

# **Operating and Safety Procedure for all Radiation Devices in Rooms 1420, 2407 and 2408, Chemistry, Texas A & M University.**

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## Definitions :

- 1.1 Facilities manager : Individual who holds a permit (sub licensee) with Texas A & M University for the use of radiation producing devices.
- 1.2 Instrument User : An employee of Texas A & M University who has been trained in the use of the radiation producing device.
- 1.3 X-ray instrumentation : radiation producing device.
- 1.4 Non occupational worker : Texas A & M University employee whose duties do not include operation of radiation producing device.
- 1.5 Service personal : Individual who is not an employee of Texas A & M University whose duties include servicing the radiation producing device.
- 1.6 Students : Students of Texas A & M University.
- 1.7 Visitors : Any individual who is not employed by Texas A & M University and is not considered a service personal.
- 1.8 Environmental Health and Safety Department (EHSD). Texas A & M University Department that is responsible for worker Health and Safety.
- 1.9 Radiation Safety Office (RSO) : Division of the EHSD.
- 1.10 ALARA : as low as reasonably allowed.

## Responsibilities of the Instrument User :

- 2.1 All employees, staff and students must comply with the safety practices set forth in this manual.
- 2.2 All employees, staff and students are required to maintain a safe workplace environment.
- 2.3 All employees, staff and students are required to immediately report any unsafe practices that they observe to the facilities manager.
- 2.4 All employees, staff and students must complete the necessary general radiation safety training (conducted by the Environmental Health and Safety Department : EHSD) and specific instrumentation safety training conducted by the facilities manager.

## Responsibilities of the Facilities Manager :

- 2.5 The manager is at all times responsible for the safe use of all radiation producing devices. Specific responsibilities are delineated in the EHSD Radiological Safety Program Manual, part 2 and the Procedure Manual for the Use of Radiation Producing Devices, Section 2.

- 2.6 The manager is responsible for proper and timely documentation of all safety related issues.

#### Regulations

- 2.7 The operation of the instrumentation is regulated by this manual and the appropriate technical manuals for the radiation producing device.
- 2.8 The operation of the facility is regulated by the EHSD as set forth in : Radiological Safety Program Manual and the Procedure Manual for the Use of Radiation Producing Devices.

#### Documentation

- 3.1 Instrument Logbook - The record of day to day operation of the radiation producing device. All appropriate information on usage, calibration, breakage and repair details will be kept in this booklet. All users are required to log their activity in this booklet.
- 3.2 Training Records - These records are maintained by the facilities manager as evidence of participation in safety courses. The facilities manager will ensure that these records are complete and up to date.
- 3.3 Safety Survey Instrumentation Calibration Records - All safety survey instrumentation will be calibrated on a regular basis.
- 3.4 Visitor Registration - visitors who will be in a situation where radiation exposure is possible must register with the facilities manager.
- 3.5 Safety inspection records - a record of all safety inspections will be kept by the facilities manager.

#### User Requirements

- 4.1 All users of x-ray instrumentation will be required to attend general and instrument specific radiation training.
- 4.2 All users will be re-trained in general safety training every five years.
- 4.3 All users must maintain proper respect of all radiation producing devices and will follow ALARA policies.
- 4.4 All users must report and real and suspected radiation exposure immediately to the EHSD, departmental representatives and the facilities manager.
- 4.5 No users are permitted to modify or repair any radiation producing device without authorization of the facilities manager.

#### X-ray Radiation Area

- 5.1. Rooms 1420, 2407 and 2409 are designated as X-ray radiation areas. These area is divided into high, low, very-low and negligible radiation areas.

- High Radiation area

- location - the area beginning at the x-ray tube and extending to the x-ray detector which encompasses the sample .This area is

accessible to only individuals who have completed the required training courses and are considered Instrument Users.

- Low Radiation area  
location – the area encompassed and controlled by the instrument enclosure, between the enclosure doors and the inside work area of the enclosure. This area is accessible only to individuals who have completed the required training courses and are considered Instrument Users.
  
- Very Low Radiation area  
location – the area immediately surrounding the x-ray producing instrument to a radius of two feet. This area is accessible for all Instrument Users, service personal and non-occupational workers who have registered with the facilities manager. Visitors are not allowed in this area.
  
- Negligible radiation area  
location – the remaining area of the room excluding the high, low and very low radiation areas. This area is open to all users and visitors to the facilities.

5.2 All areas are controlled by key (magnetic) locked doors. Only trained instrumental users are allowed access to this area.

5.3 Any violation or entry by unauthorized individuals or unescorted individuals under 18 years of age is prohibited.

5.4 Maintenance, service, construction custodial and non-occupational workers

- Only qualified instrument users are permitted to perform routine and non-routine maintenance on the radiation producing instruments.
- When construction work is performed within the high and low radiation areas then the x-ray instrumentation must be deenergized.
- When construction work is performed within the very low and negligible radiation area then the x-ray instrumentation may be energized if there is no clear and present danger of accidental exposure and workers have been granted permission to enter these areas.
- Custodial services in the high and low radiation areas are allowed if and only if the x-ray instrumentation is deenergized.
- Custodial services performed within the very low and negligible radiation area is allowed and the x-ray instrumentation may be energized if there is no clear and present danger of accidental radiation exposure.
- Radiation surveys must be completed before and after construction and custodial services.

## Radiation Surveys

- 6.1 The radiation survey will include :
  - instrument check of the radiation survey equipment
  - hand held sweep of the high, low, very low and negligible radiation areas.
- 6.2 All radiation areas shall not exceed 1mREM per hour.
- 6.3 The facilities manager will complete and record radiation surveys on a daily basis, excluding weekends and holidays (personal and private).
- 6.4 Radiation surveys will be completed after major and minor instrument service and will be recorded.

## Maximum Permissible Radiation Dose

- 7.1 Occupational instrument users must be employed by Texas A & M University and be 18 years of age or older.
- 7.2 Only occupational instrument users may operate radiation producing devices.
- 7.3 The maximum whole body radiation exposure must not exceed 5 rem/yr
- 7.4 The maximum extremity radiation exposure must not exceed 50 rem/yr
- 7.5 Visitors, custodial, construction and all non occupational workers must not receive radiation doses greater than 0.1 rem/yr
- 7.6 The dose equivalent to an embryo/fetus during pregnancy due to occupational exposure shall not exceed 0.5 rem/yr
- 7.7 As Low As Reasonably Allowed (ALARA) will be emphasized at all times
- 7.8 Warning signs will be posted on entrances and instrumentation to indicate the possible danger to personal and visitors.

## Radiation Safety Inspections

- 8.1 Radiation Safety Inspections will be conducted on a daily basis (excluding weekends and holidays, public and private) and documented in the instrument log.
- 8.2 Instruments that do not pass the radiation safety inspection will be deenergized until the appropriate repairs can be completed.
- 8.3 Instrument Users must perform individual safety inspection before activating instrumentation of performing experiments.
- 8.4 Unsafe conditions must be reported immediately to the facilities manager and all activities on the radiation producing device must cease until the appropriate repairs can be completed.

## Compliance with Posted Safety Rules

- 9.1 All users, visitors, service, maintenance, construction, custodial and non-occupational personal must follow all posted and implied safety rules for all radiation producing devices, without exception

- 9.2 The facilities manager is responsible for assuring that the radiation producing equipment is maintained in safe condition and that all safety rules are complied with.
- 9.3 Infraction of the safety rules will result in suspension of service.

#### Posted Safety Rules

- 10.1 Instrument Users are not permitted to repair or modify radiation producing devices.
- 10.2 Instrument Users are not permitted to undertake unauthorized experiments.
- only experiments sanctioned by an authorized principle investigators are allowed.
  - Unauthorized experimentation will result in suspension of service.
- 10.3 Instrument Users must immediately report damage to instrumentation to the facilities manager.
- 10.4 Instrument Users must refuse to use damaged instrumentation.
- 10.5 A list of qualified Instrument Users is maintained by the facilities manager.
- 10.6 Individuals who are not specifically on the official users list for each radiation producing device are not allowed access to high radiation areas.
- 10.7 No Instrument User may disable safety interlock devices.
- 10.8 In case of accidental radiation exposure, all instrumentation, including those instruments not involved with the accident, must be deenergized and facility closed until safety inspections have been completed.

#### Emergency Procedures

##### Known or Suspected overexposure

- 11.1 Users who have known or suspected overexposure to x-ray radiation must :
- cease work
  - deenergize instrumentation and remove transformer key
  - post appropriate warning signs
  - contact the facilities manager and radiation safety
  - leave the facility and seek medical help
- 11.2 Users must record in detail their movements before and after the known or suspected overexposure.
- 11.3 The facilities manager is responsible for compiling and submission of the appropriate documentation to the EHSD.