	<b>RMM-700-RSP-04</b> <b>Audit and Inspection of Laboratories</b>	Revision: R02 Date: 2022 Feb 2 Page: 1 of 12
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## 1 PURPOSE

- 1.1 The McMaster University Radiation Safety Program for University Laboratories (RMM 700) establishes requirements for detailed annual audits of safety and compliance in laboratories and areas where radioactive materials are used or stored. This procedure provides specific guidance on fulfilling those requirements.
- 1.2 Detailed audits of safety and compliance which meet the requirements of this procedure shall be implemented in all approved areas, rooms, and enclosures at least annually. The findings shall be reported to the Health Physics Advisory Committee (HPAC).
- 1.3 Health Physics shall conduct inspections of laboratories to assess general safety, compliance, and radiological conditions in laboratories. Basic-Level and Intermediate-Level laboratories should be inspected weekly and shall be inspected at least monthly. High and Containment Level laboratories should be inspected daily and shall be inspected at least weekly. Any exception to this frequency shall be reported to the HPAC. A summary of inspection findings shall be provided to the HPAC at least annually.
- 1.4 Routine “self-audits” of safety and compliance should be implemented by permit holders for all approved areas, rooms, and enclosures. These finding should be used by the permit holder to ensure laboratory compliance with all licenses and permits.

## 2 SCOPE

- 2.1 This procedure applies to all approved areas, rooms, and enclosures where radioactive material is used or stored.

## 3 RELATED DOCUMENTS

- 3.1 RMM 700 McMaster University Radiation Safety Program for University Laboratories
- 3.2 RMM-700-RSP-01 Radiation Safety Procedure: Routine Contamination Monitoring in Laboratories and Work Areas
- 3.3 RMM-700-RSP-02 Radiation Safety Procedure: Purchase and Inventory Controls for Radioactive Materials
- 3.4 Radiation Safety Procedure: Compliance Enforcement
- 3.5 Other current Radiation Safety Procedures. Consult Health Physics for a complete list.

## 4 DEFINITIONS

None

## **5 RESPONSIBILITIES**

5.1 Project Supervisors are responsible for:

- performing regular self-audits as assigned in a manner which is safe and compliant with this procedure
- responding to non-compliance notices in a timely manner and implementing corrective actions in all areas under their control
- maintaining records as specified

5.2 Authorized Radioisotope Users are responsible for:

- assisting in the performance of regular self-audits as assigned in a manner which is safe and compliant with this procedure

5.3 Radiation Surveyors are responsible for:

- auditing laboratories under the direction of the Health Physicist, as a result of the implementation of this procedure
- performing supplemental and regular laboratory inspections to verify general safety, compliance, and radiological conditions in laboratories

5.4 Senior Health Physicist is responsible for:

- reviewing the results of audits and inspections and reporting annually to the HPAC
- ensuring appropriate follow-up to items of non-compliance as specified in Radiation Safety Procedure: Compliance Enforcement

## **6 PROCEDURES**

### **6.1 Detailed Annual Audit of Safety and Compliance in All Approved Areas**

- 6.1.1 If possible, contact the permit holder, lab supervisor, or lab contact to schedule a time and date to conduct the annual audit.
- 6.1.2 Obtain HP-FORM-RSP-00001 Annual Audit of Safety and Compliance Checklist. Completing the permit number, laboratory room number(s), date and performed by sections at the top of the form.
- 6.1.3 Upon entering the area, verify that signs indicating the presence of radioactive materials and that no foodstuffs are to be consumed in the designated area are posted at each entrance.
- emergency contact information should also be posted
- 6.1.4 Once inside the area, ensure that the appropriate signage is present:
- indication of Laboratory Classification (Basic, Intermediate, High, or Containment) posted on the back of the door
  - current HPAC permit listing each laboratory

- spills procedure, both Health Physics Spills Procedure and Laboratory Specific Spills Procedure, for major and minor spills
  - release limits posted near the designated sink
  - poster outlining the Opening of Radioactive Parcels
- 6.1.5 Verify that no foodstuffs are being consumed in the laboratory. Check for evidence of consumption.
- 6.1.6 Fume hoods used for radioactive material work shall be labeled with radiation warning symbols (RWS). Check that the fume hood has been inspected in the past 12 months.
- 6.1.7 Fridges used to store radioactive material shall be labeled and no foodstuffs are to be stored there.
- 6.1.8 Apparatuses such as incubators and centrifuges used for radioactive materials shall also be labeled with RWS where the lab is used for a variety of purposes.
- 6.1.9 Workspaces used for radioactive work should be identified and delineated with appropriately with radioactive tape or RWS labels to identify radiological hazards.  
Work areas shall be lined with an absorbent benchcoat or with yellow epoxy plastic trays and liners when performing wet chemistry.
- 6.1.10 Contamination monitoring records for each workspace, should be up to date.

Inventory and monitoring records shall be cross-checked to ensure that monitoring was performed each week of use since the last inspection.

- 6.1.11 Stock solution shall be stored securely in proper containers, with appropriate shielding, and labeled with RWS, radioisotope, activity, and date.

Ideally, stock solution would be stored, under key-control, in lockable storage boxes. In place of this, steps to ensure that laboratories, or rooms storing radioactive materials, are locked when unoccupied.

Note: Unbound I-125 and I-131 should be stored in a fume hood. Do not store HTO in the fridge.

- 6.1.12 The total amount of each radioisotope shall not exceed the permit limit.

Inventory control documents shall record the usage of aliquots as they are removed from the stock.

Verify the inventory for all current material in the lab:

- stocks
- sealed sources
- samples > 1 EQ

A complete and current list of the sealed sources present should also be available. It should include all sealed sources as well as the calibration sources in counters.

6.1.13 Personnel handling radioactive materials are designated as Nuclear Energy Workers (NEWs) and have completed relevant training courses.

The laboratory list of authorized users should be complete and up to date.

6.1.14 Appropriate personal protective equipment should be available for use. Check that laboratory coats are free of contamination before and after use. Lab coats and gloves must be worn when conducting radioactive work.

6.1.15 Personnel handling radioactive materials are wearing appropriate dosimetry.

6.1.16 Survey instruments and contamination monitoring instruments, for the detection of the isotopes in use in the laboratory, shall be available or immediately accessible. These instruments shall be calibrated at least annually.

6.1.17 Spill kits should be prepared and ready for use.

At a minimum, the spill kit should be composed of universal absorbent material (such as absorbent pads, spill socks, and absorbent pillows), extra disposable gloves, and a waste bag. Personal protective equipment should also be available, such as lab coats.

6.1.18 Waste bins for both radioactive waste and inactive waste should be present. Radioactive waste bins should be properly labeled and not contain any liquids or bare sharps.

Radioactive bins should be used to segregate waste based on half-life or associated hazard. Radioactive waste bins marked for phosphorus-32 (P-32), actinium-225 or -227 (Ac-225, Ac-227), lutetium-177 (Lu-177), iodine-125 (I-125), or other isotopes identified by the Health Physics department must contain only the waste for the designated isotope.

The bin for inactive waste must not contain any radioactivity.

6.1.19 Empty stock vials, pots and containers should be relabeled. RWS-markings, including reference wording, should be removed, or defaced.

6.1.20 Complete a comprehensive survey and contamination check.

## 6.2 **Areas of Improvement – Major and Minor Non-Compliances**

6.2.1 Violations will be classified as major or minor. A list of major and minor non-compliance violations is included in Appendix A. Major and minor designations are also identified on HP-FORM-RSP-00001 Annual Audit of Safety and Compliance Checklist.

6.2.2 Violations should be corrected immediately, if appropriate.

Violations will be counted against the specific room in which they were noted and will be charged against the permit under which that room is listed.

Violations that take place in unposted laboratory spaces will be charged against the permit holder responsible for the research being performed.

Violations noted in common areas (corridors, equipment rooms, etc.), will be charged against the permit under which the radiation worker is listed or under which the radioactive materials were ordered, as appropriate.

- 6.2.3 The form HP-FORM-RSP-00001 Annual Audit of Safety and Compliance Checklist shall be issued to the permit holder, requiring their response to the violations noted.

These responses shall be noted on the form in the section entitled “Response from the Permit Holder” and shall be returned to Health Physics indicating that the permit holder is aware of all violations and has implemented appropriate corrective actions.

- 6.2.4 Submit the completed HP-FORM-RSP-00001 Annual Audit of Safety and Compliance Checklist for approval. All forms shall be approved by the Health Physicist or designate.
- 6.2.5 Upon satisfying the requirements of HP-FORM-RSP-00001 Annual Audit of Safety and Compliance Checklist, a copy of the form is returned to the permit holder indicating the results.

### 6.3 Monthly or Weekly Health Physics Inspections

- 6.3.1 Obtain the HP-FORM-RSP-00002 Monthly Laboratory Inspection Summary Record, and complete the laboratory room number(s), date, and performed by sections of the form.
- 6.3.2 Review the results of the previous inspection for each laboratory including contamination results.
- 6.3.3 Perform a walk-through the laboratory, generally checking for compliance with established radiation safety procedures.
- 6.3.4 Verify that there are no foodstuffs or evidence of consumption.
- 6.3.5 Look for new personnel or a change in personnel. Verify that the list of authorized users has been updated and that new personnel have appropriate training.
- 6.3.6 Verify that personnel are wearing appropriate protective equipment (lab coats, gloves) and appropriate dosimetry (badge, ring), as necessary.
- 6.3.7 Determine whether radiation work has been performed since the last inspection.
- 6.3.8 Cross-check inventory and monitoring records to ensure that monitoring was performed each week of use.
- 6.3.9 Complete the contamination swipes required:
  - general floor area, in and around area of radiation workspace, labelled “1”;
  - counters and area of radiation workspace, labelled “2”;
  - fume hood (if present and used for radioactive work), labelled “3”.
- 6.3.10 Verify the completeness and results of contamination monitoring records.
- 6.3.11 Verify the completeness and accuracy of inventory control records.

- 6.3.12 Check for radioactive waste in waste bins. Arrange for removal.
- 6.3.13 If laboratory users are present address any questions, concerns, or comments that they may have regarding the inspection process or radiation safety.

#### **6.4 Regular Self-Audit Routine**

- 6.4.1 Review the procedure outline in Section 6.1: Detailed Annual Audit of Safety and Compliance in All Approved Areas.
- 6.4.2 Obtain HP-FORM-RSP-00003 Self-Audit Routine Checklist from Health Physics. Complete the permit number, laboratory room number(s), date and performed by sections of the form.
- 6.4.3 Carry out the self-audit for the laboratory.
- 6.4.4 Submit HP-FORM-RSP-00003 Self-Audit Routine Checklist to Health Physics for review and retention.

#### **6.5 Assessing the Results of the Self-Audit**

- 6.5.1 Review the results of HP-FORM-RSP-00003 Self-Audit Routine Checklist.
- 6.5.2 Any area in which the requirements of compliance are not met must be addressed promptly.
- 6.5.3 Review the results with the Project Supervisor or designate.
- 6.5.4 Submit HP-FORM-RSP-00003 Self-Audit Routine Checklist to Health Physics for review and retention.

### **7 RECORDS**

- 7.1 The following completed records are to be retained by the Health Physics until disposal is authorized.
  - Annual Audit of Safety and Compliance Checklist
  - Results and Summary of Annual Laboratory Audit Form
  - Self-Audit Routine Checklist

### **8 EXCEPTIONS**

- 8.1 Exceptions must be reported to the HPAC and approved in writing by the Senior Health Physicist or designate.

### **9 APPENDICES**

- A. Major and Minor Non-Compliance Violations
- B. HP-FORM-RSP-00001 Annual Audit of Safety and Compliance Checklist

- C. HP-FORM-RSP-00002 Weekly/Daily Health Physics Inspections
- D. HP-FORM-RSP-00003 Self-Audit Routine Checklist

## APPENDIX A: Major and Minor Non-Compliance Violations

### Major Non-Compliance Violations

- loss of security for radioactive materials in excess of limits
- eating, drinking, or food storage in radiologically posted laboratory space
- use of radioactive materials by untrained personnel
- use of radioactive materials in an unposted laboratory or room
- radioactive contamination in excess of limits in working areas
- radioactive contamination in excess of limits in any non-working areas
- failure to wear appropriate dosimetry
- failure to perform thyroid screening when required
- radioactive materials in non-radioactive waste containers
- unauthorized receipt, transfer, or shipping of radioactive materials
- loss of radioactive materials
- evidence of unauthorized liquid radioactive waste disposal into laboratory sinks
- persons using radioactive materials while persons or laboratory is under suspension
- unlabeled contaminated laboratory equipment
- failure to wear proper personal protective equipment
- failure to perform and document radioactive contamination surveys
- failure to document inventory and usage
- failure to take appropriate immediate actions in the event of radiological emergencies
- other activities which violate CNSC regulations or provisions of the referenced documents

### Minor Non-Compliance Violations

- evidence of eating or drinking in a radiologically posted room
- loss of security for any amount of radioactivity less than 1 mCi aggregate activity
- presence of radioactive contamination more than twice background in a working area
- survey or contamination meter out of calibration or use of inoperable survey or contamination meter
- incorrect documentation of radioactive materials inventory
- improper waste segregation
- failure to demonstrate proper radiological survey techniques
- poor radiological housekeeping
- improper use of a fume hood, absorbent pads, or bench covers not used in radiological work or storage areas
- failure to post appropriate documentation/signage
- failure to remove or obliterate radiological symbols from empty containers
- failure to report a radiological incident



**APPENDIX B: HP-FORM-RSP-00001 Annual Audit of Safety and Compliance Checklist**

**HP-FORM-RSP-00001 Annual Audit of Safety and Compliance Checklist**

<b>Permit No.:</b>	
<b>Lab Room No(s).:</b>	
<b>Permit Level:</b>	
<b>Performed by:</b>	
<b>Date:</b>	

M = major non-compliance    m = minor non-compliance

Area of Compliance	Completion	Violation Type	Comments
Appropriate signs are present at entrance of the laboratory: <ul style="list-style-type: none"> <li>• Radioactive Materials</li> <li>• No food or drink within laboratory</li> <li>• Emergency contact information</li> </ul>	Complete: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	m	
Appropriate signs are present within the laboratory: <ul style="list-style-type: none"> <li>• CNSC Laboratory Classification and Rules poster</li> <li>• Current HPAC permit listing laboratory</li> <li>• Spills Procedure</li> <li>• CNSC – Opening of Radioactive Parcels</li> </ul>	Complete: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	m	
Up-to-date Documentation: <ul style="list-style-type: none"> <li>• Current laboratory permit</li> <li>• Current list of authorized laboratory users</li> </ul>	Complete: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	m	
No food or beverage consumed in the laboratory: <ul style="list-style-type: none"> <li>• No evidence of consumption in garbage or fridge.</li> </ul>	Complete: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	M	
Fume hoods are properly labelled and have been inspected in the past 12 months.	Complete: <input type="checkbox"/> Not Applicable: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	m	
Fridges are properly labelled.	Complete: <input type="checkbox"/> Not Applicable: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	m	
Apparatuses used for radioactive materials are properly labelled.	Complete: <input type="checkbox"/> Not Applicable: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	m	
Workspaces used for radioactive materials are proper: <ul style="list-style-type: none"> <li>• Identified and delineated with radioactive tape or RWS labels</li> <li>• Use of plastic trays or absorbent material</li> <li>• Appropriate shielding of proper containers</li> </ul>	Complete: <input type="checkbox"/> Not Applicable: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	m	
Contamination monitoring performed for each week of use; records are available, complete, and up to date	Complete: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	M	

<b>Inventory of radioactive material:</b> <ul style="list-style-type: none"> <li>Records of recent purchases</li> <li>Aliquot usage records are available, complete, and up to date</li> <li>Inventory is not exceeding permit limits</li> </ul>	Complete: <input type="checkbox"/> Not Applicable: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	M	
<b>Secure storage of stock solution:</b> <ul style="list-style-type: none"> <li>Containers labelled with radiation warning symbol and relevant information (date, quantity, nuclide) where necessary</li> <li>Labels on empty stock vial, pots, and containers are defaced, removed, or relabeled</li> </ul>	Complete: <input type="checkbox"/> Not Applicable: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	M	
<b>Personnel handling radioactive material are proper:</b> <ul style="list-style-type: none"> <li>Identify as NEWs and have completed appropriate training</li> <li>PPE is available in laboratory</li> </ul>	Complete: <input type="checkbox"/> Not Applicable: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	M	
<b>Personnel handling radioactive materials are wearing appropriate dosimetry.</b>	Complete: <input type="checkbox"/> Not Applicable: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	M	
<b>Survey and contamination monitoring instruments are available or immediately accessible:</b> <ul style="list-style-type: none"> <li>Survey and contamination instruments are recently calibrated</li> </ul>	Complete: <input type="checkbox"/> Not Applicable: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	m	Instrument Types:
<b>Spill kits prepared and are ready for use.</b> <ul style="list-style-type: none"> <li>Minimum requirements are universal absorbent material, such as</li> </ul>	Complete: <input type="checkbox"/> Not Applicable: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	m	
<b>Radioactive and inactive waste bins present:</b> <ul style="list-style-type: none"> <li>Radioactive waste bins are properly labelled</li> <li>Separate liquids or sharps bin</li> <li>P-32 bins only contain P-32 waste</li> <li>No radioactivity in inactive bins</li> </ul>	Complete: <input type="checkbox"/> Not Applicable: <input type="checkbox"/> Incomplete: <input type="checkbox"/>	M	
<b>Contamination Check – Swipes</b>	Acceptable: <input type="checkbox"/> Unacceptable: <input type="checkbox"/>		

**SUMMARY OF VIOLATIONS**

**RESPONSE FROM THE PERMIT HOLDER: (Completed by Permit Holder and returned to Health Physics for Approval)**

Name: \_\_\_\_\_

Date: \_\_\_\_\_


Proposed Corrective Action:

Signature: \_\_\_\_\_

Based on these results, the laboratory rooms listed above have SATISFIED/NOT SATISFIED the requirements of the Annual Audit of Safety and Compliance.

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**APPENDIX C: HP-FORM-RSP-00002 Monthly Laboratory Inspection Summary Report**

	<b>HP-FORM-RSP-00002 Monthly Laboratory Inspection Summary Record</b>	Month/Year	Performed By:
<b>Laboratory</b>			
Building:			
Permit Holder:			
Date:			
Rooms:			
<b>Compliance Items:</b>			
Security; Lockbox			
General Safety			
No Foodstuffs			
User List up-to-date?			
Training?			
Protective Equipment?			
Dosimetry			
Active work performed since last inspection?			
Up-to-date inventory documentation?			
Contamination Monitoring?			
No Radioactivity in Normal Waste Bins			
NC = non-compliance    C = compliance    NA = not applicable    O = not checked    Y = yes    N = no			

**APPENDIX D: HP-FORM-RSP-00003 Self-Audit Routine Checklist**



**HP-FORM-RSP-00003 Routine Self-Audit Checklist**

Health Physics

<b>Permit Number:</b>	<b>Lab room number(s):</b>
<b>Performed By:</b>	<b>Date:</b>

Proc. #	Area of Compliance	
6.1.4	List of authorized users and required permits are current and up-to-date;	<input type="checkbox"/>
6.1.4	Required permits and appropriate signs are present at entrance of the laboratory and/or within the laboratory space;	<input type="checkbox"/>
6.1.5	No consumption, or evidence of consumption, of foodstuffs;	<input type="checkbox"/>
6.1.6 6.1.7 6.1.8 6.1.9	Workspaces and equipment used for radioactive materials properly labeled and identified:	<input type="checkbox"/>
6.1.10	Contamination monitoring is performed at least weekly, and records are maintained;	<input type="checkbox"/>
6.1.11	All radioactive sources and containers of radioactive materials properly labeled (Isotope, Activity and Reference Date), and stored securely in appropriate containers with shielding as required:	<input type="checkbox"/>
6.1.12	Inventory of all radioactive materials within the lab is maintained and accurate including a complete and current list of sealed sources. Work is conducted within the posted permit limits;	<input type="checkbox"/>
6.1.13	Personnel handling radioactive materials are designated as NEWs and have completed appropriate training;	<input type="checkbox"/>
6.1.14 6.1.15	Personnel handling radioactive materials are wearing appropriate dosimetry and protective equipment;	<input type="checkbox"/>
6.1.16	Survey and contamination monitoring instruments available or immediately accessible;	<input type="checkbox"/>
6.1.17	Spill kits prepared and ready for use;	<input type="checkbox"/>
6.1.18	Radioactive and inactive waste bins present and properly used;	<input type="checkbox"/>
6.1.19	Labels on empty stock vial, pots and containers defaced, removed or relabeled;	<input type="checkbox"/>
	If permit changes are required, authorization is granted by the Health Physics Advisory Committee (HPAC);	<input type="checkbox"/>

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_