

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

INSPECTION REPORT

Inspection No. 03012771/2011003
Docket No. 03012771
License No. 08-17447-01
Licensee: Department of Homeland Security,
Customs & Border Protection Bureau
Location: 1300 Pennsylvania Avenue, N.W.
Washington, DC 20229
Inspection Dates: November 21, 2011 – December 16, 2011

Inspector: /RA/ 1/4/2012
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EXECUTIVE SUMMARY

Department of Homeland Security, Customs & Border Protection Bureau
NRC Inspection Report No. 03012771/2011003

An inspection was performed at Custom and Border Protection Bureau's (CBP) Port Huron Michigan, Port of Entry, using NRC Inspection Procedure IP 87124, "Fixed and Portable Gauges." Special emphasis was placed on CBP policies and procedures for performing scans of vehicles where the area to be scanned is immediately adjacent to an occupied cab area (e.g., box trucks).

Overall, the inspection determined that CBP implemented appropriate controls to monitor, protect, and secure licensed radioactive sources; independent radiation survey measurements obtained by the inspector showed that radiation dose rates in locations typically occupied by CBP Officers during VACIS scans were low; and CBP maintained and implemented adequate procedures to protect member of the public during vehicle scans. However, the inspection also identified that vehicle scanning procedures lacked some specificity with respect to scanning cargo areas that were immediately adjacent to an occupied cab, and one self-identified violation of CBP internal procedures resulted in an inadvertent radiation exposure to a member of the public.

The violation of CBP internal procedures involved an October 8, 2011, failure by a CBP Officer to ensure that a scanned area was unoccupied before initiating a scan. This resulted in an inadvertent radiation exposure to a member of the public that was estimated to be less than 0.01 millirem, which is below the NRC public dose limit of 100 mrem. Because the exposure was not intentional and was determined to be below the limit permitted by NRC regulations, this inadvertent radiation exposure event does not represent a violation of NRC requirements.

In response to this incident, the Port Huron Port Chief stated that the following corrective and preventative actions were taken: 1) a dose assessment was performed that determined that the inadvertently exposed individual received a dose that was below the NRC public dose limit; 2) the Officers involved were counseled; and 3) an e-mail was sent to all CBP Port Huron staff and information was included in daily briefings to emphasize the importance of proper communications and procedural adherence.

With regard to procedure quality, the Radiation Safety Officer (RSO) acknowledged that CBP procedural guidance for conducting scans of vehicles lacked some specificity and could be enhanced to provide better guidance for performing scans where the cargo area is immediately adjacent to an occupied cab, performing mobile VACIS scans on inclines, and communicating with vehicle drivers. He stated that the CBP Radiation Safety staff planned to perform a review of scanning procedures in order to upgrade procedures to include more specific guidance.

REPORT DETAILS

An inspection was performed at Custom and Border Protection Bureau's (CBP) Port Huron Michigan, Port of Entry, using NRC Inspection Procedure IP 87124, "Fixed and Portable Gauge." Special emphasis was placed on CBP policies and procedures for performing scans of vehicles where the area to be scanned is immediately adjacent to an occupied cab area (e.g., box trucks).

I. Organization and Scope of the Program

a. Inspection Scope

The inspector reviewed the organization and scope of Custom's and Border Protection Bureau's (CBP) licensed program at the Port Huron Michigan, Point of Entry. Information was gathered through interviews with the Radiation Safety Officer (RSO) and a Chief at CBP Port Huron Michigan, Port of Entry.

b. Observations and Findings

Gary T. McMahan is the Director of CBP Occupational Safety & Health, Steven Tilden is the RSO, and each CBP region has an assigned Health Physicist who is responsible for audits and oversight. The Port Huron Michigan, Port of Entry has a mobile vehicle and cargo inspection system (VACIS) unit and rail VACIS units that are operated routinely. Terry Ruff is a Chief at the site and is the primary point of contact for NRC inspections. The facility is located about 2 hours north east of Detroit, Michigan.

c. Conclusions

No violations of NRC requirements associated with the organization and scope of CBP's licensed program were identified.

II. Routine Inspection Using IP 87124

a. Inspection Scope

The inspector conducted a routine inspection of CBP's Port Huron Michigan, Port of Entry, using NRC Inspection Procedure IP 87124, "Fixed and Portable Gauges." Information was gathered through direct observations of mobile VACIS and rail VACIS scans, interviews with CBP Officers who operate VACIS units, interviews with a CBP Chief and a Supervisor who oversee VACIS operations, and through reviews of records including leak test results, instrument calibration records, source inventory records, and self-assessments.

b. Observations and Findings

Records showed that the CBP Port Huron facility performed appropriate source leak tests, source inventories, instrument calibrations, and self-assessments. Independent radiation survey measurements obtained by the inspector showed that radiation dose

rates in locations typically occupied by CBP Officers during VACIS scans were low (e.g., typically 12 – 20 microR/h) and elevated only when VACIS sources were exposed during vehicle or rail scans. CBP Officers were knowledgeable of methods to minimize radiation exposures through postings, access, controls, and scanning techniques that ensure that members of the public are not directly exposed during vehicle scans. In addition, CBP Officers continuously maintained access controls to the source when the source was in-use and are required to ensure that the source is securely locked-up when the source is not in-use.

During interviews with CBP Officers, the inspector inquired if Officers knew what actions to take if an individual was inadvertently exposed during a VACIS scan. Without exception, all Officers interviewed stated that the scan would be terminated and the incident would be immediately reported to management for review and evaluation. Based on this review, a previous violation of 10 CFR 19.12(a), that was identified during NRC inspection 03012771/2009001, was closed: Failure to provide training to individuals working in a restricted area (regarding the need to terminate an exposure if a stowaway is detected).

c. Conclusions

No violations of NRC requirements were identified. A previous violation of 10 CFR 19.12 identified during NRC inspection 03012771/2009001 was closed.

III. Independent and Confirmatory Measurements

a. Inspection Scope

The inspector performed independent radiation survey measurements of work area dose rates associated with the operation of the mobile and rail VACIS units. The inspector also obtained independent measurements of the mobile VACIS source housing and compared the results to the licensee's measurements in order to confirm the adequacy of the response of the licensee's survey meter. Source exposure rate measurements were then collected with both NRC and licensee survey instruments.

b. Observations and Findings

Survey Instruments Used

Survey Instruments				
Organization	Manufacturer	Model No.	Serial No.	Calibration Date
NRC	Eberline	RO-2	23173G	9/20/2011
CBP	Fluke Victoreen	451P-RYR	1324	3/20/2011

Mobile VACIS Unit Source Activity

CBP Port Huron Mobile VACIS Source Activity	
Original 7/1/2007	0.75 Curies of Cobalt 60
Calculated on 11/21/2011	0.42 Curies of Cobalt 60

Survey/measurement results:

The inspector first performed a radiation survey on a specific location on the exterior of the mobile VACIS source housing using a calibrated NRC – Eberline RO-2 ion chamber, and obtained a measurement of 1.0 - 1.2 milliRoentgen/hour (mR/h) at the chosen location. The inspector then requested a CBP Officer to obtain a measurement at the same location using a CBP calibrated Fluke Victoreen Model 451P-RYR.microR pressurized ion chamber. The CBP Officer measured approximately 1.2 mR/h at the same location. Based on that side-by-side comparison, the inspector concluded that the licensee’s survey instrument was operating properly and the response was within 20% of the NRC instrument,

Exposure Rate Measurements obtained with the Victoreen 451P-RYR	
Background: General Area with Source in Shielded Position	4 – 6 microR/h
Mobile VACIS Controlled Area Perimeter Boundary with Source Exposed	4 – 46 microR/h
Mobile VACIS Unit Control Panel Inside Vehicle with Source Exposed	12 – 20 microR/h average Highest Reading was 30 microR/h
CBP Mobile VACIS Secondary Operator’s Booth with Source Exposed	12 – 20 microR/h average Highest Reading was 20 microR/h

The inspector then requested the CBP Officers to setup a straight-line with a tape measure between the mobile VACIS source and the vertical detector. A ladder was setup at 10 feet from the source housing (i.e., typical scanning distance), and the Victoreen Model 451P-RYR was placed on the ladder in the center of the straight line between the source housing and the detector. The survey instrument was operated in an integrate mode and measurements were taken for 30 seconds at heights of 3.0 and 5.5

feet.

CBP Port Huron Michigan Facility Mobile VACIS Unit Containing 0.42 Curies of Cobalt-60 Integrated Exposure Measurements Made with a Victoreen 451-RYR			
Location	Height	Exposure in 30 Seconds	Average Exposure Per Second
10 feet from Source Housing at the Estimated Center Line of Beam*	5.5 feet	540 microR	18 microR
10 feet from Source Housing at the Estimated Center Line of Beam*	3.0 feet	330 microR	11 microR

*The survey meter was placed on a free standing ladder (i.e., not inside a vehicle which would have added additional shielding)

The inspector also observed CBP Officers performing multiple truck scans with the mobile VACIS unit. CBP Officers maintained truck speeds at less than 5 miles per hour. Using a stop watch, the inspector determined that typical scanning times for large trucks were approximately 15 – 20 seconds each, and that any two foot section of a truck was typically directly scanned for a duration of less than 1 second.

c. Conclusions

Based on a side-by-side comparison of survey instrument responses for exposure rate measurements of the mobile VACIS source housing, the inspector concluded that the licensee's Victoreen 451P-RYR microR pressurized ion chamber survey instrument was operating properly and the response was within 20% of NRC's Eberline RO-2 ion chamber survey instrument.

No violations of NRC requirements were identified.

IV. CBP Scanning Policies and Procedures

a. Inspection Scope

The inspector performed a review of CBP scanning policies and procedures with special emphasis on performing scans of vehicles where the area to be scanned is immediately adjacent to an occupied cab area (e.g., box trucks). Information was gathered through a review of CBP's NRC license No. 08-17447-01, Amendment No. 40, CBP Port Huron, Michigan, Standard Operating Procedure (SOP), Mobile Vehicle and Cargo Inspection System (Mobile VACIS), CBP Mobile VACIS Job Aids, interviews with CBP Officers who operate and oversee VACIS operations, and through direct observations of mobile and rail VACIS scans.

b. Observations and Findings

During the NRC licensing process, CBP submitted a letter dated September 3, 2003, which included the following statement: "Scanning technology is used for the detection of contraband. If people are known to be within [the target scanning area of] vehicles, containers, or objects, a scan is not performed. If during a scan, people are detected, the scan will be terminated." This letter is listed as Condition 28, Item C, of CBP's NRC License No. 08-17447-01. Accordingly, the CBP NRC license prohibits CBP from intentionally including an individual in a vehicle scan (e.g., for convenience to speed up a search), and CBP Officers are also required to immediately stop a scan if people are detected in a scan.

CBP scanning procedures specify that the [occupied] cab of the target vehicle is positioned past the detector tower so the gamma ray beam will not hit the driver when the source shutter is opened. The inspector noted that this guidance was qualitative in nature and only specified positioning the detector tower "past" the driver and did not specify a standard distance.

The inspector also noted that CBP procedures did not provide specific guidance for scanning box trucks where the cargo area is immediately adjacent to the occupied cab. The RSO stated that guidance for scanning box trucks with the mobile VACIS unit is encompassed by existing scanning procedures in that all scan target areas start at the cab area immediately behind the drivers/passengers. Accordingly, every truck with a sleeping cab is scanned in a similar manner to the way a box truck is scanned: if the cab area is not manually inspected, the Officer obtains a verbal declaration that no one is present in the target scan area and then a scan is performed of the cab area immediately behind the drivers/passengers. The RSO asserted that ensuring the safety of vehicle drivers is a routine and integral part of the job for VACIS operators and the RSO expressed confidence that CBP Officers can conduct effective scans while ensuring the safety of the public.

Officers who were interviewed acknowledged that box trucks present a challenge because the scanning target (i.e., cargo area) is immediately adjacent to the occupied cab area. The Officers stated that because the source is aligned with the vertical detector, they can ensure driver safety by confirming through direct observation that the detector tower is physically behind the driver. They also stated that if their view of the detector tower is obstructed, they can use a laser sighting to identify where the radiation beam will scan a vehicle. In addition, if the Officer does not have confidence they can obtain a scan without subjecting the driver to unnecessary radiation, they can manually inspect the box truck. All of the Officers interviewed expressed confidence that they can ensure that drivers are not directly scanned by either precisely targeting the scan or by manually searching the vehicle. With that said, several Officers stated that they believe it would be helpful if scanning procedures contained more specific guidance relative to targeting the gamma beam in situations where the area being scanned is immediately adjacent to an occupied cab.

The inspector reviewed the Sealed Source and Device Registry (SSDR) No. CA0215D107S, for the Mobile VACIS Co-60, "Mobile gauge for inspecting cargo containers and vehicles." The SSDR states that the device uses a lead collimator such that the beam width is 12 inches at 23 feet.

This means that in order to avoid exposing the driver to the direct beam, the CBP Officer must ensure that the center-line of the beam (i.e., center of the detector) is greater than one-half the beam width or 6 inches behind the driver. Because the detector column is wider than the radiation beam, the Officer only has to ensure that the edge of the detector tower is located behind the occupied area of the cab.

The inspector interviewed several CBP Primary and Secondary Mobile VACIS unit operators regarding their knowledge of the operation and use of the Mobile VACIS unit, including methods to scan box trucks. All Officers interviewed were familiar with CBP procedures for operating the VACIS unit. They indicated that procedures prohibit them from intentionally scanning humans or animals; that procedures require them to immediately terminate a scan if a human is detected in the scanning image; and if a human is detected in a scanned image, they are required to immediately stop the scan, investigate the occurrence, and report the incident to CBP management who will in turn report the occurrence to the CBP radiation safety staff for further review. All of the Officers interviewed were aware of methods to minimize their dose and dose to members of the public.

During an interview with the CBP RSO, the RSO acknowledged that CBP procedural guidance for conducting scans of vehicles lacked some specificity and could be enhanced to provide better guidance for performing scans where the cargo area is immediately adjacent to an occupied cab, performing scans on steep inclines, and actions to take if a driver moves in reverse.

c. Conclusions

The CBP is prohibited by NRC License No. 08-17447-01, Condition 28, Item C, from intentionally scanning people.

CBP standard operating procedures for the mobile VACIS contained appropriate guidance to protect members of the public and CBP VACIS operators were familiar with the procedural guidance.

The RSO acknowledged that CBP procedural guidance for conducting mobile VACIS scans of vehicles lacked some specificity and could be enhanced to provide better guidance for performing scans where the cargo area is immediately adjacent to an occupied cab, performing scans on steep inclines, and communications with drivers. He stated that the CBP radiation safety staff planned to perform a review of scanning procedures in order to upgrade procedures and include more specific guidance.

No violations of NRC requirements were identified.

V. October 8, 2011 – Port Huron Inadvertent Exposure Event

a. Inspection Scope

The inspector reviewed a CBP Radiation Survey Report for an inadvertent exposure that occurred on October 8, 2011, at the Port Huron, Michigan, Port of Entry, when an individual who was sleeping in the cab of a tractor trailer was inadvertently exposed during a scan. Information was gathered through interviews with CBP Officers and Supervisors; a review of documents including a Radiation Survey Report of an Inadvertent Exposure U.S. Customs and Border Protection: October 8, 2011, Port Huron, and the SSDR for the mobile VACIS unit; and through independent radiation survey measurements performed by the inspector.

b. Observations and Findings

A CBP Chief at the Port Huron facility stated that a miscommunication occurred between a CBP Officer and a Truck Driver, and the Officer assumed the truck driver was the only occupant in the truck cab, and the driver did not inform the CBP Officer that a co-driver was present in the sleeping area of the truck cab. Subsequently, the truck was scanned starting at the cab area immediately behind the driver. During the review of the scanned image, Officers identified an anomaly and discovered the presence of a second individual. In accordance with procedural guidance, the VACIS operators notified CBP Management, who notified the RSO, who directed a radiation dose assessment for the exposed individual.

At the direction of the CBP Health Physicist, CBP Officers operated the mobile VACIS unit and obtained integrated dose measurements at a distance from the source housing where the co-driver was estimated to have been located. Officers utilized a Fluke Victoreen 451P-RYR survey instrument operating in the integrate mode, and placed it approximately 10 feet from the source housing, and exposed the survey instrument for 30 seconds. The instrument measured 10 microR in 30 seconds. A CBP Health Physicist then took into consideration the width of the individual (25 inches) and the speed of the vehicle (greater than 25 inches per second scan time), and calculated a dose to the exposed individual of 0.33 microR.

The inspector noted that CBP's dose measurement used to estimate the dose to the inadvertently exposed individual was lower than both the NRC measurement documented in Section III above, and a calculation based on a scaled value included in the SSDR for Mobile VACIS Co-60 units (SSDR Report No. CA0215D107S).

Mobile VACIS Unit Exposure Measurement Comparison				
Organization	Exposure Height and Distance	Calculated Co-60 Source Activity in Curies	Exposure Measurement	Reference
CBP	4 feet high 11 feet from source housing	0.43	10 microR in 30 seconds	October 13, 2011, CBP Radiation Survey Report for Inadvertent Exposure at Port Huron on October 8, 2011
NRC	3 feet high 10 feet from source housing	0.42	330 microR in 30 seconds	November 21, 2011, Independent exposure rate measurement performed by NRC Inspector using CBP Victoreen 451P-RYR
Sealed Source and Device Registry	Assume 4 feet high, 12 feet from source housing	Scaled to 0.43 curies	322.5 microR* in 30 seconds (calculated from scaled measurement)	SSDR Report No. CA0215D107S Mobile VACIS Co60

$$*90 \text{ mR/h at 12' x } 0.43 \text{ Curies Co-60 x } \frac{1000 \text{ microR/h}}{\text{mR/h}} \times \frac{1 \text{ hour}}{3,600 \text{ sec/hr}} \times 30 \text{ seconds} = 322.5 \text{ } \mu\text{R in 30 seconds at 12' Curie Co-60}$$

Based on a review of this data, the inspector asked the CBP RSO to review the CBP procedure that was used by the CBP Officers at Port Huron to establish the dose estimate. The RSO acknowledged the inspectors observations and stated that the dose assessment would be re-evaluated. On December 16, 2011, the RSO reported that the dose assessment for the inadvertently exposed individual had been reassessed by placing a survey instrument inside a vehicle and scanning it several times, and that the new dose estimate was less than 0.01 mrem. The inspector noted that the revised dose estimate of 0.01 mrem was less than the 10 CFR 20.1301 Public Dose Limit of 100 mrem.

c. Conclusions

- Customs and Border Protection Port Huron, Michigan, Standard Operating Procedure, Mobile Vehicle and Cargo Inspection Procedure (SOP), step 3.4.3, requires Officers to ensure that a scanned area is unoccupied before initiating a scan by obtaining a verbal declaration from the driver or by visually inspecting potentially occupied areas.

Contrary to this requirement, on October 8, 2011, a CBP Officer failed to ensure that a scanned area was unoccupied before initiating a scan by obtaining a verbal declaration from the driver or by visually inspecting potentially occupied areas. Specifically, a miscommunication occurred between the driver and the CBP Officer, the Officer assumed that the driver was the only occupant of the vehicle, and the Officer initiated a scan of the cab area behind the driver where there was a co-driver who was asleep in the rear of the driver's cab. This resulted in an inadvertent radiation exposure to a member of the public.

The October 8, 2011, inadvertent radiation exposure to a member of the public represents a violation of CBP internal procedures. However, during the licensing process, the procedure was not specifically included as a license commitment and as such, does not represent a violation of NRC requirements. In response to this event, the following corrective and preventative actions were taken: 1) a dose assessment was performed that determined that the inadvertently exposed individual received a dose that was below the NRC public dose limit; 2) the Officers involved were counseled; and 3) an e-mail was sent to all CBP Port Huron staff and information was included in daily briefings to emphasize the importance of proper communications and procedural adherence.

- A potential error was identified in a dose measurement used by the CBP Radiation Safety Group to establish the dose estimate for a member of the public who was inadvertently scanned by the Mobile VACIS Unit on October 8, 2011. In response to the inspector's observation, CBP Health Physics staff reassessed and revised the dose estimate. Both NRC and CBP concluded that the individual received an estimated dose of less than 0.01 mrem which is below the 10 CFR 20.1301 Public Dose Limit of 100 mrem.
- The inspector concluded that an inadvertent radiation exposure event that occurred on October 8, 2011, was not intentional, CBP Officers took appropriate actions to report and investigate the event, the individual who was inadvertently scanned received a dose that was estimated to be less than the public dose limit, and no violations of NRC requirements were identified.

VI. Exit Meeting

On December 16, 2011, the inspector conducted an exit meeting by telephone with Steven Tilden, CBP Radiation Safety Officer, and Terry Ruff, Chief, Port Huron. The inspector summarized the inspection findings and observations. The Radiation Safety Officer acknowledged the inspection findings and affirmed CBP's commitment to compliance with NRC requirements and to conduct licensed activities in a manner that ensures the safety of CBP staff and members of the public.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

#* Terry Ruff, Chief, Port Huron
*Steven Tilden, CBP Radiation Safety Officer
Matthew Stopczynski, CBP Officer
Cheryl Gosselin, CBP Officer
Scott Bosze, CBP Officer
Neasbie Alston, CBP Supervisor
Richard Paddock, CBP Officer
Geoffrey Stoffel, CBP Supervisor

Individual(s) present at entrance meeting

* Individual(s) present at exit meeting conducted by telephone on 12/16/2011

INSPECTION PROCEDURES USED

Inspection Procedure(s) Used: IP 87124, "Fixed and Portable Gauges."

ITEMS OPEN, CLOSED, AND DISCUSSED

Closed: Violation of 10 CFR 19.12(a): Failure to provide training to individuals working in a restricted area (regarding the need to terminate an exposure if a stowaway is detected), identified during inspection 03012771/2009001.

LIST OF DOCUMENTS REVIEWED

- CBP's NRC license no. 08-17447-01
- CBP Port Huron, Michigan, Standard Operating Procedure (SOP), Mobile Vehicle and Cargo Inspection System (Mobile VACIS)
- CBP Mobile VACIS Job Aids.
- Letter dated September 3, 2003, from Gary T. McMahan, Chief, CBP Occupational Safety & Health Branch, to Sattar Lodhi, Ph.D., USNRC (ML032470766)
- Radiation Survey Report [Dose Assessment] for CBP Port Huron Michigan, Port of Entry October 8, 2011, Inadvertent Exposure Event
- Sealed Source and Device Registry No. CA0215D107S, Mobile VACIS Co-60
- Science Applications Incorporated (SAIC) Mobile VACIS Inspection System Frequently Asked Questions

LIST OF ACRONYMS USED

CBP	Customs & Border Protection Bureau
CFR	Code of Federal Regulations
Co-60	Cobalt 60
DHS	Department of Homeland Security
μ	micro (1/1,000,000)
microR	microRoentgen
m	milli (1,000)
mR/h	milliRoentgen per hour
NRC	Nuclear Regulatory Commission
R	Roentgen
RSO	Radiation Safety Officer
SSDR	Sealed Source and Device Registry
SOP	Standard Operating Procedure
VACIS	Vehicle and Cargo Inspection System