special nuclear materials to prevent and detect unauthorized diversions of material quantities are conducted according to provisions of 10CFR70. Health Physics maintains the SNM accountability office for NIST and administers the accountability program.

5.2 Alpha-Emitting Nuclide Chemistry Operations

The activities of alpha-emitting nuclides in dispersable form in any one laboratory operation are controlled as described in Table I.5-1. Health Physics may approve limits above those shown in the table or may approve variances to the conditions shown for lower toxicity nuclides or if the proposing user can demonstrate adequate provision for safety, such as training, equipment, or other considerations. Radiochemistry hoods are provided with local indicators for air flow and operators are instructed to observe them. Should an air flow system for any hood in use fail, the operator is to suspend operations in that hood and notify Health Physics immediately. Health Physics reviews the situation and determines the need for and the type of further action. Should gloves break or other operative defect appear for a glove box, any processes being conducted in the box are to be suspended and Health Physics notified immediately so that corrective action may be planned.

TABLE I.5-1

ALPHA CHEMISTRY LABORATORY LIMITS AND RULES
FOR HIGH-TOXICITY MATERIALS AND URANIUM

TYPE OF OPERATION	LIMIT (lesser of)	CONDITIONS
simple storage	100 mCi or 10 g	in closed containers
simple wet chemistry, e.g., aliquot extraction	10 mCi or 1 g	within hoods
normal chemistry, e.g., analysis	1 mCi or 0.1 g	in HEPA filtered hoods
complex wet chemistry, e.g., complex apparatus	0.1 mCi or 0.01 g	in HEPA filtered hoods
simple dry operations	0.1 mCi or 0.01 g	in HEPA filtered hoods
dry and dusty operations, e.g., grinding	0.01 mCi or 0.001 g	in glove boxes

* see, e.g., IAEA Safety Series No. 38, Radiation Protection Procedures

NOTE: Plutonium in solution will be limited to less than 10 millicuries at any one location or in any one process.

CHAPTER 6 - NUCLEAR CRITICALITY SAFETY

No accumulations of special nuclear materials exceeding 300 grams are permitted in any one area or room, with the exception of plutonium sealed sources. Thus, no criticality program is necessary.

CHAPTER 7 - DECOMMISSIONING PLAN

As a Federal agency, the National Institute of Standards and Technology will generate and implement a decommissioning plan at the time that operations are to be terminated and in accordance with Federal rules and regulations in effect at that time.

CHAPTER 8 - EMERGENCY PLAN

NIST shall maintain and execute the response measures of the Radiological Contingency Plan submitted to the NRC on Sept. 3, 1982. NIST shall prepare and maintain implementing procedures for the Radiological Contingency Plan. NIST shall make no change in the Radiological Contingency Plan that would decrease the response effectiveness of the Plan without prior NRC approval as evidenced by a license amendment. NIST may make changes to the Radiological Contingency Plan without prior NRC approval if the changes do not decrease the response effectiveness of the Plan. NIST shall furnish the Chief, Fuel Cycle Safety Branch, Division of Industrial and Medical Nuclear Safety, NMSS, USNRC, Washington, D. C. 20555 a report containing a description of each change within 6 months after the change is made.

CHAPTER 13 - OCCUPATIONAL RADIATION EXPOSURES

13.1 Occupational Exposure Analysis

For the period from 1985 through 1989, no monitored employee accumulated in any year a total external dose equivalent greater than 25% of the annual limit from external sources involved in materials licensed operations. Internal dose equivalents from these operations have been negligible. Measurements of radioactivity concentrations in air showed less than minimum detectable levels, i.e., less than at most 10% of MPC, demonstrating that no radiation worker was exposed to significant air activity concentrations resulting from radiation work for 1985 through 1989.

The principal exposure-producing operation for materials licensed operations for some years has been the Cf-252 irradiation project. This is expected to continue into the foreseeable future. Measures to limit exposures to these sources have been and are being implemented by the work group. These measures include installing remote handling devices for source transfer, planning for relocation of the irradiation facility to a more isolated environment, and stricter administrative control for operations timing.

No off-normal occurrence resulting in excessive exposure has been documented. Bioassays of tritium workers, workers from gaseous iodine processes, and other potential internal dose contributing work have demonstrated extremely good control of dispersable radioactive materials.

Between 1985 and 1991, 827 hood air flow measurements were performed; only two adjustments for low air flow resulted from this monitoring. For the same period, 73 air samples indicated that, based on a beta MPC of 3×10^{-9} microcuries per milliliter and an alpha MPC of 6×10^{-13} microcuries per milliliter, the beta exposure to any individual was 0.22 MPC-hours while the alpha exposure, subject to a great uncertainty from many false positives from the low count rates obtained at near background, was less than 33 MPC-hours. Again, for that same six year period, the bioassay results, these being from tritium urinalyses for workers in the Reactor and, therefore, under the Reactor license, showed that 41 persons showed a range of summed dose equivalents from 5 mrem to 475 mrem in the six years, with a total population dose equivalent of 6.24 person-rems.

13.2 Measures Taken to Implement ALARA

Health Physics dosimetry programs have been centralized, with results reviewed by a single responsible individual, who ensures that ALARA concepts are observed in surveying dosimetry data. Environmental monitoring responsibility has also been assigned to a single individual, who reviews data for ALARA purposes. Information about the ALARA concept and the NIST ALARA program has been widely disseminated and workers are requested to inform Health Physics of any pertinent data or information that could affect this program.

13.3 Bioassay Program

Workers involved in projects with a potential for significant internal dose, such as operations that could create significant airborne levels of tritium, iodine, or transuranics, may be required, at Health Physics discretion, to participate in a bioassay program. Appropriate techniques for bioassay are developed from available regulatory guidance, contracted assays may be utilized, or other acceptable bioassay mechanisms may be specified.

13.4 Air Sampling Program

Table II.12-1, Controls and Action Levels, and Table II.12-2, Administrative Action Levels and Actions, list the various levels at which certain actions would be implemented. In addition,

should any measurement of air radioactivity concentration indicate that an applicable limit would be exceeded, the operation involved or the operation generating the activity concentration would be suspended unless the condition could be remedied by prompt corrective action.

Proposal reviews and analytical observations to determine actions for specific situations involving potential airborne radioactivity releases are approached using conservative techniques, for example, conservative resuspension factors or mass loading values would be assumed for extended operations. Health Physics evaluates a proposal to conduct processes that could release radioactive material to the effluent streams and considers the potential for such release. Material containment, resuspension probability, effluent stream access, filtration available, and other chemical and physical properties involved are part of the criteria used. Should the potential for a release be greater than 10% of the maximum permissible concentrations as given in 10CFR20, Appendix B, Table II, then air sampling of the workplace will be initiated.

13.5 Surface Contamination

Table II.12-1, Controls and Action levels, and Table II.12-2, Administrative Action Levels and Actions, list controlling levels for surface contamination. Measurements for surface contamination checking and protective measures are described in sections II-12.1, II-12.4, and II-12.7 of this manual.

Hand and shoe monitoring may be performed with conveniently placed equipment; resuspension factors for transforming surface contamination levels to airborne activity concentrations are applied as described in section II-13.4 of this manual.

13.6 Shipping and Receiving

All radioactive materials received at NIST and all radioactive materials shipped from NIST are controlled by Health Physics. Usually, incoming packages are brought to the Health Physics receiving area in Building 245, unless alternate provisions are made with the ultimate recipient. In either case, surveys for compliance with transport regulations are made within time limits specified by the regulations. Health Physics and the recipient then survey the package and contents and determine if the shipment is acceptable for incorporation into the project for which the source is intended. Usually, outgoing packages are held in the NIST shipping area in Building 301 until Health Physics or a designated representative checks the package for compliance with transport regulations.

Type B shipments are made in accord with the provisions of the quality assurance program as detailed in a separately submitted document.

If an incoming shipment shows contamination at any level of packaging, the package is held in the Health Physics or other designated storage area until a decision is made, jointly between Health Physics and the recipient, on returning the source, decontaminating the source, disposing of the materials, or establishing proper controls for safe use of the source.