

CCP-TP-165

Revision 2

CCP

Real-Time Radiography #6 Operating Procedure

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APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	09/20/2007	Initial issue.
1	06/19/2008	Revised to allow use of procedure in conjunction with CCP-TP-066, <i>CCP Radiography Screening Procedure for Prohibited Items</i> .
2	01/07/2011	Revised to remove Section 2.4.10 requirement for two people to be present during drum movements. Corrected references to CCP-QP-011, <i>CCP Laboratory Logbooks</i> , and CCP-PO-005, <i>Conduct of Operations</i> . Made minor changes to correct document formatting.

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1.0 PURPOSE

The purpose of this procedure is to provide instructions for safe start-up, operation, and shut-down of the mobile Real-Time Radiography (RTR) System RTR #6 at Oak Ridge National Laboratory (ORNL). This procedure is used with CCP-TP-053, *CCP Standard Real-Time Radiography (RTR) Inspection Procedure*, for performing certified scanning of waste containers. This procedure is also used with CCP-TP-066, *CCP Radiography Screening Procedure for Prohibited Items*.

1.1 Scope

This procedure applies to operation of the RTR #6 radiographic examination unit. Maintenance activities are outside the scope of this procedure.

2.0 REQUIREMENTS

2.1 References

Referenced Documents

- CCP-QP-002, *CCP Training and Qualification Plan*
- CCP-QP-008, *CCP Records Management*
- CCP-PO-005, *CCP Conduct of Operations*
- CCP-TP-053, *CCP Standard Real-Time Radiography (RTR) Inspection Procedure*
- CCP-TP-066, *CCP Radiography Screening Procedure for Prohibited Items*

2.2 Training Requirements

2.2.1 Personnel performing this procedure will be trained and qualified in accordance with CCP-QP-002, *CCP Training and Qualification Plan*, prior to performing this procedure.

2.3 Equipment List

- RTR System
- Personal Protective Equipment (PPE)

2.4 Precautions and Limitations

- 2.4.1 If during the course of performing this procedure an abnormal situation occurs that causes deviation from the normal process, and this abnormal condition **CAN NOT** be corrected as directed in this procedure, RTR Operators shall **IMMEDIATELY STOP WORK** and notify the Vendor Project Manager (VPM), Lead Operator (LO), or designee.
- 2.4.2 The PPE for normal operations consists of leather gloves (when handling containers), safety shoes, and Thermoluminescent Dosimeters (TLDs). Safety glasses must be worn in transit between the Control Point and the RTR #6 unit. PPE for abnormal conditions will be specified by the Radiological Control Technician (RCT) or in a Radiological Work Permit (RWP). The required or specified PPE will be donned prior to starting RTR operations.
- 2.4.3 High-energy X-rays, high voltages (kV), and pinch points are potential hazards associated with the mobile RTR System. These hazards are addressed in safety training for personnel that operate the mobile RTR System.
- 2.4.4 Personnel will remain clear of all moving doors and equipment.
- 2.4.5 The RTR System generates X-rays and high voltages (up to 320 kV). Personnel will avoid radiation exposure by observing all warning devices and personnel barriers.
- 2.4.6 RTR Operators will ensure the X-ray vault is clear of personnel prior to each start-up of the X-ray System. To facilitate this, a Closed-Circuit Television system (CCTV) has been installed.
- 2.4.7 By design, there is **NO** exposed lead. However, precautions should be taken **NOT** to damage the steel vault lining as this may cause exposure to lead.
- 2.4.8 RTR Operators will ensure all electrical panels and junction boxes are closed, equipment and moving parts are clear of foreign objects, and personnel are clear of the equipment prior to start-up of the RTR System.

2.4.9 Workers who will be working in RTR #6 must have read and signed that they understand the applicable AHAs and RWPs.

2.5 Prerequisite Actions

2.5.1 Conduct Operational checks at the beginning of each shift.

2.5.2 Verify the X-ray Compliance Label, located on the X-ray Controller, is current.

[A] **IF** the radiation leak check has expired, **OR** maintenance has been performed on designed shielding components, **THEN DO NOT** proceed with RTR operations until Radiation Protection Services personnel perform **AND** document a radiation leak check, **AND** certify the RTR system is operating within allowable limits.

3.0 RESPONSIBILITIES

3.1 RTR Operator

3.1.1 Operates the RTR System.

3.2 RTR Lead Operator (LO)

3.2.1 Ensures the technical quality in all aspects of the RTR examination process.

3.3 Radiological Control Technician (RCT)

3.3.1 Conducts radiological surveys to verify radiation and contamination levels are maintained as low as reasonably achievable (ALARA).

4.0 PROCEDURE

NOTE

The RTR Operator performs all steps within this procedure unless otherwise indicated.

4.1 RTR System Start-up

4.1.1 Obtain the Power key and the X-ray key.

4.1.2 Insert the Power key into the Power key switch on the left side of the center Control Panel desk, **AND** turn the switch to the ON position to provide power to the RTR System.

[A] Verify the white light adjacent to the key switch has illuminated.

4.1.3 Turn on video recording, display, and processing equipment as indicated.

[A] Verify each component power indication light illuminates.

[B] Verify the video surveillance monitor displays an image from all four surveillance cameras.

4.1.4 Verify the X-ray Tube shutters are CLOSED.

4.1.5 Verify there are **NO** personnel in the X-ray vault.

NOTE

The X-ray key switch on the MP1 Controller has three positions:

1. OFF
 2. Main is ON – Stand-by Mode
 3. X-rays Enabled
-

4.1.6 Insert the X-ray key into the X-ray key switch, **AND** turn the key switch to position 2.

4.1.7 Verify the operability of door interlocks, **AND** document results in Attachment 1, CCP Radiography System Safety Checks, and in the RTR Operational Logbook (in accordance with CCP-PO-005, *Conduct of Operations*).

NOTE

The X-ray system contains three Emergency Stop push buttons. These push buttons are wired in series such that any one tests the ability of the emergency deactivation. As such, the operator will rotate the testing of the Emergency Stop push buttons so that each push button is tested every third day of operations.

- 4.1.8 Verify the X-ray key switch is in position 2.
 - 4.1.9 Depress the Emergency Stop push button selected for testing.
 - 4.1.10 Verify that power has been removed from the Operator and X-ray Control Panels, **AND** document the results on Attachment 1 and in the RTR Operational Logbook.
 - 4.1.11 Reset the Operator and X-ray Control Panels.
 - 4.1.12 Turn the X-ray key switch to position 2.
 - 4.1.13 **IF** any abnormal condition is noted,
THEN STOP WORK, AND notify RTR LO.
 - 4.1.14 Turn the X-ray key switch to Position 3.
-

NOTE

The warm-up cycle takes approximately 17 minutes to complete. An audible alarm will sound for 20 seconds before X-rays are generated. The 20-second prewarning time begins immediately on pushing the green X-ray On button.

- 4.1.15 Push the green X-ray On button to start the X-ray warm-up cycle.
 - [A] Verify the X-ray warm-up light illuminates.

CAUTION

If any of the X-ray warning lights fail to come ON, the RTR system SHALL be shut-down by pushing the X-ray Off button, turning the X-ray key switch to the (0) Off position and removing the X-ray key. The RTR LO will be notified and RTR operations will **NOT** be performed until the failed RTR system(s) has been repaired or replaced.

NOTE

There are three X-ray warning lights in the following locations:

- Above the X-ray vault personnel door in the Equipment Room.
- Above both of the loading doors on the outside of the RTR trailer.

4.1.16 Verify all X-ray warning lights are ON.

NOTE

Warm-up is complete when all X-ray warning lights turn OFF and the MP1 returns to operation status.

4.1.17 Upon completion of the warm-up cycle, record status of 20 second audible and visual signals, X-ray On warning signals, and completion of the warm-up cycle in the RTR Operational Logbook and on Attachment 1, **AND** turn the X-ray key switch to position 2.

4.1.18 The operator will print name, sign, and date Attachment 1 after recording the results.

4.1.19 Using the image intensifier (II) and X-ray tube manipulator joystick, ensure the horizontal movement of the II and X-ray tube is operating properly.

4.1.20 Push the Doors Open/Close green button located on the Operator Panel to open door to accept drum from conveyor.

[A] Verify the conveyor rollers move freely.

4.1.21 Hold the shutter X-ray and II switches in the OPEN position for 20 to 35 seconds.

4.1.22 Verify the shutters are OPEN by viewing the red indicator lights on the right-hand side of the control panel.

4.2 RTR System Operations

NOTE

Drums are directly loaded onto the conveyor rollers with appropriate handling equipment in accordance with governing host site procedures.

To assist the RTR Operator in determining height and volume estimations, measuring devices with graduated scales may be placed on the drum(s).

4.2.1 Drum Loading

- [A] Verify that a drum is loaded onto the conveyor by Waste Operator by observing the conveyor monitor.
- [B] Transport the drum into the X-ray vault, utilizing the Conveyor In and Out joystick at the Operator's Control Console.
- [C] Close the infeed/outfeed door using the Door Open/Close button on the Operator's Control Console while maintaining a visual on the video monitor.

4.2.2 Image Intensifier (II)/Drum Scanning

- [A] Turn the X-ray key switch to position 3.
- [B] Push the green X-RAY ON button to start the X-ray unit.
 - [B.1] Verify all X-ray warning lights are ON.
- [C] For both the II and X-ray Tube, OPEN the horizontal and vertical shutters, as desired.
- [D] Adjust the kV and milliamps knobs until the image on the video monitor has the desired display.
- [E] Rotate the drum to the desired rotation start position using the turntable joystick on the Operator's Control Console to make a detailed inspection of items in the drum in accordance with the applicable procedure.
- [F] **WHEN** the desired X-ray examination is completed, **THEN** terminate X-rays by pushing the red X-ray Off button on the controller.
- [G] Turn the X-ray key switch to position 2.

4.2.3 Drum Unloading

- [A] Open the infeed/outfeed door using the Doors Open/Close button on the Operator's Control Console while maintaining visual on the X-ray vault video monitor.
- [B] Move the drum to the unload position with the Conveyor In and Out joystick on the Operator's Control Console.
- [C] **IF** additional drum(s) are to be examined, **THEN** return to step 4.2.1[A], **ELSE** close the infeed/outfeed door using the Doors Open/Close button at the Operator's Control Console while maintaining visual on the X-ray vault video monitor.

NOTE

It is recommended to leave the X-ray system in position 2 for at least 20 minutes prior to shutdown of the RTR system to allow the cooling system to remove excess heat from the X-ray tube.

4.3 RTR System Shut-down

- 4.3.1 Turn the X-ray key switch to position 1, **AND** remove the X-ray key from the key switch.
 - [A] Return the X-ray key to the lock box.
- 4.3.2 Completely close the X-ray shutters.
- 4.3.3 Remove all audio/video media from the recording system.
- 4.3.4 Shut-down all imaging and recording equipment by pressing the appropriate switches.
- 4.3.5 Turn the Power key switch to the OFF position, **AND** remove the key from the key switch.
 - [A] Return the Power key to the lock box.

NOTE

Section 4.4 is a stand-alone section and may be performed at any time in accordance to Host site procedure.

4.4 Contamination Surveys

4.4.1 Record in the RTR Operational Logbook the date, time, and results of any RCT surveys.

5.0 RECORDS

5.1 Records generated during the performance of this procedure are maintained as Quality Assurance (QA) records in accordance with CCP-QP-008, *CCP Records Management*.

5.1.1 QA/Nonpermanent

[A] Attachment 1, CCP Radiography System Safety Checks

Attachment 1 – CCP Radiography System Safety Checks

Site Location: _____

Examination Date: _____

X-Ray Compliance Certification Current	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Audible and Visual Warning Signals Operating	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Door Interlocks Operating	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Minimum 20 Second Delay Function	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Emergency Stop Buttons	<input type="checkbox"/> Yes	<input type="checkbox"/> No
E-stop tested: _____		

RTR Operator Approval	
Operator's Printed Name: _____	
Signature: _____	Date: _____