Template Radiation Protection Program

Guidance for Using this Sample X-Ray Radiation Protection Program:

This example X-Ray Radiation Protection Program (RPP) has been developed for users of X-Ray Tube based Thermo Scientific Portable Analytical Instruments, Inc. XRF analyzers (i.e., the Model XL2, XL3t, & XL5 series Analyzers from Thermo Fisher Scientific) in the United States and its Territories. The guide incorporates the most common requirements found from state to state as well as some italicized sections that a company may wish to include voluntarily to meet additional standards or certain regulations in specific jurisdictions. The most common requirements are in normal text, requirements that might be considered optional in some jurisdictions are in italics. Included at the end of the RPP are Appendices which contain examples of forms that are referred to throughout the RPP and may be altered to better compliment your RPP.

<Company Name>

<Address>

**X-Ray Radiation Protection Program**

1. Purpose
   1. The purpose of this Radiation Protection Program (RPP) is to keep radiation exposures to workers using a Thermo Scientific Portable Analytical Instruments, Inc. XRF Analyzer (or analyzer) at <Company Name> to levels that are as low as reasonably achievable (ALARA), and
   2. Ensure that use of the analyzer(s) is in compliance with all applicable State and Federal regulations.
2. Scope
   1. This RPP applies to any use of x-ray tube-based Thermo Scientific Portable Analytical Instruments, Inc. XRF Analyzers at <Company Name>, *< Facility Name*>
3. Responsibilities
   1. <Individual in charge> shall be designated as the individual in charge of the RPP. <Individual in charge> will be responsible for maintaining and implementing the RPP which will minimize the risks associated with using portable X-Ray producing machines and which will ensure compliance with the regulations of the <State>. The specific actions to be performed by the individual in charge are as follows:
      1. Receive Radiation Safety Training provided by Thermo Scientific Portable Analytical Instruments, Inc. or by a qualified expert. This training will be documented by a certificate of completion which is to be kept on file with other RPP documents.
      2. Maintain a list of authorized users and ensure that only authorized users operate the analyzers.
      3. *Notify staff of additions to or subtractions from the authorized user list.*
      4. Schedule and/or conduct training for employees prior to authorizing their use of the analyzer(s) without direct supervision. Maintain records of training including a copy or a summary of the training material. Training shall include radiation safety, regulatory compliance, operational, and emergency procedures.
      5. *If personal exposure monitoring (dosimetry) is part of the RPP, then the Individual in charge will be responsible for maintaining dosimetry records.*
      6. Ensure that all users are following appropriate operating procedures while using analyzers.
      7. Maintain manufacturer provided instruction manuals, and operations and maintenance records.
      8. Ensure proper disposal of unneeded analyzers.
      9. Ensure that labels on analyzers are intact and legible. Notify Thermo Scientific Portable Analytical Instruments, Inc. for assistance with labeling that is damaged or illegible.
      10. *Review, as needed, the RPP content, implementation, and effectiveness.*
   2. Authorized workers are responsible for using only approved safe techniques and procedures in operations involving the Analyzer. The specific actions to be performed are as follows:
      1. Follow proper operating procedures as described in training and ensure other individuals also adhere to these requirements.
      2. Ensure that the label on the analyzer is intact and legible.
      3. *Ensure proper use of dosimetry, if dosimetry is issued.*
      4. Be familiar with emergency procedures and know how to recognize and terminate unsafe operations.
4. Safe Operating Procedures
   1. A copy of the User’s Guide and Operating and Emergency Procedures shall be made available to all workers using the analyzer. A copy will be kept with the Analyzer and another copy shall be kept on file with other RPP records.
   2. Only authorized personnel with training on radiation safety, state regulations, operating and emergency procedures shall be allowed to operate the analyzer. All authorized personnel are responsible for complying with the requirements of this RPP and will report any and all incidents involving the analyzer to the individual in charge.
   3. The operator is responsible for ensuring that no part of a person’s body is at or near the measurement point, and no closer than one foot during a measurement (trigger finger excluded).
   4. The operator will use special precaution when analyzing very small samples (i.e., smaller than the measurement window in any dimension), being aware that the sample may not be absorbing the entire primary beam. The operator will use a test stand whenever it is reasonably practical to do so to mitigate the elevated risk of analyzing small samples.
   5. The operator will use special precaution when analyzing samples of low density, particularly plastics but also aluminum and titanium alloys and other similar low density materials. These samples will emit higher levels of scattered radiation.
   6. The operator must be aware that the analyzer is emitting radiation when lights are flashing.
   7. The operator will place the instrument out of service and notify the Individual in Charge (e.g., Radiation Safety Officer or equivalent) if the indicator lights fail to function during a measurement, a label becomes illegible, or if any other condition is identified that could prevent safe operation.
   8. The operator must be aware that radiation in the primary beam could eventually cause physical harm if the device is used improperly and must be able to recognize the symptoms which would begin with skin reddening in the exposed area and at higher doses would appear as a burn or localized tissue damage. The operator must cease operation and notify the Individual in Charge (e.g., Radiation Safety Officer or equivalent) if these symptoms are observed.
   9. Prior to each use:
      1. The operator will inspect and maintain the Kapton window and all labels on the analyzer
      2. *The operator will fill out the utilization log (if required)*
   10. *<Company Name> will maintain a log documenting use of the Analyzer that contains, at a minimum, the unit serial number, date/time removed, date/time returned, and responsible individual. At the front of this log will also be a list of authorized users. Refer to Appendix A for example.*
5. Emergency Procedures
   1. In any case where one suspects that the x-ray tube remains on when the measurement is terminated or the lights do not operate during a measurement:
      1. Disconnect the battery pack immediately to turn off the x-ray tube, and
      2. Call Thermo Scientific Portable Analytical Instruments, Inc. Service Department in the United States, toll free, at (800) 875-1578.
   2. In any suspected accidental exposure to primary beam:
      1. Notify the Individual in Charge
      2. Individual in charge will asses impact and call the State Radiation Control Program, and/or Thermo Scientific Portable Analytical Instruments, Inc.’s’ RSO for assistance as necessary.
   3. Severe Physical Damage
      1. There is no radioactive material so a fire or severe damage poses no radiation hazard.
6. Radiation Safety Training
   1. The Individual in charge will be responsible for receiving Radiation Safety Training from Thermo Scientific Portable Analytical Instruments, Inc. or an equivalent training from a qualified expert. It will then be this individual’s responsibility to train the rest of the workers, whether the workers are trained by the individual in charge, Thermo Scientific Portable Analytical Instruments, Inc., or by a qualified expert. This training will be documented by a sign-off sheet that includes the topics covered in the radiation safety training which is to be kept with all the RPP documents
7. *Personnel Monitoring*
   1. *Personal exposure levels may, as determined by the responsible individual or as required by state regulations, be monitored utilizing dosimetry providers accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). Badges are not transferable. The following are a few examples of NVLAP accredited labs:*
      1. *Mirion Technologies (GDS), at 2652 McGaw Avenue Irvine, CA 92614*
      2. *Landauer, Inc. at 2 Science Road, Glenwood, Illinois 60425-9979*
      3. *Proxtronics, at 5795-B Burke Centre Highway, Burke VA 22015*
      4. *Dosimeters shall only be worn by the individuals they are issued to and shall only be worn during occupational hours. Never wear the badge during non-occupational exposures such as during medical x-rays or any medical procedures involving radiation.*
      5. *Dosimeters should be protected from extremes of heat, moisture, and pressure.*
      6. *Dosimeters shall be stored in a protected area to prevent loss, damage, and other sources of radiation.*
8. Posting and Labeling
   1. There is a relatively low radiation hazard associated with the Analyzer, and because the authorized user will be with the Analyzer at all times it is operational, posting radiation area signs will not be necessary. A copy of the <State> Notice to Employees will be kept in the Analyzer case as well as on file with other RPP documents and will be available for review at any time.
   2. The label on the Analyzer will be checked periodically by the Individual in charge as well as the workers using the Analyzer. The label will be checked for integrity and legibility. If the label becomes faded, worn, damaged, or defaced, the Analyzer will be promptly returned to Thermo Scientific Portable Analytical Instruments, Inc. for relabeling.
9. Record Keeping
   1. The individual in charge will be responsible for all the records associated with the RPP. These records will be kept in an identified location and will be made available for review by any worker or state official upon request. The following is a list of records that will be kept at minimum:
      1. Personnel training records
      2. Manufacturer provided instruction manuals and service & maintenance records
      3. Authorized Users
      4. State Analytical X-Ray Regulations and Notice to Radiation Workers
      5. *Analyzer usage log*
      6. *Personnel Dosimetry Records, if dosimetry is required*
10. *Quality Assurance / Annual Review*
    1. *At the minimum, items on the following list will be done annually:*
       1. *Radiation Safety Review for all workers*
       2. *Operational & Emergency Procedures Review for all workers*
       3. *Audit of the RPP content, implementation, and effectiveness*
11. References:
    1. DOE G 441.1-5 “Radiation-Generating Devices Guide”
    2. Thermo Scientific Portable Analytical Instruments, Inc. sample Radiation Safety Program
    3. NBS Handbook 111, Revised 1977
    4. Radiation Safety Topics “Writing a Radiation Protection Program For the Industrial X-Ray Program For a Facility with Cabinet Radiographic or Analytical X-Ray Machines”
    5. Table 11.4.19 “Good Work Practice for X-Ray Diffraction and X-Ray Fluorescence Units” The Health Physics and Radiological Health Handbook

*Appendix A*

**Utilization Log**

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| --- | --- | --- | --- | --- | --- |
| **Serial #** | **Date** | **Time Out** | **Time Returned** | **Reason** | **Responsible Individual** |
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