



DEPARTMENT OF THE NAVY
COMMANDER NAVY REGION SOUTHWEST
937 NO. HARBOR DR.
SAN DIEGO, CA 92132-0058

IN REPLY REFER TO:

COMNAVREGSWINST 6470.1A
N222

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COMNAVREGSW INSTRUCTION 6470.1A

Subj: MOBILE VEHICLE AND CARGO INSPECTION SYSTEM (VACIS)
RADIATION SAFETY PROGRAM

Ref: (a) Title 10, Code of Federal Regulations
(b) OPNAVINST 6470.3, Navy Radiation Safety Committee
(c) Title 49, Code of Federal Regulations
(d) NAVSEA S0420-AA-RAD-010 (RAD-010)

Encl: (1) Definitions
(2) Limits of Personnel Exposure
(3) Personnel Radiation Monitoring Instructions
(4) Radiation Survey Instructions
(5) Requirements for Controlling Temporary Restricted Areas
(6) Requirements for Custody and Security of Mobile VACIS equipment
(7) Mobile VACIS Operating Instructions
(8) Procurement, Receipt, and Transfer of Radioactive Material
(9) Emergency Instructions
(10) Inspection and Maintenance Program for Mobile VACIS Equipment
(11) Transportation of Mobile VACIS with an OHMART Model Gauge
(12) Mobile VACIS Records
(13) Training Requirements for Radiation Safety
(14) Internal Inspection and Control
(15) Leak Test Instructions
(16) Requirements for Evaluation of Equipment Defects and Noncompliance
(17) Emergency Reporting Requirements

1. Purpose. To promulgate instructions for the radiological control and use of sealed sources of radioactive material for use with the Mobile Vehicle and Cargo Inspection System (Mobile VACIS) in Navy Region Southwest.

2. Cancellation. COMNAVREGSWINST 6470.1.

3. Discussion. This instruction is based on requirements of the Nuclear Regulatory Commission (NRC), reference (a), requirements of the Naval Radioactive Materials Permit (NRMP) program, reference (b), Department of Transportation regulations, reference (c), and Radiological Affairs Support Program (RASP) Manual, reference (d), and must be adhered to without exception. Revisions to this directive will be forwarded to NAVSEADET RASO

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via the chain of command requesting a change to the NRMP, which authorizes use of the Mobile VACIS.

4. Responsibilities

a. The Commander is responsible for the radiation safety program and shall:

(1) Establish and implement a radiation safety program which ensures that radiation exposures are maintained As Low As Reasonably Achievable (ALARA).

(2) Appoint, in writing, personnel, who are qualified prior to appointment, as Radiation Safety Officer (RSO) and Assistant Radiation Safety Officer (ARSO) and authorize such personnel direct access to the Commander on matters dealing with radiation safety. RSO and ARSO designations require amendment to the NRMP. These designations may be made through a Memorandum of Understanding with another local command that maintains a NAVSEADET RASO approved Radiation Safety Officer on staff.

(3) Ensure effective coordination between the RSO, supervisors, workers, fire/security forces and medical department personnel.

b. The Radiation Safety Officer (RSO) is responsible to the Commander for the use of sealed sources of radioactive material and personnel safety in Mobile VACIS operations. The RSO is responsible to ensure all provisions of the NRMP, NRC regulations and Navy directives are strictly followed. The RSO is delegated the authority to halt any operation determined to be unsafe and shall have direct access to the Commander should there exist an unsafe or potentially unsafe situation with the Mobile VACIS. The RSO shall:

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

(2) Develop, promulgate, conduct and/or monitor training of Mobile VACIS operators to ensure they are properly instructed in the hazards associated with the radiation sources being used. This includes ensuring that all Mobile VACIS operators have received initial training at the eight hour SAIC Radiation Safety Training Course, and the 40 hour SAIC Mobile VACIS Operator Training Course and six hours of refresher training annually. Barrier monitors must have eight hours of initial training.

(3) Ensure compliance with this directive and requirements of enclosures (1) through (17).

(4) Ensure that all Mobile VACIS operators are provided with complete, current, personal copies of this directive and 10 CFR 19, 20, 21, 30 and 32.

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(5) Periodically monitor Mobile VACIS operations to ensure personnel are performing the operations correctly and safely per enclosure (14).

(6) Ensure semi-annual inventories of radioactive material are conducted.

(7) Establish liaison with the supporting Radiation Health Officer/Medical Officer to coordinate the Radiological Controls and Radiation Health Programs.

(8) Evaluate and report any equipment defect, deviation or noncompliance with NRC regulations per enclosure (16).

(9) Investigate emergencies, accidents and incidents as required and report per enclosure (17), current naval directives, and NRMP conditions.

(10) Conduct and document annual radiation protection program implementation review per enclosure (12).

(11) Allow only qualified Mobile VACIS operators to operate the Mobile VACIS.

(12) At least three individuals shall be used to monitor and control the exclusion area boundaries. At a minimum of one of the individuals will be a qualified Mobile VACIS operator. The other individuals may be qualified as barrier monitors. As the size of the exclusion area increases (i.e., scanning more than two trucks at a time in the mobile mode), additional barrier monitors will be used to control the boundaries. Qualified Mobile VACIS Operators may be used as Barrier Monitors without additional training.

(13) Schedule and implement Mobile VACIS operator training and qualification. This requires coordination with SAIC.

(14) Ensure required Mobile VACIS operator records are maintained. Review all records for completeness and accuracy at least quarterly.

(15) Ensure full compliance with this directive.

(16) Have successful completion of course (S-4J-0016) prior to appointment.

c. The Assistant Radiation Safety Officer (ARSO) shall ensure compliance with this instruction. The ARSO shall:

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

(2) The ARSO shall have successful completion of course

(S-4J-0016) prior to appointment.

d. The Operator-in-Charge shall:

(1) Direct and supervise assigned Mobile VACIS operations.

(2) Be responsible for full compliance with all NRC regulations, this instruction, and NRMP conditions during assigned Mobile VACIS operations.

e. Mobile VACIS operators shall:

(1) Comply with the written or verbal orders of the Operator-in-Charge.

(2) Comply with applicable instructions/procedures in this directive for the assigned task.

(3) Promptly report off-scale pocket dosimeters, emergencies or deviations from established procedures to the Operator-in-Charge.

f. Barrier Monitors. Individuals qualified as barrier monitors may be assigned to Mobile VACIS operations to control access to the exclusion area. Barrier Monitors shall:

(1) Maintain control and constant surveillance of the entire restricted area boundary. His/her function is to guard the barrier and monitor the exposure rate using the provided RADIAC. The Barrier Monitor shall have no other functions.

(2) Maintain positive communication with the Operator-in-Charge. Whistle, lights or two-way communication equipment may establish positive communication.

(3) Not enter the restricted areas during operations or operate Mobile VACIS equipment.



A. D. BRUNHART
Deputy and
Chief of Staff

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Definitions

Activity. The number of nuclear transformations occurring in a given quantity of material per unit time. The unit of activity is the Curie (Ci) and Becquerel (Bq). Submultiples of these units, millicuries, microcuries, Gigabecquerel and Terabecquerel are also used.

Barrier Monitor. A barrier monitor is not allowed to enter restricted areas during operations or operate Mobile VACIS equipment. His/her function is to guard the barrier and monitor the exposure rate using the provided RADIAC. The Barrier Monitor shall have no other functions.

Dose Equivalent. A quantity used in radiation protection to express the biological effectiveness of all radiations on a common scale. For purposes of Mobile VACIS operations, the dose equivalent is equal to the exposure. The unit of dose equivalent is the rem or sievert (Sv).

Exposure. General term meaning exposed to or receiving a dose of radiation. Units of radiation exposure of an individual are measured in rem or sievert (Sv). See Dose Equivalent. All radiation levels for the purpose of survey records shall be in mrem/hour.

Exposure Device. A device containing a sealed source which can be unshielded to make a radiographic exposure. The sealed source is exposed through the opening of shutters.

High Radiation Area. Any radiation area accessible to personnel in which there exists ionizing radiation at such levels that an individual could receive in excess of 100 mrem (1 mSv) in one hour at 30 centimeters (approximately one foot) from the radiation source or from any surface that the radiation penetrates.

Leak Test. A test to determine if a sealed source has lost its encapsulation integrity and allows leakage of radioactive material through holes or cracks.

Mobile VACIS Operations. Operations in which the shutter to the gauging device is opened, and the sealed source is exposed. This typically occurs in obtaining a density map of a vehicle.

Operator-in-Charge. Senior Mobile VACIS operator in charge of operations for the shift.

RADIAC Instrument. A portable instrument which measures the presence of ionizing radiation. RADIAC instruments shall be RASP-approved in the RADIAC allowance.

Radiation Area. Any area to which access shall be limited as

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deemed necessary by cognizant authority and in which precautionary measures are taken to protect personnel from exposure to radiation or radioactive material. A "radiation area" includes any area accessible to personnel in which there exists ionizing radiation at dose-rate levels such that an individual could receive a deep dose equivalent in excess of 5 mrem (0.05 mSv) in 1 hour at 30 centimeters from the radiation source or any surface that the radiation penetrates.

Radiation Level. Radiation exposure per unit time. Units are millirem per hour or millirem in any one hour when discussing individual radiation exposure or limits. Units are millirem per hour when discussing measurement of radiation by instruments.

Restricted Area. Any area, access to which is controlled by the command for the purpose of protection of individuals against undue risk from exposure to radiation and radioactive materials. Restricted areas may not include residential quarters, but separate rooms in a residential area may be set apart as a restricted area. The radiation levels at the restricted area boundary shall not exceed 2 mrem (0.02 mSv) in an hour or 100 mrem (1 mSv) in a year.

Sealed Source. Any radioactive material that is sealed in a capsule to prevent contact with or leakage of the radioactive material.

System International (SI) units. These units have been established by the international commission on radiological units and are used by many countries. These units compare to the rem, rad and curie, referred to as "traditional units" in the following manner:

One gray (Gy)	=	100 rad
One sievert (Sv)	=	100 rem
One becquerel (Bq)	=	2.7×10^{-11} curie (Ci)
	=	one disintegration per second
One rad	=	One centigray (cGy)
	=	1×10^{-2} gray (Gy)
One rem	=	One centisievert (cSv)
	=	1×10^{-2} sievert (Sv)
One curie	=	3.7×10^{10} becquerel (Bq)

Unrestricted Area. Any area to which access is neither limited nor controlled by the activity, and any area used for residential quarters.

Limits of Personnel Exposure

1. RASP Administrative Control Level. A control level of 0.5 rem per calendar year is established for the purpose of reducing the total man rem.

2. Quarter and Annual Limits. No person shall exceed the exposure limits specified in NAVMED P-5055.

3. The Commander must personally authorize, in writing, any exposure exceeding the administrative level, and shall specify revised administrative control levels and expiration date for each authorization.

4. Any incident when primary dosimetric device (e.g. TLD) information is not available (lost, damaged, or unauthorized), all unusual exposures, and any exposure exceeding an authorized administrative limit shall be investigated by the RSO and RHO.

a. RSO's evaluations of unusual exposures (e.g. off-scale Pocket Dosimeter (PD) readings and barrier violations by unmonitored personnel) shall include:

(1) Signed and dated statements from individuals present at the time of the possible false or unusual exposure (including helpers or witnesses). Ensure such statements are written independently and include all known pertinent information.

(2) Estimation of the actual exposure by measurement, calculation, or other appropriate methods. This includes:

(a) Exposure time and radiation levels.

(b) Exposure of other personnel performing similar work.

(c) Individual's previously recorded exposure while performing similar work.

(d) PD readings, if available.

(3) Documentation of the evaluation and conclusions, including results of interviews of personnel involved, records of telephone conversations, examination of equipment (when applicable), surveys, and corrective action to prevent recurrence.

(4) Review of existing records to insure they are complete and up-to-date.

b. If an RSO evaluation cannot conclusively prove that a reading was erroneous or that an exposure was within limits, a formal report shall be made per enclosure (17) within the specified time limit even though TLD results may not be available.

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c. Exposure estimates shall be performed when the results of the TLD are considered suspect such as the following:

(1) TLD and PD measurements differ by 30 percent or more and the TLD measurement is greater than or equal to 100 millirem.

(2) TLD and PD measurements differ by 30 millirem or more and the TLD measurement is less than 100 millirem.

d. NAVMED P-5055, paragraph 5-6(1) provides requirements for approval of investigation reports and dose estimates into individual medical record. NAVMED P-5055, paragraph 5-6(3) provides instructions on entering exposure estimates in the medical record.

5. The procedures above are established to ensure personnel exposure is maintained As Low As Reasonably Achievable (ALARA).

Personnel Radiation Monitoring Instructions

1. General. All Mobile VACIS operators and barrier monitors assigned to work in the vicinity of radiation sources or within radiation areas, associated with Mobile VACIS operations, are required to wear a TLD and two pocket dosimeters (PDs).

NOTE:

Barrier monitors cannot enter or adjust restricted area boundaries. Dosimetry and use shall conform to NAVMED P-5055, Radiation Health Protection Manual. PDs shall not be used past the calibration due date on the calibration label. TLDs shall be stored in a low radiation background area and not near RADIACs or radioactive material.

2. Mobile VACIS Operators and Barrier Monitors. All Mobile VACIS operators and barrier monitors shall comply with the applicable following requirements:

a. During VACIS operations, each Mobile VACIS operator and barrier monitor shall wear a TLD and two low-range (0-200 mrem) PDs. The PDs and the TLD shall be worn adjacent to one another on the front of the body.

b. Each operator and barrier monitor shall recharge and zero his/her PDs at the start of each workday or work shift in which the Mobile VACIS will be used or prior to commencing Mobile VACIS operations. Absolute zero need not be attained; however, if the PD cannot be brought to read less than 10 mrem, it must be rejected and returned to a calibration facility for evaluation.

c. Each operator and barrier monitor is responsible for monitoring his/her own radiation exposure. PDs shall be read and the initial and final readings recorded in the Dosimeter Log daily during use. See Figure 3-1. Operators and barrier monitors shall read the PDs frequently to check radiation exposure.

d. If an operator or barrier monitor determines that an administrative control level has been exceeded or has reason to suspect an excessive exposure, the Operator-in Charge and RSO shall be notified immediately. Following such an occurrence, the individual shall not work in a radiation area until approved by the RSO to do so.

e. If one PD goes off-scale, the individual shall immediately be removed from radiation work and his/her TLD shall be immediately processed or returned to the Naval Dosimetry Center for evaluation. The individual may be allowed to return to work before the results of the TLD evaluation are known if all of the following conditions are met:

- (1) The RSO can clearly establish that the off-scale PD

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is defective. (See below.)

and

(2) The PD which was not off-scale is functioning properly.

and

(3) The RSO has determined that the individual was not exposed beyond radiation exposure limits in NAVMED P-5055 or established administrative limits.

f. In the event one PD goes off-scale, the following checks shall be performed on both PDs:

(1) Drift Check. Charge to zero, then observe after two hours. Within the context of this procedure a defective PD is one that undergoes greater than one-tenth of full scale deflection (upward drift) within two hours.

(2) Response Check. The following procedures shall be used:

(a) Ensure that the PD has a current calibration sticker attached. (Note: calibrations are required every six months.)

(b) Zero the PD to be checked.

(c) Tape the PD to a cesium-137 check source such as those used for RADIACs.

(d) After two hours, read the PD.

(e) Any upscale reading indicates a positive response and a satisfactory PD.

(f) If no upscale reading is noted, consider the PD defective.

g. If both PDs go off-scale or if only one goes off-scale and the other indicates radiation exposure of greater than 10 mrem, the individual shall not be permitted to return to radiation work until the results of the TLD evaluation are known.

Radiation Survey Instructions

1. General

a. Routine radiation surveys shall be conducted with RASP approved RADIAC instruments which are capable of measuring 0.5 mrem/hour to 1,000 mrem/hour. This is referred to as a low-range RADIAC instrument in this instruction.

b. The low-range RADIAC instruments shall be calibrated at least every six months and after each repair or servicing at the nearest Navy RADIAC Calibration Laboratory or RADIAC Repair Facility.

c. Uncalibrated RADIAC instruments, or those whose calibration due date has passed, shall be removed from service and shall not be used.

d. One calibrated, operable, low-range RADIAC instruments (IM-231) shall be available for the Operator-in-Charge and each individual assigned to monitor the exclusion area boundary to conduct Mobile VACIS operations (i.e., a minimum of four survey instruments will be required for operations).

e. Check RADIAC instruments for current calibration and condition of batteries. Check RADIAC instruments for acceptable response to radiation using the provided check source before the first operation of the day or shift and after suspected damage (e.g. dropping).

NOTE:

Check source exposure rate values are included on RADIAC calibration certificates provided by the supporting Navy RADIAC Calibration Laboratory or RADIAC Repair Facility.

f. Remove inoperable RADIAC instruments from service and tag instrument to indicate the condition. (Note: Inoperable means poor battery condition or failure to respond to radiation properly.)

g. Mobile VACIS operations shall not be conducted if one calibrated, operable, low-range RADIAC instruments is not available for the Operator-in-Charge and each individual assigned to monitor the exclusion area boundary.

h. Radiation surveys of the Mobile VACIS source enclosure and source storage box shall be made by a qualified Mobile VACIS operator prior to removal from and return to storage.

i. A radiation survey of restricted area boundaries shall be conducted during the first exposure of each day or shift or after any change in the restricted area. This survey shall only be made by qualified Mobile VACIS operators and barrier monitors.

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j. The radiation survey of the restricted area boundary shall be documented on the Mobile VACIS Utilization Log, Figure 12-2.

2. After a Density Map Scan

a. After each density map scan, a survey shall be made to determine that the shutter on the gauging device in the source enclosure has shut, covering the sealed source.

(1) Verify the flashing BEAM ON red light is de-energized. Approach the scanned vehicle on the side of the source enclosure. Use a low-range RADIAC instrument set on a mid-range scale (0-50 mR/hour).

(2) Direct the low-range RADIAC instrument toward the source environmental enclosure. A reading greater than 2 mR/hr indicates the shutter may not be closed.

NOTE:

Abnormal readings (low or high) or sharp increases in radiation levels during the approach indicate the source may be exposed. Exterior surface of the source enclosure shall have no radiation level in excess of 2 mrem/hr at one meter from any exterior surface of the source enclosure.

Requirements for Controlling Temporary Restricted Areas

1. A minimum of three individuals shall be used to monitor the exclusion area boundaries during Mobile VACIS operations. One the three individuals shall be a qualified Mobile VACIS operator and the other individuals may be qualified as barrier monitors. As the size of the exclusion area increases (i.e., scanning more than two trucks at a time in the mobile mode), additional barriers will be used to control the boundaries. Qualified Mobile VACIS Operators may be used as Barrier Monitors.
2. One calibrated, operable, low-range RADIAC instruments (IM-231) shall be available for the Operator-in-Charge and each individual assigned to monitor the exclusion area boundary to conduct Mobile VACIS operations. (AN/PDR-43s will not satisfy this requirement).
3. A physical barrier shall be established at the point where the radiation level is less than 0.5 mrem in any one hour. This restricted area barrier shall be conspicuously posted with signs containing the radiation symbol and the words "Caution: High Radiation Area. Radiation May Be Present Whenever Red Indicator Is On. No Entry Into This Area Is Permitted When Red Indicator Is Illuminated." The barrier shall be initially established during set up of Mobile VACIS operations for the day. The minimum distances for the safety exclusion zone set up are as follows:

For stationary scans

- 5 feet behind the source enclosure
- 47 feet in front of the source enclosure (in the direction of the shutter
- 10 feet in front of the Mobile VACIS vehicle
- 10 feet in back of the Mobile VACIS vehicle

For moving scans

- 5 feet behind the source enclosure
- 47 feet in front of the source enclosure (in the direction of the shutter
- 10 feet in back of the Mobile VACIS
- 40 feet in front of the last target

NOTE:

If at any time during operations the exposure rate outside of the barriers is observed to be greater than 0.5 mR/hr, readjust the boundaries to ensure the dose rate is less than 0.5 mR/hr. If at any time during operations the exposure rate outside of the barriers is observed to be greater than 2 mR/hr, secure operations and notify the RSO immediately.

4. Prior to each vehicle scan, the restricted area shall be

inspected and cleared of all unauthorized personnel.

5. The Mobile VACIS operator-in-charge and barrier monitors shall be assigned as required to maintain control and constant surveillance of the entire restricted area boundary. Personnel who are only qualified as Barrier monitors shall not enter the restricted area. Control and surveillance of the restricted area boundary shall be maintained at ALL times when the source is exposed. Mobile VACIS personnel assigned to this task shall not leave assigned positions while the source is exposed.

6. During the first exposure, the restricted area perimeter shall be surveyed. See Enclosure (4), Paragraph 1.i for detailed survey instructions.

7. The operator-in-charge shall assure positive communication is maintained with each individual assigned to control the restricted area boundary. Positive communication may be established by whistle, lights or two-way communication equipment.

8. The operator-in-charge shall maintain control of the restricted area boundary by direct observation or by positive communication with barrier monitors.

9. Upon determining that the restricted area boundary has been penetrated:

a. The operator-in-charge shall be immediately notified.

b. The shutter will be shut, and locked in place until the area is clear of personnel and the RSO has been notified.

NOTE:

Operations will not resume until the RSO has assessed the situation and has made the determination that operations may continue.

**Requirements for Custody and Security of
Mobile VACIS Equipment**

1. When not in use, the computer system must be turned off. The keys to the ignition of the vehicle must be removed. The control panel key must be removed from the control panel. The primary shutter on the Ohmart gauge must be padlocked shut. The source enclosure must be padlocked shut. All aforementioned keys must be in the possession of a qualified Mobile VACIS operator, the RSO, or a lockbox to which only qualified Mobile VACIS operators have access.

NOTE:

The Mobile VACIS system may be used or stored at temporary job sites of the Command anywhere in the United States where the Naval Radiation Safety Committee maintains jurisdiction for regulating the use of permitted material. Contact NAVSEADET RASO when conducting operations on other than Department of Defense facilities.

2. When not in a secured condition as per paragraph 1, custody and direct surveillance of the Mobile VACIS shall be maintained by a qualified Mobile VACIS operator.

3. The RSO shall ensure a physical inventory of all Mobile VACIS sealed sources is conducted semi-annually and documented (Figure 12-2). Inventory records shall be maintained for as long as the radioactive material is retained, and for five years following the disposition of the radioactive material. Security and fire departments shall be given a copy of the inventory annually and when locations permanently change. The source inventory records shall contain the following:

a. Manufacturer, model and serial number of the source and/or device. (e.g. Amersham Corporation CDC.700, #1)

b. Radioisotope, chemical and physical form. (i.e. sealed source is sufficient for form) (e.g. Cs-137, sealed source)

c. Activity and date of determination (or purchase) (e.g. 1 Ci, 4/02/02)

d. Location and custodian. (e.g. Gate #1, RSO)

e. Date of inventory. (e.g. 10/02/02)

f. Name of individual conducting inventory. (e.g. RSO)

Mobile VACIS Operating Instructions

1. Preparation

a. Personnel shall be equipped with dosimetry per enclosure (3).

b. One calibrated, operable, low-range RADIAC instrument shall be available for the Operator-in-Charge and each individual assigned to monitor the exclusion area boundary to conduct Mobile VACIS operations.

c. Begin shift as follows:

NOTE:

The Mobile VACIS may be used for either stationary or moving scans. Based on which scan will be utilized, refer to the applicable sections in these operating instructions.

(1) Obtain keys to the vehicle, control panel, and source enclosure.

(2) Ensure the operational area is clear and no overhead obstacles are lower than 20 feet from the ground. No vehicles greater than 15.5 feet tall will be scanned.

(3) Ensure the System Power Switch, located on the Shutter Control Panel, is turned off. This switch requires a key.

(4) Set RADIAC instrument on the 0-50 mrem/hour scale. The scale should be adjusted to the appropriate scale as necessary to obtain accurate exposure readings.

(5) Take radiation readings with the RADIAC placed against the Source Storage Box on the front, left side and right side. Record the readings in the utilization log in Enclosure (12).

WARNING:

If any of the readings are above 2 mR/hr, DO NOT remove the source from the Source Storage Box. Secure the area around the Mobile VACIS unit, and contact the RSO. DO NOT proceed with the rest of the procedure.

(6) Unlock all storage boxes, including both handles on the source storage box.

(7) Unlock the hydraulic lift control panels on both sides of the Mobile VACIS.

(8) Unlock all cab doors.

(9) Remove the pin to unlatch the cover over the halogen light. The halogen light is mounted to the articulating arm.

(10) Insert the pin into the bracket on the halogen light cover to secure it during scanning.

(11) Remove the protective covers from the camera and strobe lights. The two sets of strobe lights are located above the cab.

(12) Place all the covers in the appropriate storage box.

d. Release the securing clamp as follows:

(1) Remove the safety pin that secures the securing clamp to the D-ring on the horizontal telescoping boom.

(2) Release the securing clamp by pushing the securing clamp handle up until the hook comes out of the D-ring.

(3) Reinsert the safety pin into the securing clamp so it does not get lost.

NOTE:

Be sure the securing clamp hook will not accidentally become reattached to the D-ring on the boom rest.

(4) Remove the tie-down straps and securing clamp

(a) Untie the strap if it is wrapped around the ratchet. Pull ratchet release lever, lift ratchet handle until locked into open (extended) position.

(b) Loosen the strap. Remove the hook from D-ring on the truck bed. Pull ratchet release lever again, and fold ratchet handle until locked into closed (folded) position.

(c) Remove the hook from the D-ring on the horizontal telescoping boom or detector tower frame. Wrap the strap around the ratchet.

(d) Repeat steps (a) through (c) for each tie-down strap.

e. Ensure the circuit breakers are off, then power up the Mobile VACIS using either the AuraGen or commercial power.

f.f. Turn the circuit breakers on.

2. Deploy the source enclosure and detector tower as follows:

a. Ensure the System Power Switch, located on the Shutter Control Panel. Is in the OFF position.

b. Turn on the PTO and strobe amber switches (up position), which are located on the auxiliary switch panel inside the cab above the street side visor.

c. Turn on the strobe blue switch if conducting law enforcement activities.

d. If working at night, turn on the appropriate work light switches.

e. Identify set of hydraulic lift controls to be used as follows:

(1) Go to the hydraulic lift controls located at the back of the truck bed, on the curbside. If deploying on the street side, ensure the CONTROLS lever is in the up (STREET SIDE) position.

(2) If deploying on curbside, ensure the CONTROLS lever is even with other levers (CURB), then stay at the hydraulic lift controls on the curbside.

f. Extend the Axle Supports as follows:

(1) At the Hydraulic Control levers located on the street side of the Truck Bed press both AXLE SUPPORT levers to EXTEND until the Truck Bed is completely raised.

(2) Check the Level indicator located at the street side rear of the Truck Bed to ensure the truck is level.

g. Open both Source Storage Box doors completely.

h. Lift the Source lever to the RAISE position until the Source Enclosure is completely raised.

WARNING:

Be careful not to raise the Articulating Arm too quickly to be sure the Source Enclosure will not hit anything.

WARNING:

Be careful not to raise the Arm too quickly or the weight of the arm will rock the Mobile VACIS.

i. Lift the ARM lever to the RAISE position until the Articulating Arm is completely raised. Continue to slowly raise

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the Articulating Arm so its weight will not rock the Mobile VACIS.

j. Rotate the Horizontal Telescoping boom as follows:

(1) If deploying on street side, press down the ROTATE lever clockwise (CW) until the Horizontal Telescoping Boom reaches the end stop on the Turntable.

(2) If deploying on curbside, lift up the ROTATE lever counter-clockwise (CCW) until the horizontal telescoping boom reaches the end stop on the Turntable.

WARNING:

Do not attempt to rotate the Horizontal Telescoping Boom past the end stop on the turntable, or the stop and the Boom will be damaged.

WARNING:

Do not stand underneath the Source Enclosure as it rotates.

k. Using the Inclinator determine if the Vertical Telescoping Boom is vertical. If necessary adjust as follows:

(1) If the Vertical Telescoping Boom is angled in, tilt the Horizontal Telescoping Boom upward by lifting the BOOM lever UP until it is level.

(2) If the Vertical Telescoping Boom is angled out, tilt the Horizontal Telescoping Boom downward by lifting the BOOM lever Down until it is level.

NOTE:

If the Vertical Telescoping Boom is not completely vertical when the Source Enclosure is lowered, excess friction may occur within the Vertical Telescoping Boom or the Winch Cable may bind. This may cause the Source Enclosure to Stick then quickly drop as it is being lowered. These problems can cause damage to the hydraulic motors and the Source Enclosure.

1. Press the Source lever to LOWER the Source Enclosure until it is at the desired height.

WARNING:

If you are pressing on the hydraulic control lever for a long time and source enclosure is not lowering, or the source enclosure is dropping quickly in spurts, the horizontal boom may not be level. If it is not, adjust the horizontal boom as needed.

NOTE:

Do not over-spool the Winch cable by continuing to press the SOURCE lever.

m. Lift the BOOM lever to move the Boom OUT until it is extended to its maximum length.

n. Unlock the lock on the Source Locking Pin. Remove the lock from the Source Locking Pin and pull the Source Locking Pin out of the Source Enclosure. Reattach the lock to the Source Enclosure for storage.

o. Ensure there is a minimum ground clearance of 6.5 inches above ground level in the safety exclusion zone.

NOTE:

If a minimum ground clearance of 6.5 inches cannot be obtained verify the Axle Supports are completely extended or move to a different surface.

p. Lower the Detector Tower as follows:

(1) Press the DETECTOR lever to LOWER the Detector Tower until positioned vertically within the Truck Bed frame cutout area.

WARNING:

Monitor the ground clearance of the Source Enclosure when deploying the Detector Tower. As the Detector Tower is lowered the weight of the truck will shift toward the deployed side.

(2) As the Detector Tower approaches the vertical position, move the control lever closer to the neutral position to avoid a sudden stop that may damage the Mobile VACIS or the Detector Tower.

NOTE:

Have an operator verify that the Detector Tower is being lowered properly into the Truck Bed frame cutout area and is not going to hit the Truck Bed. If the Detector Tower is not aligned with the cutout area, raise the Detector Tower completely, ensure the Horizontal Telescoping Boom is rotated completely to the end stop, and then lower the Detector Tower again.

q. Turn off the PTO switch (down position), which is located on the auxiliary switch panel in the cab above the driver's overhead visor.

r. Turn the SYSTEM POWER switch, located on the Shutter Control Panel, to ON. This switch requires a key.

s. Establish the safety exclusion zone as described in Enclosure (5), Paragraph 3.

3. Set up the computer and camera systems as follows:

- a. Ensure the SYSTEM POWER is ON.
- b. Turn on the UPS and verify the printer is on.
- c. Turn on the computer.
- d. Set up the computer monitor.
- e. Set up the keyboard and mouse.
- f. Open the Mobile VACIS software.
- g. Set up the camera monitor.
- h. Position the camera.
- i. View the camera image. IF PERFORMING A MOBILE SCAN (WITH THE MOBILE VACIS VEHICLE MOVING), SKIP TO STEP 5.

4. Set up the Radar Gun for Stationary Scans as follows:

- a. Determine the position of the Radar Gun.
- b. Set up the Radar Gun on the tripod.
- c. Power up the Radar Gun.

5. Complete the Setup Screen as follows:

- a. Measure the source to target distance
- b. Select the operational parameters on the Setup Screen.
- c. Perform all daily inspections and checks per Enclosure (10) and the VACIS Operators Manual.
- d. Optimize the source as follows:
 - (1) Verify the exclusion area is free of personnel.
 - (2) Click the Optimize Source button.
 - (3) Once the source is optimized, the system will normalize the detectors.
 - (4) Look at each circle in the detectors window to ensure that each detector is receiving full radiation.

(5) Close the Detectors window.

6. Perform a Moving Scan of a Single Target as follows:

a. Position the Mobile VACIS as follows:

(1) When the Mobile VACIS is moving forward, position the Mobile VACIS so the front bumper of the Mobile VACIS is lined up with one end of the target on the side the Source Enclosure is deployed

(2) When the Mobile VACIS is moving in reverse, position the Mobile VACIS so the rear bumper of the Mobile VACIS is lined up with one end of the target on the side the Source Enclosure is deployed.

(3) Check the level indicators inside the Cab to verify that the Mobile VACIS is level.

b. Verify the SYSTEM POWER switch on the Shutter Control Panel is turned ON. If it is not, insert the key into the SYSTEM POWER switch and turn it ON. Verify that the SHUTTER CONTROL switch on the Shutter Control Panel is set to AUTO. If it is not, turn the switch to AUTO.

c. Position the Camera on the target's license plate, container number, or other identifying mark.

d. Set the scanning direction in the Mobile VACIS software.

e. Engage the Automatic Speed Control System as follows:

(1) Verify that the Cruise Throttle switch on the dash is set to OFF.

(2) Verify that the Set Speed screen is displayed on the Automatic Speed Control Panel (ASCP). If it is not, press the F4 button on the ASCP to display the Set Speed screen. Press the F2 button to increase the speed until it is set to the desired speed. If necessary, press the F3 button to decrease the speed. Place foot on the Mobile VACIS break. Press the F4 button to display the Actual Speed screen. Press the F1 button to activate the ASCS.

(3) Release the emergency brake. Select the appropriate gear D (Drive) or R (Reverse) on the Gear Box. Wait for the Computer Operator to direct you to drive.

f. Scan a single target as follows:

(1) Verify that the Driver is ready to drive. Verify with the Safety/Traffic Controller or Boundary Monitor that the Safety Exclusion Zone is clear.

(2) Click the Acquire→Acquire!, or the icon on the Main Toolbar or press the F1 key on the keyboard.

(3) Wait for the dialog box to disappear, indicating that the Source Shutter is fully open. Instruct the Driver to drive the Mobile VACIS past the target.

(4) When the target is fully scanned and white space appears, click the stop icon on the Main Toolbar. Tell the Driver when the scan is complete. The Driver will follow the instructions of the Safety/Traffic Controller or Boundary Monitor to know where to stop.

g. Save a scanned image as follows:

(1) If the Save dialog box appears, make sure that you are in the correct folder and that you type the correct file name (YYYY.MM.DD_HH.MM.SS.tif). Click the Save button.

(2) If the Save dialog box does not appear, click the Quicksave icon on the Main Toolbar to save the image to the default folder, or click the Save icon on the Main Toolbar to save an image to a different folder or with a different name.

h. Capture a new Camera Image as follows:

(1) Ensure the image to be replaced is in the Active Window. Press the Ctrl and F11 keys on the keyboard. Save the new image by clicking the Save icon on the Main Toolbar.

(2) If the image was previously saved, a dialog box appears, stating that the file exists and asking if you want to replace the existing file. Click Yes.

(3) If the image has not been saved, save the scanned image with the new video using either Save As or Quicksave.

7. Perform a Moving Scan of Multiple Targets as follows:

a. Position the Mobile VACIS so the front bumper of the Mobile VACIS is lined up with one end of the first target on the side the Source Enclosure is deployed. Check the Level indicators inside the Cab to verify that the Mobile VACIS is level.

b. Ensure the SYSTEM POWER is ON. If it is not, insert the key into the SYSTEM POWER switch and turn it ON. Verify the SHUTTER CONTROL switch on the Shutter Control Panel is set to AUTO. If it is not, turn the switch to AUTO.

NOTE:

Zoom the Camera out to allow for differences in the positions of license plates and container numbers.

c. Position the Camera on the area in which each target's license plate, container number, or other identifying mark is placed.

d. Set the scanning direction in the Mobile VACIS software.

e. Engage the Automatic Speed Control System as follows:

(1) Verify that the Cruise Throttle switch on the dash is set to OFF.

(2) Verify that the Set Speed screen is displayed on the Automatic Speed Control Panel (ASCP). If it is not, press the F4 button on the ASCP to display the Set Speed screen. Press the F2 button to increase the speed until it is set to the desired speed. If necessary, press the F3 button to decrease the speed. Place foot on the Mobile VACIS break. Press the F4 button to display the Actual Speed screen. Press the F1 button to activate the ASCS.

(3) Release the emergency brake. Select the appropriate gear D (Drive) or R (Reverse) on the Gear Box. Wait for the Computer Operator to direct you to drive.

f. Scan a line of targets as follows:

(1) Verify that the Driver is ready to drive. Verify with the Safety/Traffic Controller or Boundary Monitor that the Safety Exclusion Zone is clear.

(2) Click the Acquire→Acquire! or the icon on the Main Toolbar or press the F1 key on the keyboard.

(3) Wait for the dialog box to disappear, indicating that the Source Shutter is fully open. Instruct the Driver to drive the Mobile VACIS past the target.

(4) When the target is fully scanned and white space appears, click the Quicksave icon on the Main Toolbar to begin scanning the next target.

(5) When scanning of all targets in the line is finished, click the stop icon on the Main Toolbar. Tell the Driver when the scan is complete. The Driver will follow the instructions of the Safety/Traffic Controller or Boundary Monitor to know where to stop

g. Save the last scanned image as follows:

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(1) If the Save dialog box appears, make sure that you are in the correct folder and that you type the correct file name (YYYY.MM.DD_HH.MM.SS.tif). Click the Save button.

(2) If the Save dialog box does not appear, click the Quicksave icon on the Main Toolbar to save the image to the default folder, or click the Save icon on the Main Toolbar to save an image to a different folder or with a different name.

h. Capture a new Camera Image as follows:

(1) Ensure the image to be replaced is in the Active Window. Press the Ctrl and F11 keys on the keyboard. Save the new image by clicking the Save icon on the Main Toolbar.

(2) If the image was previously saved, a dialog box appears, stating that the file exists and asking if you want to replace the existing file. Click Yes.

(3) If the image has not been saved, save the scanned image with the new video using either Save As or Quicksave.

8. Perform a Stationary Scan of a Single Target as Follows:

a. Position the target and make sure the cab of the target is past the Detector Tower so the gamma beam will not hit the driver when the Source Shutter is opened. Check the Level Indicators in side the Cab to verify that the Mobile VACIS is level.

b. Verify the SYSTEM POWER switch on the Shutter Control Panel is turned ON. If it is not, insert the key into the SYSTEM POWER switch and turn it ON. Verify that the SHUTTER CONTROL switch on the Shutter Control Panel is set to AUTO. If it is not, turn the switch to AUTO.

c. Position the Camera on the target's license plate, container number, or other identifying mark.

d. Set the scanning direction in the Mobile VACIS software.

(1) Verify that the Driver is ready to drive. Verify with the Safety/Traffic Controller or Boundary Monitor that the Safety Exclusion Zone is clear.

(2) Click the Acquire→Acquire!, or the icon on the Main Toolbar or press the F1 key on the keyboard.

(3) Wait for the dialog box to disappear, indicating that the Source Shutter is fully open. Have the Safety Traffic Controller or Boundary Monitor direct the driver to drive the target slowly past the Mobile VACIS.

(4) When the target is fully scanned and white space appears, click the stop icon on the Main Toolbar.

e. Save a scanned image as follows:

(1) If the Save dialog box appears, make sure that you are in the correct folder and that you type the correct file name (YYYY.MM.DD_HH.MM.SS.tif). Click the Save button.

(2) If the Save dialog box does not appear, click the Quicksave icon on the Main Toolbar to save the image to the default folder, or click the Save icon on the Main Toolbar to save an image to a different folder or with a different name.

f. Capture a new Camera Image as follows:

(1) Ensure the image to be replaced is in the Active Window. Press the Ctrl and F11 keys on the keyboard. Save the new image by clicking the Save icon on the Main Toolbar.

(2) If the image was previously saved, a dialog box appears, stating that the file exists and asking if you want to replace the existing file. Click Yes.

(3) If the image has not been saved, save the scanned image with the new video using either Save As or Quicksave.

9. Change the Setup for a Different Target as follows:

NOTE:

The minimum operational side clearance between the target and the Detector Tower or Source Enclosure is two feet.

a. Change the horizontal parameters as follows:

(1) Move the target or the entire Mobile VACIS. Position large targets closer to the Detector Tower to scan as much of the target as possible

(2) For better resolution or clarity of image move the target closer to the Source Enclosure.

(3) Update the Setup Screen

b. Change the vertical parameters as follows:

(1) Adjust the Source height using the Source lever or adjust the Source height using the Articulating Arm which will also change the Source to Detectors and Source to Target distances.

(2) Optimize the Source and update the Setup Screen.

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10. View, Modify, Examine Images and Copy Files to CD in Accordance with the Operating Manual.

11. Stow the Computer and Camera Systems as Follows:

NOTE:

The Source Enclosure may also be tilted by using the manual Tilt button on the Source Enclosure.

a. Tilt the Internal Source Holder by clicking Preferences and System Setup. With the Mouse, move the Tilt slider bar all the way down. Click Commit Moves, then click OK.

b. Power down the computer and stow the Mouse, Keyboard and Printers

12. Stow the Radar Gun in Accordance with the Following:

a. Disconnect the Radar Gun from the tripod.

b. Stow the Radar Gun Components

13. Stow the Detector Tower and Source Enclosure as Follows:

a. Prepare the dose rate meter to conduct radiation readings.

b. Turn the SYSTEM POWER to OFF by turning the key switch to OFF.

c. Obtain the Source Locking Pin from where it was stowed. Unlock the lock. Remove the lock from the Source Locking Pin. Insert the Source Locking Pin through the Source Enclosure. Insert the lock through the bracket on the Source Enclosure and the hole in the Source Locking Pin and lock padlock.

d. Press the Power Take Off (PTO) switch to the ON (up) position.

e. Ensure the CONTROLS hydraulic lever is correctly set to the deployed side of the truck.

f. Lift the Detector lever to RAISE the Detector Tower until it is parallel to the bed of the truck.

g. Press the BOOM lever to move the Boom IN. Retract the Horizontal Telescoping Boom completely.

h. Ensure the Vertical Telescoping Boom is vertical as follows:

(1) Stand behind the Vertical Telescoping Boom and look to see if it lines up with items behind it, such as a light pole or a fence post.

(2) If the Vertical Telescoping Boom is angled in, tilt the Horizontal Telescoping Boom upward by lifting the lever labeled BOOM to UP until it is level.

(3) If the Vertical Telescoping Boom is angled out, tilt the Horizontal Telescoping Boom downward by lifting the lever labeled BOOM to DOWN until it is level.

i. Raise the Source Enclosure until it is completely raised.

j. Rotate the Horizontal Telescoping Boom. If the Source Enclosure was deployed on the street side, lift the ROTATE lever to move the Boom counter-clockwise (CCW) until the red arrows on the Turntable line up, or until the Boom Rest aligns with the Boom Rest Bracket. If the Source Enclosure was deployed on the curb side, press the ROTATE lever to move the Boom clockwise (CW) until both red arrows on the Turntable line up, or until the Boom Rest aligns with the Boom Rest Bracket.

k. Press the ARM lever to LOWER the Articulating Arm until it is completely lowered and the Source Enclosure is positioned inside the Source Storage Box.

l. Press the BOOM lever to move the Horizontal Telescoping Boom DOWN until it rests on the Boom Rest.

m. Press the Source lever all the way down then quickly release it until the Source Enclosure rests on the rubber mat at the bottom of the Source Storage Box. Verify the Source Enclosure is on the Source Storage Box mat by pushing on the Vertical Telescoping Boom.

n. Close the clam shell doors to the Source Storage Box and lock the Source Storage Box.

o. Conduct radiation readings at the Source Storage Box and verify that all readings are less than 2 mR/hr. If readings are greater than 2 mR/hr, secure the area and contact the RSO for further instructions. Record the results of the radiation survey on the utilization log, Fig 12-1.

p. Go to the AXLE LOCK Hydraulic Control levers located on the street side of the Truck Bed, and lift the levers to RETRACT the Axle Supports until they are fully retracted on both sides.

q. Switch the Power Take Off (PTO) to the OFF position.

13. Take Down the Operational Area.

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NOTE:

At locations where there is a permanent safety exclusion area posted, you will not need to stow boundary material.

a. Remove the cones, tape, rope and signs used to boundary off the Operational Area from pedestrians or vehicular traffic.

b. Remove and stow all miscellaneous loose objects. Place items that belong with the Mobile VACIS in the truck bed storage boxes. Return low-range RADIACS to the control panel area in the driver's cab.

c. Power down the AuraGen if used.

d. Lock the Mobile VACIS truck

e. Verify that Mobile VACIS Utilization Log (Figure 12-1) has been properly completed.

f. Return keys to the key custodian

Procurement, Receipt and Transfer of Radioactive Material

1. Procurement

a. The RSO shall ensure that any Mobile VACIS system is procured from SAIC, and that SAIC performs the initial 40-hour training for operation of the system. As SAIC provides the material, and performs the installation, no shipping will occur through the Navy Supply system. The RSO shall approve the requisition before procurement of Mobile VACIS sources. The RSO shall also ensure that there is a maintenance contract for SAIC to perform all maintenance on the Mobile VACIS including annual shutter checks, leak tests and source change out for a period at least as long as the NRMP issue period (five years.) The RSO shall also ensure that there is an initial training contract in place for Mobile VACIS operator training from SAIC or another entity specifically licensed to conduct the training.

b. When receipt of a sealed source is anticipated, the RSO shall coordinate with SAIC to effect prompt notification and installation of the source.

(1) Coordination shall include the following:

(a) Providing a notification list of designated command personnel to be notified (e.g. security personnel).

(b) Providing a copy of the NRMP to SAIC.

(c) Briefing proper security personnel on identification of the Mobile VACIS package before each expected receipt.

(d) Ensuring the availability of secure, properly posted area for the Mobile VACIS set up.

2. Receipt. The Mobile VACIS will not be transferred to the command from SAIC until SAIC has completed installation, performed verification checks, and performed initial training.

3. Source Exchange or Source Enclosure Removal. Exchange or removal of sealed sources shall only be performed by SAIC or another entity specifically licensed by the NRC to do so. SAIC recommends that the Cs-137 source be exchanged every fifteen years in order ensure optimal system performance.

4. Transfer of Sealed Sources. Transfer sealed sources to authorized activities per the following instructions. The term "transfer" refers to a transfer of custodial responsibility.

a. Receiving activities shall be authorized to receive the type, form, and quantity of radioactive material.

b. Before transfer, obtain a current copy of the NRMP, NRC license, or written certification from the activity receiving the radioactive material that verifies the requirement in paragraph 4.a. above.

c. The Mobile VACIS source shall be prepared and packaged for shipping per enclosure (11).

d. Before shipment of a sealed source, survey the shipping package. Radiation levels shall not exceed 200 mrem/hour on contact or 10 mrem/hour at one meter. If these levels are exceeded, notify the RSO immediately. Complete Receipt and Transfer Survey Record. See Figure 8-1.

e. Apply proper labels to the shipping package based on the following criteria:

(1) Radioactive White I - The radiation level is less than 0.5 mrem/hour at any point on the package surface and does not exceed zero mrem/hour at any point one meter from the package surface (if the measured TI is not greater than 0.05, this value may be considered to be zero).

(2) Radioactive Yellow II Label - The radiation level exceeds 0.5 mrem/hour but does not exceed 50 mrem/hour on the package surface and does not exceed one mrem/hour at any point one meter from the package surface.

(4) Fill in blank labels as follows:

(a) Principal Radioactive Content - Cesium-137

(b) Activity of Contents - number of Bequerels and in parenthesis' the number of curies

(c) Transport Index -per procedure, enclosure (11), paragraph 3.c.

f. Prepare shipping papers. See enclosure (11) for shipping paper entries.

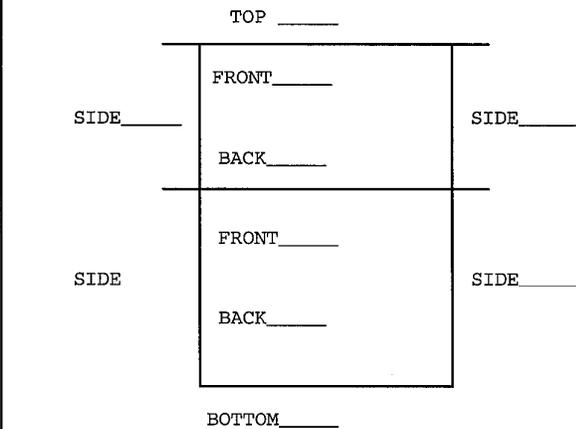
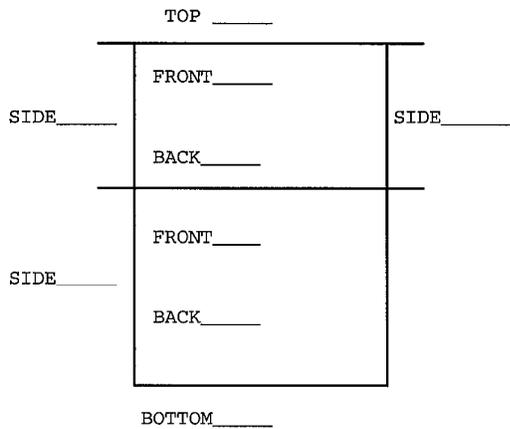
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SEALED SOURCE RECEIPT AND TRANSFER RECORD

SEALED SOURCE: Cs-137 MODEL: MOBILE VACIS SERIAL NO. _____

RECEIPT
DATE: _____ TIME: _____
ACTIVITY: _____ CURIES _____
CONDITION: _____
SURVEY READINGS TIME OF SURVEY _____
AT ONE METER: _____ MREM/HR
ON CONTACT: SEE BELOW ALL READINGS IN MREM/HR

TRANSFER
DATE: _____ TIME: _____
ACTIVITY: _____ CURIES _____
CONDITION: _____
SURVEY READINGS TIME OF SURVEY _____
AT ONE METER: _____ MREM/HR
ON CONTACT: SEE BELOW ALL READINGS IN MREM/HR



LABEL PLATE WILL ALWAYS BE THE FRONT OF THE SHIPPING CONTAINER

RADIAC MODEL NO.: _____
SERIAL NO.: _____ CAL DATE: _____
RSO: _____
MANUFACTURERS LEAK TEST RESULTS: _____ uCi DATE: _____
REVIEWS: RSO: _____ DATE: _____

RADIAC MODEL NO.: _____
SERIAL NO.: _____ CAL DATE: _____
RSO: _____
LAST LEAK TEST RESULTS: _____ uCi DATE: _____
REVIEWS: RSO: _____ DATE: _____

FIGURE 8-1

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Emergency Instructions

1. General

a. A current emergency telephone notification list shall be maintained which lists the following personnel in order of priority for notification with duty and home phone number. Notify all people on this list when an emergency event occurs.

Radiation Safety Officer
Security Officer
Command Duty Officer

b. The emergency notification list shall be prominently posted on the Mobile VACIS control panel.

2. Work-site emergency:

a. Close the shutter to the source/gauge. Lock the primary source/gauge shutter.

b. Turn off the computer, and remove the key from the control panel.

c. Turn off the power to the video camera and the video monitor.

d. Notify the individuals listed in paragraph 1.a.

3. Inability to close the shutter.

WARNING:

Notify the RSO as soon as possible, even if the problem is corrected.

a. Press an E-stop.

b. Turn the SHUTTER CONTROL switch to MAN, then press the SOURCE SHUTTER CLOSED indicator button.

c. Turn the SYSTEM POWER key switch to OFF.

d. If the red warning light is still lit or flashing for more than 10 seconds, the Source Shutter may not be closed. Survey the Source Enclosure to determine if the shutter is closed.

e. Keep all non-essential personnel out of the exclusion area. The operator should remain in the cab and additional personnel assigned to secure the exclusion area.

f. Check the circuit breakers on the distribution panel to verify none of them are tripped. Attempt to reset any tripped

breakers and close the Source Shutter.

g. If unable to close the shutter, maintain or reestablish the restricted area to the maximum extent possible. Standby and brief emergency response personnel of possible radiation hazards.

h. Make emergency notifications per paragraph 1.

4. High Radiation Readings at the Source Storage Box

a. Do not remove the Source Enclosure from the Source Storage Box.

b. Establish an exclusion zone and limit access to unauthorized personnel.

c. Report emergency to RSO.

5. Damage to, or Malfunction of Mobile VACIS Equipment:

a. In the event of an accident to any part of the Mobile VACIS equipment, such as objects falling on the source enclosure:

(1) Shut the gauge shutter, if possible.

(a) Survey the source enclosure to ensure the source is enclosed and the gauge is in the shut position. Lock the shutter.

(b) Notify the RSO.

(c) Terminate operations.

(d) The Mobile VACIS equipment shall not be used again until the malfunction or damage has been corrected and inspected by the RSO.

(2) If the shutter cannot be closed follow the instructions in item 3 above, (including manual operation):

(a) Modify the restricted area as necessary.

(b) Make emergency notifications per paragraph 1.

(3) The RSO and Operator-in-Charge shall review the on-site situation and formulate a recovery plan.

(4) The recovery plan shall maintain personnel radiation exposure As Low As Reasonably Achievable (ALARA). This includes the planning described below, estimating exposure of team members and use of remote handling tools and/or any available shielding to recover the sealed source. Recovery actions should focus on providing shielding over the exposed portion of the source, until appropriately trained personnel can shut the gauge, and provide

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corrective maintenance. If planned exposures exceed 500 mrem, contact NAVSEADDET RASO at (757) 887-4692.

(5) Brief recovery team members thoroughly on the situation, steps of the recovery plan and each individual's duties during the recovery. If possible, conduct a mockup recovery prior to attempting the actual recovery.

6. Barrier violations or exposure to non-monitored personnel. In the event of a barrier violation by unauthorized personnel or exposure to unmonitored personnel:

a. Immediately shut the gauge.

b. Hold the person(s) involved for questioning and investigation.

c. Obtain and record the names, rates and social security numbers of Navy personnel or name, addresses (or badge numbers of Navy employees) of civilian personnel.

d. Record data pertaining to the situation, including:

(1) Distances from the source for all individuals involved.

(2) Estimated time spent at those distances.

(3) Location and identification of objects (such as vehicles) of sufficient density and thickness to reduce radiation levels.

(4) Radiation levels at various distances.

e. Make emergency notification per paragraph 1.

7. Loss of source:

a. In the event a sealed source is lost:

(1) Make emergency notification per paragraph 1.

(2) The operator-in-charge will reconstruct the circumstances since the source was last positively accounted for.

(3) Establish the area of possible source location as a restricted area and check with a RADIAC.

(4) Request additional personnel as needed to guard restricted areas. Instruct personnel in guard duties.

(5) When the source has been located, the RSO, and operator-in-charge shall plan recovery operations. See paragraph

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4 above for further recovery procedures.

8. Lost, damaged, or questionable personnel monitoring devices

a. The following conditions are cause for action:

- (1) Pocket dosimeter discharged off-scale.
- (2) Damage or loss of TLD.

b. For any of the above conditions, stop work and exit the restricted area. Notify the RSO. Return of the individual to work must be approved by the RSO. See enclosure (3) for evaluation of off-scale pocket dosimeters.

9. Leaking or potentially leaking source

a. If the leak test result is 0.005 micro curies or more, the sealed source is considered leaking. Notify the RSO. See enclosure (17) for reporting requirements.

b. For leaking or potentially leaking sealed sources:

- (1) Remove the sealed source from service.
- (2) Conduct a complete investigation of the extent of contamination to include adjacent surfaces within the source enclosure.

c. Contact SAIC to recover the leaking source, and exchange with a non-leaking Cs-137 source. No source change out is to be conducted by the command.

9. Highway accident or accident during mobile VACIS transportation

a. If an accident occurs while transporting the Mobile VACIS over public highways, perform the following actions:

(1) Assign a Mobile VACIS qualified operator to guard the source. Immediately make emergency notifications per paragraph 1.

(2) Use a low-range RADIAC to verify the integrity of the source housing. Manually close the housing shutter per paragraph 3(a)(2) if normal system remote commands fail.

NOTE:

If the nature of the accident or malfunction forbids inspection of the Source shutter state, immediately complete steps (3) through (5) and complete the rest of this procedure. Otherwise, skip to step (6) and complete the rest of this procedure.

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(3) Seal off the entire surrounding area at least 25 to 50 meters from the source location and identify the boundaries with rope or tape or other suitable markers.

(4) Use the low-range RADIAC to measure and mark data points on the ground at which the dose level equals 2.0 mR/hr or less on all sides of the source location.

(5) Relocate the boundary markers as required to correspond with all of the 2.0 mR/hr data points marked in step (3).

WARNING:

Do not allow pedestrians, animals, bystanders or those untrained in accepted radioactive material and hazard handling and safety methods inside the marked off boundary.

(6) Present the following documentation per enclosure (11) (located in the Mobile VACIS document boxes) to responding emergency personnel:

(a) Shipping papers

(b) Most Recent Source Leak Test results

(c) US Department of Transportation (USDOT) Radioactive Materials Certificate #USA/0363/S Rev. 3

(d) Emergency Response Guide (ERG) #164 or emergency response information

**Inspection and Maintenance Program for
Mobile VACIS Equipment**

1. General

a. The Radiation Safety Officer (RSO) is responsible for the inspection and maintenance program for Mobile VACIS equipment.

b. The RSO shall designate the Mobile VACIS operator to perform inspections and routine maintenance. The RSO shall schedule all preventative maintenance and repairs to be performed by SAIC. This includes scheduling of annual leak tests and shutter checks with SAIC.

c. Mobile VACIS equipment shall be inspected prior to the first use of the day (daily) per paragraph 2 below.

d. Mobile VACIS equipment shall be inspected at weekly intervals or prior to first use thereafter by the Mobile VACIS operator-in-charge.

e. Annual reports of inspection performed by SAIC shall be reviewed and signed by the RSO. If there is a defect or noncompliance, then a 10 CFR 21 evaluation shall be recorded by the RSO for applicable UNSAT conditions per enclosure (16).

f. Records of daily inspections and weekly inspection and maintenance shall be retained for three years following the inspection.

2. Daily Inspection of Mobile VACIS Equipment

a. General

(1) Inspect Mobile VACIS equipment before the first use of the day (daily).

(2) Complete daily inspection record for each inspection as follows:

(a) Mark applicable items SAT or UNSAT.

(b) Mark items which are not applicable with N/A in margin next to item.

(c) For items marked UNSAT, remove equipment from service, notify the RSO, and do not use until the condition is corrected.

(d) Record condition of UNSAT items and corrective actions.

(e) The RSO shall certify satisfactory corrective action for all items marked as UNSAT.

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b. Mobile VACIS Equipment

(1) Check the system and equipment in the Control Center for problems or obvious signs of damage.

(2) Check the presence and condition of radiation warning signs.

(3) Perform a radiation survey of the source enclosure. Use enclosure (4).

(4) Verify the following:

(a) The red light on the source enclosure is on while the gauge shutter is open.

(b) The beeper is sounding when the gauge shutter is open.

(c) The red strobe lights above the VACIS vehicle cab are flashing when the gauge shutter is open.

3. Complete Service Procedure for Mobile VACIS:

a. General

(1) This maintenance shall be performed annually as a minimum and more frequently at the discretion of the RSO.

(2) This maintenance shall only be performed by individuals from SAIC or a person specifically licensed by the NRC to perform maintenance on Mobile VACIS equipment.

(3) Documentation of annual maintenance on the Mobile VACIS performed by SAIC or an individual specifically licensed to do so shall be provided to the RSO and maintained on file for three years after each annual inspection.

(4) Annual maintenance shall include, but not necessarily limited to:

(a) A leak test capable of detecting 0.005 microcurie (185 Bq) of removable contamination.

(b) Inspection of the gauge including the shutter and backup battery.

NOTE:

Operators are also responsible for performing the monthly, weekly and daily system checks in accordance with SAIC's Mobile VACIS Operator's Manual.

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Daily Inspection Record

1. Date of Inspection: _____
2. Inspection of Mobile VACIS Equipment
 - (a) Control Center equipment intact. SAT/UNSAT
 - (b) Radiation Warning signs legible and posted. SAT/UNSAT
 - (c) Radiation survey of source enclosure. SAT/UNSAT
 - (d) Source enclosure light on when shutter open. SAT/UNSAT
 - (e) Beeper on when shutter open. SAT/UNSAT
 - (f) Red strobe light on when shutter open. SAT/UNSAT

3. Description of UNSAT Items

4. Date and signature of Mobile VACIS Operator who performed inspection

Date: _____ Signature: _____

5. Corrective Action Taken on UNSAT Items

6. Signature of Operator-in-Charge

Date: _____ Signature: _____

7. Signature of Radiation Safety Officer

Date: _____ Signature: _____

Figure 10-1

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Complete Mobile VACIS Service (Annual) Record

1. Administrative Information

a. Date of Maintenance: _____

b. SAIC Individual(s) performing maintenance:

c. Mobile VACIS Ser. No. _____

2. Maintenance and Service of Mobile VACIS

a. Leak test of source _____

b. Inspection of gauge and backup battery _____

c. Review of ALARA operations _____

3. Description of unsatisfactory items and corrective action or maintenance (List parts that were replaced).

4. Individual Performing Maintenance (Signature and Date):

5. 10 CFR 21 Evaluations and Conclusion

6. Operator-in-Charge (Signature and Date):

7. Radiation Safety Officer (Signature and Date):

Figure 10-2

Transportation of Mobile VACIS with OHMART Model Gauge

1. General.

a. At least two operable low-range RADIACs shall accompany the exposure device.

b. An emergency notification list per paragraph 1, enclosure (9) shall accompany the Mobile VACIS.

c. The Source Locking Pin shall be installed and locked. The Source Enclosure shall be locked in the Source Storage Box during movement.

d. Sufficient support equipment (rope, caution signs and stanchions) to establish a restricted area shall be transported with the exposure device.

2. Transportation in the immediate vicinity of the command.

a. "Immediate vicinity" of the command means within the confines of any US military base where command is authorized to operate. If the source is transported over public highways, follow procedures in paragraph 3 and 4.

b. Upon arrival at the operating site, notify one of the following personnel on arrival in the order indicated:

(1) The Radiation Safety Officer (RSO) or in RSOs' absence the Assistant Radiation Safety Officer (ARSO).

(2) The Officer of the Deck.

(3) The Officer of the Deck at the destination.

3. Transportation outside the immediate vicinity of the command.

a. Transporting radioactive material outside the immediate vicinity of the command is permitted only in the United States, its territories, and possessions. No such movements will be made over foreign soil.

b. Proper shipping papers are required for all shipments outside the immediate vicinity of the command, including transport to a temporary job site in accordance with these instructions.

NOTE:

Emergency contact phone number listed in shipping paper must be manned continuously by a person knowledgeable of that particular shipment while the Mobile VACIS is being transported or stored incident to transportation. A copy of the proper emergency response information must be immediately available at that phone

number. Attach a copy of figure (11-1) to the shipping paper.

c. For the Mobile VACIS with an OHMART Model SH-F3 Gauge enter the following information in the shipping papers.

- (1) DOT proper shipping name. "RADIOACTIVE MATERIAL, TYPE A PACKAGE, SPECIAL FORM, 7, UN 3332, RQ"
- (2) Name of radionuclide. "CESIUM 137"
- (3) Physical and chemical form. "SPECIAL FORM"
- (4) Activity contained in package. "_____ GBq (____ Curies)" (The current activity of the source will be entered in the blank.)
- (5) Category of label applied to package. "RADIOACTIVE - _____" The proper category of label will be determined based on the following.
 - (a) Radioactive White I - The radiation level is less than 0.5 mrem/hour at any point on the package surface and does not exceed zero mrem/hour at any point one meter from the package surface (if the measured TI is not greater than 0.05, this value may be considered to be zero).
 - (b) Radioactive Yellow II - The radiation level exceeds 0.5 mrem/hour but does not exceed 50 mrem/hour at any point on the package surface and does not exceed one mrem/hour at any point one meter from the package surface.
- (6) Transport index assigned to Radioactive _____ label is "_____". The transport index assigned will be the highest radiation level in mrem/hour measured at one meter from the package surface. Round the reading up to the nearest tenth mrem/hour. Do not enter a transport index for Radioactive White I package.
- (7) Package identification number is "DOT 7A, Special Form Certificate Attached".
- (8) Emergency contact (list phone number)
- (9) Standard certification statement signed by the individual preparing the shipment.

"This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation."

d. Before transporting any device from the immediate vicinity of the command, the Operator-in-Charge shall notify the

following persons and provide the information in paragraph 3.e. below.

(1) The Radiation Safety Officer (RSO) or in RSOs' absence the Assistant Radiation Safety Officer (ARSO).

(2) The Officer of the Deck.

(3) The Officer of the Deck at the destination.

e. Information to be provided includes departure time, the means of transportation (to include the vehicle number), the route that will be used, the expected time of arrival, the person to contact if the expected time of arrival is exceeded by more than 30 minutes, and a copy of the proper emergency response information, (see figure 11-1 for a sample of the emergency response information).

f. The personnel listed in paragraph 3.d above shall be notified if any unexpected delay occurs.

g. Additional requirements for mode of transport and arrival at destination are provided in paragraphs 4 and 5 below.

4. Transport.

a. The source-locking pin shall be installed and locked within the locked source storage box prior to transport of the Mobile VACIS.

b. The boom shall be firmly secured by boom clamp prior to transport of the Mobile VACIS.

c. The passenger compartment shall be surveyed and the radiation levels shall not exceed two mrem/hour. Additional shielding shall be used to reduce radiation to this level, if necessary.

d. Hazardous materials, other than the radioactive source, shall not be transported in the Mobile VACIS.

e. Shipping papers shall be readily identifiable and carried on the seat next to the driver or in a pocket on the driver's side door.

5. Arrival at destination outside the immediate vicinity of the command.

a. Monitor the Source Storage Box to ensure that the source is still in a safe condition.

b. Notify the following persons:

(1) The Radiation Safety Officer (RSO) or in RSOs'

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absence the Assistant Radiation Safety Officer (ARSO).

(2) The Officer of the Deck.

(3) The Officer of the Deck at the destination.

EMERGENCY RESPONSE INFORMATION (SAMPLE ONLY)

1. Description of material: RQ, RADIOACTIVE MATERIAL, CS-137, SPECIAL FORM, N.O.S., UN 3332. SOURCE SERIAL NUMBER 2112. MOBILE VACIS WITH AN OHMART MODEL SH-F3 GAUGE, 59.2 GBQ (1.6 CURIES).
2. Immediate hazards to health: PROVIDED THE SOURCE ENCLOSURE IS INTACT THE IMMEDIATE HAZARD IS NONE. IF THE SHIPPING CONTAINER HAS BEEN DAMAGED THE FOLLOWING HAZARDS MAY EXIST: HIGH LEVELS OF RADIATION (5.75 REM/HOUR @ 1 FOOT) IF THE SEALED SOURCE CAPSULE HAS BEEN DAMAGED THERE MAY BE A POTENTIAL FOR RADIOACTIVE CONTAMINATION.
3. Risk of fire or explosion: THERE IS NO RISK OF FIRE OR EXPLOSION.
4. Immediate precautions to be taken in case of accident or incident:
 - a. PERFORM SURVEY OF THE SOURCE ENCLOSURE WITH AN OPERATING RADIATION SURVEY METER, MOVE THE SHIPPING CONTAINER TO A SAFE LOCATION.
 - b. IF A SURVEY METER IS NOT AVAILABLE ESTABLISH A RESTRICTED AREA 25-50 METERS AWAY, INFORM EMERGENCY PERSONNEL THAT THE HIGH RADIATION BOUNDARY IS 8 FEET AWAY.
 - c. CALL EMERGENCY RESPONSE TELEPHONE NUMBER ON THE SHIPPING PAPERS FOR FURTHER ASSISTANCE.
5. Immediate methods for handling fires: COMBAT FIRES AS NECESSARY TO PREVENT FURTHER PROPERTY DAMAGE OR LOSS OF LIFE. REDUCE EXPOSURE BY MINIMIZING TIME IN THE RADIATION AREA IF ONE EXIST.
6. Initial methods for handling spills or leaks in the absence of fire: THIS MATERIAL IS NOT IN A LIQUID STATE.
7. Preliminary first aid: MEDICAL TREATMENT TAKES PRIORITY OVER RADIOLOGICAL CONCERNS. PERFORM FIRST AID AS REQUIRED, IF THE INTEGRITY OF THE SEALED SOURCE IS IN DOUBT RUBBER GLOVES SHOULD BE WORN TO PREVENT THE SPREAD OF POTENTIAL CONTAMINATION.

Mobile VACIS Records

1. Records required by regulations and this instruction, and required retention periods are listed in this enclosure. NAVMED Forms 6470/10 and 6470/11, Records of Occupational Exposure, are maintained by the Medical Department as part of the Radiation Health Program. The RSO is responsible to ensure that these records and reports are made.

2. Radiation Safety Officer and Assistant Radiation Safety Officer Qualification. Records shall consist of letters of appointment and copies of course certificates or a memorandum stating successful completion of RSO training requirements and listing of experience, which meet the requirements. If the RSO is from another command, a copy of the Memorandum of Understanding, with signatures from both the commanding officer of the command possessing the Mobile VACIS, and the commanding officer of the RSO's command must be on file.

Retention: Retain for duration of appointment and one year after the individual transfers.

3. Mobile VACIS Operator Qualification. Record shall consist of a memorandum (See Figure 13-1) signed by the RSO to include verification of formal training from SAIC, written exam scores, satisfactory completion of a field exam. Attach copies of completed written exams to the memorandum.

Retention: Retain for three years and for at least one year after the individual transfers.

4. Refresher Training. Record shall consist of a memorandum which identifies the date of training, duration of training (hrs/subject), individual conducting the training, subjects covered during the training, and individuals who completed the refresher training.

Retention: Retain for three years.

5. Simulated Accident Drill. Record shall consist of a memorandum signed by the individual responsible for the drill. The memorandum shall identify the date of the drill, description of the drill, summary of the critique, and operators present at the critique.

Retention: Retain for three years.

6. Quarterly Inspection of Mobile VACIS Program. Record shall be a completed and signed checklist per instructions of enclosure (14).

Retention: Retain for three years.

7. Annual Inspection Record from SAIC. Annual record of leak

test, shutter check, battery check, and external audit performed by SAIC or individual(s) specifically licensed to do so by the NRC or Agreement States.

Retention: Retain indefinitely.

8. Leak Test Record. Leak test records shall be maintained as specified in enclosure (15).

Retention: Retain for three years after the next required leak test or transfer of the source.

9. Sealed Source Quarterly Inventory. The record shall be maintained as specified in figure 12-2.

Retention: Retain for five years.

10. Sealed Source Utilization Log. A log shall be maintained for each Mobile VACIS which includes the following information:

a. The name(s) of the operator(s) and barrier monitors, and signature of the Mobile VACIS Operator-in-Charge.

b. The make and serial number of RADIAC survey instrument(s) in use.

c. Initials of the operator verifying that the RADIAC survey instrument(s) has or have been source checked prior to initial exposure of the day or shift as appropriate.

d. Radiation levels on the source enclosure prior to start up, and after securing operations.

e. A diagram of the exclusion area and radiation levels on the boundaries during the first operation of the day or shift.

f. The number of scans for the shift.

g. Date of use.

h. Signature and date of the Operator-in-Charge and RSO.

See Figure 12-1 of this enclosure.

Retention: Retain indefinitely.

11. RADIAC Instrument Calibration. A record of each instrument calibration and date shall be maintained.

Retention: Retain for three years after the date of calibration.

12. Inspection and Maintenance of Mobile VACIS Equipment. Records shall be maintained as specified in enclosure (10).

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Retention: Retain for three years.

13. Sealed Source Receipt. The records shall include a copy of documentation identifying the sealed source (leak test), a copy of the bill of lading or manifest for the shipment, the time of receipt and the radiation survey made on receipt of the sealed source. (See Figure 8-1).

Retention: Retain the receipt records during possession of the sealed source and for three years following transfer of the sealed source.

14. Sealed Source Transfer. Records shall include verification that the receiving activity is authorized to receive the material, a copy of documentation identifying the sealed source, a copy of the last leak test result, a copy of the bill of lading or manifest for the shipment, a copy of the acknowledgement of receipt, and a copy of transfer surveys (See Figure 8-1).

Retention: Retain the transfer records for each sealed source for three years after date of transfer.

15. Radiation Surveys. Records shall be made as specified in enclosure (4).

Retention: Retain for three years.

16. Pocket Dosimeter Log. Record shall be maintained as specified in enclosure (3).

Retention: Retain for three years.

17. Record of Occupational Exposure, NAVMED Form 6470/10 and 6470/11. Record is maintained by the RSO.

Retention: Retain indefinitely.

18. Exposure Investigation Report. Complete a report to estimate radiation exposure estimate a dosimetric device is lost, damaged, or destroyed, per enclosure (2) and NAVMED P-5055, par 5-6.

19. Emergency Reports. Reports shall be made as specified in enclosure (17).

Retention: Retain for three years after the date of event.

20. Annual Radiation Protection Program Review. Record shall consist of a memorandum to the Commanding Officer signed by the Radiation Safety Officer. The memorandum shall include:

- a. A copy of the most recent quarterly inspection (Fig 14-1).
- b. Summary of all unusual exposure investigations and

corrective actions.

c. A list of all findings and corrective actions on equipment inspection and maintenance (daily and annual).

d. A list of all audit findings (internal and external) and final corrective action.

e. Any changes in procedures or implementation to improve efficiency or radiation safety.

f. A review of Mobile VACIS operations to ensure that the device is being operated safely and in a manner consistent with ALARA.

g. Documentation that no member of the public received greater than 100 mrem in the previous year or was exposed to greater than 2 mrem/hr.

Retention: Retain for three years.

21. Pocket Dosimeter (PD) response check records. Records of response checks shall be maintained.

Retention: Retain for three years.

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MOBILE VACIS UTILIZATION LOG

DATE _____ SOURCE SERIAL NO. _____ ACTIVITY (CURIES) _____ LEAK TEST DUE _____ / _____ / _____

STORAGE SURVEY REMOVAL _____ MR/HR AFTER USE STORAGE SURVEY _____ MR/HR

RADIAC INSTRUMENTS

NO. EXPOSURES	TOTAL EXPOSURE TIME	OPERATOR	BARRIER MONITORS	MAXIMUM EXPOSURE RATE	APPROXIMATE DISTANCE FROM SOURCE	AREA BARRIER MONITOR	R1	R2	R3	R4	MODEL	SERIAL NUMBER	CALIBRATION DATE	LOCATION OF OPERATION (I.E., STREET/BLDG NUMBER)
_____	_____	_____	_____	_____ mrem/HR	_____ FT.	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____ mrem/HR	_____ FT.	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____ mrem/HR	_____ FT.	_____	_____	_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____ mrem/HR	_____ FT.	_____	_____	_____	_____	_____	_____	_____	_____	_____

RADIATION AREA BARRIER MONITOR

MAXIMUM EXPOSURE RATE _____ mrem/HR
APPROXIMATE DISTANCE FROM SOURCE _____ FT.
R1 _____ INT.
R2 _____ INT.
R3 _____ INT.
R4 _____ INT.

OPERATOR-IN-CHARGE _____ DATE _____
RADIATION SAFETY OFFICER REVIEW _____ DATE _____

COMMAND QUARTERLY PHYSICAL INVENTORY

INVENTORY DATE	RADIOISOTOPE TYPE	CHEM/ PHYS. FORM	ID NUMBER	SOURCE ACTIVITY	LOCATION	CUSTODIAN

PERSON CONDUCTING INVENTORY DATE

RADIATION SAFETY OFFICER DATE

NOTE:

THE FIRST INVENTORY OF THE CALENDAR YEAR
AND WHEN LOCATIONS PERMANENTLY CHANGE COPIES
SHALL BE FORWARDED TO:

- CDO'S NOTE BOOK
- SECURITY FORCE
- MAA OFFICE
- EMERGENCY MANAGEMENT OFFICE
- FIRE DEPARTMENT

FIGURE 12-2

Training Requirements for Radiation Safety

1. The RSO and ARSO shall complete the Radiation Safety Officer Course (S-4J-0016, NAVSEADET RASO, Yorktown) or have equivalent training and experience. Equivalent training and experience shall be evaluated by the Naval Radiation Safety Committee prior to appointment.

2. All operators shall be graduates of SAIC Radiation Awareness Training and SAIC Mobile VACIS Operator's training. Prior to working with the Mobile VACIS, operators shall read Parts 19, 20, and 30 of Title 10, Code of Federal Regulations and this instruction. The operators shall pass a written exam and demonstrate satisfactory operation (field exam) of the equipment to the RSO. A qualification card, Figure 13-1, shall be completed for each operator.

4. Each operator shall have documented experience in 5 Mobile VACIS operations under the supervision of SAIC personnel or the RSO. (Note: This is experience directly operating Mobile VACIS equipment, not barrier monitoring.)

a. Documented experience from a prior command is acceptable. Memorandum on command letterhead signed "By direction" is acceptable.

5. Refresher training (six hours minimum) will be conducted for operators at least annually. The general outline of the refresher training will be:

- a. Accident History
- b. Review of Radiation Fundamentals
- c. Review of Operating Procedures (enclosures 5 through 10)
- d. Review of Personnel Exposure Calculations
- e. Review of Radiation Survey Procedures
- f. Review of Internal Audit Findings
- g. New Developments/Equipment
- h. Written Examination

A passing grade is 80 percent. Personnel who do not achieve a passing grade will be retrained in deficient areas and given additional questions in the deficient areas until a passing grade is achieved.

6. A simulated accident drill will be conducted at least annually. The drill will include practice in typical realistic

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job situations such as recovery from a stuck open shutter and personnel exposure calculations. Drills and critiques can satisfy refresher training requirements (5.a. - 5.d.) above.

NOTE:

All training in the use of exposure devices and equipment and manipulation of the source will be conducted by the RSO, ARSO, or a designated individual of comparable qualification.

7. Barrier Monitors shall receive initial and refresher training per NAVSEA S0420-AA-RAD-010, Section 2.2.4.

Mobile VACIS Operator Qualification Card

Name (Last, First, Middle Initial) Rate/Rank
TLD Issued: _____
School Qualification/Certification Date: _____

I have received a copy of, read and understand 10 CFR Parts 19, 20, 30, and COMNAVREGSWINST 6470.1A, Mobile VACIS Radiation Safety Program. I have read the Naval Radioactive Materials Permit.

Signature of Prospective Mobile VACIS Operator Date

Below to be completed by RSO

Pass written exam (minimum score of 80%). Test score: _____
Oral interview with RSO
 Personnel Exposure Limits and ALARA _____
 Emergency Instructions _____

Perform daily maintenance inspections in accordance with COMNAVREGSWINST 6470.1A, enclosure (10) _____

Perform as Operator-in-Charge in a mock Mobile VACIS Scan using COMNAVREGSWINST 6470.1A, and completing all required records. (May be waived for experienced Mobile VACIS operators) _____

Perform actual exposure under observation (use COMNAVREGSWINST 6470.1A Mobile VACIS operator evaluation, figure 14-2) and complete all required records.

Documented participation in 5 Mobile VACIS scans _____

Signature of RSO Date

FIGURE 13-1

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Internal Inspection and Control

1. General - The RSO shall be responsible to the Commanding Officer for ensuring that NRMP conditions, Navy regulations, NRC regulations, and operating and emergency procedures are complied with, and that qualified operators operate and handle equipment and sources.
2. Quarterly Program Inspection - The RSO shall inspect the radiography safety program each quarter using the Mobile VACIS Program Inspection Checklist, figure 14-1. This inspection should include observation of an actual operation, if an operation is conducted during the quarter. Completed checklists shall be retained on file for three years.
3. Posting of Results - A copy of the most recent RSO inspection or a letter stating where the inspection results are maintained shall be posted at the Mobile VACIS control panel.

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Mobile VACIS Program Inspection Checklist

Inspector Name (Print) _____ Date _____

1. Radiation Safety Program Inspection History

a. Date of Last Inspection

b. List findings from previous inspections in which the corrective action has not been completed. Explain.

Organization and Training

2. Is a training record available which lists RSO and ARSO training and experience to meet the requirements of Enclosure (13)? YES/NO

3. Do training records show each operator:

a. Is a graduate of SAIC Radiation Awareness and SAIC Mobile VACIS Operator? YES/NO

b. Has passed a written exam on local operating procedures? YES/NO

c. Has been qualified by the RSO on operation of local equipment? YES/NO

4. Are records of refresher training maintained and complete per enclosures (12) and (13)? YES/NO

5. Has the radiation health program been inspected at least annually by an outside activity? YES/NO

a. List the date of the last audit.

b. What was the status of corrective actions? (List)

6. Have Mobile VACIS personnel been notified of their exposure for each monitoring period and for the cumulative annual total? YES/NO

FIGURE 14-1

Materials

7. Was any source received during the quarter? YES/NO
- a. If yes, was the activity of this source less than the maximum quantity authorized by the permit when received? YES/NO
- b. If the activity of the source exceeded the maximum activity authorized by the permit,
- (1) Was the source activity on receipt within 20 percent of the maximum? YES/NO
- (2) Was the source activity ordered from the manufacturer equal to or less than the maximum authorized by the permit? YES/NO

List the date of receipt, the source activity when it was shipped from the vendor and the source activity when it was received.

8. Are records of the receipt of sealed Mobile VACIS sources maintained as long as the material is held by the command and for periods of at least three years following transfer of the material? YES/NO
9. Are records of transfer of sealed Mobile VACIS sources maintained for at least three years after such transfers? YES/NO
10. Are sealed sources leak tested at intervals not to exceed twelve months? YES/NO
- a. List the date(s) of the last leak test for the source.
- b. Were leak test results recorded in units of micro curies or dpm and retained three years after the next required leak test or transfer of the source? YES/NO
- c. Were all operations or transfers of each source within twelve months of the date of the last leak test? YES/NO
11. Was a complete and accurate inventory of radiation sources conducted quarterly? List the date of the last inventory and the scheduled date for the next inventory. YES/NO

Last inventory: _____ Next inventory: _____

FIGURE 14-1

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Facilities and Equipment

12. Was Mobile VACIS equipment inspected daily prior-to-use? YES/NO

(Check daily inspection records against source utilization log)
Explain any discrepancies.

a. List any deficiencies noted on the last quarterly inspection and maintenance record for which corrective actions have not been completed. Explain.

b. Were any noted deficiencies repeat items from prior inspections? List and explain.

13. Posting

a. Is a current (1999 or later) NRC Form 3 "Notice to Employees" posted at the Mobile VACIS control panel? YES/NO

b. Is Section 206 of the Energy Reorganization Act of 1974 (See RAD-010, Section 2.4.3) posted at the Mobile VACIS control panel? YES/NO

c. Are copies of 10 CFR 19, 20, 30, the NRMP, and the NRMP application posted or a notice stating where these documents are located? YES/NO

d. Are current operating and emergency procedures posted at the Mobile VACIS control panel? YES/NO

e. Are "Caution - Radioactive Material signs" posted at the entrance to the environmental enclosure? YES/NO

14. Is the OHMART gauge shutter kept locked at all times when not in use? YES/NO

15. Are keys to the Mobile VACIS controlled or secured in a key locker when the vault is not in use? YES/NO

16. Is key security maintained? (Keys are available only to authorized personnel) YES/NO

Operations

17. Do all Mobile VACIS operators personnel wear two (0-200 mrem) Pocket Dosimeters (PDs) in addition to a YES/NO

FIGURE 14-1

TLD while performing Mobile VACIS operations? Compare personnel on utilization logs with PD log entries. Explain any discrepancies.

18. Are the PDs recharged (zeroed) at the start of each shift or operation? YES/NO
19. Are PDs read and exposures recorded daily or at the end of each shift when an exposure device is used? YES/NO
20. Is there a proper radiation response test performed on RADIAC instruments prior to use? YES/NO
21. Are utilization log entries complete and accurate since the last program audit? YES/NO
22. Are radiation survey records complete and accurate? YES/NO
23. Have all RADIACs in use been calibrated within the last six months? YES/NO
24. Are there an adequate number of RADIACs available at temporary job sites? YES/NO
25. Are PDs response checked (calibrated) semiannually? YES/NO

Inspectors Signature _____ Date _____

RSO Review _____ Date _____

FIGURE 14-1

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**Periodic Evaluation
Checklist for Operators (Section of Internal Audit)**

Date/Time_____

Operator_____ Inspector_____

Radioisotope_____ Curies_____ (GBq_____) Serial No._____

Mobile VACIS Device Serial No._____

Survey Meter Model No._____ Serial No._____

Survey Meter Calibration Date_____

- | | |
|---|--------|
| 1. Was the operator wearing proper personnel dosimetry? | YES/NO |
| 2. Was the restricted area posted with "Caution (or Danger) High Radiation Area" signs? | YES/NO |
| 3. Was the restricted area properly controlled to prevent unauthorized entry? | YES/NO |
| 4. Did individuals controlling the restricted area boundary have positive communication with the Operator-in-Charge? | YES/NO |
| 5. Did the operator have and use a calibrated and properly operating RADIAC? | YES/NO |
| 6. Was the equipment inspected prior to use and in satisfactory condition? | YES/NO |
| 7. Did the operator properly survey the shutter after each density scan to include: | |
| a. RADIAC pointed toward environmental enclosure? | YES/NO |
| b. RADIAC on proper scale? | YES/NO |
| 8. Was the restricted area boundary surveyed during the first exposure to ensure the radiation level is less than two mrem in any one hour? | YES/NO |
| 9. Was the utilization log properly completed? | YES/NO |
| 10. Did the operator have sufficient knowledge of safety rules? (Check by oral questions.) | YES/NO |

FIGURE 14-2

Enclosure (14)

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11. Were there any other items of noncompliance not listed above? (If any, explain in remarks.) YES/NO

Remarks: _____

RSO _____

Operator _____

FIGURE 14-2

Leak Test Instructions

1. General Instructions

a. Leak testing of sealed sources shall be performed only by SAIC personnel or personnel holding a specific license pursuant to 10 CFR 30 and 10 CFR 32 or from an Agreement State or Licensing State to perform such activities.

b. The device shall be leak tested prior to initial use and at intervals not to exceed 12 months using techniques capable of detecting 0.005 micro curie (185 Bq) of removable contamination.

c. If a sealed source was received without a current leak test certificate, a leak test shall be conducted prior to use of the source.

2. Leak Test Analysis and Report

a. A leak test report shall be completed for each leak test which includes the following information:

(1) Source serial number and radioisotope.

(2) Date of leak test.

(3) Result of test in microcuries or disintegrations per minute (dpm).

(4) Minimum Detectable Activity (MDA) of test.

(5) Name of person performing leak test.

b. Leak test reports shall be retained on file for inspection.

3. Leaking or Potentially Leaking Source

a. If the leak test result is 0.005 micro curies or more, the sealed source is considered leaking. See enclosure (17) for reporting requirements.

c. For leaking sealed sources:

(1) Remove the sealed source from service.

(2) Conduct a complete investigation of the extent of contamination to include all surfaces of the OHMART gauge.

d. Contact SAIC to arrange for replacement of the OHMART gauge.

**Requirements for Evaluation of
Equipment Defects and Noncompliance**

1. 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.
2. The criteria for determination of the existence of a substantial safety hazard include:
 - a. Exposure of an individual in an unrestricted area to more than 0.5 rem in one calendar year.
 - b. Exposure in excess of 25 rem whole body exposure in a single incident.
 - c. Release of radioactive material, inside or outside of a restricted area, that would require reporting per 10 CFR 20.2202(b)(2).
 - d. 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:
 - (1) OHMART gauge shutter
 - (2) Source enclosure Lock
 - (3) Source enclosure Shielding

Such degradation does not include fair wear and tear which results from normal use.

3. 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 which has been, is being, or will be taken.
 - e. All records shall be maintained in accordance with 10 CFR 21.
4. All defects, deviations and noncompliance which could cause a

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substantial safety hazard shall be reported by OPREP-3 NAVY BLUE REPORT made in accordance with OPNAVINST 3100.6 followed by a written report within fifteen days of the determination to CNO (N45), NAVSEASYSKOM (SEA 04N), NAVSEADET RASO, and the chain of command. NAVSEASYSKOM (SEA 04N) and NAVSEADET RASO will be information addressees to the OPREP report. The report contents shall be in the format of paragraph 21.21(d)(4) of 10 CFR.

Emergency Reporting Requirements

1. OPREP-3 Navy Blue Report. An OPREP-3 Navy Blue Report shall be made in accordance with OPNAVINST 3100.6 Series for the conditions listed below. NAVSEASYSKOM (SEA 04N) and NAVSEADET RASO shall be information addressees to the OPREP-3 Navy Blue Report.

a. Radiation incidents defined in 10 CFR 20.2202 that may have caused or threaten to cause the following:

(1) A total effective dose equivalent exceeding five REMs.

(2) An eye dose equivalent exceeding 15 rem.

(3) A shallow-dose equivalent to the skin or extremities exceeding 50 rem.

b. Theft or loss of radioactive material under circumstances that may result in a substantial hazard to individuals in unrestricted areas that include:

(1) Theft or loss of a Mobile VACIS Cs-137 sealed source.

(2) Exposure of a member of the general public exceeding 500 MREM.

c. Source leak test results that indicate a total Removable activity of 0.005 micro curies or more. The report shall specify the equipment involved, test results, and corrective action.

d. Substantial Safety Hazard. See enclosure (16), Requirements for Evaluation of Equipment Defects and Noncompliance.

2. Written notification/report of overexposures and excessive levels and concentrations of radioactive material exceeding limits. A written report shall be made within 15 days to CNO (N45) with copies to NAVSEASYSKOM (SEA 04N) and NAVSEADET RASO for the conditions listed below. The report shall describe details of the incident or overexposure and planned corrective steps to prevent a recurrence. (Each report will have a separate section that lists the name, address, telephone number, social security number, date of birth, and exposure estimate for each individual exposed.

a. Radiation incident (10 CFR 20.2202) reported by OPREP-3 Navy Blue report per paragraph 1.a. above.

b. Reports of exposures, radiation levels and concentrations of radioactive material exceeding the limits defined in 10 CFR 20.2203 which include doses exceeding the following:

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(1) Occupational exposure of an individual exceeding annual dose limits specified in NAVMED P-5055, Chapter 4.

(2) Dose of a minor exceeding 10 percent of any annual dose limit for adults (e.g. total effective dose equivalent of 500 mrem).

(3) Radiation levels (whether or not actual exposure of individuals is involved) in an unrestricted area that exceeds ten times the limits for an unrestricted area.

3. Notification/written report for Mobile VACIS problems

a. The command shall notify NAVSEADDET RASO by telephone or priority message within one working day of the occurrence of any of the following during Mobile VACIS operations which are not otherwise reported per requirements above:

(1) Boundary violations as follows:

(a) Violations of a radiation area boundary which result in a calculated or measured exposure of two mrem or greater to any individual.

NOTE:

Violations of radiation area boundaries which neither allow unimpeded access to a high radiation area boundary nor result in an actual exposure to personnel of two mrem or greater do not require reporting. However, these events will be documented and retained locally for review by NAVSEADDET RASO on the next RASP inspection. These files may be destroyed after the review.

(2) Inability to shut the OHMART gauge.

(3) Significant violations of procedures during source manipulation such as failure to wear required dosimetry, and failure to immediately close the shutter upon notice that a boundary penetration has occurred.

(4) Actual exposure of an individual in an unrestricted area to greater than two mrem in any one hour.

(5) Potential exposure of an individual in an unrestricted area to greater than two mrem in any one hour as determined by using the observed or calculated exposure rate and duration of exposure, whether or not anyone was actually exposed.

b. Verbal and message reports shall be followed by a written report detailing the problem and shall include actions planned to prevent recurrence. Written reports shall be forwarded to NAVSEADDET RASO within 15 days of the problem occurrence.

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4. Notification Information:

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

Message Address: CNO Washington DC//N45//

b. Commander (SEA 04N), Naval Sea Systems Command, Bldg. 197
Stop 4120, Washington Navy Yard DC 20375-4120

Telephone Number: DSN 326-2414
Commercial (202) 781-2414

Message Address: COMNAVSEASYS COM Washington DC//04N//

c. Officer in Charge, Naval Sea Systems Command Detachment,
Radiological Affairs Support Office, PO Drawer 260, Yorktown, VA
23691-0260

Telephone Number: DSN 953-4692
Commercial (757) 887-4692

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

d. NAVSEASYS COM (SEA 04N) and NAVSEADET RASO shall be
information addressees to any OPREP-3 Navy Blue report.