ITEM 1: LICENSE ACTION TYPE
THIS IS AN APPLICATION FOR (Check appropriate item)
Type of Action License No.
[ ] A. New License Not Applicable
[ ] B. Amendment to License No. XX-XXXXX-XX
[X] C. Renewal of License No. SNM 362

ITEM 2: APPLICANT'S NAME AND MAILING ADDRESS
The federal agency is the National Institute of Standards and Technology
The mailing address is:

The National Institute of Standards and Technology
Attn: Chief of Health Physics
100 Bureau Drive, Stop 1731
Room C125, Building 245
Gaithersburg, MD 20899-1731

ITEM 3: ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

The material under this license may be approved for use and possession at any location on the NIST campus and annex located at:

National Institute of Standards and Technology

100 Bureau Drive

Gaithersburg, MD 20899

The National Institute of Standards (NIST) is an agency of the U.S. Department of Commerce. NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science standards and technology in ways that enhance economic security and improve our quality of life. The main NIST facility is located in Gaithersburg, MD and is a fenced federal facility consisting 234

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hectares (578 acres) encompassing fifty two structures and facilities. Of these twenty three are laboratory facility buildings. It is bordered to the east by Interstate 270 and Muddy Branch Road, to the north by Clopper Road and to the west by Quince Orchard Road.

Access to the NIST Gaithersburg facility is continually controlled and patrolled by NIST Federal Police. Individual buildings and use locations have additional security controls.

Any location within the NIST grounds may be approved by Health Physics for the use and possession of sources controlled under the materials license. Approval shall consider the conditions of the proposed work and the suitability of the facilities to satisfy appropriate safety and security requirements. Permanent approvals exist for facilities within Buildings 235 and 245. Building 235 houses the Center for Neutron Research Facility, a reactor based facility operated under the TR-5 license. Activated materials transferred from the TR-5 license may be covered by this materials license. Building 245 houses the Ionizing Radiation Division and the Electron and Optical Physics Division. Activities in Building 245 include the use of panoramic beam and self contained irradiators, a pool type source, primary gamma and beta standards source ranges for instrument and secondary source cross calibrations, californium and other neutron source and instrument calibration facilities, radiochemistry laboratories for standard source production, charged particle accelerators and x-ray machine facilities. In addition to the above facilities, specific laboratories in other NIST

buildings may be approved for use and storage of licensed radioactive material and approval may be granted for operations utilizing sealed, plated, or encapsulated sources on the NIST grounds outside a building (for example, for calibration, testing, and Quality Assurance (QA) of instruments). In all cases source control and security shall be required as part of the approval.

In addition to the above locations, special authorizations of limited scope and duration may be granted for use of sealed or encapsulated sources at off site locations. These will primarily be for the purpose of testing materials, instruments, and devices in field conditions. Specific requirements are discussed under "special Authorizations"

ITEM 4: PERSON TO BE CONTACTED ABOUT THIS APPLICATION

All inquiries regarding this application should be directed to the NIST RSO:

NIST
Attn: Timothy F. Mengers, MS. CHP. PE.
Chief of Health Physics
100 Bureau Drive, Stop 1731
Bldg. 245, Rm. C125
Gaithersburg, MD 20899-1731
(301) 975-5800

ITEM 5: RADIOACTIVE MATERIAL

NIST RADIOACTIVE MATERIALS LICENSE LIMITS

NUCLIDE	CHEM/PHYS FORM	POSSESSION LIMIT
A. Uranium enriched to less that 20 wt % in the U-235 isotope	Any	
B. Uranium enriched to or greater than 20 wt in the U-235 isotope	Any	
C. Uranium-233	Any	
D. Plutonium, except Pu-238	Any	
E. Plutonium	Sealed sources (includes PuBe sources)	
F. Plutonium enriched to more than 80 % in the Pu-238 isotope	Any	
G. Natural uranium	Any insoluble form Any soluble form	
H. Depleted Uranium	Any insoluble form Any soluble form	
I. Th–228	Any	
J. Th-229	Any	
K. Th-230	Any	
L. Th-232 (Th Natural)	Any	
M. Any Thorium other than Th-228, Th-229, Th230, or Th-232	Any	
N. Radium	Any	
O. Radium	Sealed (includes RaBe sources)	
P. Co-60	Sealed sources (includes irradiators)	
Q. Cs-137	Sealed sources (includes irradiators)	
R. Po-210	Sealed sources	
S. Am-241	Sealed sources (includes AmBe sources)	
T. Cf-252	Sealed sources	
U. Sr-90	Sealed sources	
V. I-125	Sources sealed in titanium or stainless steel	

NUCLIDE	CHEM/PHYS FORM	POSSESSION LIMIT
W. Byproduct material 1. any nuclide of half-life less than 30 days 2. any nuclide of half-life more than 30 days except for the following nuclides: H-3 Au-198 Kr-85 Cs-137, Mo-99, Tc-99m, and Xe-133 C-14 and Co-60 Ac-227 Am-241, -242m, and –243 Bk-247 Cf-249, -250, -251, -252, and –254 Cm-242, -243, -244, -245, -246, -247, -248, and –250 Np-236 and –237 Sm-146 and –147	Any	
X. Any byproduct material with Atomic Number 3 to 83 except for the following nuclides: Ag-108m Eu-152 and Eu-154 Tb-158 Be-10 P-32 Os-194 Cd-113m Cl-36 I-130 Hf-178m and Hf-182 Bi-210m I-125 Sm-146	Neutron irradiated samples or containers	
Y. Irradiated Fuel		

FINANCIAL ASSURANCE AND RECORDKEEPING FOR DECOMMISSIONING

As a Federal facility, 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. Health Physics maintains the records of all approved source utilization, posted facilities, and surveillance activities. These records will form the basis for the decommissioning activities.

ITEM 6: PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED

FOR PURPOSE OF THIS LICENSE THE FOLLOWING ACRONYMS APPLY

National Institute of Standards and Technology	NIST
U.S Department of Transportation	DOT
Ionizing Radiation Safety Committee	IRSC
NIST Fire Protection Group	FPG
National Voluntary Laboratory Accreditation Program	NVLAP
Health Physics	HP
Safety, Health and Environment Division	SHED
Nuclear Regulatory Commission	NRC
As Low As Reasonably Achievable	ALARA
American National Standards Institute	ANSI
Code of Federal Regulations	CFR
Department of Energy	DOE
Disintegration Per Minute	DPM
NIST Center for Neutron Research	NCNR
Nuclear Materials Management Safeguards System	NMMSS
NRC Nuclear Regulatory Guidance	NUREG
Quality Assurance	QA
Radiation Safety Officer	RSO
Special Nuclear Material	SNM
Standard Reference Material	SRM
Sealed Source Device	SSD
Total Effective Dose Equivalent	TEDE

NIST's primary mission is as a testing, measurement science, standards, and technology laboratory. This license authorizes use of radiation sources for research, development, calibration, and testing activities.

Authorized uses will primarily address but not be limited to activities associated with radioactivity assessment, radiation interactions and processes in materials, and radiation measurement standards. Source activities range from sealed high dose irradiators, both self-contained and beam type, to environmental and sub-background level sources. Source physical forms range from special form solids, to encapsulated

and plated beta and alpha sources, to liquids for radiochemistry and standards productions, to noble gasses for standards and basic and applied research.

Specifically this license allows for the following customer services:

- Calibration and assessment of instrument and measuring device response;
- Comparison and assessment of source activities and emissions;
- Assay of activities in sample materials;
- Evaluation of properties of materials;
- Production, use, and distribution of measurement reference sources.

This license allows for the transfer of byproduct, source, and special nuclear material. This includes license to license transfer of radioactive material to individuals or entities in accordance with appropriate Department of Transportation (DOT) regulations and Nuclear Regulatory Commission (NRC) licenses, an NRC Agreement State, or Department of Energy (DOE) authorizations, or in the case of international transfers in accordance with requirements of the appropriate licensing authority. The license also allows for transfer of research materials satisfying the general license requirements (i.e., sources below exempt quantities requirements of 10CFR30.71 schedule B and similar exemptions), to individuals or entities who are not required to possess a specific or broad scope NRC license. (Note: Standard reference materials manufactured by NIST meeting the exempt quantity or concentration limitations are distributed in accordance with the conditions of license 19-23454-01E issued under 10CFR32).

There shall be no authorizations under this license for the assembly, testing, or operation of critical assemblies of Special Nuclear Material.

There shall be no authorizations for intentional administration of radiopharmaceuticals or intentional direct exposures of human or live animal subjects. (i.e., no medical (10CFR35) or veterinary use). This condition does not in any way modify or limit the requirements or activities associated with area, personnel, or bioassay monitoring required to assure safe conduct of operations and regulatory compliance. Nor does this limit the ability of NIST staff to consensually monitor and track any individuals who have received uptakes or medical administrations under other licenses.

There shall be no authorizations to conduct tracer studies in the environment involving the willful and direct release of radioactive material, (This condition does not in any way modify or limit the requirements or activities associated with effluent releases and environmental monitoring performed to assure public and environmental safety and regulatory compliance.)

Among the types of activities that may be approved, the following topical list illustrates typical projects:

- materials and equipment irradiations
- source preparations
- source calibrations
- instrument calibrations
- sample assays
- source characterizations
- instrument and device characterizations

- reference or counting source uses
- radiochemistry
- general research and development
- sources incorporated into devices or equipment
- miscellaneous, e.g., static elimination

Special Authorizations:

This license allows for licensed radioactive material to be authorized for use at off-site locations subject to the following provisions:

- The proposal shall be reviewed and approved by Health Physics and if required, by the Ionizing Radiation Safety Committee;
- NIST shall be responsible for the safe use of the radioactive material, which shall be controlled by an authorized and trained individual who shall possess written operating instructions while engaged in the project;
- Written operating instructions shall include a hazards assessment, hazards mitigation plan, source security and control instructions, and incident response plan;
- Source or containment integrity shall be verified by appropriate testing for contamination prior to utilization;
- Use of devices shall conform with the manufacturers recommendations, operating procedures, and the associated device specific license requirements. Such devices may include but are not limited to Lead-in-paint detectors, density gauges, moisture gauges, explosives detectors, or similar devices;
- For sources not incorporated in a manufactured device, the total quantity of radioactive material for a single authorized use shall not exceed 100 times the

activity listed in 10CFR20, Appendix C, or, for those radionuclide not listed in Appendix C, may not exceed 100 microcuries of activity;

- During use the area shall be controlled by the authorized users to assure the dose rates to members of the public shall not exceed 2 millirem in one hour or 100 millirem in one year;
- Transportation to and from the use location shall be conducted in accordance with all applicable DOT requirements.

ITEM 7: INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM

EXECUTIVE MANAGEMENT

The Chief of Health Physics serves as the Radiation Safety Officer (RSO) leading the Health Physics staff at NIST Gaithersburg and as the Materials License Manager, representing NIST in all matters relating to this license. Health Physics is a unit of the Safety, Health and Environment Division. As such the RSO reports directly to the Chief of the Safety, Health and Environment Division who in turn reports to the Chief Human Capital Officer. The Chief Human Capital Officer reports through the Deputy Director of NIST to the Director of NIST who is the ultimate responsible official.

RADIATION SAFETY COMMITTEE

The NIST Ionizing Radiation Safety Committee (IRSC) provides the RSO with independent advice and oversight for the ionizing radiation safety program at NIST. The Ionizing Radiation Safety Committee reports directly to the Deputy Director of NIST.

The Ionizing Radiation Safety Committee performs the following functions:

a. Reviews the past year's accomplishments, the current program status, and the long-range plans and needs for radiation safety;

b. Audits the performance of operations that provide radiation safety assurance;

c. Reviews proposals for major radiation facility uses including significant modifications to existing facilities operated under this license;

d. Reviews significant proposals or modifications for use of radiation sources;

e. Reviews protocols or procedures which may have significant impact on programs, safety, or regulatory compliance;

f. Advises the Chief of the Safety, Health, and Environment Division and RSO on matters pertaining to radiation safety;

g. Reports to the Deputy Director on the status of the radiation safety program annually; and

h. Reviews incidents and compliance citations and recommends corrective actions where needed (for matters related to the NRC TR5 Reactor license, this function is normally carried out by the NCNR Safety Evaluation Committee).

The IRSC meets at least quarterly. Minutes of the committee meetings are maintained within the Health Physics files.

The committee draws on the expertise of the major groups utilizing sources of ionizing radiation at NIST. At a minimum the ex-officio positions include:

- Director for the NIST Center for Neutron Research
- Chief, Safety, Health, and Environment Division

- Chief, Ionizing Radiation Division (Physics Laboratory)
- Chief, Health Physics (RSO NIST Gaithersburg Laboratory).
- RSO, NIST Boulder Labs

Additional members and alternate proxies (including alternate proxies for the ex-officio positions) are appointed by the Deputy Director of NIST at the recommendation of the Chairman of the IRSC. Selection is based on the subject matter expertise and broad representation of the research performed. Members of the Ionizing Radiation Safety Committee shall have at a minimum a Bachelor's of Science degree or equivalent professional training in their respective fields of expertise, and at least two years of pertinent experience.

A Quorum shall consist of the Chairman (or an alternate authorized by both the Chairman and the Deputy Director of NIST), RSO (or an alternate authorized by both the RSO and the Deputy Director of NIST), and one-half of the remaining assigned members of the committee or their authorized alternates or proxies. Health Physics staff shall not serve as Chairperson, but may serve as voting members of the committee.

The Ionizing Radiation Safety Committee reports to the Deputy Director of NIST. An annual report to the Deputy Director of NIST, prepared by the RSO and approved by the IRSC, summarizes information such as:

- Trend analysis of data from personnel dosimetry, including internal, external, and extremity exposures;
- Review of radioactive material acquisition and inventory control activities;
- Results of facility monitoring and surveillance;
- Results of required program audits and inspections conducted during the previous year;
- Analysis of effluent surveillance and environmental monitoring;
- ALARA reviews and decisions;
- Reviews and recommendations for resource allocations, staffing, and equipment acquisitions for the radiological safety program;
- Incident and injury information including near misses and root cause analysis.

The leader of the Health Physics Group functions as the NIST Radiation Safety Officer (RSO) for the Gaithersburg facility and, is responsible for the following:

The Radiation Safety Officer (RSO i.e., the Chief of Health Physics), as a minimum, must be certified in Health Physics by the American Board of Health Physics or must have a Bachelor's degree in a science or engineering field and have at least five years of professional level experience in applied Health Physics.

The RSO shall be responsible for the following:

a. Ensuring compliance with regulatory requirements pertaining to radiation safety;

b. Evaluating reports of substantial radiation safety hazards from Division Chiefs, trained radiation workers, and Health Physics staff, and reporting

evaluation results that imply the existence of defects or noncompliance with NRC regulations promptly;

c. Reports evaluation results that imply the existence of defects or noncompliance with NRC regulations promptly;

d. Notifies the Nuclear Regulatory Commission of any incidents, defects, or conditions of non-compliance in accordance with the reporting requirements;

e. Establishes and updates guidance, procedures, instructions, and other internal rules required to promote radiation safety and establishing adequate safeguards to see that these are observed;

f. Provides training in radiation safety for employees;

g. Maintains documentation required to demonstrate the adequacy of the radiation safety program;

h. Coordinates the activities of the Health Physics program with the IRSC, ensures the committee is informed of significant issues requiring IRSC review;

i. Coordinates interactions with regulators and inspectors;

j. Ensures ALARA practices are applied to all licensed activities.

HEALTH PHYSICS STAFF

Senior (supervisory) Health Physicists shall have at a minimum a Bachelor's degree in science or engineering and at least two years of experience in applied Health Physics.

A fully qualified Professional Health Physicist shall have a Bachelors' degree in science or engineering and at least one year of professional level experience in applied Health Physics, or equivalent technical training and five years of professional level work experience in applied Health Physics.

A fully qualified Health Physics Technician shall have completed training as required by a Senior Health Physicist and have at least one full year of service in typical Health Physics Technician assignments.

The Senior Health Physicists shall apply regulatory policy and NIST internal procedures to day-to-day administration of the radiological safety program, review and determine action on non-routine issues, and submit significant issues to the Chief of Health Physics for policy decisions.

The RSO or designees shall assess all modifications to protocols, internal procedures, or policy issues related to the use of sources of ionizing radiation and direct significant issues to the IRSC for review.

The RSO or designees shall ensure review and approval of all routine acquisition of sources or modification of utilization of sources; authorization, training, and dosimetry of users; posting and monitoring of facilities; facility modifications; oversight of transfer, shipping, or disposal of sources.

The RSO and designees shall ensure all required surveillance and internal audits are performed in a timely manner.

The RSO and designees shall ensure all receipts and shipments of licensed sources of ionizing radiation are conducted in compliance with applicable NRC and DOT requirements.

The RSO and designees shall be responsible for ensuring that all individuals likely to receive more than 100 millirem of occupational exposures in one year (considering normal and off-normal conditions) receive training in accordance with 10CFR19, Notices Instruction and Reports to Workers: Inspections and Investigations, requirements and commensurate with their duties, responsibilities, and access to sources of ionizing radiation.

The RSO or designee is responsible for ensuring appropriate monitoring or personnel dosimetry is performed to assess doses for any individuals determined to be likely to receive more than 10 percent of the applicable occupational radiation exposure limits.

The RSO or designee is responsible for ensuring that only trained and authorized individuals may independently utilize or materially control licensed sources of ionizing radiation which are likely to cause doses in excess of the applicable regulations (i.e., 100 millirem per year Total Effective Dose Equivalent (TEDE) for members of the public).

The RSO or designee shall perform adequate monitoring to ensure compliance with exposure limits to members of the public and to ensure compliance with effluent, waste control, and materials clearance regulations and procedures.

The RSO, a Senior Health Physicist, or designee shall have the authority to immediately stop, temporarily suspend, or permanently terminate the authorization of any person or group to have access to licensed radiation sources or facilities for any cause related to unsafe practices, or failure to conform to regulatory, license, security, or internal procedural requirements.

The RSO, a Senior Health Physicist, or designee shall have the authority to immediately stop, temporarily suspend, or permanently shut down any operation that he or she believes threatens the health and safety of the employees, the public, the environment, or poses a potential for violation of applicable regulations, license conditions, or implementing procedures.

ITEM 8: TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS (INSTRUCTIONS TO OCCUPATIONAL WORKERS AND ANCILLARY PERSONNEL)

All individuals determined likely to receive more than 100 millirem of occupational exposures in one year (considering normal and abnormal conditions) shall receive training in accordance with 10CFR19 requirements and commensurate with their duties, responsibilities, and access to sources of ionizing radiation.

Individuals shall be approved by Health Physics to have independent unescorted access to licensed sources of ionizing radiation likely to cause in excess of 100 millirem in one year. Prior to receiving approval by Health Physics to work independently with licensed radioactive materials or other sources of ionizing radiation, workers shall receive training in topics such as:

- Types of ionizing radiation sources and emissions;
- Biological risks associated with exposure to radioactive materials or sources of ionizing radiation;
- Precautions or procedures to minimize exposure; (time, distance, shielding, contamination control, ventilation control);
- Purposes and functions of protective devices employed;
- Basic radiation and contamination monitoring equipment and practices;
- Procedures and requirements for control, security, storage, transfer, or use of radioactive materials at their workplaces;

- Agency and other rules and regulations and conditions of licenses, and responsibilities for observing and complying with these to the extent under the worker's control;
- Duties and responsibilities of Supervisors, Source Custodians (Principal Investigators), Facility Owners, Sponsors, Source users, and Health Physics staff;
- Requirements for reporting to supervisors any condition that may lead to or cause a violation of the rules, regulations, or conditions of licenses or an unnecessary exposure to radiation or radioactive materials;
- Reporting rights and responsibilities per 10CFR19 - NRC form 3 "Note to employees" dated August 1977, and license review;
- Appropriate responses to warnings given in the event of any unusual occurrence or malfunction that may result in or involve excessive radiation or radioactive material exposure;
- Fire and other non-radiological safety and emergency response (emergency reporting, egress, and accountability) procedures;
- Principals and practices of personnel dosimetry - availability of radiation exposure reports that may be requested – authorizations and limitations on the collection and dissemination of dosimetry information.

The extent of these instructions shall be commensurate with the potential radiological health protection issues associated with the workplaces and the specific duties involved.

Individuals authorized for independent access to certain experimental facilities or independent utilization of certain sources may require additional facility or source specific training. This may be performed by the Supervisor, Source Custodian, Facility Manager, or Health Physics as appropriate.

Health Physics review of prior work experience and training in radiological safety may show that previous training or experience can be substituted for parts of the fundamental physics aspects of the training described above. However, facility specific and internal procedure training shall still be required before approval for independent access and utilization of sources and facilities.

Evaluation of trainee understanding shall be by direct testing of knowledge skills and ability, performance observations, personal interviews, prior work experience, dosimetry reviews, or similar evaluation methods. Health Physics shall maintain documentation of the training program and results as required by regulations.

Health Physics in consultation with the individual's Division Chief and supervisor shall determine the need for specific training if safety-related changes are made in operations, or if any employee is reassigned, or returns after an extended absence.

All authorized individuals requiring training shall be trained biennially.

All individuals approved to work with the irradiators (those sources meeting 10CFR part 36 criterion) shall receive facility specific training annually.

All individuals approved to prepare packaging, labeling, and manifests (Shippers Declarations) of sources for shipment regulated by the DOT shall receive training on the appropriate transportation regulations and accountability and control procedures. Training shall be required biennially.

ITEM 9: FACILITIES AND EQUIPMENT

Radioactive material laboratories used at NIST range from low background environmental-level "clean" labs to highly shielded sealed source beam rooms, to radiochemistry laboratories. Health Physics review and approval is required for any facility to be used for posted radiological activities. Approval for use of a laboratory or facility shall be based on a hazards assessment of the radionuclide, activities, physical forms, chemical and physical processes involved, and the hazards control and monitoring systems available to assure security and safety.

Specifically, the Hazards Assessment shall consider:

- Potential doses and dose rates to authorized source users (trained radiation workers) inside the restricted area of a facility;
- Potential doses and dose rates to members of the public;
- Potential doses and dose rates in un-posted areas (hallways, adjacent areas, or areas outside of buildings);
- Potential for contamination or dispersion of the material outside the laboratory;
- Potential for contamination or dispersion of the material inside the laboratory;
- Potential for personnel contamination or uptake;
- Potential for effluent release (airborne or liquid) of the material;
- Potential for incident driven release from the facility;
- Potential non-radiological hazards.

The Hazards Controls shall consider items such as:

- Shielding – both local and structural;
- Source utilization - limitations on use, physical manipulations, chemical processes, containment, spill control, and storage conditions;
- Ventilation controls - room ventilation, local ventilation, hoods, filtration;
- Radiological monitoring systems - installed and portable;
- Contamination control practices and monitoring systems;
- Posting and labeling requirements;
- Installed control systems - source shutters and interlocks;
- Incident or emergency control and mitigation systems - communications, fire detectors, and alarms, spill containment, sinks and wash down systems;
- Physical security monitoring and access control.

This assessment may be based on experience from previous similar operations. Methodologies of facility classifications, radionuclide toxicity classification, and the modifying factors as discussed in the International Atomic Energy Agency (IAEA) Safety series No 38 and Applying Radiation Standards in Radiotherapy, Vienna, 2006 Handbook of Health Physics and Radiological Health, Third edition, Baltimore, MD: Williams & Wilkins; 1999, Chapter 11, shall be considered.

Assessments for facility approval shall be performed at the time of initial requests for use of the facility, during general use protocol reviews, and supplemented by additional reviews at the time of acquisition of sources. Facility (laboratory) Owners and Source Custodians shall be required to coordinate reviews of modifications of

facilities, equipment, or source utilizations with Health Physics staff. Facility conditions shall be reviewed and verified by Health Physics staff during regular internal audit and surveillance activities.

Sealed Source Specialized Facilities:

Specialized gamma irradiation facilities include: two vertical beam irradiators (meeting part 36 activities); three horizontal beam calibration ranges (below the 10CFR part 36 activities); one pool type irradiator (below the 10CFR part 36 activities). There are also three self-contained irradiators currently in service, and two other self contained irradiators currently in storage. NIST also currently maintains one Civil Defense box type calibrator unit.

NIST currently has two specialized "low scatter" neutron instrument calibration facilities. These use either Cf-252, AmBe, PuBe, or RaBe sealed sources or a tritium target neutron generator. There is one neutron source calibration facility (Manganese Sulfate Bath). And one specialized beta / ion chamber calibration range. In addition there are two specialized laboratories for the calibration and emissions measurement of brachytherapy seeds. A variety of additional general use laboratories are also available for sealed source uses in various configurations. These range from gamma and x-ray spectroscopy labs to enclosed gas chromatograph systems to static eliminators used in balances.

Unsealed Source Facilities:

General use laboratories approved for use of un-sealed or un-encapsulated radioactive materials above the 10CFR part 20 appendix C criterion shall meet at a minimum the requirements of a Type I laboratory (reference, "The Handbook of Health Physics and Radiological Health", Third edition, copyright 1999, Chapter 11) Most laboratories authorized for unsealed source work qualify as a Type II laboratory.

The general radiochemistry laboratories are equipped with chemical fume hoods and/or local exhaust ventilation hoods. The hoods may be configured with HEPA filters as required when source term analysis or measurement indicates the need for filtration to assure effluent control. Hoods approved to be used for radioiodine standards preparation may be configured with activated charcoal filters for the duration of the batch operations as required when source term analysis or measurement indicates the need for filtration to assure effluent control. Certain specialty hoods designed for significant use of acids are provided with scrubber wash down systems. Hoods required to be used for control of radiological operations shall be monitored quarterly for flow velocity. Any hood failing to meet the required average face velocity between 80 and 125 linear feet per minute in accordance with recommendations of the American Conference Governmental Industrial Hygienists shall be taken out of service and operations suspended until appropriate corrective action is taken and verified to meet the criterion.

In Building 235, radiochemistry hood filters are monitored with an on-line system.

In Building 245, operations determined to have significant potential for exceeding 10 % of the 10CFR20 appendix B table 2 release limitations shall be monitored on a batch basis.

General radiochemistry laboratories are equipped with sinks and eye wash stations as required. Emergency showers and eye wash stations are available in the vicinity of each laboratory. In addition, both Building 235 and Building 245 have showers that may be used for personnel decontamination.

Buildings 235 and 245 are equipped with holding tanks that collect liquids from specific sinks and floor drains in the radiochemistry laboratories. Liquid from these tanks shall be sampled and analyzed to assure compliance with effluent release limitations in 10CFR20 appendix B table 3 prior to any batched release.

Personnel contamination monitors are placed in the vicinity of major unsealed source facilities. Survey instruments are available for use in the laboratories.

NIST facilities are equipped with centrally monitored fire and smoke detection systems. Additionally, pull boxes and fire extinguishers are stationed at strategic locations throughout the facility in accordance NIST Fire Protection Group (FPG) recommendations.

Access to NIST laboratory buildings housing licensed sources are monitored by a security system managed by NIST Federal Police. Specific zones and laboratories inside the buildings shall be provided with centrally monitored access control systems. Where appropriate or necessary, additional physical key control is used to secure laboratories and source storage locations. Where required, systems are in place to assure conformance to the enhanced security and inventory control/reporting requirements for items of concern.

ITEM 10: RADIATION SAFETY PROGRAM

For purposes of application to this license specific intervals for surveillance and auditing shall be defined as follows:

- Biennially: at least once every two years with an interval not to exceed two and one-half years.

- Annually: at least once each year with an interval not to exceed 15 months.

- Semi annually: at least 2 times per year with an interval not to exceed seven and one-half months.

- Quarterly: at least 4 times per year with an interval not to exceed four months.

- Monthly: at least 11 times per year with an interval not to exceed six weeks.

- Weekly: at least 51 times per year with an interval not to exceed fourteen days.

- Daily: One time during each working day (does not include holidays or weekends or other times when the facility is closed to normal operating conditions).

AUDIT PROGRAM AUDIT AND SURVEILLANCE PROGRAM

- Oversight Audits (IRSC authorized subcommittee or visiting committee annual program audit) The Ionizing Radiation Safety Committee ensures representatives other than Health Physics staff annually audit the radiation safety program; reviewing the performance, quality of operations, and targeted aspects of the protocols and procedures that provide radiological safety assurance. The audit results shall be reported to the Committee annually. The IRSC shall report the findings to the appropriate levels of NIST management.

- Annual Report - Health Physics shall review and document program actions, surveillance monitoring, dosimetry trends, and other program metrics to assure compliance with applicable protocols and application of ALARA principles, annually. This Health Physics Annual Report shall be submitted to the IRSC for review and approval. The Chairman of the IRSC shall brief the Deputy Director of NIST on the state of the program.

- Internal Audits (Quarterly) - A professional level Health Physicist shall conduct radiation safety internal audits (inspections) quarterly for those workplaces that pose significant potential for radiation exposures or effluent releases of radioactive materials in excess of 10 % of the applicable limits. Results of these internal audits shall be documented and any identified needs for corrective action found during the audits shall be transmitted to workplace supervisors (Facility Owners or Source Custodians) in a timely fashion.

- Internal Audits (Annually) - A professional level Health Physicist shall conduct radiation safety internal audits (inspections) annually for all facilities approved and posted for use or storage of licensed radiation sources with reduced potential for exposures or releases not in excess of 10 % of the applicable limits. Results of these internal audits shall be documented and identified. Needs for corrective action shall be transmitted to workplace supervisors (Facility Owners or Source Custodians) in a timely fashion.

Internal facility audits shall include an assessment of radiological conditions, and a review of security, posting, and labeling. Where feasible, these should include observation and discussion of work practices with Research Staff, Facility Owners, and Source Custodians.

RADIATION MONITORING INSTRUMENTS

Calibrated and functional survey instrumentation shall be maintained to support monitoring needs in each facility where external dose rates are likely to reach the criteria for a radiation area as defined in 10CFR part 20 or where surface contamination control limits may be exceeded. Laboratory instrumentation shall be available to support required monitoring and surveillance activities.

The table below describes typical radiation detecting instruments commonly available for use in the radiological safety program at NIST and their characteristics.

Substitutions or alternative access arrangements are acceptable as long as there is no degradation of the radiation safety surveillance program.

TYPICAL HEALTH PHYSICS INSTRUMENTATION

INSTRUMENT TYPE	TYPICAL NUMBER	RANGE
Liquid scintillator	1	counts per time, integrating
Smear counter (alpha/beta)	1	counts per time, integrating
Gamma spectroscopy	1	Not Applicable
Low E x-ray spectroscopy	1	Not Applicable
Alpha survey meter	1	0 to 50,000 cpm
Beta/gamma survey meter (thin window gm)	4	0 to 50,000 cpm
Extendible high range gamma survey meter	1	0 to 1000 rem/hr
Ion chamber	2	0 to 1 rem/hr
Neutron survey meter	1	0 to 5 rem/h
Area monitor	2	0 to 1 rem/h
Air sampler	1	Not Applicable
Personnel contamination monitor (beta)	2	Not Applicable
Personnel contamination monitor (gamma)	2	Not Applicable
Whole body spectroscopy counter	1	Not Applicable
Thyroid bioassay counter	1	Not Applicable

- All "in-service" instruments used for health and safety or regulatory compliance monitoring shall be routinely evaluated for functionality via a calibration and testing program which is based on guidance such as that found in ANSI standard guidance, manufacturer's recommendations, or other appropriate recommendations. Any instrument that does not meet the calibration and testing requirements is considered to be "out-of-service". At a minimum, "in-

service" instrumentation shall be checked and documented for functionality annually.

- Portable survey instruments used for quantitative health and safety or regulatory compliance radiation measurements shall be calibrated annually or after repairs or modifications that could affect response.
- Portable survey instruments used in a qualitative monitoring mode (count rate or set point response) shall be calibrated electronically and source response checked annually or after repairs or modifications that could affect response.
- Calibrations shall be performed using sources traceable to NIST primary standards.
- Portable survey instruments shall be calibrated in accordance to recommendations from the manufacturers or written procedures. In general, instruments shall be evaluated at approximately 20 percent and 80 percent of each scale or decade as practicable. Instruments shall be removed from service if they can't be adjusted to within 20 percent of the expected value.
- Records of calibrations and instrument QA shall be retained for inspection for a minimum of three years.
- "In-service" portable instrumentation shall be labeled (dated) to verify calibration.

MATERIAL RECEIPT AND ACCOUNTABILITY

All acquisition of licensed Special Nuclear Material (SNM), Source Material, and Byproduct Material from outside suppliers shall be approved by the RSO or designees, and approved by the Division Chief(s) or designees responsible for the proposed Source Custodian, users, and facilities. Health Physics shall maintain records of receipts and shipments of licensed material in accordance with regulatory requirements.

Note: This does not apply to sources not covered by the Atomic Energy Act or those sources which may be distributed under a general license or are exempt from specific licensing requirements such as commercially distributed products (like smoke detectors or thorium containing welding rods) or those exempt under 10CFR part 30.18 or similar exemptions. Nor does this apply to sources covered under other NRC or agreement state licenses. (For example, radiography sources used for on-site construction activities that are controlled by the contract radiographer's license, or test sources used by suppliers or outside contractors for calibration or demonstration of functionality of instrumentation).

Proposals to acquire sources shall be reviewed and approved or denied based upon assurances of safety and regulatory compliance. Specifically, the reviews shall address the following:

- license limits and conditions;
- intended source utilization and protocols;
- facility and equipment compatibility;

- Source Custodian training, skills, and authorization status;
- user training, skills, and authorization status;
- hazard analysis and hazards control safety commitments (see facilities utilization authorization section for further details);
- dosimetry and monitoring requirements;
- inventory control, transfer, waste disposal, effluent or disposition considerations.

Source Receipt:

All labeled radioactive materials (RAM) shipments received by NIST shall be evaluated by Health Physics staff for compliance with license conditions and shipping regulations in accordance with written procedures. At a minimum, the exterior of packages shall be evaluated for dose rate and contamination, in accordance with 10CFR part 20.1906, within three hours of receipt by Health Physics during normal work hours. If received during non-work hours (evenings, weekends, or holidays) the evaluation shall be performed within three hours of the start of the next working day.

Following package evaluation and, if appropriate, package opening and source leak testing, the material should be transferred to the authorized source custodian or their designee.

Should it be determined that a received package has not been reviewed and approved for acquisition, the material shall be secured by Health Physics pending disposition.

Source Custodian Responsibilities:

- Source Custodians (Principal Investigators) shall maintain control over source utilization and ensure work is done in compliance with appropriate protocols, instructions, and safe handling practices.
- Source Custodians shall ensure all individuals who use or have unescorted, unsupervised access to the source, or can exercise material control of the source are appropriately trained and approved by Health Physics for such use or access.
- Source Custodians shall ensure through coordination with Health Physics that the source is used and stored in approved, posted, and monitored facilities, and all safety and control equipment is functional.
- Source Custodians shall maintain sufficient records of utilization, decay, transfer, and disposal to account for source inventory.
- Source Custodians shall coordinate any transfers of custodianship, changes in utilization, shipments of sources to off-site entities, or disposal of wastes with Health Physics.

Health Physics shall maintain inventory records for acquired unsealed licensed sources with quantities greater than 10CFR20 Appendix C quantities and all sealed sources requiring leak testing. Source Custodians shall conduct a physical inventory of all sources exceeding this criteria and reconciliation of records with Health Physics records at least annually. This does not in any way modify the requirements for custodians to comply with appropriate shipment, transfer, and waste disposal

regulations for unsealed licensed sources with quantities less than 10CFR part 20 Appendix C quantities and all sealed sources not requiring leak testing.

Shipments of licensed radioactive material or devices containing licensed sources shall be coordinated with Health Physics to assure and to document proper packaging, labeling, and inventory control in accordance with applicable DOT and NRC regulations.

Special Nuclear Material Accounting and Control:

In addition to the standard accountability and control system which applies to all licensed material, Health Physics shall maintain the Special Nuclear Materials (SNM) accountability office for NIST and administer the accountability system. NIST shall report SNM materials transactions and balances to the NMMSS database system in accordance with the provisions of 10CFR part 70 and NUREG BR-006 and BR-007 to prevent or detect unauthorized diversions of material quantities of SNM.

OCCUPATIONAL DOSE

The primary goal and responsibility of the radiation safety program is to assure that risks to individuals are maintained As Low As Reasonably Achievable (ALARA) commensurate with the beneficial application of radiation technologies. It is NIST policy and practice to maintain doses and risks from ionizing radiation ALARA.

NIST shall conduct operations in a manner to assure compliance with the Occupational Dose Limitations specified in 10CFR20.1201 "Dose equivalent to an

Embryo or Fetus though; 10CFR20.1208, Occupational Dose Limits for Adults."

All individuals determined likely to exceed 10 percent of the applicable occupational exposure limits shall be monitored to assure safety and compliance. Monitoring results shall be reviewed by Health Physics and used to assure ALARA practices.

External Personnel Dosimetry Monitoring:

- Health Physics conducts a personnel external dosimetry program, using devices requiring processing and meeting quality assurance criteria as required by 10CFR part 20.1501 Subpart F, – Surveys and Monitoring National Voluntary Laboratory Accreditation Program (NVLAP Accreditation).
- Health Physics assigns dosimeters to workers who would be likely to exceed 10 percent of regulatory limits (greater than 500 millirem per year whole body deep dose external exposure) based on the safety review of the facilities and source terms, and on knowledge of previous similar operations.
- The dosimeters shall be processed and reviewed at least quarterly. Any result greater than 10 percent of the regulatory limit shall be reviewed by Health Physics, the IRSC, and the appropriate management chain. Corrective action shall be taken as appropriate.
- Results exceeding 10 percent of the limit in a year are reported to the monitored individual(s).

- In addition to the dosimetry processed by a NVLAP accredited laboratory, secondary direct reading dosimetry should be used for operations where direct or immediate monitoring results may aid in maintaining doses ALARA.

Extremity Dosimetry:

- Health Physics shall assign extremity dosimetry to workers likely to exceed 10 percent of regulatory limits on the safety review of the facilities, source terms, and on knowledge of previous similar operations.
- Monitoring results shall be reviewed in a similar manner to the external dosimetry program. Any reported result greater than 10 percent of the regulatory limit shall be investigated and corrective action will be taken as appropriate.
- Results exceeding 10 percent of the limit in a year shall be reported to the monitored individual(s).

Bioassay Monitoring:

NIST maintains capabilities to perform both in-vivo and in-vitro bioassay monitoring.

- Where work place monitoring hazards analysis, or operational history indicates a reasonable potential for uptakes exceeding 10 percent of the applicable limits, Health Physics shall perform or arrange for timely bioassay monitoring.
- Analysis of significant positive bioassay results shall be used to assign values to the workers dose of record. Any result greater than 10 percent of the regulatory limit shall be investigated and corrective action will be taken as appropriate.

- Monitoring may be conducted routinely based on assigned duties or following specific operations depending on knowledge of previous similar operations.

Direct or Area Monitoring:

In lieu of specific personnel dosimetry, direct area monitoring, sampling, or source term analysis may be performed and combined with occupancy, time and motion, or similar calculation based methods to assign the dose of record.

Safe use of Radionuclides and Emergency Procedures:

AREA AND MATERIAL CONTROL ACTION LEVELS

Action Level	Action
Greater than the most restrictive of: a. 100 mrem in a year* b. 2 mrem in one hour*	Restrict (control) occupancy for general public.
Greater than 5 mrem in 1 hour**	Post as "Radiation Area" Restrict occupancy to as necessary and practicable.
Greater than 100 mrem in 1 hour**	Post as "High Radiation Area" Control access per 10CFR part 20.1601.
Greater than 500 rads in 1 hour***	Post as "Very High Radiation Area" Secure from access per 10CFR part 20.1602.

AREA AND MATERIAL CONTROL ACTION LEVELS

Action Level	Action
Greater than derived air concentration (DAC), or greater than 0.6% of the annual limit on intake (ALI) or 12 DAC-hours in a 40 hour work week.	Post as "Airborne Radioactivity Area" Restrict occupancy to as necessary and practicable. Monitor during occupancy if doses could exceed 10 % of limits.
Greater than 10CFR part 20 appendix C quantity.	Label any unattended containers with "Radioactive Material Label" and include information (10CFR part 20.1904) Limit unescorted unsupervised access to materials.
Greater than 10 times the 10CFR part 20 appendix C quantity of radioactive material in an area or room.	Post area or room with "Caution Radioactive Material" or similar posting if unattended. Restrict from unauthorized or uncontrolled access to material.

AREA AND MATERIAL CONTROL ACTION LEVELS

Action Level	Action
Areas - For alpha contaminants, greater than 200 dpm/ 100 cm^2 (removable),	Post as "Contamination Control Area" Restrict entry and use to as necessary and practicable. Consider appropriate contamination mitigation measures. Monitor upon exit.
Areas - For unknown beta/gamma contaminants or for known beta/gamma contaminants other than ^{14}C or ^{3}H, greater than 2,000 dpm/100 cm^2(removable),	Post as "Contamination Control Area" Restrict entry and use to as necessary and practicable. Consider appropriate contamination mitigation measures. Monitor upon exit.
Areas - For ^{14}C, greater than 20,000 dpm/ 100 cm^2(removable),	Post as "Contamination Control Area" Restrict entry and use to as necessary and practicable. Consider appropriate contamination mitigation measures. Monitor upon exit.
Areas- For ^{3}H, greater than 200,000 dpm/cm^2(removable).	Post as "Contamination Control Area" Restrict entry and use to as necessary and practicable. Monitor upon exit.

NOTES:

* means substantial whole body exposure or equivalent.

** means the result of an individual receiving such an absorbed dose in excess of that rate at 30 centimeters from a radiation source or from any surface that the radiation penetrates.

*** means the result of an individual receiving such an absorbed dose in excess of that rate at 1 meter from a radiation source or from any surface that the radiation penetrates.

- Upon identifying a need to post or restrict access to any area conditions, source terms, and ongoing processes shall be evaluated to determine the advisability of engineering controls, source containment/shielding, or decontamination to modify conditions and remove the need for posting and restrictions.
- Upon identifying a need to post or restrict access to a "Contamination Control Area", consideration shall be taken to assess the advisability of immediate decontamination or requiring enhanced personnel protection equipment, considering the status of operations and other hazards.

PERSONNEL EXPOSURE ACTION LEVELS		
DOSE EQUIVALENT		
External, penetrating, whole body, or internal	0.5 rem	Notify worker Review situation, recommend actions.
External, non-penetrating (shallow) or extremity dose	5 rem	Notify worker, Review situation, recommend actions.
SKIN CONTAMINATION		
Fixed or removable	Any level above background.	Review situation, Decontaminate [1]

[1] Personnel decontamination efforts should be discontinued if there is indication that continued efforts could result in damage to the skin and possible higher risks due to uptakes of material.

Contamination Clearance Levels			
Nuclide[2]	Average[3,4]	Maximum[3,5]	Removable[3,6]
Alpha emitters	100 dpm/ 100 cm^2	300 dpm/ 100 cm^2	20 dpm/ 100 cm^2
I-125, I-129	100 dpm/ 100 cm^2	300 dpm/ 100 cm^2	20 dpm/ 100 cm^2
I-126, I-131, I-133, Sr-90	1,000 dpm/ 100 cm^2	3,000 dpm/ 100 cm^2	200 dpm/ 100 cm^2

Contamination Clearance Levels			
Beta/gamma emitters except as otherwise noted	5,000 dpm/ 100 cm^2	15,000 dpm/ 100 cm^2	1,000 dpm/ 100 cm^2
H-3	50,000 dpm/ 100 cm^2	150,000 dpm/ 100 cm^2	1,000 dpm/ 100 cm^2

Notes:

(2) Where surface contamination by both alpha and beta-gamma emitting nuclides exists, the limits established for alpha and beta-gamma nuclides should apply independently.

(3) As used in this table, dpm 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 instrument.

(4) Measurements of average contamination 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.

(5) The maximum contamination level applies to an area of not more than 100 cm^2.

(6) The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with 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.

- Contamination in unrestricted areas and/or on equipment/materials to be released for unrestricted use shall not exceed the contamination levels listed.
- The contamination clearance values are based on Appendix S of NUREG 1556 Volume 11 and other guidance materials.
- Decontamination efforts shall be made to achieve the goal of no detectable removable activity being present in any unrestricted area or on any equipment or materials released for unrestricted use.

Criticality Controls:

Under the license limits of SNM-362, NIST license limits do not allow possession and use of special nuclear material in any form except sealed Pu sources in quantities and forms sufficient to form a critical mass pursuant to the definitions of 10CFR part 70.4. That is, NIST license limits are less than the defined critical mass (assuming moderation and reflection) of 350 grams of contained U-235, 260 grams of U-233, 225 grams of Pu or any combination of these in accordance with the unity rule or any form other than sealed Pu sources (mostly plutonium-beryllium neutron sources).

NIST commits to adequate practices to ensure that no more than 450 grams of Pu as plutonium-beryllium neutron sources or, by applying the unity rule, no combination of these materials exceeding unity shall be used or stored at any single location. Therefore, no criticality provisions are required.

EMERGENCY PROCEDURES

Radiological Incident Response:

- Health Physics shall maintain written instructions for responding to spills or related laboratory personnel contamination incidents. These procedures are compatible with the model emergency procedures as published in NUREG 1556 appendix R as published in April, 1999.
- Health Physics staff shall have training and knowledge in incident response practices.
- Training for radiation workers shall include how to recognize and respond to off-normal radiological conditions. These include unexpected survey monitoring results, area contamination, personnel contamination, and failures of equipment.
- Radiation workers shall be instructed to contact Health Physics for support as soon as an incident or emergency situation is identified. For after-hours response, the staff shall be trained to contact the on-site NIST dispatcher and request that Health Physics support be contacted.
- Contamination monitors shall be posted with instructions for use and contact information.
- Incident response equipment shall be maintained by Health Physics and positioned in locations near the laboratories.
- Radiation workers authorized to use unsealed sources shall be trained in the basics of personnel contamination monitoring and decontamination procedures.

Physical Security and Fire Protection:

- NIST laboratories shall be monitored by a fire detection system (smoke and heat) that is alarmed in Physical Security and at the on-site Fire Station. Additional manual pull boxes are placed throughout the facility.
- NIST buildings housing approve licensed sources and specific facilities shall be centrally monitored by active physical security access systems.
- Licensed sources shall be secured from unauthorized access by locked doors or cabinets or similar measures when unattended.
- NIST shall maintain physical security, fire protection, and facilities emergency maintenance capabilities 24 hours a day, seven days a week.
- Emergency response personnel (Fire and Police) shall receive in-service training by Health Physics biennially on how to respond to security, fire, or other monitored alarm situations.
- The on-site emergency dispatcher maintains an emergency contact list including Health Physics professional staff.
- Portable fire extinguishers are deployed throughout the laboratories and facilities according to the NIST Fire Protection Group recommendations. Building entrances and stairwells have standpipe connections; fire hydrants are located at various positions on the exterior of buildings.

In 1992, an evaluation was performed based on the license limits and documenting that the maximum dose to a member of the public offsite due to release of radioactive material would not exceed 1 rem TEDE or 5 rem to the thyroid as required in

10CFR30.32 (i). The NIST evaluation was provided for NRC review and was approved by the NRC on December 10, 1993. The proposed license limits are below those considered for the approved evaluation. Therefore, an exercised emergency plan is not required for this license.

Surveys:

Laboratory and Restricted area Surveillance and Monitoring:

Health Physics shall perform and document routine surveys of posted radiation facilities to assure health and safety and regulatory compliance. Health Physics shall determine the surveillance frequencies considering the source activity, physical form, containment, utilization, process knowledge and history. This determination shall be consistent with methodologies in NUREG 1556 vol 11 Appendix S and other guidance materials. Typical actions and surveillance frequencies are listed below but may be modified by Health Physics based on process knowledge, utilization and monitoring history, and levels of research activity.

Description	Surveillance Action	Frequency
Facilities with dose rates greater than 5 millirem per hour at 30 cm from a surface, with active transfers and utilization of sources	- Survey for dose rate measurements	Weekly
Facilities with dose rates greater than 5 millirem per hour with sources in storage or minimal inventory change or utilization	- Survey for dose rate measurements	Quarterly
Laboratories with active unsealed source utilization greater than 10CFR20 appendix C quantities	- Direct count rate based surveys - Smear surveys for contamination	Weekly

Description	Surveillance Action	Frequency
Laboratories with unsealed source work but active utilization is less than 10CFR20 appendix C quantities	- Direct count rate based surveys - Smear surveys for contamination	Quarterly
Other posted radioactive source areas with dose rates, source terms, or utilizations below the above criterion	- Direct count rate and dose rate surveys - Contamination smear surveys if unsealed material is present	Annually

Environmental and unrestricted area monitoring:

Health Physics shall conduct and document monitoring throughout the facility including restricted areas, controlled but not restricted areas, and fence lines of NIST facilities to assure and document compliance with dose and dose rate limitations for members of the public, and to assure compliance with effluent and environmental regulations.

Leak Tests:

- Sealed source leak testing shall be performed in accordance with the model set forth in NUREG 1556 vol 11. appendix T. Unless otherwise specified by the sources respective SSD Registration Certificate, tests shall be performed semiannually.
- 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 H-3, with a half-life greater than 30 days and in any form other than gas, shall be tested for leakage and/or contamination semiannually.
- 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 entity shall not be put into use until tested for leakage.
- The semi-annual leak test interval required by this section does not apply to sealed sources that are stored and not being used. However no sealed source that would otherwise require testing shall remain in storage for more than ten years without being tested. Any sealed source in storage must be leak tested prior to usage or removal from storage. This leak testing shall be performed no more than 6 months prior to the date of use or transfer.
- The leak 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 maintained for inspection by the USNRC in accordance with regulatory requirements.

- If the test reveals the presence of 0.005 microcuries or more of removable contamination from the sealed sources other than described below, or an indication that the sealed source which is stored in a water pool for shielding purposes is leaking, then NIST shall immediately withdraw the sealed source from use and shall cause it to be contained or decontaminated and repaired by a person licensed to make such repairs, or to be disposed of in accordance with USNRC regulations.
- If tests indicate leakage from a source distributed or acquired in accordance with requirements of the sealed source registry or designed, manufactured, and tested in accordance with special form requirements, within 5 days after determining that a source has leaked, NIST shall file a report with the USNRC describing the source, test results, extent of contamination, apparent or suspected cause of source failure, and corrective action taken.

ITEM 11: WASTE MANAGEMENT

Radioactive wastes may be generated as part of the utilization of licensed sources.

It is the policy and practice of NIST that wastes shall be disposed of in a manner that protects the health and safety of NIST staff, members of the public, and the environment applying the ALARA policy both for the short-term handling phases and long-term storage or disposal phases of waste management.

The primary waste streams are as follows:

Dry Active Low Level Wastes including:

- Gloves, wipes, paper, and miscellaneous containers and tools used during handling o licensed material or clean up of contaminated objects;
- Glassware, vials, dried filters and other expendable chemistry equipment;
- Components and equipment contaminated or activated during use;
- Activated samples materials or sample containers.

Liquid Wastes including:

- Liquid scintillation materials;
- Aqueous solutions of acids or bases used during chemistry processes;
- Water or cleaning liquids used during decontamination processes.

Health Physics shall train workers who generate solid waste to ensure appropriate collection of all solid waste materials that could contain activity. Wastes are segregated and collected in accordance with written procedures, documenting the source term, activity, physical and chemical state, and any other pertinent information

necessary to assure safety of the handlers and compliance with processor and disposal facility contractual and license requirements. On request from the worker, Health Physics collects the wastes from the labs and transports long-lived wastes to the radioactive waste annex in H100 in Building 235 for packaging and shipment. The wastes shall be disposed of either by transfer to a licensed waste processing contractor or by shipping directly to a licensed disposal site. If a contractor is used, the waste shall be packaged according to their instructions and in compliance with the appropriate shipping regulations. If the shipment is direct to a licensed disposal site, then all applicable waste form regulations and restrictions on packaging shall be followed. If appropriate, wastes may be compacted on-site with a commercial compactor as part of the packaging process. Protective features incorporated into the compactor facility include an interlocked enclosure and a filtered ventilation system. Regular particulate air samples shall be taken to monitor for potential effluent releases during packaging. Wastes that cannot be accommodated in drums are packaged in DOT compliant shipping containers as specified by the contractor.

Decay-In-Storage (DIS)

This license allows for Decay-in-Storage prior to disposal as provided in 10CFR part 20.2001(a)(2), "Standards for Protection Against Radiation; By Decay in Storage" and is in accordance with the following conditions:

- Isotopes must have a half life of less than 120 days;
- Radioactive wastes shall be in stable chemical and physical forms prior to placement in storage. Incompatible materials shall not be stored together;
- Wastes shall be maintained in segregated storage for at least ten half lives;

- Following the decay period wastes shall be monitored at the surface with an appropriate survey meter on the most sensitive scale (or an equivalently sensitive monitoring device) with no intervening shielding material, in a low background area;
- If monitoring results are indistinguishable from background, all radioactive materials labels shall be removed or defaced and the material may be disposed of without regard to the radiological concerns (this does not release NIST from regulatory compliance regarding chemical or other physical waste disposal hazards);
- If the monitoring detects additional activity above background, the waste shall be analyzed to identify longer half-life impurities and evaluated for disposal as radioactive wastes.

The nature of NIST activities as a Standards Laboratory often requires that materials or derived standards be maintained in inventory for extended periods for later analysis and future comparative measurements. At times this may constitute a "Decay-in-Use" situation where, after more than ten half lives from the time of acquisition, the material activity is no longer viable for measurements. Under these conditions the material shall be monitored by Health Physics with an appropriate survey meter on the most sensitive scale (or an equivalently sensitive monitoring device) with no intervening shielding material, in a low background area. If indistinguishable from background the material may be removed from institutional controls or disposed of without regards to radiological properties, similar to clearance criteria as used for decay-in-storage.

Air and Liquid Effluents

Effluent releases through the ventilation systems and through the waste tank systems shall be verified to be in compliance with the public dose limits specified in 10CFR20.1301 in accordance with the requirements of 10CFR20.1302.

Effluent releases into the air or water shall be assessed by sampling, direct measurement of the source terms, and/or calculation methods to assure compliance with the release criteria. Records shall be maintained to determine annual effluents and verify regulatory compliance.

In Buildings 235 and 245, sink drains from specific radio-chemistry laboratories are directed to a set of tanks. These tanks are sampled, analyzed, and released to the sanitary sewer in accordance with written procedures in compliance with 10CFR part 20.2003: Disposal by release into sanitary sewerage.

Bulk liquid wastes shall be collected and transferred to Health Physics. Health Physics shall determine disposition which may include release via the tanks. Typically, liquid wastes are disposed by transfer to contracted processing brokers.

Incineration and on-site burial

This license does not authorize on-site incineration or on-site burial of radioactive wastes.

Disposal of Specific Waste as if it Were Not Radioactive:

Liquid scintillation medium containing no more than 1.85 kBq (0.05 microcuries) of H-3 or C-14 per gram of the medium may be disposed of as non-radioactive waste. This does not release NIST from applicable regulations regarding the appropriate disposal of chemical hazards associated with the liquid scintillation material.

APPLICATIONS FOR EXEMPTIONS

NIST requests exemption from 10CFR part 36.27. This regulation requires a fire extinguishing system capable of extinguishing a fire without the entry of personnel into the irradiation room.

The irradiation rooms housing the part 36 panoramic irradiators are entirely of concrete construction. The rooms are limited in size so there is minimal opportunity for combustible materials to be stored in the area. NIST administratively limits storage of flammable materials in the rooms. As such, the NIST fire protection group has determined that the most credible fire incident would be an electrical fire from the control, instrumentation, or lighting systems. They have further determined that this should not be sufficient to engulf or significantly endanger the source.

Considering the most likely potential fire source, and complexity and age of the facility, the most effective and feasible fire suppression system that could be installed would be a local oxygen displacement type system. NIST has concerns for personnel safety in the relatively small irradiation rooms should such a system be inadvertently discharged during occupancy.

The facility is arranged with fire detection systems that satisfy the other aspects of the regulation.

ITEM 12: FEES

Per conversation with Breeda Reilly of US NRC, the license renewal application fees are incorporated in the regular license fee payments. No additional payment is due at the time of this application.

ITEM 13: CERTIFICATION

AS THE CERTIFYING OFFICIAL ON BEHALF OF THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST), I UNDERSTAND THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON NIST.

NIST CERTIFIES THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35 , 36, 39, 40,and 70 AND THAT ALL INFORMATION CONTANED HEREIN IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURIS DICTION.

CERTIFYING OFFICER: JAMES TURNER, PhD. DEPUTY DIRECTOR OF NIST

SIGNED:_____ DATE: 6/27/07

DELEGATION OF AUTHORITY: RADIATION SAFETY OFFICER

Memorandum To: All Employees
From: James M. Turner PhD , Deputy Director of NIST
Subject: Delegation of Authority for Radiation Safety Officer

Timothy F. Mengers, CHP, PE of the Safety Health and Environment Division has been appointed, Radiation Safety Officer and is responsible for ensuring the safe use of all Byproduct Material, Source Material, Special Nuclear Material, and Ionizing Radiation Producing Machines used at NIST.

The Radiation Safety Officer is responsible for managing the radiation safety program; implementing internal procedures to assure safety and regulatory compliance; identifying radiation safety problems; initiating, recommending, or providing corrective actions; verifying implementation of corrective actions; and ensuring compliance with regulations for the use of radiation emitting materials and machines used at NIST.

The Radiation Safety Officer is hereby delegated the authority necessary to meet these responsibilities. The Radiation Safety Officer has the authority to immediately stop or prohibit any operations, activities, or access involving the use of Byproduct Material, Source Material, Special Nuclear Material, or ionizing radiation producing machines in which health and safety of NIST workers or associates, members of the public, or the environment may be compromised or may result in non-compliance with the requirements of the US Nuclear Regulatory Commission, the US Department of Transportation , the Occupational Safety and Health Administration, or other federal or state regulatory authorities having jurisdiction over the specific activities.