

August 29, 2008

Dr. Howard D. Grimes
Vice President for Research
and Dean of the Graduate School
Washington State University
Pullman, WA 99164-1030

SUBJECT: NRC INSPECTION REPORT NO. 50-027/2008-201 AND NOTICE OF VIOLATION

Dear Dr. Grimes:

During the period July 28-31, 2008, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at your Washington State University TRIGA research reactor located in the Nuclear Radiation Center. The enclosed report documents the inspection results, which were discussed on July 31, 2008, with Dr. Donald Wall, Director of the Nuclear Radiation Center and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the NRC's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed activities, and interviewed personnel. Based on the results of this inspection, the NRC has identified a violation of NRC requirements. The violation is cited in the enclosed Notice of Violation (Notice). The circumstances surrounding it are described in detail in the subject inspection report. The violation is of concern because it demonstrates a lack of attention to detail with respect to shipping radioactive materials.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. The NRC will use your response in accordance with its policies to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In accordance with Section 2.390 of Title 10 of the Code of Federal Regulations, "Public inspections, exemptions, requests for withholding," a copy of this letter, its enclosure, and your response will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, please contact Craig Bassett at 404-358-6515.

Sincerely,

/RA Ted Blount/

Michael J. Case, Director
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No.: 50-027
License No.: R-076

Enclosures: 1. Notice of Violation
2. NRC Inspection Report No. 50-027/2008-201
cc w/encl: See next page

Washington State University

Docket No. 50-27

cc:

Director
Division of Radiation Protection
Department of Health
7171 Cleanwater Lane, Bldg #5
P.O. Box 47827
Olympia, WA 98504-7827

Mr. Steven Eckberg, CHP
Director, Radiation Safety Office
Washington State University
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Dr. James Elliston
Chair, Reactor Safeguards Committee
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Mr. Corey Hines
Acting Reactor Supervisor
Nuclear Radiation Center
Washington State University
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Office of the Governor
Executive Policy Division
State Liaisons Officer
P.O. Box 43113
Olympia, WA 98504-3113

Dr. Donald Wall
Director, Nuclear Radiation Center
Washington State University
P.O. Box 641300
Pullman, WA 99164-1300

Test, Research, and Training
Reactor Newsletter
University of Florida
202 Nuclear Sciences Center
Gainesville, FL 32611

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cc w/encl: See next page

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ACCESSION NO.: ML082280174

TEMPLATE #: NRR-106

OFFICE	PRT:RI	PRT:LA	PRT:BC	DPR:OD
NAME	CBassett chb	EBarnhill eeb	JEads jhe	MCase tb for
DATE	8/28/08	8/28/08	8/28/08	8/29/08

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NOTICE OF VIOLATION

Washington State University
Nuclear Radiation Center

Docket No. 50-027
License No. R-076

During an NRC inspection conducted on July 28-31, 2008, a violation of NRC requirements was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," NUREG-1600, the violation is listed below:

10 CFR 71.5(a) requires that each licensee who delivers licensed material to a carrier for transport shall comply with the applicable requirements of the Department of Transportation (DOT) regulations in 49 CFR Parts 107, 171 through 180, and 390 through 397, appropriate to the mode of transport.

1. 49 CFR 172.203(d)(5) requires that the description for a shipment of a Class 7 (radioactive) material must include, on the shipping papers, the transport index assigned to each package in the shipment bearing Radioactive Yellow II or Radioactive Yellow III labels. (49 CFR 173.403 defines Transport Index [TI] as the dimensionless number (rounded up to the next tenth) placed on the label of a package to designate the degree of control to be exercised by the carrier during transportation.)
2. 49 CFR 172.204(a) requires that each person who offers a hazardous material for transportation shall certify that the material is offered for transportation in accordance with this subchapter by printing (manually or mechanically) on the shipping paper containing the required shipping description the certification contained in paragraph (a)(1) of this section or the certification (declaration) containing the language contained in paragraph (a)(2) of this section. 49 CFR 172.204(d)(1) requires that the certifications required by paragraph (a) of this section must be legibly signed by a principal, officer, partner, or employee of the shipper.
3. 49 CFR 172.403(b) requires that the proper label to affix to a package of Class 7 (radioactive) material is based on the radiation level at the surface of the package and the transport index. The label to be applied must be the highest category required for any of the two determining conditions for the package. RADIOACTIVE WHITE-I is the lowest category and RADIOACTIVE YELLOW-III is the highest. 49 CFR 172.403(c) requires that packages of radioactive materials with a TI more than 0 but less than 1 or with a maximum radiation level at any point on the external surface greater than 0.5 millirem per hour (mrem/hr) but less than 50 mrem/hr be labeled with a RADIOACTIVE YELLOW-II label. In addition, radioactive materials packages with a TI more than 1 but less than 10 or with a maximum radiation level at any point on the external surface greater than 50 mrem/hr but less than 200 mrem/hr be labeled with a RADIOACTIVE YELLOW-III label. (As noted above, 49 CFR 173.403 defines TI as the dimensionless number [rounded up to the next tenth] placed on the label of a package to designate the degree of control to be exercised by the carrier during transportation. For nonfissile material packages, the number is the maximum radiation level from the external surface of the package in mrem/hr at one meter.)
4. 49 CFR 173.421(a)(2) requires that a Class 7 (radioactive) material with an activity per package which does not exceed the limited quantity package limits specified in Table 4 of 49 CFR 173.425, and its packaging, are excepted from requirements in this subchapter for specification packaging, labeling, marking (except for the UN identification number marking

requirement described in 49 CFR 173.422(a)), and if not a hazardous substance or hazardous waste, shipping papers, and the requirements of this subpart if the radiation level at any point on the external surface of the package does not exceed 0.5 mrem/hr.

Contrary to the above, during the period from January 2007 to July 2008, the licensee failed to meet the requirements of 10 CFR 71.5(a) in that the licensee failed to comply with the requirements of: 1) 49 CFR 172.203(d)(5) because an incorrect TI was listed on the shipping papers consisting of FedEx Shipper's Declarations of Dangerous Goods of three separate shipments; 2) 49 CFR 172.204(d)(1) because the Bills of Lading containing the Shipper's Declaration/Certification of radioactive material shipped on two separate occasions were not signed by a licensee representative; 3) 49 CFR 172.403(b) because drums of radioactive material shipped on two separate occasions had the incorrect labels attached when compared to the TI listed on the Bills of Lading (the shipping papers); and, 4) 49 CFR 173.421(a)(2) because packages of radioactive material were incorrectly shipped as "Radioactive Material, excepted package-limited quantity of material" on four occasions when the external surface radiation levels exceeded the established limit for such shipments.

This is a Severity Level IV violation (Supplement V).

Pursuant to the provisions of 10 CFR 2.201, Washington State University is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001, with a copy to the responsible inspector, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of the NRC's document system (ADAMS), to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. ADAMS is accessible from the NRC Web site at (the Public Electronic Reading Room) <http://www.nrc.gov/reading-rm/adams.html>. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial

information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days.

Dated at Rockville, Maryland this 29th day of August, 2008.

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No: 50-027

License No: R-076

Report No: 50-027/2008-201

Licensee: Washington State University

Facility: Nuclear Radiation Center

Location: Pullman, WA

Dates: July 28-31, 2008

Inspector: Craig Bassett

Approved by: Johnny H. Eads, Branch Chief
Research and Test Reactors Branch B
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Washington State University
Nuclear Radiation Center
Report No.: 50-027/2008-201

The primary focus of this routine, announced inspection included onsite review of selected aspects of the licensee's Class II research reactor safety program including: organizational structure and staffing, review and audit and design control functions, procedures, radiation protection, environmental protection, and transportation of radioactive materials since the last NRC inspection of these areas. The licensee's safety program was acceptably directed toward the protection of public health and safety. One violation was noted in the area of transportation of radioactive materials.

Organizational Structure and Staffing

- The organizational structure and responsibilities were consistent with Technical Specification Section 6 requirements.

Review and Audit and Design Control Functions

- The review and audit program was generally being conducted acceptably by the Reactor Safeguards Committee.
- The latest changes completed by the licensee were reviewed using the criteria specified in 10 CFR 50.59, determined to be acceptable, and approved by the Reactor Safeguards Committee.

Procedures

- Facility procedural review, revision, control, and implementation satisfied Technical Specification requirements.

Radiation Protection Program

- Surveys were being completed and documented acceptably to permit evaluation of the radiation hazards present.
- Postings met the regulatory requirements specified in 10 CFR Parts 19 and 20.
- Personnel dosimetry was being worn as required and doses were well within the licensee's procedural action levels and NRC's regulatory limits.
- Radiation monitoring equipment was being maintained and calibrated as required.
- Acceptable radiation protection training was being provided to staff personnel.
- The Radiation Protection Program being implemented by the licensee satisfied regulatory requirements.

Effluent and Environmental Monitoring

- Effluent monitoring satisfied license and regulatory requirements.
- Releases were within the specified regulatory and Technical Specification limits.

Transportation of Radioactive Materials

- One violation was noted for failure to comply with the DOT shipping regulations including improperly completing shipping papers and shipping certain radioactive materials under the wrong classification.

REPORT DETAILS

Summary of Plant Status

Washington State University's one megawatt research and test reactor continued to be operated in support of irradiation work for various experiments and organizations, operator training, and surveillance. During the inspection, the reactor was started up, operated, and shut down as required and in accordance with applicable procedures to support these ongoing activities.

1. Organizational Structure and Staffing

a. Inspection Scope (Inspection Procedure [IP] 69001)

The inspector reviewed the following regarding the licensee's organization and staffing to ensure that the requirements of Sections 6.1-6.3 of Technical Specifications (TS), Amendment No. 18, dated April 26, 2002, were being met:

- Staff qualifications
- Management responsibilities
- Washington State University (WSU) Nuclear Radiation Center organizational structure and staffing
- Annual Reports issued by the licensee for reporting periods: July 2006 - June 2007, and July 2007 - June 2008
- WSU Nuclear Radiation Center Administrative Procedure Number (No.) 1, "Responsibilities and Authority of Reactor Operating Staff," (not dated)

b. Observations and Findings

The inspector noted that the WSU Nuclear Radiation Center organizational structure and the responsibilities of the reactor staff had not changed since the last inspection. Nevertheless, during the inspection it was noted that various staff changes had occurred since the last inspection. The previous Reactor Supervisor had taken a job at another facility and had been replaced by another staff member who was designated as the Acting Reactor Supervisor. Other individuals who had held reactor operating licenses had also left the facility to accept jobs at other locations. However, several student assistants had completed the operator training program at the facility. As a result, the current licensed reactor staff consisted of the Facility Director, the Acting Reactor Supervisor, and an Engineering Technician, as well as three student assistants. The Facility Director and the Acting Reactor Supervisor were Senior Reactor Operators (SROs) while the Engineering Technician and the three students were Reactor Operators (ROs). It was also noted that three other students were currently in training to become ROs.

The organizational structure and staffing at the facility were as required by TS. Qualifications of the staff met TS and ANS 15.4, "Standard for the Selection and Training of Personnel for Research Reactors," requirements. Review of records verified that management responsibilities were administered as required by TS and applicable procedures.

c. Conclusions

The organizational structure and functions were consistent with the requirements specified in TS Section 6.

2. Review and Audit and Design Control Functions

a. Inspection Scope (IP 69001)

In order to verify that the licensee had established and conducted reviews and audits as required in TS Sections 6.5.4 and 6.5.5 and to verify compliance with 10 CFR 50.59 regarding design change control, the inspector reviewed selected aspects of:

- Recent facility design changes and/or modifications
- Safety review and audit records for the past two years
- Reactor Safeguards Committee (RSC) meeting minutes for 2006 to the present
- Annual Reports issued by the licensee for reporting periods: July 2006 - June 2007, and July 2007 - June 2008
- RSC Facility Records Quarterly Audits for 2006 to the present documenting reviews of operations records, summary records, and administrative records
- WSU Nuclear Radiation Center Administrative Procedure No. 3, "Approval and Review of Facility Modifications and Special Tests or Experiments," (not dated) which included the following forms:
 - Nuclear Radiation Center Handout No. 10, "Guidelines From 50.59," dated April 1993
 - Nuclear Radiation Center Form No. 7, "Request for Review of Facility Modification," dated September 1991
 - Nuclear Radiation Center Form No. 8, "Appendix A - Evaluation to Determine if the Proposed Modification/Test Involves a Change in Technical Specifications or an Unreviewed Safety Question," dated September 1991
 - Nuclear Radiation Center Form No. 9, "Review of Request for Modification/Test," dated September 1991
 - Nuclear Radiation Center Form No. 10, "Request for Review of a Proposed Modification/Test," dated September 1991
 - Nuclear Radiation Center Form No. 11, "Review of a Proposed Modification/Test," dated September 1991

b. Observations and Findings

(1) Design Change Control

The inspector reviewed the records and observed the changes that had been made at the facility from 2006 to the present. Prior to implementing substantive changes, the licensee was required to submit them to the RSC where they were reviewed and, if determined to be acceptable, approved by the committee. The latest modifications initiated by the licensee involved upgrading and replacing the conductivity monitoring system and upgrading and replacing the Area Radiation Monitoring system. The inspector noted that, prior to initiating the changes, the facility modification procedure was followed and an evaluation of each system was completed as required. The licensee considered the criteria included in 10 CFR 50.59 and concluded that the changes were acceptable under the regulations.

Neither of the changes constituted a safety question or required a change to the TS. A review by the RSC was conducted and the changes were subsequently approved.

(2) Review and Audit Functions

The inspector verified that RSC membership satisfied TS requirements and that the RSC had semiannual meetings as required. Review of the committee meeting minutes indicated that the RSC provided appropriate guidance and direction for reactor operations, and ensured suitable use and oversight of the reactor.

Since the last inspection all required semiannual audits of reactor facility activities and the majority of the reviews of programs, procedures, equipment changes, and proposed tests or experiments, had been completed and documented

(3) Incomplete Reviews

TS Section 6.5.4 requires that the RSC review the Radiation Protection Program annually. Section 6.5.4 also requires that the RSC conduct a biennial review of the Emergency Plan and the Security Plan.

The inspector reviewed the RSC meeting minutes and the records documenting the completion of the various reviews. It was noted that the Radiation Protection Program had not been reviewed in 2006 or 2007. The records indicated that the program was subsequently reviewed in July 2008. It was also noted that the Emergency Plan and the Security Plan were scheduled to be reviewed during the July through September 2007 timeframe. The documentation indicated that the Security Plan was not reviewed until March 2008 and the Emergency Plan was not reviewed until July 2008.

In reviewing the situation further, the inspector noted that the period when the reviews were not completed corresponded to the period of time when there were significant personnel changes occurring at the facility. A new Facility Director had been selected and was in the process of assuming his various responsibilities. Close attention was not given to these specific requirements. The licensee was informed that failure to complete these reviews was a violation of the TS. However, since the reviews were subsequently completed and no changes to the program and plans were made and no problems with the program and plans were noted, it was determined that this failure constitutes a non-repetitive minor violation that is not subject to formal enforcement action and is being treated as a violation of minor significance, consistent with Section IV of the NRC Enforcement Policy.

c. Conclusions

The latest changes completed by the licensee were reviewed using the criteria specified in 10 CFR 50.59, determined to be acceptable, and approved by the RSC. The review and audit program was generally being conducted acceptably by the RSC.

3. Procedures

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify that the licensee was complying with the requirements of TS Sections 6.5.4 and 6.8:

- Selected administrative and standard operating procedures
- Related logs and records documenting procedure implementation
- Records documenting procedure changes and temporary changes
- Administrative controls as outlined in WSU Nuclear Radiation Center Administrative Procedure No. 2, "Approval, Revision, and Review of Standard Operating Procedures," (not dated)

The inspector also observed the use and implementation of procedures by licensee personnel.

b. Observations and Findings

Procedures were available for those tasks and activities specified in the TS. Written changes were reviewed and approved by the RSC as required. The Standard Operating Procedures (SOPs) were reviewed biennially as required by TS Section 6.5.4 with the last review being completed July 21, 2008. The most recent changes to the SOPs were changes to SOPs 7 and 13 which were reviewed and approved by the RSC on September 11, 2007; and changes to SOP 6 which were reviewed and approved by the RSC on July 21, 2008.

Training of personnel on procedures and the applicable changes was acceptable. Through observation of reactor operations and the conduct of radiation surveys, the inspector verified that personnel conducted TS activities in accordance with applicable procedures. Records showed that procedures for potential malfunctions (e.g., radioactive releases, contaminations, and reactor equipment problems) had been developed and were implemented as required.

c. Conclusions

Procedural review, revision, control, and implementation satisfied TS requirements.

4. Radiation Protection Program

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with 10 CFR Parts 19 and 20, TS Sections 3.7, 5.4, and 6.8, and procedural requirements:

- Preventative Maintenance Checklists for 2007 and 2008
- Radiation Monitor Calibration Schedule Forms for 2007 and 2008
- Nuclear Radiation Center dosimetry records for 2006 through April of 2008
- Radiation and contamination survey records documented on the appropriate forms
- Calibration and periodic check records for radiation monitoring instruments documented on the applicable forms

- WSU Nuclear Radiation Center SOP No. 10, "Standard Procedure for Health Physics Surveys," last revised August 25, 2005
- WSU Nuclear Radiation Center SOP No. 17, "Standard Procedure for Checkout and Calibration of the Area Radiation Monitors," last revised February 9, 2006
- WSU Nuclear Radiation Center SOP No. 22, "Standard Procedure for Portable Survey Instrumentation Check and Calibration," last revised December 4, 2003
- WSU Nuclear Radiation Center SOP No. 26, "Standard Procedure for RM-14 Check and Calibration," last revised December 4, 2003
- WSU Nuclear Radiation Center Administrative Procedure, "Radiation Protection Program" dated August 2001 and the ALARA Policy outlined therein
- Washington State University Radiation Protection Program Manual dated March 15, 1994

The inspector also toured the facility to note any changes that may have been made and observed the use of dosimetry and radiation monitoring equipment. Licensee personnel were interviewed and radiological signs and postings were observed as well.

b. Observations and Findings

(1) Surveys

The inspector reviewed selected weekly general area radiation and contamination surveys and semiannual neutron surveys of the Pool Room and the Beam Room from 2006 to the present. The surveys had been completed by licensee personnel as required by WSU Nuclear Radiation Center SOP No. 10. The results were documented on the appropriate forms and evaluated as required and corrective actions were taken when readings or results exceeded set action levels.

During the inspection, the inspector observed as licensee representatives conducted radiation and contamination surveys in various areas of the facility. The inspector also conducted a radiation survey of the Pool Room and the Beam Room and compared the readings detected with those found by the licensee. The results were comparable and no anomalies were noted.

(2) Postings and Notices

The inspector reviewed the postings at the entrances to various controlled areas including the Control Room, the Pool Room, the Beam Room, and various laboratories in the Nuclear Radiation Center. The postings were acceptable and copies of current survey maps posted at the entrances to the areas indicated the radiation and contamination hazards present. Other postings also showed the industrial hygiene hazards present in the areas. The facility's radioactive material storage areas were noted to be properly posted. No unmarked radioactive material was detected in the facility. Copies of current notices to workers required by 10 CFR Part 19 were posted on various bulletin boards throughout the facility including in the stairway leading to the Control Room, in the Reactor Shop area, and in the Conference Room as well.

(3) Dosimetry

The inspector determined that the licensee was provided optically stimulated luminescent (OSL) dosimeters for whole body monitoring of beta and gamma radiation exposure (with an additional component to measure neutron radiation). The licensee was also provided thermoluminescent dosimeter (TLD) finger rings for extremity monitoring. The dosimetry was supplied by the campus Radiation Safety Office and processed by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor (Landauer).

An examination of the OSL and TLD results indicating radiological exposures at the facility for the past two years showed that the highest occupational doses, as well as doses to the public, were within 10 CFR Part 20 limitations. The records showed that the highest annual whole body exposure received by a single individual for 2006 was 120 millirem (mr) deep dose equivalent (DDE). The highest annual extremity exposure for 2006 was 740 mr shallow dose equivalent (SDE) and the highest skin or other shallow dose was 157 mr SDE. The highest annual whole body exposure received by a single person for 2007 was 138 mr DDE. The highest annual extremity exposure for 2007 was 1,320 mr SDE and the highest skin or other shallow dose was 146 mr SDE.

The inspector verified that NRC Form-5 reports had been completed and provided to each employee who had received exposure at the facility during 2006 and 2007.

(4) Radiation Monitoring Equipment

The inspector noted that, in the past, the calibration of portable survey meters, friskers, fixed radiation detectors, and air monitoring instruments was typically completed by licensee personnel. However, the licensee had relinquished control of various monitoring devices to the WSU Radiation Safety Office (RSO) in October 2005. Those instruments were calibrated by the WSU RSO after that date. The records of selected portable survey meters, friskers, fixed radiation detectors, and air monitoring equipment in use at the facility were reviewed. The inspector verified that appropriate calibration records were being maintained by the RSO and the licensee as required. Calibrations were completed according to procedure using NIST traceable calibration sources. Calibration frequency met the requirements established in the applicable manuals and records were being maintained as required.

(5) Radiation Protection Program

The licensee's Radiation Protection Program was established in the WSU Nuclear Radiation Center Administrative Procedure of the same name which was dated August 2001. The program was further explained in a WSU campus document entitled, "WSU Radiation Protection Program Manual," dated March 15, 1994. The program required that all personnel who had unescorted access to work in a radiation area or with radioactive material receive training in radiation protection, policies, procedures, requirements, and facilities prior to entry. As noted previously, the program was being reviewed annually as required.

(6) ALARA Policy

The ALARA Policy was also outlined and established in the WSU Nuclear Radiation Center Administrative Procedure, "Radiation Protection Program." The ALARA program provided guidance for keeping doses as low as reasonably achievable and was consistent with the guidance in 10 CFR Part 20.

(7) Radiation Protection Training

The inspector reviewed documentation of the radiation protection training given to new employees by the WSU Radiation Safety Office entitled, "Radiation Safety Training Course." The content of the course given was found to be acceptable and the training program satisfied the requirements in 10 CFR 19.12. Through a review of selected training records, the inspector verified that licensee personnel had received the training as required.

(8) Facility Tours

The inspector toured the Control Room, Pool Room, Beam Room, and selected support laboratories and offices. Control of radioactive material and control of access to radiation and high radiation areas were acceptable. As noted earlier, the postings and signs for these areas were appropriate.

c. Conclusions

The inspector determined that the Radiation Protection Program being implemented by the licensee satisfied regulatory requirements because: 1) surveys were being completed and documented acceptably; 2) postings met regulatory requirements; 3) personnel dosimetry was being worn as required and doses were well within the NRC's regulatory limits; 4) radiation monitoring equipment was being maintained and calibrated as required; and, 5) acceptable radiation protection training was being provided.

5. Effluent and Environmental Monitoring

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with the requirements of 10 CFR Part 20 and TS Sections 3.7-3.9, 3.12, 5.6, and 6.10:

- Preventative Maintenance Checklists for 2007 and 2008
- Radiation Monitor Calibration Schedule Forms for 2007 and 2008
- WSU Monthly Console Auxiliary Equipment Maintenance Checklist for 2008
- WSU Monthly Reactor Auxiliary Equipment Maintenance Checklist for 2008
- Annual Reports issued by the licensee for reporting periods: July 2006 - June 2007, and July 2007 - June 2008
- Airborne release records documented in the Average Monthly Concentration of Ar-41 Released section of the Reactor Operations Summary Log for the period from 2006 to the present
- Liquid release records documented in the Reactor Operations Summary Log and

calculated on the appropriate forms in the Liquid Waste Tank Release Data Log for the period from 2006 to the present

- WSU Nuclear Radiation Center SOP No. 11, "Standard Procedure for Analysis of Liquid Waste Samples," last revised November 29, 2006
- WSU Nuclear Radiation Center SOP No. 17, "Standard Procedure for Ar-41 Monitor Checkout and Calibration," last revised February 9, 2006
- WSU Nuclear Radiation Center SOP No. 20, "Standard Procedure for Environmental Monitoring," last revised December 4, 2003
- WSU Nuclear Radiation Center SOP No. 21, "Standard Procedure for TLD Environmental Monitoring Program," last revised December 4, 2003
- WSU Nuclear Radiation Center SOP No. 25, "Standard Procedure for Continuous Air Monitor Check and Calibration," last revised December 4, 2003
- WSU Nuclear Radiation Center SOP No. 27, "Standard Procedure for CAM (Continuous Air Monitor) Filter Analysis," last revised September 29, 2005

b. Observation and Findings

The inspector reviewed the calibration records of the area radiation monitoring system, the exhaust gas or stack monitoring system, and the continuous air monitoring system. These systems had been calibrated annually according to procedure. The monthly setpoint verification, alarm check, and operability records for the monitoring equipment were also reviewed. Corrective actions, including recalibration, were completed if the setpoint values were exceeded.

The inspector also reviewed the records documenting liquid and airborne releases to the environment for the past two years. The inspector determined that gaseous release activity continued to be calculated as required by procedure and the results were adequately documented. The releases were determined to be within the 10 CFR Part 20 Appendix B concentrations and TS limits. To demonstrate compliance with the annual dose constraints of 10 CFR 20.1101(d), the licensee used the COMPLY computer code. The highest calculated dose that could be received by a member of the public as a result of gaseous emissions from reactor operations was determined to be 1.8 E-2 millirem per year (mr/yr) for 2006 and 1.1 E-2 mr/yr for 2007. These doses were well below the 10 mr/yr limit set in 10 CFR 20.1101(d).

Liquid release activity was calculated as required and releases were approved by the Reactor Supervisor or an SRO after analysis indicated that they met regulatory requirements for discharge into the sanitary sewer. Through observation of the facility, the inspector did not identify any new potential release paths.

On-site and off-site environmental gamma radiation monitoring was conducted using TLDs in accordance with the applicable procedures. The data indicated that there were no measurable doses above any regulatory limits. These results and those above were acceptably reported in the Reactor Operations Annual Report for 2006-2007 and 2007-2008.

c. Conclusions

Effluent monitoring satisfied license and regulatory requirements and releases were within the specified regulatory and TS limits.

6. Transportation

a. Inspection Scope (IP 86740)

The inspector reviewed the following to verify compliance with procedural requirements for transferring licensed material:

- Records of radioactive material shipments for June 2005 and to the present
- WSU Nuclear Radiation Center SOP No. 30, "Standard Procedure for Off-Site Shipment of Radioactive Material," last revised November 17, 1997
- WSU Nuclear Radiation Center SOP No. 32, "Standard Procedure for Receiving and Opening Packages Containing Licensed Materials," last revised December 4, 2003
- WSU Nuclear Radiation Center SOP No. 33, "Standard Procedure for Handling Iridium Irradiations/Shipment," last revised September 29, 2005

b. Observations and Findings

(1) General Shipping Results

Through records review and discussions with licensee personnel, the inspector determined that the licensee had shipped various types of radioactive material since the previous inspection in this area. The records indicated that the radioisotope types and quantities were calculated and dose rates measured as required. All radioactive material shipment records reviewed by the inspector had been completed in accordance with Department of Transportation and NRC requirements except as noted below.

(2) Inaccurate or Incomplete Licensee Shipping Papers

10 CFR 71.5(a) requires that each licensee who delivers licensed material to a carrier for transport shall comply with the applicable requirements of the Department of Transportation (DOT) regulations in 49 CFR Parts 107, 171 through 180, and 390 through 397, appropriate to the mode of transport.

49 CFR 172.203(d)(5) requires that the description for a shipment of a Class 7 (radioactive) material must include, on the shipping papers, the transport index assigned to each package in the shipment bearing Radioactive Yellow II or Radioactive Yellow III labels. (49 CFR 173.403 defines Transport Index [TI] as the dimensionless number [rounded up to the next tenth] placed on the label of a package to designate the degree of control to be exercised by the carrier during transportation.)

49 CFR 172.204(a) requires that each person who offers a hazardous material for transportation shall certify that the material is offered for transportation in accordance with this subchapter by printing (manually or mechanically) on the shipping paper containing the required shipping description the certification contained in paragraph (a)(1) of this section or the certification (declaration) containing the language contained in paragraph (a)(2) of this section. 49 CFR 172.204(d)(1) requires that the certifications required by paragraph (a) of this

section must be legibly signed by a principal, officer, partner, or employee of the shipper.

49 CFR 172.403(b) requires that the proper label to affix to a package of Class 7 (radioactive) material is based on the radiation level at the surface of the package and the transport index. The label to be applied must be the highest category required for any of the two determining conditions for the package.

RADIOACTIVE WHITE-I is the lowest category and RADIOACTIVE YELLOW-III is the highest. 49 CFR 172.403(c) requires that packages of radioactive materials with a TI more than 0 but less than 1 or with a maximum radiation level at any point on the external surface greater than 0.5 millirem per hour (mrem/hr) but less than 50 mrem/hr be labeled with a RADIOACTIVE YELLOW-II label. In addition, radioactive materials packages with a TI more than 1 but less than 10 or with a maximum radiation level at any point on the external surface greater than 50 mrem/hr but less than 200 mrem/hr be labeled with a RADIOACTIVE YELLOW-III label. (As noted above, 49 CFR 172.403 defines TI as the dimensionless number [rounded up to the next tenth] placed on the label of a package to designate the degree of control to be exercised by the carrier during transportation. For nonfissile material packages, the number is the maximum radiation level from the external surface of the package in mrem/hr at one meter.)

In reviewing the shipping papers prepared by the licensee for the period from January 2007 to the present, the inspector noted certain discrepancies with the shipping papers prepared for various shipments of packaged radioactive material. On March 28, 2007, the licensee prepared three separate shipments of silicon disks to be shipped by FedEx to Kodak Research Labs. The paperwork prepared by the licensee indicated that the TI for one package was 0.8 and the TI for each of the other two packages was 0.9. However, the FedEx Shipper's Declarations of Dangerous Goods (shipping papers) for each of the three packages incorrectly indicated a TI of 0.09. The licensee was informed that this was an apparent violation of 10 CFR 71.5(a) in that the proper TI was not listed in accordance with 49 CFR 172.203(d)(5) (VIO 50-027/2008-201-01).

In reviewing the shipping papers prepared by the licensee for the period noted above, the inspector noted other discrepancies with the shipping papers prepared for separate shipments. On two occasions, the licensee had prepared a shipment consisting of three drums. Each drum contained a tube of iridium silica sand, which had been irradiated. The licensee had prepared a Shipper's Declaration/Certification for each shipment as required. However, on February 1 and February 12, 2007, the declaration/certification had not been signed by a licensee representative (certified shipper) as required. The licensee was informed that this was another example of an apparent violation of 10 CFR 71.5(a) in that none of the staff members who were trained as certified shippers had signed the shipping papers in accordance with 49 CFR 172.204(d)(1) (VIO 50-027/2008-201-01).

A further review of the shipping papers prepared by the licensee for the period from January 2007 to the present indicated other problems. On two occasions, the licensee had again made shipments consisting of three drums, each containing radioactive material. As above, each drum contained a tube of irradiated iridium silica sand. On March 28, 2007, the paperwork prepared by the

licensee indicated that one drum had a TI of 1.2 which would require a RADIOACTIVE YELLOW III label. However, the Bill of Lading (the shipping papers accompanying the shipment) indicated that the drum had a RADIOACTIVE YELLOW II label. On April 16, 2007, the paperwork prepared by the licensee indicated that one drum had a TI of 1.1 which would require a RADIOACTIVE YELLOW III label. However, the Bill of Lading indicated that the drum had a RADIOACTIVE YELLOW II label. The licensee was informed that this was another example of an apparent violation of 71.5(a) in that the proper label apparently was not attached to the drums in accordance with 49 CFR 172.403(b) (VIO 50-027/2008-201-01).

(3) Shipments Inaccurately Designated As Limited Quantity

10 CFR 71.5(a) requires that each licensee who delivers licensed material to a carrier for transport shall comply with the applicable requirements of the Department of Transportation (DOT) regulations in 49 CFR Parts 107, 171 through 180, and 390 through 397, appropriate to the mode of transport.

49 CFR 173.421(a)(2) requires that a Class 7 (radioactive) material with an activity per package which does not exceed the limited quantity package limits specified in Table 4 of 49 CFR 173.425, and its packaging, are excepted from requirements in this subchapter for specification packaging, labeling, marking (except for the UN identification number marking requirement described in 49 CFR 173.422(a)), and if not a hazardous substance or hazardous waste, shipping papers, and the requirements of this subpart if the radiation level at any point on the external surface of the package does not exceed 0.5 mrem/hr.

During the period from January 2007 to the present, the inspector noted that the licensee made several shipments of lexan samples to Battelle Northwest. These samples were generally shipped as limited quantity. However, in reviewing the paperwork prepared by the licensee, the inspector noted problems with four of those shipments. On March 9, 2007, a package was shipped as "Radioactive Material, excepted package – limited quantity of material," and "UN2910" but the package had an external surface radiation level reading of 0.6 mrem/hr. On May 22, 2007, a package was shipped as "Radioactive Material, excepted package – limited quantity of material," and "UN2910" but the package had an external surface radiation level reading of 1.5 mrem/hr. On August 27, 2007, a package was shipped as "Radioactive Material, excepted package – limited quantity of material," and "UN2910" but the package had an external surface radiation level reading of 0.8 mrem/hr. And, on November 8, 2007, a package was shipped as "Radioactive Material, excepted package – limited quantity of material," and "UN2910" but the package had an external surface radiation level reading of 0.7 mrem/hr. The packages had been incorrectly designated as "limited quantity." Also, by incorrectly shipping the packages as "limited quantity" this also meant that the packages did not have the proper labeling, marking, and shipping papers as well.

The licensee was informed that shipping packages of radioactive material with external surface radiation levels in excess of 0.5 mrem/hr as limited quantity was another example of an apparent violation of 10 CFR 71.5(a) requiring compliance with DOT regulations (VIO 50-027/2008-201-01).

c. Conclusions

One apparent violation, with several examples, was noted during the review of radioactive material shipments made by the licensee for failure to ship radioactive material in accordance with the requirements of DOT regulations as required by 10 CFR 71.5(a).

7. Exit Interview

The inspection scope and results were summarized on July 31, 2008, with members of licensee management. The inspector described the areas inspected and discussed in detail the inspection findings. No dissenting comments were received from the licensee.

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

A. Choiniere	Reactor Operator
C. Hines	Acting Reactor Supervisor
K. Marley	Engineering Technician III and Reactor Operator
J. Smith	Reactor Operator
D. Wall	Director, Nuclear Radiation Center

Other Personnel

J. Elliston	Chair, Reactor Safeguards Committee
S. Eckberg	Director, WSU Radiation Safety Office

INSPECTION PROCEDURES USED

IP 69001	Class II Research and Test Reactors
IP 86740	Inspection of Transportation Activities

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-027/2008-201-01	VIO	Failure to ship radioactive material in accordance with DOT regulations as required by 10 CFR 71.5(a).
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Closed

None

PARTIAL LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
DDE	Deep dose equivalent
IP	Inspection Procedure
mrem/hr	millirem per hour
NRC	Nuclear Regulatory Commission
OSL	Optically stimulated luminescent (dosimeter)
RO	Reactor Operator
RSC	Reactor Safeguards Committee
RSO	Radiation Safety Office
SDE	Shallow dose equivalent
SOP	Standard Operating Procedure
SRO	Senior Reactor Operator
TI	Transport Index
TLD	Thermoluminescent dosimeter
TS	Technical Specifications
VIO	Violation

WSU Washington State University