



UNITED STATES MARINE CORPS
MARINE CORPS AIR STATION
BOX 99100
YUMA, ARIZONA 85369-9100

StaO 6280.7
3VA3
27 MAY 1997

STATION ORDER 6280.7

From: Commanding Officer
To: Distribution List

Subj: RADIOLOGICAL AFFAIRS MANAGEMENT PROGRAM (RAMP)

Ref: (a) OPNAVINST 6470.3, Navy Radiation Safety Committee
(b) NAVSEA S0420-AA-RAD-010, Radiological Affairs Support Program Manual
(c) Title 49, Code of Federal Regulations
(d) NAVMED P-5055, Radiation Health Protection Manual

Encl: (1) Radiation Safety Program for X-Ray Fluorescence Analyzers
(2) Emergency Response Information

1. Purpose. To establish a radiation protection program for the safe handling of Radioactive materials.

2. Discussion. References (a) through (d) establish radiation safety requirements and responsibilities for use of radioactive material. Reference (a) requires possession and use of accelerator produced radioactive material to be authorized by a Navy Radioactive Material Permit (NRMP) and delineates Commanding Officer responsibilities. Reference (b) establishes specific requirements for a radiation safety program. Reference (c) establishes procedures for labeling, marking, packaging, and transportation of radioactive material. Reference (d) establishes exposure limits for radiation workers and record keeping requirements for exposure to ionizing radiation.

3. Action

a. The Commanding Officer shall:

(1) Establish and implement a radiation safety program for radioactive materials.

(2) Obtain and maintain an NRMP authorizing use of radioactive material.

StaO 6280.7
27 MAY 1997

(3) Appoint, in writing, a qualified Radiation Safety Officer (RSO) and Assistant Radiation Safety Officer (ARSO) and authorize such personnel direct access to the Commanding Officer on matters dealing with radiation safety.

b. The Radioactive Material and Equipment Managers shall:

(1) Provide an adequate permanent storage location according to the provisions of the appropriate enclosure.

(2) Prepare, amend, and renew the NRMP, as needed, to update the Radiation Safety Program.

(3) Assign, in writing, all supervisors of personnel using radioactive material or equipment and provide to the RSO.

(4) Provide the authorized operators for the radioactive equipment or material handlers.

(5) Ensure funding for maintenance of equipment.

(6) Implement and ensure compliance with enclosure (2).

c. The Radiation Safety Officer (RSO) shall:

(1) Be responsible to the Commanding Officer for safe use of the radioactive material and for compliance with all conditions of the NRMP issued to the command, Nuclear Regulatory Commission (NRC) regulations, and Navy directives.

(2) Be delegated the authority to halt any operation determined to be unsafe and shall have direct access to the Commanding Officer on radiation safety matters.

(3) Provide advice and assistance as required on all matters pertaining to radiation safety requirements, procedures and command policy.

(4) Maintain the command's NRMP and applications. Supervise the preparation of NRMP amendment and renewal applications, as necessary, to update the Radiation Safety Program and current RSO and ARSO named on the NRMP.

(5) Conduct an annual review of the radiation safety program's procedures and implementation and document results of the review.

(6) Investigate each known or suspected overexposure, loss of control, and noncompliance to determine the cause, and take steps to prevent its recurrence. Report such incidents per reference (b).

(7) Direct action to be taken in the event of an incident, damaged or leaking analyzer or other emergency.

(8) Ensure that all personnel who use radioactive materials or equipment have completed the operator's course and have been designated in writing as an authorized user by the RSO.

(9) Conduct, or have conducted, all required leak tests.

(10) Ensure that use of radioactive material or equipment complies with all NRMP conditions, this instruction and references (b) and (d). Provide a copy of the command radiation safety program to each authorized user.

d. The Assistant Radiation Safety Officer (ARSO) shall:

(1) Act for the RSO when the RSO is absent.

(2) Perform the RSO tasks identified by this instruction, provided the ARSO is under the direction of the RSO.

e. Supervisors of personnel operating radioactive equipment or handling radioactive material shall be trained as operators and shall:

(1) Provide in the field operator training to their personnel.

(2) Ensure their employees practice safety and comply with this instruction.

f. Operators shall comply with the manufacturer's operations manual and this instruction and the enclosures when using the X-Ray Fluorescence (XRF) analyzer. Operators shall be designated, in writing, by the RSO.


C. J. TURNER

DISTRIBUTION: B plus 3VA (15 cys)

**RADIATION SAFETY PROGRAM FOR
X-RAY FLUORESCENCE ANALYZERS**

1. Radiological Hazard

a. The X-Ray Fluorescence (XRF) analyzers contain up to 10 millicuries (mCi) of Cadmium-109 or Cobalt-57 radioactive material with integral shielding. The likelihood of dispersal of contents in an accident is very small. With proper training and use, the XRF represents a negligible radiation hazard. However, intentional misuse can result in excessive radiation exposure.

b. Exposure to personnel from ionizing radiation shall be reduced to As Low As Reasonably Achievable (ALARA). Unnecessary or unauthorized use of the XRF is prohibited. Table 1 identifies worst case radiation levels with the XRF's shutter open and closed at various distances.

**TABLE 1: WORST CASE RADIATION LEVELS FOR
NITON XL MODEL 309**

Surface	Distances (cm)	Open Shutter Rate (mrem/hr)	Closed Shutter Rate (mrem/hr)
Air ¹	20	23.5	ND
Wall ²	5	1.0	ND
Wall ²	30	0.13	ND
Wall ²	100	ND	ND

ND - Not Detectable

¹ - Measured directly in front of face scanner

² - Measured above the face scanner; device against a wall

Note: The readings were obtained from using wood substrate as the wall. The shutter open radiation levels may vary with differing construction materials. As an example, radiation levels measured on sheetrock are not detectable.

StaO 6280.7
27 MAY 1997

c. Table 2 identifies worst case radiation exposures when the XRF analyzers are used properly with the shutter open, eight hours per day, five days per week.

TABLE 2: WORST CASE EXPOSURES, NITON XL MODEL 309,
FACE ASSAYER SHUTTER OPEN FOR 8 HRS/DAY, 5 DAYS/WEEK

Distances (cm)	Exposure Category	Annual Exposure (rem)	Yearly Exposure Limit (rem)	Percent of Limit
5	Whole body	NA	5.0	NA
	Skin and Extremities	0.384	50.0	< 1
30	Whole body	0.048	5.0	< 1
	Skin and Extremities			

NA - Not Applicable

A considerable decrease in exposure during actual use will occur since the time of exposure will be less and the distance from the source increased.

2. Radiation Safety Officer/Assistant Radiation Safety Officer.

A Radiation Safety Officer (RSO) and Assistant Radiation Safety Officer (ARSO) shall complete the Radiation Safety Officer Course (S-4J-0016) conducted by NAVSEADET RASO, Yorktown VA.

3. Authorized Users. Only individuals who have completed the manufacturer's radiation safety training course, been trained by their supervisor in its use and have read this instruction are authorized to operate, transport or store the XRF.

4. General Operating Precautions

a. When the XRF is not in storage, it shall be under constant surveillance and immediate control of an authorized individual.

b. Records shall be kept according to paragraph 6, Records.

ENCLOSURE (1)

c. When not in use, the source shall be switched to the off position. When in use, the XRF shall be pointed away from people.

d. The manufacturer shall perform all maintenance and repair to the radioactive source.

5. Inventory Control

a. Approval of the RSO is required prior to the procurement of XRF analyzers.

b. The RSO shall maintain an inventory of all radioactive material authorized by the NRMP. The inventory shall list a source identification number, the isotope (e.g., Cadmium-109), physical form (solid), activity, date of activity determination, location, and the custodian. Every six months, the RSO shall inventory the devices and verify serial numbers and note in the inventory control log.

c. The RSO shall notify security and fire departments with a written list of permanent locations of radioactive material (storage areas) at least annually and when locations permanently change. Notification shall be documented in the inventory control log.

d. The RSO shall authorize, in writing, all transfers. Transfers are the shipment of the XRF analyzer to the manufacturer or formal change in accountability to another Federal activity. Before authorizing the transfer to another activity, the RSO shall have written verification that the receiver is authorized to receive the material. An acknowledgment of receipt of the XRF analyzers shall be obtained from the receiving activity in a timely manner. All documentation shall be retained.

6. Records. All records must be kept for a minimum of three years. Reference (b) has durations for retention of records.

a. Operators: An XRF Device Record for each XRF shall be maintained by the designated operator and kept with the device at all times. The XRF Device Record shall contain:

(1) Utilization log consisting of XRF model and serial number, date removed from storage, location of use, date of use, user(s), and date returned to storage.

(2) Calibration Check Graphs.

ENCLOSURE (1)

StaO 6280.7
27 MAY 1997

(3) Shipping papers or Notice for excepted package - instruments and articles (See paragraph 8, Transportation).

(4) This Station Order 6280.7, "Radiation Safety Program for XRF Analyzers"

(5) Authorized Users List

(6) Navy Radioactive Material Permit (NRMP)

(7) Factory Check Out Test Reference Sample Measurements

(8) Certificate of Sealed Source Test

(9) Leak Test Results

(10) NITON XL Model 309 Users Manual

b. RSO shall maintain an XRF program record and perform an audit at the time of inventory control for completeness of the XRF device records. The XRF program record shall contain:

(1) Utilization log consisting of XRF model and serial number, date removed from storage, location of use, date of use, user(s), and date returned to storage

(2) Calibration Check Graphs

(3) Shipping papers or Notice for excepted package - instruments and articles (See paragraph 8, Transportation).

(4) This Station Order 6280.7, "Radiation Safety Program for XRF Analyzers"

(5) Authorized Users List

(6) Navy Radioactive Material Permit (NRMP).

(7) Factory check out test reference sample measurements.

(8) Certificate of sealed source test.

(9) Leak test results.

(10) NITON XL Model 309 Users Manual.

ENCLOSURE (1)

b. RSO shall maintain an XRF program record and perform an audit at the time of inventory control for completeness of the XRF device records. The XRF program record shall contain:

- (1) Transfer shipping papers and documentation
- (2) Authorized users list with training certificates, supervisory approval and instruction acknowledgment
- (3) XRF inventory control log
- (4) Audit records
- (5) Leak test results
- (6) Copies of references
- (7) This Station Order 6280.7
- (8) NRMP

7. Storage

a. The XRF, when in an unrestricted area and not in storage, shall be tended under constant surveillance and immediate control of the authorized user. Except during use, the XRF analyzer shall be kept in its shipping case at all times.

b. At the permanent storage location, the XRF shall be stored in a locked room or area that prevents access and removal by unauthorized personnel. Only authorized users shall have keys to unlock the storage containers. The entrance shall be posted with the radiation caution symbol and the words, "Caution - Radioactive Materials".

c. The XRF, when stored in an unrestricted area, shall be secured from unauthorized removal from the place of storage. Only authorized users shall have keys to unlock the storage area. When the storage area is a vehicle, Section 8, Transportation applies.

8. Transportation

a. The XRF shall be transported in the manufacturer's shipping container.

ENCLOSURE (1)

StaO 6280.7
27 MAY 1997

b. When transporting the NITON XL Model 309, Department of Transportation (DOT) requirements of Title 49, Code of Federal Regulations (CFR), Part 172 and 173 (49 CFR 172 and 173) shall be complied with. Note: The XRF in its carrying case qualifies as instruments and articles in accordance with 49 CFR 173.422. The package must be certified as being acceptable for transportation by having a notice enclosed in or on the package, included with the packing list, or otherwise forwarded with the package. This notice must include the name of the consignee or consignor and the statement, "This package conforms to the conditions and limitations specified in 49 CFR 173.422 for radioactive material, excepted package-instruments or articles, UN 2910."

c. When transported in a vehicle, the shipping container shall be locked in the rear most portion of the vehicle. The shipping container shall be braced or tied down to prevent movement, protected from the elements, and locked in place.

d. When transported in the air, air shipments shall be made only in cargo aircraft.

9. Leak Tests

a. The RSO shall perform leak tests:

(1) At intervals not to exceed six months, except any source in storage and not being used need not be tested.

(2) When the device is removed from storage for use or transferred to another person and the leak test is not current (within the last six months), the device shall be tested before use or transfer.

(3) When a device is received from another person with no certificate indicating that a test was performed within six months, the device shall be tested before use.

b. Procedures

(1) Use model 006-350 Rad Wipes (or equivalent), a round paper filter, that is used to pick up any contamination from the device. The Rad Wipes can be obtained from the Radiation Service Organization at (301) 792-7444.

(2) Confirm that the XRF device is in the "off" position and the key removed from the key lock.

ENCLOSURE (1)

(3) Follow directions to conduct leak tests outlined in NITON Corp XL Model 309 Users Manual.

(4) Place the filter into the plastic envelope and close.

(5) Take the paper envelope and write on the outside the serial number of the XRF, the date the test was performed, and the words, "RADIOACTIVE MATERIAL, NO LABEL REQUIRED."

(6) Place the plastic envelope into the paper envelope and seal the paper envelope. Place the paper envelope containing the plastic envelope into the mailing envelope and seal.

(7) Mail the filter to NAVSEADET RASO, Yorktown, VA for evaluation under NRMP No. 45-45650-BINP to determine if any contamination is present.

c. Action. If more than 0.005 microcuries or more of removable contamination is measured on the test sample, the source shall be removed from service and returned to the manufacturer for repair. A complete investigation of the source and extent of contamination shall be conducted. The notification requirement of paragraph 11, Reporting Requirements, shall be followed.

10. Emergency Procedures

a. The first action to be taken in case of an accident with the XRF analyzer is keep other people away from the site. Call the emergency contact on the shipping papers.

b. Response information

(1) Immediate health hazard - Potential radiation exposure. The maximum radiation exposure obtained by contact with the bare source is 7.3 rem/hr.

(2) Risk of fire or explosion - None

(3) Immediate precautions - paragraphs 10.c(1) or 10.d(1)

(4) In case of fire - paragraphs 10.c(2) or 10.d(2)

(5) Spill response - paragraphs 10.c(3) or 10.d(3)

(6) Preliminary first aid - None needed

ENCLOSURE (1)

27 MAY 1997

c. Minor damage. If the device is superficially damaged, dented, or otherwise injured from a drop, minor runover, etc., and the source appears to be in place, then do the following:

(1) Do not walk through the site where the device was pushed or pulled. Turn the probe or face assayer over to view the source area if necessary. Visually inspect the source area for damage to the device.

(2) Allow the fire department personnel to proceed normally.

(3) If the source area is intact, pick up the device, place it in the XRF shipping container and return it to the permanent storage area. Request RSO assistance to check condition of the source.

(4) The RSO shall call manufacturer for assistance in shipping the device back to the factory for repair or disposal. DO NOT SHIP THE DEVICE WITHOUT MANUFACTURER APPROVAL OR KNOWLEDGE.

d. Major Damage. If the device is broken apart, severely burned, severely crushed, the parts strewn around, or the source holder is visibly damaged, then:

(1) Keep personnel out of the accident site. Rope off the site for at least 10 feet around. If a vehicle is involved, stop the vehicle and have the driver walk away from the area. Do not allow personnel to walk through the damaged site. If radioactive material is loose, it can be picked up and tracked elsewhere.

(2) Allow the fire department personnel to proceed normally. Fire department personnel's prevention of risk to life and property is primary. Prevention of disturbing and enlarging the boundaries of the contaminated site is secondary.

(3) The RSO shall check the site with an operating radiation survey meter to determine if the radioactive material is lost or intact.

(4) The RSO shall determine whether the site is safe and shall remove the contamination with a long handled tool if there is any.

(5) The RSO shall call the manufacturer for assistance in shipping the device back to the factory for repair or disposal. DO NOT SHIP THE DEVICE WITHOUT MANUFACTURER APPROVAL OR KNOWLEDGE.

ENCLOSURE (1)

11. Reporting Requirements

a. OPREP-3 NAVY BLUE REPORT. The following situations require immediate notification of the Commanding Officer, Command Duty Officer, and RSO. They will provide voice and message notification using OPREP-3 NAVY BLUE REPORT. An OPREP-3 NAVY BLUE REPORT shall be made in accordance with OPNAVINST 3100.6 for the conditions listed below. NAVSEASYS COM (07R) and NAVSEADET RASO shall be information addressees to the OPREP-3 NAVY BLUE REPORT.

(1) An individual who could receive one of the following in a period of 24 hours, per reference (d).

(a) A total effective dose equivalent exceeding five radiation equivalent man (rems)/year or three rem/quarter year.

(b) An eye dose equivalent exceeding 15 rems.

(c) A shallow-dose equivalent to the skin or extremities exceeding 50 rems.

(2) Source leak test results which indicate a total removable activity of 0.005 microcuries per gram or more. The report shall specify the equipment involved, test results and corrective actions.

(3) Theft or loss of radioactive material, per reference (d).

(4) Radiation incidents, 10 CFR 30.50.

(a) Any event that prevents protective actions necessary to avoid radiation exposure that could exceed regulatory limits.

(b) An unplanned contamination event that causes access to the contaminated area to be restricted for more than 24 hours.

(c) Any event in which safety equipment is disabled or fails to function as designed when it is required by regulation to prevent radiation exposure from exceeding regulatory limits or to mitigate consequences of an accident and redundant equipment is not available or does not perform.

(d) An unplanned fire or explosion damaging the radiation source (the analyzer).

(e) An unplanned medical treatment of a contaminated individual.

ENCLOSURE (1)

StaO 6280.7
27 MAY 1997

b. Written Notification/Report of Exposures, Radiation Levels and Concentrations of Radioactive Material Exceeding Limits and Follow-up Reports. A written report shall be made within 15 days to CNO (N45) with copies to NAVSEASYSKOM (SEA-07R) and NAVSEADET RASO for the conditions listed below. The report shall describe details of the incident and overexposure and planned corrective steps to prevent a recurrence. Each report will have a separate section which lists the name, address, telephone number, social security number, date of birth, and exposure estimate for each individual exposed.

(1) Radiation incident (10 CFR 20.2202) reported by OPREP-3 NAVY BLUE REPORT per paragraph 11.a.(1) above.

(2) Theft or loss (10 CFR 20.2201) reported by OPREP-3 NAVY BLUE REPORT per paragraph 11.a.(3) above.

(3) Theft or loss of radioactive material (a HNU SEFA-Pb analyzer) (10 CFR 20.2201).

(4) Exposures, radiation levels and concentrations of radioactive material exceeding limits defined in 10 CFR 20.2203 which include:

(a) Occupational exposure of an individual exceeding the quarterly or annual limits specified in NAVMED P-5055, Chapter 4.

(b) Exposure of any minor child exceeding 10 percent of annual occupational limits (500 mrem).

(c) Radiation levels (whether or not actual exposure of individuals is involved) in an unrestricted area that exceed ten times the limits for an unrestricted area (i.e., 20 mrem/hour).

(d) Any exposure to a non-occupationally exposed individual (member of the public) exceeding 100 mrem in a calendar year.

c. Notification/Written Report of Significant Abnormal Occurrence. In the event of a significant abnormal occurrence not covered by the notification requirements above (such as temporary loss of custody), the Command shall take appropriate measures to return the situation to normal. The Command shall then notify NAVSEADET RASO, review the matter, and document the review. Documentation of the review shall include preparation of narrative summary which identifies the cause of the occurrence and specifies corrective action taken to prevent recurrence. A copy of the narrative summary concerning abnormal occurrences shall be sent to NAVSEADET RASO within 30 days after the occurrence of the incident or the discovery thereof.

ENCLOSURE (1)

StaO 6280.7
27 MAY 1997

d. Notification Information

- (1) Chief of Naval Operations (N45)
Washington, DC 20350-2000

Message Address: CNO WASHINGTON DC//n45//

- (2) Commander, SEA-07R, Naval Sea Systems Command,
2531 Jefferson Davis Hwy, Arlington, VA 22242-5160

Telephone Number: DSN 332-1252
Commercial (703) 602-1252

Message Address: NAVSEASYSKOM WASHINGTON DC//07R//

- (3) Officer in Charge, Naval Sea Systems Command
Detachment, Radiological Affairs Support Office
NWS P.O. Drawer 260, Yorktown, VA 23691-0260

Telephone Number: DSN 953-4692
Commercial (804) 887-4692

Message Address: NAVSEA DET RASO YORKTOWN VA//00//

- (4) NAVSEASYSKOM (07R) and NAVSEADET RASO shall be
information addressees to any OPREP-3 NAVY BLUE
REPORT.

ENCLOSURE (1)

EMERGENCY RESPONSE INFORMATION

1. Description of material. Radioactive Material, Special Form, N.O.S., 7, UN 2974, Cd-109, 10 mCi.
2. Immediate hazards to health.
 - a. None, if Type A shipping container is intact.
 - b. If sealed source has been damaged, there may be a potential internal radiation hazard from inhalation, ingestion, or breaks in the skin.
3. Risk of fire or explosion. No risk of fire or explosion.
4. Immediate precautions to be taken in case of accident or incident.
 - a. Perform a survey of the shipping container with an operating radiation survey meter, and move the shipping container to a safe location with restricted access.
 - b. If a survey meter is not available, locate the source without touching the source and keep unnecessary personnel at least 15 feet away from the source.
5. Immediate methods for handling fires.
 - a. Combat fires, as necessary, to prevent further property damage or loss of life.
 - b. Reduce exposure by minimizing time in the area and maximizing distance from the shipping container.
 - c. Do not move damaged containers.
6. Initial methods for handling spills or leaks in the absence of fire. The radioactive material is not in a liquid state.
7. Preliminary first aid.
 - a. Give appropriate first aid treatment.

ENCLOSURE (2)

StaO 6280.7
27 MAY 1997

b. Medical treatment of life threatening conditions (i.e., severe trauma, shock, bleeding, and breathing difficulties) always take precedence over decontamination procedures, treatment of possible symptoms from irradiation, and dose estimation procedures.

c. Concerns about the spread of radioactivity, (i.e., radioactive contamination, or the possible contamination of medical personnel) should be attended to after the patient has been given medical treatment.

d. Prevent the spread of radioactivity from the immediate area by treating contaminated clothing, dressings and other medical supplies that cannot be readily decontaminated as contaminated wastes.

ENCLOSURE (2)