RADIOLOGICAL AFFAIRS SUPPORT PROGRAM MANUAL

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DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
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20 JAN 2015

From: Commander, Naval Sea Systems Command (SEA 04)

Subj: RADIOLOGICAL AFFAIRS SUPPORT PROGRAM MANUAL, NAVSEA S0420-AA-RAD-010 (RAD-010), REVISION 2

Encl: (1) RADIOLOGICAL AFFAIRS SUPPORT PROGRAM MANUAL, NAVSEA 0420-AA-RAD-010 (RAD-010), Revision 2 (2015)
(2) Instructions for Implementation of RAD-010, Rev 2
(3) Changes Incorporated into NAVSEA S0424-AA-RAD-010, Rev 2

1. Purpose. To promulgate enclosure (1).

2. Discussion. The Radiological Affairs Support Program (RASP) applies to the receipt, ownership, possession, use, repair, maintenance, storage, distribution, transportation, and disposal of all sources of ionizing radiation within the Navy and Marine Corps, except those associated with the Naval Nuclear Propulsion Program, Navy Nuclear Weapons Program, and under the authority of the Bureau of Medicine and Surgery (BUMED).

3. Action. All Navy and Marine Corps activities using RASP sources of ionizing radiation shall implement enclosure (1) using the instructions provided in enclosure (2).

4. Enclosure (3) contains the approved change request submittals received from naval commands that are included in enclosure (1).

5. This revision can be downloaded from the RASO NKO website at: (https://www.nko.navy.mil/group/raso/home).

6. The NAVSEA point of contact for this matter is CDR Jerry N. Sanders, Jr., 202-781-2414 or email at jerry.n.sanders@navy.mil.

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INSTRUCTIONS FOR IMPLEMENTATION OF RAD-010, REVISION 2

1. In the event of conflict between this manual and guidance promulgated by other directives, the provisions of this manual shall be followed and the conflict promptly reported to the Officer in Charge, Naval Sea Systems Command Detachment, Radiological Affairs Support Office (NAVSEA DET RASO) at 757-887-4692 for resolution.

2. A Plan of Action and Milestones (POA&M) shall be submitted by each command indicating the timeline for full implementation of enclosure (1) into the command's policies, procedures and practices.

3. The POA&M shall be submitted to NAVSEA DET RASO within 90 days from the date of this letter.

4. Ionizing Radiation Producing Machine Authorizations (IRPMA)

a. Commands should allow 60 days in POA&M for NAVSEA DET RASO to process and issue machine authorizations.

b. Use RASP Regulatory Guide 3, Guidance For Developing A Command RASP X-Ray Radiography Instruction, which complies with enclosure (1) for LORAD LPX 160 machines. If using another machine, emergency and operating instructions will need to be modified for that machine.

c. If several machines with the same manufacturer and model number are being submitted for IRPMAs, and the operating and emergency instructions are the same for each machine, only one copy of the operating and emergency procedures needs to be submitted for each facility where the machine is used and an open facility procedure if open facility is requested.

5. All previously issued exemptions to the RAD-010 affected by Revision 2 are cancelled six months from the date of this letter. Your intention to maintain an exemption shall be included as part of the POA&M.

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SECTION 1 - **RADIOLOGICAL AFFAIRS SUPPORT PROGRAM**

1.1 **Introduction**

1.1.1 **Purpose**

This section establishes policy, procedures, and requirements for the Radiological Affairs Support Program (RASP).

1.1.2 **Scope**

The RASP applies to the receipt, ownership, possession, use, repair, maintenance, storage, distribution, transportation, and disposal of all sources of ionizing radiation within the Navy and Marine Corps, except those associated with the Naval Nuclear Propulsion Program, Navy Nuclear Weapons Program, and under the authority of the Bureau of Medicine and Surgery (BUMED).

The RASP applies to ionizing radiation sources used in a wide range of operational, industrial, and research activities conducted in the Navy and Marine Corps both afloat and ashore. These sources include Nuclear Regulatory Commission (NRC) licensed radioactive material, radioactive waste, machine sources such as x-ray machines, particle accelerators, electron microscopes, laboratory analytical devices, vehicle and package inspection systems, and all other equipment capable of producing ionizing radiation.

The RASP also applies to commodities containing radioactive material such as electronic devices (electron tubes), luminescent/self-illuminating devices (watches), ionization devices (smoke detectors), analytical devices (gauges), and those containing natural radioisotopes (aircraft/vehicle parts and welding rods) that are not specifically licensed by the NRC.

Finally, the RASP applies to environmental restorations associated with general radioactive materials and the Department of the Navy (DON) low-level radioactive waste (LLRW) disposal program.

1.2 **Discussion**

RASP sources of ionizing radiation are used in many essential operations in the Navy and Marine Corps. These uses

include industrial radiography on aircraft and ships, chemical warfare agent detection, vehicle and package security inspections, and testing of electronic components.

It is the DON's goal when using RASP sources of ionizing radiation, henceforth called RASP sources, to keep personnel occupational radiation exposures as low as reasonably achievable (ALARA) and never exceed the federal limits. To accomplish this goal, Navy and Marine Corps commands who use RASP sources must implement a RASP that meets the requirements of this manual.

1.3 **Implementing Documents**

This manual establishes the regulatory requirements for occupational radiation protection within the Navy and Marine Corps for all sources of ionizing radiation, except those associated with the Naval Nuclear Propulsion Program, Navy Nuclear Weapons Program, and under the authority of BUMED. Failure to comply with these requirements may lead to appropriate enforcement actions.

Following the requirements of this manual will ensure compliance with applicable federal, Department of Defense (DoD) and DON requirements. Additional site-specific requirements may be contained within Navy Radioactive Material Permits (NRMPs) that supplement the requirements of this manual. If there is a conflict between the requirements of this manual and the requirements of another federal, DoD, or Navy instruction, notify Naval Sea Systems Command Detachment Radiological Affairs Support Office (NAVSEADET RASO) and forward a written request to NAVSEADET RASO for resolution. Only written interpretations of or exceptions to the requirements in this manual that are provided by COMNAVSEASYSCOM (NAVSEA 04N) are binding.

To assist commands in achieving and maintaining compliance with the requirements of this manual, RASP has established various mechanisms for providing guidance on implementing the requirements. These mechanisms include RASP Standard Applications, RASP Information Notices, RASP Policy Memoranda, and RASP Regulatory Guides. Contact NAVSEADET RASO to gain electronic access to or obtain copies of these guidance documents.

The procedure to use to request a change to this manual is provided in Appendix B.

When referencing section numbers throughout this manual, only the section number will be listed and it is implied that the section is in this manual. Section number references from other documents will include the document title or number in addition to the section number.

1.4 **Authority**

1. DODINST 6055.8 (series), Occupational Ionizing Radiation Protection Program, directs the Heads of DoD Components to establish and maintain ionizing radiation protection programs and ensure that unnecessary exposure is avoided.
2. SECNAVINST 5100.10 (series), Department of the Navy Policy for Safety, Mishap Prevention, Occupational Health and Fire Protection Programs, directs that safety and occupational health (including the RASP) are inherent responsibilities of each command and that these programs are enacted with appropriate planning, programming, qualified staffing, and budgeting to meet requirements.
3. OPNAVINST 5100.23 (series), OPNAV (N45) is given responsibility for all aspects of safety and mishap prevention with respect to occupational ionizing radiation hazards except for medical treatment or diagnosis and radioactivity associated with naval nuclear propulsion. Naval Sea Systems command (NAVSEASYSCOM) is given responsibility for all aspects of safety and mishap prevention for occupational ionizing radiation producing equipment excluding medical treatment or diagnosis and naval nuclear propulsion.
4. OPNAVINST 6470.2 (series), Occupational Radiation Protection Program:
   a. Establishes the formal radiation protection program for the DON and assigns overall management and oversight responsibilities for various applications of ionizing radiation.
   b. Designates the Commander, Naval Sea Systems Command (COMNAVSEASYSCOM) to be responsible for establishing procedures and managing the RASP for radioactive sources and radiation producing machines that are used in industrial, operational, and research applications throughout the DON.

5. OPNAVINST 6470.3 (series), Naval Radiation Safety Committee:
   a. Establishes the Naval Radiation Safety Committee (NRSC) to administer the Master Materials License (MML) issued to the DON by the NRC.
   b. Directs COMNAVSEASYSCOM to issue instructions and guidance concerning the non-medical use of radioactive material associated with the MML.
   c. Assigns the Chief, BUMED the responsibility for managing medical uses of radioactive material under the MML.
   d. Designates the Naval Sea Systems Command, Detachment Radiological Affairs Support Office (NAVSEADET RASO) and the Navy and Marine Corps Public Health Center (NMCPHC) (formerly known as the Navy Environmental Health Center (NAVENVIRHLTHCEN)) as Technical Support Centers (TSCs) for the NRSC.
6. NAVSEAINST 5100.18 (series), Radiological Affairs Support Program (RASP), establishes the RASP and assigns COMNAVSEASYSCOM as the technical manager.
7. Marine Corps Order (MCO) 5104.3 (series), Marine Corps Radiation Safety Program, establishes the Marine Corps Radiation Safety Program and directs Marine Corps activities to comply with the RASP.
8. NAVMED P-5055, Radiation Health Program Manual, provides the radiation health requirements applicable to Navy and Marine Corps radiation protection programs including the RASP.

1.5 Responsibilities

1.5.1 Programmatic Responsibilities

The responsibilities of the various components of the RASP as described in the references cited in Section 1.4 are summarized below.

1. Naval Radiation Safety Committee
   a. The NRSC was established to manage and oversee the use of all NRC licensed radioactive material in the Navy and Marine Corps. The NRSC’s principle responsibility is to administer the MML. The MML provides the DON self-regulatory authority for the

receipt, possession, distribution, use, transportation, transfer, and disposal of NRC licensed radioactive material within the Navy and Marine Corps.

b. The NRSC membership consists of:

(1) Chairman – Director, Energy and Environmental Readiness Division, Office of the Chief of Naval Operations (OPNAV N45).

(2) Executive Secretary – Director, Radiological Controls and Health, Office of the Chief of Naval Operations (OPNAV N455).

(3) Representatives from:

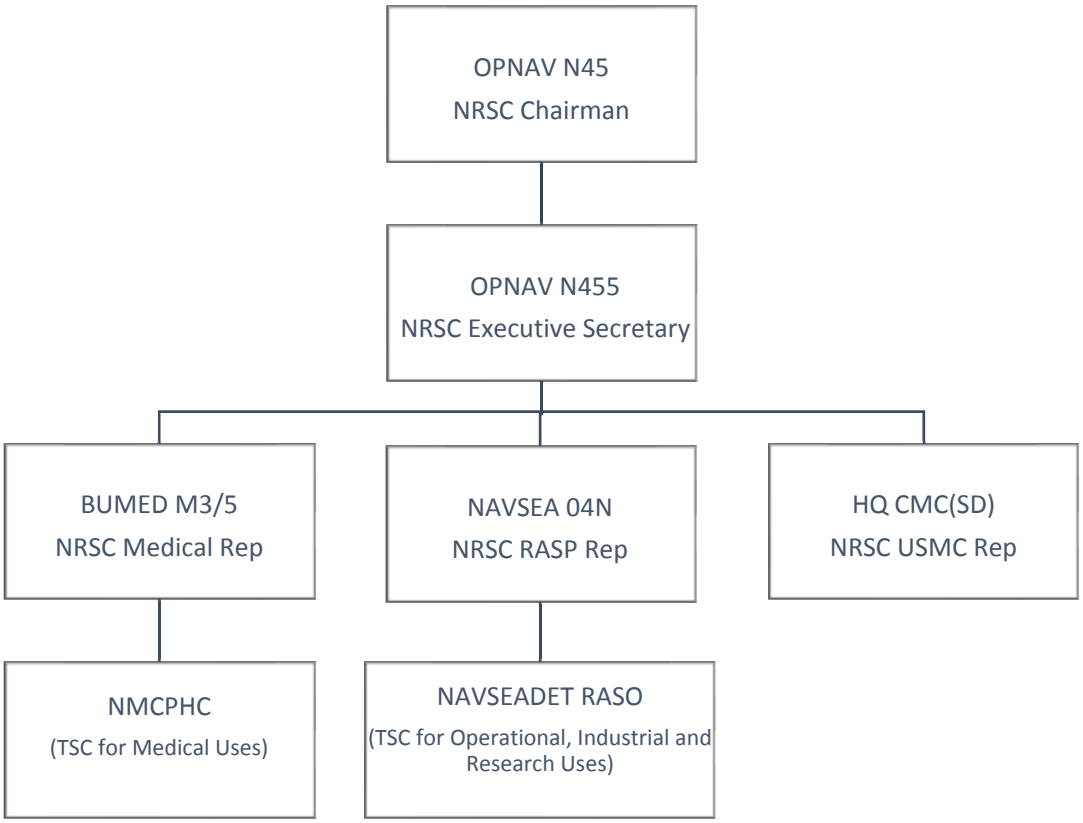
i. The Office of the Commandant, U.S. Marine Corps (CMC (SD)).

ii. Naval Sea Systems Command (NAVSEA 04N).

iii. The Bureau of Medicine and Surgery (BUMED M3/5).

(4) NAVSEADET RASO and NMCPHC are designated as TSCs and are non-voting members of the NRSC.

c. NRSC Organizational Chart:



2. The NRSC, acting for the Chief of Naval Operations, shall:
   a. Manage and oversee the Navy's MML of Broad Scope.
   b. Maintain records under the MML.
   c. Review NRMPs and recommend action to be taken by the NRSC Chairman or his designated representative.
   d. Meet on at least a quarterly basis to review the activities of the Executive Secretary.
   e. Ensure inspections are conducted to assess compliance with the provisions of the MML, NRC regulations, and the specific NRMPs.
   f. Advise the Deputy Chief of Naval Operations (Fleet Readiness and Logistics) (OPNAV N4) of all noncompliance items with Severity Levels I, II, or III.
   g. Provide copies of NRMPs to the NRC.
   h. Establish policies for the control, use, acquisition, and accountability of byproduct, source and special nuclear material.
   i. Monitor the performance of the TSCs and the Executive Secretary, and the performance of audits on the implementation of the radiation safety program.
   j. Advise the NRSC Chairman of the results of the audits and program reviews.
   k. Ensure that the permitting and inspection staff is appropriately qualified.
   l. Maintain a current list of quantities, uses, and locations where radioactive material is received, possessed, used, or stored.
   m. Establish enforcement policies and procedures.
   n. Establish technical ad hoc committees to extend staff capabilities for unique or technically complex problems.
3. NRSC Executive Secretary (OPNAV N455) shall:
   a. Be responsible for conducting day-to-day operations and issuing permits approved by the NRSC Chairman.
   b. Serve as the primary point of contact between the Department of the Navy and NRC for matters covered by the NRSC.
   c. Implement the NRSC’s enforcement sanctions.

d. Stop work activities that may pose undue risk or hazard, or may violate conditions of the MML or NRC regulations.

4. COMNAVSEASYSCOM shall:

a. Issue and maintain a comprehensive procedural and requirements directive to control the use of ionizing radiation sources under the RASP. This includes procedures and guidance for obtaining, amending, or terminating an NRMP and control of radioactive material and devices that produce ionizing radiation. This manual meets this responsibility.

b. Direct, coordinate, administer, and act authoritatively for the Chief of Naval Operations in RASP matters.

c. Serve as the central point of contact for the RASP within the DON.

d. Appoint a member to the NRSC.

e. Inspect commands that are using RASP sources. Forward reports of inspections conducted for MML compliance to the NRSC for approval and issuance. All other inspection reports are approved and issued by COMNAVSEASYSCOM.

f. Provide radiological safety training to Navy and Marine Corps RASP Radiation Safety Officers (RSOs). Act as the central technical review authority for Navy training programs that provide instruction in radiological controls and radiation safety in accordance with the RASP.

g. Provide technical assistance and radiation safety reviews to Navy and Marine Corps commands for the establishment, maintenance, and management of their command RASP.

h. Ensure adequate resources (personnel, funds, and training) are provided to implement and maintain an effective RASP and TSC.

i. Establish procedures, in coordination with the DoD Executive Agent (Army) for Low-Level Radioactive Waste Disposal, for handling, storing, shipping, and disposing of LLRW, except LLRW associated with the Naval Nuclear Propulsion Program and the Naval Nuclear Weapons Program.

j. Provide management oversight of NAVSEADET RASO

concerning the use of RASP sources at Navy and Marine Corps commands not under the control of BUMED.

5. Director, Radiological Controls Program Office, Naval Sea Systems Command (NAVSEA 04N) shall:

   a. Serve as the Program Manager for the RASP ensuring that COMNAVSEASYSCOM's responsibilities listed above are effectively performed.
   b. Conduct an annual review of this manual and update as appropriate.
   c. Provide management and programmatic oversight of NAVSEADET RASO.
   d. Serve as COMNAVSEASYSCOM's representative on the NRSC.
   e. Issue reports to Navy and Marine Corps commands for RASP inspections not associated with the MML. The NRSC issues inspection reports associated with the MML.
   f. Evaluate incidents involving RASP radiation sources and consult with the NRSC regarding appropriate enforcement actions.
   g. Serve as the program manager for RASP LLRW. Coordinate with the DoD Executive Agent on matters of LLRW policy and procedures. Maintain the LLRW Inter-Service Support Agreement (ISSA) between the Army and DON.

6. Officer in Charge, Naval Sea Systems Command Detachment, Radiological Affairs Support Office (NAVSEADET RASO) shall:

   a. Develop comprehensive procedures, guidance, and requirements for the control of radiation sources under the RASP for COMNAVSEASYSCOM review and issue.
   b. Review NRMP applications for completeness and compliance with current regulations. Prepare NRMPs and forward to the NRSC for approval and issue.
   c. Perform RASP inspections at commands to assess compliance with current Navy and Marine Corps directives and federal regulations, this manual, and provisions of the command's NRMP. Prepare inspection reports and forward for approval and issue to NAVSEA 04N or the NRSC, as appropriate.
   d. Investigate incidents involving RASP radiation

sources. Prepare incident reports and forward to NAVSEA 04N for evaluation and appropriate action.

e. Evaluate violations noted during inspections and investigations for trends and report the results to NAVSEA 04N.

f. Provide guidance to Navy and Marine Corps commands in the preparation of NRMP applications and radiation generating machine authorizations.

g. Train Navy and Marine Corps personnel to qualify as RASP RSOs.

h. Provide design reviews of facilities where RASP radiation sources will be used, to ensure radiological controls are adequate for protection of workers, the public and the environment.

i. Provide technical assistance to Navy and Marine Corps commands as necessary. Technical assistance shall be conducted in such a manner that would not constitute a conflict of interest with NAVSEADET RASO's inspection and NRMP reviewer responsibilities.

j. Serve as the central point of contact within DON for LLRW disposal actions under the RASP. Provide procedures and guidance for storing, shipping, and disposing of LLRW in coordination with the DoD Executive Agent for Low Level Radioactive Waste Disposal. Coordinate with other federal and state agencies when Navy or Marine Corps radioactive material is found in the private sector.

k. Serve as the central point of contact within DON for all environmental general radioactive material (G-RAM) issues.

1.5.2 **Command Responsibilities**

This manual specifically describes the following RASP responsibilities:

1. Commanders, Commanding Officers (COs), and Officers in Charge (OICs) of Navy and Marine Corps commands (ashore and afloat) possessing RASP radiation sources, and those acting on their behalf shall:

   a. Establish, approve, and maintain an effective command radiation safety program and issue a command endorsed RASP instruction incorporating the requirements of

this manual, other Navy and Marine Corps directives, and federal regulations, as applicable.

b. Ensure the command obtains an NRMP prior to receipt, possession, or use of radioactive material requiring an NRMP.

c. Comply with and enforce the requirements of this manual and conditions of each NRMP issued to the command.

d. Ensure that measures are established for controlling ionizing radiation sources so that personnel radiation exposures are ALARA and no greater than the limits established in NAVMED P-5055.

e. Assign, in writing, a qualified RASP RSO and Assistant RSO (ARSO).

   (1) The appointment letter shall specify that the RSO and ARSO have direct access to the Commander, CO, or OIC on matters dealing with the RASP and that the RSO and ARSO have independent authority to stop any RASP operation he/she considers to be unsafe.

   (2) Only one RSO shall be assigned to a command unless otherwise approved by NAVSEADET RASO. Multiple ARSOs may be assigned.

   (3) RSOs and ARSOs are inherently governmental in nature and are not to be outsourced to the private sector. [See SECNAVINST 5100.10 (series), Department of the Navy Policy for Safety, Mishap Prevention, Occupational Health and Fire Protection Programs, and OPNAVINST 5100.8 (series)].

f. Ensure the RSO or ARSO is available to execute the duties outlined in Section 2 in order for RASP operations to take place.

g. Ensure the RSO or ARSO are able to respond within normal commuting time (<2 hours) to a radiological emergency when RASP operations are being performed.

h. Notify NAVSEADET RASO when personnel changes are made in the RSO and ARSO positions.

i. Notify NAVSEADET RASO of changes in Commander, CO, or OIC.

j. Notify NAVSEADET RASO of any reportable violation of a command NRMP, or this manual, or any accident,

significant incident, personnel injury, suspected overexposure, spread of contamination, or suspected internal/external contamination of a person that involves any RASP radiation source. Henceforth in this manual, the term "incident" will be used to collectively refer to all these events.

k. Provide oversight of the RSO. Ensure the RSO has been provided sufficient time and authority to fulfill his or her duties and responsibilities, so that the command's RASP is effectively managed and radiation sources are used and stored in a safe manner.

l. Ensure causal analysis and corrective actions to command identified deficiencies, violations noted during RASP inspections, and incidents are appropriate and actions are carried out expeditiously.

m. Respond to violations noted on RASP Inspection Reports within the time frame specified in the report. Ensure all follow-up correspondence related to a RASP inspection is submitted to NAVSEADET RASO in a timely manner.

n. Ensure deficiencies in NRMP applications identified by NAVSEADET RASO are processed and submitted within the time frame specified.

o. For shore commands, establish a written agreement with the supporting Medical Treatment Facility (MTF) for services provided by the MTF that are associated with the RASP (e.g., radiation medical exams, dosimetry, emergency response).

p. Sign all formal cover letters or other documents as required by this manual. By direction signatures are not acceptable, except for echelon II commands. A Commander, CO or OIC for an echelon II command that conducts RASP operations may designate, in writing, a senior management representative (O6/GS-15 or higher) to sign RASP cover letters or other documents as required by this manual.

2. Command RSOs shall:

a. Act authoritatively for the Commander, CO, or OIC in carrying out the RSO duties and responsibilities to ensure that personnel radiation doses from RASP radiation sources are ALARA.

b. Stop RASP operations that he or she considers unsafe.
c. Be able to respond within normal commuting time (<2 hours) if offsite when RASP operations are being performed unless an ARSO is designated to provide oversight coverage. The RSO does not have to be physically present when RASP operations are being performed.
d. Develop, implement, and maintain an effective RASP that complies with Navy and Marine Corps directives and federal regulations and the conditions of any NRMP issued to the command.
e. Provide advice and assistance to all command elements on all matters pertaining to RASP requirements, procedures, and command policy.
f. Prepare an assessment for the Commander, CO, or OIC annually on the status of the command's RASP. In addition, keep the Commander, CO, or OIC informed of significant events and changes to the status of the program.
g. Establish liaison with the supporting MTF to coordinate radiation health program requirements and any other RASP related services provided by the MTF.
h. Ensure surveys and inspections that demonstrate compliance with the requirements in this manual and other pertinent Navy and Marine Corps directives, specific NRMP conditions, and federal regulations are properly performed.
i. Ensure personnel are issued and wear appropriate BUMED approved dosimeters, as required. Evaluate dosimetric results to ensure they are appropriate for the work performed. Ensure required bioassays are performed and results are properly evaluated. Provide the dosimetric results from each issue period and the cumulative exposure for the year to each worker.
j. Develop, coordinate, document, approve, and participate in training personnel as required by this manual.
k. Ensure that RASP management reviews, audits, work surveillances and inspections are executed, and identified deficiencies are tracked and corrected expeditiously through the RASP Deficiency Report (RDR) program or command equivalent program.

l. Maintain all applicable NRMPs current by submitting amendment, renewal, or termination requests in a timely manner. Correct NRMP application deficiencies noted by NAVSEADET RASO within the specified time frame.

m. Register all applicable machine sources of ionizing radiation with NAVSEADET RASO.

n. Conduct and document an annual review of all operating and emergency procedures pertaining to RASP radioactive material, devices containing radioactive material, and machine sources of ionizing radiation to ensure compliance with pertinent NRMPs, Navy and Marine Corps directives, and federal regulations. Assist supervisors in preparing any changes to these procedures.

o. Maintain a current inventory of all RASP radiation sources per Section 2.13.3.1 and ensure that these materials and machines are secured against loss, unauthorized use, or unauthorized disposal.

p. Promptly report to the Commander, CO, or OIC and NAVSEADET RASO any incident as defined in Section 1.5.2.1.j.

q. Ensure that radioactive material is received and shipped according to the requirements of this manual and federal regulation.

r. Maintain records and documentation that demonstrate compliance with this manual, NRMP conditions, and pertinent federal regulations.

3. Command ARSOs shall:

a. Assist the RSO in carrying out the RSO duties and responsibilities.

b. Perform the RSO duties and responsibilities in the absence of the RSO.

c. Be able to respond within normal commuting time (<2 hours) if offsite when RASP operations are being performed when acting for the RSO. The ARSO does not have to be physically present when RASP operations are being performed.

4. Command Supervisors shall:

a. Ensure that RASP operations within their areas of responsibility are conducted in compliance with the provisions of this manual, specific NRMP conditions,

and other pertinent Navy and Marine Corps directives and federal regulations.

b. Prepare operating and emergency procedures for the use of radioactive material, devices containing radioactive material, and machine sources of ionizing radiation to ensure compliance with specific NRMP conditions, and pertinent Navy and Marine Corps directives and federal regulations. Submit the procedures to the RSO for review and approval, as appropriate.

c. Ensure that subordinates are properly trained in operating and emergency procedures, work rules, and special precautions prior to use of and/or exposure from RASP radiation sources.

d. Promptly report to the RSO or ARSO any incident as defined in Section 1.5.2.1.j.

e. Assist the RSO in identifying radiation workers, scheduling radiation medical exams, and ensuring workers are wearing dosimeters, as required.

5. Radiation Workers shall:

a. Obey posted, verbal, and written command RASP operating procedures and instructions.

b. Wear dosimeters (e.g., thermoluminescent dosimeter (TLD) and secondary dosimeters) as required and promptly report any lost or damaged dosimeters to their supervisor or RSO.

c. Know their cumulative annual and lifetime occupational radiation exposures. Notify the RSO if the radiation exposure assigned for an issue period is suspect.

d. Promptly report to their supervisor or RSO any incident as defined in Section 1.5.2.1.j.

e. Prior to using or operating any RASP radiation sources, be thoroughly familiar with all equipment, procedures, and all requirements for safety or warning devices.

f. Avoid unnecessary exposure, and use the concepts of time, distance, and shielding when working in the presence of RASP radiation sources to maintain exposure ALARA.

1.6 RASP Communications and Technical Assistance

1.6.1 Communications

1. All policy issues concerning the RASP and this manual shall be addressed to COMNAVSEASYSCOM (NAVSEA 04N), via NAVSEADET RASO, in writing.
2. Communication with the NRC is a vital part of maintaining the Navy's MML. Everyone from the technician to upper management has the right to contact the NRC as outlined in NRC Form 3, Notice to Employees. NAVSEADET RASO, NAVSEA 04N, or any NRSC member should also be contacted to address command problems or issues.
3. For policy matters pertaining to the MML, only the NRSC Chairman or his/her designated representatives are authorized to communicate directly with the NRC.
4. For non-MML policy issues, only COMNAVSEASYSCOM (NAVSEA 04N) or NAVSEADET RASO are authorized to communicate with other federal and state agencies regarding the RASP.
5. For situational reporting requirements, only the NRSC Chairman or his/her designated representatives may communicate with the NRC.
6. RASP commands shall make all required situational notifications and/or reports to NAVSEADET RASO, COMNAVSEASYSCOM (NAVSEA 04N), and OPNAV (N45).
7. All formal correspondence or other documents required to be signed by the Commander, CO or OIC shall be signed by the Commander, CO, OIC, or by those acting on their behalf. By direction signatures are not acceptable, except for echelon II commands. A Commander, CO or OIC for an echelon II command that conducts RASP operations may designate, in writing, a senior management representative (O6/GS-15 or higher) to sign RASP cover letters or other documents as required by this manual.

1.6.2 Technical Assistance

1. Routine technical issues related to NRMPs, machine radiation systems, and general RASP compliance shall be addressed to NAVSEADET RASO by telephone, e-mail, or by formal correspondence, as appropriate.

2. Special technical assistance may be requested or required when:
   a. A command RASP receives an unsatisfactory rating on their command inspection and the recovery actions are clearly beyond the training and experience of the command's radiation safety staff.
   b. A command's RASP has degraded to an unacceptable level as identified by the command or NAVSEADET RASO and the recovery actions are clearly beyond the training and experience of the command's radiation safety staff.
   c. A command's RASP has special requirements that require additional technical direction beyond the scope of a routine technical issue. In such a case, the command may be directed by NAVSEADET RASO to request assistance from the RSO of another RASP command.
3. Assistance from NAVSEADET RASO shall be formally requested in writing to NAVSEA 04N. If during the technical assist visit, NAVSEADET RASO observes any severity level IV or higher violation (i.e., I, II, or III), an inspection report will be prepared citing those violations and forwarded to the NRSC or NAVSEA 04N for approval and issue.

1.7 **Required References**

Although this manual is a comprehensive document, the RASP RSO shall have the following references available, as applicable.

1.7.1 **NRMP Commands**

All commands having an NRMP shall have copies of the most recent versions of the following documents available in hard copy or electronic version:

1. Command's NRMP(s) including copies of all correspondence cited in the NRMP.
2. NAVMED P-5055, Radiation Health Protection Manual.
3. OPNAVINST 6470.2, Occupational Radiation Protection Program.
4. NAVSEA S0420-AA-RAD-010, Radiological Affairs Support

Program Manual.

5. BUMEDINST 6470.10, Initial Management of Irradiated or Radioactively Contaminated Personnel.
6. Title 10, Code of Federal Regulations – Energy.
7. Title 49, Code of Federal Regulations – Transportation.

1.7.2 **Non-NRMP Commands**

All commands not having an NRMP and using machine sources of ionizing radiation, equipment containing radioactive material generally licensed by the NRC (e.g., a gas chromatograph), or using radioactive material exempt from licensing by the NRC (e.g., thoriated tungsten weld rod) shall have copies of the most recent versions of the following documents available in hard copy or electronic version:

1. OPNAVINST 6470.2, Occupational Radiation Protection Program.
2. NAVMED P-5055, Radiation Health Protection Manual.
3. NAVSEA S0420-AA-RAD-010, Radiological Affairs Support Program Manual.
4. BUMEDINST 6470.10, Initial Management of Irradiated or Radioactively Contaminated Personnel.
5. The operator’s manual for all ionizing radiation machines registered by the command per Section 3.5

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SECTION 2 – **GENERIC RADIATION PROTECTION ELEMENTS REQUIRED IN ALL COMMAND RADIOLOGICAL AFFAIRS SUPPORT PROGRAMS**

2.1 **Introduction**

2.1.1 **Purpose**

1. This section provides generic radiation protection elements applicable to all commands for protection against ionizing radiation resulting from Navy and Marine Corps activities conducted under the Radiological Affairs Support Program (RASP).
2. This section addresses the receipt, ownership, possession, use, repair, maintenance, storage, distribution, transportation, transfer, and disposal of RASP sources of ionizing radiation such that occupational doses and doses to members of the public do not exceed the limits set in this manual, NAVMED P-5055, and Nuclear Regulatory Commission (NRC) regulations.
3. Nothing in this section shall be construed as limiting actions that may be necessary to protect health and safety.

2.1.2 **Scope**

1. The requirements in this section are germane to all programs, but not all programs are required to contain all of the elements. For example, in most situations, commands possessing only radioactive commodities do not need dosimetry or perform facility radiation surveys.
2. Some programs have specific requirements that are not addressed in this section. Other sections in this manual pertaining to specific operations may modify some of the requirements in this section. In cases involving inconsistencies between this section and specific operations sections, the specific operations sections take precedence.
3. The units of Roentgen (R), rad (G - Gray), and rem (Sv - Seivert) are used interchangeably throughout the manual since they are relatively equivalent in gamma and x-ray fields.

2.2 As Low As Reasonably Achievable (ALARA) Implementation

2.2.1 Objectives

1. Effective radiological controls are essential for the safe and beneficial use of ionizing radiation and to ensure compliance with all applicable regulations. The underlying principle for these controls is that the storage, handling, transportation, and disposal of radioactive material and use of devices that generate ionizing radiation will be controlled so that personnel will not be exposed to radiation unnecessarily and that any exposure received will be maintained ALARA.
2. Even though current occupational exposure limits provide a very low risk of injury, it is prudent to avoid unnecessary exposure to radiation. The objective is thus to reduce occupational exposures as far below the specified limits as is reasonably achievable by means of good radiation protection planning and practice, as well as by command commitment to policies that foster vigilance against departures from good practice.

2.2.2 Requirements

1. Each command RASP shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are ALARA.
2. In addition to maintaining doses to individuals ALARA, the sum of the doses received by all exposed individuals should also be maintained at the lowest practicable level.
3. Engineering process controls to avoid intakes of radioactive material should be implemented in a manner that does not increase the total effective dose equivalent (TEDE) to the workers.
4. The Annual Program Review (APR) required by Section 2.10 shall document the methods that have been used to maintain radiation exposures ALARA.
   a. The APR shall demonstrate by measurement and/or calculation that the TEDE to an individual member of the public likely to receive the highest dose from RASP operations shall not exceed the annual dose

limit for individual members of the public in Table 2-1.

b. The methods expended to reduce personnel exposures should be proportional to the magnitude of the average and maximum individual doses and, in commands with large numbers of radiation workers, the collective dose.

2.3 Radiation Protection Dose Limits

2.3.1 Summary of Dose Limits

For the protection of personnel from ionizing radiation, the RASP establishes the radiation exposure and internal intake limits based on NAVMED P-5055 and Title 10 Part 20 of the Code of Federal Regulations (CFR). The limits and associated administrative control levels (ACL) discussed in this section are summarized in Table 2.1. The limits in this section do not apply to doses received from background radiation, medical treatment, or voluntary participation in medical research programs.

Table 1-1 Summary of RASP Dose Limits and ACLs

Description of the Dose Type	RASP Limit	RASP Administrative Control Level (ACL)
Total Effective Dose Equivalent (Whole Body)	3.0 rem/qtr (0.03 Sv/qtr)	N/A
Total Effective Dose Equivalent (Whole Body)	5.0 rem/yr (0.05 Sv/yr)	0.5 rem/yr (0.005 Sv/yr)
Shallow Dose Equivalent (Extremities)	50.0 rem/yr (0.5 Sv/yr)	5.0 rem/yr (0.05 Sv/yr)
Shallow Dose Equivalent (Skin)	50.0 rem/yr (0.5 Sv/yr)	5.0 rem/yr (0.05 Sv/yr)
Eye Dose Equivalent (Eyes)	15.0 rem/yr (0.15 Sv/yr	1.5 rem/yr (0.015 Sv/yr)
Sum of Deep Dose Equivalent and Committed Dose Equivalent for any organ or tissue other than the lens of the eye (Organ Dose)	50.0 rem/yr (0.5 Sv/yr)	5.0 rem/yr (0.05 Sv/yr)
Non-Radiation Workers (Whole Body)	0.5 rem/yr (0.005 Sv/yr)	0.1 rem/yr (0.001 Sv/yr)
Embryo/Fetus	0.5 rem total (0.005 Sv total) 0.05 rem/mo (0.0005 Sv/mo)	N/A
Minors (Occupationally Exposed)	0.5 rem/yr (0.005 Sv/yr)	0.1 rem/yr (0.001 Sv/yr)
Members of Public	0.1 rem/yr (0.001 Sv/yr)	N/A

2.3.2 **Radiation Worker Dose Limits**

Radioactive material and/or other sources of ionizing radiation exposure shall not be used in such a manner as to cause any radiation worker to receive in excess of the more restrictive of the radiation dose limits in Table 2-1.

2.3.3 **Non-Radiation Worker Dose Limits**

Radioactive material and/or other sources of ionizing radiation exposure shall not be used in such a manner as to cause any non-radiation worker to exceed a TEDE of 500 millirem (mrem) (5 millisievert (mSv)) per year considering occupancy factors and source usage.

2.3.4 Embryo/Fetus Dose Limits

1. Once a woman monitored for occupational radiation exposure notifies her command in writing of her pregnancy and the estimated date of conception, exposure to the embryo/fetus shall not exceed 500 mrem (5 mSv) for the term of the pregnancy and should not exceed 50 mrem (0.5 mSv) in any month for the remainder of the pregnancy.
2. The dose to the embryo/fetus shall be determined by summing the deep dose equivalent to the declared pregnant woman and the dose to the embryo/fetus from radionuclides in the embryo/fetus and declared pregnant woman.
3. If the dose to the embryo/fetus is found to have exceeded 500 mrem (5 mSv) or is within 50 mrem (0.5 mSv) of this dose by the time the woman declares the pregnancy, any additional dose to the embryo/fetus shall not exceed 50 mrem (0.5 mSv) during the remainder of the pregnancy.
4. Follow the administrative requirements associated with notification and documentation of fetal exposure provided in NAVMED P-5055, Chapter 5.

2.3.5 Minor Dose Limits

No individuals under 18 years old shall receive an occupational exposure to ionizing radiation in excess of 10 percent of the annual TEDE limit for radiation workers.

2.3.6 Individual Members of the Public Dose Limits

1. Radioactive material and other sources of radiation shall not be used, maintained, or transferred in such a manner as to cause:
   a. The dose rate to any unmonitored personnel, from external sources of radiation, to exceed 2 mrem/hr (0.02 mSv/hr) unless otherwise specified in this manual or authorized by NAVSEA 04N.
   b. An individual member of the public to receive a TEDE in excess of 100 mrem (1 mSv) in a calendar year exclusive of background radiation.
2. Dose limits for members of the public shall apply to

unrestricted areas, berthing spaces, and controlled areas.

3. It must be locally documented, by measurement, calculation or both, that due to limited occupancy or transient conditions:
   a. The maximum exposed individual's TEDE from occupancy in unrestricted areas would not be expected to exceed 100 mrem (1 mSv) per calendar year; or
   b. The annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the values specified in Table 2 of Appendix B of 10 CFR 20 and, if an individual were continually present in an unrestricted area, the dose from external sources would not exceed 2 mrem/hr (0.02 mSv/hr) and 50 mrem (0.5 mSv) in a year.

2.3.7 **Emergency Exposure Limits**

1. In an emergency, it may be necessary for emergency workers to exceed the dose limits in Table 2-1 to save life or valuable property. In such situations, the probable risk of high exposure to the rescuer must be weighed against the expected benefits. In all cases, doses shall be kept as low as practicable by work practice or standard method.
2. In emergency situations that require personnel to search for and remove injured personnel or that require entry to prevent conditions that would probably injure numbers of people, reasoned judgment is permitted; no upper dose limit is specified. Workers used in such activities should be limited to nonpregnant volunteers who are aware of risks associated with the projected dose.
3. In emergency situations where it is desirable to enter a hazardous area to protect facilities, eliminate further escape of contamination, or to control fires, the planned TEDE should not exceed 10 rem (0.1 Sv). Workers used in such activities should be limited to nonpregnant volunteers.
4. Follow guidance and requirements of NAVMED P-5055, Chapters 4 and 5 for personnel exceeding Table 2-1 limits.

2.3.8 Exceeding RASP Dose Limits

With the exception of an emergency exposure to save a life or valuable property, no individual shall be allowed to exceed the RASP dose limits in Table 2-1. Any instance of personnel exceeding these limits shall be reported per Section 2.23.

2.4 Administrative Control Levels

2.4.1 Establishing ACLs

1. In addition to the RASP dose limits stated in Table 2.1, RASP ACLs have been established for the purpose of reducing exposures and are also shown in Table 2-1. Commands may establish lower ACLs as desired.
2. If lower ACLs are established and included in Naval Radioactive Material Permit (NRMP) applications, they shall become binding unless changed by a formal amendment request.

2.4.2 Raising ACLs

1. Radiation worker ACLs may only be raised by written approval of the individual’s Commander, Commanding Officer (CO), or Officer in Charge (OIC).
2. The worker’s supervision shall submit a written request for raising an ACL that includes justification for the increase.
3. The approval shall specify revised ACLs and expiration dates for each authorization.
4. ACLs shall not exceed the radiation worker RASP dose levels in Table 2-1.
5. Raising ACLs for non-radiation workers is not permitted.
6. Non-radiation workers that require their ACL to be raised to fulfill their work assignments shall be redesignated as radiation workers and appropriately trained.
7. If an individual exceeds his or her ACL, the responsible command shall report the event to NAVSEADET RASO per Section 2.23.

2.5 Radiation Health Program

2.5.1 Introduction

1. NAVMED P-5055 specifies the radiation health requirements applicable to Navy and Marine Corps radiation protection programs.
2. The RASP command and the supporting BUMED command share the responsibility for implementing an effective radiation health program. The primary components of the radiation health program that interface with a command's RASP are medical examinations, personnel monitoring, and radiation exposure records.
3. For RASP commands with a medical department, a command instruction must delineate the specific responsibilities of the medical department in support of the RASP program.
4. If any radiation health requirements are performed outside the RASP command, a Memorandum of Agreement (MOA) or Inter-Service Support Agreement (ISSA) must be established with the supporting medical command that addresses the specific services required by the RASP command to comply with the radiation health requirements of NAVMED P-5055 and this manual. The MOA or ISSA shall also commit the parties to mutually inform each other of all inquiries regarding radiation health issues and any actual, potential, or alleged radiation injuries to RASP personnel.

2.5.2 Medical Examinations

1. NAVMED P-5055 provides the requirements for ionizing radiation medical examinations.
2. It is the RASP command's responsibility to identify individuals requiring ionizing radiation medical examinations per NAVMED P-5055 and ensure the individuals complete the physicals within the time frames specified in NAVMED P-5055.
3. Regardless of anticipated/measured annual doses, personnel participating in industrial radiography (gamma or x-ray) operations; operating research accelerators; using portable density gauges containing radioactive material; entering posted radiation/high radiation areas

within a Radiation Detection Indication and Computation (RADIAC) calibration laboratory; performing contamination control work with unsealed sources of radioactivity; using radioactive material requiring an NRMP; or assigned as a RSO, ARSO, or radiation protection specialist at a command with an NRMP shall be medically qualified for occupational exposure to ionizing radiation per NAVMED P-5055.

2.5.3 **Personnel Monitoring**

1. NAVMED P-5055 provides the general requirements for monitoring RASP personnel for external and internal exposure to radiation and radioactive material. Section 2.6 provides specific RASP requirements for personnel monitoring.
2. Personnel performing work with unsealed radioactive sources shall be subject to routine monitoring for internal contamination (in vitro or in vivo monitoring as appropriate) per NAVMED P-5055. Additionally, per NAVMED P-5055, any person who inhaled, ingested, absorbed, or injected a measureable quantity of radioactive material as a result of a mishap or incident in which it is likely some intake of radioactive material occurred shall be monitored.
3. Environmental monitoring in areas accessible to the general public shall be performed to verify the dose limits for a member of the general public are not likely to be exceeded.
4. Area monitoring shall be performed in areas accessible to personnel in unrestricted areas to ensure that the dose equivalent to these personnel does not exceed 100 mrem (1 mSv) per year considering occupancy factors and source usage.
5. Further information on the devices used for monitoring external radiation exposure of RASP personnel is provided in Section 2.6.

2.5.4 **Radiation Exposure Records**

1. Personnel monitoring for occupational exposure to ionizing radiation shall be documented to establish individual radiation exposure histories. These histories have medical, epidemiological, and legal

significance since they include dates and locations where exposures were received. Additionally, they serve as evidence that occupational and public radiation exposure limits were or were not exceeded.

2. Personnel radiation exposure records shall be documented and maintained in strict compliance with NAVMED P-5055 and Section 2.26.4.

2.6 Personnel Dosimetric Devices

2.6.1 Introduction

1. The principal means for assessing absorbed dose or dose equivalent (shallow and deep) from external radiation exposure is by direct measurement using devices known as dosimeters per the requirements of NAVMED P-5055.
2. Dosimeters are classified as either primary or secondary. Primary dosimeters provide dose of record and secondary dosimeters are used to provide real-time indication of exposure to radiation. Primary dosimeters, normally a thermoluminescent dosimeter, used for operations subject to an NRMP must be provided and processed by a laboratory accredited under the National Voluntary Laboratory Accreditation Program.
3. The dose of record from primary dosimeters has medical, legal, and epidemiological significance; therefore, strict adherence to the policies and procedures regarding issuing and processing primary dosimeters is essential.
4. Proper administration of a local dosimetry program is essential for providing critical information to assess whether practices and procedures involving exposure to ionizing radiation are sufficiently controlled so that doses are ALARA.

2.6.2 Primary Dosimeters

1. RASP personnel shall be monitored with BUMED approved primary dosimeters that are processed by the Naval Dosimetry Center or other dosimeter processing laboratories authorized by NAVSEA 04N.
2. Commands shall evaluate their operations to determine which personnel are required to wear primary dosimeters

per NAVMED P-5055 and this manual.

3. Primary dosimeters shall be worn on the front trunk of the body between the shoulder line and the waist.
4. In unique situations where an individual's whole body is exposed in a high gradient radiation field or an individual is expected to receive a partial body dose, the RSO shall evaluate the need for additional primary dosimeters at other whole body or extremity locations.
   a. A high gradient radiation field exists when the dose to a portion of the whole body (i.e., head, chest, back, thighs) will exceed the dose to the primary dosimeter by more than 30 percent and the anticipated whole body dose is greater than 100 mrem (1 mSv).
   b. When multiple primary dosimeters are worn, the dosimeter with the highest reading shall provide the individual's whole body dose.

2.6.3 **Secondary Dosimeters**

1. RASP personnel shall use ion chamber pocket dosimeters (IPD) (IM Series/PD) or electronic personal dosimeters (EPD) as secondary dosimeters depending on the operations.
2. Secondary dosimeters shall be approved by NAVSEADET RASO when working in high and very high radiation areas, and when determined necessary by the responsible RSO.
3. RASP personnel conducting operations with pulsed x-ray machines shall only use IPDs as secondary dosimeters.
4. Secondary dosimeters shall be used with each primary dosimeter and worn adjacent to the primary dosimeter.
5. Two IPDs shall be issued to RASP personnel when performing operations requiring IPDs. Additional IPDs may be required by NRMP.
6. Secondary dosimeters shall be read at the following times:
   a. When initially issued.
   b. Just prior to commencing operations.
   c. Between each exposure or evolution during operations.
   d. Periodically, when in a high radiation area.
   e. At the end of operations.

7. IPDs shall be zeroed before issue. IPDs that cannot be zeroed to less than 10 milliRoentgen (mR) or observed to drift shall not be issued.
8. EPDs shall be checked upon issuance per Section 2.6.4.
9. Secondary dosimeters shall be response checked at intervals not to exceed the periods required by NAVSEA SE700-AA-MAN-100/Radiation Detection, Indication and Computation (RADIAC), Policies and Procedures Manual or one year, whichever is most restrictive.
10. EPD dose and dose rate alarm set points shall be set by a RADIAC calibration laboratory at 200 mrem (2 mSv) and 200 mrem/hr (2 mSv/hr), respectively.
11. Use of secondary dosimeters shall be documented and records maintained per Section 2.26.2.

2.6.4 Electronic Personal Dosimeter Operational Checks

EPDs shall be checked upon issuance to ensure they are operating properly as follows:

1. Verify the EPD has an orange cap.
2. Verify the EPD display indicates 0.0 mrem (may require a reset to 0.0 mrem).
3. Ensure the calibration (verification) date is not expired.
4. Ensure the EPD is not damaged (e.g., cracked display, broken clip, case, or lanyard, illegible serial number, punctured beta window).
5. Verify the EPD indicates no icons on the left side of the digital readout.
6. Ensure the EPD alarm functions properly as evidenced by testing the alarm.

2.6.5 Ion Chamber Pocket Dosimeter Abnormal Events

1. The following actions shall be taken if one IPD is lost, drifts, or is mechanically bumped upscale (or off-scale):
   a. If the event occurs before entering the area where the operations are to be performed, the individual issued the IPD shall be issued a replacement IPD.

b. If one of two IPDs worn is lost or goes off scale while in the area where the operations are being performed, the individual may continue RASP radiation work pending receipt of primary dosimeter results, providing the RSO determines the following conditions are met:
   (1) The unaffected IPD functions properly and reads less than 20 mR.
   (2) The affected IPD is clearly lost or defective.
   (3) A dose investigation is initiated and a preliminary dose estimate is provided, per NAVMED P-5055. The dose investigation/estimate shall be subsequently completed and documented per NAMVED P-5055.
   (4) The RSO's dose investigation determines that the individual's dose does not exceed Table 2-1 limits or locally established ACLs.

2. The following actions shall be taken if both IPDs are lost, drift, or are mechanically bumped upscale (or off-scale):
   a. If the event occurs prior to entering the area where the operations are to be performed, the individual issued the IPDs shall be issued replacement IPDs.
   b. If the event occurs after entering the area where operations are to be or are being performed, the individual issued the IPD shall:
      (1) Secure operations.
      (2) Immediately exit the operations area.
      (3) Request that other workers in the immediate area read their IPDs to determine if their IPDs read abnormally high.
      (4) Notify the RSO who will coordinate the performance of a dose investigation and provide a dose estimate as required per NAVMED P-5055.
      (5) Surrender the primary dosimeter for processing.
   c. If the IPDs are not lost, the RSO shall drift and response check the IPDs as follows:
      (1) Drift check the off-scale IPDs and any other IPDs worn with them by charging all to zero and then observe the reading after two hours. A defective IPD will read greater than 20 mR (upward drift) within two hours.

(2) If the IPD passes the drift check, zero the IPD to be checked.

(3) Perform a response check by taping the side of the sensitive end of the IPD to a Cesium-137 check source (or other sealed source) such as those used in the Navy response check kit. After two hours, read the IPD. An upscale reading indicates a positive response and properly functioning IPD. No upscale movement indicates a defective IPD.

d. The individual may continue RASP radiation work pending receipt of primary dosimeter results, providing the RSO determines the following conditions are met:

(1) The IPDs fail the drift or response checks, or both are lost.

(2) All radiation survey results and exposures received by others are normal.

(3) The dose investigation determines that the individual's dose does not exceed Table 2-1 limits or locally established ACLs.

e. If both IPDs are functioning properly, or if one IPD goes off scale and the other reads greater than 20 mR, the individual shall not resume RASP operations until the primary dosimeter is read and the dose investigation is complete.

2.6.6 **Electronic Personal Dosimeter Abnormal Events**

1. Lost EPDs and EPD performance problems including high dose alarms, screen failures, faulty buttons, and error code displays require immediate action to prevent unnecessary radiation exposure to the individual issued the EPD until his or her dose can be accurately determined from the primary dosimeter.

2. If an EPD is lost or exhibits one of the four abnormal conditions listed in 2.6.6.1 above while in the area where operations were performed, the individual issued the EPD shall:

a. Secure operations.

b. Immediately exit the operations area.

c. Request that other workers in the immediate work area read their EPDs to determine if they are reading

abnormally high.

d. Notify the RSO who will coordinate the performance of a dose investigation and provide a dose estimate as required per NAVMED P-5055.

e. Surrender the primary dosimeter for processing.

3. If a low battery liquid crystal display icon (display alarm flag) activates in an operational area, the individual issued the EPD may be allowed to finish immediate operations as the battery life has approximately 10 hours left after an initial alarm. The EPD shall be exchanged as soon as practical after this occurs.

2.6.7 **Initiation of a Dose Investigation**

1. A dose investigation shall be performed per NAVMED P-5055 under the following circumstances:

   a. A primary dosimeter is lost, destroyed, or damaged to the extent that a valid measurement cannot be obtained.

   b. An unmonitored individual enters areas where primary dosimeters are required to be worn.

   c. A primary dosimeter assigned to an individual is worn by another individual.

   d. The dose recorded by a primary dosimeter is not consistent with the individual’s work history and known radiation levels in the area(s) entered.

   e. When notified by the primary dosimeter processing facility that a valid reading could not be obtained from the dosimeter.

   f. The primary dosimeter was not worn on the correct location on the body for the radiation fields encountered during work.

   g. The measurement of gamma/deep dose by the primary dosimeter differs significantly from the recorded measurement by the secondary dosimeter and both dosimeters have been worn together at the same body location. Specific criteria are provided in NAVMED P-5055, Chapter 5.

   h. When an abnormal event occurs with a secondary dosimeter as specified in Sections 2.6.5.1.b.2 and 2.6.6.1.

2. During a dose investigation, the RSO shall:
   a. Have the individual's primary dosimeter processed as soon as possible, and perform surveys if necessary to either determine the source of the exposure or verify that there are no previously unidentified sources of exposure.
   b. Determine if the individual's primary dosimeter reading is consistent with radiation levels and time spent in the work area.
   c. Authorize the individual to return to work after the investigation.
3. Dose investigations and dose estimates shall be performed per NAVMED P-5055, Chapter 5 and records maintained per Section 2.26.3.

2.7 Radiological Affairs Support Program

2.7.1 Command RASP Instruction

1. Each command having RASP radiation sources shall develop, document, and implement a command endorsed RASP instruction commensurate with the scope and extent of RASP activities, and ensure compliance with the applicable NRMP conditions, provisions of this manual, NAVMED P-5055, and the CFR.
2. At a minimum, the local command RASP shall consist of a command-endorsed instruction that addresses the following topics:
   a. Radiation safety training
   b. Audits, surveillances and APRs
   c. Operating and emergency procedures
   d. Logs and records
   e. Radiological posting and labeling
   f. Surveys and inspections
   g. Incidents
   h. Reports and notifications
3. The local RASP instruction shall require the approval of the RSO to purchase or receive a transfer of radioactive material or ionizing radiation producing machine, except commodities in the Navy stock system.
4. Other topics from Sections 2.8 through 2.28 should be

included in the local RASP instruction based on the type of activities planned at the command.

2.7.2 Responsibilities

The command RASP instruction shall state the duties and responsibilities for each responsible individual associated with the RASP including; the Commander, CO, or OIC; RSO and ARSO; and other positions named in other operational sections of this manual, as applicable. Standard duties and responsibilities for responsible individuals are listed in Section 1.5.2.

2.8 Radiation Safety Training

2.8.1 General

1. Radiation safety training shall ensure that personnel are aware of radiation safety fundamentals and requirements, procedures to maintain radiation exposure ALARA, and procedures to reduce potential for exposure to radioactive contamination (if applicable).
2. Commands shall ensure the depth of the material and frequency of periodic training is commensurate with the level of responsibility and potential hazards. The requirements stated in this section may be modified by specific requirements in other operational sections in this manual or NRMP.
3. Annual refresher training may be interspersed in smaller portions throughout a 12-month period. It is not necessary to conduct all refresher training on the same date.

2.8.2 Command Management/Leadership

1. Within the first six months of assuming command, the Commander, CO, or OIC shall successfully complete the RASP Leadership Course (S-NKO-0001) available on the NAVSEADET RASO Navy Knowledge Online (NKO) website. Other key leadership personnel, as defined by the command, are encouraged to complete the course.
2. Annually, the Commander, CO, or OIC shall retake the RASP Leadership Course (S-NKO-0001) or alternative training specified by NAVSEADET RASO. Other key leadership personnel, as defined by the command, may also complete the course.

3. The RSO or ARSO shall provide an annual RASP leadership briefing that includes the general topics listed below:
   a. Personnel Qualifications and Experience (RSO/ARSO)
   b. Management Involvement
   c. Radiological Safety Culture
   d. Operating and Emergency Procedures
   e. Training and Evaluation Program
   f. Records and Document Control System
   g. Written Audit and Management Surveillance Programs
   h. Personnel Dosimetry Program
   i. Results of APR
4. Management/leadership training records shall be maintained per Section 2.26.5.

2.8.3 RSO and ARSO

1. Personnel designated as a RSO or ARSO shall have training and experience commensurate with the type and complexity of the local RASP to be managed. Additional use-specific qualification requirements for a gamma radiography or unsealed radioactive material NRMP are found in:
   a. Section 5.8.1 for gamma radiography; and,
   b. Section 2.8.5 for unsealed radioactive materials.
2. Prior to assuming the duties as a RSO or ARSO, an individual shall successfully complete the NAVSEADET RASO RSO Course (S-4J-0016).
3. Equivalent training and experience may substitute for the NAVSEADET RASO RSO course. Training and experience documentation shall be submitted to NAVSEA 04N, via NAVSEADET RASO, for evaluation and decision of acceptance. This evaluation shall be completed before assignment to RSO or ARSO duties.
4. All RSOs and ARSOs shall complete refresher training every five years in order to remain qualified. The effective date for compliance with this requirement is 1 January 2013.
5. RSO/ARSO refresher training requirements shall be met by either:
   a. Successfully re-completing the NAVSEADET RASO RSO

Course (S-4J-0016), or

b. Accumulate five RASP continuing training credits approved by NAVSEADET RASO within the previous five years. Credits may be earned by attending the annual RASP meetings and completing other RASP sponsored courses.

6. Compliance with the RSO/ARSO refresher training requirement shall be demonstrated by either:

   a. A certificate documenting successful completion of the NAVSEADET RASO RSO Course (S-4J-0016) within the past five years, or

   b. Certificates documenting attendance at the annual RASP meeting and course completion certificates for other RASP sponsored training courses within the past five years.

7. RSOs/ARSOs that allow their qualifications to lapse shall be required to successfully re-complete the NAVSEADET RASO RSO Course (S-4J-0016) to reinstate their qualifications.

8. RSO/ARSO training records shall be maintained per Section 2.26.5.

2.8.4 **Radiation Workers**

1. Radiation workers shall receive initial training before beginning work with or around RASP radiation sources.

2. The duration of the initial training shall be determined by the command.

3. The initial training shall be commensurate with the radiation hazards at the command and include at least the following topics:

   a. Operating, maintenance, handling, and accountability procedures for the devices or radioactive sources used (including command specific procedures).

   b. Radiation exposure limits, annual limits on intake (ALIs), and ACLs.

   c. Command specific RADIAC survey instrument requirements and operating procedures.

   d. Facility or site survey requirements and procedures (if applicable to duties).

   e. Command specific personnel dosimetry, internal

monitoring, and/or bioassay requirements.

f. Biological effects and risks associated with exposure to ionizing radiation from internal or external sources.

g. Sources and characteristics of ionizing radiation (i.e., alpha, beta, gamma, neutron).

h. Command specific procedures for using time, distance, and shielding to maintain individual exposures ALARA.

i. If applicable, use of respirators or forced air systems to limit internal deposition of radioactive materials.

j. Responsibilities of individuals.

k. Emergency procedures.

l. Biological effects of radiation exposure to the embryo/fetus.

m. Results of command internal audits, inspections, and Quality Management reviews.

n. Reporting of deficiencies into the command's RASP Deficiency Report (RDR) program.

o. Each individual is responsible for tracking his/her own radiation exposure and exposure reports that are provided by the command.

p. Notices required by 10 CFR 19 for NRMP operations regulated under the Navy Master Materials License (MML).

4. Radiation workers shall receive annual refresher training.

5. The duration of the refresher training shall be determined by the command and cover at least the following topics:

a. Command RASP operating and emergency procedures.

b. Use of RADIAC survey instruments.

c. Personnel dosimetry.

d. Results of command internal audits, inspections, and Quality Management reviews.

e. Command conducted radiation survey results and personnel exposure trends.

f. Command specific procedures for using time, distance, and shielding to maintain individual exposures ALARA.

g. Each individual is responsible for tracking his/her

own radiation exposure and exposure reports that are provided by the command.

h. Biological effects of radiation exposure to the embryo/fetus.

i. Reporting of deficiencies into the command's RDR program.

j. Problem trends and incidents that occurred since the last annual training.

6. Additional training is required if there are significant changes in duties, regulations, NRMP conditions, site conditions, or other factors that impact current working conditions. Only the changes need to be covered.

7. Training may be provided as lectures, demonstrations, video, or self-study and should emphasize the use of site-specific RASP sources.

8. The RSO, ARSO, or an individual with comparable knowledge, training, and experience shall conduct the training.

9. If an individual with comparable knowledge, training, and experience is used, they shall be designated in writing by the RSO.

10. Written examinations shall be used to demonstrate successful completion of initial and refresher training. The minimum passing score shall be 80 percent.

11. Radiation worker initial and refresher training shall be documented and records maintained per Section 2.26.5.

2.8.5 **Contamination Worker**

1. Contamination workers shall also be trained as a radiation worker per Section 2.8.4 above.

2. Contamination workers shall receive initial training before beginning work in RASP radioactive contamination areas.

3. The duration of initial training shall be determined by the command.

4. The initial training shall be commensurate with the RASP contamination hazards at the command and include at least the following topics:

a. RASP contamination control levels described in Table

2.2.

b. Posting requirements.
c. Area entry and exit requirements.
d. Protective clothing donning and doffing methods.
e. RASP contamination monitoring process and procedures to include personal monitoring.
f. Use of applicable containments.
g. Proper packaging of radioactive material.
h. RASP contamination decontamination process.
i. Expectations if an injury occurs when in a RASP radioactive contamination area.
j. Contamination control work practices to minimize the spread of radioactivity and prevent airborne radioactivity.
k. Donning, use, and removal of respirators or air fed systems if respiratory protection is required to be worn during work.
l. Bioassay and internal monitoring.
m. Demonstration by the student of proper dressing procedures, personal monitoring, and if applicable, donning and removal of respiratory protection equipment.

5. The duration of refresher training shall be determined by the command and cover each topic addressed in initial training. Additionally, any problem trends or incidents that occurred since the last annual training shall be discussed.

6. Additional training is required if there are significant changes in duties, regulations, NRMP conditions, site conditions, or other factors that impact current working conditions. Only the changes need to be covered.

7. Training may be provided as lectures, demonstrations, video, or self-study and should emphasize the use of site-specific RASP sources.

8. The RSO, ARSO, or an individual with comparable knowledge and training shall conduct the training.

9. If an individual with comparable knowledge, training, and experience is used, they shall be designated in writing by the RSO.

10. Written examinations shall be used to demonstrate

successful completion of initial and refresher training. The minimum passing score shall be 80 percent.

11. Contamination worker initial and refresher training shall be documented and records maintained per Section 2.26.5.

2.8.6 **Non-Radiation Workers**

1. Non-radiation Workers require access to posted radiation areas to perform specific functions and receive ionizing radiation exposure incidental to performing normal work tasks versus handling of radioactive material or using radiation producing machines. Emergency personnel, firefighters, medical, and security personnel are considered non-radiation workers.
2. Non-radiation workers shall receive initial training before beginning work around RASP radiation sources.
3. The duration of initial training shall be determined by the command and shall contain at least the following topics:
   a. Sources of radiation in areas they may frequent.
   b. Potential hazards associated with radiation sources in areas they may enter.
   c. Biological effects and risks associated with exposure to ionizing radiation from internal or external sources.
   d. Use and meaning of radiation warning signs and barriers.
   e. Procedures to avoid and reduce radiation exposures.
   f. Personnel dosimetry, bioassay and/or internal monitoring requirements.
   g. Biological effects of exposure to the embryo/fetus if the person will receive greater than 100 mrem per year.
   h. Each individual is responsible for tracking his/her own radiation exposure and exposure reports that are provided by the command.
4. Each non-radiation worker shall receive annual refresher training. The duration of training shall be determined by the command and cover at least the scope of the initial training requirement.

5. Additional refresher training is required if there are significant changes in potential hazards associated with RASP sources in areas they may enter. Only the changes need to be covered.
6. Training may be provided as lectures, demonstrations, video, or self-study and should emphasize the use of site-specific RASP radiation sources.
7. The RSO, ARSO, or an individual with comparable knowledge and training shall conduct the training.
8. Non-radiation workers do not require a written test to demonstrate successful training completion.
9. Emergency personnel, including firefighters and medical responders, shall receive training on emergency exposure limits and the importance of medical treatment over contamination concerns.
10. Non-radiation worker initial and refresher training shall be documented and records maintained per Section 2.26.5.

2.8.7 Members of the Public and Other Organizational Personnel Working in Proximity to RASP Controlled Areas.

1. While members of the public are not involved in the RASP, concerns about the presence of radiation warning signs may develop. To minimize possible concerns, the command shall brief these personnel before they begin work adjacent to posted RASP controlled areas.
2. The briefing shall be commensurate with the size and complexity of the command's RASP.
3. The briefing may be provided through a self-study presentation. A written examination is not required to demonstrate successful completion.
4. The briefing shall emphasize the following:
   a. A description of radiation warning signs and requirement to heed the warnings.
   b. Members of the general public are prohibited from entering radiation areas.
   c. Members of the general public will not receive radiation doses greater than 100 mrem (1 mSv) from RASP radiation sources in a year.

5. This training shall be documented and maintained per Section 2.26.5.

2.8.8 Radioactive Material Shipper Training (Transportation of Class 7 Hazardous Material)

1. Individuals who prepare Class 7 (Radioactive) Material for transportation by any mode, military or commercial, shall be trained per Defense Transportation Regulation (DTR) 4500.9-R, Chapter 204; 49 CFR 172 Subpart H, Training Requirements; and Department of Defense (DoD) component regulations prior to assignment to such duties.
2. Persons who successfully complete the NAVSEADET RASO Radioactive Transportation Course (S-553-1111) receive the required training to certify shipping papers for Class 7 materials only.
3. Individuals who attend the NAVSEADET RASO Radiation Safety Course (S-4J-0016) and pass the transportation examination also receive the required training to certify shipping papers for Class 7 materials.
4. Individuals who prepare Class 7 (Radioactive) Material for transportation by any mode, military or commercial, shall requalify per DTR 4500.9-R, Chapter 204; 49 CFR 172 Subpart H, Training Requirements; and DoD component regulations.
5. Radioactive material shipping training records shall be documented and maintained per Section 2.26.5.

2.9 RASP Audits and Surveillances

2.9.1 RASP Audit Requirements

1. A formal audit program shall be established and addressed in the command endorsed RASP instruction.
2. The audit program shall encompass compliance and performance based reviews. This includes periodic observation of actual RASP operations and activities.
3. The purpose of the audit program is to improve RASP safety, reduce RASP program violations, and prevent mishaps and near misses from occurring.
4. When deficiencies are found, the responsible command organization shall be assigned to correct the problems.

For problems of a systemic or repetitive nature, the organization shall perform a causal analysis. The responsible organization shall document the corrective actions taken for all findings and forward the documentation to the RSO.

5. The RSO or ARSO shall conduct a radiation protection audit at least every six months if the command has an NRMP or machine sources of radiation, unless otherwise specified in this manual. Annual audits shall be conducted at commands possessing only generally licensed or exempt radioactive material.

6. The audit shall verify that:

   a. Procedures, and the NRMP if applicable, are being properly maintained and are current.
   b. Appropriate radiological surveys are being conducted and reviewed in a timely manner.
   c. Required radiation medical examinations are properly conducted at required intervals.
   d. Records of occupational radiation exposure are accurate and complete.
   e. Exposure information is provided to workers.
   f. NRMP commitments are maintained by reconciling physical inventories, leak test records, and other items prescribed by the NRMP.
   g. Required records and reports are properly maintained and issued in a timely manner.
   h. Radioactive material transportation, shipping, receipt, transfer, and disposal records are properly maintained.
   i. RASP related training is properly conducted and documented.
   j. Deficiencies identified during previous evaluations, inspections, reviews, audits, and RDRs have been corrected and that corrective actions are effective.

7. Audits shall include a review of RDRs and analysis to detect any trends.

8. Audits shall be documented, command reviewed, and maintained per Section 2.26.6.

2.9.2 **RASP Surveillances**

1. A supervisor responsible for operations subject to RASP controls shall conduct and document a surveillance of operations at least quarterly. Each type of RASP operation at a command (e.g., industrial radiography, x-ray analyzer usage, radioactive material shipping) shall have a separate surveillance performed quarterly if operations are conducted. Surveillances should include observation of work in progress.
2. The RSO shall review the findings of supervisor surveillances.
3. The RSO shall conduct and document surveillances of RASP operations at least quarterly.
4. Deficiencies or improvement items noted during surveillances shall be documented on a RDR per Section 2.11.
5. RASP surveillance records shall be maintained per Section 2.26.6.

2.10 **Annual Program Reviews**

1. The purpose of the APR is to evaluate command compliance with federal regulations, adherence to applicable Navy and Marine Corps directives, NRMP conditions, and management oversight of the RASP. The RSO shall conduct the APR.
2. The requirement to conduct an APR shall be included in each command RASP instruction.
3. The APR shall include, as applicable:
   a. A review of the exposure control processes that are in place to ensure doses are maintained ALARA.
   b. A review of operating and emergency procedures to ensure compliance with governing regulations and that they are current. Include a list of the procedures and any identified discrepancies.
   c. Identification of any improvements to the RASP.
   d. A review of RASP operations with the highest personnel doses to identify opportunities to reduce these exposures.
   e. A review of personnel exposure records that includes

the individuals with the five highest annual radiation doses, those individuals with annual doses above 100 mrem (1 mSv), and the cumulative radiation dose total for all radiation workers.

f. A list of personnel who had their ACL raised and their resulting radiation exposures.

g. A review of all RASP related training.

h. A demonstration of compliance with dose limits for individual members of the public.

i. The results of the annual RDR trend report conducted by the RSO.

j. A review of all incident and critique reports, associated corrective actions, and the effectiveness of those corrective actions.

k. A summary of RASP operation surveillances and results.

l. A review of audit findings, responses, and audit effectiveness.

4. Deficiencies and program improvement items discovered during the APR and not previously identified shall be entered into the RDR program per Section 2.11.

5. APRs shall be documented and maintained per Section 2.26.7.

2.11 RASP Deficiency Report Program

2.11.1 General Requirements

1. The purpose of the RDR program at the command level is to identify and correct RASP deficiencies and abnormal conditions. RDRs are also used to document and track the completion of RASP improvements. Self-identification and correction of lower order deficiencies or abnormal conditions are effective methods to identify trends and address program weaknesses before they develop into violations.

2. The command shall establish a RDR program or use an existing system that meets the requirements of Section 2.11.2.

3. The level of effort required for the RDR program should correspond to the complexity and scope of the RASP at the command.

4. The RDR program facilitates the self-identification and reporting process, and provides a means for documenting and tracking:
   a. The identification of the problem or condition of concern.
   b. The cause of the problem or condition when appropriate.
   c. The immediate and long-term (if appropriate) corrective actions taken.
5. Each RDR deficiency shall be assigned a level of significance. (The RDR level of significance does not correlate directly to the level of severity for NRC/Navy MML violations that are separately determined.)
   a. Incident:
      (1) An actual loss of safety or security. It is associated with severe or potentially severe bodily harm to a radiation worker or member of the public.
      (2) Reflects the result of a loss of safety or security, but to a lesser extent. It is associated with bodily harm or potential bodily harm to a radiation worker or member of the public.
      (3) Failure to comply with radiation exposure control or contamination control requirements such that limits or control levels are exceeded. Exceeding a radiation exposure limit or ACL, external or internal contamination of personnel, or releases of radioactivity to the environment above limits are examples of this type of incident.
   b. Potential Incident:
      (1) Exists when there is a realistic potential for the loss of safety or security. It may be associated with systemic failure to accomplish or meet a RASP regulatory requirement.
      (2) Has more than minor safety or environmental significance. It may be associated with non-systemic failures to accomplish or meet RASP regulatory requirements. If uncorrected, the problem could lead to an incident.
   c. Deficiency/improvement item:

(1) Deficiencies have minor safety, health, or environmental significance. These violations typically reflect inadequate documentation of program compliance requirements or minor problems that if left uncorrected could lead to a more significant issue.

(2) Items identified as program improvements and do not impact RASP compliance.

2.11.2 **Specific Requirements**

1. Each command shall develop and implement a formal RDR program that requires:
   a. Personnel to document all deficiencies, abnormal conditions, and improvement items associated with the command's RASP.
   b. Supervisors ensure the actions taken to correct the deficiencies and abnormal conditions are appropriate and documented.
   c. RSO or ARSO review of each RASP deficiency or abnormal condition and corrective action.
   d. The RSO to review RDRs and perform a trend analysis as part of the semiannual (or annual) audit.
   e. Each RDR is assigned a level of significance as defined in Section 2.11.1.
   f. The RDR form provides for documentation of the problem, date of discovery, name and contact information for the person discovering the problem, immediate corrective action(s) taken, apparent cause (for deficiencies, if known), supervisory review and comment, and RSO or ARSO review and comment. The form should be annotated with a serial number comprised of the year and sequential number. Contact NAVSEADET RASO to obtain a sample form.
   g. A log be maintained that records, as a minimum, the RDR serial number, date, short problem description, and date RDR reviewed and closed out by the RSO or ARSO.
2. Incidents are reportable events per Section 2.23 and have specific reporting requirements outside the RDR program.
3. All incidents and potential incidents require a causal

analysis and corrective actions identified. Normally, a critique with all involved parties present is conducted as soon after the event as possible. The purpose of the critique is to determine the facts and implement immediate actions before work continues to preclude a recurrence. Long-term corrective actions may be determined subsequent to the critique. In order to foster an environment in which personnel critically assess the event and share the facts, no actions of an administrative or disciplinary nature shall be addressed in critiques; such actions will be determined and processed independently using normal Navy and command procedures.

4. All incidents and potential incidents shall be documented in a report per Section 2.27.1. The cause and corrective action blocks on the RDR used to initially document the problem are completed by referencing the incident or potential incident report.

5. Records of identification, tracking, and correction of deficiencies and abnormal conditions shall be maintained per Section 2.26.8.

2.12 Radiation Survey Instrumentation

2.12.1 General Requirements

1. Commands shall possess or, when necessary, have access to the types and quantities of radiation survey instruments to make accurate radiation measurements for protecting the health of individuals, demonstrating compliance with requirements, and taking actions to minimize adverse effects to the environment.

2. NAVSEA’s RADIAC Program Office (NAVSEA 04ND) has management responsibility for the Navy’s RADIAC instrumentation program and develops, acquires, and maintains RASP-approved radiation survey instruments.

3. RASP commands shall use RASP-approved radiation survey instruments or those approved per Section 2.12.2.1.c.

2.12.2 **Specific Requirements**

1. Instrument Approval

   a. RASP approved RADIAC instruments and secondary dosimeters are available from the NAVSEA RADIAC Program Office. NAVSEA SE700-AA-MAN-100/RADIAC lists Navy RADIAC Calibration Laboratories by region including their points of contact.

   b. Activities shall address RADIAC instrument inquiries to their designated calibration laboratories. NAVSEA SE700-AA-MAN-100/RADIAC also provides instructions on requesting or changing RADIAC instrument allowances.

   c. NAVSEADET RASO shall approve the use of any radiation detection instruments not listed in NAVSEA SE700-AA-MAN-100/RADIAC prior to use by a RASP command. Requests for approval of non-standard instruments shall include a detailed description of the instrument and its characteristics, methods and procedures for calibration, and procedures for use and pre-use checks.

   d. Proper calibration, maintenance, and operation of instruments procured outside the Navy's RADIAC program are the responsibility of the possessing command.

2. Instrument Calibration

   a. Instruments and equipment used for quantitative radiation measurements shall be calibrated for the type of radiation to be measured and periodically calibrated and/or response checked at intervals specified by this manual.

   b. Instruments and equipment used for quantitative radiation measurements shall be calibrated by an activity specifically authorized by an NRMP or a NRC license or Agreement State license to provide this service.

   c. Sources used for instrument calibration shall be traceable to the National Institute of Standards and Technology (NIST).

   d. Instrument calibration procedures shall comply with applicable national standards or be approved by NAVSEA 04N.

   e. RASP RADIAC instruments or other approved instruments

shall be response checked using appropriate radioactive sources either daily or before use, if not used daily, as appropriate.

3. Instrument inventory, calibration, and response checks shall be documented and maintained per Section 2.26.9.

2.13 RASP Radiation Source Receipt and Accountability

2.13.1 Procurement

1. Commands shall establish written procedures to ensure RSO approval of the acquisition of any source of ionizing radiation including those from radioactive materials and radiation producing machines and devices.
2. RSO approval shall occur prior to requisition, purchase, or transfer of ownership.
3. Section 3 establishes requirements for permitting of radioactive materials and registering radiation producing machines and devices.

2.13.2 Receipt and Transfer

1. Commands shall maintain logs that document the receipt and transfer of radioactive material and sources, and radiation producing machines and devices.
2. Naval commands that transfer, receive, disassemble, or dispose of a sealed source containing a quantity equal to or greater than Category 1 or Category 2 levels of any radioactive material listed 10 CFR 20, Appendix E (nationally tracked source) shall complete a National Source Tracking Transaction Report, NRC Form 748.
   a. Complete NRC Form 748 using the instructions provided with the form.
   b. Call NAVSEADET RASO prior to submitting NRC Form 748 at DSN 953-4692, commercial (757) 887-4692 to ensure timely processing of report.
   c. Submit NRC Form 748 to NAVSEADET RASO by faxing to (757) 887-4900 or e-mailing in PDF format to "nsscnavsearasoadmin@navy.mil" and include in the subject line or cover sheet the following “NSTS Report, NRC Form 748 - Official Use Only - Security Related Information."
   d. Quantities of radioactive material that have decayed

below the threshold levels listed in Title 10 CFR 20, Appendix E, do not require a transaction report submittal.

3. Receipt and transfer records shall be maintained per Sections 2.26.10 and 2.26.11.

2.13.3 **Inventory**

1. The RSO shall maintain a current inventory of all radioactive material authorized by NRMP(s), radioactive sources authorized by NRC general license (e.g., radioactive chemical reagents and some gauges), exempt instrument check sources, low level radioactive waste (LLRW), and radiation producing machines and devices possessed by the command.
2. Under the direction of the RSO or ARSO, the command shall conduct a physical (hands on) inventory of all ionizing radiation sources (material and machines) semiannually, unless specified otherwise in this manual or the NRMP for the command. Sighting the device or container is sufficient for inventory purposes for radioactive material contained within a device (e.g., gas chromatograph) or packaged for shipment.
3. Radioactive material scheduled for disposal shall be clearly identified as such in the inventory.
4. The RSO shall submit a copy of the inventory to NAVSEADET RASO no later than 31 January of each year that includes all inventoried RASP radioactive material and machines possessed by the command on 31 December of the preceding year.
5. The RSO or ARSO should be aware of NRC exempt sources and commodities that contain radioactive material at their command as they may affect the radiation background levels and/ or area monitoring at the command.
6. The RSO shall provide a list of all inventoried RASP radioactive material and radiation producing machines and devices, by facility and location, to appropriate security and fire departments at least annually or when changes occur.
7. The inventory shall be documented and maintained per Sections 2.26.12 and 2.26.13.

2.14 Operating and Emergency Procedures

2.14.1 General Requirements

1. Commands shall develop and maintain operating and emergency procedures for the safe use of RASP radioactive material and radiation producing machines and devices.
2. Command operating and emergency procedures shall be developed and written by the command's subject matter expert and users and operators of the radioactive material or radiation producing machines and devices.
3. The operating and emergency procedures shall be reviewed and approved by the command RSO.
4. The operating and emergency procedures shall be a command level instruction or part of a command endorsed RASP instruction.
5. Each revision to an operating and emergency procedure shall be subject to the same approval process as the original.
6. If the command possesses an NRMP, revisions or changes shall be submitted as an NRMP amendment request per Section 3.2.3.
7. Operating procedures shall not be a reprint of the manufacturer's operating manual. They shall incorporate the specific procedures and processes required by the command to safely use the device.

2.14.2 Specific Requirements

1. As appropriate, operating and emergency procedures shall:
   a. Be specific to each RASP operation, each piece of equipment, and facility/location. Use of portable equipment at multiple temporary sites outside a permanent facility constitutes one location.
   b. Specify requirements for the use of primary and secondary dosimeters as required.
   c. Specify requirements for engineered controls and equipment.
   d. Specify contamination controls to be used when working with unsealed radioactive material.

e. Specify requirements for radiation protection surveys necessary to ensure RASP operations are conducted safely to include any special instrumentation and airborne monitoring for radioactivity.
f. Specify requirements for checking safety features such as lights, alarms, and interlocks.
g. Specify the personal qualifications required to perform the operation, and if applicable, internal monitoring required when working with unsealed radioactive material.
h. Specify and provide representative examples of all logs, records, and forms required to support each operation.
i. Include or reference another document that has current and accurate information on persons to be notified in the event of a radiological incident, and specify the method of notification.
j. Specify procedures to use in case of a radiological incident, including shutting down the affected equipment and securing the area.
k. Specify that the RSO or ARSO shall be able to respond to an on-site radiological incident within the time required for normal commuting (<2 hours) to the command for RASP operations to take place.

2. Operating and emergency procedures shall be created and maintained per Section 2.26.14.

2.15 Utilization Logs

2.15.1 Requirements

1. Utilization logs shall be used and maintained for the following:
   a. Use of all unsealed radioactive material and source material.
   b. Use of sealed radioactive sources, with activities greater than 10 times the quantities listed in 10 CFR 20, Appendix C.
   c. Radioactive check sources used for instruments.
   d. Use of all registered radiation producing machines and devices.
2. The information required on a utilization log and

retention requirements are specified in Sections 2.26.15 and 2.26.16.

2.16 Radioactive Material Labeling, Storage and Control

2.16.1 Storage and Control Requirements

1. RASP radioactive material, (i.e., greater than 10 CFR 30.71, Schedule B) shall be stored in controlled areas. Licensed material authorized for possession and use by an NRMP shall be secured to prevent unauthorized removal or access.
2. Radioactive check sources used for instruments shall be stored in a locked container when not in use that can only be accessed by the RSO, ARSO, or authorized personnel.
3. RASP storage and use area access shall be limited to individuals authorized by the command.
4. RASP radioactive material shall not be stored in office spaces, food storage areas, or berthing areas.
5. Each use and storage area, with quantities of radioactive material greater than 10 times the quantities listed in 10 CFR 20, Appendix C, shall be posted with a sign or signs bearing the radiation trefoil symbol and stating “Caution-Radioactive Material” that is easily viewable by anyone entering the area (10 CFR 20.1902(e)).
6. RASP radioactive material used in an unrestricted area shall be under the constant surveillance and immediate control of the RSO, ARSO or an authorized individual.

2.16.2 Labeling

1. Each container holding quantities of radioactive material greater than listed in 10 CFR 30.71, Schedule B, or 10 CFR 20, Appendix C, shall be marked with a label bearing the radiation trefoil symbol and the words "Caution-Radioactive Material" (10 CFR 20.1904).
2. In addition, the container must be labeled with sufficient information (e.g., the radionuclide(s) present, an estimate of the quantity of radioactivity, the date when the radioactivity was estimated, radiation levels, kinds of materials) to permit individuals

handling/using the radioactive material and others working in the vicinity to minimize their exposure to ionizing radiation.

3. Radioactive material containers internally contaminated in excess of the levels in Table 2-2 shall be marked with a label bearing the radiation trefoil symbol and the words "Caution-Radioactive Contamination Inside."
4. Containers holding radioactive material in quantities less than those listed in 10 CFR 20, Appendix C are exempt from the labeling requirement if attended by a designated individual who takes precautions necessary to prevent the exposure of individuals in excess of the limits listed in Table 2-1, or all other criteria of 10 CFR 20.1905 are met.
5. Regardless of activity, radioactive check sources used for instruments or the container in which they are stored shall be marked as radioactive material.
6. Except as otherwise authorized by the Naval Radiation Safety Committee (NRSC), NAVSEA 04N, or elsewhere in this manual, the labeling shall use the conventional radiation caution colors and symbol prescribed by 10 CFR 20.1901.
7. Prior to removal or disposal of empty uncontaminated containers to unrestricted areas, all radiation and radioactive contamination related labels shall be removed or defaced to clearly indicate that the container no longer contains radioactive material.

2.17 Radiological Area Posting Requirements

2.17.1 General Requirements

1. Only RASP radiation workers, non-radiation workers, or other individuals approved by the RSO, shall be authorized entry into RASP posted radiation areas.
2. In addition to the contents of signs prescribed in this section, a command may provide additional information (e.g., the radionuclide(s) present, an estimate of the quantity of radioactivity, the date when the radioactivity was estimated, radiation levels, or kinds of materials) on or near such signs to permit individuals working in the vicinity of the signs to minimize their exposure to ionizing radiation.

3. The boundaries of controlled areas shall be defined using existing barriers (e.g., walls, doors) or temporary barriers (e.g., ropes, fencing, containments).
4. Except as otherwise authorized by the NRSC, NAVSEA 04N, or elsewhere in this manual, the posting shall use the conventional radiation caution colors and symbol prescribed by 10 CFR 20.1901.
5. Radiation and radioactive contamination related signs shall be destroyed or defaced prior to disposal of the signs.
6. Radiation areas, high radiation areas, or very high radiation areas shall be deposted when the area is being used for other than RASP operations and surveys have confirmed radiation levels have been restored to background levels.
7. The RSO shall provide cognizant security and fire departments advance notification when a temporary high radiation area is established that is not under direct supervision of an authorized individual (e.g., RADIAC calibration laboratory overnight irradiation operations).

2.17.2 **Radioactive Material Storage and Use Areas**

Each use and storage area, with quantities of radioactive material greater than 10 times the quantities listed in 10 CFR 20, Appendix C, shall be posted with a sign or signs bearing the radiation trefoil symbol and stating “Caution-Radioactive Material” easily viewable by anyone entering the area (10 CFR 20.1902(e)).

2.17.3 **Restricted Area**

A RASP restricted area is defined as an area that meets the requirements of a radiation area and shall be posted per Section 2.17.4.

2.17.4 **Radiation Area**

Each RASP radiation area shall be conspicuously posted with a sign or signs bearing the radiation trefoil symbol and the words “Caution - Radiation Area.” (10 CFR 20.1902(a))

2.17.5 High Radiation Area

Each RASP high radiation area shall be conspicuously posted with a sign or signs bearing the radiation trefoil symbol and the words "Caution – High Radiation Area" or "Danger – High Radiation Area." (10 CFR 20.1902(b))

2.17.6 Very High Radiation Area

Each RASP very high radiation area shall be conspicuously posted with a sign or signs bearing the radiation trefoil symbol and the words "Grave Danger – Very High Radiation Area." (10 CFR 20.1902(c))

2.17.7 Radioactive Contamination Area

Areas where radioactive contamination exceeds the levels of Table 2-2 shall be controlled and conspicuously posted with a sign or signs bearing the radiation trefoil symbol and the words "Caution - Radioactive Contamination Area."

2.17.8 Airborne Radioactivity Area

Areas where airborne radioactivity concentrations exceed 10 percent of the derived air concentration values of 10 CFR 20 Appendix B shall be controlled and conspicuously posted with a sign or signs bearing the radiation trefoil symbol and the words "Caution - Airborne Radioactivity Area."

2.18 Radiological Area Access Control Requirements

2.18.1 High Radiation and Very High Radiation Area

1. Except as otherwise authorized by the NRSC, NAVSEA 04N, or specified elsewhere in this manual, each entrance or access point to a RASP high radiation area or very high radiation area shall have one or more of the following features:
   a. Equipped with a control device (i.e., interlock) that, upon entry into the area, causes the level of radiation to be reduced below 100 mrem/hr (1 mSv/hr) at 30 centimeters from the radiation source or from any surface that the radiation penetrates (10 CFR 20.1601(a)(1)).
   b. Equipped with a control device that energizes a conspicuously visible or audible alarm signal

automatically so that the individual entering the high radiation area and the operator or supervisor of the operation generating the high radiation area are made aware of the entry (10 CFR 20.1601(a)(2)).

c. Locked, except during periods when access to the areas is required, with positive control over each individual entry (10 CFR 20.1601(a)(3)).

2. Except in emergency situations, a command shall obtain NRSC or NAVSEA 04N approval prior to substituting continuous direct or electronic surveillance that is capable of preventing unauthorized entry to a high radiation or very high radiation area for one of the methods listed in Section 2.18.1.1.a above (10 CFR 20.1601(b)).

3. Very high radiation areas shall be equipped with additional measures to ensure that an individual is not able to gain unauthorized or inadvertent access to areas in which radiation levels could be encountered at 500 rads (5 grays) or more in one hour at one meter from a radiation source or any surface through which the radiation penetrates (10 CFR 20.1602).

   a. Electronic or mechanical solutions for this requirement shall function automatically to prevent inadvertent entry and, in the event that entry controls fail, automatically reduce radiation levels to less than 100 mrem/hr (1 mSv/hr) at one meter from the radiation source.

4. The controls required above shall be established in a manner such that no individual is prevented from leaving the affected high radiation area or very high radiation area.

2.18.2 **Radioactive Contamination Area**

1. Personnel who enter radioactive contamination areas shall use appropriate personal protective equipment, which may include respiratory protection equipment.

2. Instruments needed to perform personal monitoring upon exit from the area shall be staged and verified operational prior to allowing entry.

3. Containments shall be inspected for integrity prior to use.

4. Any required ventilation or airborne radioactivity monitoring shall be initiated prior to the start of work operations.

Table 2-2 Acceptable Surface Contamination Levels

Radionuclides	Acceptable Surface Contamination Levels
U-NAT, U-235, U-238 and associated decay products	Average: 5000 dpm alpha/100 cm^2 (2250 pCi/100cm^2) Maximum: 15,000 dpm alpha/100 cm^2(6750 pCi/100cm^2) Removable: 1000 dpm alpha/100 cm^2(450 pCi/100cm^2)
Transuranics, Ra-226, Ra-228, Th-228, Th-230, Pa-231, Ac-227, I-125, I-129	Average: 100 dpm/100 cm^2(45 pCi/100cm^2) Maximum: 300 dpm/100 cm^2(135 pCi/100cm^2) Removable: 20 dpm/100 cm^2(9 pCi/100cm^2)
Th-NAT, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	Average: 1000 dpm/100 cm^2(450 pCi/100cm^2) Maximum: 3000 dpm/100 cm^2(1350 pCi/100cm^2) Removable: 200 dpm/100 cm^2(90 pCi/100cm^2)
Beta-gamma emitters (Nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above (see Note 7)	Average: 5000 dpm beta-gamma/100 cm^2(2250 pCi/100cm^2) Maximum: 15,000 dpm beta-gamma/100 cm^2(6750 pCi/100cm^2) Removable: 1000 dpm beta-gamma/100 cm^2(450 pCi/100cm^2)

Notes:

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

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

3. Measurements of average contamination should not be determined over more than one square meter. For objects with less surface area, the average should be derived for each object.

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

5. The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter paper 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 entire surface area should be wiped and pertinent contamination levels should be reduced proportionally. Except for transuranics and Ra-226, Ra-228, Ac-227, Th-228, Th-230 and Pa-231 alpha emitters, it is unnecessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that total residual surface contamination levels are within the limits for removable contamination.

6. The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mR/hr at one centimeter (average) and 1.0 mR/hr at one centimeter (maximum), respectively, measured through not more than seven milligrams per square centimeter of total absorber.

7. This category of radionuclides includes mixed fission products, including the Sr-90, which is present in them. It does not apply to Sr-90, which has been separated, from other fission products or mixtures where the Sr-90 has been enriched.

2.19 Leak Testing of Sealed Radioactive Sources

2.19.1 Leak Test Frequency

1. Sealed sources shall be tested for leakage or contamination at intervals not to exceed the period specified in the applicable NRMP or the NRC Sealed Source and Device Registry (SSDR), whichever is more restrictive.
2. Unless required by a NRC or general license for devices, a sealed source does not require leak testing if:
   a. It is a beta-gamma source containing 100 microcuries or less.
   b. It is an alpha source containing 10 microcuries or less.
   c. The source contains tritium (H-3) or other gaseous form radioisotope.

d. It has a half-life of less than 30 days.

3. Notwithstanding Section 2.19.1.1 above, sealed sources designed to primarily emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed three months.

4. A RASP command shall not use a newly received sealed source (requiring leak testing) unless it is accompanied by a certificate from the transferor that shows it has been successfully leak tested as specified by the SSDR.

5. Sealed sources in storage and not being used need not be tested at the required intervals. However, they shall be tested before use or transfer to another command if the storage interval exceeds the interval stated in the NRMP or certificate of registration, or if stored for a period of more than 10 years without being tested for leakage.

2.19.2 **Leak Test Sample Collection and Analysis**

1. The leak test sample shall be taken from the source or an adjacent surface where contamination is expected to accumulate.

2. Sources that emit alpha particles (i.e., plated and Mylar covered alpha check sources) shall be tested by wiping an adjacent surface and not the source directly.

3. Leak test samples shall be collected using the procedure prescribed in the applicable NRMP.

4. Leak test samples shall be analyzed by the command, or a company specifically licensed by the NRC or an Agreement State, or another command authorized by an NRMP to perform such services.

5. The leak test analysis shall be capable of detecting the presence of 0.005 microcuries (185 becquerels (Bq)) of radioactive material. This analysis shall also be able to accurately identify the radionuclide present in the test sample.

6. The performance of leak tests shall be documented and records maintained per Section 2.26.17.

2.19.3 **Required Actions for a Leaking Source**

1. The command shall notify NAVSEADET RASO immediately and

make all other notifications required by the applicable NRMP if a leak test reveals the presence of 0.005 microcuries (185 Bq) or more of removable contamination.

2. The leaking source shall be removed from service and placed in storage using appropriate contamination control measures pending instructions from NAVSEADET RASO.
3. The command shall investigate the circumstances associated with the source leakage, determine the extent of contamination, and document the investigation. The investigation report shall be forwarded to NAVSEADET RASO as soon as practicable.

2.20 Contamination Control

2.20.1 General Contamination Control Requirements

1. Eating, drinking, chewing, or smoking shall be prohibited in posted radioactive contamination areas and in areas where unsealed radioactive sources are used or stored.
2. Food storage in posted radioactive contamination areas shall be prohibited.
3. Eating, drinking, chewing or smoking while wearing potentially contaminated clothing shall be prohibited.
4. Pipetting radioactive liquids by mouth shall be prohibited.
5. Radioactive liquids and powders shall be carried in their containers within a second non-breakable container.
6. Sinks and drain systems used in rooms or facilities where liquid radioactive materials are used in quantities exceeding sanitary sewer disposal limits specified in the NRMP or 10 CFR 20.2003 shall be dedicated collection systems separate from the sanitary sewer system.
7. Only designated sinks shall be used to dispose of liquid radioactive materials used in quantities meeting sanitary sewer disposal limits (10 CFR 20.2003). Only water-soluble radioactive material shall be discharged.
8. A log shall be maintained that documents each discharge

to the sanitary sewer system that includes the date of discharge, radionuclide(s) in the effluent, quantity of radioactivity discharged, average sanitary sewer flowrate, and the person responsible. The log shall be retained per Section 2.26.20.

9. Sinks, washbasins, traps, or floor drains used for disposal of radioactive liquids shall be marked with a label or sign including the radiation symbol and additional precautionary information.

10. A radiological buffer area (i.e., control point area) shall be established for contamination control adjacent to any entrance to or exit from a walk-in radioactive contamination area or airborne radioactivity area. The size of the control point area shall be commensurate with the potential for the spread of contamination and the area needed for entry and egress. Workers shall remove protective clothing in BUFFER ZONE / AREA PRIOR TO ENTRY INTO CONTROL POINT AREA. Perform self-monitoring in the control point area before entering an unrestricted area.

11. If an area is contaminated with radionuclides with maximum beta particle energies less than 150 kiloelectron volts (keV), the RSO shall implement additional measures to properly monitor and control the radionuclides.

12. Contamination control containments shall be inspected for integrity and usability prior to each use.

13. Prior to deposting an area or containment posted as a radioactive contamination area, sufficient surveys shall be performed to verify contamination levels are below the Table 2-2 values.

14. Use of material containing hazardous regulated constituents (e.g., cadmium) within radioactive contamination areas shall be prohibited to preclude the generation of waste that is a mixture of radioactive and regulated hazardous material.

15. The RSO shall evaluate the potential for generation of airborne radioactivity in any posted radioactive contamination area where removable surface contamination limits exceed ten times the levels in Table 2-2.

    a. In general, local worksite ventilation should be used to direct airflow away from the worker and remove

airborne radioactive particles or performance of the operation in a fume hood or containment should be considered.

b. For work involving radioactive contamination at levels likely to create high airborne radioactivity, use of a containment or other engineered controls shall be used to meet the requirements for preventing internal depositions contained in NAVMED P-5055 and the controls of Section 2.20.6.

16. Airborne radioactivity sampling shall be performed in radioactive contamination areas during work operations. Sampling may be performed using a continuous monitor or portable filtered sampling unit. The measurements shall be representative of the air being breathed by the workers.

2.20.2 Entry and Exit from a Radioactive Contamination Area

1. Individuals shall be trained as a contamination worker per Section 2.8.5.
2. Protective clothing shall be worn in posted radioactive contamination areas with removable contamination above the levels in Table 2-2 commensurate with the type and level of contamination present and the activities to be performed. The RSO shall evaluate and determine the appropriate protective clothing to be worn.
3. Protective clothing worn by any individual shall be removed upon exiting the radioactive contamination area prior to entering the control point area or monitored in a control point area for release before an individual enters unrestricted areas.
4. Individuals leaving a posted radioactive contamination area shall be monitored for contamination using an IM-265/PDQ with DT 681/PDQ probe or equivalent detecting device for alpha activity or an IM-265/PDQ with DT-685/PDQ beta probe interface and DT-304 probe or equivalent device for beta-gamma activity with maximum beta particle energy greater than 150 keV as follows:

   a. Hold the probe less than 1/2 inch from surface being surveyed for beta and gamma contamination and approximately 1/4 inch for alpha contamination.

   b. Move the probe slowly over the surface at

approximately 2 inches per second.

c. If the count rate increases during monitoring, pause for 5 to 10 seconds over the area to provide adequate time for instrument response.

d. If no detectable contamination is encountered during monitoring, EXIT the control point area into the uncontrolled area.

5. If contamination is found greater than Table 2-2 values, perform the following:

a. For clothing or other personal items, have the individual remove the item and retain for further analysis and disposition. Monitor the individual again to verify contamination levels are below Table 2-2.

b. For skin or hair contamination, notify the RSO and perform decontamination per BUMEDINST 6470.10 (series) procedures.

2.20.3 **Injuries in a Radioactive Contamination Area**

1. Any injury sustained in a posted radioactive contamination area resulting in an open wound or lesion shall be reported IMMEDIATELY to the RSO and evaluated by a medical department representative or medical officer/physician.

2. The RSO shall report the injury and resultant actions to NAVSEADET RASO per Section 2.23 and document the event and surveys performed.

3. Medical treatment of injuries sustained in a posted radioactive contamination area shall take priority over contamination controls. Further guidance on the medical management of radiological injuries is provided in BUMEDINST 6470.10 (series).

2.20.4 **Contamination Survey Methods**

1. Contamination surveys of areas, equipment, tools, and other items shall be performed using a combination of dry smears and direct scanning to determine removable and fixed contamination levels depending on the radionuclide of concern.

2. The RSO shall evaluate and document the survey techniques to be used at the command based on the

radionuclides of concern.

3. Contamination surveys shall be performed with an appropriate radiation detection instrument of sufficient sensitivity to detect the type of potential radioactive contamination at levels below the levels in Table 2-2.

4. The instrument efficiency for each radionuclide in question shall be determined if this efficiency has not been previously established and documented. Contact NAVSEADET RASO for assistance.

5. Comprehensive contamination surveys shall be performed in all areas of facilities where contaminated or potentially contaminated materials are used or stored as follows:

   a. The survey shall be of sufficient detail to ensure the detection of an uncontrolled spread of contamination.

   b. The survey will consist of both smears and direct monitoring using an IM-265/PDQ with DT 681/PDQ probe or equivalent detecting device for alpha activity or an IM-265/PDQ with DT-685/PDQ beta probe interface and DT-304 probe or equivalent device for beta-gamma activity with maximum beta particle energy greater than 150 keV as follows:

      (1) Perform a direct scan survey by holding the probe less than 1/2 inch from the surface being surveyed for beta and gamma contamination and approximately 1/4 inch for alpha contamination.

      (2) Move the probe slowly over the surface at approximately 2 inches per second.

      (3) If the count rate increases during monitoring, pause for 5 to 10 seconds over the area to provide adequate time for instrument response and document the results.

      (4) If direct scan surveys indicate that total residual surface contamination levels are less than the levels for removable contamination in Table 2-2, it is unnecessary to use smears to determine removable contamination levels except for transuranics and Ra-226, Ra-228, Ac-227, Th-228, Th-230 and Pa-231 alpha emitters.

      (5) Perform a smear survey of representative areas to be surveyed by wiping the dry smear over an

area of approximately 100 cm^2 and hold the smear under the appropriate probe at ½ inch for beta and gamma and ¼ inch for alpha for 5 to 10 seconds and document the results.

(6) If contamination is found greater than Table 2-2 values, decontaminate the area or item to levels less than Table 2-2 values or properly post and control the area or item.

6. Contamination from radionuclides with maximum beta particle energy less than 150 keV shall be evaluated using smears and instruments capable of detecting low energy particles such as gas proportional or liquid scintillation detectors.

7. Contamination surveys shall be documented and maintained per Section 2.26.18.

2.20.5 Release of Tools, Equipment, and Other Items from a Radioactive Contamination Area

1. All tools, equipment, and other items used in a posted radioactive contamination area shall be surveyed per Section 2.20.4 and decontaminated as necessary before release to an unrestricted area.

2. Survey results for tools, equipment, and other items released from a posted radioactive contamination area for unrestricted use shall be less than the contamination levels in Table 2-2.

3. Items that have internal surfaces that cannot be surveyed per Section 2.20.4 must be evaluated by the RSO to determine if the item can be released to an unrestricted area.

4. Items that cannot be evaluated shall be labeled as "Potential Internal Contamination" and controlled as radioactive material. If a remediation plan is authorized by NAVSEA 04N, items may be disassembled in a properly controlled area for further surveys and, if necessary, decontaminated.

5. Items that have contamination levels greater than Table 2-2 must be properly packaged, labeled, and controlled as radioactive material.

6. Surveys to release tools, equipment, and other items shall be documented and maintained per Section 2.26.18.

2.20.6 **Airborne Radioactivity Control**

1. Airborne radioactivity area means a room, enclosure, or area where airborne radioactivity concentrations can exceed 10 percent of the derived air concentration values of 10 CFR 20 Appendix B.
2. The command shall use work processes or other engineering controls (e.g., containment, decontamination, or ventilation) to control the concentration of airborne radioactivity.
3. Ventilation systems for airborne radioactivity control shall be high efficiency particulate air (HEPA) filtered.
   a. The design considerations for controlled ventilation systems in DOE HDBK-1169-2003, "Nuclear Air Cleaning Handbook," and Section 9 of NAVSEA 0989-039-9000, "In Place Testing of High Efficiency Particulate Air Filter Systems," shall be considered when designing controlled ventilation systems.
   b. Controlled ventilation systems shall be checked per local procedures that include velocity measurements and/or smoke tests.
4. Ventilations systems exhausting from radioactive contamination areas to the environment shall be monitored by fixed filter sampling to record the amount of measureable radioactivity released and demonstrate compliance with the effluent concentration limits of Appendix B of 10 CFR 20.
5. When chemical fume hoods are used to contain radioactive material during contamination control work:
   a. They shall be equipped with a HEPA filter and shall be marked with "Caution Radioactive Material" signs or labels.
   b. Any ventilation lines between the fume hood and the HEPA filters shall be labeled as "Potentially Contaminated, Contact RSO for Entry" or equivalent wording.
   c. The average airflow velocity through the face of a chemical fume hood, used to contain radioactive material, shall be at least 100 linear feet per minute.
   d. The exhaust to the environment shall be monitored by

fixed filter sampling to record the amount of measurable radioactivity released and demonstrate compliance with the effluent concentration limits of Appendix B of 10 CFR 20.

6. HEPA filtered vacuum cleaners may be used for control of radioactivity and maintain negative pressure in contamination control containments.
7. The command shall have procedures for replacing and testing filters in HEPA filtered ventilation systems and vacuum cleaners. Testing shall be performed after filter replacements and at least annually. The command shall have procedures for inspecting, inspection frequency, and survey requirements, during and after use, for HEPA filtered ventilation systems and vacuum cleaners.
8. Ventilation system designs as well as operating, maintenance, and testing procedures should be forwarded to NAVSEADET RASO for information. For new systems, this information should be forwarded prior to system use.
9. Airborne radioactivity sampling shall be performed in airborne radioactivity areas during work operations. Sampling may be performed using a continuous monitor or portable filtered sampling unit. The measurements shall be representative of the air being breathed by the workers.
10. If engineered controls are not sufficient or feasible, and respiratory protection is required to perform work, NAVSEADET RASO shall be notified.
    a. Only workers with the proper medical and training qualifications may perform work using respiratory protection equipment.
    b. Use of air supplied respirators shall be approved by NAVSEADET RASO.

2.21 Radiation Protection Surveys

2.21.1 General Requirements

1. Radiation protection surveys are conducted to determine radiological conditions before, during, and after radiological work. Surveys shall be of sufficient frequency and detail to ensure personnel radiation

exposures and radioactive material are properly controlled per the requirements of this manual and NRMPs.

2. This manual and procedures incorporated by reference in NRMPs specify survey requirements for specific operations. Completion of required surveys does not preclude the necessity for additional surveys if appropriate. Surveys for RASP operations must be adequate to properly assess the hazards to personnel and the environment, and demonstrate compliance with specific requirements of this manual.

2.21.2 **Radiation Surveys**

1. Unless otherwise specified in this manual or NRMP, radiation surveys shall be conducted:
   a. Weekly in the vicinity of temporary radiation area boundaries. Ropes across building openings, such as a door, do not require weekly survey.
   b. Monthly in occupied radiation areas, high radiation areas, radioactive material storage areas, and areas adjacent to these areas.
   c. At least annually in unoccupied radiation areas, high radiation areas, and radioactive material storage areas even if the area must be opened to perform the survey.
   d. Annually on ventilation systems used in support of radioactive contamination work or to control airborne radioactivity.
2. Radiation surveys shall be performed on radiation producing machines or facilities after maintenance that involves unit shielding or could change radiation levels emitted.
3. Radiation surveys shall be conducted in controlled and adjacent uncontrolled areas during or after movement of radioactive material or radiation producing machines that could result in a change in area radiation levels.

2.21.3 **Contamination Surveys**

1. Unless otherwise specified in this manual or NRMP, contamination surveys shall be conducted:
   a. Daily in occupied radioactive contamination areas,

control point areas, and areas immediately adjacent to control point areas. Surveys need only be conducted on days when work in the area with unsealed sources or contaminated equipment and material is performed.

b. Monthly in all areas of facilities where contaminated or potentially contaminated materials are used or stored.

2. Perform contamination surveys in plenums downstream of HEPA filters in ventilation systems used for radioactive contamination work to check for buildup of radioactivity in ducting. These surveys shall be performed during filter changes or at least annually for systems that have been used during the previous year.

3. Perform surveys of areas where spills of radioactive liquid have occurred or airborne radioactivity has exceeded the derived air concentrations of Appendix B of 10 CFR 20 to determine the need for protective clothing and the extent of the contaminated area.

4. Contamination surveys shall be documented and maintained per Section 2.26.18.

2.21.4 **Facility Radiation Survey**

1. Facility radiation surveys are required for facilities meeting the criteria of Section 2.24.1.

2. It includes a physical inspection of the facility and operation and measurements of the radiation levels under a full range of expected operating conditions.

3. Surveys shall be conducted to evaluate the extent of radiation hazards.

4. The survey documentation shall clearly identify all adjacent areas including unrestricted areas.

5. The survey shall indicate present and expected future occupancy factors for adjacent areas.

6. Radiation levels shall be measured in all adjacent areas that could be occupied.

   a. The measurements shall be made under practical conditions that will produce the highest exposure at the point of interest.

   b. Appropriate material shall be placed in the primary

beam to cause scatter conditions approximating that produced under normal operations.

7. Radiation protection equipment and systems shall be tested for proper operation. These devices include audible or visible warning signals, interlocks, emergency stops, timer delay switches, and mechanical or electronic devices that restrict radiation source positioning.
8. The RSO or ARSO shall review all associated RASP instructions and procedures to ensure they are up to date.
9. The RSO or ARSO shall conduct or supervise all facility radiation surveys.
10. A facility radiation survey shall be conducted:
    a. Before a new facility is placed into routine operations.
    b. Following a significant change in conditions from the initial facility radiation survey that could adversely affect radiation safety (e.g., facility modification, change in operating parameters, etc.).
    c. Every five years unless specified otherwise by NRMP condition or in other sections in this manual.
11. Additional facility radiation survey requirements are included in other sections of this manual.
12. Facility radiation surveys shall be documented and maintained per Section 2.26.19.
13. Evaluation and Approval
    a. Surveys required by this section shall be submitted to NAVSEADET RASO for evaluation and approval.
    b. Routine operation of new or modified facilities as described in Section 2.24 shall not commence prior to NAVSEADET RASO approval of the corresponding radiation protection survey.
    c. Commands observing unexpected survey results shall notify NAVSEADET RASO immediately and suspend operations in the affected facility pending NAVSEADET RASO guidance.

2.22 Transportation

2.22.1 Introduction

1. Regulations governing the transportation of hazardous material are designed to prevent undue exposures and injury to the transporters and public during transport. Packaging, labeling, and other tasks associated with the transportation of radioactive material are complex and depend on the form, quantity, and radionuclide to be transported.
2. It is not possible to provide comprehensive guidance for every potential transportation operation in the limited scope of this manual. Comprehensive regulations concerning the transportation of radioactive material are provided in 49 CFR Parts 170-199, 10 CFR Part 71, and DTR 4500.9-R.

2.22.2 Shipping Requirements

1. Each command shall ensure that personnel assigned to duties involving radioactive material transportation are trained in the applicable sections of 49 CFR 172 Subpart H and the DTR prior to commencing work.
2. Each command shall consult the appropriate section(s) of 49 CFR, 10 CFR 71, DTR, Part II, and this manual, prior to commencing any transportation operation.
3. Any material consignment containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in the table of exempt material activity concentrations and exempt consignment activity limits for radionuclides in 49 CFR 173.436, is considered radioactive for the purpose of transportation.
4. Department of Transportation (DOT) and DTR regulations shall apply to the movement of radioactive material over DoD controlled and uncontrolled roads.
   a. A road is considered controlled by a military service (e.g., DON) if access to the road is restricted at all times through the use of gates and guards.
   b. Movement of regulated amounts of radioactive material, as defined in 49 CFR 172.101, on military installations where access is controlled by the use

of gates and guards, does not require the use of HAZMAT shipping papers provided the material does not leave the confines of the installation. Commands moving regulated amounts of radioactive material shall comply with all other requirements of 49 CFR, Subchapter C.

c. Each command as applicable shall prepare a command endorsed instruction that specifies the process for transporting regulated amounts of radioactive material on military controlled roads.

d. Commands moving regulated amounts of radioactive material, as defined in 49 CFR 172.101, over DoD uncontrolled roads shall comply with all 49 CFR, Subchapter C, requirements including the use of HAZMAT shipping papers.

5. No command shall offer any radioactive material for transport aboard a passenger-carrying aircraft unless the material is intended for use in medical treatment, diagnosis or research or exempted by 49 CFR 173.4 as small quantities. RADIAC instrument check sources and other similar sources that are exempt from DOT HAZMAT requirements may be transported on passenger aircraft under this exception at the discretion of the carrier.

6. Radioactive material transportation on military aircraft shall comply with requirements of NAVSUP PUB 505/MCO P4030.

7. The RSO shall ensure that all packages offered for transportation, or transported by the command or activity conform to applicable requirements of 49 CFR, DTR, and this manual.

8. The RSO shall also ensure that a certified shipper for Class 7 hazardous material (i.e., radioactive material) certifies the package, when required (DTR Chapter 203).

9. Each command shall ensure that radioactive material that has been properly packaged and certified is expeditiously transported to the receiving organization.

10. Prior to first use of any package, the shipping command or activity shall verify that the quality of design and construction meets the requirements of 49 CFR and 10 CFR 71.87, when applicable, and meets the specified limits in the package design by examination or written certification from the manufacturer or supplier of the

packaging.

11. A shipping command shall obtain special form documentation, including supporting safety analysis or manufacturer's certification as specified in 49 CFR 173.476, and shall retain this documentation for one year after completing the associated shipment.

12. A shipping command shall obtain written documentation of the tests and evaluations for Specification 7A packages, and shall maintain this documentation for one year following the last use of the package, including the original test report and any shipper comparison between limits of the package used and limits in the test report.

13. Prior to shipping greater than Type A quantities of radioactive material (defined as Type B quantities), the shipping command shall:

    a. Implement a NRSC approved Quality Assurance Program (QAP). QAP applications shall be prepared per 10 CFR 71.101 and submitted to NAVSEADET RASO.

    b. Register as a user of any package carrying a NRC Certificate of Compliance per 10 CFR 71.12(c)(3) prior to using the package for the first time. Registration requests shall be submitted to the NRSC via NAVSEADET RASO. The NRSC will forward the request to the NRC.

    c. Comply with 10 CFR 71.5 and 49 CFR general requirements for packaging, marking, labeling, placarding, shipping papers, and shipment modes.

    d. Comply with 10 CFR 71, Subpart G, Operating Controls and Procedures, and Subpart H, Quality Assurance, requirements.

14. Documentation for Type B packages shall include:

    a. Written certification from the package vendor or owner that the package was built and maintained in accordance with an NRC approved QAP.

    b. A Certificate of Compliance for NRC approved packages.

    c. Copies of applicable documents referenced in the certificate for use, maintenance, and actions required prior to shipment.

15. Prior to each shipment of radioactive material, the

shipping command shall ensure that:

a. The package is proper for the contents to be shipped.
b. The packages are inspected for damage, leakage, and radiation level and for proper classification, marking, labeling, shipping papers and certification.
c. External radiation and contamination levels are within limits (10 CFR 71.47 and 87, 49 CFR 173.441 and 443).
d. Special requirements of 49 CFR 173.475 and 10 CFR 71.87 are met, when applicable, for shipment of greater than Type A quantities.
e. Records of the above determinations are maintained for at least three years after shipment.

16. For NRC licensed material, the supply command shall verify consignee authorization to receive the radioactive material. This is an NRC or state license for commercial firms or an NRMP for Navy commands as required by 10 CFR 30.41.

17. For NRC licensed material, the supply command shall formally notify the consignee or transportation officer by priority message or equivalent method at least 24 hours prior to the expected arrival of the package at the consignee.

18. Radioactive material shipping and transfer records shall be maintained per Section 2.26.11.

2.22.3 **General Receipt Requirements**

1. To the maximum extent possible, all material shall be received in a single location.

2. Supply activities that expect to receive packages containing more than Type A quantities as defined in 10 CFR 71.4 and Appendix A to 10 CFR 71 shall make arrangements:

   a. To receive a package when it is offered for delivery by the carrier; or
   b. To be notified by the carrier when a package arrives at the carrier's terminal and to pick up the package as soon as possible after notification.

3. All packages containing radioactive material shall be inspected as soon as possible after being located in an

incoming shipment. When the package shows signs of damage (crushed, wet, or visible damage), government-owned vehicles shall be surveyed for contamination. Government-owned vehicles shall not be released until contamination is reduced to the level specified in 49 CFR 173.443. For commercial vehicles, the driver (if available), the carrier, and NAVSEADET RASO shall be notified of the potential contamination without the vehicle being surveyed.

4. Shipments shall be examined to determine if there is any leakage from contents or apparent damage. If damage or leakage is suspected, the RSO shall be notified immediately and the package shall not be moved or further handled except as directed by the RSO.
5. Packages containing NRC licensed radioactive material shall not be opened unless directed by the RSO as a result of package damage or discrepancy.

2.22.4 **Receipt Surveys**

1. Monitor the external surfaces of all packages labeled with a Radioactive White I, Yellow II, or Yellow III label for radioactive contamination unless the package contains only radioactive material in the form of a gas or in special form as defined in 10 CFR 71.4.
2. Monitor the external surfaces of all packages containing more than Type A quantities as defined in 10 CFR 71.4 and 10 CFR 71 Appendix A (Type B), which are labeled with a Radioactive White I, Yellow II, or Yellow III label for radiation levels.
3. For any package known to contain radioactive material that has evidence of degradation of package integrity such as packages that are crushed, wet, or damaged:
   a. Monitor the package for radioactive contamination
   b. Monitor the package for radiation levels
4. All packages shall be monitored as described above as soon as practical after receipt of the package, but not later than 3 hours after the package is received at the licensee’s facility if it is received during the licensee’s normal working hours, or not later than 3 hours from the beginning of the next working day if it is received after working hours.

5. The RSO shall immediately notify the final delivery carrier and NAVSEADET RASO when:
   a. Removable radioactive surface contamination exceeds the limits of 10 CFR 71.87(i); or
   b. External radiation levels exceed the limits of 10 CFR 71.47.

2.22.5 Additional Requirements for Radiographic Sources

1. Gamma radiographic source packages (source changers or exposure devices) shall be transferred without delay per applicable routing instructions.
2. Gamma radiographic sources shall not be left unattended on loading docks or released to unauthorized personnel

2.22.6 Storage Requirements for RASP Radioactive Material

1. RASP Radioactive materials shall be stored in locked areas with the number of keys and the individuals with access to the keys kept to a minimum.
2. RASP Radioactive material shall not be stored in the same warehouse section with explosives, flammable materials, photosensitive items (e.g., photographic film), food products, or other incompatible commodities.
3. The entrances to each storage area shall be posted with signs stating "Caution Radioactive Material."
4. Boundaries of the storage area shall be surveyed and checked whenever new packages are received to determine proper warning signs. Measurements or calculations shall demonstrate that radiation levels at the boundary to personnel in unrestricted areas shall not exceed 2 mrem (0.02 mSv) in any one hour and the radiation dose does not exceed 100 mrem (0.01 mSv) in one year. Additional radiological postings may be required based on radiation levels (see Section 2.17).

2.23 Radiological Incidents and Emergency Planning

2.23.1 General Requirements

1. A radiological incident can occur where radioactive materials or radiation-producing equipment are used, stored or transported. The magnitude of the incident

and the severity of consequences will determine the level of response.

2. The following conditions, situations and occurrences shall be considered as radiological incidents:
   a. External radiation exposure in excess of the limits of Table 2-1.
   b. External radiation exposure in excess of the ACLs in Table 2-1.
   c. Personnel contamination above the levels of Table 2-2.
   d. Exposure of personnel to airborne radioactivity above 10 percent of the derived airborne concentrations of Appendix B of 10 CFR 20 without respiratory protection.
   e. A mishap resulting in the inhalation or ingestion of a measurable quantity of radioactive material.
   f. Unauthorized or accidental entry of personnel into a high radiation area or unauthorized or accidental entry into a radiation area and the person(s) receives an estimated unmonitored exposure of greater than two mrem.
   g. Entry into a high radiation area without the required dosimetric devices and one mrem or more of exposure is received.
   h. Spills of radioactive material outside controlled areas.
   i. Theft or loss of radioactive material or machines that produce ionizing radiation.
   j. Release of radioactive material into the environment above the effluent limits of Appendix B of 10 CFR 20.
   k. Receipt of packages with contamination or radiation levels in excess of 10 CFR 71 limits.
   l. Failure of safety devices to function properly such as an interlock not terminating exposure.
   m. Leaking sealed radioactive source.
   n. Discharges or spills of material or fluids that might be considered pollutants which endanger critical water areas, have the potential to generate public concern, become the focus of enforcement action, have domestic or international implications, or pose a threat to public health or welfare.

o. Unauthorized disposal of radioactive material.

p. Any gamma radiography reportable events specified in Section 5.17.1.

q. Any x-ray radiography reportable events specified in Section 11.16.1.

3. Radiological incidents shall be reported per Section 2.27.

2.23.2 Emergency Plans, Notifications and Annual Drills

1. Procedures shall identify conditions constituting an emergency, list by priority individuals and departments to be notified (primary and alternates) during duty hours and off-duty hours, radiological exposure control, and actions to be taken to include responsibility for notifications.

2. The RSO shall prepare for the possibility of an emergency by developing, testing, and maintaining an emergency response plan commensurate with the radiation hazards at the command.

3. Emergency plans for radioactive material shall be included in the NRMP application submitted to NAVSEADET RASO.

4. Emergency plans shall be reviewed and updated at least annually.

5. Annual Emergency Drills

   a. Commands that have the potential for one or more of the hazardous conditions listed in Section 2.23.1.2 above, shall conduct at least one emergency drill per year to ensure that RASP workers, radiation safety, emergency responders and other personnel are familiar with their roles and responsibilities during emergency situations.

   b. The drill scenario shall be based on one or more of the emergency situations outlined in the command emergency procedures and shall include participation by fire department and other emergency response personnel if appropriate. Table top exercises can only be used to satisfy the annual emergency drill requirement with pre-approval by NAVSEADET RASO.

2.24 Facility Design and Shielding Review

2.24.1 General Requirements

1. This section provides guidance and requirements for the design of new or modified facilities where ionizing radiation (radioactive material or machine generated) will be used.
2. Thorough evaluation of planned operations and correct application of design standards and regulatory requirements protect personnel while avoiding unnecessary costs, and eliminate the need for expensive modifications after construction.
3. This section applies to DON facilities ashore and afloat using radiation sources for industrial purposes, including government owned contractor operated (GOCO) and government owned joint operated (GOJO) facilities.
4. This section does not apply to operations using radiation sources whose design does not require a special facility review, such as analytical x ray units, gas chromatographs, gauges, etc.
5. Specific sections in this manual will state when facility design and shielding reviews are required.
6. Review and approval of ionizing radiation safety features and shielding requirements for medical and dental facilities is the responsibility of BUMED.
7. Facility design records shall be part of the command’s configuration management system and be maintained for the life of the facility.

2.24.2 Radiation Levels Adjacent to Facilities

Facilities shall be designed and constructed so that personnel in unrestricted areas shall not be exposed to more than 2 mrem/hr (0.02 mSv/hr) at 30 cm and shall not receive more than 100 mrem (1 mSv) in one year unless authorized by COMNAVSEASYSCOM.

2.24.3 Unsealed Radioactive Material

Facilities built for unsealed radioactive material use shall meet the applicable requirements of National Council on Radiation Protection and Measurements (NCRP) Report 30 (Old

National Bureau of Standards (NBS) Handbook 92, "Safe Handling of Radioactive Materials", 1964) or other pertinent design documents.

2.24.4 **Design Plan Review by NAVSEADET RASO**

Commands planning to build or modify facilities for RASP radiation source use shall submit design plans to NAVSEADET RASO at the 35 and 100 percent design completion (or equivalent) stages (i.e., prior to construction) for review and approval.

2.24.5 **Information Required for Design Plan Review**

1. The following information shall be submitted to NAVSEADET RASO with the design plans:
   a. All radiation sources (radioactive material and machine produced).
   b. Type and thickness of construction materials in the walls (including windows), floor, and ceiling.
   c. Dimensions of the room in which the source is to be used. Include floor size, height from finished floor to ceiling and roof, distances to finished floors above and below the source usage room, etc.
   d. Location of radiation source within the shielded facility (i.e., distance from walls, floor, ceiling, and targets).
   e. Presence of other nearby radiation sources which contribute to radiation levels outside the facility.
   f. Location and function of facility safety systems such as interlocks, warning lights and alarms, and access controls to radiation and high radiation areas.
   g. Detailed drawings of penetrations through walls, ceiling, floor, or doors of shielded rooms.
   h. Completed architectural drawings of the proposed facility (at 100 percent design stage).
   i. Plans or design requirements that show or describe the installation shielding materials. This should include joints between sheets and panels, joints at bends (i.e., corners), door jambs, lintels, thresholds (astragal), door latches and knobs, shield penetrations, and how the shielding material will be secured.
   j. Applicable shielding calculations and assumptions for

all shielded spaces in the facility (at 35 and 100 percent design stages).

k. Design criteria, specifications, and drawings for engineered systems for the control of airborne radioactivity.

2. Additional requirements indicated by NRMP condition or specific sections of this manual, as applicable.

2.24.6 **Applicable References**

The design of facilities using sealed radioactive sources and radiation-producing machines shall meet the applicable requirements of the following documents:

1. NAVSEA S0420-AA-RAD-010, Radiological Affairs Support Program Manual.
2. American National Standard Institute (ANSI) N43.03-2008, "General Radiation Safety - Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies Up to 10 MeV."
3. NCRP Report No. 38, "Protection Against Neutron Radiation" (1971).
4. NCRP Report No. 144, "Radiation Protection for Particle Accelerator Facilities" (2003).
5. NCRP Report No. 88, "Radiation Alarms and Access Control Systems" (1987).
6. ANSI/HPS N43.01-2001, "Radiation Safety for the Design and Operation of Particle Accelerators."
7. ANSI N43.05-2005, "Radiological Safety Standard for the Design of Radiographic and Radioscopic Non-Medical X-Ray Equipment Below 1 MeV."
8. DOE HDBK-116-2003, "Nuclear Air Cleaning Handbook."
9. ANSI N13.49-2001, "Performance and Documentation of Radiological Surveys."
10. NCRP Report No. 151, "Structural Shielding Design and Evaluation for Megavoltage X- and Gamma-Ray Radiotherapy Facilities" (2005).
11. NCRP Report No. 147, "Structural Shielding Design for Medical X-Ray Imaging Facilities" (2004).

2.25 Disposal of Radioactive Material and Radiation Producing Machines

2.25.1 Disposal of Radioactive Material

1. Radioactive material designated for disposal shall be stored in preparation for shipment in a manner that prevents loss, inadvertent exposure of unmonitored personnel, release of radioactive contamination to unrestricted areas or the environment, or unwarranted concern by members of the command and the public. Additional requirements pertaining the storage and control of radioactive waste are contained in Section 16.
2. The RSO shall maintain an inventory of all radioactive material to be disposed of per Section 2.13.3.
3. The RSO shall approve the disposal of all radioactive materials by the command.
4. The RSO shall notify and coordinate the disposal of all radioactive material with NAVSEADET RASO per Section 16 of this manual.
5. Under no circumstances shall radioactive material be removed from a device without specific written approval (i.e., Navy letter) from NAVSEADET RASO.
6. RADIAC instruments with attached radioactive sources shall be delivered to a RADIAC calibration laboratory for disposal, and reported to NAVSEASYSCOM (04ND) per NAVSEA SE700-AA-MAN-100/RADIAC.
7. Radioactive sources attached to RADIAC instruments that are received by the RADIAC calibration laboratory for disposal shall be reported to NAVSEASYSCOM (04ND) per NAVSEA SE700-AA-MAN-100/RADIAC.
8. NAVSEADET RASO shall coordinate the packaging, pickup, processing, and disposal of radioactive waste with the DoD Executive Agent for LLRW.
9. Documentation of disposal of radioactive material and radioactive source disposal shall be maintained per Section 2.26.20.

2.25.2 Disposal of Radiation Producing Machines

1. Machine sources of ionizing radiation designated for

disposal shall be rendered inoperable (i.e., incapable of generating x-rays) to prevent the inadvertent exposure of unmonitored personnel (see Section 3.5.5).

2. The RSO shall approve the disposal of all machine sources of ionizing radiation at the command.
3. Documentation of disposal of radiation producing machine disposal shall be maintained per Section 2.26.20.

2.26 Records

2.26.1 General Requirements

1. Records shall be organized such that requested records can be easily retrieved.
2. Environmental conditions in record storage areas shall prevent record deterioration for the entire retention period.
3. RASP activities shall maintain their RASP records as described below.
4. Records may be stored electronically as long as they are readily available for review and include the required information.
5. Record and log entries shall not be made in pencil or other easily altered medium.

2.26.2 Secondary Dosimetry Records

1. Calibration and response check records for secondary dosimeters shall be maintained for three years.
2. Commands shall use locally generated secondary dosimetry logs that contain the following information as a minimum:
   a. Command name.
   b. Date of dosimeter issue.
   c. Name of individual to whom issued.
   d. Dosimeter serial number.
   e. Initial secondary dosimeter reading.
   f. Final secondary dosimeter reading.
   g. Net secondary dosimeter reading (final minus initial).
   h. Initials or digital signature of the user verifying

that the information entered in the log is correct.

3. Secondary dosimeter logs shall be maintained for at least three years after the date of the final entry.

2.26.3 **Dose Investigation and Dose Estimate Records**

1. Dose investigations and dose estimates shall be documented and maintained per NAVMED P-5055.
2. All the supporting data for each dose investigation or dose estimate shall be maintained with the official document copy.
3. Paper or electronic copies of dose investigations and dose estimates shall be maintained indefinitely by the generating and affected command(s).

2.26.4 **Radiation Exposure Records**

1. Exposure records shall be documented and maintained per NAVMED P-5055.
2. In addition to the paper copies in an employee’s medical record, the command or a designated central repository shall maintain a copy of each employee’s external and internal radiation exposure results indefinitely in a secure location.
   a. A central DON archive may be used to meet this requirement.
   b. These records may be hard copies kept in a location where the paper will not deteriorate, electronic copies of the scanned paper originals, or entries in a validated and secure electronic database.
3. Annual exposure notification reports shall be in writing and contain, at a minimum, the year for which the report applies, the name of the command, the name of the individual monitored, and the individual’s exposure information. Paper or electronic copies of annual exposure notification reports shall be maintained indefinitely.
4. Exposure records (i.e., environmental or area monitoring using primary dosimetry) and other documents used to demonstrate compliance with public dose limits shall be documented as prescribed by NAVMED P-5055 and maintained indefinitely.

5. Paper or electronic copies of all ACLs that were raised shall be maintained indefinitely.
6. Paper or electronic copies of the BUMED Annual and Situational Reports of Personnel Exposure to Ionizing Radiation prescribed by NAVMED P-5055 shall be maintained indefinitely.

2.26.5 **Radiation Safety Training Records**

1. Radiation safety training shall be documented.
2. The RSO shall retain copies of the initial training records and retain them for three years after the trained individual leaves the command.
3. Records for sanctioned Navy initial training shall include the course completion certificates or signed memoranda from the training command indicating successful completion of the specific initial training.
4. Records for local initial training shall identify the training date(s), course subject matter (i.e., a brief description of the subjects covered), length of training, student test scores (if applicable), instructor name(s) and attendee name(s).
5. Periodic training records may be maintained in any format. As a minimum, the records shall identify the training date(s), course subject matter (i.e., a brief description of the subjects covered), length of training, student test scores (if applicable), instructor name(s) and attendee name(s).
6. Records of RASP management/leadership training shall consist of a copy of the certificate of completion of initial training and an attendance list that includes the list of topics covered as part of the annual program review.
7. Periodic radiation safety training records for all personnel associated with the RASP shall be maintained by the RSO or command training office for three years after the training date.
8. Radioactive material shipper training records shall be maintained by the RSO for three years after the trained individual leaves the command.

2.26.6 **RASP Audit and Surveillance Records**

1. Audits shall be documented to clearly articulate observed discrepancies, negative trends, and improvement items. The local organization responsible for addressing each finding will be identified. The local organization shall develop short and long-term corrective actions, and evaluate the effectiveness of the prior corrective actions.
2. Audit reports shall include the following information:
   a. The audit date(s).
   b. The name of the person(s) conducting the audit.
   c. The names of the persons contacted by the auditor(s).
   d. The areas audited (including a listing of records reviewed, number of records reviewed, and operations observed).
   e. All findings.
   f. The organization responsible to address each finding.
   g. A copy of the formal plan used to conduct the audit program.
3. A summary of the audit results shall be documented as a memorandum from the RSO to the Commander, CO, or OIC, who will endorse the summary.
4. The organization responsible for addressing a finding shall document by memoranda to the RSO the results of any causal analyses and all corrective actions planned or taken. Actions incomplete when the audit response is forwarded shall be tracked to completion. The organization shall forward documentation to the RSO when the tracked actions are complete.
5. Records of audits, audit responses, and records of action completion shall be maintained for a minimum of three years from the date of completion.
6. Surveillance records shall include the following information:
   a. The surveillance date(s).
   b. The title of the person(s) performing the surveillance.
   c. The title of the person(s) under surveillance.
   d. A description of the areas or processes observed.

e. A statement discussing the outcome of the surveillance including any findings and/or actions resulting from the surveillance with actual or proposed dates of completion.

7. Surveillance records shall be maintained for a minimum of three years.

2.26.7 **Annual Program Review Records**

1. APR records shall address all areas listed in Section 2.10, and include the following information:
   a. The APR date(s).
   b. The name of the person(s) conducting the review.
   c. The names of the persons contacted by the reviewers.
2. APR records shall be maintained for three years after the date the review is completed.
3. Corrective actions for discrepancies found during APRs shall be tracked to completion and the record of completion maintained for a minimum of three years from the date of completion.

2.26.8 **Records of RASP Deficiency Report Program**

1. Deficiencies shall be documented.
2. A running log of RDRs shall be maintained.
3. The RSO’s annual evaluation and trend analysis of deficiencies shall be issued as a memorandum to the Commander, CO, or OIC. Copies of the memorandum shall be provided to senior command managers and RASP personnel supervisors.
4. Electronic or paper copies of RDRs shall be maintained for three years.

2.26.9 **Radiation Survey Instrumentation Records**

1. Instrument calibration records shall be documented and maintained as prescribed by NAVSEA SE700-AA-MAN-100/RADIAC or equivalent.
2. Radiation detection instruments inventory, calibration, and response check records shall be maintained for three years.

2.26.10 **RASP Radioactive Material Receipt**

1. Material receipt records shall include the following information at a minimum:
   a. A copy of the source procurement documentation (i.e., a DD 250, DD 1149, etc.,) identifying the radioactive material.
   b. A copy of the bill of lading or manifest for the shipment.
   c. The time of receipt and the radiation survey corresponding to receipt of the radioactive material (sealed or unsealed).
2. Receipt records shall be maintained indefinitely.

2.26.11 **RASP Radioactive Material Transfer Records**

1. Material transfer records shall contain the following information at a minimum:
   a. A copy of documentation verifying that the receiving command or activity is licensed or authorized by an NRMP to receive the material.
   b. For sealed sources, a copy of the current leak test certificate, if applicable.
   c. A copy of the bill of lading or manifest for the shipment, if applicable.
   d. A copy of the material receipt acknowledgement of receipt from the receiving command or activity.
2. Transfer records shall be maintained indefinitely.

2.26.12 **RASP Radioactive Material Inventory Records**

1. Material inventory records shall contain the following information, as applicable, at a minimum:
   a. The manufacturer, model, and serial number of each sealed source and/or device, as applicable.
   b. A source identification number (if no serial number is available).
   c. The radionuclide identity.
   d. The radionuclide chemical and physical form.
   e. The quantity of source(s) on hand.
   f. The activity per source in curies (becquerels)

(depleted uranium, natural uranium, U-233, U-235, U-238 and plutonium quantity shall be specified in mass (i.e., kg)).

g. The activity determination date.

h. The source and/or device location.

i. The custodian’s name (i.e., person in possession of the source).

j. The physical inventory date(s) (i.e., hands on location date(s)).

k. The name of the person(s) conducting the inventory.

l. The date the RSO reviewed the inventory record and his/her signature.

2. Source inventory records shall account for all materials awaiting disposition (transfer or disposal).

3. Source inventory records shall be maintained indefinitely.

4. NRMP conditions and other sections of this manual may prescribe additional radioactive material inventory record information requirements for specific RASP uses.

2.26.13 **RASP Machine Inventory Records**

1. Machine inventory records shall contain the following information at a minimum:

   a. The physical inventory date(s) (i.e., hands on location date(s)).

   b. The name of the person(s) conducting the inventory.

   c. The manufacturer, make, model, and serial number of each machine.

   d. The location of each machine.

   e. The custodian’s name (i.e., person in possession of the machine).

   f. The date the RSO reviewed the inventory record and his or her signature.

2. Machine source of ionizing radiation inventory records shall be maintained for five years after the date of the record.

3. The RSO shall adjust the command's machine source registry listing required by Section 3.5.4 as necessary following each inventory.

2.26.14 **Operating and Emergency Procedure Records**

1. Activities shall follow current SECNAV, OPNAV, SYSCOM and Type Commander requirements for generating local instructions.
2. Electronic or paper copies of operating and emergency procedure records shall be maintained indefinitely.

2.26.15 **Utilization Logs for Radioactive Materials**

1. Utilization log records for RASP radioactive materials listed in Section 2.15.1.1 shall include the following information at a minimum:
   a. The source serial number.
   b. The name(s) of individual(s) using the source.
   c. The use date and time.
   d. The use location.
   e. The date the source is returned to storage (if the source is removed from the normal storage area).
   f. The quantity of activity used and its disposition (for unsealed sources).
   g. The date the RSO reviewed the utilization log and his/her signature.
2. Additional requirements for gamma radiography utilization log records are listed in Section 5.
3. Radioactive material utilization log records shall be maintained for three years after the date of the last entry unless a different retention period is required by another section of this manual.

2.26.16 **Utilization Logs for Machine Sources of Ionizing Radiation**

1. All machine source operations shall use a utilization log. Utilization log records for machine sources of ionizing radiation shall include the following information at a minimum:
   a. The machine manufacturer, make, model, and serial number(s).
   b. The use date and time.
   c. The use location.

d. The radiation exposure time length.
e. The maximum and operating voltage (kVp) and current (mA).
f. The target material if applicable.
g. The name and signature of the operator.
h. The date the RSO reviewed the utilization log and his or her signature.

2. Additional requirements for x-ray radiography and research accelerator utilization log records are listed in Sections 11 and 12, respectively.

3. Machine source utilization log records shall be maintained for three years after the date the record is generated unless a different retention period is required by another section of this manual.

2.26.17 **Leak Test Records**

1. Leak test records shall include the following information at a minimum:
   a. The identity of each source or device (e.g., source or device manufacturer, model number, serial number, isotope, and quantity).
   b. The identity of the command possessing the source.
   c. The leak test date and next scheduled leak test date.
   d. The leak test methods used (e.g., dry filter paper or wet cloth swipe and areas wiped).
   e. The leak-test results expressed in microcuries for each area wiped.
   f. A description of the equipment used to analyze the leak test (e.g., counting instrument manufacturer, model number, and serial number), if provided or available.
   g. The name of the organization performing the test.
   h. The name and dated signature of the certifying individual.

2. If the result is expressed as less than the minimum detectable activity (MDA), then the MDA shall be specified in addition to other required information.

3. Leak test records shall be maintained indefinitely.

2.26.18 **Contamination Survey Records**

1. Contamination survey records shall include the following information at a minimum:
   a. The survey date and time.
   b. The survey location.
   c. A diagram of area surveyed.
   d. The locations of contamination readings/wipes.
   e. The instrument efficiency for the radionuclide of concern.
   f. The gross and net count rates.
   g. The background count rate.
   h. All observed contamination levels (in terms of activity).
   i. A description of the instrument(s) used including model number and serial number.
   j. The last calibration date for each instrument used.
   k. The name of the individual(s) who performed the survey.
   l. The date the RSO reviewed the contamination survey and his/her signature.
2. Contamination survey results shall be maintained indefinitely.

2.26.19 **Radiation Survey Records**

1. Radiation survey records shall include the following information at a minimum:
   a. The survey date and time.
   b. The name of the person(s) conducting the survey.
   c. The nomenclature for the radiation source and installation (e.g., sealed or machine source model and serial numbers; and building name or number and room number).
   d. The identity of the radiation survey instruments used, including model and serial numbers, and dates of last calibration.
   e. The source intensity in roentgens per hour at one meter or source activity in curies for a beta-gamma source.
   f. The radiation source location at the time of the

survey.

g. The date the RSO reviewed the survey and his or her signature.

2. Shielded facility radiation survey records shall include the following information at a minimum:

   a. The information in Section 2.26.19.1 above.
   b. The location of nearby workstations and the current and expected occupancy of the workstations and adjacent areas to the radiation area.
   c. An indication of required warning sign(s) posting locations, and personnel occupancy restrictions.
   d. A list of devices having a bearing on radiation protection requirements and their operational status.
   e. A statement indicating the appropriate facility classification provided by NAVSEADET RASO.
   f. Pertinent exposure conditions including the type, amount, and location of scatter material (e.g., objects typically imaged in a radiography vault) intentionally introduced into the primary radiation beam, and the orientation of the useful beam in relation to each exposure measurement.
   g. A diagram of each unrestricted barrier showing the location of all radiation levels above background and the readings at each location.
   h. A statement of the restrictions, if any, that shall be placed on the weekly workload, occupancy, or time that the useful beam may be directed at any facility barrier.
   i. The action(s) required to ensure compliance, including resurveys, shall be included in the survey report when a facility is found not to comply with its designed requirements.

3. Shielded facility radiation survey records shall be maintained indefinitely.

4. Additional information may be required as specified in other sections of this manual.

2.26.20 **Disposal of Radioactive Material and Radiation Generating Machine Records**

1. All disposal action records, including the disposition of low-level radioactive waste, mixed waste, greater-

than-Class-C waste, and sealed sources shall describe the specific disposal method or procedure used (e.g., decay-in-storage).

2. For those cases when radioactive materials are disposed of by a licensed waste recipient (licensed collector, waste processor, or licensed disposal site), the records shall specify the name, address, and telephone number of the licensed waste recipient, and a copy of the licensed waste recipient's NRC or Agreement State license number (or equivalent documents that show the waste recipient can receive the waste).
3. The command shall retain all disposal records until the NRSC terminates the NRMP that authorized possession of the material.

2.27 Reports and Notifications

2.27.1 Reporting of Radiological Incidents

1. Each command shall, upon discovery of the event, immediately report to NAVSEADET RASO any event listed in Section 2.23.
2. Initial notification shall be made by telephone to NAVSEADET RASO ((757) 887-4692). If after normal work hours, the command shall contact the emergency number provided on NAVSEADET RASO's after-hours voice message.
3. Initial follow up written reports shall be made within 10 days with update reports to be determined by NAVSEADET RASO.
4. The written report shall include:
   a. A description of the operation, date, time, individual(s) involved, doses received, etc.
   b. A description of the circumstances under which the accident or incident occurred.
   c. Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas.
   d. A determination of the cause(s), immediate actions taken, long-term corrective actions planned to prevent recurrence, and the plan of actions and milestones (POAM).

e. An assessment of the radiological significance of the event.

f. Signature of the Commander, CO, or OIC.

2.27.2 **Reports of Theft or Loss of Licensed Material**

1. Immediately after its occurrence becomes known to the command, any lost, stolen, or missing licensed material shall be reported to NAVSEADET RASO.
2. Initial notification shall be made by telephone to NAVSEADET RASO ((757) 887-4692). If after normal work hours, the command shall contact the emergency number provided on NAVSEADET RASO's after-hours voice message.
3. Initial follow up written reports shall be made within 10 days with update reports to be determined by NAVSEADET RASO.
4. The written report shall include:
   a. A description of the licensed material involved, including kind, quantity, and chemical and physical form.
   b. A description of the circumstances under which the loss or theft occurred.
   c. A statement of disposition, or probable disposition, of the licensed material involved.
   d. Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas.
   e. Actions that have been taken, or will be taken, to recover the material.
   f. Procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of the licensed material.
   g. Signature of the Commander, CO, or OIC.

2.27.3 **Other Reports**

The RSO shall submit to NAVSEADET RASO no later than 31 January of each year an inventory of all RASP radioactive material possessed by the command on 31 December of the previous year.

2.27.4 Notification Information

1. OIC, Naval Sea Systems Command Detachment, Radiological Affairs Support Office, 160 Main Road, Yorktown, VA 23691, Telephone Number: DSN 953-4692 or Commercial: (757) 887-4692 PLA: NAVSEADET RASO YORKTOWN VA//00//.
2. If the OIC NAVSEADET RASO cannot be contacted, notify either:
   a. Chief of Naval Operations (N45), 2000 Navy Pentagon, Washington, DC 20350, Telephone Number: DSN 225-5272 or Commercial: (703) 695-5272, PLA: CNO WASHINGTON DC//N45//; or
   b. Commander (SEA 04N), Naval Sea Systems Command, 1333 Isaac Hull Ave SE, Washington, DC, 20376, Telephone Number: DSN 326-2414 Commercial: (202) 781-2414 PLA: COMNAVSEASYSCOM WASHINGTON DC//04N//.

2.28 Contractor Use of NRC Licensed Radioactive Material or Machine Sources of Ionizing Radiation While Performing DON Work

2.28.1 Introduction

DON has established strong radiation safety standards and oversight programs to protect its personnel and the public from operations involving ionizing radiation. Contractors performing DON work do not always maintain as vigorous radiation protection standards as does the Navy. It thus falls to the Navy to ensure that appropriate radiological control practices and processes are in place to ensure that government personnel, as well as members of the public, and the environment are protected from unnecessary ionizing radiation exposure.

2.28.2 General Requirements

1. Commands issuing contracts involving RASP type work must be authorized by NAVSEA 04N. Commands shall formally request this authorization via NAVSEADET RASO per Section 15.
2. Commands responsible for providing contractor oversight involving RASP type work must be authorized by NAVSEA 04N. Commands shall formally request this authorization via NAVSEADET RASO per Section 15.
3. Due to the numerous possible Government/contractor work

arrangements and the various legal, regulatory, and jurisdictional dimensions controlling these contractual relationships, the specific requirements for contractor oversight responsibilities for each command will be determined on a case-by-case basis.

4. Contractors performing work on federal property using radioactive material under a state license must submit NRC Form 241, Report of Proposed Activities in Non-Agreement States, Areas of Exclusive Federal Jurisdiction, or Offshore Waters at least three days before work is scheduled to begin. Failure to submit the form is a NRC violation and could result in a fine.

5. Contractors working under a command RASP as a radiation worker shall be required to comply with all aspects of the command RASP including meeting the medical examination requirements for radiation workers in NAVMED P-5055.

6. Contractors shall use primary dosimeters processed by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory.

SECTION 3 – **NAVAL RADIOACTIVE MATERIALS PERMITS AND IONIZING RADIATION PRODUCING MACHINE REGISTRATION AND AUTHORIZATION**

3.1 **Introduction**

3.1.1 **Purpose**

To establish requirements for receiving, amending, renewing and terminating Naval Radioactive Materials Permits (NRMPs) and Ionizing Radiation Producing Machine Authorizations (IRPMAs) and to establish requirements for registering radiation producing machines and equipment.

3.1.2 **Scope**

The requirements in this section apply to all Department of the Navy (DON) radioactive material regulated by the Nuclear Regulatory Commission (NRC) for which NRMPs are issued under the Navy Master Materials License (MML) in lieu of specific NRC licenses. This section also contains requirements for certain machines and equipment that produce ionizing radiation.

3.2 **Naval Radioactive Material Permitting**

3.2.1 **General Requirements**

1. All Navy and Marine Corps commands shall receive, possess, use, store, transfer, or dispose of NRC regulated radioactive material only as authorized by an NRMP.
2. Except as the Chief of Naval Operations (CNO) may direct, NRMPs are not required for the following:
   a. Radioactive material below the exempt concentrations specified in Schedule A of Title 10 Code of Federal Regulations (CFR) Part 30.70 and exempt quantities specified in Schedule B of 10 CFR 30.71.
   b. Devices containing exempt quantities of radioactivity manufactured and distributed per the requirements of 10 CFR 30.14 through 30.20.
   c. Unimportant quantities of source material as delineated in 10 CFR 40.13 provided all specific limitations and use requirements are met.
   d. Naturally occurring or accelerator produced

radioactive material in quantities below the quantities specified in 10 CFR 30.71, Schedule B.

3. Sealed sources and devices, including military systems constructed under a development contract, shall be registered with the NRC per 10 CFR 32.210 or by an Agreement State under equivalent regulations prior to issuance of an NRMP and receipt by a Navy or Marine Corps command, except as authorized by NRC policy directives.

4. Generally licensed items (identified in 10 CFR 31, 40.22, 40.25, and 70.19) shall be permitted at the discretion of the Naval Radiation Safety Committee (NRSC) in the same manner as specifically licensed items. See Sections 7, 10 and 14 for additional requirements for certain generally licensed material and devices that require an NRMP.

5. Each command receiving an NRMP shall comply with the conditions stated in the NRMP.

6. Additionally, the command shall conduct its RASP program in accordance with the statements, representations, and procedures contained in the documents submitted with an NRMP application and referenced in the NRMP.

   a. A command possessing an NRMP must maintain the information contained in the NRMP application up to date by submitting amendments as necessary.

   b. Changes to the original application and supplemental information cannot be implemented until approved by the NRSC with the following exceptions:

      (1) Directives from the NRSC (OPNAV N455).

      (2) Changes to correct obvious unsafe conditions.

         i. Notify Naval Sea Systems Command Detachment (NAVSEADET) Radiological Affairs Support Office (RASO) immediately upon discovery of changes required to correct unsafe conditions.

         ii. An amendment request shall be submitted within 15 days (30 days if overseas) of implementation of the change.

7. All NRMP requests and amendments shall be sent to NAVSEADET RASO by command endorsed correspondence.

8. All NRMP requests or amendments shall contain a cover letter signed by the Commander, Commanding Officer (CO), Officer in Charge (OIC) or those acting on their behalf.
9. Radioactive material received under the NRMP shall only be transferred to another command possessing an appropriate NRMP, or to an organization or person specifically licensed to possess the material.
10. Each command requesting an amendment to an existing NRMP shall continue to operate per the requirements of their existing NRMP until the command receives formal approval of the amendment from the NRSC. A command requesting the issuance of a new NRMP shall not commence operations until formal approval of the NRMP by the NRSC has been received by that command.

3.2.2 **Requirements for a New NRMP**

1. The command requesting a new NRMP shall prepare an application using the current NRC Form 313.
   a. The application shall be signed and dated by the Commander, CO, or OIC.
   b. The application and cover letter shall be submitted to NAVSEADET RASO.
2. The application shall address all requirements of the appropriate volume of NRC Nuclear Regulatory Guide (NUREG) 1556. The items listed below shall be addressed in a command-endorsed RASP instruction. Do not repeat these items in other parts of the application.
   a. Responsibilities by organization and position.
   b. Audit program (including audit checklists).
   c. Survey instrument types and calibration.
   d. Material receipt and accountability procedures.
   e. Control of radiation exposure to the public.
   f. Methods for monitoring personnel for occupational radiation exposure.
   g. Training required for authorized users.
   h. Operating and emergency procedures for each unique use of radioactive material (e.g., instrument calibration) and associated facilities (e.g., instrument calibration range).
   i. Facility diagrams for storage or use of material

showing restricted areas, adjacent occupied areas, and additional information required by other sections of this manual.

j. Types and frequencies of required surveys.

k. Leak test procedures and training required to perform the test.

l. Sample analysis procedures and training required to perform the analysis.

m. Equipment maintenance procedures.

n. Radioactive material transportation.

o. Radioactive waste management.

3. All references cited in the application shall be provided as part of the application unless NAVSEADET RASO concurs, in advance of application submission, that a reference does not need to be submitted.

4. The application shall include the command endorsed RSO and ARSO designation letters.

5. The application shall be submitted to arrive at NAVSEADET RASO at least 180 days prior to the desired approval date.

6. An application to use radioactive material in the form of a sealed source or in a device that contains the sealed source must identify the source or device by manufacturer and model number as registered with the NRC under 10 CFR 32.210.

7. NAVSEADET RASO may require additional information after the submission of the original application to ensure the application is complete before forwarding it to the NRSC for approval.

3.2.3 **Requirements to Amend an NRMP**

1. An NRMP shall be amended any time a change in information in the currently approved NRMP is necessary. Some examples include changes to personnel responsible for the NRMP (e.g., RSO/ARSO), changes to documents submitted or referenced in the NRMP condition(s), changes to supporting procedures or instructions, and changes or addition of the type and/or quantity of radionuclides used.

2. A command requesting an NRMP amendment shall prepare the

amendment using the current NRC Form 313.

a. The application shall be signed and dated by the Commander, CO, or OIC.
b. Submit the amendment request and cover letter to NAVSEADET RASO.

3. All references cited in the application shall be provided as part of the application unless NAVSEADET RASO concurs, in advance of application submission, that a reference does not need to be submitted.
4. The cover letter accompanying the amendment request shall provide a synopsis of the requested changes.
5. Certain changes, such as physical changes in a facility or the types of radioactive sources used, may require additional information to be submitted, such as copies of recent surveys, calculations of a new public dose, and/or new facility drawings.
6. All material submitted, even if not affected by the amendment request, will be reviewed by NAVSEADET RASO for technical correctness, completeness, and currency.

3.2.4 **Requirements to Renew an NRMP**

1. NRMPs are renewed at intervals established by the NRSC. An expiration date is provided on each NRMP.
2. An application to renew an NRMP shall be complete without reference to previously submitted information.
3. An NRMP renewal application must be forwarded to NAVSEADET RASO at least 30 days before the NRMP expiration date to ensure the application is received before its expiration. NAVSEADET RASO will notify the submitting command in writing when the renewal application is received, by Navy letter, stating the application has been “timely filed.”
4. The command requesting a renewal to an NRMP shall submit the request using the current NRC Form 313.

   a. The application shall be signed and dated by the Commander, CO, or OIC.
   b. The application and cover letter shall be submitted to NAVSEADET RASO.

5. The application shall address all requirements of the

appropriate volume of NRC NUREG 1556. The items listed below shall be addressed in a command-endorsed RASP instruction. Do not repeat these items in other parts of the application.

a. Responsibilities by organization and position.
b. Audit program (including audit checklists).
c. Survey instrument types and calibration.
d. Material receipt and accountability procedures.
e. Control of radiation exposure to the public.
f. Methods for monitoring personnel for occupational radiation exposure.
g. Training required for authorized users.
h. Operating and emergency procedures for each unique use of radioactive material (e.g., instrument calibration) and associated facilities (e.g., instrument calibration range).
i. Facility diagrams for storage or use of material showing restricted areas, adjacent occupied areas, and additional information required by other sections of this manual.
j. Types and frequencies of required surveys.
k. Leak test procedures and training required to perform the test.
l. Sample analysis procedures and training required to perform the analysis.
m. Equipment maintenance procedures.
n. Radioactive material transportation.
o. Radioactive waste management.

6. All references cited in the application shall be provided as part of the application unless NAVSEADET RASO concurs, in advance of application submission, that a reference does not need to be submitted.

7. The application shall include the command endorsed RSO and ARSO designation letters.

8. An application to use radioactive material in the form of a sealed source or in a device that contains the sealed source must identify the source or device by manufacturer and model number as registered with the NRC under 10 CFR 32.210.

9. NAVSEADET RASO may require additional information after

the submission of the renewal application to ensure the application is complete before forwarding it to the NRSC for approval.

10. An NRMP for which a renewal application is received after the NRMP expiration date is no longer valid. All operations involving radioactive material covered by the NRMP shall be secured in a "storage only" status until the renewal application is approved by the NRSC, or the NRMP is terminated.

3.2.5 Unauthorized Possession or Use of Radioactive Material

1. Commands shall ensure that they do not possess radioactive material, or use any radioactive material in ways not authorized by their NRMPs.
2. The following constitute unauthorized possession or use of radioactive material:
   a. Receipt or possession of radioactive material requiring an NRMP per the requirements of Section 3.2.1 without obtaining an NRMP.
   b. Possession of quantities of radioactive material exceeding the limits authorized in an NRMP.
   c. Receipt or use of licensed radioactive material in equipment, devices, or storage containers not approved for use by an NRMP.
   d. Use of licensed radioactive material by an individual who is not qualified under the conditions of an NRMP.
3. When a command discovers unauthorized possession or use of radioactive material, it shall:
   a. Immediately withdraw the radioactive material or excess quantities from use and place it in secure storage.
   b. Notify NAVSEADET RASO of the event within 24 hours of discovery.
   c. With NAVSEADET RASO's concurrence, the command shall transfer the radioactive material or excess quantities to an organization or command that has a valid NRC or Agreement State license or NRMP authorized to possess the material, apply for a new NRMP or submit an amendment request, as applicable.
   d. Investigate the unauthorized possession, review

procedures, and initiate necessary corrective action to prevent recurrence.

e. Submit an official report to NAVSEADET RASO within 30 days of the discovery. The report shall describe the event circumstances and the corrective actions taken to prevent recurrence.

f. Ensure any additional security controls are implemented, if applicable, based on the quantity of material possessed.

3.2.6 **Suspension of NRMP Operations**

1. The NRSC may suspend operations involving the use of permitted radioactive material when deemed necessary. The suspension may be conveyed to the command initially by telephone but will be followed by official correspondence that provides the reason for suspension.

2. When operations are suspended, the command shall:

   a. Secure all radioactive materials, placing them in a "storage only" status.

   b. Continue to control all restricted areas.

   c. Not handle radioactive material or equipment containing radioactive material unless specifically authorized by NAVSEADET RASO or the NRSC. This includes, but is not limited to, training, leak testing and shipping/receiving activities.

3. If the NRSC determines the command cannot perform the limited functions above safely, or complete immediate actions required to restore the site to a safe condition, the NRSC may direct a special technical assistance visit by NAVSEADET RASO as described in Section 4.8.

4. Upon notification that operations are suspended, the command shall:

   a. Perform a causal analysis.

   b. Determine short-term and long-term actions necessary to address the causes of the program failure and to restore operations based on the causal analysis.

   c. Develop a plan of action and milestones (POA&M).

   d. Forward the POA&M to NAVSEADET RASO for evaluation and concurrence within 30 days of the suspension notification.

5. The NRSC will lift the suspension when it determines that the command is capable of operating within the conditions of its NRMP. If the NRSC determines that the command is unable to operate safely within its NRMP conditions, the NRSC may revoke the NRMP (see Section 3.2.7).

3.2.7 **Revoking an NRMP**

1. The NRSC may revoke an NRMP at any time it determines that the command is unable to safely conduct operations within the conditions of the NRMP. The revocation takes effect immediately upon notification by the NRSC.
2. Once notified, the command will cease operations and make preparations to terminate the NRMP (See Section 1.2.8). The command shall take the following steps:
   a. Secure all radioactive materials and place them in a "storage only" status.
   b. Continue to control all restricted areas until notified that the NRMP is terminated.
   c. Only the Commander, CO, or OIC controls access to radioactive material.
   d. Radioactive material or equipment containing radioactive material is not handled unless specifically authorized by NAVSEADET RASO or the NRSC. This includes, but is not limited to, training, leak testing and shipping/receiving activities.
3. Upon notification that the NRMP is revoked, the command shall develop a plan to terminate the permit. The command will send the plan to NAVSEADET RASO for evaluation and concurrence within 30 days of notification.

3.2.8 **Requirements to Terminate an NRMP**

1. A command may terminate its NRMP when operations involving radioactive material are no longer necessary or when directed by the NRSC to terminate operations. Before requesting termination of an NRMP, a command shall take the following actions:
   a. Dispose of, or transfer all radioactive material held under the NRMP to be terminated.

b. Decommission its facilities (See Section 1.4).

c. Perform and document radioactive contamination surveys, if required, to verify no residual radioactive material remains (see Section 1.4).

2. A command requesting NRMP termination shall provide the following information to NAVSEADET RASO:

a. A completed NRC Form 314 and a cover letter requesting the termination. The Commander, CO, or OIC shall sign both items.

b. A brief history of the building and areas authorized to use and store the radioactive material. This should include:

(1) Previous uses of the facility and/or area.

(2) Other radioactive material previously used and its chemical and physical form.

(3) Incidents involving radioactive material and final disposition.

(4) Documentation confirming the radioactive material was transferred or disposed of properly.

(5) Current leak test results for all sealed sources on hand at the time of the termination request, and copies of all leak test results available for the life of the NRMP.

(6) Results of a quick scan survey in unsealed source storage and use areas (swipes may be required for areas using unsealed alpha sources).

(7) For facilities or areas requiring decommissioning, a copy of the final status survey (See Section 1.4).

3. An NRMP is not terminated until the command receives the approved NRMP amendment from the NRSC indicating termination.

4. The command shall maintain restricted area status for all areas where the radioactive material was stored or used until the NRMP termination amendment is received.

5. After receiving the NRMP termination, the command shall archive all records pertaining to the NRMP according to current SECNAV M-5210.1 series guidance (SSIC 5104).

3.3 Reporting of Equipment Defects and Noncompliance

3.3.1 General Requirements

1. Commands possessing and using radioactive materials authorized by an NRMP shall comply with the requirements of 10 CFR Part 21 with the exception that required reports shall be made per Section 3.3.3.
2. Each command with an NRMP shall establish procedures that:
   a. Require notification of command designated officials of equipment defects that could create a substantial safety hazard or equipment that fails to comply with any applicable NRC rule, regulation, orders, or license relating to substantial safety hazards.
   b. Evaluate equipment defects and noncompliance to determine if a substantial safety hazard exists per Section 3.3.2.
   c. Maintain records of all evaluations. Records shall conclude whether a substantial safety hazard exists or could be created.
   d. Take appropriate corrective actions as directed by the NRSC.
3. Equipment noncompliance does not include improper performance of maintenance or normal wear-and-tear.

3.3.2 Substantial Safety Hazard Determination

1. The RSO shall perform the evaluation to determine if a substantial safety hazard exists or could be created.
2. A substantial safety hazard exists if one of the following criteria is met:
   a. A person meets or exceeds any RASP Administrative Control Level (specified in Section 2, Table 2-1) due to the equipment defects or noncompliance.
   b. A release of radioactive material occurs inside or outside a restricted area that requires reporting per 10 CFR 20.2202(b)(2) due to the equipment defects or noncompliance.
   c. Major degradation of RASP related equipment occurs that could cause the exposures or releases described above.

3.3.3 Reporting Requirements

The command shall notify NAVSEADET RASO as soon as an equipment defect or noncompliance is discovered.

3.4 Decommissioning of Facilities and Areas

3.4.1 General Requirements

1. Each command shall maintain a historical file for each facility or outside area where radioactive material is stored or used containing the following information:
   a. A listing of all areas designated and formerly designated as restricted areas (per 10 CFR 20.1003) for the purpose of protecting individuals from the presence of radiation and radioactive materials. Temporary job sites (i.e., established for periods less than a week) are excluded from this requirement unless there was a release of radioactive material at the site.
   b. The record for each area shall identify the radionuclide and amount of radioactivity, the makes and model numbers of devices or sealed sources used in the area, and a summary statement on the leak test history for each source or device for which leak tests were required.
   c. A listing of all known locations of current and past burial areas within the command’s jurisdiction. The listing will include summary information on the types, forms, and quantities of radioactive material in each burial area.
   d. Historical records of licensed, accelerator produced, NRC exempt quantity radioactive material and radium.
   e. A listing of all locations requiring decontamination or that were decontaminated (including decommissioning documentation if the NRMP was not terminated).
   f. A listing of locations where radioactive commodities are or were stored in bulk. Commodities include items such as deck markers, compasses, dials, gauges, electron tubes, smoke detectors, gun sights and fire control devices, chemical agent monitors (CAMs), chemical agent detectors (CADs), automatic chemical agent detector alarms (ACADAs), and exit signs.

g. Records of information important to the safe and effective decontamination of the facility including:

(1) Records of spills or other unusual occurrences resulting in the spread of radioactivity in and around the facility.

i. These records should identify areas where there is a reasonable likelihood that contaminants may have spread to inaccessible areas including seepage into porous materials such as concrete.

ii. These records must include any known information on radionuclides involved including quantities, physical forms, and concentrations.

(2) As built drawings and drawings of modifications of the facility including locations of potentially inaccessible contamination, such as buried pipes that may be contaminated.

(3) If drawings are not available, the command shall provide records of available information describing such facilities.

2. Each command is responsible for all funding associated with its decommissioning operations.

3. Each facility or area no longer used for licensed radioactive material storage or operations shall be decontaminated to the criteria set in 10 CFR 20 before being released for other than radiological operations or unrestricted use.

4. The command shall provide a decommissioning plan to the NRSC, via NAVSEADET RASO, for approval before beginning decommissioning operations.

3.4.2 **Timing of Decommissioning**

1. The facility or area decommissioning process commences when any of the following occurs:

a. Thirty (30) days pass after the NRMP expires or is revoked.

b. The command decides to permanently cease operations involving the use of permitted radioactive material at the entire site or in any separate building or outdoor area that contains residual radioactivity,

such that the building or area is unsuitable for release in accordance with Navy, Marine Corps or NRC requirements.

c. Twenty-four (24) months after principal activities involving permitted radioactive material are conducted.

d. No NRMP activities are performed in a separate building or outdoor area for a period of 24 months, and residual radioactivity is present that would preclude the building or area's release in accordance with Navy, Marine Corps or NRC requirements.

e. The command shall notify the NRSC, via NAVSEADET RASO, within 60 days of any of the conditions listed above.

2. The command shall submit its decommissioning plan to the NRSC, via NAVSEADET RASO, within 12 months of making notification that permitted operations have ceased.

3. Decommissioning must be completed within 24 months of decommissioning plan approval by the NRSC.

4. The NRC may authorize extensions of the timeline for submitting a decommissioning plan and/or completing the decommissioning process provided the NRC determines that the relief is not detrimental to public health and safety and is otherwise in the public interest. The NRSC can petition the NRC for such alternate decommissioning schedules when necessary.

5. The command shall submit its alternate decommissioning schedule request to the NRSC, via NAVSEADET RASO, at least 60 days before the decommissioning plan is due or decommissioning is to be complete.

6. The command shall continue the decommissioning process prescribed by the original plan until the NRC approves the alternate schedule.

3.4.3 **The Decommissioning Process**

1. The decommissioning process consists of a series of integrated activities that begin when a command notifies the NRSC of its intention to cease NRMP operations and end with NRMP or partial NRMP termination. Although steps may vary depending on local factors, the basic decommissioning process for all NRMP holders is similar.

2. A command undergoing facility or site decommissioning shall:
   a. Stop licensed radioactive material operations in the facilities or areas where radioactive material is/was used or stored and intended for decommissioning.
   b. Notify the NRSC, via NAVSEADET RASO, that operations have stopped within 60 days of their cessation.
   c. Arrange to have all radioactive material removed from the areas or facilities to be terminated.
   d. Prepare a Historical Radiological Assessment (HRA) to determine the location and level of radioactive contamination remaining in the facility or area. This may require the use of a contractor. Contact NAVSEADET RASO for assistance.
   e. If required, develop a decommissioning plan to remove residual radioactive contamination to levels prescribed by 10 CFR 20.1402 or 20.1403. This may require the use of a contractor. The command should contact NAVSEADET RASO for assistance in developing the plan. The plan must address the following:
      (1) Current radioactive contamination levels at the site.
      (2) The criteria for the final condition of the site.
      (3) A process to remediate existing radioactive contamination not currently authorized by the NRMP (if applicable).
      (4) Procedures to protect workers performing decontamination.
      (5) Decommissioning cost estimates.
      (6) The final survey method to demonstrate compliance with NRC release criteria.
      (7) A schedule for remediation activities and NRMP termination.
   f. Provide environmental radioactivity information to demonstrate compliance with Environmental Protection Agency (EPA) regulations.
   g. Receive NRSC approval, through an NRMP amendment, to begin decommissioning activities.
   h. Decontaminate appropriate locations as required.
   i. Conduct a Final Status Survey to demonstrate

compliance with Navy and NRC dose limits required for NRMP termination.

j. Request that the NRSC terminate or amend the NRMP, as applicable.

3.4.4 Required Records

1. A command that decommissions facilities or areas, but continues to use licensed radioactive material in other facilities or areas, shall retain its decommissioning documentation until its NRMP is terminated.
2. The command shall follow the requirements for maintaining records important to decommissioning (including the type of information required) stated in 10 CFR 30.35(g).
3. Each command that terminates its NRMP shall archive all records pertaining to the NRMP in accordance with SECNAV Manual M-5210.1, SSIC 5104.

3.5 Ionizing Radiation Producing Machine Authorization (IRPMA) and Registration

3.5.1 General Requirements

1. Each command possessing machines and equipment listed below that produce ionizing radiation shall register the machine(s) or equipment with NAVSEADET RASO before placing them in routine operation as outlined in Section 3.5.2.

   a. Industrial x-ray machines(continuous, pulsed, and flash), accelerators, cargo and personnel scanning, vehicle inspection equipment, computed tomography (CT) and multiple bag capable baggage scanners, X-ray diffraction units, X-ray fluorescence analyzers, cabinet X-rays and neutron generators.

   b. Machines or equipment that produce ionizing radiation incidental to their operation for other purposes are exempt from the registration requirements of this section under specific conditions. In order for the equipment to be exempt, the dose equivalent rate averaged over an area of 10 square centimeters shall not exceed 0.5 millirem per hr (0.005 millisieverts per hr) at two inches (five centimeters) from any accessible surface of the machine or piece of

equipment. Electron beam welders, filter debris analyzers, scanning and transmission electron microscopes, magnetron tubes in shipboard and shore based radar, klystron tubes, computer monitors, and televisions qualify for this exemption.

2. All Navy and Marine Corps commands shall receive, possess, use, store, transfer, or dispose of machine sources listed in Section 3.5.1.3 below which produce ionizing radiation only as authorized by an IRPMA.

3. Applicable machines and equipment requiring an IRPMA include:

   a. Industrial x-ray machines and equipment (continuous, pulsed, and flash) with a machine rating equal to or greater than 100 kilovolt peak (kVp).

   b. Accelerators used for industrial x-ray or research operations.

4. The command may submit multiple machine systems or equipment under a single cover letter. One IRPMA will be issued per command.

5. Each command receiving an IRPMA shall comply with the conditions stated in the IRPMA.

6. Additionally, the command shall conduct its RASP program in accordance with the statements, representations, and procedures contained in the documents submitted with an IRPMA application and referenced in the IRPMA.

   a. A command possessing an IRPMA must maintain the information contained in the IRPMA application up to date by submitting amendments as necessary.

   b. Changes to the original application and supplemental information cannot be implemented until approved by NAVSEA with the following exceptions:

      (1) Directives from NAVSEA (04N).

      (2) Changes to correct obvious unsafe conditions.

         i. Notify Naval Sea Systems Command Detachment (NAVSEADET) Radiological Affairs Support Office (RASO) immediately upon discovery of changes required to correct unsafe conditions.

         ii. An amendment request shall be submitted within 15 days (30 days if overseas) of

implementation of the change.

7. All IRPMA requests and amendments shall be forwarded to NAVSEADET RASO with a cover letter signed by the Commander, Commanding Officer (CO), Officer in Charge (OIC), or those acting on their behalf.
8. A command requesting the issuance of a new IRPMA shall not commence operations until formal approval of the IRPMA by NAVSEA has been received by that command.
9. Each command requesting an amendment to an existing IRPMA shall continue to operate per the requirements of their existing IRPMA until the command receives formal approval of the amendment from NAVSEA.
10. For a command with an existing IRPMA, an amendment is not required when adding or changing equipment with the identical manufacturer name, make and model used in the same location and for the same purpose.

3.5.2 Requirements for a Registration of Ionizing Radiation Producing Machines and Equipment

1. The command shall register each machine or piece of equipment through official correspondence to NAVSEADET RASO, using the registration form provided in Section 3.6 and a cover letter signed by the Commander, CO, OIC or those acting on their behalf.
2. A command may register multiple machine systems or equipment under a single cover letter.
3. NAVSEADET RASO will review the registration form of Section 3.6 to verify that the RSO/ARSO(s) have the appropriate qualifications to oversee operation of the equipment and that the facility has been approved for operation of the machine or piece of equipment at the planned operating parameters (if applicable).
4. NAVSEA 04N provides a registration certificate to the requesting command stating any operating conditions or restrictions required.
5. The command shall retain its current registration certificate and cover letter for five years after the certification expiration date.

3.5.3 **Requirements for a New IRPMA**

1. The command requesting a new IRPMA shall prepare an application using the form provided in Section 3.6.
   a. The application shall be signed and dated by the Commander, CO, or OIC.
   b. The application and cover letter shall be submitted to NAVSEADET RASO.
2. The IRPMA application shall include the items listed below in a command-endorsed RASP instruction.
   a. Responsibilities by organization and position.
   b. Internal inspection and control audit program (including audit checklists).
   c. Security of ionizing radiation producing machines.
   d. Control of radiation exposure to the public.
   e. Methods for monitoring personnel for occupational radiation exposure.
   f. Training and qualification requirements for X-ray radiographers and assistants, authorized users, and barrier monitors (as applicable).
   g. Operating and emergency procedures for each machine shall be included in a separate enclosure. The procedures should be specific to each facility where the machine will be used (only one open facility procedure is required for each machine).
   h. Equipment maintenance procedures for each type of machine or equipment being used.
   i. X-ray radiographic records management, if applicable.
   j. Emergency reporting requirements.
3. All references cited in the application shall be provided as part of the application unless NAVSEADET RASO concurs, in advance of application submission, that a reference does not need to be submitted.
4. The application shall include the command endorsed RSO and ARSO designation letters and a summary of their training experience.
5. The application shall be submitted to arrive at NAVSEADET RASO at least 180 days prior to the desired approval date.
6. NAVSEADET RASO may require additional information after

the submission of the original application to ensure the application is complete before final approval.

7. IRPMA authorizations will incorporate all requirements related to receipt, possession, use, and transfer, for machine operations including any requested exemptions.
8. The command shall retain a copy of the IRPMA documents for five years after the authorization's expiration date.

3.5.4 Requirements to Change a Registration

1. The command shall keep its registration(s) current for any machines or equipment listed in Section 3.5.1.1.a and at a minimum, resubmit the registration form and cover letter every five years even if no changes occur.
2. The command shall submit a new registration form and cover letter when changes occur to the information listed in the current registration certificate.
3. The registration change request will be processed in the same manner as new requests per Section 3.5.2.

3.5.5 Requirements to Amend an IRPMA

1. An IRPMA shall be amended any time a change in information in the currently approved IRPMA is necessary. Some examples include changes to RSO/ARSO, changes to supporting procedures or instructions, changes or addition of the type and/or models used, changes in vault classification, or use of equipment, etc.
2. The command requesting an IRPMA amendment shall prepare the amendment using the IRPMA application form in Section 3.6.
   a. The application shall be signed and dated by the Commander, CO, or OIC.
   b. Submit the amendment request and cover letter to NAVSEADET RASO.
3. All references cited in the application shall be provided as part of the application unless NAVSEADET RASO concurs, in advance of application submission, that a reference does not need to be submitted.
4. The cover letter requesting the amendment shall provide

a synopsis of the requested changes.

5. Certain changes, such as physical changes in a facility, changes in the use of a machine or the types of machine to be used, may require additional information to be submitted, such as copies of recent surveys, calculations of a new public dose, and/or new facility drawings.
6. All material submitted, even if not affected by the amendment request, will be reviewed by NAVSEADET RASO for technical correctness, completeness, and currency.

3.5.6 **Requirements to Renew an IRPMA**

1. IRPMAs are renewed at intervals established by NAVSEA. An expiration date is provided on each machine authorization form.
2. An application to renew a machine authorization shall be complete without reference to previously submitted information.
3. An IRPMA renewal application must be forwarded to NAVSEADET RASO at least 30 days before the IRPMA expiration date to ensure the application is received before its expiration. NAVSEADET RASO will notify the submitting command in writing when the renewal application is received, by Navy letter, stating that the renewal application has been "timely filed."
4. The command requesting a renewal to an IRPMA shall submit the request using the IRPMA application form provided in Section 3.6.
   a. The application shall be signed and dated by the Commander, CO, or OIC.
   b. The application and cover letter shall be submitted to NAVSEADET RASO.
5. The application shall include the same items listed in Section 3.5.5.2 in a command-endorsed RASP instruction.
6. All references cited in the application shall be provided as part of the application unless NAVSEADET RASO concurs, in advance of application submission, that a reference does not need to be submitted.
7. The application shall include the command endorsed RSO and ARSO designation letters.

8. NAVSEADET RASO may require additional information after the submission of the renewal application to ensure the application is complete before final approval.
9. An IRPMA for which a renewal application is received after the IRPMA expiration date is no longer valid. All operations involving machine operations covered by the IRPMA shall be secured until the renewal application is reviewed and approved by NAVSEADET RASO, or the machine authorization is terminated.

3.5.7 Unauthorized Use of Ionizing Radiation Producing Machines and Equipment

1. Commands shall ensure they do not use ionizing radiation producing machines in ways not authorized by their IRPMA or machine registration. The following are examples of unauthorized use of ionizing radiation producing machines:
   a. The use of ionizing radiation producing machines listed in Section 3.5.1.3 without obtaining an IRPMA.
   b. The use of an ionizing radiation producing machine in excess of the maximum allowed kVp or milliamp (mA) or in a facility or on a barrier not authorized by the machine authorization.
   c. The use of an ionizing radiation producing machine by an individual who is not trained and qualified to operate the machine.
2. When a command discovers unauthorized use of an ionizing radiation producing machine, it shall:
   a. Immediately secure the ionizing radiation producing machine from use and place it in secure storage.
   b. Notify NAVSEADET RASO of the event within 24 hours of discovery.
   c. Investigate the unauthorized usage, review procedures, and initiate necessary corrective action to prevent recurrence.
   d. Submit an official report to NAVSEADET RASO within 30 days of discovery. The report shall describe the event circumstances and corrective actions taken to prevent recurrence.

3.5.8 Suspension of Ionizing Radiation Producing Machine Operations

1. NAVSEA, in consultation with stakeholders, may suspend operations involving the use of ionizing radiation producing machines when deemed necessary. The suspension may be conveyed to the command initially by telephone but will be followed by official correspondence that provides the reason for suspension.
2. When operations are suspended, the command shall:
   a. Secure all ionizing radiation producing machines and have the Commander, CO, or OIC take possession of the key(s) of the machine control panel(s). Alternatively, shut off power to the machine(s), lock the power supply so the machine(s) cannot be reenergized, and have the Commander, CO, or OIC take possession of the keys to the locks. Portable equipment shall be locked in secure storage with access controlled by the Commander, CO, or OIC. A Commander, CO or OIC for an echelon II command that conducts RASP operations may designate, in writing, a senior management representative (O6/GS-15 or higher) to take possession of the keys.
   b. Not operate any ionizing radiation producing machines unless specifically authorized by NAVSEA. This includes, but is not limited to, training, maintenance, radiation protection inspection, and facility surveys.
3. If NAVSEA determines the command cannot perform the limited functions above safely, or complete immediate actions required to restore the machine to a safe condition, NAVSEA may direct a special technical assistance visit by NAVSEADET RASO as described in Section 4.8.
4. Upon notification that operations are suspended, the command shall develop a POA&M providing the actions it will take to eliminate the cause of the suspension and ensure the cause for suspension will not reoccur. The command will send the plan to NAVSEADET RASO for evaluation and concurrence within 30 days of suspension notification.
5. NAVSEA will lift the suspension when it determines that the command is capable of operating within the

parameters of its machine authorization or registration. If NAVSEA determines that the command is unable to operate safely within the machine authorization or registration parameters, it may revoke the machine authorization or registration.

3.5.9 **Revoking an IRPMA or Machine Registration**

1. NAVSEA may revoke an IRPMA or machine registration at any time it determines that the command is unable to safely conduct operations within the conditions of the machine authorization or registration. The revocation takes effect immediately upon notification by NAVSEA.
2. Once notified, the command will cease operations and make preparations to terminate the machine or equipment operations. The command shall take the following steps:
   a. Secure all ionizing radiation producing machines and have the Commander, CO, or OIC take possession of the key(s) of the machine control panel(s). Alternatively, shut off power to the machine(s), lock the power supply so the machine(s) cannot be reenergized, and have the Commander, CO, or OIC take possession of the keys to the locks. Portable equipment shall be locked in secure storage with access controlled by the Commander, CO, or OIC. A Commander, CO or OIC for an echelon II command that conducts RASP operations may designate, in writing, a senior management representative (O6/GS-15 or higher) to take possession of the keys.
   b. Restrict access to the ionizing radiation producing machines, so that only the Commander, CO, or OIC controls direct access to the equipment.
   c. Do not operate any ionizing radiation producing machines unless specifically authorized by NAVSEA. This includes, but is not limited to training, maintenance, and radiation protection inspection and facility surveys.
3. Upon notification that the machine authorization or registration is revoked, the command shall develop a plan to terminate the IRPMA or deregister the machine, as applicable. The command will send the plan to NAVSEADET RASO for evaluation and concurrence within 30 days of notification.

3.5.10 Requirements to Deregister Ionizing Radiation Producing Machines and Equipment

1. A command shall request the termination of an active machine or equipment registration by utilizing the same process as for a new registration request.
2. The command shall submit a revised registration form and cover letter requesting termination for the specific machine or piece of equipment after disposal by one of the methods listed in Section 3.5.11.1.a through c.
3. A command that transfers or disables all of its machines or equipment need not include a registration form with its termination request. However, the command-endorsed letter should specifically indicate that all machines and equipment have been removed from use.
4. Program records shall be archived per SECNAV Manual M-5210.1, SSIC 5104.

3.5.11 Requirements to Terminate an IRPMA

1. A command may terminate its IRPMA when operations involving machine produced ionizing radiation are no longer necessary or when directed by NAVSEA to terminate operations. Before requesting termination of an IRPMA, a command shall dispose of the machine(s) by one of the following methods:
   a. Returning the machine or equipment to the manufacturer or the program manager.
   b. Transfer or the machine or equipment to another Navy or Marine Corps command authorized to possess the equipment.
   c. Turning the machine or piece of equipment into the local Defense Reutilization and Marketing Office (DRMO).
      (1) For machines and equipment turned in to DRMO, the following actions shall be taken:
         i. Cut the connectors off of the power cable.
         ii. Remove or paint over any radiation symbols.
         iii. Dispose of the control panel keys in the trash.

iv. Provide a statement that no radioactive or hazardous material is present.

2. The command requesting IRPMA termination shall submit a completed IRPMA application form provided in Section 3.6 and a cover letter requesting termination for each specific machine(s) or piece of equipment. The Commander, CO, or OIC shall sign both the cover letter and authorization application form.

3. A command that transfers or disables all of its machines or equipment need not include an IRPMA application form for the machine(s) with its termination request. However, the command-endorsed letter should specifically indicate that all machines and equipment have been removed from use.

4. Program records shall be archived per SECNAV Manual M-5210.1, SSIC 5104.

3.6 **Ionizing Radiation Producing Machine Authorization (IRPMA) and Registration Form**

1. Navy Command And Unit Identification Code (UIC) Or Marine Corps Command And Reporting Unit Code (RUC):		
2.a Name of RSO:	3.a Phone Number:	4.a E-mail Address:
2.b Name of ARSO:	3.b Phone Number:	4.b E-mail Address:
2.c Name of ARSO:	3.c Phone Number:	4.c E-mail Address:

5.a Component Description:	6.a Maximum Operating Parameters:	7.a Serial No.(s):	8.a Use Location:	9.a Facility Classification:	10.a Status: ☐ New ☐ Amendment ☐ Renewal ☐ Termination	11.a Type: ☐ Registration ☐ Authorization
5.b Component Description:	6.b Maximum Operating Parameters:	7.b Serial No.(s):	8.b Use Location:	9.b Facility Classification:	10.b Status: ☐ New ☐ Amendment ☐ Renewal ☐ Termination	11.b Type: ☐ Registration ☐ Authorization

5.c Component Description:	6.c Maximum Operating Parameters:	7.c Serial No.(s):	8.c Use Location:	9.c Facility Classification:	10.c Status: ☐ New ☐ Amendment ☐ Renewal ☐ Termination	11.c Type: ☐ Registration ☐ Authorization
5.d Component Description:	6.d Maximum Operating Parameters:	7.d Serial No.(s):	8.d Use Location:	9.d Facility Classification:	10.d Status: ☐ New ☐ Amendment ☐ Renewal ☐ Termination	11.d Type: ☐ Registration ☐ Authorization
5.e Component Description:	6.e Maximum Operating Parameters:	7.e Serial No.(s):	8.e Use Location:	9.e Facility Classification:	10.e Status: ☐ New ☐ Amendment ☐ Renewal ☐ Termination	11.e Type: ☐ Registration ☐ Authorization
5.f Component Description:	6.f Maximum Operating Parameters:	7.f Serial No.(s):	8.f Use Location:	9.f Facility Classification:	10.f Status: ☐ New	11.f Type: ☐ Registration

					☐ Amendment ☐ Renewal ☐ Termination	☐ Authorization
12. Are Open Facility Operations Conducted?		13. Estimated Annual Open Facility Operations (hours of machine operation):				
14. Telefax number for correspondence:						
15 Radiation Safety Officer Signature:				16. Date:		
17. Commanding Officer/Commander/OIC Signature:				18. Date:		

NOTE: This form shall be submitted to NAVSEADET RASO, with a cover letter, by official correspondence to Officer in Charge, NAVSEADET RASO, 160 Main Road, Yorktown, VA 23691-0260.

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3.7 Ionizing Radiation Producing Machine Authorization (IRPMA) and Registration Form Instructions

This form shall be completed by all commands that utilize ionizing radiation producing machines or equipment including industrial X-ray machines (continuous, pulsed, and flash), accelerators, cargo scanning and vehicle inspection equipment, non-medical computed tomography (CT) and multiple bag capable baggage scanners, X-ray diffraction units, X-ray fluorescence analyzers, cabinet X-rays, and neutron generators.

This form is to be submitted to NAVSEADET RASO by official correspondence to Officer in Charge, NAVSEADET RASO, 160 Main Road, Yorktown, VA 23691-0260.

This form shall be resubmitted each time there is a change, addition or deletion in ionizing radiation producing machine(s) or equipment, primary use location, change or addition to facility operations (e.g.: addition of open facility operations in addition to shielded facility operations), or machine operating parameters. This form shall also be used for the IRPMA or Registration termination requests.

Block 1. Navy command and unit identification code (UIC) or Marine Corps command and reporting unit code (RUC): Complete command address and UIC or RUC.

Block 2.a Name of RSO: Name of assigned Radiation Safety Officer (RSO).

Block 3.a Phone number: Phone number of RSO.

Block 4.a E-mail address: E-mail address of RSO.

Block 2.b, 3.b, 4.b and 2.c, 3.c, 4.c: Names of assigned Assistant Radiation Safety Officers and corresponding contact information. “N/A” if this is not applicable.

Block 5.a Component Description: Provide the type of machine and a description of how the equipment is utilized, including manufacturer’s name, make, and model number (e.g., industrial x-ray radiography, LORAD LPX-160).

Block 6.a Maximum Operating Parameters: Provide maximum operating voltage and maximum operating current for the component.

Block 7.a Serial Number: Provide the component serial number. For systems with multiple serialized components, provide the generator number.

Block 8.a Use Location: Provide the building and room number in which the component is typically used or stored. For industrial X-ray machines, this would typically be the location of an X-ray exposure facility. For analytical machines, this will typically be the location of the equipment. Open facility locations are not required to be listed in this block.

Block 9.a Facility Classification: Provide the current classification of the space that the equipment is used in, either exempt shielded, shielded, and/or open facility. Note that this only applies to industrial X-ray radiography. Mark N/A if not applicable.

Block 10.a Status: Check if this will be a new, amendment, renewal, or termination request for the component.

Block 11.a Type: Check if this request is for a registration and/or a machine authorization. See Section 3.5.1.3 to determine if a machine authorization is required.

Blocks 5.b, 6.b, 7.b, 8.b, 9.b, 10.b, 11b and following: Same as for 5.a, 6.a, 7.a, 8.a, 9.a, 10.a, 11a but for each additional ionizing radiation producing machine or piece of equipment. Mark "N/A" if not applicable. If more space is required, continue on attached continuation sheet.

Block 12. Are open facility operations conducted? If industrial X-ray operations are conducted outside of a shielded or exempt shielded facility, answer "yes." If not, answer "no."

Block 13. Estimated Annual Open Facility Operations: If answer to Block 11 above is "yes," provide a rough estimate in hours of X-ray tube head time that corresponds to open facility operations conducted in the past year.

Block 14. Telefax number for correspondence: Provide the telefax number that is appropriate for all correspondence including inspection announcements, equipment notifications, etc.) If for a ship, mark "N/A."

Block 15. Radiation Safety Officer Signature: Signature of the command Radiation Safety Officer.

Block 16. Date: Date of signature of the command Radiation Safety Officer.

Block 17. Commanding Officer/Commander/OIC Signature: Signature of the Commanding Officer/Commander/OIC.

Block 18. Date: Date of signature of the Commanding Officer/Commander/OIC.

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SECTION 4 - **INSPECTIONS**

4.1 **Introduction**

4.1.1 **Purpose**

To establish a process and requirements for performing Radiological Affairs Support Program (RASP) inspections to ensure that requirements of applicable federal regulations, Navy and Marine Corps directives, the provisions of this manual, and applicable Naval Radioactive Materials Permit (NRMP) conditions are followed by Navy and Marine Corps commands using permitted radioactive material and other ionizing radiation sources.

4.1.2 **Scope**

The requirements in this section apply to all Navy and Marine Corps commands possessing, using, operating, or storing RASP radiation sources.

4.2 **Notice of RASP Inspections**

1. RASP inspections, including routine and reactive inspections, are unannounced unless security requirements dictate announcing.
2. Outside continental United States (OCONUS) commands and deployed/deploying ships may be notified of an inspection further in advance due to the difficulty in assuring access and availability.
3. When inspections are announced, they are made by Navy letter or by naval message. The Radiation Safety Officer (RSO) and Assistant Radiation Safety Officer (ARSO) will also be notified by fax or email.

4.3 **Inspection Frequencies**

1. Inspection frequencies are established based on Nuclear Regulatory Commission (NRC) requirements, the type of RASP operation, and the command’s inspection history.
2. Table 4-1 lists routine inspection frequencies for RASP operations. These inspection frequencies may change with changing requirements.
3. Commands with new NRMPs or machine programs are inspected within six months of receipt of permitted

material or use of machine source.

4.4 **Command Responsibilities**

1. The command being inspected is responsible to assist the Naval Sea Systems Command Detachment (NAVSEADET) Radiological Affairs Support Office (RASO) inspector as necessary during the inspection process.
2. These responsibilities include:
   a. Providing written acknowledgement (fax or email) to NAVSEADET RASO upon receipt of an inspection announcement that includes the following information:
      (1) Name and telephone number of a designated command representative.
      (2) Date, time, and location for a pre-inspection briefing (in-brief) with the Commander, Commanding Officer (CO), Officer in Charge (OIC) or his or her designated representative.
   b. Providing a current inventory of all command RASP radiation sources to the inspector at the pre-inspection briefing.
   c. Ensuring the inspector has access to all areas where RASP radiation sources are stored or used.
   d. Having all records, logs and other documents that demonstrate compliance with RASP requirements readily available for review.
   e. Making the necessary arrangements to demonstrate RASP operations requested by the inspector.
      (1) Commands shall be prepared to perform routine operations authorized by the command’s RASP.
      (2) Commands conducting gamma and x-ray radiography that are authorized to perform temporary jobsite or open facility radiography operations shall arrange to demonstrate field operations during the inspection.
      (3) Gamma radiography commands shall designate a command point of contact to communicate scheduled radiographic operations at temporary jobsites to NAVSEADET RASO. Schedules of temporary jobsite radiographic operations shall be submitted quarterly and as updates are known.

4.5 **Inspection Protocol**

1. The command's overall conduct of RASP operations will be rated as satisfactory or unsatisfactory.
   a. Satisfactory ratings will be assigned to commands where no significant RASP violations are found.
   b. Unsatisfactory ratings will be assigned to commands when there is an actual or potential risk of the loss of safety or security of RASP radiation sources due to substandard operations. An unsatisfactory rating may also be assigned if the inspection determines that a lapse in program oversight exists due to an aggregate number of lesser violations.
   c. A rating of incomplete may be assigned to a command if conditions warrant or the inspection is ongoing with approval from NAVSEA 04N or OPNAV N455.
2. Distinct inspection violations will be assigned severity levels of I through V, with I being the most severe. Severity levels are further discussed in Section 4.6.
3. The Deputy Chief of Naval Operations for Fleet Readiness Logistics (OPNAV N4) and the Director of the Radiological Controls Program Office (NAVSEA 04N) shall be advised of all Severity Level I, II, or III violations.
4. The Commander, CO, OIC or designated representative shall be presented with a preliminary report at the inspection conclusion (out-brief).
   a. The report shall contain the recommended overall rating, preliminary violations, and the severity level of each violation.
   b. The inspection team may identify recommendations for improving RASP operations. Recommendations for improvement shall also be discussed during the out-brief.
   c. Preliminary reports are written by onsite NAVSEADET RASO inspectors and are not final inspection reports.
   d. Final inspection reports will be signed by NAVSEA 04N for machine RASP radiation sources and by OPNAV N455 for material RASP radiation sources. Although not typical, violations on a final inspection report may be different from those initially listed on a preliminary report.

5. Final inspection reports will be sent to the Commander, CO, OIC, or command address by U.S. mail. Advanced signed copies may be sent by electronic mail or faxed to the RSO.
6. For RASPs rated as satisfactory the command shall respond to any violations in writing as instructed in the final inspection report within 60 days of the date of the final inspection report.
7. For RASPs rated as unsatisfactory:
   a. The command shall be evaluated for potential suspension of operations by the Naval Radiation Safety Committee (NRSC) or NAVSEA 04N (see Section 3.2.6).
   b. The command shall respond to any violations in writing as instructed in the final inspection report within 30 days of the date of the final inspection report.
   c. The command shall be re-inspected prior to returning to normal operations.
   d. The command shall normally be re-inspected within six months of completing all required corrective actions.
   e. The inspection interval may be temporarily shortened to ensure the effectiveness of the corrective actions.

4.6 Severity Level System

4.6.1 General Requirements

1. The severity level system is established by the NRC. The Navy has adopted these severity levels through the Navy Master Materials License (MML) to maintain radiation safety compatibility with the NRC.
2. Applicable severity level violations shall apply to radioactive material covered under the MML and ionizing radiation producing machines and equipment covered by the RASP.
3. Severity levels will be escalated if circumstances surrounding the violation involve careless disregard of requirements, deception, willful violation, or false statements.

4.6.2 **Severity Level I Violations**

1. Severity Level I violations reflect an actual loss of safety or security. They are frequently associated with severe or potentially severe bodily harm to a radiation worker or member of the public.
2. A command shall receive an overall unsatisfactory rating for any Severity Level I violation.
3. Examples of Severity Level I violations include:
   a. A radiation dose to a radiation worker in excess of 25 rem (0.25 sievert (Sv)) Total Effective Dose Equivalent (TEDE), 75 rem (0.75 Sv) to the lens of the eye, or 250 rads (2.5 gray (Gy)) to the skin of the whole body, the extremities, or to any other organ or tissue during any year.
   b. An annual dose to a member of the public in excess of 1 rem (0.01 Sv) TEDE.
   c. A radiation dose to the embryo/fetus of a declared pregnant woman in excess of 2.5 rem (0.025 Sv) TEDE over the gestation period.
   d. A radiation dose to a minor in excess of 2.5 rem (0.025 Sv) TEDE, 7.5 rem (0.075 Sv) to the lens of the eye, or 25 rem (0.25 Sv) to the skin of the whole body, the extremities, or to any other organ or tissue during any year.
   e. Improper disposal of licensed or permitted radioactive material in quantities or concentrations in excess of 10 times the limits of Title 10 Code of Federal Regulations Part 20.2003 (10 CFR 20.2003).
   f. Release of radioactive material to an unrestricted area at concentrations resulting in a dose in excess of 50 times the limits for members of the general public as described in 10 CFR 20.1302(b)(2)(i).
   g. Failure to meet transportation requirements that result in loss of control of radioactive material with a breach in package integrity such that the material causes a radiation dose to a member of the public to exceed 100 mrem (1 mSv) TEDE.
   h. Package surface contamination in excess of 50 times the NRC limit.
   i. Package external radiation levels in excess of 10 times the NRC limit.

j. Level I violations of NRC requirements for increased control of licensed or permitted radioactive material as specified in the NRC Enforcement Policy.

4.6.3 Severity Level II Violations

1. Severity Level II violations also reflect the result of loss of safety or security, but to a lesser extent. They are frequently associated with bodily harm or potential bodily harm to a radiation worker or member of the public.
2. A command shall receive an overall unsatisfactory rating for any Severity Level II violation unless mitigating circumstances exist.
3. Examples of Severity Level II violations include:
   a. A radiation dose to a radiation worker in excess of 10 rem (0.1 Sv) TEDE, 30 rem (0.3 Sv) to the lens of the eye, or 100 rads (1 Gy) to the skin of the whole body, the extremities, or to any other organ or tissue during any year.
   b. An annual dose to a member of the public in excess of 0.5 rem (5 millisieverts (mSv)) TEDE.
   c. A radiation dose to the embryo/fetus of a declared pregnant woman in excess of 1 rem (0.01 Sv) TEDE over the gestation period.
   d. A radiation dose to a minor in excess of 1 rem (0.01 Sv) TEDE, 3 rem (0.03 Sv) to the lens of the eye, or 10 rem (0.1 Sv) to the skin of the whole body, the extremities, or to any other organ during any year.
   e. Release of radioactive material to an unrestricted area at concentrations resulting in a dose in excess of 10 times the limits for members of the public as described in 10 CFR 20.1302(b)(2)(i).
   f. Failure to make notifications to the NRSC required by the command’s NRMP.
   g. Improper disposal of licensed or permitted radioactive material in quantities or concentrations in excess of five times the limits of 10 CFR 20.2003.
   h. Failure to notify the NRSC immediately of an existing condition resulting in the Navy’s failure to make an immediate notification to the NRC as required by 10 CFR 20.2202(a)(1) or (a)(2).

i. Failure to meet transportation requirements that result in loss of control of radioactive material with a breach in package integrity such that there was a clear potential for a member of the public to exceed 0.1 rem (1 mSv) TEDE.

j. Package surface contamination in excess of 10 times, but not more than 50 times, the NRC limit.

k. Package external radiation levels in excess of five times, but not more than 10 times, the NRC limit.

l. Level II violations of NRC requirements for increased control of licensed or permitted radioactive material as specified in the NRC Enforcement Policy.

4.6.4 Severity Level III Violations

1. Severity Level III violations exist when there is a realistic potential for the loss of safety or security. They are associated with systemic failure to accomplish or meet a RASP regulatory requirement.

2. An overall command rating of unsatisfactory is considered for any Severity Level III violations.

3. Examples of Severity Level III violations include:

   a. A radiation dose to a radiation worker in excess of 5 rem (0.05 Sv) TEDE, 15 rem (0.15 Sv) to the lens of the eye, or 50 rem (0.5 Sv) to the skin of the whole body, extremities, or to any other organ or tissue during any year.

   b. A radiation dose to the embryo/fetus of a declared pregnant woman in excess of 0.5 rem (5 mSv) TEDE over the gestation period (except when doses are in accordance with the provisions of 10 CFR 20.1208(d)).

   c. A radiation dose to a minor in excess of 0.5 rem (5 mSv) TEDE, 1.5 rem (0.015 Sv) to the lens of the eye, or 5 rem (0.05 Sv) to the skin of the whole body, extremities, or to any other organ or tissue during any year.

   d. A radiation dose to a member of the public in excess of 0.1 rem (1 mSv) TEDE during any year that has not been approved by the NRSC.

   e. Failure to notify the NRSC immediately of an existing condition resulting in the Navy’s failure to make the 24-hour notification to the NRC required by 10 CFR

20.2202(b) or an immediate notification required by 10 CFR 20.2201(a)(1)(i).

f. A significant potential for exposures or releases in excess of applicable limits in 10 CFR 20.1001 to 20.2401 and NAVMED P-5055 (whether or not the exposure or release occurs) such as:

   (1) Entry into a high radiation area without having performed an adequate survey.

   (2) Operation of an irradiation facility with a non-functioning or malfunctioning interlock system.

   (3) Failure of the first person entering a vault or area where an x-ray exposure has taken place to perform a thorough radiation survey of the x-ray tube head to ensure x-ray production has ceased. This includes surveying the tube head aperture.

   (4) Failure during radiographic operations, to perform a radiation survey after each exposure, including the entire circumference and top of the exposure device and the guide tube if used, for the purpose of determining that the sealed source has been returned to its shielded position.

   (5) Radiation levels in an unrestricted area such that an individual could receive greater than 100 mrem (1 mSv) in any one-hour period.

g. A release of radioactive material to an unrestricted area at concentrations in excess of two times the effluent concentration limits in 10 CFR 20.1302(b)(2)(i) (except when operation up to 0.5 rem (5 mSv) has been approved by the NRSC).

h. Improper disposal of licensed or permitted radioactive material not covered in Severity Levels I or II violations.

i. A release of radioactive material or contaminated equipment that poses a realistic potential for exposure to members of the general public to doses exceeding the NRC annual dose limits for members of the public.

j. A violation involving failure to secure, or maintain surveillance over, licensed or permitted material that:

   (1) Involves licensed or permitted radioactive material in any aggregate quantity greater than

1000 times the quantity specified in Appendix C of 10 CFR 20.

(2) Involves licensed or permitted radioactive material in any aggregate quantity greater than 10 times the quantity specified in Appendix C of 10 CFR 20, where such failure is accompanied by the absence of a functional program to detect and deter security violations that include training, staff awareness, detection (including auditing), and corrective action (including disciplinary action).

(3) Results in a substantial potential for exposures or releases in excess of the applicable limits in 10 CFR 20.

k. Failure of a command to have a qualified RSO.

l. A breakdown in the RASP involving a number of related violations (or recurring, if isolated) that collectively represent a potentially significant lack of attention to or carelessness toward responsible use or control of any RASP source.

m. Any noncompliance with licensed or permitted material labeling, placarding, shipping papers, packaging, loading, or other requirements that could reasonably result in one or more of the following:

(1) Failure to identify the type, quantity, or form of radioactive material

(2) Failure of the carrier or recipient to exercise adequate controls

(3) A potential for improper transfer of radioactive material that could have resulted in either personnel dose or contamination above regulatory limits

n. Failure to have at least two qualified gamma radiographers present during radiographic operations performed under 10 CFR 34.

o. Failure to use radiographic equipment, radiation survey instruments, and/or personnel monitoring devices as required by 10 CFR 34.

p. Failure to receive NRSC approval prior to implementing a change in NRMP activities that has radiological or programmatic significance such as a change in the location where licensed or permitted radioactive material is used or stored, or where new

facilities do not meet applicable radiation safety guidelines.

q. Failure to receive NAVSEA approval prior to implementing a change in RASP activities that has radiological or programmatic significance such as a change in the location where ionizing radiation producing machines or equipment is used or stored, or where new facilities do not meet applicable radiation safety guidelines.

r. Failure to stop work after an ion chamber pocket dosimeter (IPD) goes off-scale, or after an electronic personal dosimeter (EPD) reads greater than 200 mrem (2 mSv), during radiographic operations.

s. Lack of management oversight and/or a RSO not properly discharging his/her duties as indicated by an aggregate of violations regardless of severity level.

t. Package surface contamination in excess of five times, but not more than 10 times, the NRC limit.

u. Package external radiation levels in excess of one times, but not more than five times, the NRC limit.

v. Level III violations of NRC requirements for increased control of licensed or permitted radioactive material as specified in the NRC Enforcement Policy.

4.6.5 **Severity Level IV Violations**

1. Severity Level IV violations have more than minor safety or environmental significance. They are associated with non-systemic failures to accomplish or meet RASP regulatory requirements.

2. An overall command rating of unsatisfactory may be considered for Severity Level IV violations if they are similar to previous violations that the command did not effectively correct since its last inspection.

3. A program may also be rated unsatisfactory if the aggregate number of Severity Level IV violations indicates a lack of management oversight.

4. Examples of Severity Level IV violations include:

   a. Radiation levels in an unrestricted area or

controlled area such that an unmonitored individual could receive greater than 2 mrem (0.02 mSv) in any one hour or 100 mrem (1.0 mSv) in a year.

b. Failure to implement and maintain a RASP program to keep exposure to ionizing radiation ALARA.

c. Failure to notify the NRSC immediately of an existing condition resulting in the Navy's failure to make a 30-day notification to the NRC required by 10 CFR 20.2201(a)(1)(ii) or 20.2203(a).

d. Failure to provide the NRSC with necessary information resulting in the Navy's failure to make a timely follow up written report to the NRC required by 10 CFR 20.2201(b), 20.2204, and 20.2206.

e. Failure to register as an authorized user of an NRC-certified Transport Type B package. In addition, a failure to demonstrate that packages meet DOT Specifications for 7A Type A packages.

f. Noncompliance with shipping papers, marking, labeling, placarding, packaging or loading requirements that is not a Severity Level I, II, or III violation.

g. Any other matter that has more than minor safety, health, or environmental significance.

h. Breach of package integrity without external radiation levels exceeding the NRC limit or without contamination levels exceeding the NRC limit.

i. Package surface contamination in excess of, but not more than five times the NRC limit.

j. Level IV violations of NRC requirements for increased control of licensed or permitted radioactive material as specified in the NRC Enforcement Policy.

4.6.6 **Severity Level V Violations**

1. Severity Level V violations have minor safety, health, or environmental significance. These violations typically reflect inadequate documentation of program compliance requirements.

2. Severity Level V violations will not incur an overall command rating of unsatisfactory.

4.7 Nuclear Regulatory Commission Inspections

1. The NRC is authorized by 10 CFR to inspect NRC licensed or permitted radioactive material, the premises where it is stored or used, and the records maintained to demonstrate compliance with NRC regulations. NRC inspections are typically unannounced.
2. Navy and Marine Corps commands authorized to use radioactive materials under the authority of an NRMP shall cooperate fully with NRC inspectors including making records, logs, or other necessary documents available to demonstrate compliance with federal regulations and NRMP conditions.
3. Navy and Marine Corps commands shall notify NAVSEADET RASO immediately when NRC inspectors arrive at the command to conduct an inspection.
4. The command shall notify NAVSEADET RASO of the inspection results and any violations identified by the NRC immediately after completion of the out-brief.
5. The command shall contact NAVSEADET RASO immediately and make arrangements for NAVSEADET RASO to be teleconferenced to the inspection out-brief if the NRC will issue a Severity Level I-III violation.

4.8 Technical Assist Visits

1. NAVSEADET RASO is authorized to provide technical assistance to commands requiring support in the administration of their NRMPs and RASP. This assistance is categorized as either routine, special technical support, or directed technical support.
2. Routine technical support is typically provided through telephone conversations, e-mails, and correspondence. Routine technical support typically involves routine day-to-day issues associated with licensing, radiation generating machine systems, or compliance.
3. Special technical support is available in situations where a command’s RASP degrades to marginal levels and the Commander, CO or OIC need extra help to restore the RASP. In such cases, the command may request a NAVSEADET RASO specific technical support assist visit through official correspondence. These visits will be approved by NAVSEA 04N on a case-by-case basis.

4. Special technical support visits shall be documented to demonstrate progress toward RASP improvement. If, during the visit the NAVSEADET RASO staff member observes one or more Severity Level IV or greater violations (i.e., I, II or III), he/she shall record his/her violations on an inspection report and process per Section 4.5.
5. Directed technical support is typically provided in situations where a command's RASP degrades to marginal levels and the command has lost confidence in the staff to restore the RASP. In such cases, the command will be directed to request a NAVSEA 04N technical support assist visit via Navy letter or naval message. These visits shall be approved by NAVSEA 04N on a case-by-case basis.

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Table 4-1 RASP Inspection Frequencies			
RASP Usage Code	Usage Code Title	Usage Code Description*	Inspection Frequency (Years)
A	Gamma Radiography (NUREG 1556, Vol. 2)	Authorizes use of permitted material in the nondestructive examination of material at both permanent radiographic installations and temporary jobsites (03310 and 03320)	1
B	General Industrial (NUREG 1556, Vol. 7)	Authorizes use of permitted material for industrial operations not described by another usage code	3
C	Instrument Calibration Services (NUREG 1556, Vol. 18)	Authorizes use of permitted material for calibration services of RADIAC instruments (03221 and 03222)	3
D	Decommissioning of Byproduct Material (NUREG 1757)	Authorizes decontamination and decommissioning (D&D) according to an approved plan under 10 CFR 30.36 (03900)	1
E	Research and Development Type A Broad Scope (NUREG 1556, Vol. 11) Also includes; Academic Type A Broad Scope	Authorizes use of permitted material in any chemical or physical form for research and development as approved by a local Radiation Safety Committee for approved users per 10 CFR 33.13 (03610 and 01100)	2
F	Research and Development Type B Broad Scope (NUREG 1556, Vol. 11) Also includes; Academic Type B Broad Scope	Authorizes use of permitted material in any chemical or physical form for research and development as approved by a local Radiation Safety Officer for approved users per 10 CFR 33.14 (03611 and 01110)	3

Table 4-1 RASP Inspection Frequencies			
RASP Usage Code	Usage Code Title	Usage Code Description*	Inspection Frequency (Years)
G	Research and Development Type C Broad Scope (NUREG 1556, Vol. 11) Also includes; Academic Type C Broad Scope	Authorizes use of permitted material in any chemical or physical form for research and development by users specifically named in the NRMP per 10 CFR 33.15 (03612 and 01120)	5
H	Special Nuclear Material (SNM) Plutonium, U-235 and/or U-233 (unsealed less than critical mass) and SNM Plutonium (sealed neutron sources, less than 200 g)	Authorizes use of less than 200 g Pu, 350 g U-235, 300 g U-233, for biological and chemical testing, instrument calibration (22110, 22111) and use of plutonium-beryllium howitzer for instrument calibration, teaching and demonstration purposes, and industrial applications (22120)	2
I	Portable Gauges (NUREG 1556, Vol. 1)	Authorizes use of permitted material in moisture/density gauges containing gamma and neutron sources for measurement in soils, compacted soils and road surfacing materials (03121)	5
J	Analytical Measuring Instruments (NUREG 1556, Vol. 7)	Authorizes use of permitted material in x-ray fluorescence analyzers (03122)	5
K	Gas Chromatographs (NUREG 1556, Vol. 7)	Authorizes use of permitted material to produce ionization in one or more detection cells (03123)	5
L	Depleted Uranium Munitions Distribution and Storage	Authorizes indoor and outdoor testing and possession of ammunition containing DU as a kinetic energy armor penetration projectile and/or for the pyrophoric properties (11220, 11221)	3

Table 4-1 RASP Inspection Frequencies			
RASP Usage Code	Usage Code Title	Usage Code Description*	Inspection Frequency (Years)
M	Subcritical Assemblies (NUREG 1556, Vol. 17)	Authorizes use of SNM in an unsealed form (less than 350 g U-235, or 300 g U-233) as slugs in a water bath for teaching and research (22151)	2
N	Radioactive Thermo Generator Power Sources	Authorizes use of permitted material for heat or power generators in remote locations (22130)	5
O	Radium Luminous Product Possession	Authorizes the possession of luminous products containing Ra-226 authorized under 10 CFR 31.12 (02710)	3
P	Fixed Gauges (NUREG 1556, Vol. 4)	Authorizes use of permitted material in non-portable gauges for measurement or control of material density, flow, level, thickness or weight (03120)	5
Q	Irradiators (NUREG 1556, Vol. 5)	Authorizes use of permitted material in self-shielded irradiators (no external beam) less than or equal to 10,000 curies (03510)	3
R	Buried Waste	Authorizes burial for disposal of low level radioactive materials as a base for a paved equipment parking area, no operations are authorized	5
S	Source Material (NUREG 1556, Vol. 17)	Authorizes use of source material for shielding (other than munitions) and in products containing thorium-magnesium alloys (11210)	3

Table 4-1 RASP Inspection Frequencies			
RASP Usage Code	Usage Code Title	Usage Code Description*	Inspection Frequency (Years)
T	Radioactive Commodities Distribution and Use	Authorizes the storage, distribution, use, and disposal of commodities containing licensed or permitted material throughout the Navy and Marine Corps	3
U	Services and Maintenance (NUREG 1556, Vol. 18)	Authorizes the permittee to provide leak test analyses services and maintenance of devices containing less than or equal to 100 curies of licensed or permitted material (03220 and 03225)	3
V	Special Nuclear Material (less than 200 grams) (NUREG 1556, Vol. 17)	Authorizes use of SNM in a sealed form (less than 200 g of Pu or other SNM) as a neutron source (22150)	5
W	Research and Development (NUREG 1556, Vol. 7)	Authorizes use of permitted material for non-human research and development (03620)	5
X	Byproduct Material Standby (no operations)	Principle activities have ceased, permittee is undecided about terminating the permit, packaging and shipping operations are authorized, D&D are not authorized (03810)	2
Y	Source Material Standby (no operations)	Principle activities have ceased, permittee is undecided about terminating the permit, packaging and shipping operations are authorized, D&D are not authorized (11810)	2
Z	Vehicle and Cargo Interrogation Systems (VACIS) (NUREG 1556, Vol. 7)	Authorizes use of permitted material to conduct security inspections of cargo and vehicles (03130)	2

Table 4-1 RASP Inspection Frequencies			
RASP Usage Code	Usage Code Title	Usage Code Description*	Inspection Frequency (Years)
IC	Increased Controls for Sources Containing Radioactive Material Quantities of Concern	Based on requirements of 10 CFR 37, the NRSC issued policy letter, CNO WASHINGTON DC ltr 5104 Ser N45/13U139761 of 2 Oct 2013. All commands are required to provide reasonable assurance of the security of category 1 or category 2 quantities of radioactive material, as defined by Appendix A of 10 CFR 37, by protecting these materials from theft or diversion.	Inspections are to be done in conjunction with the permitted material.
AA	Analytical Measurement Instruments (machine sources)	Conduct of machine operations for analytical equipment included in Section 13.	5
BB	X-Ray Radiography (shielded facility)	Conduct of x-ray machine operations for the nondestructive examination of material at permanent radiographic installations (both exempt shielded and shielded facilities operations)	2
BO	X-Ray Radiography (open facility)	Conduct of x-ray machine operations for the nondestructive examination of material at open radiographic installations (open facility operations)	1

Table 4-1 RASP Inspection Frequencies			
RASP Usage Code	Usage Code Title	Usage Code Description*	Inspection Frequency (Years)
CC	Accelerators	Conduct of machine operations that generate ionizing radiation, by means of particle acceleration, for the conduct of research or material testing	2
DD	Radium Removal	Program for the removal of radium containing devices from decommissioned naval vessels	3
RCOMA	RASP Contract Oversight Management Authorization	Authorizes the oversight of contractor operations using radioactive material or machine sources of ionizing radiation on Government property	1
RCIA	RASP Contract Issuance Authorization	Authorizes the issuance of contracts for operations using radioactive material or machine sources of ionizing radiation on Government property	1

*The five-digit code in the description corresponds to the NRC Inspection Program Codes listed in the NRC Inspection Manual, Chapter 2800

SECTION 5 - **GAMMA RADIOGRAPHY**

5.1 **Purpose**

This section describes the requirements for Navy and Marine Corps commands conducting gamma radiography. Industrial gamma radiography creates a potential for significant exposure or overexposure to ionizing radiation to radiography personnel, non-radiation workers, and members of the general public in the vicinity of radiographic operations. Because of the potential for personal injury, the Nuclear Regulatory Commission (NRC) has established strict and comprehensive regulations for gamma radiography and the storage and handling of the gamma radiography sources and radiographic exposure devices. These rules are contained in Title 10, Code of Federal Regulations (CFR) Part 34 and are incorporated into every Naval Radioactive Materials Permit (NRMP) for gamma radiography.

5.2 **Scope**

The requirements in this section apply to all commands conducting industrial gamma radiography.

The provisions and requirements of this section are in addition to, and not in substitution for, other requirements of this manual. In particular, the requirements and provisions of Sections 2, 3, and 4 that apply to NRMP applications and NRMPs issued per this section.

5.3 **Responsibilities**

5.3.1 **Commanders, Commanding Officers, and Officers in Charge**

1. Designate, in writing, a senior radiographer on the NRMP when either the radiation safety officer (RSO) or assistant radiation safety officer (ARSO) is not a qualified radiographer.
2. General responsibilities are described in Section 1.5.2.1.

5.3.2 **Radiation Safety Officers**

1. RSOs for gamma radiography programs shall:

   a. Ensure the proper use, maintenance, and leak testing

of approved radiography sources and radiographic exposure devices per the requirements of this section.

b. Monitor emergency events.

c. Ensure proper additional security requirements that may be associated with radiography sources and radiographic exposure devices during storage, use, and transportation are being implemented per the requirements of this section.

d. Ensure the radiographer in charge (RIC), senior radiographer, radiographers, radiographer's assistants, and barrier monitors (BMs) are properly qualified.

e. Perform evaluations of radiographers and radiographer's assistants at intervals not to exceed six months as long as the RSO has a minimum of one year of actual experience as a radiographer.

   (1) If the RSO does not meet that requirement, he/she shall designate, in writing, a senior radiographer or other radiographer who meets that experience requirement to perform evaluations.

   (2) The RSO shall perform surveillances of evaluations as specified in Section 5.15.

f. Review operating and emergency procedures for compliance with this manual, Navy and Marine Corps directives, NRMP conditions, and NRC regulations, and obtain approvals per Section 2.14.

g. Submit applications for amendment or renewal of NRMPs when required by Section 3.

h. Ensure surveillances of radiographic operations are performed and documented per Section 5.15.

2. General responsibilities are described in Section 1.5.2.2.

5.3.3 Assistant Radiation Safety Officers

General responsibilities are described in Section 1.5.2.3.

5.3.4 Senior Radiographer (if applicable)

1. The senior radiographer shall be responsible for the day-to-day operations of the gamma radiography program.

2. The senior radiographer shall:
   a. Prepare operating and emergency procedures that properly implement the requirements of this manual and the command's NRMP.
   b. Oversee all source assembly exchanges.
   c. Ensure leak testing of radiography sources and radiographic exposure devices is performed.
   d. Direct and supervise the recovery of damaged, disconnected or lost source assemblies.
   e. Report equipment malfunctions to the RSO.
   f. Ensure that daily visual and operability checks, quarterly inspection and maintenance, and annual maintenance are performed on radiographic exposure devices and associated equipment.
   g. Allow only qualified radiographers and radiographer's assistants, with a current six-month evaluation, to take custody of radiographic exposure devices for radiographic operations.
   h. Assign a RIC for each temporary job site radiographic operation.
   i. Assign a minimum of two qualified radiographers for radiographic operations at temporary job sites.
   j. Implement, schedule and maintain radiographer and radiographer's assistant training and qualifications.
   k. Conduct all training in the use and handling of radiography equipment.
   l. If designated by the RSO, evaluate radiographers and radiographer's assistants at intervals not to exceed six months during an actual radiographic operation.
   m. Promptly report incidents or deviations from established procedures to the RSO.

5.3.5 **Radiographer in Charge**

1. The RIC is responsible for all aspects of assigned radiographic operations.
2. The RIC shall:
   a. Direct and supervise assigned radiographic operations.
   b. Immediately stop unsafe radiographic operations.
   c. Ensure compliance with this manual, NRMP conditions,

and operating and emergency procedures during assigned radiographic operations.

d. Promptly report any alarming or malfunctioning electronic personal dosimeter (EPD) to the RSO.

e. Promptly report incidents or deviations from established procedures to the senior radiographer or the RSO.

5.3.6 **Radiographers**

1. Radiographers are responsible for compliance with this manual, NRMP conditions, and operating and emergency procedures during assigned radiographic operations.
2. Radiographers shall:
   a. Comply with the written or verbal orders of the RIC.
   b. Promptly report any alarming or malfunctioning EPD to the RIC.
   c. Promptly report incidents or deviations from established procedures to the RIC.
   d. Directly supervise radiographer’s assistants whenever the radiographer’s assistant uses radiographic exposure devices, associated equipment, or sealed sources, or conducts surveys of the radiographic exposure devices for the purpose of ensuring the source assembly has returned to the shielded position.
   e. In conjunction with the radiographer's assistant, maintain custody of radiographic exposure devices while in use.
   f. If designated by the RSO, evaluate radiographers and radiographer’s assistants at intervals not to exceed six months during an actual radiographic operation.

5.3.7 **Radiographer’s Assistants**

1. Radiographer’s assistants shall work under the direct supervision (in the physical presence) of a radiographer when using radiographic equipment during radiographic operations.
2. Radiographer's assistants shall be responsible for full compliance with this manual, NRMP conditions, and operating and emergency procedure during assigned radiographic operations.

3. Radiographer’s assistants shall:
   a. Comply with the written or verbal orders of the RIC.
   b. Promptly report any alarming or malfunctioning EPD to the RIC.
   c. Promptly report incidents or deviations from established procedures to the RIC.
   d. In conjunction with the radiographer, maintain custody of the radiographic exposure devices while in use.

5.3.8 Barrier Monitors

1. BMs shall be responsible for full compliance with this manual, NRMP conditions, and operating and emergency procedures during assigned radiographic operations.
2. BMs shall:
   a. Comply with the written or verbal orders of the RIC.
   b. Promptly report incidents or deviations from established procedures to the RIC.
   c. Guard access to the radiation area boundary.
   d. Perform supplemental surveys at the radiation area boundary during gamma radiographic operations.
   e. Promptly report any alarming or malfunctioning EPD to the RIC.
3. BMs are not authorized to establish or modify radiation area boundaries.
4. BMs shall not enter the radiation area.

5.4 Gamma Radiography Requirements

5.4.1 General Requirements

1. Gamma radiography shall be accomplished in accordance with the Gamma Radiography Standard Application (GRSA). Any conflicts between this manual and the GRSA shall be directed to NAVSEA 04N, via NAVSEADET RASO, for written clarification.
2. No Navy or Marine Corps command shall conduct gamma radiography or obtain gamma radiography equipment prior to obtaining an NRMP authorizing possession of such equipment and conduct of specific operations.

3. All commands authorized by an NRMP to conduct gamma radiography shall operate their program in strict compliance with Navy and Marine Corps directives, federal regulations, the requirements of this manual, and conditions of their NRMP.
4. At least two Radiological Affairs Support Program (RASP) approved, calibrated, and operating survey instruments that have been response checked shall be available for all radiographic operations.

5.4.2 Requirements for Custody and Security of Radiographic Exposure Devices and Source Changers

1. When not in use, radiographic exposure devices and source changers shall be stored in an authorized storage area that is locked to prevent personnel access to the radiographic exposure device or source changer.
2. The storage area shall be posted with a "Caution Radioactive Material" sign.
3. Only a qualified radiographer or radiographer's assistant shall have unescorted access to the storage area.
4. Except during actual exposures or source changes, or when a radiographic exposure device or source changer is in secure storage, a qualified radiographer or radiographer's assistant shall maintain custody and direct surveillance of the radiographic exposure device or source changer. (During actual exposures or source changes, the device is within a high radiation area that is controlled to prevent access.)
5. The radiographic exposure device or source changer shall be locked with the source assembly in the SHIELDED position when in storage and during transport.

5.4.3 Physical Requirements for a Permanent Radiographic Installation

1. Each entrance that is used for personnel access to the high radiation area in a permanent radiographic installation (PRI) shall have either:
   a. An entrance control of the type described in 10 CFR 20.1601(a)(1) that reduces the radiation level upon entry into the area; or

b. Both conspicuous visible and audible warning signals to warn of the presence of radiation.

2. The visible signal shall be activated by radiation whenever the source is exposed.

3. The audible signal shall sound if anyone tries to enter the PRI while the source is exposed.

4. All entrances to the PRI shall be posted with a sign containing the conventional radiation symbol and the words "Caution – Entering Radiation Exposure Room" on a yellow background.

5. The interior of the PRI shall be posted with signs containing the conventional radiation symbol and the words "Caution – High Radiation Area" , "Danger – High Radiation Area" or "Grave Danger – Very High Radiation Area" on a yellow background depending on the radiation levels generated by the radiographic exposure device. There must be sufficient signs visible by anyone entering the PRI.

5.4.4 Operating Requirements for a Permanent Radiographic Installation

1. Prior to the first exposure of the day, the radiographer shall test all entrance control devices for proper operation, if installed.

2. Prior to or during the first exposure of the day or shift, the radiographer shall test the alarm system with a radiation source for proper operation including a check of visible and audible signals.

3. If an entrance control device or an alarm is operating improperly, it must be immediately labeled as defective and repaired within seven calendar days.

4. The facility may continue to be used during this seven-day period, provided the command implements temporary job site controls for the area.

5. After each radiographic exposure, the radiographer shall use a calibrated and operating survey instrument to monitor radiation levels during entry into the PRI.

6. The radiographer shall survey the entire circumference (excluding the bottom) of the radiographic exposure device and the entire attached source guide tube up to

the source stop or collimator to verify that the source assembly has returned to the fully shielded position.

5.4.5 Operating Requirements for Locations Outside of a Permanent Radiographic Installation (Temporary Job Site)

1. The command RSO or ARSO shall be notified of the time, date, and location of all radiographic operations at temporary job sites.
2. Whenever gamma radiography operations are performed at a location other than a PRI, the radiographer shall be accompanied by at least one other qualified radiographer. The additional qualified individual shall observe the operations and be capable of providing immediate assistance to prevent unauthorized entry.
3. The radiation area boundary at the worksite shall initially be established at or beyond the calculated distance where the radiation level is 2 millirem per hour (mrem/hr) instantaneous exposure rate (0.02 milliseiverts per hour (mSv/hr)) during source exposure. Exposure rates at the boundary during source travel from the radiographic exposure device to and from the collimator/source tube termination may exceed 2 mrem/hr provided exposure rates do not exceed 100 mrem/hr.

   EXCEPTION: The radiation area boundary may be established where the expected radiation level exceeds 2 mrem/hr (0.02 mSv/hr) for short duration exposures (i.e., less than 10 minutes) provided that all the following conditions are met:

   a. The radiation level at the radiation area boundary does not exceed 100 mrem/hr (1.0 mSv/hr).
   b. Calculations are made before the operation to demonstrate that personnel at the radiation area boundary will not receive a dose greater than 2 mrem in any one hour to include exposure received during source travel and exposure during the radiograph(s).
   c. Other alternatives such as temporary shielding have been considered.
   d. The RSO shall authorize the use of the exception in writing before the operation is conducted.
4. The radiation area boundary shall be conspicuously

posted with signs containing the radiation symbol and the words "Caution: Radiation Area" in addition to a sign that includes the following: "Radiography in Progress - Keep Out Unless Authorized by Radiographer-In-Charge."

5. The high radiation area boundary shall be established at the calculated distance where the radiation level is expected to exceed 100 mrem/hr (1 mSv/hr).

6. The 100 mrem/hr (1 mSv/hr) boundary SHALL NOT be verified by survey.

7. The high radiation area boundary shall be conspicuously posted with signs containing the conventional radiation symbol and the words “Caution – High Radiation Area,” "Danger - High Radiation Area," or “Grave Danger – Very High Radiation Area” on a yellow background. The determination of which sign to use depends on the radiation levels generated by the exposure device.

8. After the boundaries are established, a thorough visual search for personnel shall be performed by a radiographer or radiographer’s assistant of all areas inside the posted boundaries, paying particular attention to areas inside large structures (e.g., aircraft, submarine sonar domes, buildings).

9. During radiography, only qualified radiographers, radiographer’s assistants, RSO, and ARSO(s) are permitted within the posted radiation boundary. Other personnel (e.g., senior quality assurance manager, auditors) may be granted permission on a case-by-case basis with proper written justification by the RSO to be within the posted area provided the person is escorted by a radiographer, radiographer’s assistant, RSO, or ARSO and has the proper dosimetric devices. When watchstanders have to remain in radiation areas posted for radiography, the authorization shall include all conditions and controls to minimize the watchstander(s) exposure and include an estimate of the maximum dose to be received during a watch. Radiation exposure rates shall not exceed 100 mrem/hr at the watchstander(s) location(s) during source travel from the radiographic exposure device to and from the collimator/source tube termination. Total dose to watchstanders should not exceed 10 mrem in any one day.

10. All personnel within the radiation boundary during a radiographic exposure shall have a properly operating survey meter or be escorted by a person with a properly operating survey meter.
11. Entry into the radiation area by personnel between exposures is occasionally required to complete time sensitive functions (e.g., watchstander logs). If this is necessary, it shall only be done with the permission of the Radiographer in Charge (RIC). The boundary at the access point shall be dropped; the person shall not step over or around the boundary. The person shall enter and exit at the same point unless arrangements have been made in advance for an alternate exit that is manned by the radiographer, radiographer's assistant, or BM. The person is logged in and out of the area on the utilization log. The boundary shall be reestablished after the person exits. If the open boundary access point was not guarded during the entire time it was lowered, the area shall be reestablished per Section 5.4.5.8.
12. All accesses to the high radiation area boundaries shall be under direct continuous visual surveillance to protect against unauthorized entry. All radiographers and radiographer's assistants surveilling access to the high radiation boundaries shall be in continuous positive communication (e.g., via radios) with the radiographer operating the exposure device. Communications between the RIC and each radiographer or radiographer's assistant surveilling access to the high radiation boundaries shall be verified prior to each exposure. The intent of this requirement is to enable the radiographer to immediately retract the source if an unauthorized person crosses the radiation area boundary.
13. After each exposure, the entire circumference (excluding the bottom) of the radiographic exposure device and the entire attached source guide tube up to the source stop or collimator shall be surveyed to verify that the source assembly has returned to the fully shielded position.
14. During the first exposure of the day, the radiation levels at the radiation area boundary shall be verified by confirmatory survey and adjusted as required to ensure the radiation levels do not exceed 2 mrem/hr

(except as noted in Section 5.4.5.3 above).

15. The radiation area boundary shall be adjusted as necessary by the radiographer or radiographer's assistant. BMs shall not move radiation area boundaries.
16. If conditions change substantially (e.g., removal of collimator or redirecting primary beam), the radiation levels at the radiation area boundary shall be verified per Section 5.4.5.14 above. Ensure any radiation levels exceeding the requirements of Section 5.17.1 are properly reported.
17. When preparing for radiography, the radiographer shall calculate, for each exposure or series of exposures, the distance from the uncollimated source to the high radiation area boundary and to the radiation area boundary. This calculation shall be recorded on the utilization log.

5.5 Leak Test of Source Assemblies and Radiographic Exposure Devices

1. Only trained radiographers designated by the senior radiographer or the RSO are authorized to conduct leak tests.
2. Leak tests shall be conducted on the source assemblies at intervals not to exceed six months.
3. Leak tests for depleted uranium (DU) contamination shall be conducted on the radiographic exposure devices at intervals not to exceed 12 months.
4. Leak tests shall be analyzed by the command only if authorized by NRMP condition. If the command is not authorized, then other persons, specifically licensed by the NRC, an Agreement State, or an NRMP authorizing performance of such services for others, shall be used.
5. Sealed sources that are in storage and not in use do not require leak testing, but shall be leak tested before use or transfer to another person, if the storage interval exceeds six months.
6. Radiographic exposure devices that are in storage and not in use do not require leak testing, but shall be leak tested before use or transfer to another person, if the storage interval exceeds 12 months.

7. A leak test report shall be completed for each leak test and include the following:
   a. Source assembly serial number and radionuclide or radiographic exposure device model and serial number, as applicable.
   b. Date of leak test.
   c. Results of the leak test in microcuries.
   d. Name of person performing the leak test analysis.
8. The source assembly or radiographic exposure device is considered leaking if the leak test reveals the presence of 0.005 microcuries (185 Bq) or more of removable contamination.
9. For leaking source assemblies and radiographic exposure devices the command shall:
   a. Report to NAVSEADET RASO by telephone or PRIORITY message within one working day of any leak test with results that exceed the threshold in Section 5.5.8 above, and describe the equipment involved, the leak test results, and the corrective actions taken.
   b. Conduct a complete investigation of the extent of contamination to include the source tube connector port, the inside of the storage plug, source guide tube(s), and control assembly.
   c. Contact the manufacturer for shipping instructions for returning the leaking source assembly and radiographic exposure device and associated contaminated equipment.

5.6 Inventory of Gamma Radiography Sources, Radiographic Exposure Devices and Source Changers

1. The RSO shall ensure a physical inventory of all gamma radiography sources, radiographic exposure devices, and source changers containing DU is conducted quarterly.
2. The inventory records shall contain the following:
   a. Date of inventory.
   b. Manufacturer, model, and serial number of each source assembly, radiographic exposure device or source changer, as appropriate.
   c. A source identification number, if no serial number.
   d. Radionuclide, chemical and physical form (e.g. sealed

source is sufficient for physical form).

e. Activity in curies (Bq) per source (quantities of DU shall be provided in mass (kg)).
f. Date of radioactivity determination.
g. Location of each source assembly, radiographic exposure device or source changer.
h. Custodian (i.e., person in possession of the source assembly, radiographic exposure device or source changer).
i. Name and date of person conducting the inventory.
j. Date of review by and signature of the RSO.

5.7 Inspection and Maintenance of Equipment

5.7.1 Daily Visual and Operability Checks

1. Radiographic exposure devices, transport containers, associated equipment, and source changers shall be checked for damage and proper operation prior to the first use of the day or shift.
2. The checks shall ensure the equipment is in good working condition, the sources are adequately shielded, required labeling is present, and the equipment has had inspection and maintenance performed within the required time period.

5.7.2 Quarterly Inspection and Routine Maintenance

1. Radiographic exposure devices, transport containers, associated equipment, and source changers shall be inspected and maintained, per written procedures, to ensure the proper functioning of components important to safety.
2. Inspections and routine maintenance shall be performed at intervals not to exceed three months or before the first use thereafter.
3. Quarterly inspections and maintenance shall be documented on an inspection report. This report shall be reviewed and approved by the RSO.
4. If any defect or noncompliance is identified, the RSO shall report the defect or noncompliance as required by Section 3.3.

5. When unsatisfactory conditions are found, the condition and corrective actions shall be described and recorded on the inspection report and entered into the Radiological Deficiency Reporting (RDR) program.
6. Equipment that is not in satisfactory condition shall be removed from service until corrective maintenance is completed.
7. The senior radiographer shall verify that the corrective actions have been satisfied for all items identified as unsatisfactory.
8. The RSO shall review and approve the completion of the corrective actions prior to the item being placed back in service.

5.7.3 Annual Maintenance of Radiographic Exposure Devices

1. A radiographer, who holds an Industrial Radiography Radiation Safety Personnel (IRRSP) certification or equivalent and has completed the Radiographic Safety Training Course (S-491-0020) (formerly S-4J-0020) or equivalent course approved by NAVSEADET RASO or an authorized manufacturer’s representative, shall perform annual maintenance on radiographic exposure devices.
2. Annual maintenance shall be documented on an inspection report. This report shall be reviewed and approved by the RSO.
3. If any defect or noncompliance is identified, the RSO shall report the defect or noncompliance as required by Section 3.3.
4. When unsatisfactory conditions are found, the condition and corrective actions shall be described and recorded on the inspection report and entered into the RDR program.
5. Equipment that is not in satisfactory condition shall be removed from service until corrective maintenance is completed.
6. The senior radiographer shall verify that the corrective actions have been satisfied for all items identified as unsatisfactory.
7. The RSO shall review and approve the completion of the

corrective actions prior to the item being placed back in service.

5.8 Training Requirements

5.8.1 Radiation Safety Officer and Assistant Radiation Safety Officer

1. RSOs and ARSOs who are radiographers shall meet the following criteria:
   a. Have a minimum of one year (2,000 hours) of documented hands-on experience as a qualified radiographer.
   b. Have completed the Radiation Safety Officer Course (S-4J-0016) and Radiographic Safety Training Course (S-491-0020) or have equivalent training and experience. Equivalent training and experience shall be evaluated and approved by the Naval Radiation Safety Committee (NRSC).
2. RSOs and ARSOs who are not radiographers shall meet the following criteria:
   a. Successfully completed the Radiation Safety Officer Course (S-4J-0016) and Radiographic Safety Training Course (S-491-0020).
   b. Have at least one year of experience as a RSO or ARSO on an NRMP or NRC license of comparable size and complexity to the command’s radiography program. This would include NRMPs involving instrument calibration, industrial research, teletherapy, brachytherapy, and any industrial or medical broad scope NRMP. Managers in the Nuclear Propulsion Program may be considered to have equivalent experience as approved by NAVSEADET RASO.
   c. Have at least one of the following requirements:
      (1) A bachelor’s or advanced degree in engineering or the physical sciences.
      (2) Board certification by the American Board of Health Physics, American Board of Radiology, American Board of Science in Nuclear Medicine.
      (3) Registration by the National Registry of Radiation Protection Technologists.
   d. Evaluation of the candidate’s qualifications to include completion of related professional courses,

the individual's regulatory compliance record, and currency of the individual's experience.

e. If neither the RSO nor the ARSO is a qualified gamma radiographer with at least one year experience, the command shall designate, in its NRMP application, a senior radiographer as the person responsible for the daily supervision of the gamma radiography program.

5.8.2 Senior Radiographers

1. The senior radiographer shall complete the Radiation Safety Officer Course (S-4J-0016) and Radiographic Safety Training Course (S-491-0020).
2. The senior radiographer shall be a qualified radiographer per Section 5.8.3 below and shall have a minimum of one-year (2,000 hours) actual experience as a radiographer.

5.8.3 Radiographers

1. All radiographers qualifying after 22 February 2008 shall be graduates of the Radiographic Operators Course (A-701-0032), Radiographic Operator/Inspector Course (A-701-0057) or Principles of Radiation Theory and Safety Course (A-701-0044). NAVSEADET RASO shall approve exceptions to this requirement.
2. The classroom training shall include the following subjects:
   a. Fundamentals of radiation safety including:
      (1) Characteristics of gamma radiation.
      (2) Units of radiation dose and quantity of radioactivity.
      (3) Hazards of exposure to radiation.
      (4) Levels of radiation from licensed material.
      (5) Allowable radiation exposure levels.
      (6) As Low As Reasonably Achievable (ALARA) principles, including techniques for maintaining personnel exposures as low as reasonably achievable.
      (7) Methods of controlling radiation dose and review of personnel exposure calculations.
      (8) Results of the annual radiation safety program

review.

b. Radiation detection instruments including:
   (1) Use, inspection, operation, calibration, and limitations.
   (2) Survey techniques.
   (3) Use of personnel monitoring equipment.

c. New or revised procedures.

d. Equipment to be used including:
   (1) Operation and control of radiographic exposure equipment, remote handling equipment and storage containers including pictures or models of source assemblies.
   (2) Storage, control, and disposal of licensed material.
   (3) Inspection and maintenance of equipment.
   (4) New equipment developments.
   (5) Principles and operation of thermoluminescent dosimeters (TLDs) and EPDs and action to take for alarming or faulty EPDs.

e. The requirements of pertinent regulations, including new or revised regulations.

f. Transportation procedures.

g. Observations and deficiencies noted during audits and discussion of any significant incidents involving radiography.

h. Specific instruction about prenatal exposure risks to the developing embryo and fetus. This shall include requirements of NAVMED P-5055 and applicable information in NRC Regulatory Guide 8.13 “Instruction Concerning Prenatal Radiation Exposure.”

i. Case histories of accidents in radiography.

j. Time for employees to ask safety questions.

3. In addition to the required classroom training, radiographers shall complete a minimum of 320 hours of on-the-job training under the supervision of a qualified radiographer.

4. Radiographers are required to be certified through a third-party radiographer certification program (such as the American Society for Non-Destructive Testing (ASNT) which administers the IRRSP certification process),

after the radiographer has completed the 320 hours of on-the-job training.

5. Radiographers shall receive copies of and instruction in the requirements described in 10 CFR Part 34, 10 CFR Parts 30.7, 30.9, 30.10, the applicable sections of 10 CFR parts 19 and 20, in applicable DOT regulations as referenced in 10 CFR part 71, the NRMP, and the operating and emergency procedures under which the radiographer will perform gamma radiography.
6. Radiographers shall pass a 50 question, closed book, oral or written examination on gamma radiography operating and emergency procedures with a minimum grade of 80 percent.
7. Radiographers shall receive a minimum of four hours training under the supervision of a qualified radiographer on the following:
   a. Use of radiographic exposure device(s).
   b. Use of sealed sources.
   c. Use of survey instruments to include a response test using a check source.
   d. Daily visual and operability checks of radiographic exposure devices and associated equipment.
8. Radiographers shall demonstrate competence to the RSO, ARSO, or senior radiographer in the use of radiographic equipment by passing a practical examination that includes a written examination consisting of 5-10 questions on each of the topics in Section 5.8.3.7 above with a minimum score of 80 percent.
9. Radiographers who hold third party certification prior to Department of the Navy employment may be granted qualification at the discretion of the NAVSEADET RASO after completion of Section 5.8.3.4 through 7 listed above, and a satisfactory evaluation during an actual radiographic operation per Section 5.8.7. The evaluation shall be documented in the individual’s training records.

5.8.4 **Radiographer’s Assistants**

1. The command shall not permit any individual to act as a radiographer's assistant until the individual:
   a. Has received training on the subjects in Section

5.8.3.2 and has received copies of and instruction in the requirements described in 10 CFR Part 34, 10 CFR Parts 30.7, 30.9, 30.10, the applicable sections of 10 CFR parts 19 and 20, in applicable DOT regulations as referenced in 10 CFR part 71, the NRMP and the operating and emergency procedures under which the radiographer's assistant will perform gamma radiography.

b. Has demonstrated understanding of the instructions provided by successfully completing a 25-50 question, closed book, written examination on the items in Section 5.8.4.1.a with a minimum grade of 80 percent.

c. Has developed competence to use, under the direct supervision of a qualified radiographer, the radiographic exposure devices, sealed sources, associated equipment, and radiation survey instruments.

d. Has demonstrated competence in the use of gamma radiography equipment by successful completion of a practical examination consisting of 5-10 questions on each of the topics in Section 5.8.4.1.c above with a minimum score of 80 percent.

5.8.5 Radiographers and Radiographer’s Assistants Refresher Training

1. The command shall provide annual refresher training for each radiographer and radiographer's assistant at intervals not to exceed 12 months.
2. Annual refresher training shall cover the subjects in Section 5.8.3.2.
3. Successful completion shall be demonstrated by the radiographers and radiographer’s assistants attaining a minimum score of 80 percent on a written examination.
4. Personnel who do not achieve a passing grade shall be re-instructed in deficient areas and given additional questions in the deficient areas until a passing grade is achieved.

5.8.6 Barrier Monitors

1. Prior to assignment as a BM, and annually thereafter, personnel shall receive training on the subjects listed below.

a. Survey instrument operation.
b. Boundary survey techniques.
c. Allowable radiation levels for radiation area boundaries.
d. Requirement to keep personnel from crossing boundaries into radiation areas, except during emergencies.
e. Requirements for controlling high radiation and preventing entry by unauthorized personnel.
f. Proper communication methods with the RIC during operations.
g. Principles and operation of TLDs and EPDs and action to take for alarming or faulty EPDs.
h. Relative risk associated with exposure to ionizing radiation.
i. Specific instruction about prenatal exposure risks to the developing embryo and fetus. This shall include requirements of NAVMED P-5055 and applicable information in NRC Regulatory Guide 8.13 "Instruction Concerning Prenatal Radiation Exposure."
j. As low as reasonably achievable (ALARA) principles and techniques.

2. The duration of the training shall be determined by the command RSO. This training shall be conducted and documented by the RSO or designated representative.

3. Successful completion of initial and refresher BM training shall be demonstrated by the BM attaining a minimum score of 80 percent on a written examination. The BM shall also demonstrate the proper checks and use of survey instruments to be used.

4. Qualified radiographers or radiographer's assistants may serve as BMs without completing this additional training.

5.8.7 Radiographer and Radiographer's Assistant Evaluations

1. Evaluations of each radiographer and radiographer's assistant shall be conducted at six-month intervals. If the evaluation is due and there is no work scheduled, the evaluation shall occur at during the next radiographic operation.

2. The evaluation shall be performed by the RSO or the ARSO(s) if qualified or by a senior radiographer or other radiographer if designated in writing by the RSO.
3. The evaluation shall include an observation of the performance of each radiographer and radiographer's assistant during an actual industrial gamma radiography operation.
4. If a radiographer or radiographer's assistant has not participated in an industrial radiography operation for more than six months since the last evaluation, the radiographer shall demonstrate knowledge of the training requirements of Section 5.8.3.7 or the radiographer's assistant shall demonstrate knowledge of the training requirements of Section 5.8.4.1.c by practical examination before he or she can participate in a radiographic operation.
5. PRI exposures (for radiography or surveys), temporary job site exposures, source exchanges, or any time the source assembly is removed from the radiographic exposure device (maintenance) are considered radiographic operations that may be used to perform the evaluation.
6. The individual undergoing evaluation shall perform several duties that demonstrate a range of skills expected of a radiographer or radiographer's assistant such as overall control of an operation, manipulation of the source, and radiographic exposure device surveys (surveying boundaries during an operation is not adequate for evaluation if it is the only function an individual performed). The individual shall be evaluated only on the attributes they actually perform.
7. The radiographer or radiographer's assistant shall be evaluated on a sufficient number of the following attributes such that the evaluator can conclude that the person has demonstrated he/she follows procedures and uses all equipment properly.
   a. Properly following operating procedures.
   b. Knowledge of emergency procedures.
   c. Performance of radiation survey instrument daily checks including response checks.
   d. Proper use of survey instrument.
   e. Proper use of TLDs and EPDs and knowledge of actions

to take for faulty or alarming EPDs.

f. Performance of interlock checks (if applicable), verification of proper operation of warning lights, and proper radiological postings.

g. Performance of pre-brief to all BMs for temporary job sites.

h. Conduct or direct the conduct of surveys for temporary job sites or permanent radiographic installations.

i. Proper control of radiographic exposure device keys.

j. Proper survey of the radiographic exposure device at conclusion of an exposure.

k. Use of ALARA principles.

l. Proper completion of all logs and records.

m. Proper completion of the calculations for determining the location of the radiation and high radiation area boundaries during temporary job site operations (if applicable).

n. Establishment and control of radiation and high radiation area boundaries for temporary job site operations (if applicable).

8. Failure to properly perform the items in Section 5.8.7.7 above during the exposure evaluation shall result in an immediate disqualification of an individual as a gamma radiographer or radiographer’s assistant, pending remedial training, and re-qualification by the RSO.

9. All remedial training and test results shall be documented in the radiographer or radiographer’s assistant training file.

10. A single evaluation at either a PRI or temporary job site operation satisfies the requirement for a periodic evaluation.

11. Any individual who acts as the RIC during gamma radiography operations shall have a current evaluation or be undergoing an evaluation.

12. Two individuals may be evaluated in a single operation by rotating or exchanging roles for different exposures. (A typical radiographic operation involves more than one exposure. For example, a source exchange consists of two separate operations. Placing the old source in the source changer is one operation and retracting the new

source into the radiographic exposure device is another.)

13. Evaluation checklists shall include the requirements of Section 5.16.3.

5.8.8 Annual Drill

1. A simulated accident drill shall be conducted at least annually to meet the requirements of Section 2.23.2.5.
2. The drill shall be a typical, realistic job situation and require demonstration of techniques for maintaining exposures ALARA and performance of personnel dose calculations.
3. Drills and de-briefs after the drill can be used to satisfy some of the refresher training requirements in Section 5.8.5.

5.9 Operating and Emergency Procedures

5.9.1 General Requirements

1. General requirements for operating and emergency procedures are provided in Section 2.14.
2. Operating and emergency procedures shall include, as a minimum, instructions in the following:
   a. Appropriate handling and use of licensed sealed sources and radiographic exposure devices so that no person is likely to receive radiation doses in excess of the limits in Section 2.3.
   b. Methods and occasions for conducting radiation surveys.
   c. Methods for controlling access to radiographic areas.
   d. Methods and occasions for locking and securing radiographic exposure devices, transport and storage containers, and sealed sources.
   e. Personnel monitoring and the use of personnel monitoring equipment.
   f. Transporting sealed sources to field locations, including packing of radiographic exposure devices and storage containers in the vehicles, placarding of vehicles when needed, and control of the sealed sources during transportation (refer to 49 CFR 171-

173).

g. The inspection, maintenance, and operability checks of radiographic exposure devices, survey instruments, transport containers, and storage containers.
h. Steps that must be taken immediately by radiography personnel in the event an EPD alarms unexpectedly.
i. The procedure(s) for identifying and reporting defects and noncompliance, as required by 10 CFR 21.
j. The procedure for notifying proper persons in the event of an accident.
k. Minimizing exposure of persons in the event of an accident.
l. Source recovery procedure if the command is allowed to perform source recovery per their NRMP.
m. Maintenance of records.

5.9.2 Notification List

1. A current emergency telephone notification list shall be maintained, which lists personnel to be notified in order of notification priority and includes duty and off-duty contact numbers.
2. When an emergency event occurs, the RIC shall notify the Command Duty Officer (CDO), the senior radiographer, and the RSO or the next available person on this list. The RSO shall notify the Commander, Commanding officer (CO), or Officer in Charge (OIC).
3. The emergency notification list shall be prominently posted in the PRI.
4. The emergency notification list shall always accompany a radiographic source when in the possession of the command outside of the PRI.

5.9.3 Emergency Procedures

1. Emergency procedures submitted as part of the NRMP application shall include provisions for the following events:
   a. A work site emergency (such as fire, flooding, or personnel accidents).
   b. Damage to or malfunction of a radiographic exposure device or radiographic equipment.

c. Boundary violations or exposure to unmonitored personnel.
d. Vehicle accident.
e. Boating accident if a source is transported by watercraft.
f. Loss of source.
g. Lost, damaged, or questionable personnel monitoring devices.

2. Emergency procedures shall be maintained current and available at all PRIs and temporary job sites.

5.10 Personnel Dosimetry

1. All personnel assigned to or associated with gamma radiography operations are required to wear a primary dosimeter approved by BUMED per Section 2.6.
2. When not in use, primary dosimeters shall be stored in an area with low background radiation levels.
3. All personnel participating in gamma radiography operations (including BMs) shall wear one primary dosimeter and one secondary dosimeter (EPD). The EPD is required to alarm when the radiation dose rate exceeds 200 mrem/hr (2 mSv/hr) or the total dose exceeds 200 mrem (2 mSv).
4. The use of secondary dosimeters shall be documented and records maintained per Section 2.26.2.

5.11 Radiation Surveys

5.11.1 Radiation Survey Instruments

1. RASP approved survey instruments supporting gamma radiography shall be calibrated at least every six months and after each repair or servicing.
2. Survey instruments, whose last calibration date exceeds six months, shall be removed from service, and shall not be used.
3. Radiation survey instruments shall be response checked for proper response to radiation, following NAVSEA RADIAC Program Office approved procedures, prior to the first use of the day or shift.

   a. Instruments that fail to respond within the

acceptable response range shall not be used and shall be returned to the RADIAC calibration laboratory for re-calibration or repair.

b. Such instruments shall be labeled out of commission (OOC) to prevent use until repaired or re-calibrated.

c. Satisfactory response checks shall be annotated in the utilization log.

5.11.2 General Requirements

1. Radiation surveys shall be conducted with RASP approved survey instruments that are capable of measuring 2 mrem/hr to 1,000 mrem/hr (0.02 mSv/hr to 10 mSv/hr). Survey instruments used for radiography shall stay on the upper limit of the scale(s) when exposed to radiation levels beyond the range of the instrument.
2. A qualified radiographer, or radiographer’s assistant under the personal supervision of a qualified radiographer, shall conduct radiation surveys of radiographic exposure devices and source changers.
3. Radiation area boundary verification surveys shall be conducted by radiographers or radiographer’s assistants.

5.11.3 Radiographic Exposure Device Removal From and Return to Storage

1. A radiation survey shall be conducted on the radiographic exposure device each time it is removed from storage and prior to each time it is placed in storage. The purpose of this survey is to ensure the source assembly is in the radiographic exposure device and is properly shielded.
2. The radiation survey of the radiographic exposure device shall include a survey of all six sides of the radiographic exposure device including the top and bottom with the shipping plug installed or outlet port cover closed.

   a. This will require that the radiographic exposure device be placed on its side in order to survey the bottom surface.

   b. The only exception to this requirement applies to the AEA Technology/QSA Model 680 radiographic exposure device because the weight of this device precludes

surveying the bottom surface.

3. Radiation levels shall not exceed 200 mrem/hr (2 mSv/hr) at any exterior surface and 10 mrem/hr (0.1 mSv/hr) at one meter from any exterior surface with the source assembly in the shielded position.
4. If these levels are exceeded, follow the emergency procedures for damage to or malfunction of a radiographic exposure device or radiography equipment.
5. Record the result of this survey on the respective utilization log or survey record when the radiographic exposure device is removed from storage and prior to return to storage.

5.11.4 Shipping Package Prior-to-Transport Survey

1. Prior to shipping a source, the radiographic exposure device shall be placed in an over-pack, if applicable, and a radiation survey shall be performed over the entire circumference (including the bottom) on contact with the shipping package.
2. The maximum radiation level at one meter from the shipping package shall be measured and recorded as the transport index (TI) as defined in 49 CFR 173.403.

5.11.5 After Each Radiographic Exposure

1. A radiation survey shall be conducted after each radiographic exposure to ensure that the source assembly has been returned to its shielded position.
2. A quick scan survey shall be conducted of the entire circumference of the radiographic exposure device (excluding the bottom) and the source guide tube(s), including source stop and collimator (when used).
3. The highest reading identified during the quick scan shall be recorded on the utilization log.

5.11.6 Temporary Job Site Boundaries

1. During the first exposure of the day or shift, the radiation levels at the radiation area boundary shall be verified and adjusted as required to ensure that the radiation levels do not exceed 2 mrem/hr (except as noted in Section 5.4.5.3).

2. The radiation area boundary shall be adjusted as necessary to maintain radiation levels in the unrestricted areas less than 2 mrem/hr (0.02 mSv/hr) by a qualified radiographer or radiographer's assistant. BMs shall not move boundaries.
3. If conditions change substantially (e.g., removal of collimator or redirecting primary beam) during radiographic operations, the radiation levels at the radiation area boundary shall be verified and adjusted as necessary. Ensure any radiation levels exceeding the requirements of Section 5.17.1 are properly reported.
4. A radiation survey shall be conducted at the control assembly with the source exposed and recorded on the utilization log.

5.11.7 **Temporary Job Site Storage**

1. Whenever the radiographic exposure device is stored at a temporary job site, a radiation survey of the exterior of the storage area shall be conducted and the results shall be recorded on the utilization log.
2. Radiation levels on the exterior of the storage area shall not exceed 2 mrem/hr. Radiation levels shall also be controlled such that the dose to an individual member of the general public shall not exceed 100 mrem (1 mSv) in a year.

5.11.8 **Permanent Radiographic Installation**

1. A radiation protection survey, as described in Section 2.21, of the accessible unrestricted area around the PRI shall be conducted:
   a. When a new source assembly is received with a source strength greater than the source strength of any previously documented radiation protection survey. Alternatively, the new source assembly shall remain in the shipping container until it has decayed below the activity of the source assembly in the previously documented survey.
   b. After any structural repairs or changes in shielding to the PRI.
   c. After any change to the PRI (including occupancy) that could result in radiation levels exceeding 2

mrem/hr (0.2 mSv/hr) at 30 cm (1 foot) from the outside surface of the PRI or 100 mrem (1 mSv) in a year in areas accessible to the general public.

d. Every five years for all active PRIs.

2. Each accessible unrestricted area shall be surveyed during exposures to ensure all potential source orientations in the PRI are evaluated without the use of collimators.

3. If radiation levels exceed 2 mrem/hr (0.02 mSv/hr) at 30 cm (one foot) from the outside surface of the PRI, complete one of the following actions:

   a. Set radiation area boundaries during radiographic exposures and conduct radiography as if the PRI is a temporary job site.

   b. Correct PRI shielding to reduce radiation levels to less than 2 mrem/hr (0.02 mSv/hr) at 30 cm (one foot) and 100 mrem (1 mSv) in a year at the accessible unrestricted area. Changes shall be approved by the RSO.

   c. Control the source assembly in the PRI by use of a collimator on all shots or by restricting the source location to reduce radiation levels to less than 2 mrem/hr (0.02 mSv/hr) at 30 cm (one foot) and 100 mrem (1 mSv) in a year at the accessible unrestricted area. Such restrictions shall be specified in writing and approved by the RSO.

   d. Temporarily restrict the duration of gamma radiography operations to reduce radiation levels to less than 2 mrem/hr (0.02 mSv/hr) at 30 cm (one foot) and 100 mrem (1 mSv) in a year at the accessible unrestricted area. The RSO shall approve such restrictions in writing.

4. PRI radiation protection surveys shall be retained indefinitely.

5.11.9 **Source Changer Removal From and Return To Storage**

1. The source changer shall be surveyed upon removal from and prior to placement in storage.

2. The entire circumference (including the bottom) shall be surveyed.

3. The results of the survey shall be documented.

5.11.10 **Source Assembly Exchange**

1. The entire circumference of the radiographic exposure device and source changer (excluding the bottom) and the source guide tube shall be surveyed after transfer of a source assembly from the radiographic exposure device to the source changer or from the source changer to the radiographic exposure device.

Note: The survey is to ensure the source assembly has been properly transferred and is in the fully shielding position after transfer. Abnormal readings (low or high) or sharp increases in radiation levels during the approach indicate the source may not be fully shielded.

2. Radiation levels shall not exceed 200 mrem/hr (2 mSv/hr) on any surface of the radiographic exposure device or source changer and 10 mrem/hr (0.1 mSv/hr) at one meter.
3. If these levels are exceeded, follow the emergency procedures for damage to or malfunction of a radiographic exposure device or radiography equipment.

5.12 **Transportation**

5.12.1 **General Requirements for Transport Within a Command**

1. A radiographer, or radiographer’s assistant, shall be present and maintain custody of the radiographic exposure device at all times.
2. Ensure the shipping plug is in place or the outlet port cover is closed prior to and during movement.
3. At least two operable radiation survey instruments shall accompany the radiographic exposure device.
4. An emergency notification list shall accompany the radiographic exposure device. The personnel listed shall be notified if any unexpected delay occurs.
5. Radiographic exposure devices shall not be hand carried unnecessarily.
6. Sufficient support equipment (rope, caution signs, etc.) to establish a radiation area shall be transported with the radiographic exposure device.
7. Before transporting any radiographic exposure device

onto a ship, the RIC shall obtain permission from the CDO, Officer of the Deck (OOD), or other ship's representative.

8. When the radiographic exposure device is transported over water and the potential exists for the radiographic exposure device to enter the water:
   a. A buoy shall be securely attached to the device using line of sufficient length (minimum 50 ft.).
   b. A sonar pinger shall also be attached to aid in recovery in the event of a mishap.
   c. The buoy shall be painted or marked with words stating, "MARKER BUOY, SUNKEN RADIOACTIVE MATERIAL, DO NOT DISTURB." The buoy should be visible in the event that the source is not visible due to bottom silt or obstructions.
9. The radiographic exposure device shall be surveyed upon arrival to ensure that the source is still in a safe condition.
10. Only government owned vehicles shall be used.
11. The radiographic exposure device shall be firmly secured in the vehicle.
12. Radioactive material shall not be transported in the same vehicle with Class 1 hazardous materials, except for depleted uranium munitions as explained herein. Radioactive material may be transported with Class 2.1 hazardous materials only if 49 CFR 177.848(e)(3) requirements are met. Depleted uranium ammunition may only be shipped in accordance with a current special permit issued to the Department of Defense by the Department of Transportation (i.e. DOT-SP-9649). A current copy of the special permit shall be carried aboard each cargo vessel or motor vehicle used to transport packages covered by the special permit.
13. Except for the vehicle operator(s), no personnel outside the RASP program shall be a passenger in the vehicle.

5.13 Radiographic Exposure Devices

1. Commands authorized to perform gamma radiography shall only use radiographic exposure devices and shipping containers authorized by their NRMP.

2. Radiographic exposure devices and source changers shall have a label that includes command information required by 10 CFR 34.35, and a Navy control number issued by NAVSEADET RASO.

5.14 Procurement and Receipt of Radiography Sources

1. The RSO shall review and approve the procurement of radiography sources to ensure compliance with the NRMP.
2. The supply document (if applicable) shall be annotated to ensure that a system of package tracking is used.
3. When receipt of a radiography source is anticipated, the RSO shall ensure coordination with the designated supplier to receive prompt notification of the shipment and proper receipt of the source.
4. Only a qualified radiographer shall receive a radiography source.
5. Before transfer, obtain a current copy of the NRMP, NRC license, or Agreement State license from the command or licensee receiving the radiography source that verifies that the receiving entity is approved to receive it. The term "transfer" refers to a transfer of custodial responsibility.

5.15 Surveillance Program

1. The RSO or ARSO shall perform surveillances of the gamma radiography program each quarter per Section 2.9.2.
2. These surveillances shall include observation of actual radiographic operations if conducted during the quarter.
3. Evaluations conducted per Section 5.8.7 may be counted as a surveillance. If the senior radiographer or other radiographer is designated to perform evaluations per Section 5.8.7, the RSO or ARSO shall periodically observe evaluations performed.

5.16 Records

5.16.1 General Requirements

Log and record requirements in this section are in addition to the record requirements specified in Section 2.26.

5.16.2 **Training Records**

1. RSO and ARSO Training and Qualification
   a. Initial and refresher training records for the RSO and ARSO(s) shall be retained as described in Section 2.26.5.
   b. Qualification records shall consist of letters of appointment and copies of course certificates or a memorandum stating successful completion of RSO training requirements and the documentation of experience that meet the requirements of Section 5.8.1.
2. Senior Radiographer Training and Qualification
   a. Initial and refresher training records for the senior radiographer shall be retained as described in Section 2.26.5.
   b. Qualification records shall consist of a copy of the letter of designation from the Commanding Officer, and verification of formal training and experience as a certified radiographer.
3. Radiographer Training and Qualification
   a. Initial and refresher training records for the radiographer shall be retained as described in Section 2.26.5.
   b. Qualification records shall consist of verification of formal training, written exam scores, satisfactory completion of a practical exam and independent certification signed by the RSO and the Senior Radiographer. Copies of completed written exams shall be retained.
4. Radiographer’s Assistant Training and Qualification
   a. Initial and refresher training records for the radiographer’s assistant shall be retained as described in Section 2.26.5.
   b. Qualification records shall consist of certificates signed by the Senior Radiographer and the RSO to include verification of formal training, written exam scores, and satisfactory completion of a practical exam. Copies of completed written exams shall be retained.
5. BM Training and Qualification

a. Initial and refresher training records for the radiographer's assistant shall be retained as described in Section 2.26.5.

b. Qualification records shall consist of certificates signed by the senior radiographer and the RSO to include verification of formal training, written exam scores, and satisfactory completion of a practical exam. Copies of completed written exams shall be retained.

6. Training and qualification records shall consist of a memorandum that identifies the date of training, duration of training (hours per subject), individual conducting the training, subjects covered during the training, and names of the individuals who completed the training and copies of completed written exams.

7. A copy of the initial training and qualification records shall be retained for three years after the trained individual leaves the command.

8. Refresher training records shall be retained for three years after the date of completion of the training.

5.16.3 **Radiographer and Radiographer's Assistant Evaluations**

1. A written checklist shall be used to document the evaluation.

2. The checklist shall describe each of the attributes evaluated and the radiographer or radiographer's assistant performance.

3. The checklist shall also include:

   a. Date and time of evaluation.

   b. Name of radiographer evaluated.

   c. Duties performed during the evaluation.

   d. Name and signature of evaluator.

   e. Evaluator's comments.

   f. Signature and date reviewed by the RSO.

4. Records of evaluations shall be maintained for a minimum of three years.

5.16.4 **Utilization Logs**

1. Utilization logs shall be maintained for each PRI used by the command and for each radiographic operation conducted outside of a PRI such as a temporary job site.
2. Utilization logs used in a PRI shall contain, as a minimum, the following information:
   a. A description, including the manufacturer make, model, and serial number of the radiographic exposure device or storage container in which the sealed source is located.
   b. The radioactivity of the source on the day of exposure.
   c. The name(s) and signature(s) of the radiographer(s).
   d. The model and serial number of the survey instrument(s) in use.
   e. Initials of a radiographer or radiographer's assistant verifying that survey instrument(s) has (have) been response checked prior to the initial exposure of the day or shift as appropriate.
   f. The duration of and beam direction for each exposure.
   g. The location of the facility where the source is used.
   h. Initials of a radiographer verifying the check of entrance control devices for proper operation, if installed.
   i. Initials of a radiographer verifying the proper operation of all warning systems.
   j. Date of use, including the dates the radiographic exposure device was removed and returned to storage.
   k. Additional information as required by Section 2.26.15
3. Utilization logs used at temporary job sites or in other than PRIs shall contain, as a minimum, the following information:
   a. A description, including make, model, and serial number of the radiographic exposure device or storage container in which the sealed source is located.
   b. The radioactivity of the source on the day of exposure.
   c. The name(s) of the radiographer(s), signature(s) of the radiographer(s) and signature of the RIC.

d. The model and serial number of the survey instrument(s) in use.

e. Initials of a radiographer or radiographer's assistant verifying that survey instrument(s) have been response checked prior to the initial exposure of the day or shift, as appropriate.

f. The duration of and beam direction for each exposure.

g. The location where the source is used.

h. Date of use, including the dates the radiographic exposure device was removed and returned to storage.

i. A sketch of the radiographic operation area for each exposure or group of repetitive exposures, which shows:

(1) The orientation of the radiography site in relation to fixed reference parameters – magnetic north, ship's bow, etc.

(2) Layout of equipment in the area (control assembly, radiographic exposure device, and source stop or collimator).

(3) Significant structural features that may provide attenuation of the beam.

(4) Approximate high radiation area boundary distance from the exposed source.

(5) Approximate radiation area boundary distance from the exposed source.

(6) The calculated distance from the uncollimated source to the high radiation area boundary and the calculated distance from the source to the radiation area boundary.

(7) The maximum radiation levels as observed at a minimum four points on the radiation area boundary.

(8) Radiation levels at the control assembly with the source exposed.

(9) The names of the radiographic personnel (radiographers, radiographer's assistants and BMs) helping to monitoring the boundaries.

j. Additional information as required by Section 2.26.15.

4. Utilization logs shall be retained indefinitely.

5.16.5 Radiographic Operations Incident Notification and Reports

Incident and emergency records and reports shall be maintained indefinitely.

5.16.6 Records of Inspection and Maintenance of Radiographic Exposure Devices, Transport and Storage Containers and Source Changers

Records of daily, quarterly, and annual checks, inspections, and maintenance performed by the command or an authorized manufacturer’s representative shall be retained for three years after inspection or maintenance.

5.16.7 Surveillance Program

Records of surveillances shall be documented and maintained per Section 2.26.6.

5.16.8 Radiation Survey Instruments

Records of radiation survey instrument calibrations shall be documented and maintained per Section 2.26.9.

5.16.9 Secondary Dosimetry Logs

The use of secondary dosimetry shall be documented and records maintained per Section 2.26.2.

5.16.10 Leak Tests

Leak tests records shall be documented and maintained per Section 2.26.17.

5.16.11 Inventory

Inventory records shall be documented and maintained per Section 2.26.12.

5.17 Reporting Requirements

5.17.1 Notification and Reporting of Radiographic Incidents (10 CFR 34.101)

1. Notification shall be made to NAVSEADET RASO by telephone or by priority message if at sea, within one

working day of the occurrence of any incidents involving radiography equipment listed below.

a. Boundary violations
   (1) Violations of a high radiation area boundary.
   (2) Violation of a radiation area boundary that would allow unimpeded access to a high radiation area.
   (3) Violations of a radiation area boundary which result in a measured exposure of 2 mrem (0.02 mSv) or greater to any individual.
   (4) Any significant mislocation or miscalculation of the radiation area boundary. Report instances where actual radiation levels exceed 20 mrem/hr (0.2 mSv/hr) at the radiation area boundary.

b. Significant violations of procedures during source manipulation such as failure to hook up the guide tube, failure to place the source stop on the guide tube, failure to lock the radiographic exposure device prior to moving it, failure to wear required dosimetry, and failure to immediately retract the source upon notice that a boundary penetration has occurred.

c. Inability to retract the source assembly to its fully shielded position and secure it in that position or extend the source for any reason other than operator error.

d. Failure of any component (critical to safe operation of the radiographic exposure device) to properly perform its intended function (such as drive cable coming off the drive mechanism, drive cable binding, seriously impediment of source assembly movement, failure of the guide tube stop, etc.).

e. Unintentional disconnection of the source assembly from the control cable.

f. Any unplanned exposure to a radiographer or others, caused by failure to retract the source, failure to conduct radiation surveys to verify retraction, or use of improper storage areas.

g. Unless excepted in Section 5.4.5.3, actual exposure of an individual member of the public in an unrestricted area to greater than 2 mrem/hr (0.02 mSv/hr) or 100 mrem (1 mSv) in a year.

h. Unless excepted in Section 5.4.5.3, potential exposure of an individual member of the public in an unrestricted area to greater than 2 mrem/hr (0.02 mSv/hr) or 100 mrem (1 mSv) in a year as determined by using the observed or calculated dose rate and duration of exposure, whether or not anyone was actually exposed.

2. A written report shall be made to OPNAV (N45), copy to NAVSEADET RASO, within 15 days of the event.

3. The report shall include the following:

   a. A description of the equipment problem.
   b. Cause of each incident, if known.
   c. Name of the manufacturer and model number of equipment involved in incident.
   d. Place, time, and date of incident.
   e. Actions taken to establish normal operations.
   f. Corrective action taken or planned to prevent recurrence.
   g. Qualifications of personnel involved in this incident.

5.17.2 **Annual Reporting of Individual Monitoring**

1. Each command shall submit an annual individual monitoring report in the format required by 10 CFR 20.2206 to NAVSEADET RASO prior to 31 March for the preceding year.

2. Information shall be provided only for individuals monitored for exposure required by 10 CFR 34.47(a).

3. Records shall be retained for three years.

5.17.3 **Reporting Defects and Noncompliance**

1. General reporting requirements are provided in Section 3.3.

2. The RSO shall evaluate all inspection and maintenance deficiencies and all compliance inspection deficiencies for defects, deviations, or noncompliance (failure to comply) with any applicable NRC regulation or order which could create a substantial safety hazard of an ongoing or recurring nature.

3. The criteria for determination of the existence of a substantial safety hazard include major degradation of essential safety related equipment, which could allow the exposures or releases above to occur. This equipment includes, but is not limited to, the following:
   a. Source Pigtail.
   b. Source Connector.
   c. Source Drive Cable.
   d. Radiographic Exposure Device Lock.
   e. Radiographic Exposure Device Shielding.
   f. Such degradation does not include wear and tear, which results from normal use.
4. The evaluation and the record of evaluation should include the following:
   a. Sufficient information to describe the deviation.
   b. Analysis of the effects of the defect, deviation or noncompliance.
   c. A conclusion based on the analysis as to whether the defect, deviation, or noncompliance could create a substantial safety hazard. The conclusion shall be recorded.
   d. Record of any corrective action that has been, is being, or will be taken.
   e. All records shall be maintained in accordance with 10 CFR 21.
5. All defects, deviations and noncompliance which could cause a substantial safety hazard shall be reported immediately to NAVSEADET RASO, followed by a written report within 15 days of the determination to OPNAV(N45), NAVSEASYSCOM (NAVSEA 04N), and NAVSEADET RASO.

SECTION 6 – **RADIATION DETECTION, INDICATION, AND COMPUTATION (RADIAC) CALIBRATION LABORATORY OPERATIONS**

6.1 **Introduction**

This section establishes specific requirements for RADIAC calibration laboratories that are in addition to the general requirements in Section 2 and any applicable Naval Radioactive Material Permits (NRMP).

6.2 **Responsibilities**

6.2.1 **Radiation Safety Officer (RSO)**

1. The RSO shall ensure that the following elements of the RASP are accomplished:
   a. Physical inventory checks, radiation surveys, and contamination surveys are performed and documented.
   b. Operating and emergency procedures are written and updated.
   c. Leak tests are performed by qualified personnel as required by conditions in an NRMP.
   d. All RADIAC calibration personnel receive required initial and refresher radiation safety training. If not personally conducting the training, monitor training provided by the senior RADIAC calibration technician or RADIAC calibration laboratory supervisor.
   e. Applications for amendment or renewal of NRMPs are submitted when required by Section 3.
2. All other pertinent requirements and responsibilities of an RSO as specified in this manual are accomplished.

6.2.2 **Senior RADIAC Calibration Technician and RADIAC Calibration Laboratory Supervisor**

1. The senior RADIAC calibration technician or RADIAC calibration laboratory supervisor shall perform or ensure qualified personnel perform the following functions:
   a. Daily, prior-to-use inspections of calibration sources and related equipment such as, interlocks,

warning lights, and audible alarms.

b. Conduct operations per approved operating and emergency procedures, the NRMP, and the requirements of this manual.

c. Inventories and inspections of sources and equipment.

d. Leak tests of calibration sources, if qualified.

e. Initial and refresher radiation safety training of RADIAC calibration personnel approved by the RSO.

f. Physical inventory checks, radiation surveys, and contamination surveys of calibration sources and work areas.

g. Contamination surveys of all incoming RADIAC instruments.

2. The senior RADIAC calibration technician or RADIAC calibration laboratory supervisor shall notify appropriate personnel, such as the RSO, security, fire department and appropriate supervisors of any planned overnight or unattended calibration operation.

6.2.3 **RADIAC Calibration Technician**

1. The RADIAC calibration technician performs the following functions:

a. Daily, prior-to-use inspections of calibration sources and related equipment such as interlocks, warning lights, and audible alarms.

b. Conduct operations per approved operating and emergency procedures, the NRMP, and the requirements of this manual.

c. Inventories and inspections of sources and equipment.

d. Leak tests of calibration sources under the direction of the senior RADIAC calibration technician or RADIAC calibration laboratory supervisor, if qualified.

e. Physical inventory checks, radiation surveys, and contamination surveys of calibration sources and work areas.

f. Contamination surveys of incoming RADIAC instruments.

6.3 **Training**

1. The RASP RSO shall be trained in accordance with Section 2.8.3.

2. All personnel who operate RADIAC calibrators, directly supervise calibrator operations, or perform leak tests shall complete 40 hours of training in a Radiological Health and Safety course, or in a NAVSEA 04ND approved RADIAC Instrument Calibration Course, and training in local operating and emergency procedures prior to assuming those duties and prior to designation in an NRMP. For training other than a NAVSEA 04ND approved RADIAC Instrument Calibration Course, a complete course description and curriculum outline shall be submitted to NAVSEADET RASO for approval prior to individuals performing any unsupervised job functions.
3. RADIAC calibration technicians and the RADIAC calibration laboratory supervisor shall be trained as radiation workers per Section 2.8.4.
4. Annual refresher training shall be conducted for all personnel in accordance with Section 2.8.

6.4 Radiological Surveys

6.4.1 Radiation Surveys

1. A radiation survey of all accessible spaces adjacent to each calibration room shall be performed at least semiannually.
2. All gamma and neutron calibration source(s) that could be exposed simultaneously shall be fully exposed during the survey.
3. The record of survey shall contain the information specified in Section 2.26.19.

6.4.2 Contamination Survey

1. A contamination survey of all areas where potentially contaminated instruments or sources are handled or stored shall be conducted at least weekly.
2. The record of survey shall contain the information specified in Section 2.26.18.
3. A record of surveys shall be maintained indefinitely.

6.4.3 Facility Radiation Survey

1. A complete radiation survey of the facility and all

accessible spaces adjacent to each calibration room shall be performed in accordance with Section 2.21.4 by the RSO or a qualified individual after any of the following:

a. Receipt of a new source with higher activity than the old source.
b. Any modifications to the room that result in changes to the shielding integrity.
c. After any significant changes in conditions from the initial facility radiation survey which could adversely affect radiation safety, e.g. facility modification or damage, change in operating parameters (isotope, increase in activity, or time).
d. Other actions that may increase the potential for exposures outside the exposure room.

2. A copy of the survey report shall be forwarded to NAVSEADET RASO for approval.
3. Approved survey reports shall be maintained as a permanent record by the calibration laboratory.

6.5 Source Inventory, Inspection, and Maintenance

6.5.1 Inventory

1. A physical inventory of all radioactive commodities and radioactive material authorized by an NRMP held by a calibration laboratory shall be conducted at least semi-annually.
2. The inventory shall contain the information required by Section 2.26.12, shall be documented per Section 2.13.3, and include a legible signature accompanying the name of the person performing the inventory.
3. Radioactive check sources containing exempt quantities of radioactive material contained in RADIACs that are held by a laboratory for calibration or repair need not be reported on the semi-annual source inventory. These sources are accounted for separately by inventory control records generated by the stocking activity when the RADIAC is issued to the end user.

6.5.2 Inspection and Maintenance

1. Daily or prior-to-use, all calibrators, interlocks,

audible and visual warning devices, and all other safety devices shall be checked for proper operation.

2. If any device does not operate, it shall be repaired prior to performing calibrations.
3. A record of preoperational checks shall be maintained for three years.
4. Maintenance and repair of calibrators, interlocks, warning devices, and other safety related devices shall only be performed by personnel determined by the RSO to be appropriately qualified.
5. Records of maintenance shall be maintained for three years.
6. All shields, interlocks, and other safety devices shall be inspected by personnel who are knowledgeable in their design, operation, and maintenance.

6.6 **Receipt, Survey, and Decontamination of RADIACS**

1. Each radiation survey instrument presented to a calibration facility shall be surveyed for contamination before the instrument is accepted into the laboratory.
2. Contamination levels shall not exceed the levels in Table 2-2.
3. Any instrument, carrying case or component found to be contaminated during the receipt survey shall be sealed in a polyethylene or polyurethane bag or suitable container and segregated from non-contaminated items as soon as practicable.
4. A record of all contaminated items shall be maintained. The record shall contain at least the following information:
   a. Date and time of receipt.
   b. Nomenclature and serial number of item.
   c. Command from which received.
   d. Contamination level when received.
   e. Date and time of decontamination, if applicable.
   f. Contamination level at termination of decontamination operation, if applicable.
   g. Disposition of item.
   h. Name and signature of individual performing

decontamination.

5. Items which cannot be decontaminated to acceptable levels shall be disposed of as low-level radioactive waste as directed by NAVSEA 04ND.
6. Activities handling radiation survey instruments with accompanying check sources shall maintain a custody control log showing from whom such survey instruments are received and to whom they are transferred.
7. The command that shipped the contaminated instrument(s) shall be immediately notified so that a contamination survey of their operations is conducted.

6.7 **Personnel Dosimetry**

1. Primary dosimeters shall be worn in accordance with Section 2.6.2.
2. Personnel who operate an AN/UDM-1A or 1B calibrator shall wear an electronic personal dosimeter (EPD) per Section 2.6.3

6.8 **Operating and Emergency Procedures**

1. Operating and emergency procedures shall be established, in writing and be command endorsed, for each type of permitted calibration source or generic procedures of non-permitted source sets per Section 2.14.
2. The instructions shall include, as a minimum, detailed operating procedures for each type of permitted calibrator utilized and detailed emergency procedures for all reasonably foreseeable emergency conditions that may be encountered.
3. Any change in the operating or emergency procedures shall require an amendment to the NRMP.
4. Each calibration laboratory shall conduct at least one emergency drill annually.
5. The drill shall be based on one or more of the emergency situations outlined in the emergency procedures and shall include participation by fire department and other emergency response personnel.
6. The results of the drill shall be documented in a report and deficiencies documented in the RASP Deficiency Report (RDR) program per Section 2.11.

6.9 Source Leak Tests

1. Calibration sources shall be leak tested in accordance with Section 2.19 or as specified in an NRMP.
2. A copy of the leak test results shall be maintained by the calibration facility indefinitely and included with the calibration certificate when the instrument is returned to the using command.
3. Calibration sources and instrument check sources that fail the leak test shall be disposed of in accordance with the procedures outlined in NAVSEA SE700-AA-MAN-100/RADIAC.

6.10 Audits and Surveillances

Audits and surveillances of RADIAC calibration laboratory RASP operations shall be conducted per the requirements of Section 2.9.

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SECTION 7 - **OTHER SOURCES OF IONIZING RADIATION**

7.1 **Gas Chromatographs**

7.1.1 **Introduction**

Gas chromatographs use millicurie (mCi) amounts of radioactive material, commonly nickel-63 (Ni-63) or tritium (Hydrogen-3), under a general license from the NRC or an NRMP.

The provisions and requirements of this section are in addition to, and not in substitution for, other requirements of this manual. In particular, the requirements and provisions of Sections 2, 3, 6, and 14 that apply to the control, usage, storage, labeling of generally licensed and exempt material devices and any applicable Naval Radioactive Materials Permits (NRMPs).

7.1.2 **Requirements**

1. Gas chromatographs, which are generally licensed, shall be used in accordance with the Generally Licensed Devices paragraphs of Section 14. Gas chromatographs that require a specific license shall be used in accordance with the NRMP.

2. Gas chromatograph detector cells shall be secured against unauthorized access when not in use.

3. Gas chromatographs shall be vented to the outside atmosphere or to a fume hood which is vented to the outside atmosphere when:

   a. containing titanium or scandium tritide foils;

   b. using tritium (Hydrogen-3); or,

   c. when required by the manufacturer.

   If vented to a fume hood, the fume hood exhaust shall be operating whenever the gas chromatograph is operated.

4. If a gas chromatograph malfunctions or is damaged in a manner that could result in vaporization or damage to the radioactive source, then the unit shall be secured and the RSO notified.

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SECTION 8 – **TYPE A BROAD SCOPE PERMIT CONDITIONS**

8.1 **Introduction**

Type A Permits of Broad Scope differ from all other types of radioactive materials permits in that they allow much more latitude in choice of quantities and types of radioactive sources, and because they are based primarily on administrative procedures and organizational qualifications of the command to operate safely rather than on a detailed review of the qualifications, equipment, and procedures of the user and detailed limitations established by a Naval Radioactive Materials Permit (NRMP).

8.2 **General Requirements**

1. Radioactive material shall only be used by, or under the direct supervision of, individuals approved by the command Radiation Safety Committee (RSC).
2. The command shall establish a comprehensive RASP, which incorporates the requirements of this section and other applicable requirements of this manual.
3. In accordance with 10 CFR 33.17(a), a Type A permit does not authorize the following:
   a. Conduct tracer studies in the environment involving direct release of radioactive material.
   b. Receive, acquire, own, possess, use, transfer, or import devices containing 100,000 curies (3700 terabequerels) or more of byproduct material in sealed sources used for irradiation of materials.
   c. Conduct activities requiring a specific NRMP pursuant to 10 CFR 32, 34, or 35.
   d. Add or cause the addition of byproduct material to any food, beverage, cosmetic, drug, or other product designed for ingestion or inhalation by, or application to, a human being.

8.3 **Organizational Requirements and Responsibilities**

8.3.1 **Radiation Safety Committee**

1. The RSC shall include the radiation safety officer (RSO), a senior manager responsible for implementing the RASP during operations, and individuals qualified by

training and experience from departments using ionizing radiation sources.

2. The management member, or members, should ensure management support of the radioactive materials program and due consideration of the legal interests of the organization.
3. Technical members should have training and experience in the use of radioactive materials and radiation safety, but not necessarily as experienced as the RSO.
4. The RSC shall:
   a. Review and approve, in advance of procurement, proposed uses of sources of ionizing radiation.
   b. Review and approve program and procedure changes for new or modified uses of sources of ionizing radiation in accordance with criteria developed.
   c. Advise on all RASP operations.
   d. Review personnel doses and the ALARA program.
   e. Review radiological incidents.
   f. Perform periodic audits and surveillances. These RSC audits and surveillances are in addition to the RSO audits and surveillances required by Section 2.9.
   g. Delegate authority to approve procurement, transfer, or disposal of radiation sources that are defined as routine.
   h. Qualify individuals as authorized users.
5. The RSC shall meet at least quarterly.
6. The RSC shall meet to act on unresolved or new safety issues, non-routine requests, or uses that require extra command or departmental coordination or cooperation.
7. A quorum of the RSC consisting of the RSO, acting as chairman, and two members qualified by training and experience shall conduct routine RSC business such as approving or disapproving routine procurements or to qualify users.
8. A written record of all committee actions shall be maintained. Records of routine RSC business shall be reported to the full committee at least quarterly.
9. The RSC shall conduct a full review of the RASP annually.

8.3.2 **Radiation Safety Officer**

1. The RSO should have an academic degree in physical or biological science, and considerable professional experience (about five years) with radioactive materials.
2. The RSO shall be responsible for the day-to-day coordination and management of the RASP.
3. The RSO shall report to the Commander, Commanding Officer (CO), or Officer in Charge (OIC) in a staff capacity and shall brief the Commander, CO, or OIC on the entire RASP at least semi-annually.
4. The RSO shall have ready access to all levels of the command organization with the authority to immediately terminate a RASP project if found to be a threat to health, safety, or property and shall report all radiological incidents to the Commander, CO, or OIC.
5. The RSO shall be a full-time assignment supported by a staff commensurate with the program size and complexity.
6. RSO duties shall include:
   a. Maintaining NRMPs and preparing permit applications, amendments, renewals, and reports as required by federal and Navy and Marine Corps directives.
   b. Establishing basic guidelines and advising supervisors and employees in radiation safety.
   c. Coordinating safety evaluations of all proposed uses of radioactive material.
   d. Maintaining routine surveillance and monitoring records of all controlled areas.
   e. Determining compliance with rules and regulations, NRMP conditions, and the conditions of project approvals specified by the RSC.
   f. Maintain procedures and oversee receiving, opening, and delivering all shipments of radioactive material arriving at the command, and receiving, packaging, and shipping all radioactive material from the command.
   g. Maintaining an inventory of all radiation sources.
   h. Supervising and coordinating the radioactive waste disposal program including maintaining waste storage and disposal records and monitoring effluents.

i. Oversee storage of all radioactive materials not in current use, including wastes.
j. Distributing dosimeters and arranging for their processing, determining the need for bioassays, keeping records of personnel exposures and bioassays, notifying individuals and their supervisors of exposures that are approaching Table 2-1 values, and recommending and supervising appropriate remedial action.
k. Performing or arranging for calibration of instruments.
l. Performing independent surveys of radiological areas to verify conditions and work controls.
m. Performing leak tests on sealed sources and maintaining records of leak tests.
n. Conducting training programs and otherwise instructing personnel in the proper procedures before they are allowed to use radioactive material and as required by changes in procedures, equipment, regulations, etc.
o. Maintain records required by this manual, the broad scope NRMP, and those necessary to support decommissioning.

8.4 Safety Evaluations for Use of Radioactive Material

8.4.1 Introduction

10 CFR 33.13(3) requires safety evaluations by the RSC as a key element of administrative control necessary to obtain and administer a Type A Broad Scope Permit. In addition to radioactive material, safety evaluations wi11 also be conducted for machine sources of ionizing radiation and naturally occurring and accelerator produced radioisotopes.

8.4.2 Requirements:

1. Safety evaluations shall be conducted for all nonexempt quantities of radioactive material and other sources of ionizing radiation.
2. Safety evaluations shall be written and include:
   a. Training and experience requirements for project supervisors, and individual users who will use

material without direct supervision.

b. Facilities and equipment, to include the following as appropriate:
   (1) Shielding.
   (2) Containment (hoods, filters, glove boxes).
   (3) Contamination controls.
   (4) Restricted area controls and posting.
   (5) Protective clothing.
   (6) Survey and monitoring instruments.
   (7) Special radioactive material handling or accountability controls.

c. Use protocols.

d. Operating and emergency procedures.

e. Implementation of ALARA principles.

3. Operating and emergency procedures shall be established for all uses of radioactive material containing radioactivity in excess of quantities listed in 10 CFR 30.71 Schedule B.

4. Operating and emergency procedures shall be established and tested prior to procurement or use of radioactive material.

5. All safety evaluations shall be maintained for the duration of the NRMP, including formal review and approval or disapproval by the RSO and RSC.

8.5 Administrative Controls

8.5.1 Introduction

Federal regulations (10 CFR 33.13(3)) requires appropriate procedures to control the procurement and use of radioactive material. The requirements in this section are in addition to other requirements of this manual.

8.5.2 Requirements:

1. The RSC shall be notified in writing in advance of the procurement of all radiation sources (ionizing radiation producing machines, radioactive material requiring an NRMP or accelerator produced radioactive material) and the medical (physical) qualifications, training and experience of proposed users.

2. Individuals who request approval as authorized users shall:
   a. Be qualified by training and experience.
   b. Successfully complete any required medical examinations.
   c. Be certified by the branch and division managers as qualified.
3. Qualification as an authorized user does not imply blanket approval to use other radioactive material or radiation sources.
4. Each source shall be assigned to a custodian and be assigned by source number and location.
5. The custodian shall be an authorized user who has accepted additional responsibility for his branch or division to account for assigned radioactive material and radiation sources.
6. The custodian shall perform periodic inventories, keep records of inventories, and assure only authorized users have access to the radioactive material or radiation sources. He is responsible for knowing the location of all radioactive material and radiation sources and shall be held accountable for loss.
7. Transfer of custodianship of any radioactive material or radiation source shall be approved by the RSC or RSO in accordance with local procedures.
8. All custodians shall inventory and transfer sources to a designated replacement custodian prior to terminating employment at the command.
9. The supply division or persons receiving radioactive material shall notify the RSO as soon as possible after receipt to ensure the package is surveyed within three hours during normal work hours or within three hours of the next normal work day if received after normal work hours.
10. Sources not in use shall be stored in a locked source storage facility controlled by the RSO.
11. Personnel planning to work after normal working hours with sources of ionizing radiation shall request an evaluation and approval by the RSO prior to commencing work.

12. Emergency procedures shall be established and posted in all controlled areas. The emergency procedures shall identify:
    a. Initial response to likely emergencies such as fire, spills, release, or loss of material, or personnel contamination.
    b. Securing the area.
    c. Notifications and requests for assistance.
13. A security plan for radioactive material shall be established and reviewed and updated annually.
14. The security plan shall be distributed to the Commander, CO, or OIC, and RSC members, RSO, department heads, supervisors, and custodians of radioactive material and radiation sources.

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SECTION 9 - **RADIOACTIVE COMMODITIES**

9.1 **Introduction**

9.1.1 **Purpose**

This section outlines procedures and defines responsibilities at all Navy and Marine Corps commands for the control of radioactive commodities.

9.1.2 **Scope**

This section includes standard methods for acquisition, accountability, identification, possession and handling, storage, shipment and transport, and transfer and disposal of radioactive commodities except:

1. Radioactive material associated with the Navy Nuclear Propulsion Program.
2. Nuclear weapons.
3. Radionuclides used for diagnostic or treatment procedures in Bureau of Medicine and Surgery (BUMED) programs.

9.1.3 **General Requirements**

1. NAVSUPINST 4000.34C (MCO P4400.105E) provides guidance for the control of radioactive commodities in the Department of Defense (DoD) Supply System.
2. Typical National Stock Number (NSN) numbered commodities containing radioactive material in the supply system include electronic devices (including electron tubes), luminescent (self-illuminating) devices, ionization devices, commodities containing natural sources, and analytical devices.
3. Use and maintenance of certain radioactive commodities requires an NRMP per Section 3. This requirement is identified when the radioactive commodity is entered into the Hazardous Material Information Resource System (HMIRS) per DoD Instruction (DoDI) 6050.05.
4. Naval Sea Systems Command Detachment Radiological Affairs Support Office (NAVSEADET RASO) is the review and approval authority for all Navy and Marine Corps radioactive commodities entered into HMIRS except for

the situations stated in Section 9.1.2.

5. The use and stocking of radioactive materials in items of supply shall be kept to a minimum consistent with command needs. Practical non-radioactive substitutes shall be procured and used where feasible.
6. Radium shall not be procured or used unless it has been established that a non-radioactive substitute or a less hazardous radioactive substance cannot feasibly be used.
7. Requests to procure or use radium shall be submitted via NAVSEADET RASO to Naval Sea Systems Command (NAVSEA 04N). The request shall include documentation that justifies the need and verifies that a non-radioactive material or a lesser radioactive one is not available or adequate.

9.2 Responsibilities

9.2.1 Commanders, Commanding Officers (COs), and Officers in Charge (OICs)

1. General responsibilities are described in Section 1.5.2.1.
2. Be responsible for and assure safe handling, storage, and shipment of radioactive commodities at their facility.
3. Assure procedures are prepared for handling credible emergencies with radioactive commodities during receipt, use, storage, maintenance, and shipment.
4. Assure compliance with this manual, pertinent Navy and Marine Corps directives, conditions of applicable NRMPs or NRC licenses, and applicable federal regulations governing the use, control, and accountability of radioactive commodities at their facilities.
5. Be responsible for control and accountability of radioactive commodities at their facilities.
6. Appoint, in writing, individuals qualified by training and experience per Section 2 to act as radiation safety officer (RSO) and assistant radiation safety officer (ARSO) with prime functional responsibility for the command RASP.
7. Ensure that all required records and reports are

maintained and submitted in a timely manner.

8. Ensure that discrepancies between published data concerning radioactive commodities and data determined by examination at the command are reported per Section 2.27.
9. Assure that radioactive commodities received for repair, maintenance, or disposal are marked per MIL-STD-129P (Military Standard Marking for Shipment and Storage), prior to return to stock or use.
10. Ensure that areas where radioactive commodities are used or stored are posted, and surveyed per Sections 2.16 and 2.21.
11. Ensure that written operating and emergency procedures for handling, receipt, storage, maintenance, shipment, and disposal of radioactive commodities are prepared and posted in all work areas to which they apply, and that personnel are trained in these procedures.
12. Comply with all applicable directives for the disposal of excess, surplus, and condemned radioactive commodities and associated radioactive waste.

9.2.2 Radiation Safety Officer

1. General responsibilities are described in Section 1.5.2.2.
2. RSOs shall:
   a. Conduct radiation and contamination surveys as necessary to evaluate specific potential hazards where radioactive commodities are used or stored.
   b. Ensure that excess, surplus, and condemned radioactive commodities are disposed of in a timely manner.

9.3 RASP Requirements for Radioactive Commodities

9.3.1 General Requirements

1. Commands implementing a RASP for radioactive commodities only shall implement the applicable requirements in Section 2. Contact NAVSEADET RASO for assistance in determining applicability.
2. Additional specific requirements for radioactive

commodities are described below.

9.3.2 Training

1. All personnel using, handling, storing shipping or disposing of radioactive commodities shall be trained commensurate with the hazards associated with the commodity and their duties and responsibilities prior to assignment to those duties.
2. All personnel handling or using radioactive commodities shall ensure that exposure to ionizing radiation is as low as reasonably achievable (ALARA).

9.3.3 Operating and Emergency Procedures

1. Procedures shall be developed for the protection of personnel handling radioactive commodities (e.g., shipment, inspection, storage, use, maintenance, and disposal operations).
2. All commands whose personnel handle radioactive commodities shall prepare standard operating procedures per Section 2. These procedures shall be tailored to the operation being performed and the type of commodities handled.
3. Written standard operating procedures shall be prepared to include specific measures to minimize internal hazards from such operations as handling leaking radioactive commodities, repairing broken radioactive commodities, working in contaminated areas or in airtight storage areas containing leaking radioactive commodities, and accident response.
4. All commands storing, stocking or performing maintenance on radioactive commodities shall include instructions for:
   a. Assuring safe handling, storage, and shipment of radioactive commodities.
   b. Assuring safe operation of repair and maintenance facilities handling radioactive components, where applicable.
   c. Assuring procedures are prepared for handling credible emergencies during receipt, storage, maintenance, and shipment.
   d. Reporting defective radioactive commodities to the

Material Inventory Control Point.

e. Complying with all applicable directives for the disposal of excess, surplus and condemned radioactive commodities and or radioactive waste.

f. Conducting a physical inventory of all radioactive commodities at least annually.

9.3.4 **Accountability**

1. The supply and, where appropriate, the stocking command shall establish a computer inventory program for radioactive commodities.

   a. The program shall be able to print out all radioactive commodities in storage by NSN, hazard code, and name, and if available, quantity, radionuclide, activity, location, and status.

   b. The RSO shall be able to obtain this printout upon request and distribute to emergency support elements as required.

2. All losses of radioactive commodities shall be reported per Section 2.27.

3. All radioactive commodities shall be marked per MIL-STD 129P.

9.3.5 **Storage and Use Areas**

1. All storage areas containing radioactive commodities, and entrances to such areas, shall be posted with signs containing the three-bladed radiation symbol and the words "Caution - Radioactive Materials” per Section 2.17.2.

2. Smoking, eating, drinking, and chewing shall be prohibited in areas where radioactive commodities are stored or handled.

3. Storage of food, beverages, tobacco products and materials, cosmetics, and eating and drinking utensils shall be prohibited in areas where radioactive materials are stored or handled.

4. Areas used for storage of radioactive commodities shall be kept to the minimum for adequate control.

5. Radioactive commodities shall not be stored in the same warehouse section with explosives, flammable materials,

photosensitive items (e.g., photographic film), food products or other incompatible commodities.

6. Radioactive commodities shall be stored so that they are protected from adverse weather or conditions, which may deteriorate the packaging materials.
7. Commodities that contain radioactive gases, tritium, or radium shall be stored in ventilated structures.

9.3.6 Contamination Control

1. Removable loose radioactive contamination in all areas shall not exceed the levels in Table 2-2.
2. Personnel in potentially contaminated storage areas, particularly if they handle contaminated materials, shall be trained per Section 2.8.5 before entry to the area.
3. Reasonable care shall be taken in packaging and storing contaminated items to prevent the spread of contamination and to ensure that entry to areas where such storage is permitted does not result in the contamination of personnel or other areas.

9.3.7 Radiological Surveys

1. Radiation and contamination surveys of areas where radioactive commodities are used or stored shall be performed per Section 2.21 and records maintained per Section 2.26.
2. Closeout radiation and contamination surveys shall be made and documented for all storage and maintenance locations when operations involving radioactive commodities have terminated. Contamination survey results shall be less than the values in Table 2-2 or controlled per Section 2.20.

9.3.8 Surplus Radioactive Commodities

1. Surplus radioactive commodities shall NOT be transferred to the Defense Reutilization and Marketing Office (DRMO), but shall be retained until shipping instructions are received from the Inventory Control Point.
2. Radioactive commodities which cannot be decontaminated

or repaired shall be disposed of by the command as radioactive waste.

3. Surplus radioactive commodities shall be disposed of as radioactive waste when the Inventory Control Point or owning command determines that any other method of disposal is not in the best interest of the government.
4. All radioactive waste shall be coordinated with NAVSEADET RASO and disposed of in accordance with federal regulations, Navy and Marine Corps directives, and burial site criteria, as applicable.
5. Under no circumstances shall radioactive commodities be disposed of as uncontrolled refuse for incineration or burial in unrestricted landfills.

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SECTION 10 – **SOURCE MATERIAL**

10.1 **Introduction**

This section discusses requirements for unimportant quantities of source material. It also discusses requirements for handling depleted uranium (DU) and thorium components. It does not include special nuclear material.

10.2 **Generally Licensed and Unsealed Source Material**

Generally licensed source material and unsealed source material shall be requisitioned, used, and stored in accordance with Section 14.

10.3 **Unimportant Quantities of Source Material**

Unimportant quantities of source material are defined in 10 CFR 40.13. Commands that have unimportant quantities of source material, by definition, are generally exempt from permitting. As specified below, an NRMP may be required for depleted uranium or thorium source material.

10.4 **Depleted Uranium**

Depleted uranium (DU) is a heavy metal used as ballast or counterweights in aircraft gyroscope assemblies, flight control surfaces, helicopter blade assemblies, elevator balance assemblies, aileron balance assemblies, etc. It is also used in aircraft, rockets, projectiles, and missiles as well as penetrators in certain ammunition. Depleted uranium is natural uranium that has most of the uranium-235 and uranium-234 atoms removed.

10.4.1 **Depleted Uranium Counterweights**

1. General Requirements

   a. Plated DU counterweights for use in aircraft are considered unimportant quantities of source material by the Nuclear Regulatory Commission (NRC) according to 10 CFR 40.13(c)(5) and therefore do not require a Naval Radioactive Materials Permit (NRMP).

   b. In order to be considered an unimportant quantity of source material, chemical, physical, or metallurgical

treatment or processing of counterweights other than repair or restoration of the plating or covering on the counterweight is prohibited.

c. Any use of these counterweights other than for their intended purpose in aircraft requires the issue of a specific NRMP.

d. Personnel involved in the handling, use and distribution of these counterweights shall comply with the requirements of this section.

2. Specific Requirements

a. Depleted uranium counterweights shall only be used as counterweights in Navy and Marine Corps aircraft and they shall never be transferred to personnel or organizations for any purpose other than use in aircraft.

b. Depleted uranium counterweights shall not physically be transferred to Defense Reutilization Marketing Offices (DRMOs) for resale.

c. Aircraft parts such as wings and helicopter blades containing DU counterweights shall be stripped of counterweights prior to disposal or resale by DRMOs.

d. No attempt shall be made to clean corrosion from DU counterweights. Depleted uranium counterweights with corroded surfaces or chipped or peeled cladding shall be painted to seal the material and then placed in plastic bags. Gloves should be worn while handling the counterweights. When replacement counterweights are not available, the counterweight shall be painted to seal potential contamination and the counterweight may be reinstalled on the aircraft until a replacement is available.

e. When performing work on aircraft where DU counterweights are close (less than 36 inches) to the eyes or trunk of the body, exposures shall be minimized by either removing the counterweight from the aircraft or shielding it by placing lead foil

over the counterweight.

f. Corroded or damaged counterweights may be returned to an authorized manufacturer for repair or disposal in accordance with Section 10.5.1.2.h below. Corroded or damaged counterweights shall not be wrapped in lead foil.

g. DU counterweights which are in serviceable condition may be returned to an authorized manufacturer for disposal in accordance with Section 10.5.1.2.h below provided:

   (1) The counterweights have been offered for use by other Navy and Marine Corps aviation units operating or repairing similar aircraft.

   (2) The counterweights have been offered for use by other U.S. Armed Forces operating or repairing similar aircraft.

h. NAVSEADET RASO shall provide specific authorization for all transfers of counterweights from Navy and Marine Corps commands to any civilian activity.

   (1) Request for authorization to transfer counterweights to a manufacturer shall be submitted to NAVSEADET RASO by letter in accordance with Section 16.5.1.

   (2) Upon receipt of a transfer authorization request, NAVSEADET RASO shall provide packaging, marking, documentation, and transportation requirements for the specific shipment.

   (3) Upon assurance that all NRC and Department of Transportation (DOT) regulations are met, NAVSEADET RASO shall provide authorization for shipment of the counterweights to a specific manufacturer.

10.4.2 **Depleted Uranium Projectiles**

1. General Information

The Navy and Marine Corps use DU projectiles in 20 mm CIWS rounds, 30mm GAU 12 aircraft rounds, 105 mm and 120 mm artillery projectiles. These DU sources are not exempt from NRC licensing requirements but are used under a specific NRMP. The NRMP is issued to the item manager and not to each command that stores or uses the projectiles.

2. Requirements

a. The item manager shall maintain an NRMP for storage, handling, and transportation of DU ammunition.

b. The item manager shall provide copies of the approved NRMP to each Navy and Marine Corps command that will handle, store, and transport the DU ammunition.

c. Navy and Marine Corps commands that store, or handle DU ammunition shall comply with all requirements contained in the applicable NRMP.

d. DOT exemptions shall constitute exemption from transportation requirements of this manual.

10.4.3 **Other Depleted Uranium Sources**

All other uses of DU which are not exempted in 10 CFR 40.13 or 40.25 shall require an NRMP to be issued prior to possession and use.

10.5 **Thorium**

Thorium is a naturally occurring radionuclide contained in various manufactured items such as incandescent gas mantles, welding rods, lenses, and aircraft engine parts. Manufactured items exempted in 10 CFR 40.13 do not require an NRMP. Grinding of thoriated tungsten electrodes can produce surface contamination.

10.5.1 Control Requirements for Grinding Thoriated Tungsten Welding Rods

1. Isolate grinding areas by providing a separate grinding booth or enclosure (e.g., Plexiglas box with arm holes) around the grinder.

2. Wet belt/disk grinding is the preferred method to preclude the generation of dust.

3. Provide exhaust ventilation for the grinding booth or grinder enclosure if performing dry grinding operations. Ventilation shall be equipped with a high efficiency particulate airborne (HEPA) filter. Grinder enclosures may be ventilated using a vacuum equipped with a HEPA filter.

4. Clean the grinding area after each shift, when used, by vacuum cleaning or wiping with damp cloths.

5. Place chips and weld rod pieces to be discarded in a collection container. Notify the RSO or ARSO when disposal is required.

6. HEPA ventilation filters shall be changed by, or under the direction of, the RSO or ARSO using appropriate controls in accordance with Section 2.

7. Vacuums shall be emptied and vacuum HEPA filters changed by, or under the direction of, the RSO or ARSO using appropriate controls in accordance with Section 2.

8. All waste materials generated above must be disposed of through the DON LLRW Program according to Section 16.

10.5.2 Welding

1. Ensure adequate ventilation by welding in large open area whenever possible.

2. In enclosed areas, provide appropriate dust respirators for workers or provide adequate ventilation by hood or

portable duct.

3. Hoods, enclosures and portable ducts shall be designed and operated in accordance with the latest edition of "Industrial Ventilation", American Conference of Governmental Industrial Hygienists. The face velocity for portable ducts shall be at least 1,500 feet per minute.

10.5.3 Handling and Disposal of Thoriated Tungsten Weld Rods

1. The shipping of thorium is regulated by DOT. The command should ensure shipments of thoriated tungsten weld rods follow the applicable DOT regulations for consignment and concentration values for natural thorium.

2. Thoriated tungsten weld rods shall not be stored in, or in areas adjacent to, dosimeter processing or storage areas.

3. Disposal of thoriated tungsten weld rods is not regulated for radioactivity. However, an accumulation of discarded thoriated tungsten weld rods can cause alarms at waste disposal sites and rejection of waste. Therefore, in shop areas where thoriated tungsten weld rods are normally discarded, provide waste collection containers. When containers need to be emptied, contact the RSO, ARSO, or NAVSEADET RASO LLRW Program Manager for disposal instructions.

10.5.4 Repair and Processing of Magnesium-Thorium Alloy Manufactured Parts

1. Magnesium-thorium is commonly used in gearboxes and other manufactured aircraft parts. Chemical, physical (including filing or grinding), or metallurgical treatment or processing of any manufactured parts requires an NRMP.

2. Contact the RSO, ARSO, or NAVSEADET RASO LLRW Program Manager for disposal instructions for magnesium-thorium items.

SECTION 11 – **X-RAY RADIOGRAPHY**

11.1 **Purpose**

This section provides the Radiological Affairs Support Program (RASP) requirements for conducting industrial x-ray radiography. Industrial x-ray radiography represents a potential for serious radiation exposure to x-ray radiography personnel, other organizational personnel, and members of the public in the vicinity of x-ray radiography operations. Because of the potential for personal injury, it is incumbent upon each Navy and Marine Corps command that conducts x-ray radiography to operate its program in strict compliance with established radiation safety requirements.

11.2 **Scope**

The requirements in this section apply to all commands using x-rays to conduct industrial radiography. This section also addresses the use of accelerator systems for conducting x-ray radiography. This section does not include requirements for flash x-ray systems, cabinet x-ray systems, vehicle cargo inspection systems, personnel inspection systems, or accelerator systems used for research (i.e., not used for industrial radiography).

The provisions and requirements supplement other requirements of this manual. In particular, the requirements and provisions of Sections 2, 3, and 4 that apply to x-ray radiography.

11.3 **Responsibilities**

11.3.1 **Commanders, Commanding Officers, and Officers in Charge**

General responsibilities are described in Section 1.5.2.1.

11.3.2 **Radiation Safety Officers**

1. Radiation Safety Officers (RSOs) for x-ray radiography programs shall:
   a. Ensure the proper use of x-ray radiography equipment.
   b. Monitor emergency events.
   c. Ensure x-ray radiographers, x-ray radiographer’s

assistants and barrier monitors (BMs) are properly qualified.

d. Ensure surveillance of x-ray radiographic operations are performed and documented per Sections 11.8.6, 11.14, and 11.15.

2. General responsibilities are described in Section 1.5.2.2

11.3.3 **Assistant Radiation Safety Officers**

General responsibilities are described in Section 1.5.2.3.

11.3.4 **X-Ray Radiographers**

1. Radiographers are responsible for performing x-ray radiography in compliance with the requirements of this manual and Navy and Marine Corps directives.
2. Radiographers shall:
   a. Comply with operating and emergency procedures and the written or verbal orders of the RSO.
   b. Promptly report any lost or malfunctioning electronic personal dosimeter (EPD) or ion chamber pocket dosimeter (IPD) to the RSO.
   c. Promptly report any higher than expected or abnormal EPD/IPD readings to the RSO.
   d. Promptly report incidents or deviations from established procedures to the RSO.
   e. Ensure completion, review, proper filing, and retention of all required logs and records.

11.3.5 **X-Ray Radiographer’s Assistant**

1. X-ray radiographer’s assistants are responsible for performing x-ray radiography in compliance with the requirements of this manual and Navy and Marine Corps directives.
2. X-ray radiographer’s assistants shall be under the direct supervision of a qualified radiographer when conducting x-ray radiography.
3. X-ray radiographer’s assistants shall:
   a. Comply with operating and emergency procedures and written or verbal orders from the radiographer.

b. Promptly report any lost or malfunctioning EPD or IPD to the radiographer.
c. Promptly report any higher than expected or abnormal EPD/IPD readings to the radiographer.
d. Promptly report incidents or deviations from established procedures to the radiographer.
e. Perform duties as a barrier monitor as assigned.

11.3.6 X-Ray Radiography Barrier Monitors (BMs)

1. BMs shall be responsible for compliance with the requirements of this manual and Navy and Marine Corps directives.
2. BMs shall:
   a. Comply with operating and emergency procedures and the written or verbal orders of the radiographer.
   b. Promptly report incidents or deviations from established procedures to the radiographer.
   c. Guard access to radiation area boundaries and maintain constant communication with the radiographer.
   d. Report any boundary violations immediately to the radiographer.
   e. Survey the radiation area boundary during open facility x-ray radiography operations and report any abnormal radiation levels or malfunctioning radiation survey instruments to the radiographer.
   f. Promptly report any lost or malfunctioning EPDs/IPDs to the radiographer.
   g. Promptly report any higher than expected or abnormal EPD/IPD readings to the radiographer.

11.4 General Requirements for Conducting X-ray Radiography

11.4.1 X-ray Machine Registration

Each command desiring to utilize x-ray producing equipment to perform radiography shall submit an “Ionizing Radiation Producing Machine/Equipment Registration Form” to Naval Sea Systems Command Detachment (NAVSEADET) Radiological Affairs Support Organization (RASO) per Section 3.5.

11.4.2 General Operating Requirements for Conducting X-Ray Radiography in All Facilities

1. Command endorsed operating and emergency procedures shall be available in the immediate vicinity of the x-ray control panel.
2. Only qualified x-ray radiographers, or x-ray radiographer's assistants under the direct supervision of a qualified x-ray radiographer, shall operate the x-ray control panel. X-ray radiographer's assistants in training are allowed to operate the x-ray control panel during qualification under the direct supervision of a qualified x-ray radiographer.
3. At least two RASP approved, calibrated, and operating radiation survey instruments shall be available during the conduct of x-ray radiography operations.
4. There shall be at least one RASP approved, calibrated, and operating radiation survey instrument located at the x-ray control panel at all times when x-rays are being produced.
5. Radiation survey instruments shall be response checked for proper response to radiation, following NAVSEA RADIAC Program Office approved procedures, prior to the first use of the day or shift.
   a. Instruments that fail to respond within the acceptable response range shall not be used and shall be returned to the RADIAC calibration facility for re-calibration or repair. Such instruments shall be labeled Out of Commission (OOC) to prevent use until repaired or re-calibrated.
   b. Satisfactory response checks shall be annotated in the utilization log.
6. Prior to initiating an x-ray exposure, the x-ray radiographer shall ensure the high radiation and radiation areas are clear of unauthorized personnel. This can be by direct observation or by report from other qualified x-ray radiographers or qualified x-ray radiographer's assistants.
7. Any restrictions on x-ray machine settings (e.g., do not exceed 120 kilovolt potential (kVp) and 5 milliampere (mA)) shall be conspicuously posted at the x-ray control panel.

8. X-ray control panels shall be equipped with a key switch that:
   a. Prevents the initiation of x-ray production when in the "off" position.
   b. Is clearly marked with the "on" and "off" position of the key switch. This may be with the words "on" and "off" or industry accepted symbols.
   c. Has a key that CANNOT be removed when the switch is in the "on" position.
9. Machines with a key switch having a "Standby" position shall not be capable of generating x-rays in the "Standby" position. The "Standby" position may be utilized between exposures provided the key can be removed between exposures.
10. Whenever an exposure is not actually in progress including setup between exposures, the key is removed from the x-ray control panel and the x-ray radiographer or qualified x-ray radiographer's assistant maintain personal custody of the key until the next exposure is made.
11. Whenever not in use, x-ray radiographic equipment shall be secured to prevent use of the equipment by unauthorized personnel. At a minimum, the x-ray control panel key shall be removed and secured such that only qualified x-ray radiographers or x-ray radiographer's assistants have access to the key.
12. Prior to the first exposure of the day or shift:
   a. The x-ray tube head, cables, x-ray control panel, coolant lines, power supplies, insulating gas pressure and other critical support items shall be checked for obvious defects. Defective equipment shall not be used.
   b. All interlocks and audible and visual warning devices, as appropriate, shall be checked for proper operation and the results annotated in the utilization log.
   c. The interlock checks shall be performed by:

      (1) actually tripping the interlock by opening the door or panel while operating the equipment at the lowest possible kVp and mA to stop x-ray production;

(2) closing the door or panel to confirm x-ray production does not restart automatically; and

(3) manually re-energizing a suitable device located on or near the control panel to restart x-ray production.

d. Alternative interlock check procedures shall be approved by NAVSEADET RASO.

e. Daily interlock checks at facilities using accelerators to conduct x-ray radiography operations shall be conducted per Section 11.10.5.

f. Interlocks shall not be bypassed in order to test any component.

g. Emergency stop devices inside shielded or exempt shielded facilities shall be checked for proper operation every six months.

13. The x-ray radiographer shall remain at the x-ray control panel when the x-ray machine is energized and producing x-rays.

14. Upon first entering the facility after each x-ray exposure, the x-ray radiographer or x-ray radiographer’s assistant shall use a radiation survey instrument to survey continuously from the entrance up to and including the x-ray tube head to ensure that x-ray production has ceased. If still detecting radiation, back away from the tube head and disconnect the machine from the power source or open the circuit breaker supplying power to the unit.

15. Any proposed changes to the x-ray machine, interlock systems, or warning devices shall be approved in writing by NAVSEADET RASO prior to implementation.

16. Repair or maintenance of all x-ray machines shall be conducted by an authorized manufacturer representative except for routine maintenance that is designed to be performed by the user such as replacing or cleaning filters for the cooling system as stated in manufacturer's technical manual.

17. The RSO shall conduct a facility radiation survey per Section 11.13 after any repairs or maintenance that may affect the output of the x-ray machine or alter any interlocks or shielding.

18. Under no circumstances except as stated in Section 11.7.1.2.b.1 shall the radiation levels in unrestricted areas exceed 2 millirem per hour (mrem/hr)(0.02 millisievert (mSv/hr)) or result in personnel in unrestricted areas exceeding 100 mrem (1 mSv) in one year.
19. Each x-ray radiography exposure or group of exposures, including machine warm-up shall be documented on utilization logs per Sections 11.15.2 through 11.15.5.

11.5 Exempt Shielded Facilities

11.5.1 Physical Requirements for an Exempt Shielded Facility

1. Prior to constructing a new exempt shielded facility or modifying an existing facility, the facility design shall be submitted to NAVSEADET RASO for evaluation and approval per Section 2.24.
2. All exempt shielded facility designs shall include the information required by Section 2.24.5 and meet the requirements of Section 11.5.1.3 below.
3. An exempt shielded facility shall meet the following requirements:
   a. The exempt shielded facility shall be a permanent structure that houses the x-ray tube head and all objects to be irradiated.
   b. The radiation level at two inches from any accessible surface outside the exempt shielded facility shall not exceed 0.5 mrem/hr (0.005 mSv/hr).
   c. This radiation level at two inches shall be determined during initial evaluation, re-evaluation, and during all periodic facility radiation surveys.
   d. Radiation surveys shall be conducted with the x-ray machine at maximum allowed kVp and mA and the unattenuated primary beam directed at each of the six barriers in turn at a target-to-barrier distance (TBD) of 36 inches.
   e. Each barrier shall be thoroughly surveyed to verify that there will be sufficient shielding to ensure radiation levels are below the required values in Section 11.5.1.3.b above. This may require relocating the tube head to make sure the entire

barrier is exposed to the primary x-ray beam.

f. If design restrictions preclude a TBD of 36 inches, the closest possible distance to 36 inches shall be used for the four bulkheads, the deck, and the closest practical distance for the overhead.

g. All entrances to the exempt shielded facility shall have a light outside, which is illuminated simultaneously with x-ray production.

h. These warning lights shall be integrated into the interlock system such that they are illuminated simultaneously with x-ray production.

i. The warning lights shall be an illuminated sign reading "X-RAY ON" or a red flashing or rotating light with a sign or label indicating "X-RAY ON WHEN LIT."

j. The warning lights shall automatically deactivate upon the termination of x-ray production.

k. All entrances to the exempt shielded facility shall be posted with a sign containing the conventional radiation symbol and the words "Caution - Entering Radiation Exposure Room" on a yellow background.

l. Each entrance or panel providing access to the exempt shielded facility shall have fail-safe interlocks installed or be locked from inside the exempt shielded facility to prevent access.

m. All exempt shielded facilities designed after December 2011 shall use interlocks that discontinue the supply of electricity to the x-ray machine high voltage circuit when the entrance or panel is opened.

n. The interior of the exempt shielded facility shall be posted with signs containing the conventional radiation symbol and the words "Caution – High Radiation Area," "Danger - High Radiation Area," or "Grave Danger – Very High Radiation Area" on a yellow background depending on the radiation output of the machine. There must be sufficient signs to be visible by anyone entering the exempt shielded facility.

o. High radiation area, or very high radiation area postings shall be removed or covered when x-ray radiography operations are not being conducted unless the posting contains a statement specifying when the radiation is present. (For example, Danger – High

Radiation Area when Red Light is Flashing).

p. Audible and visible warning signals shall be located within each exempt shielded facility.
   (1) The audible and visible warning signals shall be integrated into the interlock system such that they are activated when the x-ray on button/switch is engaged.
   (2) The audible and visible warning signals shall activate for a minimum of 20 seconds immediately before x-rays are produced.
   (3) The visible warning signal (preferably a rotating beacon) must remain illuminated during x ray production.
   (4) The visible signal must deactivate when x-ray production is terminated.
   (5) It is acceptable to have two separate lights, such that one is illuminated during the 20 second warning and the other light is illuminated when x-rays are being generated. If two lights are used, the x-ray on light shall be red and the 20-second warning light shall be a different color.

q. A suitable means of exit shall be available so that any person who inadvertently remains in the exempt shielded facility may leave without delay.

r. A means shall be available within the exempt shielded facility to prevent or quickly interrupt x-ray production (emergency stop).

s. The emergency stop device shall require manual resetting from inside the exempt shielded facility to enable the resumption of x-ray production.

t. The use and function of the emergency stop device(s) inside the exempt shielded facility shall be clearly labeled.

11.5.2 **Operational Requirements for an Exempt Shielded Facility**

1. In addition to the general requirements of Section 11.4.2, a quick scan radiation survey and visual check shall be conducted to ensure the door seams, overlaps and deck coamings of any personnel or equipment access doors are intact and radiation streaming is not evident.

2. This survey shall be conducted during the machine warm-up/first exposure of the day and documented in the utilization log including the maximum radiation levels identified, location of the reading, and machine kVp and mA settings.

11.6 Shielded Facilities

11.6.1 Physical Requirements for a Shielded Facility

1. Prior to constructing a new shielded facility or modifying an existing shielded facility, a facility design shall be submitted to NAVSEADET RASO for evaluation and approval per Section 2.24.
2. All shielded facility designs shall include the information required by Section 2.24.5 and meet the requirements of Section 11.6.1.3 below.
3. A shielded facility shall meet the following requirements:
   a. The shielded facility shall be a permanent structure that houses the x-ray tube head and all objects to be irradiated.
   b. The radiation levels at one foot from any accessible surface outside the facility shall not exceed 2 mrem/hr at the maximum allowed kVp and mA setting for each x-ray system used in the shielded facility.
   c. The radiation level at one foot shall be determined during initial evaluation, re-evaluation, and during all periodic facility radiation surveys.
   d. The four bulkheads, deck, and overhead of the facility shall be classified as either a primary barrier or a secondary barrier.
      (1) Barriers that will have the primary x-ray beam directed towards it shall be classified as a primary barrier.
      (2) Barriers that will only see scattered or leakage radiation shall be classified as a secondary barrier.
      (3) Under no circumstances shall the primary x-ray beam be directed at a secondary barrier.
   e. Radiation surveys shall be conducted with the x-ray machine at the maximum allowed kVp and mA settings and the unattenuated primary x-ray beam directed at

each primary barrier in turn at a TBD of 36 inches.

f. Each barrier shall be thoroughly surveyed to verify that there is sufficient shielding to ensure radiation levels are below the required values in Section 11.6.1.3.b above. This may require relocating the tube head to make sure the entire barrier is exposed to the primary x-ray beam.

g. If design restrictions preclude a TBD of 36 inches, the closest possible distance to 36 inches shall be used for the primary barriers.

h. All entrances to the shielded facility shall have a light outside, which is illuminated simultaneously with x-ray production.

i. These warning lights shall be integrated into the interlock system such that they are illuminated simultaneously with x-ray production.

j. The warning lights shall be an illuminated sign reading "X-RAY ON" or a red flashing or rotating light with a sign or label indicating "X-RAY ON WHEN LIT.”

k. The warning lights shall automatically deactivate upon the termination of x-ray production.

l. All entrances to the shielded facility shall be posted with a sign containing the conventional radiation symbol and the words "Caution - Entering Radiation Exposure Room" on a yellow background.

m. Each entrance or panel providing access to the shielded facility must have fail-safe interlocks installed or be locked from inside the shielded facility to prevent access.

n. All shielded facilities designed after December 2011 shall use interlocks that discontinue the supply of electricity to the x-ray machine high voltage circuit when the entrance or panel is opened.

o. The interior of the shielded facility shall be posted with signs containing the conventional radiation symbol and the words “Caution – High Radiation Area,” "Danger - High Radiation Area," or “Grave Danger – Very High Radiation Area” on a yellow background depending on the radiation output of the machine. There must be sufficient signs to be visible by anyone entering the shielded facility.

p. High radiation area, or very high radiation area

postings shall be removed or covered when x-ray radiography operations are not being conducted unless the posting contains a statement specifying when the radiation is present. (For example, Danger – High Radiation Area when Red Light is Flashing.)

q. If the shielded facility is very large or is configured such that the radiographer cannot readily ensure that the facility is unoccupied, then the facility must have the following features:

(1) Audible and visible warning signals shall be located within the shielded facility.

(2) The audible and visible warning signals shall be integrated into the interlock system such that they are activated when the x-ray on button/switch is engaged.

(3) The audible and visible warning signals shall activate for a minimum of 20 seconds immediately before x-rays are produced.

(4) The visible warning signal (preferably a rotating beacon) must remain illuminated during x-ray production.

(5) The visible signal must deactivate when x-ray production is terminated.

(6) It is acceptable to have two separate lights, such that one is illuminated during the 20 second warning and the other light is illuminated when x-rays are being generated. If two lights are used, the x-ray on light shall be red and the 20-second warning light shall be a different color.

(7) A suitable means of exit shall be available so that any person who inadvertently remains in the shielded facility may leave without delay.

(8) A means shall be available within the shielded facility to prevent or quickly interrupt x-ray production (emergency stop).

(9) The emergency stop device must be manually reset from inside the shielded facility to enable the resumption of x-ray production.

(10) The use and function of the emergency stop device(s) inside the shielded facility shall be clearly labeled.

r. Inside the shielded facility, each barrier (bulkheads, deck, and overhead) shall be clearly labeled with their classification as either a “Primary Barrier” or a “Secondary Barrier.”

s. Inside the shield facility, any barrier classified as a secondary barrier shall also be labeled with the words "Do Not Irradiate With Primary Beam.”

11.6.2 Operational Requirements for a Shielded Facility

1. In addition to the general requirements of Section 11.4.2, a quick scan radiation survey and visual check shall be conducted to ensure the door seams, overlaps and deck coamings of any personnel or equipment access doors are intact and radiation streaming is not evident.
2. This survey shall be conducted during the machine warm-up/first exposure of the day and documented in the utilization log including the maximum radiation level identified, location of the reading, and machine kVp and mA settings.
3. During shielded x-ray radiography operations, the x-ray radiographer shall not irradiate any secondary barrier with the primary x-ray beam.

11.7 Open Facilities

11.7.1 Physical Requirements for an Open Facility

1. If a facility is not classified as an exempt shielded or shielded facility, it shall be considered an open facility.
2. An open facility shall meet the following requirements:

   a. Posted High Radiation Area

      (1) The x-ray tube head and all objects to be irradiated must be within a conspicuously posted perimeter that shows the area in which the dose rate can exceed 100 mrem/hr.

      (2) The high radiation area boundary shall only be calculated.

      (3) Under no circumstances shall the high radiation area boundary be surveyed.

      (4) The perimeter of the high radiation area shall be a physical boundary (e.g. an enclosure,

stanchions/rope).

(5) The high radiation area boundary shall be conspicuously posted with signs containing the conventional radiation symbol and the words "Caution – High Radiation Area," "Danger - High Radiation Area," or "Grave Danger – Very High Radiation Area" on a yellow background depending on the radiation output of the machine.

(6) These signs shall be visible to anyone approaching the high radiation area from any accessible route.

(7) In some cases, such as open facility operations in an aviation "hush house" or other structure where the walls are sufficiently thick, evidence for the adequacy of the wall shielding to reduce the high radiation area perimeter shall be documented by the RSO in a memorandum and be on file for review during audits and inspections.

b. Posted Radiation Area

(1) The radiation area boundary shall initially be established at or beyond the calculated distance where the radiation level is 2 millirem per hour (mrem/hr) instantaneous exposure rate (0.02 millisieverts per hour (mSv/hr)).

EXCEPTION: The radiation area boundary may be established where the expected radiation level exceeds 2 mrem/hr (0.02 mSv/hr) for short duration exposures (i.e., less than 10 minutes) provided that all the following conditions are met:

i. The radiation level at the radiation area boundary does not exceed 100 mrem/hr (1.0 mSv/hr)

ii. Calculations are made before the operation to demonstrate that personnel at the radiation area boundary will not receive a dose greater than 2 mrem in any one hour.

iii. Other alternatives such as temporary shielding have been considered.

iv. The RSO shall authorize the use of the exception in writing before the operation

is conducted.

(2) The perimeter of the radiation area shall be a physical boundary (e.g., an enclosure, stanchions/ rope).

(3) The radiation area boundary shall be conspicuously posted with signs containing the conventional radiation symbol and the words “Caution: Radiation Area.”

(4) The radiation area signs shall be visible to any person approaching the radiation area from any accessible route.

(5) In some situations, the radiation area boundary for an open facility may be completely or partially enclosed by a facility. In such cases, all access routes to the radiation area, such as doors or hatches, shall be posted with radiation area signs.

(6) In some cases, such as open facility operations in an aviation “hush house” or other structure where the walls are sufficiently thick, evidence for the adequacy of the wall shielding to reduce the radiation area perimeter shall be documented by the RSO in a memorandum and be on file for review during audits and inspections.

(7) Explosive concerns take precedence over radiation area postings. If explosive boundaries are greater than the calculated radiation area boundaries, the explosive area boundaries may serve as the radiation area boundaries and must be posted as a radiation area with written permission from NAVSEADET RASO.

c. Warning Light

(1) A rotating or flashing red light and warning sign stating "X-RAY ON WHEN LIT” shall be located next to the tube head.

(2) The warning light shall be interlocked to the x-ray control panel so that it is illuminated when x-rays are being produced.

(3) The warning light shall be large enough so that it can be easily seen before crossing any high radiation area boundary. This light shall deactivate upon the termination of x-ray

production.

11.7.2 **Operational Requirements for an Open Facility**

1. All applicable general operating requirements from Section 11.4.2 shall be implemented.
2. The RSO or ARSO shall be notified of the time, date, and location of all planned open facility x-ray operations.
3. The RSO/ARSO shall evaluate the operation to determine if any personnel (including those in buildings) will be in the immediate proximity of the radiation area boundary. If there are personnel in these areas, these individuals shall be notified of the operations.
4. BMs shall be briefed on their responsibilities and issued the necessary radiation survey instruments, primary dosimeters, EPDs/IPDs, and appropriate communication equipment. BMs shall be briefed to remain outside radiation area boundaries unless directed to enter by the radiographer.
5. BMs shall also be briefed on actions to take for an alarming or faulty EPD, or other emergency situation.
6. A procedure for BMs to have positive communication with the x-ray radiographer shall be established and the method verified prior to the conduct of x-ray radiography operations.
7. After the boundaries are established, a thorough visual search for personnel shall be performed by the x-ray radiographer or x-ray radiographer’s assistant of all areas inside the posted boundaries, paying particular attention to the insides of large structures (e.g., aircraft, submarine sonar domes, buildings, etc).
8. Entry into the radiation area by personnel between exposures is occasionally required to complete time sensitive functions (e.g., watchstander logs). If this is necessary, it shall only be done with the permission of the x-ray radiographer. The boundary at the access point shall be dropped; the person shall not step over or around the boundary. The person shall enter and exit at the same point unless arrangements have been made in advance for an alternate exit that is manned by the x-ray radiographer, x-ray radiographer’s assistant, or BM. The person is logged in and out of the area on the

utilization log. The boundary shall be reestablished after the person exits. If the open boundary access point was not guarded during the entire time it was lowered, the area shall be reestablished per Section 11.7.2.7 above.

9. All accesses to the high radiation area boundaries shall be under direct continuous visual surveillance to protect against unauthorized entry. All x-ray radiographer's assistants or BMs who are surveilling the high radiation boundaries shall be in continuous positive communication (e.g., via radios) with the x-ray radiographer at the control panel. Communications between the x-ray radiographer and each x-ray radiographer's assistant or BM who is surveilling the high radiation boundaries shall be verified prior to each exposure. Note: The intent of this requirement is to enable the x-ray radiographer to immediately shut down x-ray production if an unauthorized person crosses the radiation area boundary.
10. The x-ray radiographer shall shut down the x-ray machine immediately upon observing or being notified that the radiation area boundary has been crossed by an unauthorized person.
11. BMs shall survey the entire radiation area boundary from the outside and adjust it if necessary as directed by the radiographer. BMs shall begin the survey at the location where the highest radiation levels are expected.
12. The survey shall be conducted when the x-ray machine is operating at the maximum kVp and mA to be used for the procedure and documented in the utilization log.
13. Under no circumstances shall the high radiation boundary be surveyed. The boundary shall be established by calculation only.
14. If the beam's orientation or shielding is changed or the kVp or mA is increased between exposures, the radiation area boundary must be re-established and verified by surveys. The high radiation area boundary shall also be recalculated.

11.7.3 Physical and Operational Requirements for Flight Deck and Hangar Deck X-Ray Radiography

Note: Additional radiation safety requirements are required when X-ray radiography is performed on the hangar deck or flight deck of CV, CVN, LHA, LPH, and LHD type ships because of the unusual nature of this type of open facility operation.

1. All requirements for open facility x-ray radiography apply to flight and hangar decks.
2. Whenever possible, x-ray radiography shall be conducted on a deck-edge elevator with the elevator on the hangar deck level.
3. When conducting x-ray radiography with a horizontal beam orientation, the beam shall be directed outboard to sea such that it does not intersect any portion of the ship's structure. Do not conduct radiography using this orientation when another ship is along side.
4. During horizontal beam orientations, extreme caution must be exercised because the radiation area boundary can extend several hundred feet.
5. During flight deck x-ray radiography aboard LHA, LPH, and LHD-type ships, the x-ray beam shall never be aimed directly at the flight deck.

Note: On these classes of ships, the thickness and composition of the flight deck is not an adequate shield and does not prevent a radiation area from occurring in the spaces immediately below the flight deck.

6. During hangar deck x-ray radiography operations, extra vigilance (including assigning extra BMs as necessary) shall be established because of the increased chance of ship's personnel unintentionally crossing a radiation area boundary.
7. The red flashing light adjacent to the tube head may be removed during operations when it might compromise flight line safety. This shall only be done **at sea** when x-ray operations cannot be scheduled around flight operations.

11.8 Training Requirements

11.8.1 Initial and Refresher Training of Radiation Safety Officers and Assistant Radiation Safety Officers for X-Ray Radiography Operations

In accordance with the initial and refresher training requirements specified in Section 2.8.3, the RSO and ARSO shall successfully complete the NAVSEADET RASO X-Ray Radiation Safety Officer Course (S-491-0016) prior to October 2010 or complete the revised Radiation Safety Officer Course (S-4J-0016 after October 2010.

11.8.2 Initial Training of X-Ray Radiographer's Assistants

1. Each x-ray radiographer's assistant shall successfully complete one of the following courses:
   a. NDI Technician Course (C-603-3191) presented by Naval Air Technical Training Command, Pensacola Fl (Previously offered at Millington TN, and Naval Unit, Chanute Air Force Base, Rantoul, IL).
   b. Radiographic Operator Course (A-701-0032 or A-701-0057) presented by Service School Command, Great Lakes, IL.
   c. A local command sponsored course that has been reviewed and approved by NAVSEADET RASO.
   d. A commercial company sponsored course that has been reviewed and approved by NAVSEADET RASO.
2. Documentation demonstrating NAVSEADET RASO approval of local command and commercial company courses shall be maintained by the command.
3. Locally sponsored command and commercial company courses shall be reviewed and re-approved by NAVSEADET RASO every five years.

11.8.3 Command Qualification of X-Ray Radiographer's Assistants

1. All x-ray radiographer's assistants shall complete a local qualification process prior to qualifying as a command x-ray radiographer's assistant.
2. As a minimum, the qualification shall include completion

of the following:

a. Complete initial training as described in 11.8.2 above.

b. Training as a radiation worker per Section 2.8.4.

c. Formal training on the contents of the command x-ray radiography operating and emergency procedures by the RSO or designated representative. At a minimum, the training shall include the following topics.

   (1) Responsibilities of the x-ray radiographer, x-ray radiographer’s assistant, and BM.

   (2) Radiation survey instrument requirements and operation.

   (3) Relative risk associated with exposure to ionizing radiation.

   (4) Specific instruction about prenatal exposure risks to the developing embryo and fetus. This shall include the requirements of NAVMED P-5055 and applicable information in Nuclear Regulatory Commission Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure."

   (5) X-ray radiography accident case histories and lessons learned.

   (6) Results of internal and external audits and inspections.

   (7) Maintenance of required records (e.g., utilization and secondary dosimeter logs, radiation protection surveys, RASP inspections, personnel exposure records, radiation survey instrument calibration records, annual formal review of occupational exposure).

   (8) ALARA principles, including techniques for maintaining personnel exposures as low as reasonably achievable (ALARA).

   (9) Emergency actions to be taken and notifications to be made in the case of a real or suspected overexposure, failed interlocks, stolen equipment, unauthorized or accidental entry into a radiation area, single dose greater than 150 mrem (1.5 mSv) or dose rate greater than 200 mrem/hr (2 mSv/hr) on an EPD.

d. Performance of four radiographic operations under direct supervision of a qualified command x-ray

radiographer.

e. Satisfactorily pass a written, closed book, specific examination on command x-ray radiography operating and emergency procedures with a minimum score of 80 percent.

11.8.4 Qualification of X-Ray Radiographers

1. All x-ray radiographers shall complete the requirements for qualification as an x-ray radiographer’s assistant in accordance with Section 11.8.2 and 11.8.3.
2. Receive training on responsibilities contained in command operating and emergency procedures that differ from those of an x-ray radiographer’s assistant.
3. Complete 160 hours of x-ray radiography operations.
4. Complete certification as an Industrial Radiography Radiation Safety Personnel (IRRSP) x-ray radiographer through the American Society for Nondestructive Testing (ASNT).
   a. This radiation safety certification requires a minimum of 40 hours of classroom training and 160 hours of x-ray operation experience, as well as a practical examination and a written examination.
   b. Radiation safety certifications sponsored by other independent certifying organizations may be substituted if reviewed and approved by NAVSEADET RASO prior to use.

11.8.5 Refresher Training for X-Ray Radiographers and X-Ray Radiographer’s Assistants

1. All x-ray radiographers and x-ray radiographer’s assistants shall complete at least eight hours of annual refresher training.
2. The refresher training may be combined with gamma radiography annual refresher training for commands that maintain capability for both x-ray and gamma radiography operations.
3. All annual refresher training shall be conducted at intervals not to exceed 12 months and documented by the RSO or designated representative.
4. Refresher training shall also be conducted and

documented each time there is a substantive change in equipment or operating and emergency procedures. Training shall occur prior to equipment use.

5. Annual refresher training, at a minimum, shall include training on the topics listed in Section 11.8.3.2.c.
6. Successful completion of annual refresher training shall be demonstrated by the x-ray radiographer or x-ray radiographer’s assistant attaining a score of 80 percent or higher on a written examination.
7. Annual x-ray radiographer and x-ray radiographer’s assistant refresher training records shall be maintained per Section 2.26.5.
8. Each x-ray radiographer shall keep his IRRSP or equivalent certification current. This includes 40 hours of documented refresher training during a five-year period, and successful completion of a practical examination and written test.

11.8.6 Performance of Semi-annual X-Ray Radiographer And X-Ray Radiographer’s Assistant Evaluations

1. The command shall establish a program that evaluates each x-ray radiographer's and x-ray radiographer’s assistant’s performance during an actual radiographic operation at intervals not to exceed six months.
2. The RSO, ARSO, or qualified x-ray radiographer designated by the RSO may perform the evaluation. An x-ray radiographer performing the evaluation must have a minimum of one year experience as a certified x-ray radiographer. No x-ray radiographer shall evaluate his or her own performance.
3. X-ray radiography operations shall not be scheduled solely to fulfill this requirement.
4. If an x-ray radiographer or x-ray radiographer’s assistant has not participated in a radiography evaluation for more than six months since the last observed evaluation, the x-ray radiographer's or x-ray radiographer’s assistant’s performance shall be evaluated the next time the individual participates in an x-ray radiography operation.
5. The x-ray radiographer or x-ray radiographer’s assistant being evaluated must be the x-ray machine operator.

6. The x-ray radiographer or x-ray radiographer's assistant shall be evaluated on a sufficient number of attributes such that the evaluator can conclude that the person has demonstrated he/she follows procedures and uses all equipment properly:
   a. Properly following operating procedures.
   b. Knowledge of emergency procedures.
   c. Performance of radiation survey instrument daily checks including response checks.
   d. Proper use of survey instrument.
   e. Proper use of TLDs and EPDs and knowledge of actions to take for faulty or alarming EPDs, or off-scale EPD.
   f. Performance of interlock checks, verification of proper operation of warning lights, and proper radiological postings.
   g. Performance of pre-brief to all BMs.
   h. Conduct or direct the conduct of the quick scan survey for exempt shielded or shielded facility operations.
   i. Proper control of x-ray machine keys.
   j. Proper survey of the x-ray tube head at conclusion of an x-ray exposure.
   k. Use of ALARA principles.
   l. Proper completion of all logs and records.
   m. Proper completion of the calculations for determining the location of the radiation and high radiation area boundaries during open facility operations (if applicable).
   n. Establishment and control of radiation and high radiation area boundaries for open facility operations (if applicable)
7. Failure to properly perform the items in Section 11.8.6.6 above during the x-ray exposure evaluation shall result in an immediate disqualification of an individual as an x-ray radiographer or x-ray radiographer's assistant, pending remedial training and re-qualification by the RSO.
8. The RSO shall document all remedial training and test results in the radiographer's personal training files and in the RSO's training records.

11.8.7 Initial Training of X-Ray Radiography Barrier Monitors

1. Prior to assignment as a BM, personnel shall receive initial training on the following subjects:
   a. Survey instrument operation.
   b. Boundary survey techniques.
   c. Allowable radiation levels for radiation area boundaries.
   d. Requirement to keep personnel from crossing boundaries into radiation areas.
   e. Controls for surveilling high radiation areas and preventing entry by unauthorized personnel.
   f. Proper communication methods with the x-ray radiographer during operations.
   g. Principles and operation of TLD and EPD/IPD, actions to be taken for an alarming EPD, off scale IPD, or faulty EPDs/IPDs.
   h. Relative risk associated with exposure to ionizing radiation.
   i. Specific instruction about prenatal exposure risks to the developing embryo and fetus. This shall include the requirements of NAVMED P-5055 and applicable information in NRC Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure."
   j. As low as reasonably achievable (ALARA) principles and techniques.
2. The duration of the training shall be determined by the RSO.
3. This training shall be conducted by the RSO or designated representative.
4. Successful completion of initial BM training shall be demonstrated by the BM attaining a score of 80 percent or higher on a written examination.
5. Qualified x-ray radiographers or x-ray radiographer’s assistants may serve as BMs without completing this additional training.

11.8.8 Annual Refresher Training for X-Ray Radiography Barrier Monitors

1. BMs shall receive annual refresher training on the topics listed above in Section 11.8.7.1. The training shall be conducted at intervals not to exceed 12 months.
2. The duration of the refresher training shall be determined by the command RSO.
3. This training shall be conducted by the RSO or designated representative.

11.9 Operating and Emergency Procedures

11.9.1 Requirements

1. General requirements for operating and emergency procedures are provided in Section 2.14.
2. X-ray radiography operating and emergency procedures shall:
   a. Include step-by-step instructions for each facility and each type of machine used in that facility.
   b. Not use technical manuals as a substitute for step-by-step instructions in the command operating and emergency procedures.
   c. Address each type of facility (i.e., exempt shielded, shielded, or open facility), in the local operating and emergency procedures.
   d. Have only one procedure for open facility x-ray radiography operations, regardless of the number of physical locations where open facility operations occur, as long as all open facility requirements are included.
   e. Refer to facility worksite postings where current and accurate information on persons to be notified in the event of an incident can be found.
   f. Require coordination of open facility x-ray operations with the command RSO.
   g. Contain each of the general operating requirements for conducting x-ray radiography discussed in Section 11.4.2.
   h. Contain a specific provision or caution that when conducting open facility x-ray radiography, the

boundary of the high radiation area shall be calculated but never actually surveyed.

i. Contain a requirement to maintain continuous direct surveillance of access to the high radiation area boundary. This shall be done except:
   (1) Where the high radiation area is equipped with a control device (e.g., emergency shutdown device) that reduces radiation levels below 100 mrem/hr (1 mSv/hr) upon entry.
   (2) Where the high radiation area is equipped with an alarm system that notifies the person and x-ray radiographer or supervision of the unauthorized entry.
   (3) Where the high radiation area is locked or interlocked to protect against unauthorized or accidental entry.

j. Contain a requirement that high radiation areas shall be secured in such a manner so that any person who inadvertently remains inside the area can leave the structure or facility without delay.

k. Specify logs and records to be maintained by radiography personnel such as the utilization and EPD logs.

l. Specify key control and machine security requirements to prevent inadvertent operation by unauthorized personnel.

m. Contain a requirement that only qualified x-ray radiographers or x-ray radiographer’s assistants under direct supervision of a qualified x-ray radiographer shall conduct x-ray radiography operations.

n. Contain a requirement that AT LEAST ONE qualified x-ray radiographer AND one x-ray radiographer’s assistant or BM shall be present when x-ray radiography operations are conducted as an open facility operation. Additional BMs shall be assigned as required to maintain complete surveillance and perform surveys of the radiation area boundaries.

o. Contain a requirement that the x-ray radiographer shall not unlock or enable the x-ray control panel until ready to energize the x-ray unit.

p. Contain a requirement for the x-ray radiographer to verify no personnel are within the shielded/exempt

shielded facility enclosures or inside the radiation area for an open facility prior to each exposure. This shall, at a minimum, include a requirement to conduct a detailed search of the area prior to each shift.

q. Contain emergency procedures that address:
   (1) Real or suspected overexposure.
   (2) Unauthorized or accidental entry of personnel into a radiation area.
   (3) Theft of an x-ray machine.
   (4) Failure of x-ray facility interlocks.
   (5) EPD alarm, EPD/IPD readings greater than 150 mrem, an off scale IPD, or an EPD failure.
   (6) Failure of the x-ray machine to shutdown.
   (7) Fire in or near x-ray radiography operations.

r. Contain the statement that "Under no circumstances shall the x-ray device be tampered with or wiring reconfigured."

s. Require that any proposed preventative or corrective maintenance procedure that affects radiation safety be approved in writing by the RSO prior to execution.

t. Contain the manufacturer's warm up procedures for the x-ray device.

u. Contain any x-ray machine administrative limitations.

3. Operating and emergency procedures shall be posted, if practicable, or otherwise be readily available at the x-ray control panel.

11.10 Additional Requirements for Conducting X-ray Radiography Using Accelerators

11.10.1 General Requirements

1. These requirements are in addition to all other requirements for conducting x-ray radiography unless otherwise stated below.

2. For purposes of this section, an accelerator is considered to be machine or apparatus used to accelerate charged particles to energies greater than one million electron volts (MeV).

11.10.2 **Accelerator Training**

1. Accelerator operators shall be trained as radiation workers per Section 2.8.4. Operators of accelerators for which surface contamination can be produced and contamination surveys or controls are necessary shall be trained as contamination workers per Section 2.8.5.
2. In addition to training on operating and emergency procedures required in radiation worker training, accelerator operators shall also be trained on the use of any instruments required to perform surveys in accordance with operating procedures. This training will be verified by practical examination.

11.10.3 **Accelerator Expert**

1. Each command conducting x-ray radiography using an accelerator shall designate an individual as an accelerator expert who has the appropriate combination of education and work experience to make sound radiation safety judgments related to the design and operation of accelerators.
2. The command shall submit a detailed resume for each proposed accelerator expert to NAVSEADET RASO for review and approval prior to designation.
3. The accelerator expert shall:
   a. Develop or review the design of each new accelerator facility or modification to existing accelerator facilities.
   b. Develop or review new or proposed changes to accelerator operating and emergency procedures.
   c. Review accelerator operating and emergency procedures annually to ensure the procedures are correct and up to date.
   d. Develop detailed procedures for conducting the facility radiation protection survey and interlock testing.
   e. Conduct or personally oversee the examination and testing of all emergency stops, interlocks, and safety and warning devices for proper operation at intervals not to exceed six months.
   f. Ensure configuration management of electrical circuit diagrams for the accelerator and the associated

safety interlock systems is maintained. These diagrams shall be available to operators of the facility and inspection by NAVSEADET RASO.

g. Review any proposed changes to the accelerator electrical and interlock systems.

11.10.4 **Accelerator Operating and Emergency Procedures**

1. Accelerator operating and emergency procedures shall:
   a. Include the requirements of Section 11.9.
   b. Be part of the command x-ray radiography operating and emergency procedures.
   c. Include detailed procedures for performing daily checks of the accelerator interlock systems.
2. A copy of the current operating and emergency procedures shall be maintained at the accelerator control panel during operations.

11.10.5 **Accelerator Safety Interlock Systems**

1. Each accelerator facility shall have a safety interlock system specifically designed to avoid and/or terminate a hazardous radiation safety condition.
2. The safety interlock system shall be a redundant system, which means there are two or more complete, independent interlock systems, configured such that a single failure cannot disable both systems.
3. Each entrance into an accelerator facility shall be equipped with a barrier and an interlock that shuts down the accelerator when opened or be locked from inside the facility to prevent access from the exterior of the facility ensuring emergency egress is maintained. Each of these interlocks shall be part of the interlock system.
4. All interlocks in the system shall be:
   a. On a circuit which is independent of all other interlocks.
   b. Tamper-resistant and fail-safe.
   c. Designed so that operation of the accelerator is not possible unless all interlocks are closed.
5. When an interlock has been tripped, it shall only be

possible to restart the accelerator by manually resetting the interlock first at the location of the tripped interlock and then at the main control console.

6. Interlocks and access controls shall not prevent an individual from leaving a high radiation area.
7. All interlocks shall be tested daily for proper operation.
   a. Unlike x-ray machines, daily interlock tests are not to be conducted with the accelerator at power. Tripping interlocks at power could cause irreparable damage to the accelerator.
   b. The interlock system shall have a means of testing operability of each interlock independently without power being applied to the accelerator.
   c. There shall be an indicator for each interlock and emergency stop at the main control console. The indicators will show the position of each interlock or emergency stop as being open or closed.
8. All emergency stops shall be integrated into the interlock system.
9. All emergency stops shall:
   a. Include a manual reset at the location where it was activated.
   b. Have the function of the emergency stop clearly marked near the stop.
   c. Be tested for proper operation every six months.
10. Primary controls for power to radiation producing circuits of the accelerator shall be equipped with a key operated switch. The key switch shall only be enabled when all interlocks and emergency stops are closed.

11.10.6 **Requirements for Warning Devices and Radiological Postings**

1. Each high radiation area shall have audible and visible warning signals located within the facility.
   a. The audible and visible warning signals shall be integrated into the interlock system such that they are activated when the x-ray on button/switch is engaged.
   b. The audible and visible warning signals shall

activate for a minimum of 20 seconds immediately before x-rays are produced.

c. The visible warning signal (preferably a rotating beacon) must remain illuminated during x ray production.

d. The visible signal must deactivate when x-ray production is terminated.

e. It is acceptable to have two separate lights, such that one is illuminated during the 20 second warning and the other light is illuminated when x-rays are being generated. If two lights are used, the x-ray on light shall be red and the 20 second warning light shall be a different color.

2. The interior of the accelerator facility shall be posted with signs containing the conventional radiation symbol and the words “Caution – High Radiation Area,” "Danger - High Radiation Area," or “Grave Danger – Very High Radiation Area” on a yellow background depending on the radiation output of the accelerator. There must be sufficient signs to be visible by anyone entering the facility.

3. All entrances to the exposure room(s) shall be posted with a sign containing the conventional radiation symbol and the words "Caution - Entering Radiation Exposure Room" on a yellow background.

11.10.7 Special Requirements for Conducting X-ray Radiography with Accelerators Operating at Energies Exceeding Ten MeV

1. The accelerator expert shall determine the likelihood of neutron activation when conducting x-ray radiography with accelerators operating at energies exceeding ten MeV.

   a. The results of the evaluation shall be maintained on file until the facility is decommissioned.

   b. If the evaluation determines neutron activation is expected, accelerator operations shall comply with the additional requirements below.

2. The Naval Dosimetry Center shall be contacted to evaluate and establish, if necessary, neutron energy correction factors (NECFs) for the primary dosimeters used at the facility.

3. Operating and emergency procedures shall include procedures for conducting radiation and contamination surveys.
   a. These procedures shall be developed by the accelerator expert.
   b. The procedures shall include steps for:
      (1) Determining activation of accelerator components (e.g., targets, windows, collimators, beam dumps) prior to maintenance.
      (2) Determining activation of all material and components prior to removal from the accelerator facility.
      (3) Determining surface contamination of material and components prior to release of material or components for unrestricted use. Contamination levels shall be less than the values in Table 2.2.
4. The accelerator expert shall evaluate the potential for generation of airborne radioactivity produced by accelerator operations.
5. If the potential for airborne radioactivity exists, the following actions shall be taken.
   a. Air exchange rates and/or delay in personnel entry into the facility shall be sufficient to ensure 10 room exchanges take place before entry to prevent airborne radioactivity from being inhaled upon personnel entry into the facility after the accelerator has been shutdown.
   b. Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words "CAUTION AIRBORNE RADIOACTIVITY AREA."
   c. Exhaust air vents shall be located to prevent exhausted air from being drawn into nearby air intakes for the facility or work areas.
   d. A program to monitor personnel for internal exposure shall be implemented per NAVMED P-5055 if accelerator operations will produce airborne radioactivity and operating personnel have the potential to be exposed.
   e. An evaluation shall be performed to determine if effluent monitoring will be required.

6. Monitoring for neutron radiation during accelerator operations shall be performed using portable neutron survey instruments or other neutron detection methods approved by NAVSEADET RASO.

11.11 Radiation Monitoring Equipment for X-Ray Radiography

11.11.1 Radiation Survey Instruments

1. The IM-231 series ionization chambers are the RASP-approved radiation survey instrument for use when conducting x-ray radiography operations.
2. NAVSEADET RASO shall approve the use of all alternate survey instruments.
3. The x-ray radiation survey instrument shall be capable of measuring 2 mrem/hr (0.02 mSv/hr) to 1000 mrem/hr (10 mSv/hr).
4. Instruments not calibrated through the NAVSEA RADIAC program office (NAVSEA 04ND) shall be calibrated per American National Standards Institute (ANSI) Standard N323A, Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments.
5. All radiation survey instruments used for conducting x-ray radiography shall be calibrated at six-month intervals or after each repair or servicing.
6. Radiation survey instruments shall be checked for acceptable response to radiation using a NAVSEA 04ND approved check source prior to the first operation of the day or shift, and after suspected damage to the instrument, such as would occur if the instrument is dropped.
7. Uncalibrated instruments, instruments that fail to properly respond during response checks, or instruments exceeding the calibration due date, shall not be used without specific approval by NAVSEADET RASO.
8. Under no circumstance shall Geiger-Mueller (GM) tube type instruments, such as an IM-265(AN/PDQ), be used during x-ray operations or x-ray facility radiation surveys. GM-type instruments do not accurately measure x-rays produced during x-ray radiography operations.
9. When using the IM-231 series instruments to survey x-ray machines operating below 120 kVp, the sliding window

(beta window) on the base of the instrument shall be opened and the open window pointed at the area to be surveyed. This procedure compensates for the instrument's under-response to low energy photons (40 keV and below).

11.11.2 Personnel Dosimetry

1. All personnel assigned to or associated with x-ray radiography operations are required to wear a primary dosimeter approved by BUMED per Section 2.6.
2. When not in use, primary dosimeters shall be stored in an area with low background radiation levels.
3. In addition to a primary dosimeter, all personnel participating in x-ray radiography operations (including BMs) shall wear and use one EPD or two IPDs as described in Section 2.6.
4. The use of secondary dosimetry shall be documented and records maintained per Section 2.26.2.

11.12 Facility Radiation Protection Inspections

11.12.1 General Requirements

1. A radiation protection inspection shall be conducted and documented for all facilities classified as exempt shielded or shielded.
2. Inspections shall be conducted at a frequency not to exceed every six months for operating facilities.
3. Inspections shall be conducted prior to resuming operations in a facility that has been inoperative for over six months.
4. The RSO or a qualified x-ray radiographer shall conduct the radiation protection inspection.

11.12.2 Conduct of Radiation Protection Inspections

1. The radiation protection inspection shall:
   a. Verify the operational status of all audible and visible warning signals, interlocks, delay switches, emergency stops and mechanical and electrical devices that restrict the x-ray beam.
   b. Verify that all warning signs, placards, and labels

are conspicuously posted as required and legible.

2. Proper operation of emergency stop devices shall be checked by:
   a. Tripping each stop individually while the x-ray machine is shut down and ensuring all other interlocks are not tripped.
   b. Exiting the facility and attempting to operate the x-ray machine.
   c. If the machine does not operate, the check is considered satisfactory.
3. A quick scan radiation survey of all primary barriers with personnel or equipment access doors shall be conducted as follows:

Note: Most facilities DO NOT have personnel or equipment access doors in primary barriers and therefore are not required to perform this survey.

   a. The x-ray machine shall be operated at maximum authorized operating parameters as stated in the latest radiation protection survey.
   b. The TBD shall be 36 inches. If design restrictions preclude a TBD of 36 inches, the closest possible distance to 36 inches shall be used.
   c. The primary x-ray beam shall be directed at each of the primary barriers that have personnel or equipment access doors and a radiation survey conducted to determine the maximum radiation levels at the outside of the personnel or equipment access doors. Record the readings and location on the inspection form.
   d. For exempt shielded facilities, the maximum radiation levels shall be determined at two inches from the barrier.
   e. For shielded facilities, the maximum dose rate shall be determined at one foot from the barrier.

11.13 Facility Radiation Surveys

11.13.1 General Requirements

1. Facility radiation surveys shall be conducted and documented for all facilities classified as an exempt shielded or shielded as follows:

a. Before a new facility is placed into routine operation.
b. After any significant changes in conditions from the initial facility radiation survey which could adversely affect radiation safety, e.g. facility modification or damage, change in operating parameters (kVp, mA, or time).
c. Every five years unless otherwise specified.

2. Facility radiation surveys shall not be scheduled to correspond with the performance of radiation protection inspections required by Section 11.12 above. The purpose of Section 11.12 is to ensure facilities are adequately maintained without the additional burden of personnel time, radiation dose, and wear and tear on equipment required to perform the facility radiation survey.
3. General requirements for radiation protection surveys are provided in Section 2.21.

11.13.2 **Conduct of Facility Radiation Surveys**

1. The facility radiation survey shall be conducted using the conditions expected to cause the greatest radiation levels external to the exempt shielded or shielded facility during normal operations (i.e., machine or device operating at maximum kVp and mA).
2. When conducting the facility radiation survey for a facility classified as exempt shielded, the survey shall be conducted with the x-ray unit operating at the maximum operating parameters and directed at each of the four bulkheads, the overhead, and the deck.
3. When conducting the facility radiation survey for a facility classified as shielded, any restrictions determined during the radiation survey shall be the limiting conditions for normal shielded facility operations. These limiting conditions include restrictions on x-ray tube head placement, as well as voltage and current restrictions.
4. The facility radiation survey shall:
   a. Verify the operational status of all audible and visible warning signals, safety interlocks, delay switches, emergency stops and mechanical and

electrical devices that restrict the x-ray beam.

b. Verify that all warning signs, placards, and labels are conspicuously posted as required and legible.

5. Radiation surveys shall be conducted on all facility barriers that are adjacent to accessible unrestricted areas.

   a. The survey shall be performed under practical operating conditions that will result in the greatest radiation levels at the point of interest.

   b. The TBD shall be 36 inches. If design restrictions preclude a TBD of 36 inches, the closest possible distance to 36 inches shall be used.

   c. For exempt shielded facilities, the maximum radiation levels shall be determined at two inches from the barrier.

   d. For shielded facilities, the maximum radiation levels shall be determined at one foot from the barrier.

6. If radiation levels exceed 2 mrem/hr (0.02 mSv/hr) at one foot for a shielded facility, complete one of the following actions:

   a. Set radiation area boundaries during x-ray radiography operations and conduct radiography as an open facility.

   b. Correct facility shielding to reduce radiation levels to less than 2 mrem/hr (0.02 mSv/hr) at one foot and 100 mrem (1 mSv) in a year at the accessible unrestricted area.

   c. Restrict the tube head location to reduce radiation levels to less than 2 mrem/hr (0.02 mSv/hr) at one foot and 100 mrem (1 mSv) in a year at the accessible unrestricted area.

7. If radiation levels exceed 0.5 mrem/hr (0.005 mSv/hr) at two inches from any surface for an exempt shielded facility, complete one of the following actions:

   a. Set radiation area boundaries during x-ray radiography operations and conduct radiography as an open facility.

   b. Correct facility shielding to reduce radiation levels to less than 0.5 mrem/hr (0.005 mSv/hr) at two inches from any surface and 100 mrem (1 mSv) in a year at the accessible unrestricted area.

c. Restrict the tube head location to reduce radiation levels to less than 0.5 mrem/hr (0.005 mSv/hr) at two inches from any surface and 100 mrem (1 mSv) in a year at the accessible unrestricted area.

8. Facility or equipment limitations shall be approved by the RSO, incorporated into operating and emergency procedures, and posted at x-ray control panels.

11.14 Surveillance of Open Facility Operations

1. The RSO shall observe open facility operations at intervals not to exceed three months. The RSO is encouraged to observe operations as frequently as practical. It is not the intent of this requirement that operations be performed for the sole purpose of conducting the surveillance.
2. In the event that open facility operations are not conducted during the three-month period, the RSO shall evaluate the next regularly scheduled open facility operation that the command performs.
3. The RSO shall prepare and use a checklist for performing surveillances of open facilities. The surveillance can be performed as part of a x-ray radiographer's semi-annual performance evaluation per Section 11.8.6.
4. The surveillance shall include as a minimum:
   a. Verification that all required equipment (e.g., signs, rope, stanchions, radiation survey instruments, and a copy of the approved operating and emergency procedures, etc.) is on hand.
   b. Verification that the utilization logs are properly completed.
   c. Verification that the high radiation and radiation area distances are properly calculated and the boundaries properly posted.
   d. Verification that a flashing "X-ray on when lit" light is used.
   e. Verification that operations (including survey instrument functional check) are performed in accordance with operating and emergency procedures.
5. A record of the surveillance shall be maintained in accordance with Section 11.15.16.

11.15 Records

11.15.1 General Requirements

Log and record requirements in this section are in addition to the record requirements specified in Section 2.26.

11.15.2 Utilization Logs – General Requirements

1. The x-ray radiography utilization log is an important record that shall be as complete and accurate as possible.
2. Utilization logs shall be forwarded for RSO review within 2 working days of completion of radiography and reviewed, signed, and dated by the RSO or ARSO within five working days of receipt.
3. Separate utilization logs shall be maintained for each machine and facility used by the command (i.e., exempt shielded, shielded, or open facility).
4. The format of the utilization log shall be determined at the command to allow for unique local requirements.
5. To ensure uniformity and avoid confusion, the following symbols shall be used as standards for describing x-ray beam orientation:
   a. ↑̄ Indicates beam aimed up.
   b. ↓̲ Indicates beam aimed down.
   c. ↑ Indicates beam aimed north or forward.
   d. ↓ Indicates beam aimed south or aft.
   e. → Indicates beam aimed east or starboard.
   f. ← Indicates beam aimed west or port.

11.15.3 Utilization Logs – Exempt Shielded Facility

1. Utilization logs for an exempt shielded facility shall contain the following minimum information:
   a. A description of the x-ray machine including make, model, maximum operating kVp, and mA.
   b. The kVp, mA, exposure duration, beam orientation, and date for each exposure, or group of uninterrupted exposures for repetitive work.
   c. The legibly printed name(s) of the x-ray

radiographer(s).

d. The make, model, serial number, and calibration date of the radiation survey instruments.

e. Initials of the x-ray radiographer verifying that the radiation survey instruments were response checked prior to the initial exposure of the shift.

f. Initials of the x-ray radiographer verifying that all interlocks and alarms have been checked for proper operation before the initial exposure of the shift.

g. The maximum radiation level obtained during the quick scan radiation survey of the personnel or equipment access doors including the location of the reading and the machine kVp and mA.

11.15.4 **Utilization Logs – Shielded Facility**

1. Utilization logs used in a shielded facility shall contain the following minimum information:

   a. A description of the x-ray machine including make, model, maximum operating kVp, and mA.

   b. The kVp, mA, exposure duration, and date for each exposure, or group of uninterrupted exposures for repetitive work.

   c. The legibly printed name(s) of the x-ray radiographer(s).

   d. The make, model, serial number, and calibration date of the radiation survey instruments.

   e. Initials of the x-ray radiographer or x-ray radiographer’s assistant verifying that the radiation survey instruments were response checked prior to the initial exposure of the shift.

   f. Initials of the x-ray radiographer verifying that all interlocks and alarms have been checked for proper operation before the initial exposure of the shift.

   g. The maximum radiation level obtained during the quick scan radiation survey of the personnel or equipment access doors including the location of the reading and the machine kVp and mA.

   h. The beam direction for each exposure or group of exposures for repetitive work.

   i. Identification of the primary and secondary barriers.

11.15.5 **Utilization Logs – Open Facility**

1. Utilization logs used in open facility x-ray operations shall contain the following minimum information:
   a. A description of the x-ray machine including make, model, maximum operating kVp, and mA.
   b. The kVp, mA, exposure duration, and date for each exposure, or group of uninterrupted exposures for repetitive work.
   c. The legibly printed name(s) of the x-ray radiographer(s) and BMs.
   d. The make, model, serial number, and calibration date of the radiation survey instruments.
   e. Initials of the x-ray radiographer verifying that the radiation survey instruments were response checked prior to the initial exposure of the shift.
2. A sketch of the operation area for each exposure or group of exposures that shows:
   a. The orientation of the x-ray radiography site in relation to fixed reference parameters – magnetic north, ship’s bow, etc.
   b. Beam orientation.
   c. The location of the radiation and high radiation area boundaries, location of the x-ray tube head, flashing or rotating beacon, and the object being radiographed.
   d. The approximate distance from the tube head to the radiation and high radiation area boundaries.
   e. Maximum radiation levels measured at the radiation area boundaries. This shall include a sampling of radiation levels around the entire boundary (a minimum of four points).
3. The general location where open facility x-ray radiography was conducted.

11.15.6 **RSO and ARSO Training Records**

Initial and refresher training records for the RSO and ARSO(s) shall be retained as described in Section 2.26.5.

11.15.7 **Initial X-ray Radiographer Training Records**

1. The RSO shall keep a copy of the course completion certificate or equivalent record for individuals that received initial training from either the NDI Technician Course (C-603-3191) or Radiographic Operator Course (A-701-0032 or A-701-0057).
2. Records for local initial training shall include a descriptive memorandum signed by the RSO or individual conducting the training, a copy of the course outline and a copy of the course approval letter from NAVSEADET RASO, copies of the examinations used in training, and student test scores.
3. Records for contractor provided initial training shall consist of course completion certificates or signed memoranda from the contractor indicating successful completion of the training and a copy of the course approval letter from NAVSEADET RASO.

11.15.8 **Command Qualification Record for X-Ray Radiographers And X-Ray Radiographer's Assistants**

1. A qualification record shall be used to document that an x-ray radiographer and x-ray radiographer's assistant has successfully completed the command qualification program.
2. The RSO shall sign and date the command qualification record certifying that the x-ray radiographer or x-ray radiographer's assistant has satisfactorily completed:
   a. Initial training as described in Section 11.8.2.
   b. IRRSP or equivalent NAVSEADET RASO approved certification process for x-ray radiographers.
   c. Formal training on the command's operating and emergency procedures.
   d. Four x-ray radiographic operations under the direct supervision of a qualified command x-ray radiographer.
   e. A written examination on the command operating and emergency procedures. A copy of the written examination shall be retained as part of the qualification record.
   f. An ionizing radiation medical examination per NAVMED P-5055.

3. Records of the qualification shall be maintained for three years after the radiographer has transferred.

11.15.9 Refresher Training for X-Ray Radiographers Records

Annual refresher training records shall be maintained per Section 2.26.5.

11.15.10 Semi-annual X-Ray Radiographer and X-Ray Radiographer's Assistant Evaluation Records

1. A written checklist shall be used to document the evaluation.
2. The checklist shall describe each of the attributes listed in Section 11.8.6.6 and the x-ray radiographer's or x-ray radiographer's assistant's performance for each.
3. The checklist shall also include:
   a. Date and time of evaluation.
   b. Name and signature of radiographer evaluated.
   c. Name and signature of evaluator.
   d. Evaluator's comments.
   e. Signature and date reviewed by the RSO.
4. Records of x-ray radiographer and x-ray radiographer's assistant evaluations shall be maintained for a minimum of three years.

11.15.11 Initial and Annual Refresher Training of X-Ray Radiography Barrier Monitor Records

Initial and refresher BM training records shall be maintained per Section 2.26.5.

11.15.12 Radiation Survey Instrument for X-Ray Radiography Records

Records of radiation survey instrument calibrations shall be documented and maintained per Section 2.26.9.

11.15.13 Secondary Dosimetry Logs

The use of secondary dosimetry shall be documented and records maintained per Section 2.26.2.

11.15.14 **Facility Radiation Protection Inspection Records**

1. Radiation protection inspection reports shall contain the following minimum information:
   a. Identification of the person conducting the inspection.
   b. Location of the facility (i.e., room number, building number, or hanger).
   c. Classification of the facility (i.e., exempt shielded or shielded).
   d. Date of the inspection.
   e. A diagram of the facility showing all adjacent areas with present occupancy factors (see glossary) for adjacent offices or spaces.
   f. A listing of audible and visible warning signals, interlocks, emergency stops, delay switches and mechanical and electrical devices that restrict the x-ray beam.
   g. Verification that each audible and visible warning signals, interlocks, emergency stops, delay switches and mechanical and electrical devices that restrict the x-ray beam are operating properly.
   h. Verification that all required warning signs, placards, and labels are posted and legible.
   i. The results of the quick scan survey, if conducted, of any primary barriers with personnel or equipment accesses.
   j. The radiation protection inspection report shall be signed by the person conducting the inspection and reviewed, signed, and dated by the RSO.
2. The inspection reports shall be maintained on file for a period of three years.
3. Records of emergency stops, interlocks, and safety and warning devices examination and testing shall be maintained at the facility for three years from date of completion.

11.15.15 **Facility Radiation Survey Records**

1. In addition to the requirements of Section 2.26.19, facility radiation survey reports shall contain the following minimum information:

a. Identification of the facility (i.e., room number, building number).
b. Identification of the x-ray machine(s) (make, model, serial number and maximum kVp and mA).
c. A diagram of the facility showing:
   (1) All adjacent areas with present and expected future occupancy factors for adjacent offices and spaces.
   (2) The location of all entrances and personnel and equipment access to the x-ray vault.
   (3) The location of the x-ray control panel.
   (4) The location and wording of all warning signs, within and external to the x-ray vault.
   (5) The location of all audible and visible warning signals, interlocks, emergency stops, delay switches, and mechanical and electrical devices that restrict the x-ray beam.
d. An electrical schematic of the interlocks, emergency stops, warning signals, delay switches, alarm systems and electrical devices that restrict the x-ray beam with the facility classification survey.
e. A statement verifying all interlocks, emergency stops, warning signals, delay switches, alarm systems and electrical devices that restrict the x-ray beam were tested and operating properly.
f. A description of all pertinent technique factors and the tube head location.
g. Direction of the x-ray beam for each measurement, or set of measurement(s).
h. Distance of the x-ray tube head to the barrier for each measurement, or set of measurement(s).
i. For each survey instrument used provide whether the instrument window was open or closed, and documented response check.
j. A statement that the entire surface of all accessible unrestricted areas was surveyed.
k. A diagram of each unrestricted barrier showing the location of all radiation levels above background and the readings at each location.
l. The distance of the survey instrument from the surface being surveyed (2 inches for exempt shielded facilities and one foot for shielded facilities).

m. An estimate of the x-ray system "ON" time during a heavy workload week.

n. Any additional remarks which may be pertinent to the overall radiation safety aspects of the facility.

o. A statement that the facility "meets" or "does not meet" requirements for its present or requested classification.

p. If the facility is found to be inadequate, the actions projected to correct deficiencies shall be stated.

q. When deficiencies are corrected, the RSO shall verify completion and attached a signed statement to the radiation protection survey report.

r. Name, signature and date of each individual performing the survey.

s. Signature and date documenting the RSO’s review of the survey.

2. Facility radiation surveys shall be maintained indefinitely.

11.15.16 **Surveillance of Open Facility Operations Records**

1. The record of the surveillance as a minimum shall include:

   a. A description or diagram of the open facility showing the area around the posted area, the location of all required equipment (e.g., signs, rope, stanchions, tube head, control panel, flashing “X-ray on when lit” and the object being examined).

   b. A written checklist that describes each of the attributes evaluated.

   c. The time, date, and location of the open facility operations.

   d. The names of all radiographers and BMs involved in the operation.

   e. Name and signature of evaluator.

   f. Evaluator’s comments.

   g. Signature and date reviewed by the RSO.

2. Records of surveillance of open facility operations shall be maintained for three years.

11.16 Reports and Notifications

11.16.1 Reportable Events

1. General reporting and notification requirements are provided in Section 2.27.
2. In addition to any reports or notifications required in Section 2.27, any command conducting x-ray radiography operations shall inform NAVSEADET RASO by telephone (DSN 953-4692 or commercial (757) 887-4692) within one working day of any of the following events during x-ray radiography operations:
   a. Violation of a radiation area boundary that results in an estimated or measured dose to an individual of 2 mrem (0.02 mSv) or greater.
      (1) Violations of radiation area boundaries that neither allow unimpeded access to a high radiation area boundary nor result in an actual dose to personnel of 2 mrem (0.02 mSv) or greater do not require reporting.
      (2) However, these events shall be documented and retained locally for review by NAVSEADET RASO during the next RASP inspection. Retain these files indefinitely.
   b. Unless excepted in Section 11.7.1.2.b(1), radiation levels outside of a posted radiation area boundary that exceed 2 mrem/hr (0.02 mSv/hr).
   c. Violations of procedures during x-ray radiography operations that reflect an actual loss of control of x-ray production or significant safety deficiency, such as:
      (1) Failure to check the x-ray facility (inside the radiation area and high radiation area boundary) for occupancy prior to x-ray production.
      (2) Allowing unqualified personnel to conduct x-ray radiography.
      (3) Failure to calculate, post, survey, or control high radiation and radiation area boundaries.
      (4) Deliberate unauthorized defeating or bypassing of safety features or devices.
      (5) Performing x-ray radiography without using the required primary or secondary dosimeters or

radiation survey instrument.

(6) Failure of safety equipment such as interlocks, audible alarms, and interrupt switches during actual operations. For fail-safe systems, this is defined as failure of the safety equipment to interrupt x-ray production.

(7) Operation of x-ray equipment without a command endorsed operating and emergency procedure.

(8) Unplanned exposure to radiographers, or other personnel, caused by improper x-ray tube orientation such that the primary beam is directed at other than a designated primary barrier.

(9) Evidence of tampering with x-ray equipment.

11.16.2 **Reports**

1. Verbal reports shall be followed by a written report in accordance with Section 2.27.

SECTION 12 – **RESEARCH ACCELERATOR OPERATIONS**

12.1 **Electron Accelerators**

12.1.1 **General Discussion**

1. Accelerators vary in energy from one million electron volts (MeV) to 150 MeV and can deliver a lethal dose of radiation in as little as five seconds in the direct radiation beam. At energies above 10 MeV, accelerators can produce neutron radiation, which requires specialized survey and personnel monitoring equipment. Furthermore, the radioactive material produced by activation of components in or near the direct radiation beam should be controlled.
2. The requirements of this section are basic to operation of electron accelerators but do not substitute for a detailed analysis of operations and hazards for the specific accelerator.

12.1.2 **Radiation Safety Requirements**

1. Written operating and emergency procedures shall be established per Section 2.14 and reviewed annually by the Radiation Safety Officer (RSO), accelerator operator(s), supervisors, and facility management.
2. The accelerator operator shall be responsible for all operations of the accelerator, including the radiation safety of everyone in and around the accelerator facility. This responsibility is in addition to that of the RSO.
3. The accelerator operator shall conduct operations in strict compliance with approved operating and emergency procedures, and shall secure operations if unable to comply with a procedural requirement or an unsafe condition is indicated.

12.1.3 **Training**

1. The RSO and ARSO(s) shall complete the training required in Section 2.8.3.
2. Accelerator operators shall be trained as radiation workers per Section 2.8.4. Operators of accelerators for which surface contamination can be produced and

contamination surveys or controls are necessary shall be trained as contamination workers per Section 2.8.5.

3. In addition to training on operating and emergency procedures required in radiation worker training, accelerator operators shall also be trained on the use of any instruments required to perform surveys in accordance with operating procedures. This training will be verified by practical examination.

12.1.4 Area Control Requirements

1. Radiation levels in unrestricted areas shall not exceed an instantaneous dose rate of 2 mrem/hr (0.02 mSv/hr).
2. All radiation areas shall be controlled by positive means such as a wall or fence.

12.1.5 Accelerator Control and Interlock System Requirements

1. Instrumentation and controls on the control console shall be clearly identified and easily discernible.
2. Primary controls governing the operation of accelerators should be capable of being locked. When an accelerator is in operation, the operator in charge shall have immediate responsibility for accelerator related safety and shall have custody of keys governing accelerator operation.
3. Each entrance into an exposure room or other high radiation areas shall be equipped with a barrier and an interlock that shuts down the machine when opened.
4. Each interlock shall be on a circuit, which is independent of all other interlocks.
5. All interlocks shall be designed so that any defect or component failure in its system prevents operation of the accelerator.
6. When an interlock has been tripped, it shall only be possible to restart the accelerator by manually resetting controls first at the position of the trip and last at the main control console.
7. Interlocks and access controls shall not prevent an individual from leaving a high radiation area.
8. Operation of the accelerator shall not be possible

unless all interlocks are closed.

9. All emergency power cutoff switches shall include a manual reset at the site where it was activated. The function of all switches shall be clearly marked.

12.1.6 Warning Devices and Area Radiation Monitor Requirements

1. Each location designated as a high radiation area and each entrance to that location shall be equipped with easily observable warning lights (flashing or rotating) that operate when, and only when, radiation is being produced. The light shall be provided with a label, which indicates their purpose.
2. Each accessible high radiation area shall have an audible warning device, which activates for at least 20 seconds prior to the possible creation of the high radiation area. In large facilities, the audible warning device shall be on long enough that a person can identify the signal and exit the high radiation area or reach an emergency cut off switch. This warning device shall be clearly discernible from ambient noise and from other audible signals.
3. Lights of a different color than the high radiation area warning lights shall be used for other visual indicators when they are required.
4. All access barriers and pathways leading to high radiation areas shall be posted as "Caution - Entering High Radiation Area."
5. During operation of the accelerator, radiation levels in all high radiation areas shall be continuously remotely monitored. The monitoring devices shall be electrically separate from the accelerator control and safety interlock systems and provide a readout at the control panel.
6. All area monitors shall be calibrated at intervals not to exceed three years and after each servicing and repair.

12.1.7 Operational Requirements

1. Electron accelerators shall be secured to prevent unauthorized use when not in operation.

2. The interlock system shall not be used to turn off the accelerator beam except in an emergency.
3. All safety and warning devices, including interlocks, shall be examined and tested by a qualified individual for proper operation at intervals not to exceed six months. Records of such tests and maintenance shall be maintained at the accelerator facility for inspection by NAVSEADET RASO.
4. Safety and warning devices, including interlocks, shall be checked for proper operation by the operator prior to each day of use and results recorded and initialed in the operator log.
5. Current electrical circuit diagrams of the accelerator and the associated safety interlock systems shall be maintained for inspection by NAVSEADET RASO and shall be available to the operator at each accelerator facility.
6. If it is necessary to intentionally bypass a safety interlock such action shall be:
   a. Authorized, in writing, by the RSO and the shift supervisor (operator).
   b. Recorded in a permanent log and a notice posted at the accelerator control console.
   c. Terminated as soon as possible and before resumption of routine operation.
7. A copy of the current operating and emergency procedures shall be at the accelerator control panel.
8. Prior to startup, the operator shall make a personal, complete visual inspection of all high radiation areas and restricted areas, to assure all personnel have left the area.

12.1.8 **Radiation Survey Instrument Requirements**

1. Operable and calibrated, portable ion chamber survey instruments shall be available at each electron accelerator facility. The instruments shall be calibrated for radiations being produced by the accelerator, shielded for radio-frequency interference and approved by NAVSEADET RASO.
2. Geiger-Mueller survey instruments shall not be used to survey the accelerator or auxiliary equipment.

3. Electron accelerators operating at energy levels greater than 10 MeV shall have neutron survey instruments available.
4. Survey instruments shall be calibrated at least every six months and after each repair or servicing.
5. Survey instruments shall be checked for proper response to radiation prior to the first use of the day or shift and after suspected damage such as dropping.

12.1.9 **Personnel Dosimetry Requirements**

Personnel dosimeters shall be used per Section 2.6 and NAVMED P-5055.

12.1.10 **Facility Radiation Survey Requirements**

1. A qualified expert in the design and operation of electron accelerator facilities shall perform a detailed radiation survey when the accelerator is first capable of producing radiation. Curricula vitae shall be forwarded to NAVSEADET RASO for evaluation prior to obtaining the services of a "qualified expert."
2. A facility radiation survey shall be performed and documented by a qualified operator when changes have been made in shielding, operation, equipment, or occupancy of adjacent areas that could adversely affect radiation safety.
3. Facility radiation surveys for accelerators with maximum energies greater than 10 MeV shall:
   a. Be conducted at the highest rated energy and current, or exposure rate.
   b. Evaluate airborne radioactivity.
   c. Evaluate neutron leakage.
   d. Identify activated components and established radiological control procedures for maintenance and repair.
4. Radiation surveys shall be conducted in accordance with written procedures previously established by a qualified expert.
5. After operation of the accelerator, a radiation survey shall be conducted by the operator upon initial entry into an exposure room to verify the accelerator is off

and to identify any radiation hazards due to neutron activation (for operation above 10 MeV).

6. Radiation surveys shall be conducted as necessary:
   a. To determine and document that radiation levels in unrestricted areas do not exceed 2.0 mrem/hr (0.02 mSv/hr), or 100 mrem (1 mSv) in a calendar year).
   b. To determine that personnel in occupied areas are not exposed to excessive radiation levels due to incorrect or unusual accelerator operation.
   c. To determine radiation levels and controls for auxiliary accelerator equipment which produce ionizing radiation.

12.1.11 Special Considerations for Electron Accelerators with Energies Exceeding 10 MeV

1. Radiation safety programs, procedures, and surveys shall be reviewed at least annually by a qualified expert (staff member or consultant under contract).
2. LiF thermoluminescent dosimeters (TLDs) or other Bureau of Medicine and Surgery (BUMED) approved dosimetry shall be worn to measure gamma and neutron exposure.
3. Neutron energy correction factors shall be established for LiF TLDs. The neutron correction factor shall be established in accordance with BUMED survey procedures.
4. Procedures shall be established by the RSO or a qualified expert for the following:
   a. Surveys for activation of accelerator components (e.g., targets, windows, collimators, beam dumps) prior to maintenance.
   b. Surveys for activation of all material prior to removal from the accelerator facility. Material released for unrestricted use shall comply with surface contamination levels of Table 2-2.
5. If the potential for airborne radioactivity exists, the following actions shall be taken.
   a. Air exchange rates and/or delay in personnel entry into the facility shall be sufficient to ensure 10 room exchanges take place before entry to prevent airborne radioactivity from being inhaled upon personnel entry into the facility after the

accelerator has been shutdown.

b. Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words "CAUTION AIRBORNE RADIOACTIVITY AREA."

c. Exhaust air vents shall be located to prevent exhausted air from being drawn into nearby air intakes for the facility or work areas.

d. A program to monitor personnel for internal exposure shall be implemented per NAVMED P-5055 if accelerator operations will produce airborne radioactivity and operating personnel have the potential to be exposed.

e. An evaluation shall be performed to determine if effluent monitoring will be required.

12.1.12 **Logs and Records**

1. General requirements for logs and records are provided in Section 2.26. Additional requirements for accelerators are provided below.

2. Utilization Log

   a. A log shall be maintained for each used accelerator of the command.

   b. Logs shall contain at least the following information:

      (1) Machine identification.

      (2) Energy, current or radiation output, duration of operation and date.

      (3) Primary beam orientation.

      (4) Name(s) of the operator(s) and signature of the Senior Operator.

      (5) Model, serial number, and calibration dates of survey instrument(s).

      (6) Initials of the operator verifying that the radiation survey instruments have been source checked prior to the initial exposure of the day or shift.

      (7) Initials of the operator certifying that all interlocks and alarms have been checked for proper operation before the initial exposure of the day or shift.

12.2 Other Research Accelerators

Requirements for other types of research accelerators will be determined by NAVSEADET RASO on a case-by-case basis.

SECTION 13 – **RADIATION SAFETY REQUIREMENTS FOR ANALYTICAL X-RAY EQUIPMENT AND ELECTRON MICROSCOPES**

13.1 **Radiation Safety Requirements for Stationary Analytical X-ray Equipment**

13.1.1 **Introduction**

This part provides special requirements for analytical x-ray equipment used for x-ray diffraction or fluorescence analysis. The requirements here are in addition to applicable requirements in other parts of this manual.

13.1.2 **General Requirements**

1. A Radiation Safety Officer (RSO) shall be appointed in writing and qualified per Section 2.8.3.
2. No individual shall be permitted to operate or maintain analytical x-ray equipment unless such individual has received instruction from the RSO and has demonstrated competence in identification of equipment radiation hazards, operating and emergency procedures, warning system, safety precautions, and reporting of actual or suspected exposures.
3. Standard operating and emergency procedures shall be written and approved in accordance with the RASP instruction required by Section 2.7, and provided to all operators and their supervisors.
4. No individual shall be permitted to operate equipment in any manner other than that specified in the procedures unless the individual has obtained prior written approval from the RSO. Standard operating procedures include sample insertion and manipulation, equipment alignment, and maintenance.
5. Manufacturer's special alignment procedures shall be used when available and shall be approved in writing by the RSO.

13.1.3 **Open and Enclosed Beam Systems**

1. General Requirements
   a. The dose rate due to stray radiation from components such as high voltage rectifiers shall not exceed 2

millirem per hour (mrem/hr) (0.02 millisieverts per hour (mSv/hr)) at any accessible location five centimeters from the outside surface of the generator cabinet without access controls in place.

b. If an individual may be near the operating equipment for as long as 40 hours per week, the radiation level shall not exceed 0.25 mrem/hr (2.5 microsieverts (microSv)/hr) at five centimeters.

c. The x-ray accessory apparatus shall include a beam trap or other barrier with sufficient shielding so that the radiation level from the transmitted primary beam does not exceed 0.25 mrem/hr (2.5 microSv/hr) under normal operating conditions.

d. To determine if this requirement has been met, the inherent shielding on the trap or barrier must be at least equivalent to the thickness of lead specified in the table below for the maximum rated anode current and potential.

Thickness of Lead Required for a Primary Beam Barrier Located Five Centimeters from the Focal Spot

	THICKNESS OF LEAD (mm)		
ANODE CURRENT (mA)	50 kVp	70 kVp	100 kVp
20	1.5	5.6	7.7
40	1.6	5.8	7.9
80	1.6	5.9	-
160	1.7	-	-

e. A fail-safe warning light or device that is labeled “X-RAYS ON,” or other similar words shall be located near any switch which energizes the x-ray tube.

f. A fail-safe light or indicator in a conspicuous location near the radiation source housing shall be used to indicate when the x-ray tube is on.

g. The control panel of each analytical x-ray unit shall be equipped with a key-operated power switch or power switch and password protection system, which shall

prevent the production of x-rays when in the “off” position. The “on” and “off” positions shall be clearly marked and the key shall be removable only when the switch is in the “off” position.

h. A label bearing the conventional radiation symbol and the words "CAUTION: THIS EQUIPMENT PRODUCES X-RAYS WHEN ENERGIZED - TO BE OPERATED ONLY BY QUALIFIED PERSONNEL", or other similar words shall be attached near any switch which energizes an x-ray tube.

i. Each x-ray tube housing shall be equipped with an interlock that shuts off the tube if it is removed from the radiation source housing or if the housing is disassembled.

2. Open Beam System

a. All personnel working with open beam analytical x-ray equipment shall be considered as occupationally exposed individuals and trained as a radiation worker in accordance with Section 2.8.4.

b. A primary dosimeter shall be worn on the upper chest or collar.

c. Finger ring or wrist dosimeters shall be provided to and used by:

(1) Operators using open-beam systems not equipped with a safety device.

(2) Personnel performing maintenance on the equipment, if the maintenance procedures require the primary x-ray beam to be turned on when any local component in the system is disassembled or removed.

d. Annotation of exposure to low-energy highly collimated x-rays shall be made on the dosimetry report submitted with the primary dosimeters for processing.

e. All shutters shall have a fail-safe "shutter open" indicator.

f. Radiation levels external to the x-ray tube housing with all shutters closed shall not exceed 2.5 mrem/hr (0.025 mSv/hr) measured at five centimeters from the surface of the housing when the x-ray tube is operated at full rated power at maximum rated potential.

g. Each port of the source housing shall be provided

with a beam shutter interlocked with the x-ray accessory apparatus coupling or collimator so that the port shall be on only when the collimator or coupling is in place. Shutters at unused ports shall be secured to prevent casual opening.

h. A guard or interlock shall prevent entry of any part of the body into the primary beam.

i. Radiation levels near controls and adjustments of the x-ray accessory apparatus shall not exceed 37.5 mrem/hr (0.375 mSv/hr) to the hands or 2.5 mrem/hr (0.025 mSv/hr) to the whole body or lens of the eye.

3. Enclosed Beam X-Ray System

a. All personnel working with enclosed beam x-ray systems which meet all design requirements listed in this section may be classified as non-radiation workers and personnel dosimetry is not required. Personnel shall receive initial and annual refresher training in accordance with Section 2.8.6.

b. If personnel dosimetry is not required, perform area monitoring per Section 2.5.3.

c. The radiation source, sample, detector, and analyzing crystal (if used) shall be enclosed in a chamber or coupled chambers that exclude any part of the body during normal operation.

d. The inherent shielding of the chamber walls shall be sufficient to limit the radiation level at five centimeters from the outer wall surface to 0.25 mrem/hr (2.5 microSv/hr) during normal operation.

e. The sample chamber closure shall be interlocked with the x-ray tube high voltage supply or a shutter in the primary beam so that no x-ray beam can enter the sample chamber while it is open unless the interlock has been consciously and deliberately defeated.

f. The interlock shall be a fail-safe design.

g. The requirements of Section 13.1.3 apply to each port and each x-ray tube in the x-ray system.

13.1.4 **Operational Requirements**

1. Rooms housing analytical x-ray systems shall be designated as controlled areas. The dose to an individual in the surrounding area shall not exceed 0.25 mrem/hr (2.5 microSv/hr) or 10 mrem/week (0.10

mSv/week). This limit shall be met at any specified tube rating.

2. Safety devices or interlocks shall not be bypassed except as required during operation and maintenance per approved procedures.
3. When a safety device or interlock has been bypassed, a readily discernible sign bearing the words "SAFETY DEVICE INOPERATIVE," or similar words, shall be placed on the tube housing.
4. Except as specified in Section 13.1.4.2 above, no operation involving removal of covers, shielding materials or tube housings or modifications to shutters, collimators, or beam stops shall be performed without determining that the tube is off and will remain off until safe conditions have been restored. The main switch, rather than interlocks, shall be used for routine shutdown in preparation for repairs.
5. If an alignment procedure may result in increasing the radiation levels in an area, temporary barriers and warning signs shall be erected and surveillance of the area maintained until normal operation has been restored. This shall only be done with the permission and oversight of the RSO.
6. After reassembly, the x-ray system shall be checked by the RSO. Particular attention shall be given to alignment of shielding, shutters, and collimators during the survey.
7. Each area or room containing the equipment shall be conspicuously posted with a sign or signs bearing the radiation symbol and the words "CAUTION-X-RAY EQUIPMENT."
8. No accessory shall be aligned or operated until procedures have been reviewed and a radiation survey conducted by the RSO.
9. The RSO shall be notified whenever alignment or repair operations are undertaken.

13.1.5 **Radiation Survey Requirements**

1. Radiation surveys of all systems shall be performed as follows:
   a. Upon installation of the equipment and at least semi-annually thereafter.
   b. Following any change in the initial arrangement.
   c. Following any maintenance requiring the disassembly or removal of a local component in the system.
   d. During maintenance and alignment if the procedures require the presence of a primary x-ray beam when any local component in the system is disassembled or removed.
   e. Any time a visual inspection of the local components in the system reveals an abnormal condition.
   f. Whenever dosimetry results show a significant increase in doses over the previous monitoring period or the readings are approaching the limits specified in Table 2-1.
2. An ionization chamber survey instrument with a thin window (7.0 mg/cm^2 or less) shall be used to measure radiation levels.
3. For machines with narrow x-ray beams (defined as any beam with a cross-sectional area less than the cross-sectional area of the ion chamber detector), the radiation survey results must be corrected to compensate for the incomplete ionization inside the detector.
   a. To determine the cross sectional area of a narrow beam, expose a piece of x-ray film at a known distance and measure the beam cross sectional area. For very small beam sizes, use a cross-sectional area of one square centimeter.
   b. Determine the ionization chamber detector cross-sectional area from the instrument technical manual or by measurement.
   c. Divide the ionization chamber detector cross-sectional area by the cross-sectional area of the beam and multiply the radiation levels determined in Section 13.1.5.2 by this factor.
4. Geiger-Mueller survey meters with thin windows may be used to detect small beams and leakage when checking

shielding or after beam alignments. However, they shall not be used to quantify radiation levels.

13.1.6 Records

Records are maintained per Section 2.26.

13.2 Radiation Safety Requirements for Handheld X-Ray Fluorescence Analyzers (XRFs)

13.2.1 Introduction

Handheld XRFs provide on-the-spot elemental analysis from phosphorus to uranium, using x-ray tube technology, which eliminates the use of radioactive isotopes and related restrictions. These devices can generate dose rates in excess of 200 mrem/hr of low energy x-rays thus presenting a significant radiation hazard. Commands possessing an XRF analyzer(s) shall establish a radiation safety program.

13.2.2 Requirements

1. An RSO shall be appointed in writing and qualified per Section 2.8.3.
2. Devices utilizing an x-ray tube as the radiation source shall be registered at NAVSEADET RASO in the machine source registry per Section 3.5. Devices containing a radioactive source shall be permitted per Section 3.2.
3. The command shall establish a command endorsed instruction that includes the following:
   a. Standard operating and emergency procedures.
   b. A statement of the maximum potential radiation exposure rates expected per design specifications.
   c. A warning not to bypass interlocks.
   d. A warning not to point the device in the direction of any body parts.
   e. A requirement not to hold any samples being analyzed.
   f. A requirement that the device only be operated when a sample is in place (i.e., no open air exposures) except as recommended by the manufacturer when performing interlock checks.
   g. A requirement that all maintenance and repair other than exterior cleaning and routine maintenance

consistent with manufacturer's recommendations must be performed by the manufacturer of the device.

h. A requirement that the device(s) be returned to the manufacturer every 2 years for maintenance and operability checks of interlocks.

i. A requirement for initial training and refresher training (see Section 13.2.2.4)

j. A requirement to maintain a utilization log in accordance with Section 2.26.15 or 2.26.16 as applicable.

k. Utilization logs shall be maintained for the device indefinitely

4. All authorized users shall meet the following training requirements:

a. Initial training:

(1) Initial training shall be conducted by the manufacturer.

(2) Individuals can receive training by person(s) who had initial manufacturer's training (a second generation trainer). Commands that conduct their own initial training or receive initial training from someone other than the manufacturer must submit the training plan to NAVSEADET RASO for approval. This training plan must contain a review of the information listed in 13.2.2.3 above, associated radiation safety features and warnings, and satisfy the training requirements for non-radiation workers in Section 2.8.6.

(3) Records of initial training shall be maintained in organizational training records for as long as the individual is assigned to the organization.

b. Refresher Training:

(1) Refresher training must be performed annually.

(2) Refresher training must include training on the command instruction with particular attention to warnings and safe operations that satisfy the requirements of Section 2.8.6 as discussed in Section 13.2.2.4.a.2 above.

c. Records of refresher training shall be maintained in organizational training records for a period of three

years.

5. The device must contain warning light(s) indicating that the unit is “on” and producing x-rays.
6. The device must have password or key control restricted operation.
7. The device must have a caution label stating “Caution – this unit produces x-rays when energized – to be operated only by Qualified Personnel” (or similar words).
8. Repair/modification of the device must be performed by manufacturer.

13.3 Radiation Safety Requirements for Electron Microscopes

13.3.1 Introduction

Electron microscopes are operated at voltages and currents, which produce x-rays. When properly designed, shielded, operated, maintained and supervised, minimal personnel radiation exposure can occur.

13.3.2 Requirements

1. All personnel working with electron microscopes, which meet all radiation safety requirements of this section may be classified as non-radiation workers and personnel dosimetry is not required.
2. An RSO and assistant RSO (ARSO) shall be appointed in writing and qualified per Section 2.8.3.
3. No individual shall be permitted to operate or maintain electron microscopes until the following training has been received:
   a. As a non-radiation worker per Section 2.8.6.
   b. Operating and emergency procedures, including identification of abnormal operating conditions.
4. All meters, lights, indicators and user controls shall be clearly labeled.
5. A standard radiation warning sign shall be permanently affixed to the external surface of the unit with a label stating "Caution-Produces X-ray When On" or words to that effect.

6. The control panel shall be equipped with a removable key operated power switch or a power switch and password protection system.
7. Radiation levels shall not exceed 0.5 mrem/hr (5.0 microSv/hr) five centimeters from any external surface of the unit. If radiation levels exceed this limit, the unit shall not be used until radiation levels meet this criteria.
8. Standard operating procedures shall be established, operators trained and a copy posted at the control console.
9. Routine operations shall not be permitted when shields are removed or cabinet doors are open.
10. Non-standard accessories shall not be installed, aligned, or operated until inspected and approved, in writing, by the RSO.
11. Operations shall be suspended and the RSO notified when any unusual operating conditions (high beam current, dark current or extra bright beam) or suspected deficiencies are noted.
12. If a key operated switch is used, keys to the power switch shall be removed from the console and controlled such that only qualified users of the electron microscope have access to the keys. If the system uses password protection, the password shall be controlled such that only qualified users of the electron microscope have access to the password.
13. A radiation survey shall be performed by the RSO as follows:
    a. Prior to placing a new unit in service and semi-annually thereafter.
    b. Immediately after maintenance or repair.
    c. After shock, earthquake, etc., or suspected deficiency.
    d. When major beam realignment is in progress.
    e. Whenever equipment is modified.
14. Measurements shall be made with the unit operating at a voltage and beam current that yields the highest output.
15. The radiation survey shall include the viewing column area, high voltage power supply, and lens column,

penetrations into the column, control console, and electron beam target area. For high voltage electron microscopes (greater than 200 kVp), the high voltage generator tanks shall also be surveyed. Installed interlocks shall be tested under actual use conditions.

16. Radio-frequency shielded ion chambers, IM-231/PD ion chambers or equivalent, shall be used to quantify radiation levels. Geiger-Mueller type survey instruments shall not be used for this.
17. Records shall be maintained per Section 2.26.

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SECTION 14 – **GENERALLY LICENSED RADIOACTIVE DEVICES AND SOURCE MATERIAL, EXEMPT RADIOACTIVE DEVICES AND QUANTITIES**

14.1 Introduction

14.1.1 **Purpose**

This section outlines procedures, responsibilities, and information for the control of generally licensed devices, generally licensed source material, exempt devices, and exempt quantities at all Navy and Marine Corps commands. This section applies during receipt, while in possession, and during transfer by the command.

14.1.2 **Scope**

1. The provisions and requirements in this section apply to all commands possessing generally licensed devices, generally licensed source material, exempt devices and exempt quantities.
2. Section 7 provides additional requirements for the use of generally licensed devices such as gas chromatographs.
3. The provisions and requirements of this section are in addition to applicable requirements in other parts of this manual. In particular, the requirements and provisions of Sections 2, 3, 6, 7, and 10 which apply to the control, usage, storage, and labeling of generally licensed source material, generally licensed devices, exempt devices and exempt quantities as well as any applicable Naval Radioactive Material Permits (NRMPs).

14.2 **Generally Licensed Devices**

14.2.1 **General Requirements**

1. NRC's regulations provide a general license for the use of radioactive material contained in certain products. This general license allows certain persons to receive and use a device containing radioactive material if the device has been manufactured and distributed in accordance with a specific license issued by the NRC or by an Agreement State.

2. A generally licensed device usually consists of radioactive material contained in a sealed source within a shielded device, such as gas chromatograph units, fixed gauging devices, static eliminators, luminous exit signs, and calibration or reference standards. Some ice detection devices, chemical agent detectors, gun sights, and in vitro laboratory kits are also generally licensed. The device is designed with inherent radiation safety features so that it can be used by persons with no radiation training or experience. The command must comply with the requirements for labeling, usage, inventory, proper storage, and disposition for the use of generally licensed devices.
3. Commands shall obtain authorization by NAVSEA (SEA 04N) prior to acquiring any generally licensed device requiring a periodic leak check be performed as specified in Section 2.19.

14.2.2 Types of Generally Licensed Devices and Generally Licensed Source Material

1. A general license is issued by the NRC to commands that acquire, receive, possess, use, or transfer the following types of devices or source material:
   a. Devices used for producing light or an ionized atmosphere such as gas chromatograph units, self-luminating exit signs, static eliminators, and ion generating tubes as described in 10 CFR 31.5.
   b. Aircraft luminous safety devices and dials not to exceed 10 Ci of H-3 or 300 mCi of Promethium-147 (Pm-147) as described in 10 CFR 31.7.
   c. Calibration or reference sources containing Am-241 or Ra-226 not to exceed 5µCi at any one time as described in 10 CFR 31.8. This is applicable only to those commands that possess an NRMP which authorizes them to receive, possess, use, and transfer byproduct material, source material, or special nuclear material.
   d. Generally licensed source material which contains thorium or uranium. Examples include uranyl acetate for electron microscopy and thorium dioxide used in crafting of lenses. Federal agencies are authorized by a general license in 10 CFR 40.22 to possess and use small quantities of source material for research,

development, educational, or operational purposes. Commands will only requisition generally licensed source material per Section 14.4.

e. Products containing Ra-226 manufactured prior to November 30, 2007 as described in 10 CFR 31.12.

2. The regulations in 10 CFR 31.5 require certain general licensees who possess devices containing at least 10 mCi of Cesium-137 (Cs-137), 0.1 mCi of Strontium-90 (Sr-90), 1 mCi of Cobalt-60 (Co-60), or 1 mCi of Americium-241 (Am-241) or any other transuranic (i.e., element with atomic number greater than uranium [92]) to register with the NRC. Navy and Marine Corps activities are prohibited from acquiring these generally licensed devices except as authorized under an NRMP.

3. The use of Sr-90 contained in ice detection devices on board aircraft is generally licensed under 10 CFR 31.10 provided that the devices contain no more than 50 mCi.

4. Specific NRC requirements for generally licensed source material are contained in 10 CFR 40. 10 CFR 40.22 provides requirements for the use of small quantities of source material (e.g. uranyl acetate, uranyl zinc acetate used in electron microscopy and thorium dioxide used in crafting high quality lenses). 10 CFR 40.25 provides requirements for the use of certain industrial products and devices containing source material (e.g., a depleted uranium collimator used in an accelerator).

14.3 Responsibilities

14.3.1 Commanders, Commanding Officers (COs), and Officers in Charge (OICs)

1. General responsibilities are described in Section 1.5.2.1.

2. Be responsible for and assure safe handling, storage, accountability, transport and disposal of generally licensed devices and source material at their command.

3. Assure compliance with this manual, pertinent Navy and Marine Corps directives, conditions of applicable NRMPs or NRC licenses, and applicable federal regulations governing the use, control, and accountability of generally licensed devices and source material at their commands.

4. Designate, in writing, the following:
   a. A Generally-Licensed Material Officer (GLMO) who is responsible for the receipt, control, transfer, and disposal of generally licensed devices and source material. For commands which have a qualified Radiation Safety Officer (RSO) and Assistant RSO, one of these individuals can perform these duties.
   b. Storage areas for generally licensed devices and source material.

14.3.2 Generally-Licensed Material Officer (GLMO)

1. The GLMO shall:
   a. Ensure possession, use, storage, and maintenance of generally licensed devices and source material are consistent with the limitations in the authorization, the Sealed Source and Device Registry sheet(s), manufacturer's recommendations and instructions, and the provisions of this section.
   b. Ensure individuals using generally licensed devices and source material meet the requirements of the manufacturer's instructions for the device.
   c. Ensure source leak checks, as applicable, are conducted per Section 2.19.
   d. Ensure that excess, damaged, and obsolete generally licensed devices are disposed of in accordance with Section 2.25.1, or per the conditions outlined in the NRMP (if applicable).
   e. Ensure that all required records and reports are maintained per Section 2.26.
   f. Ensure that areas where generally licensed devices and source material are stored are posted per the applicable requirement of Section 2.17(unless excepted by 10 CFR 20.1903) and are surveyed in accordance with Section 2.21.
   g. Ensure inventories are conducted per Section 2.13.3.

14.4 Requisitioning of Generally Licensed Devices and Generally Licensed Source Material

1. Commands will only requisition generally licensed devices and source material in accordance with Sections 14.2.1.3 and 14.2.2.2, per NAVSEA 04N authorization, or

the command NRMP.

2. Requisitions for all generally licensed devices and source material shall be made using normal supply system or command procurement procedures following RSO approval per Section 2.13.

14.5 Receipt of Generally Licensed Devices or Generally Licensed Source Material

Generally licensed devices and generally licensed source material received by a command require special control procedures to ensure adequate radiological safety precautions are observed, both in unpacking and in subsequent use of the material. Potential radiological problems may include external exposure and surface contamination from leaking sources. In addition, special precautions may be required if damage has occurred during shipment. The following procedures shall be used for generally licensed devices received at a command in addition to those specified in Section 2.22.3.

1. All packages containing generally licensed devices and generally licensed source material shall be receipt inspected by the GLMO. This inspection should consist of inspecting the external surfaces of the device(s) for damages which could cause leakage and radioactive contamination. If package is damaged, survey for radioactive contamination and radiation levels. Receipt inspection should also verify items received are authorized or covered under an NRMP for the receiving activity, that the packaging is as described on the associated shipping papers, and transfer documentation is properly prepared and executed. Any discrepancies found during receipt inspection or unpacking shall immediately be brought to the attention of the organization originating shipment or transfer. If the possibility exists that a device is leaking or that contamination or radiation levels are in excess of 10 CFR 71 limits, notify NAVSEADET RASO per Section 2.27.1, and if applicable, the command RSO.
2. If the possibility exists that a device is leaking, or that contamination or radiation levels are in excess of 10 CFR 71 limits, isolate the package/area, and immediately notify the GLMO or RSO (if applicable) who will provide further instructions. If the GLMO or RSO (if applicable) is not present at the facility,

immediately notify NAVSEADET RASO and obtain further instructions. In all cases, NAVSEADET RASO shall be notified as soon as practical per Section 2.27.1.

3. Receipt documents should be returned promptly to the organization transferring or shipping the item, if requested. Unauthorized or damaged items will be controlled by the GLMO. Disposition instructions should be requested from NAVSEADET RASO. Appropriate radiological control procedures shall be used while the item is pending disposition.

14.6 Custody Control of Generally Licensed Devices or Generally Licensed Source Material

Custody control procedures shall be established for generally licensed source material or devices as described below.

1. Following receipt of the material or device, a Generally Licensed Radioactive and Source Material Custody and Inventory Log, Section 14.23, shall be prepared for each generally licensed device or source material following the instructions listed in Section 14.24. Command may include generally licensed items on their RASP inventory record per Section 2.13.3 without maintaining a separate Generally Licensed Radioactive and Source Material Custody and Inventory Log.
2. The GLMO shall maintain a book of Generally Licensed Radioactive and Source Material Custody and Inventory Log sheets for all generally licensed source material or devices held by the command.
3. The Generally Licensed Radioactive and Source Material Custody and Inventory Log shall be updated whenever material is received or transferred. The log shall also be updated any time there is a change in location or custodian. Generally Licensed Radioactive and Source Material Custody and Inventory Log sheets shall be retained indefinitely.

14.7 Labeling of Generally Licensed Devices

The GLMO shall verify that generally licensed devices are labeled per the manufacturers’ instructions.

14.8 Storage and Use Areas for Generally Licensed Devices or Generally Licensed Source Material

14.8.1 General Requirements

1. Storage of generally licensed devices or generally licensed source material shall be in accordance with Sections 2.16 and 2.22.6.
2. The GLMO shall provide a list of all inventoried RASP radioactive material and radiation producing machines and devices, by facility and location, to appropriate security and fire departments at least annually or when changes occur.
3. The Commanding Officer shall designate in writing all locations authorized for storage of generally licensed source material or devices. Each area or room in which a total amount of generally licensed devices or generally licensed source material exceeding 10 times the quantities listed in 10 CFR 20, Appendix C, is stored shall be posted per Section 2.17.2 unless excepted by 10 CFR 20.1903.
4. Generally licensed devices or generally licensed source material shall not be stored in or adjacent to primary dosimeter storage lockers.

14.8.2 Outdoor Storage

Generally licensed source material or devices shall be stored such that they are protected from adverse weather or conditions which may deteriorate their encasements.

14.8.3 Minimizing Generally Licensed Source Material or Devices in Storage

1. In order to minimize the complexities of accounting for a large number of generally licensed source material or devices and the possibility of it being lost, commands shall consolidate generally licensed source material or devices in as few areas as practicable and minimize the number of devices in storage.
2. Commands which have not used generally licensed source material or a generally licensed device for more than two years shall evaluate the necessity for maintaining the device and dispose of or transfer the material or

device as necessary.

14.9 Use of Generally Licensed Source Material

Controls shall be established for work involving unsealed sources of source material to preclude the ingestion or inhalation of the material and monitor personnel for internally deposited source material in accordance with Section 2.20 and/or the conditions outlined in the NRMP.

14.10 Contamination Control for Generally Licensed Devices

1. In the event that a generally licensed device is damaged, or surface contamination is indicated by a source leak test, the user shall isolate the unit and immediately contact the GLMO and RSO (if applicable). The GLMO shall immediately notify NAVSEADET RASO, in the absence of a command RSO. Subsequent action should be taken to prevent the spread of contamination by containing the unit or damage, such as with polyethylene wrapping or bags. In all cases, NAVSEADET RASO shall be notified as soon as practical per Sections 2.19.3 and 2.27.2
2. The facility shall invoke appropriate contamination controls specified in Section 2.20 to prevent the spread of radioactivity from the area, and control personnel who may have handled the damaged device. These controls shall be specified by the RSO (if applicable), or the GLMO in consultation with NAVSEADET RASO in the absence of a facility RSO.

14.11 Movement and Shipping of Generally Licensed Source Material or Devices

1. The movement or shipment of generally licensed source material or devices shall be performed in accordance with Section 2.22.
2. If the movement involves a permanent change to the storage location, the new storage location of the item shall be entered on the Generally Licensed Radioactive and Source Material Custody and Inventory Log, Section 14.23 or on RASP inventory record maintained per Section 2.13.3, by the GLMO.

14.12 Inventory of Generally Licensed Source Material or Devices

1. All generally licensed material or devices shall be inventoried at least semi-annually unless otherwise specified in the NRMP, SSDR, or this manual. The results of this inventory shall be provided to NAVSEADET RASO annually per Section 2.13.3.
2. Results of the inventory specified in 14.12.1 shall be documented on the Generally Licensed Radioactive and Source Material Custody and Inventory Log, Section 14.23 or on RASP inventory record maintained per Section 2.13.3. The results of this inventory can be used in the preparation and submission of the annual inventory provided to NAVSEADET RASO per Section 2.13.3.
3. Inventory reports for generally licensed source material shall be retained indefinitely.

14.13 Loss of Generally Licensed Source Material or Devices

1. If generally licensed source material or devices are lost, immediately conduct a search to ascertain that no one will receive inadvertent internal or external radiation exposure from the lost material or device(s).
2. NAVSEADET RASO shall be notified immediately, upon discovery of the event, as specified in Section 2.27.1. For devices allocated to a command under an NRMP the loss of the material shall be reported per the conditions specified in the NRMP.

14.14 Leak Tests of Generally Licensed Devices

Generally licensed devices requiring leak tests shall be performed in accordance with the manufacturers' instructions.

14.15 Transfer and Disposal Procedures of Generally Licensed Source Material or Devices

1. The transfer and disposal of generally licensed source material or devices shall be performed in accordance with Sections 2.25.1 and 2.26.20.
2. The transfer of generally licensed source material or

devices maintained under an NRMP shall be per the conditions outlined in the NRMP.

3. On permanent transfer of a generally licensed source material or device, the Radioactive and Source Material Custody and Inventory Log of Section 14.23 shall be annotated to indicate the transfer or disposal of the device. The associated transfer paperwork shall be retained indefinitely.

14.16 Exempt Quantities and Devices

Consumer products containing byproduct material that are used by Navy and Marine Corps commands are exempted from licensing requirements only if the NRC determines that the products or types of uses do not constitute an unreasonable risk to the common defense or security or to public health and safety and the environment. Radiation Safety features are built into the sealed source or device or the amount of radioactive material that can initially be distributed in such a device is restricted. The Rules of General Applicability to Domestic Licensing of Byproduct Material, Title 10, Code of Federal Regulations, Part 30, exempts Navy and Marine Corps commands from the requirements for an NRC license when they receive, possess, use, transfer, own, or acquire byproduct material in products such as silicon chips, electron tubes, gunsights, and smoke detectors.

14.17 Exempt Quantities, Device Uses and Unimportant Quantities

14.17.1 Exempt Quantity Use (10 CFR 30.18)

Exempt quantity use includes the use of small quantities of byproduct material that do not exceed the applicable quantities set forth in 10 CFR 30.71, Schedule B. It also includes the use and transfer of small quantities of byproduct material such as may occur when two labs exchange counting standards for inter-comparison on a noncommercial basis.

14.17.2 Exempt Device Uses

Items include electron tubes, self luminous watches, or radiation measuring instruments for standardization or calibration purposes as described in 10 CFR 30.15. Self luminous products containing tritium, krypton-85 or promethium-

247 such as gun sights as described in 10 CFR 30.19. Smoke detectors and chemical agent detectors containing Am-241 or Ni-63 as described in 10 CFR 30.20.

14.17.3 Unimportant Quantities of Source Material (10 CFR 40.13)

Items include thoriated tungsten welding rods, depleted uranium counterweights, magnesium-thorium alloys for engines, piezoelectric ceramics, and vacuum tubes. Refer to Section 10 for requirements concerning these items.

14.18 Requisitioning of Exempt Quantities and Devices

Requisitions for exempt devices and exempt quantities shall be made using normal supply system or command procurement procedures.

14.19 Receipt of Exempt Quantities and Devices

Exempt devices and quantities which are received by a command also require special control procedures to ensure adequate radiological safety precautions are observed. This includes both unpacking and in subsequent use of the material. Potential radiological problems may include external exposure and surface contamination from broken sources. Special precautions may be required if damage has occurred during shipment. The following procedures shall be used for exempt quantities and devices received at a command.

1. When received, all exempt devices and quantities shall be inspected. This inspection should consist of inspecting the external surfaces of the device(s) for damages which could cause leakage and radioactive contamination. Any discrepancies found during receipt inspection or unpacking shall immediately be brought to the attention of the organization originating shipment or transfer.
2. Damaged devices shall be controlled by the command. Disposition instructions should be requested from NAVSEADET RASO. Appropriate accountability procedures shall be used while the item is pending disposition.

14.20 Minimizing Exempt Quantities and Devices in Storage

In order to minimize the complexities of controlling large amounts of exempt quantities and devices and the possibility of losing such devices, commands shall consolidate exempt quantities and devices in as few areas as practicable and minimize the number of devices in storage.

14.21 Contamination Control for Exempt Quantities and Devices

1. In the event that an exempt device is damaged, or surface contamination is indicated by a contamination survey, the user shall isolate the unit and immediately contact the GLMO and RSO (if applicable). The GLMO shall immediately notify NAVSEADET RASO, in the absence of a command RSO. Subsequent action should be taken to prevent the spread of contamination by containing the unit or damage, such as with polyethylene wrapping or bags. In all cases, NAVSEADET RASO shall be notified as soon as practical per Sections 2.19.3 and 2.27.2.
2. The facility shall invoke appropriate contamination controls specified in Section 2.20 to prevent the spread of radioactivity from the area, and control personnel who may have handled the damaged device. These controls shall be specified by the RSO (if applicable), or the GLMO in consultation with NAVSEADET RASO in the absence of a facility RSO.

14.22 Disposal of Exempt Quantities and Devices

The disposal of exempt quantities and devices shall be performed in accordance with Sections 2.25.1 and 2.26.20.

14.23 Generally Licensed Radioactive and Source Material Custody and Inventory Log

1. Command Name:						**UIC/RUC:**	
2. Device Description:							
3. Make:		**4. Model:**		**5. Serial No.:**			
6. Isotope(s):		**7. Activity/Grams:**				**8. License**	
9. Activity Determination Date:							
10. Form:		**11. SSDR No.**					
12. Date Received:		**13. Date Returned:**					
14. Shipping Class:		**15. A1/A2 value:**				**16. UN No.:**	
17. Date	**18. Qty**	**19. Bldg**	**20. Room**	**21. Custodian**	**22. Notes**	**23. Signature**	**24. Disposal**

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14.24 Generally Licensed Radioactive Device and Source Material Custody and Inventory Log Instructions

The following instructions shall be used in completing Section 14.23:

Block 1. Command Name: Navy command and unit identification code (UIC) or Marine Corps command and reporting unit code (RUC).

Block 2. Device Description: Description of the item as shown in the Sealed Source Device Registry (SSDR) or shipping document (e.g.; Gas Chromatograph, EXIT Sign, Static Eliminator Brush, Check Source, Depleted Uranium, Thorium Dioxide, Uranyl Acetate, etc).

Block 3. Make: Indicate the make of the device (e.g.; AEA Technology, Eberline, USN, etc.).

Block 4. Model: Indicate the model of the device (e.g.; MX-12133/S, USN-1B29, DU Projectile, etc.).

Block 5. Serial Number: List the serial number for the device.

If the device is received as a set (e.g.; calibration source sets), provide the serial number for each source in the set. List the source identification number if no serial number is provided.

Block 6. Isotope: List the isotope, or isotopes, which are contained within the device.

Block 7. Activity/Grams: List the activity of the isotope as shown on the device in Curies. If the device is received as a set (e.g.; calibration source sets), provide the activity for each source in the set. For thorium, depleted uranium, natural uranium, U-233, U-235, U-238, and plutonium, list the total number of grams.

Block 8. License: Indicate the license number that the device is controlled under. (e.g.; NRMP number or generally licensed)

Block 9. Activity Determination Date: List the activity determination date as shown on the device or receipt paperwork.

Block 10. Form: List the chemical and physical form of the device as either solid, liquid or gas and if the device is "SEALED" or "UNSEALED".

Block 11. SSDR No.: List the Sealed Source and Device Registry (SSDR) number for device. If no SSDR number is assigned list "NONE".

Block 12. Date Received: List the date the device was received by the command.

Block 13. Date Returned: List the date the device was transferred, returned to manufacturer, or disposed.

Block 14. Shipping Class: List the shipping class for the device as shown in 49 CFR (e.g.; Limited Quantity, LSA, Type A, Type B, Excepted Package, etc.).

Block 15. A1/A2 Value: List the A1 or A2 value in Terabecquerels (TBq) and Curies (Ci) for the device.

Block 16. UN Number: List the UN number associated with the shipping class as shown in 49 CFR 172.101.

Block 17. Date: List the date the line item entry was made.

Block 18. Quantity: List the quantity of devices on hand. If the device is received as one set (e.g.; calibration source sets) with multiple sources, the quantity shall be listed as one for each set. Blocks 2, 5, and 7 will indicate the quantity of individual sources assigned to each set. For thorium, depleted uranium, natural uranium, U-233, U-235, U-238, and plutonium, indicate the total number of grams. For source material (e.g. thorium oxides, uranyl acetate, etc) that is expended due to operations and experiments, the quantity of grams shall be updated after each usage until supply is exhausted.

Block 19. Building: List the building name or number where the sources are being stored or used.

Block 20. Room: List the room name or number where the sources are being stored or used.

Block 21. Custodian: List the name of the person in possession of the device.

Block 22. Notes: List the following applicable notes in this block:

- RECEIPT: Indicates when the item was initially received by the command or to annotate its return to permanent storage following use at a temporary job site or alternate approved location. The building and room number for this line item entry will be the permanent storage location for the device.

- INVENTORY: Indicates when the device was inventoried. Annotate if the inventory was "ANNUAL", "SEMI-ANNUAL", "QUARTERLY" or other periodicity specified in this manual or NRMP. The individual conducting the inventory shall list his or her name in block 21.

- TEMPORARY STORAGE: Indicates the device has been moved from its permanent storage location for use at a temporary job site or alternate approved location. The building and room number for this line item entry will be the temporary storage location for the device. If the device is moved from its original permanent storage location to a different approved permanent storage location, a "RECEIPT" entry shall also be used to annotate this action listing the new building and room number.

- PERMANENT TRANSFER: Indicates the device has been permanently transferred or disposed of by the command. Block 18 shall be updated to reflect the current quantity on hand following the transfer of any devices.

- LEAK TEST: Indicates the date that the leak check of the source was completed as required by the SSDR or NRMP (whichever is more restrictive).

- MONTHLY SURVEY: Indicates that the monthly radiation survey of the radioactive material storage area has been conducted as specified in Section 2.21.2.1.b (as applicable).

- LOSS: Indicates that the device has been lost and that the command has taken all actions specified in Section 2.27.2. Block 18 shall be updated to reflect the current quantity on hand following the loss of any devices.

Block 23. Signature: GLMO signature indicating that all line item entries are correct and have been reviewed for accuracy and completeness.

Block 24. Disposal: Annotate “YES” or “NO” if the device is scheduled for disposal.

SECTION 15 – **RADIOLOGICAL CONTRACT OVERSIGHT MANAGEMENT AUTHORIZATION**

15.1 **Introduction**

15.1.1 **Purpose**

To establish requirements for receiving, amending, renewing and terminating Radiological Contract Oversight Management Authorizations (RCOMAs) and establish the minimum requirements for contractor operations aboard Navy and Marine Corps commands, vessels, or facilities.

15.1.2 **Scope**

The requirements in this section apply to all Department of the Navy (DON) commands that contract radiological services not already covered by an existing NRMP or RASP authorization.

15.2 **Discussion**

1. Sources of ionizing radiation are used in many essential contracted services supporting the Navy and Marine Corps. These uses include industrial radiography on aircraft, on ships, and at facilities. Moisture density analysis at construction sites and material composition analysis using XRF technology are also conducted.
2. It is the DON's goal when contracting RASP source services to keep DON personnel occupational radiation exposures as low as reasonably achievable (ALARA) and to never exceed the Section 2.3.1 limits for the public. To accomplish this goal, Navy and Marine Corps commands that contract for the use of ionizing radiation sources must establish a contract oversight program that meets the requirements of this section. The purpose of this requirement is to ensure that DON personnel, members of the general public, and the environment are all appropriately protected from radiation sources used by contractor personnel.
3. The contract oversight authorization process consists of the following elements:
   a. Initiating the contract using the NAVSEA Standard Contract Items. This formally establishes the radiological safety standards to be used by the

contractor.

b. A review of the contractor's credentials to perform the required work.

c. Formal documentation and communication between the contractor and the contracting command to invoke the controls listed in the contract.

d. Surveys, surveillance of contractor operations, and documentation to ensure that radiological work performed for the command is not a hazard to government personnel, the general public, or the environment.

e. Verification that the contractor's work does not result in future remediation, restricted operations, or liability by the DON.

4. NAVSEA Standard Items are updated by fiscal year and available at the Specification for Ship Repair and Alteration Committee (SSRAC) website: http://www.navsea.navy.mil/CNRMC/SERMC/SSRAC1/default.aspx. Changes to the Standard Items may be requested by using the procedures listed on the website.

5. The NAVSEA Standard Items were selected as the contract language source to achieve common contract language and acceptable safety standards.

6. For the purposes of this section, the word SUPERVISOR means the Supervisor of Shipbuilding, Contracting Officer or acquisition professional responsible for a contract and therefore is the government person with the authority to enter into, administer, and/or terminate contracts and make related determinations.

15.3 Responsibilities

15.3.1 Commanders, Commanding Officers, and Officers in Charge

1. General responsibilities are described in Section 1.5.2.1.

2. Ensure the command establishes a RCOMA program prior to contracting for RASP radiological services.

3. Comply with and enforce the requirements of this manual and conditions of each RCOMA that is issued to the command.

15.3.2 **Radiation Safety Officers**

1. General responsibilities are described in Section 1.5.2.2
2. Radiation Safety Officers (RSOs) for Radiological Contract Oversight Management programs shall:
   a. Be responsible for conducting oversight of contractor operations that use sources of ionizing radiation aboard U.S. Government property and/or vessels associated with the command's contracts.
   b. Act as the principal point of contact for contractor radiation safety issues. Contact NAVSEADET RASO when assistance is needed.
   c. Monitor emergency events.
   d. Ensure contracting officers/officials and contract oversight technicians are trained per Section 15.6.
   e. Ensure surveillance of contractor operations are performed and documented in accordance with Section 15.5.
   f. Designate in writing all Contract Oversight Technicians (COT) qualified to oversee radiological contractors.
   g. Coordinate with the Contracting Officer to ensure no operations involving the use of sources of ionizing radiation commence without written approval from the RSO/ARSO.
   h. Maintain and ensure copies of records required by Section 15.10 are collocated with the RSO for inspection by NAVSEADET RASO. Should the RSO not be assigned at the address in block 1 of the command's authorization, for example at a regional command, the RSO shall immediately notify NAVSEADET RASO of the alternate inspection location.

15.3.3 **Assistant Radiation Safety Officers**

General responsibilities are described in Section 1.5.2.3.

15.3.4 **Contracting Officer/Official**

1. Ensure that the NAVSEA Standard Item for General

Criteria (009-01), Sections 3.14 through 3.14.7, is included in all contracts involving the use of sources of ionizing radiation (e.g., moisture density gauges, radiography).

2. Forward all information required by the NAVSEA Standard Items to NAVSEADET RASO via the Supervisor at least 5 working days prior to the start of work for review and approval.

   a. Coordinate with the contractor in correcting any deficiencies noted by the RSO/ARSO.

   b. Ensure no operations involving the use of sources of ionizing radiation commence without written approval from the RSO/ARSO.

3. Ensure that the NAVSEA Standard Item for Prevention of Radiographic-Inspection Ionizing-Radiation Hazards (009-112) is included in all contracts that utilize radiographic inspection as part of their work.

   a. Ensure that the Radiography Worksite Planning Sheet, Attachment A to Standard Item 009-112, is completed and submitted by the contractor at least 14 days prior to commencement of radiography operations. Forward Attachment A of Standard Item 009-112 to the RSO/ARSO for review and approval.

   b. Ensure no radiography operations commence without the RSO/ARSO's written approval.

4. The contracting officer/official shall notify the RSO of all contracts resulting in work using ionizing radiation.

15.3.5 **Contract Oversight Technician**

1. Contract Oversight Technicians (COT) are responsible for compliance with this manual, RCOMA conditions, and command procedures during assigned contractor oversight operations.

2. The COT shall:

   a. Perform the duties assigned by the RSO/ARSO to accomplish contractor surveillances as described in Section 15.5.

   b. Promptly report incidents or deviations from

established procedures to the RSO/ARSO.

c. In the case of a base emergency or natural disaster, ensure the contractor secures operations and places the sources of ionizing radiation in a safe condition.

15.4 Contract Oversight Program Requirements

15.4.1 General Requirements

1. Radiological Contract Oversight shall be accomplished in accordance with the RCOMA Standard Application, Section 2.28 and this section. Any conflicts between this manual and the RCOMA Standard Application or the Federal Acquisition regulations shall be directed to NAVSEA 04N, via Naval Sea Systems Command Detachment (NAVSEADET) Radiological Affairs Support Office (RASO), for written clarification.
2. All Navy and Marine Corps commands issuing contracts for RASP sources of ionizing radiation shall receive authorization from NAVSEA 04N prior to issuing such contracts.
3. Except as the Director of Radiological Controls (SEA 04N) may direct, RCOMAs are not required for the following:
   a. Use of radioactive material in quantities or concentrations below the exempt concentrations specified in Schedule A of Title 10 Code of Federal Regulations (CFR) Part 30.70 and exempt quantities specified in Schedule B of 10 CFR 30.71.
   b. Contracted operations covered by an NRMP or RASP authorization implemented by other chapters of this manual and supervised by a governmental RSO.
   c. Services contracted in coordination with the DoD Executive Agent (Army) for Low-Level Radioactive Waste Disposal (LLRW), for handling, storing, shipping, and disposing of LLRW.
   d. Contracts for site remediation or decommissioning in coordination with the NAVSEADET RASO Environmental Management Division.
   e. Contracts for the maintenance, repair or modification of government owned equipment under Section 13. Maintenance, repair or modification plans shall be

approved in writing by the RSO.

4. When a command is authorized to initiate a radiological contract, but cannot provide the radiological contract oversight the following conditions must be met:
   a. After consultation and approval by NAVSEA 04N, a temporary Memorandum of Agreement (MOA) or Interservice Support Agreement (ISSA) will be executed with a command that has an existing RCOMA of similar scope prior to the execution of the contract.
   b. The MOA/ISSA will be a temporary measure not to exceed the terms and conditions of the contract to ensure that appropriate contract oversight is provided pending the issuance of a RCOMA authorization.
   c. A copy of that MOA/ISSA agreement shall be forwarded to NAVSEADET RASO.
5. Each command receiving a RCOMA shall comply with the conditions stated in the RCOMA.
6. Additionally, the command shall conduct its RASP program in accordance with the statements, representations, and procedures contained in the documents submitted with a RCOMA application and referenced in the RCOMA.
   a. A command possessing a RCOMA must maintain the information contained in the RCOMA application up to date by submitting amendments as necessary.
   b. Changes to the original application and supplemental information cannot be implemented until approved by NAVSEA with the following exceptions:
      (1) Directives from NAVSEA (SEA 04N).
      (2) Changes to correct obvious unsafe conditions.
         i. Notify NAVSEADET RASO immediately upon discovery of changes required to correct unsafe conditions.
         ii. An amendment request shall be submitted within 15 days (30 days if overseas) of implementation.
7. All RCOMA requests and amendments shall be sent to NAVSEADET RASO by command endorsed correspondence.
8. All RCOMA requests or amendments shall contain a cover letter signed by the Commander, Commanding Officer (CO),

Officer in Charge (OIC), or those acting on their behalf.

9. Each command requesting an amendment to an existing RCOMA shall continue to operate per the requirements of their existing RCOMA until the command receives formal approval of the amendment from NAVSEA. A command requesting the issuance of a new RCOMA shall not commence operations until formal NAVSEA 04N approval of the RCOMA has been received by that command.
10. Regional or concurrent site commands with RCOMAs shall notify and coordinate contracted radiological services with adjacent and tenant RSOs to prevent interference with tenant RASP programs.

15.4.2 **Contractor Certification**

1. All contractors must be certified by NAVSEADET RASO as described below. Certification is valid for the services specified for 3 years.
2. For radioactive material use, the RCOMA RSO shall submit one legible copy, via electronic media, of the applicable NRC or Agreement State License, including procedures regarding system process and operation for use of licensed radioactive material, to NAVSEADET RASO, via the supervisor. Agreement State licensees shall provide evidence of NRC Form 241 (Report of Proposed Activities in a Non-Agreement State) with the copy of the Agreement State license. If security related information must be handled at a command not under an Increased Controls Order, the contractor/NRC/ Agreement State may provide that information directly to NAVSEADET RASO.
3. For machine sources, the RCOMA RSO shall submit one legible copy, via electronic media, of the applicable state license, authorization, or registration for machines that produce ionizing radiation to NAVSEADET RASO. The contractor must be authorized to operate in the state where operations are to be accomplished.
4. For all sources of ionizing radiation, the RCOMA RSO shall submit one legible copy, via electronic media, of a formal Radiological Safety Plan, which shall include operating and emergency procedures pertinent to the services to be provided and actions to control jobsite-

boundary radiation exposures below those allowed for members of the general public under NRC and OSHA standards, to NAVSEADET RASO.

5. The RCOMA RSO shall determine and report to NAVSEADET RASO the jurisdiction at the site of proposed operation.
   a. Jurisdiction guidance is available in NUREG 1556 Volume 19.
   b. Jurisdiction should be reported as under exclusive federal jurisdiction, concurrent jurisdiction, state jurisdiction, or other special jurisdiction.
   c. Where jurisdiction is under a unique or foreign entity the RCOMA RSO shall provide any special jurisdictional requirements.
6. If the contractor will be utilizing US Government owned or furnished equipment that produces ionizing radiation, this must be identified and the following information shall reported to NAVSEADET RASO by the RCOMA RSO:
   a. Name of the federal agency or command that owns the equipment.
   b. Manner and conditions under which the equipment was turned over to the contractor.
   c. Organization responsible for the maintenance and repair of the equipment.
7. Once certified, the RCOMA RSO shall maintain a copy of the documents submitted and the approval from NAVSEADET RASO while the certification is active.
8. If the contractor’s NRC or state licensure, authorization or registration expires, is revoked, or is not renewed, the RSO shall have the contracting officer/official stop all radiological services by the contractor and notify NAVSEADET RASO.
   a. A contractor operating under a timely filed letter for NRC or state license, authorization or registration will not be deemed to have expired until the issuing authority has determined the status of the application.
   b. The RCOMA RSO shall follow up periodically with a contractor under a timely filed letter and obtain the status of the final determination of the issuing

authority.

9. The RSO shall ensure the following items are up to date prior to each contract being executed:
   a. NAVSEADET RASO has certified the contractor.
   b. The related NRC/state licensure, authorization or registration for the work to be performed has not expired and is valid for the state or jurisdiction in which the work is to be performed.
   c. The Radiological Safety Plan for the contractor is valid for the new activity location/operation.

15.5 Contractor Oversight

15.5.1 Contractor Oversight Requirements

1. All gamma and x-ray operations will have an RSO/ARSO/COT onsite who verifies the contractor's boundaries and safety plan performance as follows and shall be documented per Section 15.10.2:
   a. The RSO/ARSO/COT shall monitor the first operation each day and ensure the contractor's boundaries are satisfactory per NAVSEA STANDARD ITEM 009-112, Section 3.5 through 3.5.2. The RSO/ARSO/COT shall perform an independent confirmatory survey and use Navy/Marine Corps provided, RASP approved RADIACs.
   b. Any change of radiological conditions (increased kVp, mA, change of beam orientation, boundaries or shielding/collimation) at the site of operations that is different from the original plan shall be approved by the RSO. The RSO shall re-perform the confirmatory survey of 15.8 after each change.
   c. The RSO/ARSO/COT shall observe the first operation each day and as required to ensure government employee and general public safety in areas outside of the contractor's boundary as defined in NAVSEA STANDARD ITEM 009-112, Section 3.4.
2. The first time use of all nonradiography services for each contractor will have an RSO/ARSO/COT onsite who shall verify the contractor's safety plan performance for an entire operation. The RSO/ARSO/COT shall brief the contractor on the contractor's responsibilities outlined in NAVSEA Standard Item 009-01 Sections 3.14.2 through 3.14.7 and NAVSEA Standard Item 009-112 Sections

3.3 through 3.7.1.1. The brief shall include specific instructions on when operations must be suspended and when RSO permission is required to continue operations. Copies of the NAVSEA Standard Items may be provided to the contractor.

3. Non-radiographic services shall be monitored on a random basis not to exceed every three months after the first satisfactory observed evolution.

4. All observed contractor services shall be documented as directed by the NAVSEA Standard Items and as a surveillance.

5. For gamma and x-ray radiography:

   a. The RSO/ARSO/COT shall arrange and conduct a briefing with the contractor, and tended vessel (if applicable), to discuss radiography operations including type of radiography, expected length of radiography operations, location of radiography operations, location of 2 millirem per hour (mrem/hr) (0.02 milliSievert per hour (mSv/hr)) physical boundary and words to be passed over ship's announcing system before, during and after radiography operations (if applicable).

   b. The RSO/ARSO/COT shall perform independent checks to verify 2 mrem/hr (0.02 mSv/hr) boundaries during radiography operations. In some circumstances, the boundary may be established at a point where the dose to an individual in any unrestricted area would not exceed 2 mrem in any one hour and the radiation level at the boundary does not exceed 100 mrem/hr. The perimeter of the radiation area shall be a physical barrier established by an enclosure or by stanchions and rope, as necessary. Post this boundary with tri-foil radiation warning symbol, "Radiation Area," "Radiography in Progress," and "Keep Out" signs written in English and host-country language. The signs shall be visible to any person approaching the radiation area barrier from any accessible direction.

   c. For gamma radiography, the RSO/ARSO/COT shall arrange to escort contractor from base gate to site of radiography and back to gate once operations are completed. Perform a survey of contractor's vehicle upon arrival and prior to leaving the worksite to ensure radiation levels are <2 mrem/hr (0.02 mSv/hr)

on contact of the vehicle. If radiation levels on contact with the vehicle are >2 mrem/hr (0.02 mSv/hr), have the contractor shield the source of radiation until levels are <2 mrem/hr (0.02 mSv/hr) on contact. Do not allow Security to approach the vehicle until radiation levels are <2 mrem/hr (0.02 mSv/hr) on contact.

d. **IMMEDIATELY STOP** all radiography operations for any unsafe condition or for any violation of a boundary established per Section 15.5.1.5.b above. Have the contractor place the source of radiography in a safe mode. Report the violation to the RSO/ARSO, Commanding Officer/Officer-In-Charge and to NAVSEADET RASO prior to recommencing operations. Inform the contractor that radiography shall not re-commence without authorization from the RSO/ARSO.

15.6 Training

15.6.1 Initial and Refresher Training of Radiation Safety Officers, Assistant Radiation Safety Officers and Contract Oversight Technicians for Contractor Oversight Operations

1. The RSO and ARSO shall be appointed in writing, maintain proficiency and be qualified per Section 2.8.3. The RSO or ARSO shall provide the initial and refresher training for COTs.
2. Prior to assignment as a COT, personnel shall receive initial training on the following subjects:
   a. Command radiation safety operating and emergency procedures.
   b. Documentation of radiography surveillances, non-radiography surveillances, boundary violation reports and surveys.
   c. Radiation exposure limits and control levels.
   d. Facility or site survey requirements and techniques.
   e. Dosimetry requirements (if any).
   f. Biological effects and risks associated with exposure to ionizing radiation.
   g. Types and sources of ionizing radiation contributing to personnel exposure.
   h. Specific procedures for using time, distance and

shielding to maintain individual exposures ALARA.

i. Duties, responsibilities and reporting requirements.

j. Lessons learned from contractor operations.

3. The COT shall attend the NAVSEADET RASO Radiological Safety Oversight of Contractor Operations course (S-493-0612).

4. Each qualified COT shall be designated in writing by the RSO.

5. Each COT shall be provided annual refresher training covering the topics listed in Section 15.6.1.2.

15.7 Dosimetry

15.7.1 Personnel Monitoring and Medical Examinations

1. Personnel performing contract oversight duties are not considered participants in the radiography they are observing. Unless required by another section of this manual, dosimetry is not required, as contract oversight personnel should be performing their duties in unrestricted areas.

2. Contract oversight personnel shall be considered non-radiation workers and do not require medical examinations to perform these duties.

3. Should unusual circumstances require the contract oversight personnel to wear dosimetry or be considered a radiation worker, these circumstances shall be explained in the command’s application for authorization and the appropriate Section 2 requirements shall be incorporated into the command’s instruction.

15.8 Surveys

15.8.1 Confirmatory Surveys

1. Radiation surveys shall be conducted and documented for all contractor surveillances of radiography operations performed.

2. Surveys will be documented per Section 2.26.

3. Surveys shall be retained for 5 years.

15.9 Audits and Surveillances

15.9.1 Audits and Surveillances

1. Audits shall be performed annually per Section 2.9.1.
2. Surveillances will be performed at the frequency listed in 15.5.1 by the RSO, ARSO or COT in lieu of the supervisor. Surveillances shall be reviewed and adjudicated per Section 2.9.2.
3. Annual Program Reviews per Section 2.10 are not required.
4. Annual Drills per Section 2.23.5 are not required.

15.10 Records

15.10.1 Records of Contract Oversight

1. The following additional contract oversight records will be retained for 5 years by the RSO and made available for review by inspectors:
   a. Contractor inventory provided per NAVSEA Standard Item 009-01, Section 3.14.3.
   b. Contractor license/registration provided per NAVSEA Standard Item 009-01, Section 3.14.5.
   c. Contractor Radiological Safety Plan per NAVSEA Standard Items 009-01, Section 3.14.6. Include copies of any identified shortcomings and remedies identified per NAVSEA Standard Items 009-01, Section 3.14.7.
   d. Contractor Operations Planning Worksheet and any other documentation provided per NAVSEA Standard Items 009-112, Sections 3.3 and 3.4.
   e. Contractor provided survey data per NAVSEA Standard Items 009-112, Section 3.5.2.1.
   f. Any records of boundary violation or incidents required by NAVSEA Standard Items 009-112, Sections 3.6 and 3.7.
   g. Records of contract oversight surveillances shall meet the requirements of Section 2.26.6, except that they shall be retained for 5 years.
2. A record of all radiological contractor operations shall be maintained for 5 years. The record shall contain the

following information:

a. Name of the contractor and contract number.
b. Date(s) of operation.
c. Type of operation conducted by the contractor.
d. Description of the physical location of the operation.
e. The record will include contractor use of ionizing radiation that were supervised per Section 15.5 and those that were not supervised.

3. Records of NAVSEADET RASO contractor certification will be retained for 5 years.

4. For contractor gamma and x-ray radiography, the information on the Contractor Radiography Oversight Check Sheet provided in Section 15.10.2 will be recorded for each operation. This information shall be maintained for 5 years.

15.10.2 CONTRACTOR RADIOGRAPHY OVERSIGHT CHECK SHEET

ATTRIBUTE	RSO/ARSO/COT SIGNATURE	DATE
Contractor has submitted Attachment A of NAVSEA Standard Item 009-112		
RSO/ARSO/COT performed area or ship check of proposed radiography site with the contractor.		
RSO/ARSO/COT independently verified the contractor's proposed location for the 2 mrem/hr (0.02 mSv/hr) boundary. Maintain as part of the official record in accordance with Section 15.10.1.		
RSO/ARSO/COT arranged and conducted a pre-job brief with the tended ship (if applicable).		
RSO/ARSO/COT escorted the contractor and the gamma source on base (if applicable).		

ATTRIBUTE	RSO/ARSO/COT SIGNATURE	DATE
RSO/ARSO/COT performed radiation survey external to the contractor's vehicle to ensure radiation levels are ≤ 2 mrem/hr (0.02 mSv/hr) on contact. If levels were > 2 mrem/hr (0.02 mSv/hr), the contractor provided shielding to the source to ensure levels were ≤ 2 mrem/hr (0.02 mSv/hr) on contact with the vehicle.		
RSO/ ARSO/ COT provided the ship with the proper wording to be passed over the ship's announcing system before, during and after radiography operations (if applicable).		
Have the ship's SDO/CDO meet the RSO/ARSO/COT at the Quarterdeck prior to bringing the source on board; obtain the SDO/CDO's permission to bring the source on board (if applicable).	SDO/CDO Signature and date: RSO/ARSO/COT Signature and date:	

ATTRIBUTE	RSO/ARSO/COT SIGNATURE	DATE
RSO/ARSO/COT escorted the contractor to the job site (if gamma radiography).		
RSO/ARSO/COT verified the contractor had established and properly manned the 2 mrem/hr (0.02 mSv/hr) boundary; ensured proper warning signs are posted and they are in English and in the host-nation language (if applicable); and ensured effective communications have been established between the radiographer and boundary monitors.		
RSO/ARSO/COT conducted surveys during radiography operations to verify the 2 mrem/hr (0.02 mSv/hr) boundary. Maintain survey records as official documents in accordance with Section 15.10.1. Had the contractor adjust boundaries as required.		

ATTRIBUTE	RSO/ARSO/COT SIGNATURE	DATE
Upon completion of radiography operations for the day, obtained permission from the SDO/CDO to remove the source from the ship; the SDO/CDO was present at the Quarterdeck (if applicable).	SDO/CDO Signature and date: RSO/ARSO/COT Signature and date:	
RSO/ARSO/COT escorted the contractor and source from the ship to the contractor's vehicle (for gamma sources).		
For gamma radiography, RSO/ARSO/COT performed radiation survey external to the contractor’s vehicle to ensure radiation levels are ≤ 2 mrem/hr (0.02 mSv/hr) on contact, if levels were > 2 mrem/hr (0.02 mSv/hr), the contractor provided shielding to the source to ensure levels are ≤ 2 mrem/hr (0.02 mSv/hr) on contact with the vehicle.		
RSO/ARSO/COT escorted the contractor from the job site to the base gate (for gamma sources).		

SECTION 16 – **DON LOW-LEVEL RADIOACTIVE WASTE (LLRW) DISPOSAL PROGRAM**

16.1 **Introduction**

16.1.1 **Purpose**

1. This section provides requirements for disposal of Low-Level Radioactive Waste (LLRW) through the Department of the Navy (DON) LLRW Program. The DON LLRW Program operates as part of the Department of Defense (DoD) LLRW Program that was established to manage the disposal of all LLRW generated by the Army, Air Force, Navy and Defense Logistics Agency. The Department of the Army, Office of the Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health (DASA-ESOH) is assigned as the DoD Executive Agent for LLRW disposal. The Army Joint Munitions Command, Rock Island, IL acts as the Executive Agency (DODEA) for implementation of the DoD LLRW Program. This section will provide details on the interface between the DoD LLRW Program and DON LLRW Programs and how to use the DON LLRW Program for disposal of LLRW.
2. LLRW can be found at any DON command. This section addresses the storage, packaging, transportation, transfer, recycling, and disposal of LLRW.

16.1.2 **Scope**

1. The requirements of this section apply to all LLRW generated by DON commands and DoD commands operating under a Naval Radioactive Materials Permit (NRMP). This section does not apply to LLRW generated by the Naval Nuclear Propulsion Program or materials transferred from the Department of Energy to the Department of Navy under the authority of the Navy Nuclear Weapons Program.
2. Radioactive waste, as defined by the DoD/DON LLRW Program, includes:
   a. LLRW; any waste consistent with applicable law that the Nuclear Regulatory Commission (NRC) classifies as LLRW. Outside of the United States, this may include host nation defined materials.
   b. Mixed Waste; any waste that contains both hazardous waste (as defined by the Resource Conservation and

Recovery Act (RCRA)) and source, special nuclear, or by-product material (as defined by the Atomic Energy Act).

c. NRC licensed and exempt from licensing waste; any waste that contains or is composed of NRC specifically licensed material, generally licensed material, or material that is exempt from NRC licensing.

d. Naturally Occurring Radioactive Material (NORM) Waste; any waste composed of naturally occurring radioactive material or whose natural radioactivity has been technologically enhanced by a human process or activity (TENORM).

e. Naturally Occurring or Accelerator Produced Radioactive Material (NARM) Waste; any waste composed of radioactive materials produced by an accelerator used in sub-atomic particle physics research or NORM.

3. LLRW, as defined by the DON LLRW Program, can be found in a variety of materials, including, but not limited to:

a. Orphan sources, containing or contaminated with radioactive material (RAM);

b. Surplus, unwanted, or unserviceable devices, commodities, instruments, and articles readily identifiable as containing or contaminated with RAM;

c. RAM for which there is no longer a useful purpose;

d. Property contaminated with RAM to the extent that decontamination is economically unfeasible;

e. Radioactive residue from decontamination activities;

f. Residue from the maintenance of devices or equipment containing RAM;

g. Animal tissue contaminated with RAM;

h. Items containing depleted uranium, e.g., counterweights or munitions;

i. Waste generated from grinding thoriated tungsten welding rods, including HEPA ventilation filters;

j. Consumer products that are considered exempt from NRC licensing (see 10 CFR 30.14-21 and 40.13), which include radioactive material (byproduct and source material). These products include, but are not limited to, smoke detectors, electron tubes, vacuum tubes, welding rods, exit signs, compasses, and some

gun sights;

k. Contaminated materials generated as the result of former or current activities by DON commands or DoD commands operating under an NRMP involving the use, handling, storage, or disposal of RAM or commodities containing RAM; and

l. Contaminated materials from Navy Environmental Restoration (ER) Program, Resource Conservation and Recovery Act (RCRA), and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and NRMP decommissioning response actions.

16.2 Responsibilities

16.2.1 DON Commands and DoD Commands Operating Under an NRMP

1. DON commands, as active participants in the LLRW Disposal Program, shall:

   a. Dispose of LLRW only through the DON LLRW Program unless an alternate method is authorized by the NRSC and DODEA.

   b. Submit formal requests for disposal of DON LLRW inventories to NAVSEADET RASO and provide quarterly updates of LLRW inventories until a disposal action is completed by the DODEA or its contractors (inventories only need updating if the inventory changes).

   c. Comply with instructions and guidance issued by OPNAV N45, NAVSEA 04N, NAVSEADET RASO, or the DODEA for LLRW disposal transactions.

   d. Fund the disposal of emergent non-programmatic, non-routine or command-owned DON LLRW.

   e. Consult with NAVSEADET RASO before creating LLRW or mixed waste to ensure there is a disposal option.

   f. Manage activities to limit the amount of radioactive waste produced.

   g. Not accept LLRW from other DON commands, outside agencies, or the public sector without approval from NAVSEADET RASO.

   h. Contact NAVSEADET RASO for handling and disposal instructions if an orphan source is reported, discovered, or delivered to the command.

i. Properly store all LLRW at the command pending pickup for disposal.

j. Not transfer any material designated as LLRW to another DON command, OPNAV N45, NAVSEA 04N, or NAVSEADET RASO.

k. Not use RAM or conduct demilitarization or decontamination operations without specific authority from NAVSEADET RASO.

l. Provide assistance to the broker, as required, during inventorying, packaging, and loading of LLRW for shipment and disposal.

16.3 Management of LLRW at DON Commands and DoD Commands Operating Under an NRMP

16.3.1 General LLRW Requirements

1. For all LLRW identified therein, DON commands and DoD commands operating under an NRMP shall:

   a. Store LLRW in accordance with applicable Federal, State, and Naval Radioactive Material Permit (NRMP) requirements;

   b. Identify the location of LLRW storage areas to local emergency responders.

   c. Maintain a written inventory of LLRW, including all containerized waste that indicates activity, isotope, serial number (if applicable), and date placed in LLRW storage. Physically inventory and inspect LLRW every six months or in accordance with the NRMP. Document these inventories on the written inventory record by noting date and name of inspector;

   d. Survey LLRW to document compliance with exposure, contamination, and security controls, particularly when there are changes to the storage facility or the inventory;

   e. Document and submit to NAVSEADET RASO an LLRW Disposal request at least every six months or more frequently if there are sizeable changes in the LLRW inventory;

   f. Other than storage for radioactive decay, not store LLRW for long periods of time unless there are no disposal options available. Long-term storage (greater than one year) requires approval from

NAVSEADET RASO.

16.3.2 LLRW Storage Location Requirements

1. DON commands shall ensure that LLRW storage locations(s), in addition to the requirements for radioactive material storage areas contained in Section 2.16, are:
   a. Secured so that workers and the public will not inadvertently enter spaces or have access to the LLRW.
   b. Posted to identify that it is a radioactive materials storage area. Postings shall include contact information for emergency access.
   c. Adequate to ensure environmental conditions (temperature, humidity, exposure to the elements, including fire and flooding) do not negatively affect the integrity of the waste form or packaging.
   d. Adequate in size and afford locations for the stable placement, movement, and inspection of the LLRW.
   e. Adequately ventilated to help regulate environmental conditions and to prevent build-up of any gases produced by waste decay (e.g., radon gas).
   f. Sufficiently lit to permit identification of LLRW and unsafe radiological and non-radiological conditions.
   g. Adequately equipped with mechanical systems necessary for LLRW storage operations, e.g., hoists, dollies, skates, pallet jacks, platform truck, hand cart/truck, or pulling and securing equipment.

16.3.3 Packaging, Containerizing, and Marking/Labeling of LLRW

1. LLRW shall:
   a. Not be permanently packaged, containerized, or compacted by DON commands. LLRW can be placed in containers with shielding (i.e., lead, concrete, etc.) to reduce dose to workers and the general public. However, LLRW shall not be placed in such a manner as to contaminate the shielding materials.
   b. Be accessible for inventorying and leak testing, when appropriate.
   c. Be stored appropriately and marked for the type and

amount of radioactive material in the waste. In many instances, the LLRW will not need individual labeling; posting of the LLRW storage container or facility will be sufficient.

d. Not be placarded or labeled for shipment as the material will be packaged and labeled for shipment by the broker prior to shipment.

16.4 LLRW Disposal and Shipment

16.4.1 LLRW Disposal Request

1. To initiate LLRW disposal, a DON command or DoD command operating under an NRMP shall submit a formal LLRW disposal request to NAVSEADET RASO. No disposal action will be initiated prior to receipt of the LLRW disposal request. Sample disposal requests can be obtained from NAVSEADET RASO and are available on the Navy Knowledge Online (NKO) NAVSEADET RASO website. The request must:

   a. Be a formal letter signed by the Commanding Officer or designated representative.

   b. Be submitted electronically or as a hard copy.

   c. Include an LLRW inventory with all available information about the waste stream. If possible, the inventory should include National Stock Number or manufacturer and part number, quantity, radionuclide, amount of radioactivity, physical form (i.e., soil, water, solid, etc.). If this information is not available, it is important to include a description or photo of the LLRW. AT NO TIME SHOULD UNKNOWN LLRW BE OPENED OR DISASSEMBLED TO OBTAIN INFORMATION FOR THE LLRW INVENTORY WITHOUT CONCURRENCE FROM NAVSEADET RASO.

   d. Include geographical location of the waste (i.e., building number, room number, etc.).

   e. Indicate if the LLRW is NRC specifically licensed material, generally licensed material, or exempt material. If the LLRW is NRC specifically licensed material, provide the command NRMP number or NRC license under which it is controlled.

   f. Include command POC and telephone number. This should be someone who will be able to provide assistance to the broker when arranging the pickup and at the time the LLRW is packaged and loaded for transport.

2. Upon receipt of the LLRW request, NAVSEADET RASO will review the request for completeness and prioritize the request. The command POC will be informed when the request is received and if any additional information is required to process the request.
3. During the review process, NAVSEADET RASO will determine if disposal of the LLRW on the inventory qualifies for funding by the DON LLRW Program. If not, NAVSEADET RASO will contact the command to discuss alternative funding.
4. Once the LLRW request has been reviewed and approved by NAVSEADET RASO, the request is forwarded to the DODEA for processing. The command POC will be informed when this occurs.
5. The DODEA reviews the request for completeness, assesses the items on the disposal request, and determines the best possible disposition method, if one exists. The DODEA will contact NAVSEADET RASO or the command to rectify discrepancies with the disposal request or if disposal is not an option for the LLRW.
6. After the inventory is rectified the DODEA contracts a broker to carry out the LLRW pickup and shipment.

16.4.2 **DODEA Broker**

1. The broker makes all of the following arrangements:
   a. Plans and coordinates the shipment between the consignor (command), transporter (carrier), and consignee (receiver, e.g., processing facility or disposal site).
   b. Obtains all required tools, equipment, and supplies.
   c. Obtains shipping packages and labels.
2. Once on-site at the command, the broker:
   a. Inventories and packages all LLRW that qualifies for transport and disposal.
   b. Prepares shipping containers for transport.
   c. Completes LLRW manifests and associated paperwork.
   d. Arranges for the transporter (carrier) to pickup the packaged LLRW.
   e. Loads, blocks, and braces the packaged LLRW, as appropriate.
   f. Performs final quality assurance check on all aspects

of the shipment to ensure it meets regulatory and consignee's requirements.

g. Signs the manifests and associated paperwork and obtains a signature from the carrier on the manifest. Ensures that the command POC and DODEA receive copies of all paperwork.

h. Tracks each shipment until it reaches its destination. Ensures that acceptance signatures are received on the manifests and provides copies of manifests to the command and DODEA.

i. After final disposition, ensures that copies of certificates of disposal are provided to the command and DODEA. This may be a significant time after transfer due to processing and handling prior to final disposition.

16.4.3 **Coordinating the LLRW Pickup**

1. The Command Point of Contact (POC) is paramount in the success of an LLRW pickup and shipment and has the following responsibilities:

   a. Coordinates the command's pickup and shipment of LLRW with NAVSEADET RASO and the broker.

   b. Coordinates access to the command and the LLRW storage location(s) for both the broker and the carrier's transport vehicle.

   c. Ensures that the broker has a large enough work area to inventory, sort, segregate, and package the waste and there is electrical power, portable lighting if electrical lighting is not available, copier access, and, if necessary, equipment to assist in moving and loading the LLRW.

   d. Ensures that only the LLRW on the submitted inventory is provided to the broker for shipment. Once the LLRW contract is established, it is not possible to add LLRW to the contract.

2. Because of the importance of the command POC to the LLRW process, the following requirements apply:

   a. Information about the command POC must be current and kept up to date. The command should update their request for LLRW Disposal if the command POC changes.

   b. The command POC must be available and knowledgeable

about the command's LLRW and its physical location.

c. The command POC must be available by cell or office phone and be on-site at the time specified for the scheduled pickup date.

3. If the command POC, or suitable alternate, is not available at the time of the LLRW pickup, the shipment will not be made and will need to be rescheduled.

16.5 DON LLRW Disposal Program Waivers

16.5.1 Requesting a Waiver

1. A DON command, or DoD command possessing an NRMP, may send a written request for waiver from the requirements of the DON LLRW Program to NAVSEADET RASO. The waiver, if granted, will allow disposal of a certain quantity of LLRW through an alternative method. Each waiver request is considered on a case-by-case basis.
2. The waiver submitted to NAVSEADET RASO shall include:
   a. Details on the waste stream and location of the LLRW.
   b. Proposed methodology for packaging, transport, and disposal.
   c. Specifics on licensing of brokers and disposal sites.
   d. Break down of costs for all aspects of the disposal effort.
   e. Health and safety plans for packaging and shipment.
   f. Emergency response coverage during shipment.
3. Upon receipt, NAVSEADET RASO will review the waiver request and submit a recommendation to the NRSC. If approved, the waiver request will be forwarded to the DODEA for consideration.
4. Waiver disapprovals will include an explanation as to why the waiver request was denied.

16.5.2 Appealing a Disapproved Waiver

1. Commands may appeal a disapproved waiver request to the NRSC via NAVSEADET RASO.
2. The NRSC may appeal a waiver request disapproved by the DODEA to the LLRW Disposal Advisory Committee.

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SECTION 17 – **RASP EMERGENCY RESPONSE PLAN**

17.1 **Introduction**

17.1.1 **Purpose**

This section establishes policy, procedures, and requirements for the RASP Emergency Response Plan. The requirements in this section do not apply to the radiological programs of the Naval Nuclear Propulsion Program (NNPP), Naval Nuclear Weapons, or Navy Medicine.

17.1.2 **Scope**

This section describes the RASP Emergency Response Plan (RERP), and provides guidance for responding to radiological emergencies. The Radiological Emergency Response Organization (RERO), is a joint response organization comprised of personnel and resources from RASP commands, NAVSEADET RASO, and Commander, NAVSEA 04N. Commands with a well-established RERO for other radiological programs may elect to use that framework for emergency response, recognizing the roles of NAVSEADET RASO and NAVSEA 04N if RASP radioactivity is involved. If resources from other radiological control programs at the command are needed to fulfill the requirements of this section, the resources and control of those resources during a RASP emergency shall be defined in the command emergency plan with all affected organizations concurring on the plan. The consolidated RERO has three primary responsibilities:

1. Executing Incident Command System response duties for emergencies at RASP commands.
2. Establishing and applying a standardized communication system for dissemination of information among command and support elements and, as appropriate, cooperating agencies and organizations.
3. Formalizing processes to manage and direct resources efficiently and effectively during emergency response.

17.2 **Requirements**

17.2.1 **RASP Command**

1. RASP commands are responsible for establishing prompt and effective control of any radiological emergency or

incident within the confines of the command. The RASP command shall use Section 2.23.1 of this manual to define an emergency or incident and Section 2.23.2 to model its emergency response plan. The command shall activate its RERO, if appropriate. Examples of events that may require RERO activation are spills of radioactive materials outside a controlled area, release of radioactive materials into the environment above regulatory effluent limits, discharges or spills of radioactive materials that might be considered pollutants or might have potential to generate public concern, and elevated radiation levels in uncontrolled areas that could cause members of the general public to exceed dose limits.

2. RASP commands shall have sufficient resources to initially control the emergency and commence recovery operations. Commands with an NRMP shall submit the command emergency plan as part of the NRMP application. Programs with NRMPs predating these requirements that do not include an emergency plan shall submit an NRMP amendment to incorporate the command emergency plan within a time period provided by NAVSEADET RASO.

3. The event shall be immediately reported per Section 2.27. In the event of an emergency that exceeds command response capabilities, the command shall immediately request assistance from NAVSEA 04N. Technical assistance will be provided by NAVSEA 04N via NAVSEADET RASO.

17.2.2 **NAVSEA 04N**

If necessary, NAVSEA 04N will deploy a Technical Assist Team (TAT) based on the evaluation of the overall radiological risk and/or impact associated with the emergency.

17.2.3 **TAT**

1. The TAT will consult, coordinate with, and assist the Incident Commander during the emergency to avoid confusion, overlapping responsibility, and duplication of efforts.

2. RASP emergency response will parallel the National Response Framework (NRP) and utilize the National Incident Management System (NIMS) based on five key

principles:

a. Engaged partnership.
b. Tiered response.
c. Scalable, flexible, and adaptable capabilities.
d. Unity of effort through unified command.
e. Readiness to act.

17.3 Responsibilities

17.3.1 RASP command

1. Ensure all initial and refresher training is conducted and documented for applicable command personnel per RASP program requirements commensurate with types and scopes of operations (for example, training regarding Section 1.6, applicable operating and emergency procedures, RERO and personnel responsibilities, etc.).
2. Perform radiological surveys of affected area.
3. Establish communication with NAVSEADET RASO and provide data updates from emergency response efforts.
4. Implement casualty procedures to protect personnel and property following the "As Low As Reasonably Achievable" (ALARA) principle. Commands shall have casualty procedures specific to each type of RASP high-risk operations or possible events. This would include procedures for each applicable type of operation (for example, radiography, instrument calibration range, operations under contract oversight).
5. Establish an Incident Command Post with sufficient emergency responders to address the event. The Incident Command Post (ICP) is the field location where functions are performed. The ICP can be co-located with other incident facilities.

17.3.2 RASO Detachment

1. Provide technical assistance to RASP commands as required and coordinate emergency response efforts with NAVSEA 04N and the RASP command.
2. Establish an Emergency Control Center (ECC) to support the TAT and headquarters efforts during the event. The RASO ECC will be manned with the appropriate personnel

for the emergency. For commands that have established ECCs (or equivalent) frameworks for other radiological programs, the command may elect to utilize those resources for responding to RASP emergencies or incidents.

3. Track and assess onsite and initial off-site (if applicable) radiological measurements.
4. Provide oversight for RASP program commands.
5. Coordinate responses to public inquiries regarding radiological events with NAVSEA 04N.
6. Maintain a reference guide for RASP, State, County, city points of contact and assets for radiological emergencies. Provide knowledgeable representatives at the Regional Response Coordination Center, State Emergency Operating Center, and County Emergency Operating Center, if necessary, based on the extent of the incident.

17.3.3 **Technical Assistance Team**

1. Deploy, when directed by NAVSEA 04N, to RASP commands combating a radiological casualty with an appropriate number of responders for the event.
2. Provide direct support and assistance to the RASP command during emergency response efforts.
3. Establish communications with NAVSEADET RASO and NAVSEA 04N. Send daily situational reports to all stakeholders.

17.3.4 **NAVSEA 04N**

1. Provide direction and assistance to NAVSEADET RASO.
2. Coordinate assistance to commands by deploying TATs.
3. Coordinate multi-agency emergency response as required.
4. Determine reporting requirements to local, state, federal agencies, and other affected stakeholders.
5. Coordinate responses to public inquiries via the Public Affairs circuit, US Navy Chief of Information, and Office of Legislative Affairs.
6. Notify stakeholder Naval programs and appropriate chain of command as well as Federal, State and local civil authorities.

7. Evaluate and recommend emergency response efforts and determine status of affected command.

17.3.5 **State Agencies**

The role of some state agencies may vary depending on the event.

17.3.6 **Local Agencies**

The role of some agencies may vary from locality to locality. County or city is responsible for protecting the public health and safety of its community. Normally the cities and counties assign this responsibility to the local Emergency Coordinator.

17.4 **RASP Emergency Response Organization**

17.4.1 **Background**

1. The fundamental principle of emergency response operations for a RASP command is that the Commanding Officer, Commander, or Officer-in-Charge is in charge of the actions on his/her command (Afloat or Ashore). In terms of the NIMS Incident Command System (ICS), the Commanding Officer (CO) is equivalent to the On-Scene Incident Commander (IC) and may assign Incident Commander responsibilities to a qualified delegate. The Area ECC shall provide the CO with the assistance he/she needs but shall not attempt to control the details of the operators' actions. Focus areas for ECC operations shall be external communications, follow-up and/or recovery actions, and evaluation of the overall emergency response. The following discussion illustrates the expected relationships and interactions that will likely be encountered during the response to a radiological accident. The Area ECC will be supported by the Primary Command (NAVSEA 04N) and NAVSEADET RASO ECC.
2. The initial response to an incident by the command's responders shall be in accordance with casualty procedures and operating procedures. During this period, when off-site support generally will not be available and timing of response actions will be critical, it is paramount that the operating force is in control and is

relied upon to take appropriate actions. It is acceptable for commands with existing radiological response organizations to use those structures for the initial and subsequent phases of response to the RASP emergency or incident.

3. During or following this period, increased involvement by NAVSEA 04N and NAVSEADET RASO will likely occur. Control of the scene will be and must remain with the operating crew while communications between the activities increases. These communications will primarily involve data transfer, discussions of courses of action with requests for evaluation or consideration of various recommendations, and, in some cases, recommendation to carry out a specific course of action.

17.4.2 **On-site Emergency Response Organization**

1. In the event of a RASP incident, the major response will take place at the location of the emergency. Although headquarters and remote off-site support organizations may be notified and mobilized, the immediate and most effective initial response is that implemented by an on-site emergency response organization. This section describes a generic on-site emergency response organization for establishing prompt and effective control of a radiological emergency.
2. NIMS uses a systematic approach incorporating processes and methods which results with a unified framework for incident management. The capabilities of the NIMS organizational structure shall be designed based on risk levels and facilities, with consideration given to available resources, to perform the necessary functional objectives for an emergency. The organizational structure described in this chapter is consistent with the NIMS ICS structure.

17.4.3 **On-Scene Response**

1. Depending on the extent of the emergency, the on-scene area may range from the immediate area to the entire site. The on-scene area is controlled by trained technical personnel who are organized into functional areas.
2. ICS requires a single Incident Commander (IC), with

training in management of emergency operations, to be in charge of overall incident management for the on-scene response. ICS organization allows for a modular approach to establishing one or several General Staff positions to manage incident response. Each General Staff position in the ICS organizational structure is delegated authority by the IC. Personnel responsible for General Staff Sections are designated as Section Chiefs. These personnel shall be experienced, knowledgeable, specifically trained in matters for which they are responsible, and capable of independently directing action under their cognizance.

3. Each Section Chief is responsible for their assigned functional area(s). The IC is responsible to integrate the functions into an effective unit. For example, the medical function relative to a life-threatening situation may deserve highest priority; however, this does not mean other functions are to be neglected. The remaining teams must accomplish their assigned responsibilities in an integrated manner without impacting the accomplishment of medical treatment. For example, a whole body frisk for an injured person in a radiological emergency may have to be postponed, and the radiologically controlled area enlarged, until the medical situation can be stabilized. It is important to ensure that appropriate controls based on the existing conditions at the time of the emergency are not omitted.

17.4.4 Area Emergency Control Center

Overall coordination of the facility response to an emergency is directed by senior management and technical personnel assembled in the emergency control center. Major responsibilities of the emergency control center include coordinating support and assistance from local organizations, notifying higher Naval commands (NAVSEADET RASO, COC), coordinating and providing technical assistance, and assessing radiological measurements. Other ECCs may exist such as NAVSEA 04N (Primary) and at NAVSEADET RASO.

17.5 RASP Command Radiological Emergency Response Organization

The RERO is a joint response organization comprised of personnel and resources from various local commands. The RERO is structured into five groups with each group having a distinct

area of responsibility based on functional objectives. All groups and billets are not required for every emergency. In addition, there may also be differing titles and organizational structures in commands with emergency response organizations for radiological operations other than RASP.

17.5.1 **Command Group**

1. Ensure implementation and execution of actions in accordance with OPNAVINST 5102.1 Series.
2. Manage the Emergency Response Organization.
3. Concur in major actions or plans proposed by staff.
4. Assure preparation and release of OPREP-3 reports, if required after coordination with COC. The classification specified for an emergency is based on Level of risk to the public. Modeled after the NRC's Emergency Classifications, there are four Emergency Classification Levels (ECLs) for RASP COMMAND emergencies: Unusual Event, Alert, Site (Area) Emergency, and General Emergency.

17.5.2 **Technical Assistance Team**

1. Assess radiological risks; determine the accident category, recommend protective actions needed. The TAT team composition will be based upon the event and resources at the command.
2. Evaluate doses to site personnel and provide recommendations on personnel movements (e.g., egress of personnel or rotating personnel due to fatigue or radiation dose).
3. Follow decontamination and Medical Services response.
4. Dispatch team members, as needed, to pertinent locations (e.g., ECC, ICP, decontamination site(s)) to facilitate and enhance timely communications.
5. Maintain equipment (e.g., RADIACS, two-way radios, voice recorders) at pertinent locations to provide independent, confirmatory measurements, documentation, and updates, as needed.
6. Maintain liaison with ECC, ICP, NAVSEADET RASO ECC, and NAVSEA 04NB.
7. This group may be manned by selected subject matter

experts, local command personnel, a Technical Assistance Team from NAVSEADET RASO, or a combination of both.

17.5.3 **On-scene Command Group**

1. Coordinate on-scene actions.
2. Control people, areas, and radioactivity.
3. Describe on-scene problem, and status to the ECC.
4. Determine radiological conditions on-scene via surveys.

17.5.4 **Public Information Group**

1. Prepare and release public information in coordination with NAVSEADET RASO and NAVSEA 04N.
2. Ensure all information released is factual and compatible with prior statements.
3. Maintain liaison with news media; arrange press conference when directed by the Area ECC Commander; monitor local news broadcasts.
4. Brief Area ECC Commander on status and content of inquiries, message reports, and press liaison.

17.5.5 **Communications Group**

1. Provide technical support for radio and telecommunications services in the ECC.
2. Ensure proper functioning of computer and electronics equipment in the ECC.
3. Operate command audio/video equipment.
4. Initiate notification of the Emergency Response Organization.
5. Ensure operation of Emergency Notification System.

17.6 **Training**

One of the key elements to properly respond to an emergency is having a training program that prepares personnel for an unusual occurrence. Training documentation and records shall be retained and available for review during internal reviews, assessments, audits, and inspections.

17.6.1 **NIMS**

The required training based on RERO personnel responsibilities is listed below in Table 17.1

Table 17.1 Required Training based on RERO responsibilities

Personnel	Required Training
Entry Level First Responder	• FEMA IS-700: NIMS, AN Introduction • IS-100: Introduction to Incident Command System
First Line Supervisors (e.g. Division Heads)	• FEMA IS-700: NIMS, An Introduction • IS-100: Introduction to Incident Command System
Middle Management (e.g. Department Heads)	• FEMA IS-700: NIMS, An Introduction • IS-100: Introduction to Incident Command System • IS-200: Single Resources and Initial Action Incidents
Command Management (e.g. CO, XO, CMC, Directors)	• FEMA IS-700: NIMS, An Introduction • IS-800: National Response Framework (NR), An Introduction* • IS-100: Introduction to Incident Command System • IS-200: Single Resources and Initial Action Incidents • IS-300: Intermediate ICS for Expanding Incidents • IS-400: Advanced ICS Command and General Staff

17.6.2 **Radiological**

Additional training identified by the command shall be provided to command personnel that address specific radiological events likely to occur at the command. The type of material or hazard presented, locations of RASP material storage and usage, radiological incident consequences, radiological measurement and assessment, mitigation strategies, and interface with local government, the public, and the press shall be addressed in this training. Training shall also include responsibilities and duties for assigned tasks during emergency response, and site

access requirements. Personnel shall be trained and qualified for positions in the RERO upon initial assignment and biennially thereafter.

17.6.3 **Records**

The command shall track qualifications and maintain qualification records for a minimum of three years.

17.7 **Drills**

To test the Command's ability to respond to an unusual occurrence, each command shall perform emergency drills as described in Section 2.23.2. Each command shall determine the complexity of the drill and response based on the radiological hazards and consequences identified during preparation of the command emergency plan and review of conditions, situations, and occurrences in Section 2.23.

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APPENDIX A - GLOSSARY

Absorbed Dose — The energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest. The unit of absorbed dose are the rad and the gray (Gy). One Gy equals 100 rads.

Accelerator Expert — An individual who has the appropriate combination of education and work experience to make sound judgments regarding specific areas of work to which he or she has been assigned. Minimum qualifications include a Bachelor of Science (BS) in a science or engineering field and 3 years of work experience at accelerator facilities. A higher degree of education can substitute for some working experience. For example, an individual authorized to design and/or certify interlocked access control systems must have education, experience, and training that is commensurate with the tasks assigned. In addition, the individual authorized to design and/or certify the radiation shielding design must have the knowledge and training to undertake an analysis and design of a radiation-shielding system.

Agency — A division of government with a specific function offering a particular kind of assistance. In the Incident Command System, agencies are defined either as jurisdictional (having statutory responsibility for incident management) or as assisting or cooperating (providing resources or other assistance). Governmental organizations are most often in charge of an incident, though in certain circumstances private-sector organizations may be included. Additionally, nongovernmental organizations may be included to provide support.

Airborne Radioactive Material — Any radioactive material dispersed in air in the form of dusts, fumes, particles, mists, vapors, or gases.

Airborne Radioactivity Area — A room, enclosure, or area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations:

In excess of 10 percent of the derived air concentrations (DACs) specified in appendix B, to 10 CFR 20, or

To such a degree that an individual present in the area without respiratory protective equipment could exceed, during

the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC-hours.

ALARA – Acronym for "As Low As is Reasonably Achievable" means making every reasonable effort to maintain exposures to radiation as far below the dose limits stated in Table 2-1 as is practical and consistent with the command's mission, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the Department of Defense's mission in service to the public interest of national security.

Alert - If an alert is declared, events may occur, are in progress, or have occurred that could lead to a release of radioactive material[s] but that the release is not expected to require a response by an offsite response organization to protect persons offsite.

Annual Limit on Intake (ALI) – The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 5 rem (0.05 Sv) or a committed dose equivalent of 50 rem (0.5 Sv) to any individual organ or tissue.

Area Command – The command pre-designated by the primary commander as having responsibility for implementing and executing actions directed by the primary commander or deputy primary commander in response to a radiological accident in a particular geographical area under the cognizance of the primary commander.

Assisting Agency – An agency or organization providing personnel, services, or other resources to the agency with direct responsibility for incident management.

Associated Equipment (Gamma Radiography) – Equipment that is used in conjunction with a radiographic exposure device to make radiographic exposures that drives, guides, or comes in contact with the source (e.g., guide tube, control tube, control (drive) cable, removable source stop, “J” tube, and collimator when it is used as an exposure head). Each radiographic exposure device, source assembly, or sealed source, and all

associated equipment must meet the requirements specified in American National Standards Institute, N432-1980 "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography," (published as National Bureau of Standards (NBS) Handbook 136, issued January 1981).

Authorized User – An individual that uses radioactive material or operates a machine that generates ionizing radiation, who has had the appropriate training, and is determined by the Radiation Safety Officer to be qualified to work with the radioactive material or machine.

Becquerel (Bq) – A unit of radioactivity equal to one disintegration per second.

Broker - A person who manages the shipment (packaging, handling, manifesting, and transportation) of DON LLRW from the point of generation (DON command) to the receiving facility (e.g., processor, burial site, or recycler) and ensures the shipment complies with Federal, State, and local regulations. The broker is responsible for certifying the integrity of the shipment by signing the shipping papers (manifest).

Byproduct Material – Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident to the process of producing or using special nuclear material;

The tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by these solution extraction operations do not constitute ''byproduct material'' within this definition;

Any discrete source of radium-226 that is produced, extracted, or converted after extraction, before, on, or after August 8, 2005, for use for a commercial, medical, or research activity; or

Any material that has been made radioactive by use of a particle accelerator and is produced, extracted, or converted after extraction, before, on, or after August 8, 2005, for use for a commercial, medical, or research activity;

Any discrete source of naturally occurring radioactive material, other than source material, that;

a. The Commission, in consultation with the Administrator of the Environmental Protection Agency, the Secretary of Energy, the Secretary of Homeland Security, and the head of any other appropriate Federal agency, determines would pose a threat similar to the threat posed by a discrete source of radium-226 to the public health and safety or the common defense and security; and
b. Before, on, or after August 8, 2005, is extracted or converted after extraction for use in a commercial, medical, or research activity.

Calibration – To adjust or determine the response or reading of an instrument relative to a series of conventionally true values; or to determine the activity of a radiation source relative to a standard or conventionally true value.

Command – Any Navy or Marine Corps base, facility or activity.

Committed Dose Equivalent – The dose equivalent to an organ or tissue that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

Committed Effective Dose Equivalent – The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues.

Confirmatory survey - a survey performed by a radiographer or a radiographer's assistant during the first exposure of the source in order to confirm the calculated location of the restricted area boundary and to make any necessary adjustments to the boundary.

Contamination – The presence of radioactive material where it is not wanted.

Contamination Worker - Contamination workers are personnel who receive exposure to ionizing radiation in the course of their employment or duties, and are identified by their command as being occupationally exposed. Normally, these individuals'

routine duties require working directly with unsealed radioactive material and have a potential to become contaminated. These individuals normally receive radiation medical examinations. These individuals also normally receive specialized training as part of a specific radiological controls program.

Contractor Owned Contractor Operated (COCO) Facility – A facility that is owned and operated by a non-government, private firm under contract with the Government.

Controlled Area – Controlled area means an area, outside of a restricted area but inside the site boundary, access to which can be limited by the licensee for any reason.

Curie – A unit of radioactivity equal to $3.7x10^{10}$ disintegrations per second or $3.7x10^{10}$ becquerels or $2.22x10^{12}$ disintegrations per minute.

Derived Air Concentration Hour (DAC-Hr) – The product of the concentration of radioactive material in air (expressed as a fraction or multiple of the derived air concentration for each radionuclide) and the time of exposure to that radionuclide, in hours. A licensee may take 2,000 DAC-hours to represent one ALI, equivalent to a committed effective dose equivalent of 5 rem (0.05 Sv).

Dose – A generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent.

Dose Equivalent – The product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert (Sv).

Dosimetry (Primary and Secondary) – Individual monitoring equipment designed to be worn or carried by an individual for the purpose of detecting and measuring an individual's exposure to ionizing radiation.

Effective Dose Equivalent – The sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues that are irradiated.

Emergency – Any incident, whether natural or manmade, that requires responsive action to protect life or property. Under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, an emergency means any occasion or instance for which, in the determination of the President, Federal assistance is needed to supplement State and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States.

Emergency Classification Level (ECL) – The classification specified for an emergency based on Level of risk to the public. There are four ECLs for RASP COMMAND emergencies: Unusual Event, Alert, Site (Area) Emergency, and General Emergency. Upon making notifications per Section 2.27, assistance will be provided as to classification of the emergency.

Emergency Control Center (ECC) – The physical location at which coordination of information and resources to support RASP COMMAND incident management activities normally takes place. An ECC is generally consistent in application and capability to an EOC.

Emergency Operations Center (EOC) – The physical location at which the coordination of information and resources to support domestic incident management activities normally takes place. EOC is generally consistent in application and capability to an ECC, but is a common term used outside the RASP COMMAND. EOCs may be organized by major functional disciplines (e.g., fire, law enforcement, and medical services), by jurisdiction (e.g., Federal, State, regional, county, city, tribal), or some combination thereof.

Emergency Public Information – Information that is disseminated primarily in anticipation of an emergency or during an emergency.

Emergency Responder or Emergency Response Provider – Includes Navy/Federal, state, local, and tribal emergency public safety, law enforcement, emergency response, emergency medical (including hospital emergency facilities), and related personnel, agencies, and authorities.

Exempt Shielded Facility – A facility that provides the highest degree of inherent safety because the protection does not depend on compliance with any operating limitations. This

type of facility also has the advantage of not requiring restrictions on occupancy outside the enclosure since inherent shielding is sufficient to meet the maximum permissible dose equivalent requirements for uncontrolled areas. An exempt shielded facility meets all the requirements of Section 11.5.

Exposure – The process of being exposed to ionizing radiation or radioactive material.

Facility – The location at which one or more devices or sources of ionizing radiation are installed or located within one building, vehicle, or under one roof and are under the same administrative control.

Facility Re-Evaluation – An evaluation of an existing facility due to a change in equipment, shielding, workload, or occupancy in adjacent areas.

Fail-Safe Design – A feature of an interlocked safety system that renders the system safe when a component of the safety system fails or a system having the property that any failure causes a sequence of actions, which always results in a safe situation.

Fail-Safe Switch - An access interlock switch which is intended to prevent the generation of ionizing radiation when access by any part of the human body to the interior of the facility or vault through a door or access panel and shall meet all of the following criteria:

a. It shall be designed and mounted such that door or panel opening results in physical disconnection of the energy supply circuit to the high voltage generator, and such disconnection shall not be dependent upon any moving part other than the door.

b. Shall be certified by the Center for Devices and Radiological Health (CDRH) to meet the criteria for "fail-safe design." Access door or panel interlock safety switches include electromagnetic, knife-edge and finger stock, shorting bar, or plug and socket type connections. These switches operate by physical removal or a part of the electrical circuit when the door or panel is opened. Relays, micro switches, and roller switches all contain moving parts and, therefore, cannot be used to satisfy the requirement

that the physical disconnect interlock is not dependent on any moving part other than the door.

Federal Coordinating Officer (FCO) – The Federal officer who is appointed to manage Federal resource support activities related to Stafford Act disasters and emergencies. The FCO is responsible for coordinating the timely delivery of Federal disaster assistance resources and programs to the affected State and local governments, individual victims, and the private sector.

Federal Emergency Management Agency (FEMA) – Federal organization in the Department of Homeland Security tasked with responding to, planning for, recovering from and mitigating disasters. In consultation with RASP COMMAND during an accident involving the RASP COMMAND, FEMA will coordinate the provision of Federal resources and assistance to affected State, local, and tribal governments. FEMA establishes and maintains a source of integrated, coordinated information about the status of all non-radiological resource support activities.

First Responder – Local and nongovernmental police, fire, and emergency personnel who, in the early stages of an incident, are responsible for the protection and preservation of life, property, evidence, and the environment. Also included are emergency management, public health, clinical care, public works, and other skilled support personnel who provide immediate support services during prevention, response, and recovery operations. First responders may include personnel from Federal, State, local, tribal, or nongovernmental organizations.

General Emergency - A general emergency involves actual or imminent substantial release of radioactivity or radiation exposure. Radioactive releases during a general emergency can reasonably be expected to exceed any RASP dose limit in Table 2-1 of Section 2.

General Public – Individuals who are not occupationally exposed to ionizing radiation shall be considered members of the general public. Examples would include individuals that live and work outside the perimeter of a command, family members of an employee, or crew members that live on a base but are outside a controlled industrial area, and visitors that do not normally receive occupational exposure.

General Staff – A group of incident management personnel organized according to function and reporting to the Area or Incident Commander.

Government Owned Contractor Operated (GOCO) Facility – A facility that is owned by the Government and operated under contract by a non-government, private firm.

Government Owned Joint Operated (GOJO) Facility – A facility that is owned by the Government and operated under a joint contract between the Government and a non-government, private firm.

Hazardous Waste - A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may: (1) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (2) pose a substantial or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

High Radiation Area – Any area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 0.1 rem (1.0 mSv) per hour at 30 cm (approximately 1 foot) from the radiation source or 30 centimeters from any surface the radiation penetrates.

Immediate Notification – In reference to contacting RASO, the Radiation Safety Officer or Assistant Radiation Safety Officer shall make positive contact with someone at NAVSEADET RASO (757-887-4692) as soon as possible after it becomes known to the command of an incident that requires immediate notification.

Incident Command System (ICS) – A standardized on-scene emergency management construct specifically designed to provide for the adoption of an integrated organizational structure that reflects the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. ICS is the combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, designed to aid in the management of resources during incidents.

Incident Commander (IC) - The individual responsible for all incident activities, including the development of strategies and tactics and the ordering and the release of resources. The Incident Commander has overall authority and responsibility for conducting incident operations and is responsible for the management of all incident operations at the incident site.

Incident Management Team – The IC and appropriate Command and General Staff personnel assigned to an incident.

Interlock – A device or device group arranged to sense a limit, an off-limit condition or improper event sequence that functions to shut down the equipment or prevent its operation. Interlocks are specifically designed to avoid and/or terminate a hazardous radiation condition.

Internal Audit – A documented examination by responsible management individual (i.e., Radiation Safety Officer , Assistant Radiation Safety Officer, Senior Radiographer, supervisor, foreman, etc.) of the RASP or any element thereof (training, posting, operations, procedures, records, etc.,) to verify compliance with requirements and established procedures.

Ionization – The process of adding one or more electrons to, or removing one or more electrons from, atoms or molecules, thereby creating ions. High temperatures, electrical discharges, or nuclear radiations can cause ionization.

Ionizing Radiation – Any electromagnetic or particulate radiation capable of producing ions, directly or indirectly, in its passage through matter. Ionizing radiation includes the following: gamma rays, x-rays, alpha particles, beta particles, neutrons, protons, and other particles and electromagnetic waves capable of producing ions.

Ionizing Radiation Sources - Any machine or radioactive material source capable of producing ionizing radiation.

Initial Facility Evaluation – An evaluation of an x-ray radiography facility to determine its classification as an exempt shielded, shielded, or open facility prior to placing a facility into routine operation. A radiation protection survey will provide the basis for the facility evaluation. Facility evaluations will be conducted by NAVSEADET RASO using data provided by a radiation protection survey performed by the local Radiation Safety Officer/Assistant Radiation Safety Officer.

Jurisdiction – A range or sphere of authority. For radiological accidents involving the RASP COMMAND, the RASP COMMAND has jurisdictional authority on the site or federal property. Outside these areas, State and, depending on State law, local officials have jurisdictional authority.

Leak Test – A test to determine if a sealed source has lost its integrity and allows leakage of radioactive material through holes or cracks. The test is normally performed by wiping the source with filter paper or absorbent material to determine the presence of radioactive contamination, which indicates leakage.

Licensed Radioactive Material – Source Material, special nuclear material, or byproduct material that is received, possessed, used or transferred under a general or specific license issued by the Nuclear Regulatory Commission.

LLRW Disposal - The transfer of ownership of LLRW to an authorized government agency, or NRC or Agreement State licensed facility for the purposes of processing, recycling, long-term storage or in-ground disposal.

LLRW Disposal Request - A formal letter from the DON command possessing LLRW to NAVSEADET RASO signed by the Commanding Officer or his/her designated representative. The disposal request must include an LLRW inventory, geographical storage location, and a command point of contact (POC) that has direct knowledge of the LLRW inventory and storage location and can provide assistance to the broker during waste packaging and loading for transport.

LLRW Storage - Containment of LLRW, either on a temporary or semi-permanent basis, in a secured manner that does not result in the spread of waste or constitute disposal of such waste.

Manifest - The form used for identifying the quantity, composition, and the origin, routing, and destination of LLRW during its transportation from the point of generation to the point of disposal, treatment, or storage.

Naval Radioactive Materials Permit (NRMP) – Authorization issued by the Naval Radiation Safety Committee to a command to receive, possess, use, store, transfer or dispose of radioactive material as specified in Section 3.

National Incident Management System (NIMS) – A system mandated by Homeland Security Presidential Directive (HSPD)-5 that provides a consistent nationwide approach for state, local, and tribal governments; the private-sector, and nongovernmental organizations to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity. To provide for interoperability and compatibility among state, local, and tribal capabilities, the NIMS includes a core set of concepts, principles, and terminology. HSPD-5 identifies these as the Incident Command System; multiagency coordination systems; training; identification and management of resources (including systems for classifying types of resources); qualification and certification; and the collection, tracking, and reporting of incident information and incident resources.

NIMS Command – The act of directing, ordering, or controlling by virtue of explicit statutory, regulatory, or delegated authority.

NIMS Command Staff – In the Incident Command System, the incident management positions consisting of the On-Scene Incident Commander and the special staff positions of Public Information Officer, Safety Officer, Liaison Officer, and other positions as required, who report directly to the Area or Incident Commander. They may have an assistant or assistants, as needed.

Non-Radiation Worker – Workers who receive very low-level radiation exposure incidental to their employment at a command but not as an integral part of their skill, trade or work assignment. Their assigned duties do not involve the direct use of RASP sources of ionizing radiation and they are not authorized to receive, in a year, a dose of radiation greater than 500 mrem (5 mSv) from RASP sources. These individuals may regularly access areas near or adjacent to RASP sources and may periodically be in radiation areas. Examples include supervisors, management personnel, safety inspectors, radiation health personnel, gas chromatograph operators, maintenance personnel, delivery personnel, messengers, security personnel, firefighters, medical personnel, emergency response personnel and inspectors. Radiation safety training for non-radiation radiation workers should be specific to the areas and hazards that the individual could reasonably encounter.

Occupancy Factor – The factor (≤1) for the degree of occupancy (by any one person) of the area in question while the radiation source is emitting radiation.

Official Correspondence - All formal correspondence submitted in accordance with the most recent version of the Navy Correspondence Manual (SECNAV M-5216.5).

On-scene Incident Commander (IC) – The individual responsible for all incident activities, including the development of strategies and tactics, and the ordering and release of resources. The IC has overall authority and responsibility for conducting incident operations and is responsible for the management of all incident operations at the incident site.

Open Facility – A facility that is not classified as an exempt shielded or shielded facility.

Orphan Source - A source of radioactive material contained in a small volume or device, excluding radioactively contaminated soils and bulk metals, in any one or more of the following conditions: (1) in an uncontrolled condition that requires removal to protect public health and safety from a radiological threat; (2) in a controlled or uncontrolled condition for which a responsible party cannot be readily identified; (3) in a controlled condition in which the material's continued security cannot be assured and, if held by a licensee, the licensee has few or no options for, or is incapable of providing for, the safe disposition of the material; (4) in a controlled or uncontrolled condition in the possession of a person not licensed to possess the material or who did not seek to possess the material; or (5) in a controlled or uncontrolled condition in the possession of a state radiological protection program for the sole purpose of mitigating a radiological threat because the orphan source is in one of the conditions described above and for which the state does not have a means to provide for the material's appropriate disposition.

Permanent Radiographic Installation (PRI) – Permanent radiographic installation means an enclosed shielded room, cell, or vault, not located at a temporary jobsite, in which radiography is performed.

Positive Communication – Positive communications are the use of a standard method to ensure consistency and effectiveness of communication such as using radios, whistles, hand signals, and repeat backs. Communications must be clear, concise, and correctly understood.

Practical Examination – A demonstration through practical application of the safety rules and principles in industrial radiography including use of all appropriate equipment and procedures. This may include a written test.

Principal Activity – Activities authorized by the NRMP which are essential to achieving the purpose(s) for which the NRMP was issued or amended. Storage during which no licensed material is accessed for use or disposal and activities incidental to decontamination or decommissioning are not principal activities.

Pulsed X-Ray Machine – An x-ray machine that produces x-ray pulses of very short duration (typically in the nanosecond range).

Qualified Expert – An individual who has the appropriate combination of education and work experience to make sound judgments regarding specific areas of work to which he/she has been assigned. Minimum qualifications should include a Bachelor of Science (BS) in science or engineering fields and 3 years of work experience at accelerator facilities. Higher degree of education can substitute some working experience. For example, a worker authorized to design and/or certify interlocked access control system must have education, experience and training that is commensurate with the tasks assigned. Radiation Safety Professional is a qualified expert in the areas of radiation safety.

Quarter (Calendar) – A period of time equal to one-fourth of the year (approximately 13 consecutive weeks), providing that the beginning of the first quarter in a year coincides with the starting date of the year and that no day is omitted or duplicated in consecutive quarters.

Quality Assurance Program (QAP) – A program for the systematic monitoring and evaluation of the various aspects of a project, service, operation, or facility to ensure that standards of quality are being met.

Quick Scan Radiation Survey – A radiation survey conducted by moving a radiation survey instrument over a specific area anticipated to be the most likely source of leakage at a slow enough movement rate to allow adequate response and noting the highest reading observed.

Radiation Area – An area, accessible to individuals, in which radiation levels exceed 2 mrem/hr (0.02 mSv/hr) at 30 centimeters from the radiation source or from any surface that the radiation penetrates. For the purposes of the RASP, a restricted area, as defined in 10 CFR 20, is considered a radiation area and will meet the definition of a radiation area.

Radiation Producing Machine – Any device or equipment capable of generating ionizing radiation directly or indirectly.

Radiation Protection Survey – An evaluation of the radiation hazards incident to the production, use, release, disposal or presence of radioactive material or other sources of radiation under a specific set of conditions including a physical survey of the location of materials and equipment and measurements of levels of radiation.

Radiation Safety Officer – A qualified individual, appointed by the Commander, Commanding Officer, or Officer in Charge who is responsible for the safe conduct and assurance of adequate radiation protection from the use of radioactive material and radiation generating equipment associated with the RASP and in accordance with this manual.

Radiation Worker – Radiation workers are individuals who receive exposure to ionizing radiation in the course of their employment or duties and are identified by their command as being occupationally exposed. Normally, these individuals' routine duties require working directly with sources of ionizing radiation and have a significant potential for exposure. These individuals receive radiation medical examinations. These individuals normally receive specialized training as part of a specific RASP.

Radioactive Commodity – Any item or device composed in whole or in part of radioactive material that a National Stock Number (NSN), Management Control Numbers (MCNs), Line Item Numbers (LINS), Non-Standard Line Item Numbers (NSLIN), trade or supply name, Commercial and Government Entity (CAGE) number or part number has been assigned.

Radioactive Contamination Area – Any area, accessible to individuals, where surface contamination levels exceed, or are likely to exceed, the surface contamination values specified in Table 2-2.

Radioactive Material – Any material or combination of materials, which spontaneously emit ionizing radiation.

Radioactive Waste – Any radioactive material that meets all of the following conditions: (1) material no longer needed or usable; (2) material that cannot be returned to the manufacturer; (3) material requires controlled disposal; and (4) material has been declared to be waste by an inventory control point.

Radiographic Exposure Device – Any instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof, may be moved or otherwise changed from a shielded to unshielded position for purposes of making a radiographic exposure.

Radiographer – Any individual who performs radiography or who in attendance at the site, personally supervises radiographic operations, and who is responsible to the Commander, Commanding Officer, or Officer in Charge for assuring compliance with the requirements of this manual and any applicable Naval Radioactive Materials Permit.

Radiographer's Assistant – Any individual who under the direct supervision of a radiographer, uses radiographic exposure devices, sealed sources or related handling tools, or radiation survey instruments in industrial radiography.

Radiographic Operations – All activities associated with the presence of radioactive sources in a radiographic exposure device during use of the device or transport (except when being transported by a common or contract transport), to include surveys to confirm the adequacy of boundaries, setting up equipment and any activity inside radiation area boundaries.

Radiography – The examination of the structure of material by nondestructive methods utilizing sealed sources of radioactive material or radiation producing machines.

Radiological Accident or Emergency – Loss of control of radiation producing machines or radioactive material which

presents a hazard to life, health or property, or which may result in any member of the general population exceeding dose limits for ionizing radiation.

Radiological Emergency Response Organization (RERO) – Designated personnel at a RASP COMMAND facility/organization who are assigned to respond in support of incident management for radiological hazards.

RASP command - The command having custody of radioactive materials or ionizing-radiation producing equipment.

Recovery – The development, coordination, and execution of service- and site-restoration plans; the reconstitution of government operations and services; individual, private-sector, nongovernmental, and public-assistance programs to provide housing and to promote restoration; long-term care and treatment of affected persons; additional measures for social, political, environmental, and economic restoration; evaluation of the incident to identify lessons learned; post-incident reporting; and development of initiatives to mitigate the effects of future incidents.

Recovery Plan – A plan developed by jurisdictional authorities, with assistance from responding Federal agencies, to restore the affected area.

Response – Activities that address the short-term, direct effects of an incident. Response includes immediate actions to save lives, protect property, and meet basic human needs. Response also includes the execution of emergency operations plans and of mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes.

Restricted Area – See definition of radiation area.

Safety Officer – A member of the NIMS Command Staff responsible for monitoring and assessing safety hazards or unsafe situations and for developing measures for ensuring personnel safety.

Sealed Source – Any byproduct material that is encased in a capsule designed to prevent leakage or escape of the byproduct material.

Senior Radiographer – The qualified individual appointed by the Commanding Officer that is responsible for the day to day radiography operations when the Radiation Safety Officer/Assistant Radiation Safety Officer is not a qualified radiographer. For commands that do not appoint a Senior Radiographer, the respective requirement will be performed by the Radiation Safety Officer/Assistant Radiation Safety Officer.

Site Area Emergency - A site area emergency involves events in progress or which have occurred that could lead to a significant release of radioactive material(s), and the release could require a response by off-site response organizations to protect the people off-site.

Supplemental survey - a survey performed by the barrier monitor during subsequent exposures in order to monitor confirmatory survey measurements at the restricted area boundary. If a barrier monitor identifies unexpected readings at the restricted area boundary, the Radiographer in Charge shall be notified.

Source Changer – Any device designed and used for replacement of sealed sources in radiographic exposure devices including those also used for transporting and storage of sealed sources.

Source Material – Source material means: (1) Uranium or thorium, or any combination thereof, in any physical or chemical form or (2) ores which contain by weight one-twentieth of one percent (0.05 percent) or more of: (i) Uranium, (ii) thorium or (iii) any combination thereof. Source material does not include special nuclear material.

Span of Control – The number of individuals a supervisor is responsible for, usually expressed as the ratio of supervisors to individuals. (Under the NIMS, an appropriate span of control is between 1:3 and 1:7.)

Special Nuclear Material – Special nuclear material means: (1) Plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material, which the Commission, pursuant to the provisions of Section 51 of the Atomic Energy Act, determines to be special nuclear material; or (2) any material artificially enriched by any of the foregoing.

Stafford Disaster Relief and Emergency Assistance Act – Establishes the programs and processes for the Federal Government to provide disaster and emergency assistance to States, local governments, tribal nations, individuals, and qualified private nonprofit organizations. The Act covers all hazards including natural disasters and terrorist events. The Act includes a process for Governors to request Federal disaster and emergency assistance from the President and for the President to declare a major disaster or emergency.

State Coordinating Officer (SCO) – The State counterpart to the Federal Coordinating Officer who manages the State's incident management programs and activities.

Strategic Plan – A plan that addresses long-term issues such as impact of weather forecasts, time-phased resource requirements, and problems such as permanent housing for displaced disaster victims, environmental pollution, and infrastructure restoration.

Surveillance – The observation of a person or group for the purpose of assessing the operational performance of the individual or group.

Target-To-Barrier Distance (TBD) – The distance between the x-ray target that is internal to the tube head and the shield barrier.

Task Force – Any combination of resources assembled to support a specific mission or operational need. All resource elements within a Task Force must have common communications and a designated leader.

Total Effective Dose Equivalent – The sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

Type "A" Package – A package designed to retain the integrity of containment and shielding required by 49 CFR under normal conditions of transport as demonstrated by the tests set forth in 49 CFR 173.465 or 173.466, as appropriate.

Type "B" Package – A package designed to retain the integrity of containment and shielding required by 49 CFR when subjected to the normal conditions of transport and hypothetical accident test conditions set forth in 10 CFR 71.

Unit – The organizational element having functional responsibility for a specific incident planning, logistics, or finance/administration activity.

Units of Radiation Dose – Note: For x-ray and gamma rays fields, 1 roentgen (R) is approximately numerically equal to 1 rad, which is also approximately numerically equal to 1 rem.

Gray (Gy) – The SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 Joule/kilogram (100 rads).

Rad – The special unit of absorbed dose. One rad is equal to an absorbed dose of 100 ergs/gram or 0.01 joule/kilogram (0.01 gray).

Rem – The special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rads multiplied by the quality factor (1 rem=0.01 sievert).

Roentgen (R) – A unit of x-ray or gamma exposure determined by measuring the ionization produced in air by x or gamma radiation of energies less than or equal to 3 MeV. It is the sum of the electrical charges of all of the ions of one sign produced in air when all electrons liberated by photons in a volume element of air are completely stopped in the air, divided by the mass of the air in the volume element. One roentgen produces 2.58×10^{-4} coulombs/kilogram of air.

Sievert (Sv) – The SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor (1 Sv=100 rems).

Unity of Command – The concept by which each person within an organization reports to one and only one designated person. The purpose of unity of command is to ensure unity of effort under one responsible commander for every objective.

Unrestricted Area – Any area access to which is not controlled by the command for the purposes of protection of individuals from exposure to radiation or radioactive materials and any area used for residential quarters.

Unusual Event - Under this category, events are in process or have occurred which indicate potential degradation in the level of safety of the facility. No release of radioactive material requiring offsite response or monitoring is expected unless further degradation occurs.

Very High Radiation Area – Any area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving an absorbed dose in excess of 500 rads (5.0 Gy) in 1 hour at 1 meter from a radiation source or 1 meter from any surface that the radiation penetrates. Note: At very high doses received at high dose rates, units of absorbed dose (e.g., rad (Gy)) are appropriate, rather than units of dose equivalent (e.g., rem (Sv)).

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APPENDIX B - PROCEDURES FOR REQUESTING A CHANGE TO NAVSEA S0420-AA-RAD-010 MANUAL

B.1 General Information

This manual will be updated periodically in order to:

- Keep up with the changes that occur in regulations and requirements.
- Clarify existing policies and requirements.
- Provide for the continual improvement of the RASP.
- Correct errors that are discovered.

Each request for a change shall be technically evaluated by Naval Sea Systems Command Detachment, Radiological Affairs Support Office (NAVSEADET RASO).

Requests and the associated NAVSEADET RASO evaluation shall be submitted by NAVSEADET RASO to NAVSEA 04N with recommendation for action.

NAVSEADET RASO will respond to change requests via letter or electronic means (e.g. email, NKO, milSuite).

B.2 Procedure to Request a Change

Recommended changes, corrections, additions, or deletions to NAVSEA S0420-AA-RAD-010 shall be submitted to NAVSEADET RASO.

Submissions shall be made by one of the following methods.

- E-mail to nsscnavsearasoadmin@navy.mil
- U.S. mail to:

  OIC NAVSEADET RASO
  160 Main Rd.
  Yorktown, VA 23691

- Fax to 757-887-4900
- Naval message to PLA: NAVSEA DET RASO

Submissions shall be submitted using the form in Section B.3 or an equivalent form with the same information.

References to separate attached pages may be made for entries in the form in Section B.3.

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B.3 **Request Form**

Request for Change to NAVSEA S0420-AA-RAD-010

Name of Command:		Plain Language Address (PLA) of Command:	
Marine Corps Reporting Unit Code (RUC) or Navy Unit Identification Code (UIC):		Mailing Address of Command:	
Name of Requestor:		Number of Pages submitted:	
E-mail of Requestor:			
Phone Number of Requestor:			
Date of Request:			
Date of RASO Response:			

Item Number	Section Number	Current Version	Proposed Version	Justification for changing current version	Applicable reference to support proposed version
1					
2					
3					

Request for Change to NAVSEA S0420-AA-RAD-010 (Continued)

Item Number	Section Number	Current Version	Proposed Version	Justification for changing current version	Applicable reference to support proposed version
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
1.2	It is the DON's goal when using RASP sources to keep personnel occupational radiation exposures as low as reasonably achievable (ALARA) and never exceed the federal limits. To accomplish this goal, Navy and Marine Corps commands who use RASP sources must implement a RASP that meets the requirements of this manual.	It is the DON's goal when using RASP sources of ionizing radiation, hence forth called RASP sources, to keep personnel occupational radiation exposures as low as reasonably achievable (ALARA) and never exceed the federal limits. To accomplish this goal, Navy and Marine Corps commands who use RASP sources must implement a RASP that meets the requirements of this manual.
1.4.3	OPNAVINST 5100.8 (series), Navy Safety and Occupational Safety and Health Program, requires Naval Sea Systems Command (NAVSEASYSCOM) to develop procedures and provide instructions for all aspects of ionizing radiation except for medical treatment or diagnosis, and radioactivity associated with the Naval Nuclear Propulsion Program per Executive Order 12344 and Public Laws 98-525 and 106-65.	OPNAVINST 5100.23 (series), OPNAV (N45) is given responsibility for all aspects of safety and mishap prevention with respect to occupational ionizing radiation hazards except for medical treatment or diagnosis and radioactivity associated with naval nuclear propulsion. Naval Sea Systems command (NAVSEASYSCOM) is given responsibility for all aspects of safety and mishap prevention for occupational ionizing radiation producing equipment excluding medical treatment or diagnosis and naval nuclear propulsion.
1.5.2.1.p	new paragraph no current wording	Sign all formal cover letters or other documents as required by this manual. By direction signatures are not acceptable, except for echelon II commands. A Commander, CO or OIC for an echelon II command that conducts RASP operations may designate, in writing, a senior management representative (O6/GS-15 or higher) to sign RASP cover letters or other documents as required by this manual.
1.5.2.1	1. Commanders, Commanding Officers (COs), and Officers in Charge (OICs) of Navy and Marine Corps commands (ashore and afloat) possessing RASP radiation sources shall:	1. Commanders, Commanding Officers (COs), and Officers in Charge (OICs) of Navy and Marine Corps commands (ashore and afloat) possessing RASP radiation sources, and those acting on their behalf shall:
1.6.1.7	new paragraph no current wording	All formal correspondence or other documents required to be signed by the Commander, CO or OIC shall be signed by the Commander, CO, OIC, or by those acting on their behalf. By direction signatures are not acceptable, except for echelon II commands. A Commander, CO or OIC for an echelon II command that conducts RASP operations may designate, in writing, a senior management representative (O6/GS-15 or higher) to sign RASP cover letters or other documents as required by this manual.
1.5.2.2.o	Maintain a current inventory of all RASP radiation sources (machine and material) and ensure that all sources are secured against loss, unauthorized use, or unauthorized disposal.	Maintain a current inventory of RASP radiation sources per Section 2.13.3.1 and ensure that these materials and machines are secured against loss, unauthorized use, or unauthorized disposal.
Table 2-2	Notes: 4. …. cm2	Notes: 4. …. cm^2
2.6.2.4.a	A high gradient radiation field exist when…	A high gradient radiation field exists when…

Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
2.8.3.1	Personnel designated as a RSO or ARSO shall have training and experience commensurate with the type and complexity of the local RASP to be managed. This will be considered during processing of NRMP amendments to add personnel as RSOs or ARSOs. Additional requirements for qualification as a RSO or ARSO for gamma radiography are contained in Section 5.8.1.	Personnel designated as a RSO or ARSO shall have training and experience commensurate with the type and complexity of the local RASP to be managed. Additional use-specific qualification requirements for a gamma radiography or unsealed radioactive material NRMP are found in: a. Section 5.8.1 for gamma radiography; and b. Section 2.8.5 for unsealed radioactive materials
2.11.2.1.f	The form should be annotated with a serial number comprised of the two-digit year and sequential number.	The form should be annotated with a serial number comprised of the year and sequential number.
2.13.2.2.c	Submit NRC Form 748 to NAVSEADET RASO by faxing to (757) 887-4900 or e-mailing in PDF format to "nsscnavsearasoadmin@navy.mi1 and include in the subject line or cover sheet the following "NSTS Report, NRC Form 748 - Official Use Only - Security Related Information."	Submit NRC Form 748 to NAVSEADET RASO by faxing to (757) 887-4900 or e-mailing in PDF format to "nsscnavsearasoadmin@navy.mil"and include in the subject line or cover sheet the following "NSTS Report, NRC Form 748 - Official Use Only - Security Related Information."
2.13.3.6	The RSO shall provide a list of RASP radioactive material and radiation producing machines and devices, by facility and location, to appropriate security and fire departments at least annually or when changes occur.	The RSO shall provide a list of all inventoried RASP radioactive material and radiation producing machines and devices, by facility and location, to appropriate security and fire departments at least annually or when changes occur.
2.14.1.1	Commands with RASP radiation sources shall develop and maintain operating and emergency procedures for the safe use of radioactive material and radiation producing machines and devices.	Commands shall develop and maintain operating and emergency procedures for the safe use of RASP radioactive material and radiation producing machines and devices.
2.15.1.1	Utilization logs shall be used and maintained for the following: a. Use of all unsealed radioactive material and sources. b. Use of sealed radioactive sources, with activities greater than 10 times the quantities listed in 10 CFR 20, Appendix C, unless otherwise authorized by a NRMP. c. Radioactive instrument check sources d. Use of all registered radiation producing machines and devices	Utilization logs shall be used and maintained for the following: a. Use of all unsealed radioactive material and source material. b. Use of sealed radioactive sources, with activities greater than 10 times the quantities listed in 10 CFR 20, Appendix C. c. Radioactive check sources used for instruments d. Use of all registered radiation producing machines and devices
2.16.1.2	Radioactive instrument check sources shall be stored in a locked container when not in use that can only be accessed by the RSO, ARSO, or authorized personnel.	Radioactive check sources used for instruments shall be stored in a locked container when not in use that can only be accessed by the RSO, ARSO, or authorized personnel.
2.16.2.5	Regardless of activity, radioactive instrument check sources or the container in which they are stored shall be marked as radioactive material.	Regardless of activity, radioactive check sources used for instruments or the container in which they are stored shall be marked as radioactive material.
2.17.6	Each RASP very high radiation area shall be conspicous posted with a sign…	Each RASP very high radiation area shall be conspicuously posted with a sign…
2.20.1.1	Eating, drinking, chewing, or smoking shall be prohibited in posted radioactive contamination areas or in areas where unsealed radioactive sources are used or stored.	Eating, drinking, chewing, or smoking shall be prohibited in posted radioactive contamination areas and in areas where unsealed radioactive sources are used or stored.

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
2.20.1.10	A radiological buffer area (i.e., control point area) should be established for contamination control adjacent to any entrance to or exit from a walk-in radioactive contamination area or airborne radioactivity area. The size of the control point area should be commensurate with the potential for the spread of contamination and the area needed for entry and egress. Workers remove protective clothing and perform self-monitoring in the control point area before entering an unrestricted area.	A radiological buffer area (i.e., control point area) shall be established for contamination control adjacent to any entrance to or exit from a walk-in radioactive contamination area or airborne radioactivity area. The size of the control point area shall be commensurate with the potential for the spread of contamination and the area needed for entry and egress. Workers shall remove protective clothing in BUFFER ZONE/AREA PRIOR TO ENTRY INTO CONTROL POINT AREA. Perform self-monitoring in the control point area before entering an unrestricted area.
2.20.2.4.d	no current text new step added	If no detectable contamination is encountered during monitoring, EXIT the control point area into the uncontrolled area.
2.20.3.1	Any injury sustained in a posted radioactive contamination area resulting in an open wound or lesion shall be reported to the RSO and evaluated by a medical department representative or medical officer/physician.	Any injury sustained in a posted radioactive contamination area resulting in an open wound or lesion shall be reported IMMEDIATELY to the RSO and evaluated by a medical department representative or medical officer/physician.
2.20.5.4	Items that cannot be evaluated may be disassembled for further surveys, if authorized to so, or the items labeled as “Potential Internal Contamination” and radiologically controlled.	Items that cannot be evaluated shall be labeled as "Potential Internal Contamination" and controlled as radioactive material. If a remediation plan is authorized by NAVSEA 04N, items may be disassebled in a properly controlled area for further surveys and, if necessary, decontaminated.
2.20.6.7	The command shall have procedures for replacing and testing filters in HEPA filtered ventilation systems and vacuum cleaners. Testing shall be performed after filter replacements and at least annually.	The command shall have procedures for replacing and testing filters in HEPA filtered ventilation systems and vacuum cleaners. Testing shall be performed after filter replacements and at least annually. The command shall have procedures for inspecting, inspection frequency, and survey requirements, during and after use, for HEPA filtered ventilation systems and vacuum cleaners.
2.22.6.1 and 2	2.22.6 Storage Requirements for NRC Licensed Material 1. Radioactive materials shall be stored in locked areas with the number of keys and the individuals with access to the keys kept to a minimum. 2. Radioactive material shall not be stored in the same warehouse section with explosives, flammable materials, photosensitive items (e.g., photographic film), food products, or other incompatible commodities.	2.22.6 Storage Requirements for RASP Radioactive Material 1. RASP radioactive materials shall be stored in locked areas with the number of keys and the individuals with access to the keys kept to a minimum. 2. RASP radioactive material shall not be stored in the same warehouse section with explosives, flammable materials, photosensitive items (e.g., photographic film), food products, or other incompatible commodities.
2.23.2.1	Procedures shall identify conditions constituting an emergency, list by priority individual and departments…	Procedures shall identify conditions constituting an emergency, list by priority individuals and departments…
2.24.6.6	ANSI N43.01-1978, “Radiological Safety in the Design and Operation of Particle Accelerators.”	ANSI/HPS N43.1-2001, “Radiation Safety for the Design and Operation of Particle Accelerators.”

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
2.25.1.1	Radioactive material designated for disposal shall be stored in preparation for shipment in a manner that prevents loss, inadvertent exposure of unmonitored personnel, release of radioactive contamination to unrestricted areas or the environment, or unwarranted concern by members of the command and the public.	Radioactive material designated for disposal shall be stored in preparation for shipment in a manner that prevents loss, inadvertent exposure of unmonitored personnel, release of radioactive contamination to unrestricted areas or the environment, or unwarranted concern by members of the command and the public. Additional requirements pertaining the storage and control of radioactive waste are contained in Section 16.
2.25.1.4	The RSO shall notify and coordinate the disposal of all radioactive material with NAVSEADET RASO.	The RSO shall notify and coordinate the disposal of all radioactive material with NAVSEADET RASO per Section 16 of this manual."
2.25.1.6	RADIAC instruments with attached radioactive sources shall be delivered to a RADIAC calibration laboratory for disposal, and reported to NAVSEASYSCOM (04LR) per NAVSEA SE700-AA-MAN-100/RADIAC.	RADIAC instruments with attached radioactive sources shall be delivered to a RADIAC calibration laboratory for disposal, and reported to NAVSEASYSCOM (04ND) per NAVSEA SE700-AA-MAN-100/RADIAC.
2.25.1.7	Radioactive sources attached to RADIAC instruments that are received by the RADIAC calibration laboratory for disposal shall be reported to NAVSEASYSCOM (04LR) per NAVSEA SE700-AA-MAN-100/RADIAC	Radioactive sources attached to RADIAC instruments that are received by the RADIAC calibration laboratory for disposal shall be reported to NAVSEASYSCOM (04ND) per NAVSEA SE700-AA-MAN-100/RADIAC
2.26.6.3	A summary of the audit results shall be documented as memoranda from the RSO to the Commander, CO, or OIC, who will endorse the audit. ~~The endorsement shall not be signed by direction.~~	A summary of the audit results shall be documented as a memorandum from the RSO to the Commander, CO or OIC, who will endorse the summary.
2.26.10	RASP Radioactive Source Receipt	RASP Radioactive Material Receipt
2.26.11	2.26.11 RASP Radioactive Source Transfer Records	2.26.11 RASP Radioactive Material Transfer Records
2.26.15.1	Utilization log records for radioactive sources shall include the following information at a minimum:	Utilization log records for RASP radioactive materials listed in Section 2.15.1.1 shall include the following information at a minimum:
2.26.19.2.g	The exposure rates in all adjacent occupied and unoccupied areas (facility drawings shall be used to identify measurement locations).	A diagram of each unrestricted barrier showing the location of all radiation levels above background and the readings at each location.
2.28.2.1	Commands issuing contracts involving RASP type work must be authorized by NAVSEA 04N. Commands shall formally request this authorization via NAVSEADET RASO.	Commands issuing contracts involving RASP type work must be authorized by NAVSEA 04N. Commands shall formally request this authorization via NAVSEADET RASO per Section 15.
2.28.2.2	Commands responsible for providing contractor oversight involving RASP type work must be authorized by NAVSEA 04N. Commands shall formally request this authorization via NAVSEADET RASO.	Commands responsible for providing contractor oversight involving RASP type work must be authorized by NAVSEA 04N. Commands shall formally request this authorization via NAVSEADET RASO per Section 15.
Section 3	Section 3 was extensively revised. Changes as a result of change requests are listed below. See yellow highlighted text in the section for additional changes	
3.2.1.2.d	Naturally occuring or accelerator produced radioactive material in quantities below the quantities specified in 10 DFR 30.71, Schedule B.	Naturally occuring or accelerator produced radioactive material in quantities below the quantities specified in 10 CFR 30.71, Schedule B.
3.2.1.4	Generally licensed items (identified in 10 CFR 31, 40.22, 40.25, and 70.19) shall be permitted at the discretion of the Naval Radiation Safety Committee (NRSC) in the same manner as specifically licensed items.	Generally licensed items (identified in 10 CFR 31, 40.22, 40.25, and 70.19) shall be permitted at the discretion of the Naval Radiation Safety Committee (NRSC) in the same manner as specifically licensed items. See Sections 7, 10 and 14 for additional requirements for certain generally licensed material and devices that require an NRMP.

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3.2.1.8	All NRMP requests or amendments shall contain a cover letter signed by the Commander, Commanding Officer (CO) or Officer in Charge (OIC). Emergent request or amendment cover letters may be signed by the acting Commander, CO, or OIC.	All NRMP requests or amendments shall contain a cover letter signed by the Commander, Commanding Officer (CO), Officer in Charge (OIC), or those acting on their behalf.
3.4.1	Each command shall maintain a file for each facility or outside area where radioactive material is stored or used containing the following information:	Each command shall maintain a historical file for each facility or outside area where radioactive material is stored or used containing the following information:
3.5.2.1	The command shall register each machine or piece of equipment through official correspondence to NAVSEADET RASO, using the registration form provided in Section 3.6 and a cover letter signed by the Commander, CO, or OIC.	The command shall register each machine or piece of equipment through official correspondence to NAVSEADET RASO, using the registration form provided in Section 3.6 and a cover letter signed by the Commander, CO, OIC, or those acting on their behalf.
4.4.2.e(3)	new paragraph no current wording	Gamma radiography commands shall designate a command point of contact to communicate scheduled radiographic operations at temporary jobsites to NAVSEADET RASO. Schedules of temprorary jobsite radiographic operations shall be submitted quarterly and as updates are known.
4.5.6.b	The command shall provide subsequent reports at 30 day intervals until all corrective actions have been completed.	delete paragraph b
4.5.7.c	The command shall provide subsequent reports at 30 day intervals until all corrective actions have been completed and NAVSEADET RASO is confident that corrective actions are sufficient to prevent future occurrences of the violations.	delete paragraph c and renumber remaining paragraphs
Table 4-1	Increased Controls Increased Controls for Sources Containing Radioactive Material Quantities of Concern - On November 14, 2005 and December 22, 2005, the NRC issued Orders entitled: “Increased Controls for Licensees that Possess Sources Containing Radioactive Material Quantities of Concern,” to radioactive materials, licensees who hold licenses issued by the NRC authorizing possession of such material, at or above threshold limits. The Orders supplement existing regulatory requirements in 10 CFR 20.1801 and 10 CFR 20.1802 in order to ensure adequate protection of, and minimize danger to, the public health and safety	Based on requirements of 10 CFR 37, the NRSC issued policy letter, CNO WASHINGTON DC ltr 5104 Ser N45/13U139761 of 2 Oct 2013. All commands are required to provide reasonable assurance of the security of category 1 or category 2 quantities of radioactive material, as defined by Appendix A of 10 CFR 37, by protecting these materials from theft or diversion.
Table 4-1	Use Code Description for AA usage code: Conduct of machine operations for analysis of materials using x-ray diffraction or x-ray fluorescence	Use Code Description for AA usage code: Conduct of machine operations for analytical equipment included in Section 13
5.4.3.5	The interior of the PRI shall be posted with signs containing the conventional radiation symbol and the words “Caution – High Radiation Area” or “Danger – High Radiation Area” on a yellow background depending on the radiation levels generated by the radiographic exposure device. There must be sufficient signs visible by anyone entering the PRI.	The interior of the PRI shall be posted with signs containing the conventional radiation symbol and the words “Caution – High Radiation Area” , “Danger – High Radiation Area” or "Grave Danger - Very High Radiation Area" on a yellow background depending on the radiation levels generated by the radiographic exposure device. There must be sufficient signs visible by anyone entering the PRI.

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5.4.4.2	During the first exposure of the day or shift, the radiographer shall test the alarm system with a radiation source for proper operation including a check of visible and audible signals.	Add "Prior to or" to the beginning of the sentence
5.4.5.3	The radiation area boundary at the worksite shall initially be established at or beyond the calculated distance where the radiation level is 2 millirem per hour (mrem/hr) instantaneous exposure rate (0.02 milliseiverts per hour (mSv/hr) during source exposure.	The radiation area boundary at the worksite shall initially be established at or beyond the calculated distance where the radiation level is 2 millirem per hour (mrem/hr) instantaneous exposure rate (0.02 milliseiverts per hour (mSv/hr)) during source exposure.
5.6.2.d	The inventory records shall contain the following: d. Radionuclide, chemical and physical form.	The inventory records shall contain the following: d. Radionuclide, chemical and physical form (e.g. sealed source is sufficient for physical form).
5.7.1.1	Radiographic exposure devices, transport and storage containers, associated equipment, and source changers shall be checked for damage and proper operation prior to the first use of the day or shift.	Radiographic exposure devices, transport ~~and storage~~ containers, associated equipment, and source changers shall be checked for damage and proper operation prior to the first use of the day or shift.
5.8.3.2	The classroom training shall include the following subjects:... i. Time for employees to ask safety questions.	The classroom training shall include the following subjects:... i. Case histories of accidents in radiography. j. Time for employees to ask safety questions.
5.8.4.1.a	Has received copies of and instruction in the requirements described in 10 CFR Part 34, 10 CFR Parts 30.7, 30.9, 30.10, the applicable sections of 10 CFR parts 19 and 20, in applicable DOT regulations as referenced in 10 CFR part 71, the NRMP and the operating and emergency procedures under which the radiographer's assistant will perform gamma radiography.	Has received training on the subjects in Section 5.8.3.2 and has received copies of and instruction in the requirements described in 10 CFR Part 34, 10 CFR Parts 30.7, 30.9, 30.10, the applicable sections of 10 CFR parts 19 and 20, in applicable DOT regulations as referenced in 10 CFR part 71, the NRMP and the operating and emergency procedures under which the radiographer's assistant will perform gamma radiography.
5.8.6.1.b	b. Boundary verification survey techniques.	b. Boundary ~~verification~~ survey techniques
5.8.7.9	The RSO shall document all remedial training and test results in the radiographer or radiographer's assistant personal training files and in the RSO's training records.	All remedial training and test results shall be documented in the radiographer or radiographer's assistant training file.
5.9.1.2.d	Methods and occasions for locking and securing radiographic exposure devices transport and storage containers and sealed sources.	d. Methods and occasions for locking and securing radiographic exposure devices, transport and storage containers, and sealed sources.
5.9.2.4	The emergency notification list shall always accompany the radiographic exposure device when used at temporary job sites.	4. The emergency notification list shall always accompany a radiographic source when in the possession of the command outside of the PRI.
5.11.8.1.c	After any change to the PRI (including occupancy) that could result in radiation levels exceeding 2 mrem/hr (0.2 mSv/hr) or 100 mrem (1 mSv) in a year in areas accessible to the general public.	After any change to the PRI (including occupancy) that could result in radiation levels exceeding 2 mrem/hr (0.2 mSv/hr) at 30 cm (1 foot) from the outside surface of the PRI or 100 mrem (1 mSv) in a year in areas accessible to the general public.

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5.11.8.3	If radiation levels exceed 2 mrem/hr (0.02 mSv/hr), complete one of the following actions:	If radiation levels exceed 2 mrem/hr (0.02 mSv/hr) at 30 cm (one foot) from the outside surface of the PRI complete one of the following actions:
5.11.8.3.b	Correct PRI shielding to reduce radiation levels to less than 2 mrem/hr (0.02 mSv/hr) and 100 mrem (1 mSv) in a year at the accessible unrestricted area. Changes shall be approved by the RSO.	Correct PRI shielding to reduce radiation levels to less than 2 mrem/hr (0.02 mSv/hr) at 30 cm (one foot) and 100 mrem (1 mSv) in a year at the accessible unrestricted area. Changes shall be approved by the RSO.
5.11.8.3.c	Control the source assembly in the PRI by use of a collimator on all shots or by restricting the source location to reduce radiation levels to less than 2 mrem/hr (0.02 mSv/hr) and 100 mrem (1 mSv) in a year at the accessible unrestricted area. Such restrictions shall be specified in writing and approved by the RSO.	Control the source assembly in the PRI by use of a collimator on all shots or by restricting the source location to reduce radiation levels to less than 2 mrem/hr (0.02 mSv/hr) at 30 cm (one foot) and 100 mrem (1 mSv) in a year at the accessible unrestricted area. Such restrictions shall be specified in writing and approved by the RSO.
5.11.8.3.d	Temporarily restrict the duration of gamma radiography operations to reduce radiation levels to less than 2 mrem/hr (0.02 mSv/hr) and 100 mrem (1 mSv) in a year at the accessible unrestricted area. The RSO shall approve such restrictions in writing.	Temporarily restrict the duration of gamma radiography operations to reduce radiation levels to less than 2 mrem/hr (0.02 mSv/hr) at 30 cm (one foot) and 100 mrem (1 mSv) in a year at the accessible unrestricted area. The RSO shall approve such restrictions in writing.
5.12.1.12	Radioactive material shall not be transported in the same vehicle with Class 1 hazardous material.	Radioactive material shall not be transported in the same vehicle with Class 1 hazardous materials, except for depleted uranium munitions as explained herin. Radioactive material may be transported with Class 2.1 hazardous materials only if 49 CFR 177.848(e)(3) requirements are met. Depleted uranium ammunition may only be shipped in accordance with a current special permit issued to the Department of Defense by the Department of Transportation (i.e. DOT-SP-9649). A current copy of the special permit shall be carried aboard each cargo vessel or motor vehicle used to transport packages covered by the special permit.
5.13.2	Radiographic exposure devices shall have a label that includes command information required by 10 CFR 34.35, and a Navy control number issued by NAVSEADET RASO.	Radiographic exposure devices and source changers shall have a label that includes command information required by 10 CFR 34.35, and a Navy control number issued by NAVSEADET RASO.

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5.16.4.2	Utilization logs used in a PRI shall contain, as a minimum, the following information: a. A description, including the manufacturer make, model, and serial number of the radiographic exposure device or storage container in which the sealed source is located. b. The radioactivity of the source on the day of exposure. c. The name(s) of the radiographer(s), and the name and signature of the RIC. d. The model and serial number of the survey instrument(s) in use. e. Initials of a radiographer or radiographer's assistant verifying that survey instrument(s) has (have) been response checked prior to the initial exposure of the day or shift as appropriate. f. The duration of and beam direction for each exposure. g. The location of the facility where the source is used. h. Initials of a radiographer verifying the check of entrance control devices for proper operation, if installed. i. Initials of a radiographer verifying the proper operation of all warning systems. j. Dates of use, including the dates the radiographic exposure device was removed and returned to storage.	Utilization logs used in a PRI shall contain, as a minimum, the following information: a. A description, including the manufacturer make, model, and serial number of the radiographic exposure device or storage container in which the sealed source is located. b. The radioactivity of the source on the day of exposure. c. The name(s) and signature (s) of the radiographer(s) d. The model and serial number of the survey instrument(s) in use. e. Initials of a radiographer or radiographer's assistant verifying that survey instrument(s) has (have) been response checked prior to the initial exposure of the day or shift as appropriate. f. The duration of and beam direction for each exposure. g. The location of the facility where the source is used. h. Initials of a radiographer verifying the check of entrance control devices for proper operation, if installed. i. Initials of a radiographer verifying the proper operation of all warning systems. j. Date of use, including the dates the radiographic exposure device was removed and returned to storage. k. Additional information as required by Section 2.26.15
5.16.4.3.j	new paragraph no current wording	j. Additional information as required by Section 2.26.15
5.16.4.3.c	The name(s) of the radiographer(s), and signature of the RIC.	c. The name(s) of the radiographer(s), signature(s) of the radiographer(s) and signature of the RIC.
5.16.4.3.h	Dates of use, including the dates the radiographic exposure device was removed and returned to storage.	Date of use, including the dates the radiographic exposure device was removed and returned to storage.
5.17.1.1.g	Actual exposure of an individual member of the public in an unrestricted area to greater than 2 mrem/hr (0.02 mSv/hr) or 100 mrem (1 mSv) in a year.	Unless excepted in Section 5.4.5.3, actual exposure of an individual member of the public in an unrestricted area to greater than 2 mrem/hr (0.02 mSv/hr) or 100 mrem (1 mSv) in a year.
5.17.1.1.h	Potential exposure of an individual member of the public in an unrestricted area to greater than 2 mrem/hr (0.02 mSv/hr) per or 100 mrem (1 mSv) in a year as determined by using the observed or calculated dose rate and duration of exposure, whether or not anyone was actually exposed.	Unless excepted in Section 5.4.5.3, potential exposure of an individual member of the public in an unrestricted area to greater than 2 mrem/hr (0.02 mSv/hr) or 100 mrem (1 mSv) in a year as determined by using the observed or calculated dose rate and duration of exposure, whether or not anyone was actually exposed.
6.3.2	… or in a NAVSEA 04LR approved RADIAC Instrument Calibration Course,...other than a NAVSEA 04LR approved…	… or in a NAVSEA 04ND approved RADIAC Instrument Calibration Course,...other than a NAVSEA 04ND approved…

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6.4.1.3	The record of survey shall contain at least the following: a. Date of survey. b. Sketch of the facility showing the location of survey points relative to the radiation source. c. Source activity and date of determination. d. Source(s) serial number(s). e. Exposure rate at each survey point. f. Radiation survey instrument type and serial number. g. Radiation survey instrument calibration date. h. Name and signature of individual performing the survey.	The record of survey shall contain the information specified in Section 2.26.19
6.6.5	... acceptable levels shall be disposed of as low-level radioactive waste as directed by NAVSEA 04LR.	... acceptable levels shall be disposed of as low-level radioactive waste as directed by NAVSEA 04ND.
6.9.2	All RADIACs containing check sources that require leak testing shall be source leak tested when the instruments are presented for repair or calibration.	Paragraph deleted; there are no RADIACS with sources requiring leak test
7.1	7.1 Portable gauges	7.1 Gas chromatographs
7.1.1	7.1.1 Introduction This section establishes specific requirements for portable gauging devices (e.g., nuclear moisture density gauges) that are in addition to the general RASP requirements of a Naval Radioactive Materials Permit (NRMP) if not already specified in the NRMP.	Deleted since portable gauges no longer used - current Section 7.2.1 will become 7.1.1 see below for additional changes. If a command desires to use a portable gauge in the future it must be used under an NRMP. Any conditions of use will be incorporated into the permit.

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
7.1.2	**7.1.2 Responsibilities** 1. Radiation Safety Officer a. The RSO is responsible to ensure: (1) Possession, use, storage, and maintenance of sources and gauges are consistent with the limitations in the NRMP, the Sealed Source and Device Registration sheet(s), and manufacturer's recommendations and instructions. (2) Individuals using gauges are properly authorized and trained. (3) Personnel monitoring devices are used and exchanged at the proper intervals. (4) Records of the results of such monitoring are maintained per Section 2.26.4. (5) Gauges are properly secured. (6) Gauges are properly leak tested. (7) Proper authorities are notified in case of accident, damage to gauges, fire, or theft. (8) Unusual occurrences involving the gauge (e.g., accident, damage) are investigated, cause(s) and appropriate corrective action are identified, and corrective action is taken. (9) Audits and surveillances are performed per Section 2.9. (10) Portable gauges are properly disposed of when no longer needed (11) The NRMP is maintained current per Section 3.2.3. 2. Authorized Users a. Users shall be authorized in writing by the RSO. b. Authorized users shall be trained as radiation workers per Section 2.8.4. The training shall be verified by practical examination and a 25 to 50 question closed-book written examination with a passing grade of 80 percent.	Deleted since portable gauges no longer used - current Section 7.2.2 will become 7.1.2 see below for additional changes. If a command desires to use a portable gauge in the future it must be used under an NRMP. Any conditions of use will be incorporated into the permit.

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
7.1.3	**7.1.3 General Requirements** 1. Authorized users shall operate portable gauges per operating and emergency procedures, the requirements of this manual, and the NRMP. 2. Portable gauges containing radioactive material shall be under the direct surveillance and control of the RSO or authorized user (including during transport to a temporary job site) when not in storage to prevent access or removal by unauthorized personnel. 3. When not in use, portable gauges shall normally be stored in properly posted storage areas that are not normally occupied (see Sections 2.16 and 2.17). 4. Portable gauges shall be secured in storage using two independent physical controls. For example, the portable gauge may be stored inside a locked cabinet inside a locked room within a facility. 5. Storage at a temporary job site may be accomplished by meeting the requirements of Section 7.1.3.4 above, or placing the device within a locked container within a locked vehicle, or chaining the device within a locked vehicle. 6. The vehicle must be marked with temporary radioactive material postings when storing portable gauges. 7. Portable gauges shall be returned to normal storage when work operations end for the day. 8. Portable gauges shall be secured within the vehicle during transport, and transported per Section 2.22. 9. Personnel handling and using portable gauges shall be monitored for occupational radiation exposure with a primary dosimeter, per Sections 2.5 and 2.6 that is processed by a NVLAP accredited processor. For portable gauges that contain a neutron source, the dosimeter shall measure occupational exposure from both gamma and neutron radiations. 10. Leak tests shall be performed by the RSO at intervals specified in the NRMP. 11. Routine maintenance (e.g., cleaning and lubrication) shall be performed by the RSO or authorized user under direct surveillance of the RSO. Maintenance requiring disassembly of the unit or removal of the source rod shall only be performed by the manufacturer.	Deleted since portable gauges no longer used. Subsequent sections will be renumbered to accommodate the deletion (i.e gas chromatographs will become Section 7.1). If a command desires to use a portable gauge in the future it must be used under an NRMP. Any conditions of use will be incorporated into the permit.

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
7.1.4	**7.1.4 Operating and Emergency Procedures** 1. Operating procedures shall be established per Section 2.14 and the conditions of the NRMP. 2. The operating procedures shall address, as a minimum: a. Instructions for using the portable gauge and performing routine maintenance according to the manufacturer's recommendations and instructions. b. Instructions for maintaining security during storage and transportation. c. Instructions to keep the gauge under control and immediate surveillance during use. d. Steps to take to keep radiation exposures ALARA. e. Steps to maintain accountability during use. 3. Emergency procedures shall address, as minimum, the following: a. Steps to control access to a damaged or malfunctioning gauge. b. Steps to take, and whom to contact, when a gauge has been damaged or malfunctions.	Deleted since portable gauges no longer used. Subsequent sections will be renumbered to accommodate the deletion (i.e gas chromatographs will become Section 7.1). If a command desires to use a portable gauge in the future it must be used under an NRMP.
7.2.1	**7.2.1 Introduction** Gas chromatographs use millicurie amounts of radioactive material (commonly nickel-63 or tritium) under general Nuclear Regulatory Commission (NRC) licenses or a NRMP.	7.1.1 Introduction Gas chromatographs use millicurie (mCi) amounts of radioactive material, commonly nickel-63 (Ni-63) or tritium (Hydrogen-3), under a general license from the NRC or an NRMP. The provisions and requirements of this section are in addition to not in substitution for, other requirements of this manual. In particular, the requirements and provisions of Sections 2, 3, 6, and 14 that apply to control, usage, storage, labeling of generally licensed and exempt material devices and any applicable Naval Radioactive Materials Permits (NRMPs).

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7.2.2	**7.2.2 Requirements** 1. Gas chromatographs shall be operated by personnel authorized by the RSO. 2. Authorized users shall be briefed by the RSO prior to operating a gas chromatograph for the first time, and annually thereafter, on the following topics: a. The type and location of radioactivity within the gas chromatograph. b. Precautions for use to preclude damaging the source. c. Actions to be taken in the event the unit malfunctions or is damaged in a manner that could vaporize or damage the radioactive source. 3. Gas chromatograph detector cells authorized by a NRC general license shall be: a. Leak tested per manufacturer's instructions. b. Returned to the manufacturer when operations with the gas chromatograph are terminated. 4. Gas chromatograph detector cells shall be secured against unauthorized access when not in use. 5. Gas chromatographs that are vented shall be vented to the outside atmosphere or to a fume hood which is vented to the outside atmosphere. If vented to a fume hood, the fume hood exhaust shall be operating whenever the gas chromatograph is operated. 6. If a gas chromatograph malfunctions or is damaged in a manner that could result in vaporization or damage to the radioactive source, then the unit shall be secured and the RSO notified.	7.1.2 Requirements 1. Gas chromatographs which are generally licensed, shall be used in accordance with the Generally Licensed Devices paragraphs of Section 14. Gas chromatographs that require a specific license shall be used in accordance with the NRMP. 2. Gas chromatograph detector cells shall be secured against unauthorized access when not in use. 3. Gas chromatographs shall be vented to the outside atmosphere or to a fume hood which is vented to the outside atmosphere when: a. containing titanium or scandium tritide foils; b. using tritium (Hydrogen-3);or c. when required by the manufacturer. If vented to a fume hood, the fume hood exhaust shall be operating whenever the gas chromatograph is operated. 4. If a gas chromatograph malfunctions or is damaged in a manner that could result in vaporization or damage to the radioactive source, then the unit shall be secured and the RSO notified.
10.1	10.1 Introduction This section discusses requirements for handling uranium, including depleted uranium (DU), and thorium components. It does not include special nuclear material.	10.1 Introduction This section discusses requirements for unimportant quantities of source material. It also discusses requirements for the handling of depleted uranium (DU) and thorum components. It does not include special nuclear material.
10.2	10.2 Depleted Uranium Depleted uranium is a heavy metal used as ballast or counterweights in aircraft gyroscope assemblies, flight control surfaces, helicopter blade assemblies, elevator balance assemblies, aileron balance assemblies, etc., in aircraft, rockets, projectiles, and missiles; and as penetrators in certain ammunition. Depleted uranium is natural uranium that has most of the uranium-235 and uranium-234 atoms removed.	10.2 Generally Licensed and Unsealed Source Material Generally licensed source material and unsealed source material shall be requisitioned, used, and stored in accordance with Section 14.

Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
10.2 new revision 10.4	10.2 Depleted Uranium Depleted uranium is a heavy metal used as ballast or counterweights in aircraft gyroscope assemblies, flight control surfaces, helicopter blade assemblies, elevator balance assemblies, aileron balance assemblies, etc., in aircraft, rockets, projectiles, and missiles; and as penetrators in certain ammunition. Depleted uranium is natural uranium that has most of the uranium-235 and uranium-234 atoms removed.	10.4 Depleted Uranium Depleted uranium (DU) is a heavy metal used as ballast or counterweights in aircraft gyroscope assemblies, flight control surfaces, helicopter blade assemblies, elevator balance assemblies, aileron balance assemblies, etc. It is also used in aircraft, rockets, projectiles, and missiles as well as penetrators in certain ammunition. Depleted uranium is natural uranium that has most of the uranium-235 and uranium-234 atoms removed.
10.2.1	10.2.1 Depleted Uranium Counterweights	10.4.1 Depleted Uranium Counterweights
10.2.1.1.a new revision 10.4.1.1.a	Plated DU counterweights for use in aircraft are manufactured and distributed under a general Nuclear Regulatory Commission (NRC) license granted in 10 CFR 40.13(5) and therefore do not require a Naval Radioactive Materials Permit (NRMP).	a. Plated DU counterweights for use in aircraft are considered unimportant quantities of source material by the Nuclear Regulatory Commission (NRC) according to 10 CFR 40.13(c)(5) and therefore do not require a Naval Radioactive Materials Permit (NRMP).
10.2.1.1.b new revision 10.4.1.1.b	The general license prohibits chemical, physical, or metallurgical treatment or processing of counterweights other than repair or restoration of the plating or covering on the counterweight.	b. In order to be considered an unimportant quantity of source material, chemical, physical, or metallurgical treatment or processing of counterweights other than repair or restoration of the plating or covering on the counterweight is prohibited.
10.2.1.1.d new revision 10.4.1.1d	Personnel involved in the handling, use and distribution of these counterweights shall comply with the requirements of this manual.	d. Personnel involved in the handling, use and distribution of these counterweights shall comply with the requirements of this section.
10.2.1.2.d new revision 10.4.1.2.d	No attempt shall be made to clean corrosion from DU counterweights. Depleted uranium counterweights with corroded surfaces or chipped or peeled cladding shall be painted to seal the material, placed in plastic bags ~~and returned to a manufacturer for repair or disposal~~. When replacement counterweights are not available, the counterweight shall be painted to seal potential contamination and the counterweight may be reinstalled on the aircraft until a replacement is available.	d. No attempt shall be made to clean corrosion from DU counterweights. Depleted uranium counterweights with corroded surfaces or chipped or peeled cladding shall be painted to seal the material and then placed in plastic bags. Gloves should be worn while handling the counterweights. When replacement counterweights are not available, the counterweight shall be painted to seal potential contamination and the counterweight may be reinstalled on the aircraft until a replacement is available.
10.2.1.2.f new revision 10.4.1.2.f	Corroded or damaged counterweights may be returned to an authorized manufacturer for repair or disposal in accordance with Section 10.2.1.2.h below.	f. Corroded or damaged counterweights may be returned to an authorized manufacturer for repair or disposal in accordance with Section 10.5.1.2.h below. Corroded or damaged counterweights shall not be wrapped in lead foil.
10.2.1.2.g new revision 10.4.1.2.g	The counterweights have been offered for use by other U.S. armed forces operating or repairing similar aircraft.	(2) The counterweights have been offered for use by other U.S. Armed Forces operating or repairing similar aircraft.

Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
10.2.1.2.h(1) new revision 10.4.1.2.h(1)	Request for authorization to transfer counterweights to a manufacturer shall be submitted to NAVSEADET RASO by letter or message.	(1) Request for authorization to transfer counterweights to a manufacturer shall be submitted to NAVSEADET RASO by letter in accordance with Section 16.6.1.
10.2.2	10.2.2 Depleted Uranium Projectiles	10.4.2 Depleted Uranium Projectiles
10.2.2.1 new revision 10.4.2.1	The Navy and Marine Corps use DU projectiles in 20 mm CIWS rounds, 30mm GAU 12 aircraft rounds, 105 mm and 120 mm artillery projectiles. These DU sources are not exempt from NRC licensing requirements but are used under a specific NRMP. The NRMP is issued to the item manager ~~(Naval Weapons Support Center, Crane)~~ and not to each command that stores or uses the projectiles.	The Navy and Marine Corps use DU projectiles in 20 mm CIWS rounds, 30mm GAU 12 aircraft rounds, 105 mm and 120 mm artillery projectiles. These DU sources are not exempt from NRC licensing requirements but are used under a specific NRMP. The NRMP is issued to the item manager and not to each command that stores or uses the projectiles.
10.2.2.2.c new revision 10.4.2.2.c	c. Navy and Marin Corps commands that store, or handle DU ammunition shall comply with all requirements contained in the applicable NRMP.	c. Navy and Marine Corps commands that store, or handle DU ammunition shall comply with all requirements contained in the applicable NRMP.
10.2.3	10.2.3 Other Depleted Uranium Sources	10.4.3 Other Depleted Uranium Sources
10.3	10.3 Thorium Thorium is a naturally occurring radionuclide contained in various manufactured items such as incandescent gas mantles, welding rods, lenses, and aircraft engine parts. Manufactured items exempted in 10 CFR 40.12 do not require a NRMP. Grinding of thoriated tungsten electrodes can produce surface contamination.	10.3 Unimportant Quantities of Source Material Unimportant quantities of source material defined in 10 CFR 40.13. Commands that have unimportant quantities of source material, by definition, are generally exempt from permitting. As specified belwo, a NRMP may be required for depleted uranium or thourium source material.
10.3.1	10.3.1 Control Requirements for Grinding Thoriated Tungsten Welding Rods	10.5.1 Control Requirements for Grinding Thoriated Tungsten Welding Rods
10.3.1.5 new revision 10.5.1.5	Dispose of cleaning rags as normal waste materials as they are generated.	#5 removed and replaced with "All waste materials generated above must be disposed of through the DON LLRW Program according to Section 16. " at the end of the list. Renumbered paragraph
10.3.2	10.3.2 Welding	10.5.2 Welding
10.3.3	10.3.3 Handling and Disposal of Thoriated Tungsten Weld Rods	10.5.3 Handling and Disposal of Thoriated Tungsten Weld Rods
10.3.3.3 new revision 10.5.3.3	Disposal of thoriated tungsten weld rods is not regulated for radioactivity. However, an accumulation of discarded thoriated tungsten weld rods can cause alarms at waste disposal sites and rejection of waste. Therefore, in shop areas where thoriated tungsten weld rod is normally discarded, provide waste collection containers. When containers need to be emptied, contact the RSO, ARSO, or NAVSEADET RASO LLRW Program for disposal instructions.	3. Disposal of thoriated tungsten weld rods is not regulated for radioactivity. However, an accumulation of discarded thoriated tungsten weld rods can cause alarms at waste disposal sites and rejection of waste. Therefore, in shop areas where thoriated tungsten weld rods are normally discarded, provide waste collection containers. When containers need to be emptied, contact the RSO, ARSO, or NAVSEADET RASO LLRW Program Manager for disposal instructions.
10.3.4	10.3.4 Repair and Processing of Magnesium-Thorium Alloy Manufactured Parts	10.5.4 Repair and Processing of Magnesium-Thorium Alloy Manufactured Parts
10.4	10.4 Generally Licensed Source Material	10.4 Depleted Uranium

Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
10.2.1.2 h(1) new revision 10.4.1.2.h(1)	Request for authorization to transfer counterweights to a manufacturer shall be submitted to NAVSEADET RASO by letter or message.	Request for authorization to transfer counterweights to a manufacturer shall be submitted to NAVSEADET RASO by letter in accordance with Section 16.5.1.
11.3.5.3	X-ray radiographer's assistants shall: a. Comply with operating and emergency procedures and written or verbal orders from the radiographer. b. Promptly report any lost or malfunctioning EPD or IPD to the radiographer. c. Promptly report any higher than expected or abnormal EPD/IPD readings to the radiographer. d. Promptly report incidents or deviations from established procedures to the radiographer.	X-ray radiographer's assistants shall: a. Comply with operating and emergency procedures and written or verbal orders from the radiographer. b. Promptly report any lost or malfunctioning EPD or IPD to the radiographer. c. Promptly report any higher than expected or abnormal EPD/IPD readings to the radiographer. d. Promptly report incidents or deviations from established procedures to the radiographer. e. Perform duties as a barrier monitor as assigned
11.4.2.11	Whenever not in use, x-ray radiographic equipment shall be secured to prevent use of the equipment by unauthorized personnel. At a minimum, the x-ray control panel key shall be removed and secured such that only qualified x-ray radiographers have access to the key.	Whenever not in use, x-ray radiographic equipment shall be secured to prevent use of the equipment by unauthorized personnel. At a minimum, the x-ray control panel key shall be removed and secured such that only qualified x-ray radiographers or x-ray radiographer's assistants have access to the key.
11.4.2.12.c	The interlock checks shall be performed by actually tripping the interlock while operating the equipment at the lowest possible kVp and mA.	The interlock checks shall be performed by: (1) actually tripping the interlock by opening the door or panel while operating the equipment at the lowest possible kVp and mA to stop x-ray production; (2) closing the door or panel to confirm x-ray production does not restart automatically; and (3) manually re-energizing a suitable device located on or near the control panel to restart x-ray production.
11.4.2.12.h	Prior to the first exposure of the day or shift: h. Proper operation of emergency stop devices shall be checked by: (1) Tripping each stop individually while the x-ray machine is shutdown and ensuring all other interlocks are not tripped. (2) Exiting the facility and attempting to operate the x-ray machine. (3) If the machine does not operate, the check is considered satisfactory.	Move all words to 11.12.2 "Conduct of Radiation Protection Inspections "
11.4.2.20	Radiation area, high radiation area, or very high radiation area postings shall be removed or covered when x-ray radiography operations are not being conducted unless the posting contains a statement specifying when the radiation is present. (For example, Danger – High Radiation Area when Red Light is Flashing.)	Paragraph deleted This does not apply to open facility operations. See revisions to 11.5.1.3.n and 11.6.1.3.o to include this for shielded and exempt facilities only.

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11.5.1.3.n	The interior of the exempt shielded facility shall be posted with signs containing the conventional radiation symbol and the words "Caution - High Radiation Area," "Danger - High Radiation Area," or "Grave Danger - Very High Radiation Area" on a yellow background depending on the output of the machine. There must be sufficient signs to be visible by anyone entering the exempt shielded facility.	n. The interior of the exempt shielded facility shall be posted with signs containing the conventional radiation symbol and the words "Caution - High Radiation Area," "Danger - High Radiation Area," or "Grave Danger - Very High Radiation Area" on a yellow background depending on the output of the machine. There must be sufficient signs to be visible by anyone entering the exempt shielded facility. o. High radiation area postings shall be removed or covered when x-ray radiography operations are not being conducted unless the posting contains a statement specifying when the radiation is present. (For example, Danger - High Radiation Area When Red Light is Flashing). renumber rest of section
11.6.1.3.o	o. The interior of the shielded facility shall be posted with signs containing the conventional radiation symbol and the words "Caution - High Radiation Area," "Danger - High Radiation Area," or "Grave Danger - Very High Radiation Area" on a yellow background depending on the output of the machine. There must be sufficient signs to be visible by anyone entering the shielded facility.	o. The interior of the shielded facility shall be posted with signs containing the conventional radiation symbol and the words "Caution - High Radiation Area," "Danger - High Radiation Area," or "Grave Danger - Very High Radiation Area" on a yellow background depending on the output of the machine. There must be sufficient signs to be visible by anyone entering the shielded facility. p. High radiation area postings shall be removed or covered when x-ray radiography operations are not being conducted unless the posting contains a statement specifying when the radiation is present. (For example, Danger - High Radiation Area When Red Light is Flashing). renumber rest of section
11.5.1.3.o	Fail-safe audible and visible warning signals shall be located within each exempt shielded facility.	~~Fail-safe~~ Audible and visible warning signals shall be located within each exempt shielded facility
11.6.1.2	All shielded facility designs shall include the information required by Section 2.24.4 and meet the requirements of Section 11.6.1.3 below.	All shielded facility designs shall include the information required by Section 2.24.5 and meet the requirements of Section 11.6.1.3 below.
11.6.1.3.p(1)	Fail-safe audible and visible warning signals shall be located within the shielded facility.	~~Fail-safe~~ Audible and visible warning signals shall be located within the shielded facility.
11.7.1.2.b(1)	(1) The radiation area boundary shall initially be established at or beyond the calculated distance where the radiation level is 2 millirem per hour (mrem/hr) instantaneous exposure rate (0.02 millisieverts per hour (mSv/hr).	(1) The radiation area boundary shall initially be established at or beyond the calculated distance where the radiation level is 2 millirem per hour (mrem/hr) instantaneous exposure rate (0.02 millisieverts per hour (mSv/hr)).
11.7.1.2.c(3)	The warning light shall be large enough so that it can be easily seen before crossing the radiation area boundary. This light shall deactivate upon the termination of x-ray production	The warning light shall be large enough so that it can be easily seen before crossing any high radiation area boundary. This light shall deactivate upon the termination of x-ray production

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
11.8.3.2.d	Performance of four radiographic operations under direct supervision of a qualified command x ray radiographer.	Performance of four radiographic operations under direct supervision of a qualified command x-ray radiographer.
11.10.6.1	Each high radiation area shall have fail-safe audible and visible warning signals located within the facility	Each high radiation area shall have ~~fail-safe~~ audible and visible warning signals located within the facility
11.11.1.4	Instruments not calibrated through the NAVSEA RADIAC program office (NAVSEA 04LR) shall be calibrated per …	Instruments not calibrated through the NAVSEA RADIAC program office (NAVSEA 04ND) shall be calibrated per …
11.15.15.1.d	An electrical schematic of the interlocks, emergency stops, warning signals, delay switches, alarm systems, and electrical devices that restrict the x-ray beam with the initial facility classification survey.	An electrical schematic of the interlocks, emergency stops, warning signals, delay switches, alarm systems, and electrical devices that restrict the x-ray beam with the ~~initial~~ facility classification survey.
11.16.1.2.b	Radiation levels outside of a posted radiation area boundary that exceed 2 mrem/hr (0.02 mSv/hr).	Unless excepted in Section 11.7.1.2.b(1), radiation levels outside of a posted radiation area boundary that exceed 2 mrem/hr (0.02 mSv/hr).
11.16.2.1	1. Verbal reports shall be followed by a written report detailing the event and shall include actions planned to prevent recurrence per Section 2.27.1.	1. Verbal reports shall be followed by a written report in accordance with Section 2.27. Delete number 2
13.2.2.3.f	A requirement that the device only be operated when a sample is in place (i.e., no open air exposures).	A requirement that the device only be operated when a sample is in place (i.e., no open air exposures) except as recommended by the manufacturer when performing interlock checks.
13.2.2.3.g	A requirement that all maintenance and repair other than exterior cleaning must be performed by the manufacturer of the device.	g. A requirement that all maintenance and repair other than exterior cleaning and routine maintenance consistent with manufacturer's recommendations must be performed by the manufacturer of the device.
Appendix A Glossary	add definition	Agency — A division of government with a specific function offering a particular kind of assistance. In the Incident Command System, agencies are defined either as jurisdictional (having statutory responsibility for incident management) or as assisting or cooperating (providing resources or other assistance). Governmental organizations are most often in charge of an incident, though in certain circumstances private-sector organizations may be included. Additionally, nongovernmental organizations may be included to provide support.

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
Appendix A Glossary	add definition	Alert - If an alert is declared, events may occur, are in process, or have occurred that could lead to a release of radioactive material(s) but that the release is not expected to require a response by an offsite response organization to protect persons offsite.
Appendix A Glossary	add definition	Area Command — The command pre-designated by the primary commander as having responsibility for implementing and executing actions directed by the primary commander or deputy primary commander in response to a radiological accident in a particular geographical area under the cognizance of the primary commander.
Appendix A Glossary	add definition	Assisting Agency — An agency or organization providing personnel, services, or other resources to the agency with direct responsibility for incident management.
Appendix A Glossary	add definition	Broker - A person who manages the shipment (packaging, handling, manifesting, and transportation) of DON LLRW from the point of generation (DON command) to the receiving facility (e.g., processor, burial site, or recycler) and ensures the shipment complies with Federal, State, and local regulations. The broker is responsible for certifying the integrity of the shipment by signing the shipping papers (manifest).
Appendix A Glossary	add definition	Emergency — Any incident, whether natural or manmade, that requires responsive action to protect life or property. Under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, an emergency means any occasion or instance for which, in the determination of the President, Federal assistance is needed to supplement State and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States.
Appendix A Glossary	add definition	Emergency Classification Level (ECL) — The classification specified for an emergency based on Level of risk to the public. There are four ECLs for RASP COMMAND emergencies: Unusual Event, Alert, Site (Area) Emergency, and General Emergency. Upon making notifications per Section 2.27, assistance will be provided as to classification of the emergency.
Appendix A Glossary	add definition	Emergency Control Center (ECC) — The physical location at which coordination of information and resources to support RASP COMMAND incident management activities normally takes place. An ECC is generally consistent in application and capability to an EOC.

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
Appendix A Glossary	add definition	Emergency Operations Center (EOC) — The physical location at which the coordination of information and resources to support domestic incident management activities normally takes place. EOC is generally consistent in application and capability to an ECC, but is a common term used outside the RASP COMMAND. EOCs may be organized by major functional disciplines (e.g., fire, law enforcement, and medical services), by jurisdiction (e.g., Federal, State, regional, county, city, tribal), or some combination thereof.
Appendix A Glossary	add definition	Emergency Public Information — Information that is disseminated primarily in anticipation of an emergency or during an emergency.
Appendix A Glossary	add definition	Emergency Responder or Emergency Response Provider — Includes Navy/Federal, state, local, and tribal emergency public safety, law enforcement, emergency response, emergency medical (including hospital emergency facilities), and related personnel, agencies, and authorities.
Appendix A Glossary	add definition	Federal Coordinating Officer (FCO) — The Federal officer who is appointed to manage Federal resource support activities related to Stafford Act disasters and emergencies. The FCO is responsible for coordinating the timely delivery of Federal disaster assistance resources and programs to the affected State and local governments, individual victims, and the private sector.
Appendix A Glossary	add definition	Federal Emergency Management Agency (FEMA) — Federal organization in the Department of Homeland Security tasked with responding to, planning for, recovering from and mitigating disasters. In consultation with RASP COMMAND during an accident involving the RASP COMMAND, FEMA will coordinate the provision of Federal resources and assistance to affected State, local, and tribal governments. FEMA establishes and maintains a source of integrated, coordinated information about the status of all non-radiological resource support activities.
Appendix A Glossary	add definition	First Responder — Local and nongovernmental police, fire, and emergency personnel who, in the early stages of an incident, are responsible for the protection and preservation of life, property, evidence, and the environment. Also included are emergency management, public health, clinical care, public works, and other skilled support personnel who provide immediate support services during prevention, response, and recovery operations. First responders may include personnel from Federal, State, local, tribal, or nongovernmental organizations.

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
Appendix A Glossary	add definition	General Emergency - A general emergency involves actual or imminent substantial release of radioactivity or radiation exposure. Radioactive releases during a general emergency can reasonably be expected to exceed any RASP dose limit in Table 2-1 of Section 2.
Appendix A Glossary	add definition	General Staff — A group of incident management personnel organized according to function and reporting to the Area or Incident Commander.
Appendix A Glossary	add definition	Hazardous Waste - A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may: (1) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (2) pose a substantial or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.
Appendix A Glossary	add definition	Ionizing Radiation Sources - Any machine or radioactive material source capable of producing ionizing radiation.
Appendix A Glossary	add definition	Incident Command System (ICS) — A standardized on-scene emergency management construct specifically designed to provide for the adoption of an integrated organizational structure that reflects the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. ICS is the combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, designed to aid in the management of resources during incidents.
Appendix A Glossary	add definition	Incident Commander (IC) – The individual responsible for all incident activities, including the development of strategies and tactics and the ordering and the release of resources. The Incident Commander has overall authority and responsibility for conducting incident operations and is responsible for the management of all incident operations at the incident site.
Appendix A Glossary	add definition	Incident Management Team — The IC and appropriate Command and General Staff personnel assigned to an incident.
Appendix A Glossary	add definition	Jurisdiction — A range or sphere of authority. For radiological accidents involving the RASP COMMAND, the RASP COMMAND has jurisdictional authority on the site or federal property. Outside these areas, State and, depending on State law, local officials have jurisdictional authority.

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
Appendix A Glossary	Licensed material: Radioactive Material that is received, possessed, used, transferred or disposed of under a general or specific license issued by the Commission.	Licensed Radioactive Material: Source material, special nuclear material, or byproduct material that is received, possessed, used, transferred or disposed of under a general or specific license issued by the Nuclear Regulatory Commission.
Appendix A Glossary	add definition	LLRW Disposal - The transfer of ownership of LLRW to an authorized government agency, or NRC or Agreement State licensed facility for the purposes of processing, recycling, long-term storage or in-ground disposal.
Appendix A Glossary	add definition	LLRW Disposal Request - A formal letter from the DON command possessing LLRW to NAVSEADET RASO signed by the Commanding Officer or his/her designated representative. The disposal request must include an LLRW inventory, geographical storage location, and a command point of contact (POC) that has direct knowledge of the LLRW inventory and storage location and can provide assistance to the broker during waste packaging and loading for transport.
Appendix A Glossary	add definition	LLRW Storage - Containment of LLRW, either on a temporary or semi-permanent basis, in a secured manner that does not result in the spread of waste or constitute disposal of such waste.
Appendix A Glossary	add definition	Manifest - The form used for identifying the quantity, composition, and the origin, routing, and destination of LLRW during its transportation from the point of generation to the point of disposal, treatment, or storage.
Appendix A Glossary	add definition	NIMS Command — The act of directing, ordering, or controlling by virtue of explicit statutory, regulatory, or delegated authority.
Appendix A Glossary	add definition	NIMS Command Staff — In the Incident Command System, the incident management positions consisting of the On-Scene Incident Commander and the special staff positions of Public Information Officer, Safety Officer, Liaison Officer, and other positions as required, who report directly to the Area or Incident Commander. They may have an assistant or assistants, as needed.

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
Appendix A Glossary	add definition	National Incident Management System (NIMS) — A system mandated by Homeland Security Presidential Directive (HSPD)-5 that provides a consistent nationwide approach for state, local, and tribal governments; the private-sector, and nongovernmental organizations to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity. To provide for interoperability and compatibility among state, local, and tribal capabilities, the NIMS includes a core set of concepts, principles, and terminology. HSPD-5 identifies these as the Incident Command System; multiagency coordination systems; training; identification and management of resources (including systems for classifying types of resources); qualification and certification; and the collection, tracking, and reporting of incident information and incident resources.
Appendix A Glossary	add definition	Official Correspondence - all formal correspondence submitted in accordance with the most recent version of the Navy Correspondence Manual (SECNAV M-5216.5).
Appendix A Glossary	add definition	On-scene Incident Commander (IC) — The individual responsible for all incident activities, including the development of strategies and tactics, and the ordering and release of resources. The IC has overall authority and responsibility for conducting incident operations and is responsible for the management of all incident operations at the incident site.
Appendix A Glossary	add definition	Orphan Source - A source of radioactive material contained in a small volume or device, excluding radioactively contaminated soils and bulk metals, in any one or more of the following conditions: (1) in an uncontrolled condition that requires removal to protect public health and safety from a radiological threat; (2) in a controlled or uncontrolled condition for which a responsible party cannot be readily identified; (3) in a controlled condition in which the material's continued security cannot be assured and, if held by a licensee, the licensee has few or no options for, or is incapable of providing for, the safe disposition of the material; (4) in a controlled or uncontrolled condition in the possession of a person not licensed to possess the material or who did not seek to possess the material; or (5) in a controlled or uncontrolled condition in the possession of a state radiological protection program for the sole purpose of mitigating a radiological threat because the orphan source is in one of the conditions described above and for which the state does not have a means to provide for the material's appropriate disposition.

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
Appendix A Glossary	add definition	Radiological Emergency Response Organization (RERO) — Designated personnel at a RASP COMMAND facility/organization who are assigned to respond in support of incident management for radiological hazards.
Appendix A Glossary	add definition	RASP command — The command having custody of radioactive materials or ionizing radiation producing equipment.
Appendix A Glossary	add definition	Recovery — The development, coordination, and execution of service- and site-restoration plans; the reconstitution of government operations and services; individual, private-sector, nongovernmental, and public-assistance programs to provide housing and to promote restoration; long-term care and treatment of affected persons; additional measures for social, political, environmental, and economic restoration; evaluation of the incident to identify lessons learned; post-incident reporting; and development of initiatives to mitigate the effects of future incidents.
Appendix A Glossary	add definition	Recovery Plan — A plan developed by jurisdictional authorities, with assistance from responding Federal agencies, to restore the affected area.
Appendix A Glossary	add definition	Response — Activities that address the short-term, direct effects of an incident. Response includes immediate actions to save lives, protect property, and meet basic human needs. Response also includes the execution of emergency operations plans and of mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes.
Appendix A Glossary	add definition	Safety Officer — A member of the NIMS Command Staff responsible for monitoring and assessing safety hazards or unsafe situations and for developing measures for ensuring personnel safety.
Appendix A Glossary	add definition	Site Area Emergency - A site area emergency involves events in process or which have occurred that could lead to a significant release of radioactive material(s), and the release could require a response by off-site response organizations to protect the people off-site.
Appendix A Glossary	add definition	Span of Control — The number of individuals a supervisor is responsible for, usually expressed as the ratio of supervisors to individuals. (Under the NIMS, an appropriate span of control is between 1:3 and 1:7.)

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Section Number	Current Revision 1 or 1A Wording	Wording for Revision 2
Appendix A Glossary	add definition	Stafford Disaster Relief and Emergency Assistance Act — Establishes the programs and processes for the Federal Government to provide disaster and emergency assistance to States, local governments, tribal nations, individuals, and qualified private nonprofit organizations. The Act covers all hazards including natural disasters and terrorist events. The Act includes a process for Governors to request Federal disaster and emergency assistance from the President and for the President to declare a major disaster or emergency.
Appendix A Glossary	add definition	State Coordinating Officer (SCO) — The State counterpart to the Federal Coordinating Officer who manages the State's incident management programs and activities.
Appendix A Glossary	add definition	Strategic Plan — A plan that addresses long-term issues such as impact of weather forecasts, time-phased resource requirements, and problems such as permanent housing for displaced disaster victims, environmental pollution, and infrastructure restoration.
Appendix A Glossary	add definition	Task Force — Any combination of resources assembled to support a specific mission or operational need. All resource elements within a Task Force must have common communications and a designated leader.
Appendix A Glossary	add definition	Unit — The organizational element having functional responsibility for a specific incident planning, logistics, or finance/administration activity.
Appendix A Glossary	add definition	Unity of Command — The concept by which each person within an organization reports to one and only one designated person. The purpose of unity of command is to ensure unity of effort under one responsible commander for every objective.
Appendix A Glossary	add definition	Unusual Event - Under this category, events are in process or have occurred which indicate potential degradation in the level of safety of the facility. No release of radioactive material requiring offsite response or monitoring is expected unless further degradation occurs.
Appendix A Glossary	Very High Radiation Area	**Very High Radiation Area**
Appendix B B.1 paragraph 4	Commands submitting a request shall receive a NAVSEADET RASO response letter that addresses each request for change	NAVSEADET RASO will respond to change requests via letter or electronic means (e.g. email, NKO, milSuite).
all	a NRMP	Change to be consistently an NRMP throughout manual