

CCP-TP-122

Revision 3

CCP RTR #2 Operating Procedure

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APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	03/16/2004	Initial Issue
1	10/13/2005	Procedure revised to reflect changes made to the real-time radiography (RTR) system, revised records section and made other clarifications.
2	12/18/2006	Revised to implement the Waste Isolation Pilot Plant Hazardous Waste Facility Permit requirements resulting from the Section 311/Remote-Handled (RH) Permit Modification Request (PMR).
3	01/30/2008	Revised to incorporate additional hazard control methods.

TABLE OF CONTENTS

1.0	PURPOSE	4
1.1	Scope.....	4
2.0	REQUIREMENTS.....	4
2.1	References	4
2.2	Training Requirements.....	4
2.3	Equipment List	5
2.4	Software.....	5
2.5	Precautions and Limitations.....	5
2.6	Prerequisite Actions.....	7
3.0	REQUIREMENTS.....	8
3.1	RTR Operator	8
3.2	RTR Lead Operator (LO)	8
3.3	Radiological Control Technician (RCT).....	8
3.4	Vendor Project Manager (VPM).....	8
4.0	PROCEDURE.....	9
4.1	RTR System Start-up.....	9
4.2	RTR System Operations	13
4.3	RTR System Shut-down	18
4.4	Radiological Surveys	18
5.0	RECORDS.....	19

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, Los Alamos National Laboratory (LANL) RTR #2.

1.1 Scope

This procedure applies to LANL RTR #2 activities performed by qualified RTR Operators. Maintenance activities are outside the scope of this procedure.

2.0 REQUIREMENTS

2.1 References

Baseline Documents

- CCP-TP-053, *CCP Standard Real-Time Radiography (RTR) Inspection Procedure*

Referenced Documents

- LANL ISD 101-3, *Lockout/Tagout for Hazardous Energy Control*
- LANL ISD 121-1.1, *Radiation Protection*
- CCP-PO-005, *CCP Conduct of Operations*
- CCP-QP-002, *CCP Training and Qualification Plan*
- CCP-QP-008, *CCP Records Management*
- CCP-QP-011, *CCP Notebooks and Logbooks*

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

- Allen Wrench
- RTR System
- Personal Protective Equipment (PPE)
- NDE Operational Logbook

2.4 Software

2.4.1 None.

2.5 Precautions and Limitations

2.5.1 If during the course of performing this procedure a change occurs that causes deviation from the normal process, **AND** this condition can **NOT** be corrected as directed in this procedure, RTR Operators shall IMMEDIATELY STOP WORK and notify the Vendor Project Manager (VPM) and the RTR Lead Operator (LO) or designee.

2.5.2 If containers are not able to be unloaded from the system, RTR Operators will record the container numbers and their status in the NDE Operational Logbook in accordance with CCP-QP-011, *CCP Notebooks and Logbooks*, and notify the TA-54 Operations Center.

2.5.3 Verify container numbers and their status outside of the X-ray vault.

2.5.4 PPE for normal operations are safety shoes and safety glasses. Leather gloves will be worn when handling drums or performing activities where pinch point hazards exist.

2.5.5 Personnel will remain clear of the external shield door, transfer cart, and moving equipment when the system is energized.

2.5.6 The RTR system generates X-rays (up to 450 kilovolts [kV]). Personnel will avoid radiation exposure by observing all warning devices and personnel barriers. An interlock system will de-energize X-ray generation when one of the X-ray vault doors is opened. A radiation survey is required before entering the X-ray vault.

2.5.7 RTR Operators will ensure the X-ray vault is clear of personnel and the shield doors are closed prior to start-up of the X-ray system. To facilitate this, a Closed-Circuit Television (CCTV) system has been installed.

- 2.5.8 By design, there is NO exposed lead. However, precautions should be taken **NOT** to damage the steel X-ray vault lining as this may cause exposure to lead. If exposed lead is discovered, report this condition to the VPM so it can be isolated.
- 2.5.9 RTR Operators will ensure 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.
- 2.5.10 Workers who will be working in a radiation area must have read and signed that they understand the controlling work package Radiation Work Permit (RWP) and Integrated Work Document (IWD).
- 2.5.11 A radiation survey must be performed when X-ray vault doors are opened following the conclusion of an exposure to verify the X-ray tube has been de-energized.
- 2.5.12 When entry into the X-ray vault is required during operations, the system will be de-energized by removing the Control Panel Power key **OR** a lockout/tagout (LO/TO) shall be applied to the PLC Power Supply before entry into the X-ray vault.
- 2.5.13 If entry into the X-ray vault is being performed using Key Control, the Control Panel Power key will be maintained by the person entering the X-ray vault. No other personnel may enter the X-ray vault at any time that Key Control is used for control of moving equipment hazards.
- 2.5.14 When entering the X-ray vault using Key Control, actions are limited to installing the lines pair gauge, performing visual inspections of equipment, or centering drums on the turntable.
- 2.5.15 Entry of multiple personnel into the X-ray vault requires a (LO/TO) applied by personnel qualified in accordance with LANL ISD 101-3, *Lockout/Tagout for Hazardous Energy Control*.
- 2.5.16 If entry is required for actions other than installing the lines pair gauge, performing visual inspections of equipment, or centering drums on the turntable, a LO/TO SHALL be applied by personnel qualified in accordance with LANL ISD 101-3 to the PLC Power Supply prior to entry into the X-ray vault.
- 2.5.17 The VPM must be notified before entry into the X-ray vault unless the purpose of the entry is specifically controlled by this procedure.

2.5.18 DO **NOT** sit, stand, climb, or walk on the transfer cart or equipment in the X-ray vault due to potential pinching/falling hazards.

2.5.19 The personnel access door to the X-ray vault SHALL remain shut except when the X-ray vault is occupied.

2.5.20 RTR Operator shall ensure all equipment guards are installed prior to system operation.

2.6 Prerequisite Actions

2.6.1 Conduct a safety walk-down of the equipment, **AND** record results in the NDE Operational Logbook in accordance with CCP-QP-011 at the beginning of each shift.

2.6.2 VPM or designee, verify the RTR Lead Operator and RTR Operator(s) qualifications are current.

2.6.3 Verify the X-ray RP-3 compliance label, located on the X-ray Control Panel, is current.

[A] **IF** the radiation leak check has expired,
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 REQUIREMENTS

3.1 RTR Operator

3.1.1 Operates the RTR System.

3.1.2 Maintains the NDE Operational Logbook.

3.2 RTR Lead Operator (LO)

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

3.2.2 Provides supervision for the overall operation of the mobile RTR system and is, at a minimum, a qualified RTR Operator.

3.2.3 Ensures RTR Operators are trained and qualified; or trainees are under the direct supervision of a qualified Subject Matter Expert (SME)/On-the-job training (OJT) Instructor in accordance with CCP-QP-002 and CCP-PO-005, *CCP Conduct of Operations*.

3.2.4 Request pre-approval from the VPM for visitor or trainee access to the RTR system control area.

3.3 Radiological Control Technician (RCT)

3.3.1 Conducts radiological surveys to verify radiation and contamination levels are maintained in accordance with LANL ISD 121-1.1, *Radiation Protection*.

3.4 Vendor Project Manager (VPM)

3.4.1 Ensures Central Characterization Project (CCP) personnel comply with LANL integrated work management, environmental, safety, and security requirements and CCP safety requirements.

3.4.2 Monitors the List of Qualified Individuals (LOQI) daily to confirm that only qualified personnel perform waste characterization and transportation activities.

4.0 PROCEDURE

NOTE

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

NOTE

Cart movement speed, X-ray tube/Image Intensifier (II) vertical speed, and turntable rotational speeds are controlled by potentiometers located on the control panel. These adjustments are made at the operator's discretion.

4.1 RTR System Start-up

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

4.1.2 Obtain the Control Panel Power key and the X-ray key from the lock box adjacent to the RTR Operator's control panel.

4.1.3 Insert the Control Panel Power key into the Control Panel 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 yellow light adjacent to the Control Panel Power key switch has illuminated.

4.1.4 Verify audio/video recording, display, and processing equipment as indicated are energized.

4.1.5 Verify surveillance cameras are powered ON, **AND** video monitor displays an image from all four cameras.

4.1.6 Notify and receive acknowledgement from all affected workers that X-ray system is about to be energized.

NOTE

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

1. (Symbol O) Power switched OFF to controller;
2. (Symbol ~) Main is ON;
3. (Symbol  Lightning Bolt) High Tension (HT) on Enable

4.1.7 Insert the X-ray key into the X-ray key switch on the MP1 controller, **AND** turn the X-ray key to position 2.

4.1.8 Verify the operability of door interlocks by performing the following:

- [A] Verify the green safety light is illuminated on the MP1 controller.
- [B] OPEN the personnel access door to the X-ray vault.
- [C] Verify the green safety light is extinguished.

WARNING

Personnel **SHALL** keep hands clear of personnel door to X-ray vault when opening or closing, due to potential pinch points.

- [D] CLOSE the personnel access door.
- [E] Verify the green safety light is illuminated.

WARNING

Prior to initiating the AUTO IN or AUTO OUT sequence, visually verify the X-ray vault is clear of personnel and outside rails are clear of personnel/obstructions. This may be performed utilizing the surveillance system cameras.

- [F] Press the AUTO OUT button on the control panel.
- [G] **WHEN** the rear X-ray vault door opens, **THEN** verify the green safety light is extinguished.
- [H] Verify the cart moves freely.
- [I] Press the AUTO IN button.

- [J] **WHEN** the rear X-ray vault door closes,
THEN verify the green safety light is illuminated.
- [K] Depress the red E-STOP button on the control panel.
- [L] Verify the control panel de-energizes, **AND** the green safety light is extinguished.
- [M] Reset the red E-STOP button.
- [N] Re-energize the control panel.
- [O] Verify the green safety light is illuminated.
- [P] Record the results of door interlock checks in the NDE Operational Logbook.

4.1.9 **IF** any abnormal condition is noted,
THEN STOP WORK, AND notify RTR LO and the VPM.

4.1.10 Turn the X-ray key to position 3.

NOTE

The warm-up cycle takes approximately 15 minutes to complete. An audible alarm will sound for 20 seconds before X-rays are generated. The 20 second pre-warning time begins immediately upon pressing the green X-ray On button.

4.1.11 Push the green X-ray On button to start the X-ray warm-up cycle.

- [A] Verify the X-ray warm-up light is illuminated.

WARNING

If any of the X-ray warning lights fail to come ON during warm-up, the RTR system SHALL be shut-down by depressing the Red X-ray Off button, turning the X-ray key to Position 1 the (Symbol O) OFF position, **AND** removing the X-ray key. The RTR LO and the VPM will be notified, **AND** RTR operations will **NOT** be performed until the failed RTR system(s) has been repaired or replaced.

NOTE

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

- Yellow X-ray On light on the MP1 controller
- Flashing beacon light inside the X-ray vault
- Flashing beacon light outside, above the rear X-ray vault doors.
- Flashing light/sign above the personnel access door in the equipment bay.

4.1.12 Verify all X-ray warning lights are ON.

NOTE

Warm up is complete when all X-ray warning lights turn OFF and the warm-up light on the center control panel is OFF.

4.1.13 Record status of 20-second audible and visual signals and X-ray On warning signals in the NDE Operations Logbook.

4.1.14 Verify the kV and the milliamp (mA) displays start indicating voltage and current as the warm-up cycle progresses.

4.1.15 At the completion of the warm-up cycle, turn the X-ray key to position 2, **AND** record the completion of the warm-up cycle in the NDE Operational Logbook.

4.1.16 Using the Image Intensifier (II) and X-ray joystick, ensure the vertical movement of the II and X-ray tube is operating properly.

4.1.17 Hold the Shutter X-ray and II switches in the OPEN position for approximately 5 seconds.

4.2 RTR System Operations

WARNING

Prior to any personnel entering the X-ray vault, the X-ray key switch shall be turned to position 1 and the X-ray key removed. Entry into the X-ray vault requires a LO/TO on the PLC Power Supply **OR** positive Key Control, except as noted in step 4.2.3.

NOTE

A forklift equipped with a drum grabber will load/unload the drums from the turntables. Once the drums are secure on the turntables, the transfer cart is moved back into the X-ray vault by using the AUTO IN button. When drums have reached the appropriate scanning position, the exterior X-ray vault door will automatically close.

NOTE

Steps 4.2.1 through 4.2.5 may be performed in any order. Substeps **SHALL** be performed in order.

NOTE

Step 4.2.3 may be performed anytime when entry into the vault requires the installation or removal of the lines pair gauge test or to perform visual inspections of equipment, or to center drums on the transfer cart.

4.2.1 Drum Loading

WARNING

Verify the transfer cart path is clear of foreign objects or obstructions prior to initiating the AUTO OUT function.

- [A] Verify path is clear
- [B] Push the AUTO OUT button to start the AUTO OUT sequence for the drum/turntable cart. The cart will automatically advance to the loading station.

WARNING

A radiation survey or verification of the radiation monitoring device is required upon opening the X-ray vault door to verify X-ray tube has been de-energized.

- [C] Complete a radiation survey **OR** verify monitoring device to verify X-ray tube has been de-energized.
- [D] Direct the forklift operator to load a drum or drums (three maximum) onto the turntable cart.

WARNING

Verify the forklift/spotter are clear of rail area before moving transfer cart. Ensure transfer cart is clear of foreign objects, and personnel are clear of the equipment prior to initiating the AUTO IN function.

NOTE

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

Measuring devices will be affixed **OR** removed from the containers prior to loading the container in the X-ray vault **OR** after unloading the container from the X-ray vault.

- [E] Verify path is clear.
- [F] Push the AUTO IN button.

4.2.2 Image Intensifier (II)/Drum Scanning

- [A] Turn the X-ray key to position 3.
- [B] Push the green X-ray On button to start the X-ray system.
- [C] For both the II and X-ray tube, OPEN the horizontal and vertical shutters, as desired.
- [D] Adjust the high voltage (kV) and milliamps (mA) knobs until the image on the video monitor has the desired display.
- [E] Turn the Drum Select switch to position 1, 2, or 3 for the drum to be examined.

- [F] Turn the Drum Rotate switch to the desired rotation direction (clockwise [CW] or counter-clockwise [CCW]) position.
- [G] Using the Rotational Speed dial located on the center desk section of the Control Panel, adjust the drum rotation to the desired speed.
- [H] Using the Image system control joystick, move the imaging system in the desired direction.
- [I] Using the Imaging system control joystick and Drum Rotate switch, position the imaging system and drum in the desired position to make a detailed inspection of items in the drum.
- [J] **WHEN** the desired X-ray examination is completed, **THEN** terminate X-rays by pushing the red X-ray Off button on the controller.
- [K] Turn the X-ray key to position 2.

4.2.3 Checking Oil Level, Installing Lines Pair Gauges, or Centering a drum on the transfer cart

- [A] Turn OFF the X-ray and Control Panel Power keys **AND** remove the keys.
- [B] Ensure the Control Panel Power key and X-ray key are positively controlled by the person entering the X-ray vault.
- [C] OPEN the personnel access door.

WARNING

A radiation survey or verification of the radiation monitoring device is required upon opening the X-ray vault door to verify the X-ray tube has been de-energized.

- [D] Complete a radiation survey **OR** verify monitoring device to verify X-ray tube has been de-energized.
- [E] Notify the VPM prior to entry into the X-ray vault.

WARNING

Personnel **SHALL NOT** sit, stand, climb or walk on the transfer cart or its rails due to potential pinching/falling hazard.

- [F] Enter the X-ray vault and check the oil level in the X-ray cooler or, install the lines pair gauge, or center a drum on the transfer cart.
- [G] Exit the X-ray vault.

WARNING

Personnel **SHALL** keep hands clear of personnel door when closing, due to potential pinch points.

- [H] Verify **NO** personnel are in the X-ray vault.
- [I] Close the personnel access door.

4.2.4 Drum Unloading

- [A] Verify the X-ray key switch is in position 2.

WARNING

Verify the forklift/spotter is clear of rail area before moving transfer cart. Ensure transfer cart is clear of foreign objects, and personnel are clear of the equipment prior to movement of the transfer cart.

- [B] Verify path is clear
- [C] Press the AUTO OUT button.
- [D] Complete a radiation survey **OR** verify monitoring device to verify X-ray tube has been de-energized.
- [E] Direct the Forklift Operator to unload the drums.
- [F] Verify path is clear
- [G] **IF** additional drum(s) are to be examined, **THEN** return to Section 4.2.1[C]; **ELSE** press the AUTO IN button.

4.2.5 Modifying Turntable Configuration

- [A] Turn OFF the X-ray and Control Panel Power keys, and remove the keys, **AND** place into lock box.
- [B] Ensure a LO/TO to the PLC Power Supply has been applied by personnel qualified in accordance with LANL ISD 101-3 prior to entry.
- [C] OPEN the personnel access door.
- [D] Complete a radiation survey **OR** verify radiation monitoring device to verify X-ray tube has been de-energized.
- [E] Notify the VPM prior to entry into the X-ray vault.
- [F] Enter the X-ray vault.

WARNING

Personnel SHALL **NOT** sit, stand, climb or walk on the transfer cart or its rails due to potential pinching/falling hazard.

- [G] Remove/Replace the 55-gallon drums stop bolts as required using Allen Wrench.
- [H] Exit the X-ray vault.
- [I] Remove the LO/TO in accordance with LANL ISD 101-3.
- [J] Verify NO personnel are in the X-ray vault.

WARNING

Personnel SHALL keep hands clear of personnel door when closing, due to potential pinch points.

- [K] CLOSE the personnel access door.
- [L] Re-energize the control panel.

NOTE

It is recommended to leave the X-ray system in position 2, for 5-20 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 to position 1, **AND** remove the X-ray key from the key switch.

4.3.2 CLOSE the X-ray shutters completely by holding the control switches for approximately 5 seconds.

4.3.3 Shut-down all imaging and recording equipment by pressing the appropriate switches.

4.3.4 Turn the Control Panel Power key switch to the OFF position, **AND** remove the Control Panel Power key from the key switch.

[A] Return the Control Panel Power key and X-ray key to the lock box adjacent to the RTR Operator's control panel.

4.3.5 **IF** containers are to be left on the transfer cart overnight, **THEN** notify the VPM and the Operations Center, **AND** record the container numbers and their status in the NDE Operational Logbook.

4.4 Radiological Surveys

NOTE

The X-ray vault will be periodically surveyed as specified by site RCTs. All surveys will be kept on file. RTR Operators will be notified if radiological contamination is identified.

4.4.1 Record the date, time, and any abnormal results of the RCT's daily surveys in the NDE Operational Logbook.

5.0 RECORDS

- 5.1 The NDE Operational Logbook generated during the performance of this procedure are identified as quality assurance (QA) records in CCP-QP-011 and maintained as QA records in accordance with CCP-QP-008, *CCP Records Management*.