

FW: RTR Cursor Issue

Maestas, Ricardo, NMENV

Sent: Monday, November 26, 2012 3:46 PM

To: Allen, Pam, NMENV

Attachments: INST-OI-12 R49.pdf (507 KB) ; INST-OI-81 R10.pdf (419 KB) ; VJ Window Leveling.mp4 (1 MB)



October WIPP file

From: Pace, Berry [mailto:Berry.Pace@wipp.ws]

Sent: Tuesday, October 23, 2012 1:23 PM

To: Maestas, Ricardo, NMENV

Subject: RTR Cursor Issue

Ricardo,

Attached are the two AMWTP RTR procedures for scanning drums and boxes. Also, I've attached a brief video depicting the new V.J. Technology for "screen-leveling". It also, describes the use of the cursor for improving image quality in assisting the operator in the identification of prohibited items.

Hope this helps.

Regards

Berry D. Pace

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Real-Time Radiography Operations (for WIPP Certification of Boxes)

(Controlled Activity)

Advanced Mixed Waste Treatment Project

Approved:

(Signature on file. See DCR-11431.)

Brian Warner
Characterization Lead

08/06/12

Date

AMWTP INSTRUCTION		
INST-OI-81, Rev. 10	Issued: 08/23/12	Effective: 08/23/12 @ 0900 Hrs
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1.0 PURPOSE/SCOPE

The Advanced Mixed Waste Treatment Project (AMWTP) Real-Time Radiography (RTR) system is a nondestructive examination technique used to verify the physical form of the waste and the absence of liquids and containerized gases within the contents of radioactive and mixed waste containers. In addition to identifying the contents of containers, the RTR system also provides digital data-recording capabilities. Examination of containers verifies the specific waste matrix code (WMC) and *waste stream* (see def.) description, identifies prohibited items, and estimates each waste material parameter weight as required for disposal at the Waste Isolation Pilot Plant (WIPP). In the case of unlabeled containers, RTR is used to correlate the contents of the container with known waste types and, if possible, assign an item description code (IDC).

This document applies to the operation of the RTR and operating software.

(HWMA/RCRA Permit; MP-TRUW-8.1; MP TRUW-8.2; CCP-PO-003)

2.0 ROLES AND RESPONSIBILITIES

Performer	Responsibilities
Operations Technician (OT)	<ul style="list-style-type: none"> • Unless otherwise specified, performs the steps in this instruction.
Shift Supervisor (SS)	<ul style="list-style-type: none"> • Logs status changes • Updates the applicable status boards • Performs post-job reviews • Makes necessary notifications.
System Engineer (SE)	<ul style="list-style-type: none"> • Evaluates conditions and advises SS.

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3.0 PRECAUTIONS AND LIMITATIONS/PREREQUISITES

3.1 Precautions and Limitations

3.1.1 The RTR door interlock systems, audible and visual warning signals, minimum 20-second delay function, emergency shutdown switches, and shielding shall be *operable* (see def.) when the associated RTR x-ray unit is capable of generating x-rays.

(ANSI-N43.3)

3.1.2 To avoid personnel exposure, personnel must ensure that the shielded enclosure is clear of personnel before initiating x-rays.

3.1.2.1 When personnel are using the mirror mounted inside the shielded enclosure, they must ensure the hidden area located underneath the camera is unoccupied.

3.1.3 To avoid personnel exposure to x-rays and personnel injury, emergency stops to shut off x-ray generation and equipment movement are located on the operator control console (red mushroom pushbutton), and within the RTR enclosure (pull cords).

3.1.4 The personnel access door can be opened from inside the RTR enclosure to allow personnel egress during an emergency. If x-rays are being generated, opening the personnel door will stop generation of x-rays.

3.1.5 The cart enable/disable key must be switched to DISABLE, the key removed, and maintained under operator control when loading, unloading, and rotating the cart or installing/removing the drum manipulator and when entered the enclosure.

3.1.6 The maximum capacity for the x-ray cart is 10,000 lb.

3.1.7 Before leaving the RTR control console unattended, the x-ray controller must be placed in STAND BY mode and the key must be removed and maintained under operator control or stored in the master key locker.

3.1.8 The x-ray controller may be turned off at any time; however, if time permits, maintaining the key switch in STANDBY after periods of continuous operation will help ensure adequate cool down before switching off.

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- 3.1.9 To ensure waste boxes are not frozen, waste boxes must be preheated for a minimum of 72 hours at 18°C or higher during cold weather. Preheating is required October through April. The SS will determine if preheating is required outside the October through April window. After 72-hour initial preheat and if the box has not been removed from WMF-634, the temperature may fall below 18°C (in WMF-634) as long as it does not fall below 1°C for any period of time.

(HWMA/RCRA Permit)

- 3.1.10 For safety, personnel must stay clear of the moving cart and moving doors.
- 3.1.11 When entering the shielded enclosure following the conclusion of x-ray generation, a qualified radiological controls technician (RCT) shall use a suitable, operable, calibrated survey instrument to verify that the source is in its fully shielded condition or that the x-ray tube has been de-energized. The qualified RCT shall document this survey in accordance with MP-RS&C-6.22, Radiological Survey Program.
- 3.1.12 The x-ray enclosure interior is a very high radiation area when the x-ray generator is on. Personnel are not allowed inside the enclosure while x-rays are being produced.
- 3.1.13 The RTR is an x-ray-generating device. Direct exposure to the x-ray beam may result in serious injury or death. Personnel must avoid exposure by observing all warning devices and personnel barriers.
- 3.1.14 Alternative methods for hazardous energy control are used in this procedure for servicing tasks that are routine, repetitive, and integral to the use of the equipment for production in accordance with MP-COPS-9.20, Hazardous Energy Control Processes.
- 3.1.15 Waste containers containing explosives must have a nonconformance report (NCR) generated in accordance with MP-QS&I-5.4, Identification of Nonconforming Conditions, and will be identified for return shipment to the waste-generating Department of Energy (DOE) contractor following appropriate shipping procedures and regulations.

(HWMA/RCRA Permit)

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Real-Time Radiography Operations (for WIPP Certification of Boxes)**3.2 Prerequisites**

3.2.1 Personnel operating the RTR are properly qualified in accordance with MP-RTQP-14.4, Personnel Qualification and Certification, by completing the qualification checklist for an RTR operator (QPOT03A).

(HWMA/RCRA Permit; MP-TRUW-8.1)

3.2.2 The following forms are available:

- Applicable operator log
- Form-1578, Imaging Quality Indicator Verification Form for RTR
- Form-1218, Daily RTR Safety Checks.

3.2.3 Operations Technician has obtained the following items (keys are in the master key locker):

- Operator control console power key
- E-Stop reset key
- X-ray control console key
- Cart enable/disable key
- Recording media (DVD if needed)
- Image Quality Indicator (IQI) test pattern.

(HWMA/RCRA Permit; MP-TRUW-8.1)

3.2.4 Waste Tracking System (WTS) is available.

3.2.5 A pre-job brief has been performed per MP-COPS-9.17, Performing Pre-Job Briefings and Post-Job Reviews, as directed by the SS prior to performing work in this procedure.

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- 3.2.6 The following required safety checks have been verified (and logged on the applicable operator log) to be within periodicity
OR the system is being operated to perform the safety checks or other activities to restore the system to operability.

Safety Check	Performed Per	Periodicity
RTR door interlocks, warning signals, delay function, and emergency switches	INST-MI-1002, RTR 6-Month Safety Check for RTR System Z-213-101 and Z-213-106	Semiannually or following configuration changes or modifications
RTR shielding survey	Form-1377, WMF-634 RTR Shielding Radiation Survey	Semiannually or following configuration changes or modifications

(ANSI-N43.3)

4.0 INSTRUCTIONS

4.1 General Instructions

NOTE: *Entering the shielded enclosure may be performed at any time throughout this procedure as necessary to perform routine inspections and escort personnel for inspections or training.*

- 4.1.1 **IF** entry into the shielded enclosure is necessary at any point during the performance of this procedure,
THEN GO TO Section 4.3
AND RETURN TO the point of departure in the previous section when complete.

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- 4.1.2 **IF** an abnormal or infrequent event is encountered at any point while working this procedure,
THEN GO TO Section 4.13
AND RETURN TO the point of departure in the previous section when complete.
- 4.1.3 **GO TO** the appropriate procedure section from the following table based on the desired task to be performed,
THEN RETURN TO this step if further activities will be performed:

Task	Section
System Startup	4.2
Entry into Shielded Enclosure	4.3
Beginning of Shift Activities	4.4
Warm up	4.5
Imaging System Check	4.6
Operation of RTR System	4.7
Moving Boxes into and out of the Enclosure	4.8
Real-Time Radiography Examination Guidelines	4.9
RTR Examination and WTS Data Entry	4.10
Total System Shutdown	4.11
Post-Job Review	4.12
Abnormal and Infrequent Operations	4.13

4.2 System Startup

- 4.2.1 Ensure x-ray cooler is ON.
- 4.2.2 Insert the cart enable/disable key and turn to ENABLE.

NOTE: *Applicable steps may be performed to shutdown and restart computers because of minor computer malfunctions on the barcode scanner, RTR, and WTS systems.*

- 4.2.3 Ensure the electrical power strip is turned on.
- 4.2.4 Ensure the RTR computer systems are on.
- 4.2.5 Ensure all RTR system monitors are on.

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- 4.2.6 Perform Windows login, as necessary.
- 4.2.7 Ensure the closed-circuit television (CCTV) monitor is turned on.
- NOTE:** *The power-on lamp will be illuminated after an approximate 15-second delay.*
- 4.2.8 Ensure the operator control console power key is inserted into the POWER key switch.
- 4.2.8.1 Turn the key to the RESET position
AND release.
- 4.2.9 Ensure the E-Stop reset key is inserted into the “E-Stop Reset” switch.
- 4.2.10 Double click on barcode icon, if necessary.
- 4.2.11 Double click Vi3 icon, if necessary.
- NOTE:** *Before the control system can be operated, the system is in the HOME position (see def.). The HOME position is selected by pressing the AUTO OUT pushbutton. The AUTO OUT lamp will flash while the x-ray tube head and Flat Panel Digital Radiography Imaging System (FP) manipulator are returning to the HOME positions.*
- 4.2.12 Press the AUTO OUT button to home the system, as applicable.
- 4.2.13 Insert x-ray controller key into key switch on x-ray control console and turn key to STAND BY position.
- 4.2.14 Ensure the x-ray shutters are closed.
- 4.2.15 **IF** this is a full system startup,
THEN enter the time of the system power up in the applicable operator log.
- NOTE:** *The WTS will not permit logon if Form-1268, Production Systems Access Request, is not current.*
- 4.2.16 Log in to the WTS RTR operation navigation screen, if necessary.

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4.3 Entry into Shielded Enclosure

NOTE: *The only activities authorized to be performed using this section are entry into the shielded enclosure to perform routine inspections or escorting personnel into the shielded enclosure for inspections and/or training.*

4.3.1 Ensure radiation survey of enclosure has been completed by a qualified RCT prior to entry into shielded enclosure.

4.3.2 **IF** system startup is required,
THEN GO TO Section 4.2.

4.3.3 Ensure cart movement has been disabled prior to enclosure entry.

4.3.3.1 Insert the cart enable/disable key
AND turn it to the ENABLE position, if necessary.

NOTE: *The following step is performed to verify the cart and other equipment are capable of moving as a pre-check to satisfy using an alternate method to hazardous energy control.*

4.3.3.2 Press the AUTO IN button and allow the cart to enter the enclosure and the bi-parting door to close, if necessary.

4.3.3.3 Home the RTR system by pressing the AUTO OUT pushbutton.

4.3.3.4 Set cart enable/disable key to DISABLE to disable cart movement.

4.3.3.5 Remove the cart enable/disable key
AND maintain under operator control.

4.3.3.6 Verify that the RTR cart is nonoperational after key removal by attempting to move cart from RTR Control Room with key removed.

4.3.3.7 Ensure that the drum manipulator is removed, if necessary.

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NOTE: *The only personnel authorized to enter the shielded enclosure under this alternate method to hazardous energy control are the OT in control of cart enable/disable and x-ray keys and any personnel being escorted by OT in control of cart enable/disable and x-ray keys.*

4.3.3.8 **IF** performing shielded enclosure inspection for any reason other than the daily inspection and completion of Form-1218,
THEN GO TO Step 4.3.3.12.

4.3.3.9 **IF** performing shielded enclosure inspection for daily inspection and completion of Form-1218.
THEN perform the following:

NOTE: *Remaining steps in this section may be performed concurrently.*

4.3.3.9.1 Inspect the shielded enclosure vault as follows:

- General cleanliness
- Foreign objects or signs of tampering with equipment
- Oil on the floor
- Drive screws on both the x-ray tube head and (FP) manipulators free of obstructions.

NOTE: *An IQI is required at system startup prior to examining boxes and at least once every 24 hours during continuous operations.*

4.3.3.10 **IF** an IQI image verification is required,
THEN mount the IQI test pattern on the cart, if necessary.

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NOTE: *It is management's expectation that Form-1218 is not completed until the SS has reviewed it and signed on the appropriate line.*

4.3.3.11 Ensure that Form-1218 has been completed for the applicable RTR unit for the current day.

(ANSI-N43.3)

4.3.3.11.1 **IF** any item in Section I or II is unsatisfactory, **THEN** immediately take the following steps:

4.3.3.11.1.1 Stop production operations with the RTR system **AND** generate an NCR on the system.

4.3.3.11.1.2 Notify the SS.

4.3.3.11.1.3 **GO TO** Section 4.13.14.

(ANSI-N43.3)

4.3.3.12 Enter the shielded enclosure to perform inspection/training as necessary.

4.4 Beginning of Shift Activities

4.4.1 **IF** Form-1218 has **NOT** been completed for the current day, **THEN GO TO** Section 4.3 to complete Form-1218 **AND RETURN TO** Step 4.4.2 when complete.

(ANSI-N43.3)

NOTE: *The WTS will not permit logon if the Form-1268 is not current.*

4.4.2 Log in to the WTS, RTR operation navigation screen, as necessary.

4.4.3 Double click the barcode reader icon, if necessary.

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NOTE: *An IQI is required at system startup prior to examining waste and at least once every 24 hours during continuous operations.*

4.4.4 **IF** IQI has been completed for the current day, as evidenced on Form-1578,
THEN verify it is complete and compliant by viewing the recording and listening to the audio.

4.4.4.1 **IF** IQI is found to **NOT** be complete and compliant,
THEN notify SS.

NOTE: *The cart will have to be out in order to mount the IQI test pattern.*

4.4.5 **IF** the IQI image verification is required,
THEN mount the IQI test pattern on the cart.

4.5 Warm-up

4.5.1 Ensure Sections 4.2 through 4.4 are completed prior to RTR system operations.

NOTE: *In the event that an extended manual warm-up is necessary, personnel should consult with the SS and RTR SE for guidance. The GE Inspection Technologies Isovolt operating instructions are available for a more detailed description of operation.*

4.5.2 Ensure the x-ray shutters are closed.

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WARNING
When the x-ray generator is on, personnel in the enclosure could suffer fatal injuries.

NOTE 1: *The DOOR CLOSE button light on the operator control panel will be illuminated when the bi-parting door is closed.*

NOTE 2: *The hidden area located underneath the camera can be checked using the mirror mounted inside the shielded enclosure.*

4.5.2.1 Ensure that the enclosure is unoccupied
AND both the personnel access door and the bi-parting doors are closed.

4.5.3 **GO TO** the appropriate procedure section from the following table based on the desired warm-up activities to be performed,
THEN RETURN TO this step, if further warm-up activities will be performed:

Task	Section
Start of shift OR after daily safety checks completion	4.5.4
RTR has been in continuous operation for less than 2 hours and prompts for warm-up when entering a high kV value, OR has been idle for 2-3 hours	4.5.5
RTR System has been idle for 3–4 hours	4.5.6
RTR System has been idle for >4 hours	4.5.7
Warm-up is complete	4.5.8

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NOTE: *The controller will display "Tube To Be Warmed-Up" and display options for: NO (F1), 1..2 Days (F4), 2..14 Days (F5), >14 Days (F6), and RTC auto (F7).*

4.5.4 **IF** at the start of shift

OR AFTER daily safety checks completion,

THEN cycle the key position from the ON/STANDBY position to OFF and back to ON.

NOTE: *After performing the following step, a screen prompting to "Enter Test Voltage" will appear.*

4.5.4.1 Press F6 to select >14 Days.

4.5.4.2 Type 420 kV
AND press ENTER.

4.5.4.3 Press the X-RAY ON button to begin the warm-up.

NOTE: *The controller will display "Tube To Be Warmed-Up" and display options for: NO (F1), 1..2 Days (F4), 2..14 Days (F5), >14 Days (F6), and RTC auto (F7).*

4.5.5 **IF** the RTR system has been in continuous operations for less than 2 hours and prompts for warm-up when entering a high kV value

OR the RTR system has had continuous idle time for 2-3 hours,

THEN cycle the key position from the ON/STANDBY position to OFF and back to ON.

NOTE: *After performing the following step, a screen prompting to "Enter Test Voltage" will appear.*

4.5.5.1 Press F4 to select 1..2 Days.

4.5.5.2 Type 420 kV
AND press ENTER.

4.5.5.3 Press the X-RAY ON button to begin the warm-up.

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NOTE: *The controller will display "Tube To Be Warmed-Up" and display options for: NO (F1), 1..2 Days (F4), 2..14 Days (F5), >14 Days (F6), and RTC auto (F7).*

4.5.6 **IF** the RTR system has been idle for 3–4 hours,
THEN cycle the key position from the ON/STANDBY position to OFF and back to ON.

NOTE: *After performing the following step, a screen prompting to "Enter Test Voltage" will appear.*

4.5.6.1 Press F5 to select 2..14 Days.

4.5.6.2 Type 420 kV
AND press ENTER.

4.5.6.3 Press the X-RAY ON button to begin the warm-up.

NOTE: *The controller will prompt for a warm up and give options for: NO (F1), 1..2 Days (F4), 2..14 Days (F5), >14 Days (F6), and RTC auto (F7).*

4.5.7 **IF** the RTR system has had continuous idle time for more than 4 hours,
THEN cycle the key position from the ON/STANDBY position to OFF and back to ON.

NOTE: *After performing the following step, a screen prompting to "Enter Test Voltage" will appear.*

4.5.7.1 Press F6 to select >14 Days.

4.5.7.2 Type 420 kV
AND press ENTER.

4.5.7.3 Press the X-RAY ON button to begin the warm-up.

4.5.8 **WHEN** the appropriate warm-up is complete,
THEN perform the following:

4.5.8.1 Follow prompts on the x-ray controller
AND turn the x-ray control console key to the STAND BY position.

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4.5.8.2 **IF** leaving the RTR control room,
THEN perform the following:

4.5.8.2.1 Remove the x-ray control console key.

4.5.8.2.2 Maintain the x-ray control console key either
under the operator control or store it in the
master key locker.

4.5.8.3 **IF** warm-up was performed,
THEN record the following in the applicable operator log:

- Elapsed warm-up time
- Warm-up completion time
- Any pertinent comments.

4.6 **Imaging System Check**

4.6.1 Ensure a disk ID file has been created in the RTR Imaging Transfer Application (RITA) for the current RTR batch, by double clicking RITA icon.

4.6.1.1 **IF** a disk has **NOT** been created,
THEN follow Appendix B, Creating or Transferring Data to
the RITA Archival System
AND THEN RETURN TO Step 4.6.2.

4.6.2 Verify the precision of *radiography* (see def.) prior to use by adjusting
the image enough to demonstrate compliance with the quality assurance
objectives (QAOs) through viewing an image test pattern.

(MP-TRUW-8.1; MP-TRUW-8.2)

4.6.3 Perform an imaging system check daily, prior to use
AND record on applicable operator log, and Form-1578.

(HWMA/RCRA Permit; MP-TRUW-8.2)

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NOTE 1: *There are a number of controls that will affect the quality of the recorded image (including IQI placement, zoom functions, Automatic Defect Enhancement (ADE) filter, window leveling, x-ray focal spot), all of which can be adjusted by the OT. The intent of the IQI evaluation is to demonstrate the imaging system capability to achieve a specified resolution. During RTR imaging of waste containers, the OT has the latitude to adjust these same parameters, as needed, to obtain the best image possible.*

NOTE 2: *It is management's expectation that Form-1218 is not completed until the SS has reviewed it and signed on the appropriate line.*

4.6.4 Ensure that Form-1218 has been completed for the current day for the applicable RTR unit.

(ANSI-43.3)

4.6.4.1 **IF** any item in Section I or II is unsatisfactory, **THEN** take the following steps:

4.6.4.1.1 Stop production operations with the RTR system
AND generate an NCR on the system.

(ANSI-N43.3)

4.6.4.1.2 Notify the SS.

4.6.4.1.3 **GO TO** Section 4.13.14.

4.6.5 Place the cursor in the first edit box located on the screen of the barcode reader window.

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- 4.6.6 **IF** an IQI is required,
THEN enter the IQI number using the following format:
mmddyXXXWWWQ; where mm is the month, dd is the day, yy is the year, XXX stands for IQI, WWW for the RTR System 101 (Z-213-101) or 106 (Z-213-106), and Q stands for the shift (D for day shift or N for night shift).
- 4.6.6.1 Set or advance to the next entry location by manually performing the following:
- 4.6.6.1.1 Press the “Shift” and “:” keys simultaneously to set the entry.
- 4.6.6.1.2 Press the “Shift” and “>” keys simultaneously to advance to the next entry location.
- 4.6.7 Select the CONFIRM button to finalize the entry.
- 4.6.8 Ensure that the x-ray system has been warmed up and the x-ray controller is ready for operation.
- NOTE:** *The IQI will be recorded on the same recording media as for the current RTR batch.*
- 4.6.9 Select “Start New Cycle” to retrieve barcode data from the barcode window, if necessary.
- 4.6.10 Select the IQI number to be recorded.
- 4.6.11 **IF** recording confirmation prompt displays correct ID for recording,
THEN click OK.
- 4.6.11.1 **IF** recording confirmation prompt displays incorrect ID,
THEN RETURN TO Step 4.6.9.
- 4.6.12 Adjust the voltage to approximately 100 kV and the current to approximately 2.0 mA, if necessary.
- 4.6.13 Ensure that the x-ray control console is in the ON position.

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- 4.6.14 Press the green X-RAY ON button.
- 4.6.14.1 **IF** an x-ray system error message occurs during two consecutive starts/restarts,
THEN immediately notify SS/SE for instruction prior to any additional attempts to generate x-rays.
- 4.6.15 Open the x-ray shutters, as required.
- 4.6.16 Position the cart, x-ray tube-head, and FP to center the IQI test pattern.
- 4.6.17 Adjust the zoom functions, ADE filter, window leveling, kV, and mA, as needed, for image resolution and clarity to obtain a good image of the IQI.
- 4.6.18 Select red RECORD button on Debut Professional program.
- 4.6.19 Record verbal comments by speaking into the microphone.
- 4.6.20 Start IQI recording by stating the operator identification (ID), IQI number, and lines of resolution obtained.
- 4.6.20.1 To ensure that an acceptable recording has been done, stop x-ray generation prior to viewing the recording.
- 4.6.20.2 Verify the acceptable recording of the IQI and the audio/video recording.
- 4.6.20.2.1 **IF** the audio/video recording was **NOT** acceptable,
THEN contact the SS.
- 4.6.21 Record IQI results and the number corresponding to the crosshatched pattern visible in both the horizontal and vertical directions on the applicable operator log (see Exhibit 1, RTR Image Test Quality Grid, for RTR image test grid figure) and Form-1578.
- 4.6.22 Record RTR settings (voltage, current) on Form-1578.

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NOTE: *Verification of the resolution is with visual confirmation by the OT. The recorded image may not represent the actual image due to degradation from the recording.*

4.6.23 **IF** the resolution is less than 16 lines/inch,
THEN contact the SS
AND troubleshoot.

4.6.24 Press the red X-RAY OFF button on the x-ray controller unit panel, if applicable,
AND turn the x-ray control console key to the STAND BY position.

4.6.25 **IF** leaving the RTR control room,
THEN perform the following steps:

4.6.25.1 Remove the X-ray control console key.

4.6.25.2 Maintain the x-ray control console key either under the operator control or store it in the master key locker.

4.7 Operation of RTR System

4.7.1 Ensure that no NCRs exist against the RTR system.

4.7.2 Check initial conditions as follows:

4.7.2.1 Ensure Sections 4.2 through 4.6 are completed prior to RTR system operations.

NOTE 1: *The RTR system cannot detect frozen liquids, and therefore, frozen waste boxes cannot be examined. To ensure that a waste box is not frozen, the waste is preheated for a minimum of 72 hours at 18°C or higher during cold weather. Preheating is required from October through April. The SS will determine if preheating is required outside the October through April window.*

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NOTE 2: *After the box has met the 72-hour preheat requirement and if the box has not been moved out of WMF-634, the temperature may fall below 18°C (inside WMF-634) for any period of time, as long as it does not fall below 1°C.*

4.7.2.2 **IF** preheating is required,
THEN ensure the waste package has been preheated for a minimum of 72 hours at 18°C or higher, per WTS.

4.8 Moving Boxes into and out of the Enclosure

NOTE 1: *Steps in this section may be completed out of sequence, concurrently, or as needed.*

NOTE 2: *Handrails may be removed as necessary to facilitate removal of the drum manipulators and loading a box.*

- 4.8.1 Home the RTR system by pressing the AUTO OUT pushbutton, if needed.
- 4.8.2 Set the enable/disable key to DISABLE, to disable cart movement if needed.
- 4.8.3 Remove the enable/disable key, if needed,
AND maintain under operator control.
- 4.8.4 Verify, by visual inspection, that a candidate box is linked to the correct historical data by comparing the following:
- Historical ID
 - Tamper-indicating device
 - Generator
 - Other historical data, as available, between the box and the historical data displayed in WTS.
- 4.8.5 **IF** the correct link is confirmed,
THEN load the box on the RTR.

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4.8.6 **IF** the correct link is **NOT** confirmed,
THEN notify the SS or acceptable knowledge expert (AKE).

4.8.6.1 **IF** SS or AKE were unable to correct the link,
THEN record all historical information from the container
in the WTS container marking screen, which is accessible
from the RTR screen or the AMWTP container screen.

WARNING
Failure to ensure that no portion of the box extends past the cart could result in a container breach causing possible inhalation hazard to personnel.

CAUTION 1
Failure to ensure that no portion of the box extends past the cart could result in the container being breached or equipment damage.
CAUTION 2
Failure to disconnect the electrical cable at the rear of the cart will result in damage to the connector and cable.

NOTE: *Handrails may be removed as necessary to facilitate removal of the drum manipulators and loading a box.*

4.8.7 Load a box onto the cart, as applicable, ensuring no portion of the box extends past the cart.

4.8.8 Ensure the box on the RTR cart has been received to the equipment using WTS.

4.8.9 Perform a barcode cycle, as necessary, by performing the following:

4.8.9.1 Ensure the Windows login is complete.

4.8.9.2 Double click the barcode reader icon, if necessary.

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4.8.9.3 **IF** previous barcodes are present,
THEN select CLEAR ALL button.

4.8.9.4 Place the cursor in the first edit box located on the screen of the barcode reader window, if necessary.

**WARNING**

Eye injury may occur if personnel look directly into the barcode scanner beam.

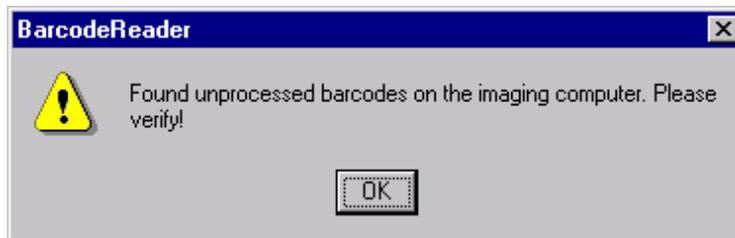
4.8.9.5 Scan the barcode of the box into drum No. 1/box
AND visually confirm the correct barcode has populated,
taking care to **NOT** look directly into the barcode reader.

4.8.9.6 **IF** the barcode does **NOT** scan,
THEN perform Section 4.13.13
AND RETURN TO Step 4.8.9.7.

NOTE 1: *If the system finds unused barcodes from previous scans either in a previous session or the CONFIRM button was selected prior to the CLEAR ALL button, the software will display a warning message stating that it found unused bar codes.*

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NOTE 2: *The unused barcodes will be displayed in sequence. However the cursor will move to the first edit box so that the operator can overwrite the older text. The CLEAR ALL button is used to clear the text in the edit boxes. The cursor is displayed in the first edit box.*



NOTE 3: *Selecting the CONFIRM button will communicate the scanned barcodes to the RTR (imaging) computer.*

- 4.8.9.7 Select the CONFIRM button.
- 4.8.10 Insert the cart enable/disable key
AND turn it to the ENABLE position.
- 4.8.11 Home the RTR cart system by pressing the AUTO OUT pushbutton, if necessary.
- 4.8.12 Press the AUTO IN button and allow the cart to enter the enclosure and the bi-parting door to close.
- 4.8.13 Ensure that x-ray system has been warmed up
AND the x-ray controller is ready for operation.
- 4.8.14 In the Vi3 program, Select “Start New Cycle” to retrieve barcode data from the barcode window, if necessary.

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- 4.8.15 **IF** the barcode data has already been retrieved for the cycle of the box being examined,
THEN select “Select Next Drum/Box,” if necessary.
- 4.8.16 Select the barcode number of the box to be examined and confirm that Recording Confirmation prompt displays correct information
AND click OK.
- 4.8.16.1 **IF** Recording Confirmation prompt displays incorrect information,
THEN RETURN TO Step 4.8.14.
- 4.8.17 Ensure a disk ID file has been created in RITA for the current RTR batch, by double clicking RITA icon.
- 4.8.17.1 **IF** a disk has **NOT** been created,
THEN follow Appendix B
AND THEN RETURN TO Step 4.8.18.
- NOTE:** *It is management’s expectation that Form-1218 is not completed until the SS has reviewed it and signed on the appropriate line.*
- 4.8.18 Ensure that Form-1218 has been completed for the current day for the applicable RTR unit.

(ANSI-N43.3)

WARNING
When the x-ray generator is on, personnel in the enclosure could suffer fatal injuries.

- NOTE:** *The hidden area located underneath the camera can be checked using the mirror mounted inside the shielded enclosure.*
- 4.8.19 Ensure that the enclosure is unoccupied
AND both the personnel access door and the bi-parting doors are closed.
- 4.8.20 Insert x-ray control console key into x-ray control console
AND turn it to the ON position.

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4.8.21 Set the x-ray controller to 100 kV and 2 mA.

4.8.21.1 Open X-ray shutters, as necessary.

4.8.22 Press the green X-RAY ON button.

4.8.23 Adjust kV and mA as appropriate.

NOTE: *At any time, the control room operator can select "Single" mode to enable the x-ray head and FP to be raised or lowered independent of each other, up to a maximum of 5 inches. This will produce an oblique image.*

4.8.24 Ensure that the DUAL position is selected to provide synchronized movement of the x-ray head and FP.

4.8.25 Select red RECORD button on Debut Professional program.

4.9 Real-Time Radiography Examination

NOTE 1: *A complete scan of the waste box is required. A complete box scan is defined as across the entire top, through the center of the waste from top to the bottom, going from side to side in overlapping layers, across the entire bottom, and up the side of the container. 100% of each container must be scanned to meet the radiography quality assurance objective for completeness. All the data must be collected and evaluated to complete the WTS and have a complete scan.*

(MP-TRUW-8.1; MP-TRUW-8.2)

NOTE 2: *The replicate scan will be conducted by an RTR qualified operator who was not involved in the original scan of the waste container and documented in WTS.*

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NOTE 3: *Sections 4.9 and 4.10, and steps within these sections, may be performed concurrently, out of sequence, or repeated during the examination of the waste container, as applicable. All the required data will be captured in WTS and on the audio/visual record. WTS will not save the record if any of the required data is not populated in WTS.*

4.9.1 Perform replicate scan on one waste box per day or once per testing batch, whichever is less frequent under uniform conditions and procedures.

(MP-TRUW-8.1; MP-TRUW-8.2)

NOTE: *The independent observation is conducted by a qualified RTR OT who was not involved in the original scan of the waste container and documented in WTS.*

4.9.2 Perform an independent observation on one waste box (which must **NOT** be the same box that was used for the replicate scan) once per day or once per testing batch, whichever is less frequent under uniform conditions and procedures.

(MP-TRUW-8.1; MP-TRUW-8.2)

4.9.3 **Adjust Image Enhancement System**

4.9.3.1 Ensure that the X-RAY/FP MANIPULATOR VERTICAL SPEED CONTROL is adjusted for speeds that are appropriate for the waste container to be examined.

4.9.3.2 Increase or decrease the x-ray kV and/or mA as needed.

4.9.3.3 Adjust the zoom functions, as required, to characterize small objects.

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NOTE: *The RTR examination is recorded in both the WTS and in the audio/video record. All characterization activities are required to be announced in the audio/video record.*

(HWMA/RCRA Permit)

4.9.3.4 Shake boxes along the horizontal axis to detect the presence of liquids.

NOTE: *X-ray generation is stopped prior to switching the focus (filament) between broad and fine.*

4.9.3.5 Use the Broad or Fine focus (filament), as appropriate, for boxes containing high density material.

NOTE: *Two measuring annotations are available, the linear measurement and the protractor tool to help assist the operator with waste characterization.*

4.9.3.6 **IF** the image is difficult to see,
THEN perform the following:

4.9.3.6.1 Switch the x-ray filters to 0, 1, 2, or 3, as necessary.

4.9.3.6.2 Mask exposed portions of the image with the x-ray shutters.

4.9.3.6.3 Adjust window leveling as needed to achieve desired penetration and image quality.

NOTE: *The ADE filter is meant to be a tool to help the operator discern details in objects, and guide the operator to areas for further examination under the primary window leveling tool. While the filter is active the operator will notice a delay and choppiness for objects in motion.*

4.9.3.6.4 Apply ADE filter as needed.

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4.10 RTR Examination and WTS Data Entry

NOTE 1: *Nonconformance reports are not required to be generated as part of a replicate or operator independent observation examination.*

NOTE 2: *An audio/video recording of the radiography examination and a validated radiography data form in the WTS will be obtained for each container. The contents of the waste container are described in sufficient detail on the audio/video record to provide an adequate inventory of the waste container contents in the audio/video record narrative.*

(MP-TRUW-8.1; MP-TRUW-8.2)

NOTE 3: *The RTR examination is recorded in both the WTS and in the audio/video record.*

(HWMA/RCRA Permit)

4.10.1 Enter as an introduction for the examination of the waste container the following:

- Operator ID
- Container ID
- IDC
- WMC
- Waste stream description as defined in RPT-TRUW-05, Waste Matrix Code Reference Manual, in the audio/video record
- Waste **NOT** covered in RPT-TRUW-05 or other approved applicable acceptable knowledge (AK) documents and report.

(HWMA/RCRA Permit)

4.10.2 Verify the correct container number.

NOTE: *Step 4.10.3 may be performed by either typing in the box number and using F8 to query the information or selecting the appropriate box number from the list of values and clicking the mouse in the "Recording ID" field.*

4.10.3 Enter the container ID number in WTS **AND** query the container information.

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- 4.10.4 Verify the container data and analysis information have auto-populated in the container information section of the WTS RTR record (i.e., batch number, container type, RTR date).
- 4.10.5 **IF** any of the required fields are **NOT** populated, **THEN** contact the SS for guidance.
- 4.10.6 Verify the “Equipment” field for the processing area for WTS has auto-populated.
- 4.10.7 Verify the current procedure and revision number.
- 4.10.8 **IF** the revision number of the procedure is incorrect in WTS, **THEN** enter the procedure number and current revision used to conduct the examination in the “Result Comment” field in WTS.
- 4.10.9 Ensure the Recording ID is correct.
- 4.10.10 Enter the identification in the format: WXXXyy-nnnnn; where W stands for RTR system one (Z-213-101) or two (Z-213-106), XXX stands for RTR, yy is the year, and nnnnn is the disk number, **AND** enter the side as A or B.

NOTE: *The QAO for precision at RTR is verified upon satisfactory completion of an IQI test at least once every 24 hours or upon system start-up as specified in Section 4.6, by verifying that the audio/video record of the IQI has been recorded, and by answering “Yes” to the question: “Is the Imaging Quality Indicator Satisfactory?”*

- 4.10.11 Enter Y/N in WTS to the question “Is the Imaging Quality Indicator Satisfactory?”

(MP-TRUW-8.1; MP-TRUW-8.2)

- 4.10.12 Ensure the replicate is completed on one box per day or once per testing batch, whichever is least frequent, as documented on applicable operator log, and in WTS.

(MP-TRUW-8.1; MP-TRUW-8.2)

- 4.10.12.1 **IF** Debut Professional program “File Already Exists Replace Existing File?” pops up, **THEN** answer NO.

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- 4.10.13 Ensure a qualified RTR OT that was **NOT** involved in the original scan of the waste container performs the replicate scan.

(MP-TRUW-8.1; MP-TRUW-8.2)

NOTE: *The independent observation is performed by viewing the recording from a waste container (not the replicate), and documenting the results on a radiography analysis sheet in WTS. The independent observation is performed without reference to the original radiography analysis sheet in WTS.*

- 4.10.14 Ensure the independent observation analysis is completed on one box per day (not the replicate) or once per testing batch, whichever is least frequent, as documented on applicable operator log and in WTS.

(MP-TRUW-8.1; MP-TRUW-8.2)

- 4.10.15 Ensure a qualified RTR OT that was **NOT** involved in the original scan of the waste container performs the independent observation analysis.

(MP-TRUW-8.1; MP-TRUW-8.2)

NOTE: *The purpose of checking the visual class inspection form is to assist the RTR OT in looking for pinhole(s) and/or weakness in the container wall.*

- 4.10.16 **IF** the “Visual Classification” inspection form is available in WTS, **THEN** review the form to see the container classification **AND** look for pinhole(s) and/or weakness in the container wall.

- 4.10.16.1 **IF** pinholes and/or weaknesses are found, **THEN** perform the following:

4.10.16.1.1 Notify the SS.

4.10.16.1.2 Document the finding in WTS.

4.10.16.1.3 Handle the container as directed by the SS.

- 4.10.17 Estimate and enter the fill factor for the waste container (in percent) in WTS.

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NOTE: *The “twisted and tied” or “zipped and tied” closure methods are entered as “twisted and taped.”*

4.10.18 Enter the closure method(s) for the waste container and inner packages in WTS.

NOTE: *Sealed containers >4 liters are considered a layer of confinement.*

4.10.19 Determine the layers of confinement for the waste container **AND** enter in WTS.

4.10.20 Enter the presence of liquids by selecting YES in WTS.

(HWMA/RCRA Permit)

4.10.21 Enter the volume and location of liquids in WTS.

(HWMA/RCRA Permit)

NOTE 1: *Observable liquids (see def.) in association with an identified polychlorinated biphenyl (PCB) item or PCB waste are considered PCB-contaminated liquids and will have a disposition of treatment or special-case waste.*

(HWMA/RCRA Permit)

NOTE 2: *“Internal container” means container inside the outermost container examined during radiography or visual examination. Drum liners, liner bags, plastic bags used for contamination control, capillary-type lab ware, and debris not designed to hold liquid at the time of original waste packaging are not internal containers.*

4.10.22 **IF** observable liquid is prohibited as defined in Exhibit 4, List of Prohibited Items
OR is equal to or greater than 4.4 pints,
THEN record the presence of prohibited liquids in WTS by selecting YES.

**(HWMA/RCRA Permit; MP-TRUW-8.1; MP-TRUW-8.2)
(CCP-PO-003)**

4.10.23 **IF** observable liquid is noted
AND the total liquid is **NOT** prohibited,
THEN enter NO for prohibited liquids.

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NOTE: *Item 10 of Exhibit 6, Common Liquid Measurements and Conversions, provides a conversion for milliliters (ml) to pints.*

4.10.24 **WHEN** internal containers with observable liquid, are present,
THEN enter YES for internal containers with liquid.

4.10.25 **IF** prohibited liquids are identified,
THEN initiate an NCR in accordance with MP-Q&SI-5.4.

(HWMA/RCRA Permit)

4.10.25.1 Select the NCR RTR Characterization for Liquids and the applicable “Liquids Identified” category as observed in the RTR examination.

4.10.26 Document the absence or presence of sharp or non-braced objects that could be a puncture hazard to the waste container in WTS.

NOTE 1: *Sharp or non-braced objects that are not protected will be NCR’d appropriately to ensure remediation.*

NOTE 2: *Although cardboard liners do offer protection for sharp objects, as determined by the RTR operator, they are not considered as “liners” for headspace gas drum age criteria and are considered as cellulosic waste.*

4.10.27 Document in WTS if sharp or non-braced objects are protected.

4.10.28 Document the absence or presence of PCBs in WTS by performing the following:

(HWMA/RCRA Permit)

4.10.28.1 **IF** PCBs are **NOT** present,
THEN document NO for PCBs present in WTS.

(40 CFR 761)

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NOTE: *“Yes Acceptable” PCBs are given a process code of Direct Ship as PCBs are not approved for super compaction.*

4.10.28.2 **IF** PCBs present are “Yes - Acceptable” to document non-prohibited PCBs,
THEN perform the following:

4.10.28.2.1 Document a description of non-prohibited PCBs in the “PCB Comment” field.

4.10.28.2.2 Document the weight of non-prohibited PCBs in the “PCB Weight” field.

4.10.28.2.3 Ensure the non-prohibited PCBs are included in the waste container inventory with a description, item weight, and assignment to the applicable waste parameters field.

4.10.28.3 **IF** prohibited PCBs present are “Yes - Prohibited,”
THEN perform the following:

4.10.28.3.1 Document a description of prohibited PCBs in the PCB comment field.

4.10.28.3.2 Document the net weight of the box in the PCB weight field.

4.10.28.3.3 Ensure the prohibited PCBs are included in the waste container inventory with a description, item weight, and assignment to the applicable waste parameters.

4.10.28.3.4 Initiate an NCR in accordance with MP-Q&SI-5.4.

(MP-TRUW-8.1)

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4.10.28.4 Answer the following container questions on the WTS CONTENTS BOX tab in WTS, as applicable.

- HEPA Filters?
- Graphite?
- Metal Debris?
- Paper/Rags?
- Plastics/PVC/Rubber?
- Electrical Conduits or Wiring?
- Scaffolding Poles or Planks?
- Heavy, Dense Objects?
- Steel/Metal Rods or Bars?
- Bulky, Shreddable Objects?
- Concrete/Bricks/Solids?

4.10.28.5 **IF** Heavy Dense Objects or Concrete/Bricks/Solids are **YES**, **THEN** include an approximate dimension in the description.

NOTE: *Mercury is not prohibited unless the criteria for prohibited observable liquid are exceeded.*

4.10.29 Document in WTS the absence or presence of the following:

- A. Mercury
- B. Lead, and in what physical form
- C. Wet cell batteries.

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NOTE 1: *Lead content needs to be identified and listed as a hazardous material in the data package prepared for each WIPP-certifiable container (i.e., leaded rubber gloves, lead aprons, and lead bricks).*

NOTE 2: *When examining containers whose contents prevent full examination of a waste item (e.g., check weights or calorimeter cans) or of the remaining contents (e.g., an aggregate of bulk-loaded dense sludge), AK information that may have determined a visual examination would not provide additional relevant information for the referred to container.*

(MP-TRUW-8.1; MP-TRUW-8.2)

NOTE 3: *Lead shielding cannot be used to shield an item or waste container to meet external surface dose rates.*

NOTE 4: *When examining containers whose contents prevent full examination, such as multiple dense sludge containers or over-packed into a box, an NCR will be written that box contents could not be confirmed.*

4.10.29.1 **IF** container is lead-lined
OR IF lead tape, impenetrable objects, and/or shielded objects are present that prevent full examination,
THEN initiate RTR NCR in accordance with MP-Q&SI-5.4.

4.10.29.2 **IF** any of the items listed in Step 4.10.29 are detected,
THEN enter a comment in the appropriate comment field in WTS.

(MP-TRUW-8.1; MP-TRUW-8.2)

4.10.30 Document in WTS the presence of prohibited items in the waste, if any, using Exhibit 4.

(MP-TRUW-8.1; MP-TRUW-8.2)

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- 4.10.31 **IF** any prohibited items are present, in accordance with Exhibit 4, **THEN** perform the following:
- 4.10.31.1 Initiate an NCR in accordance with MP-Q&SI-5.4.
- 4.10.32 Examine the waste and enter data into WTS with the description, weight and the assignment to the appropriate waste parameters by performing the following:
- 4.10.32.1 Select item(s) from look-up table, where appropriate, and enter quantity.
- 4.10.32.2 **IF** item is **NOT** shown on look-up table, **THEN** perform **ONE** of the following to add the waste item(s) to the container inventory:
- 4.10.32.2.1 **IF** entering item(s) by weight, **THEN** perform the following:
- 4.10.32.2.1.1 Enter a description.
- 4.10.32.2.1.2 Enter item type as weight.
- 4.10.32.2.1.3 Enter weight.
- 4.10.32.2.1.4 Enter quantity.
- 4.10.32.2.1.5 Assign the appropriate waste parameter(s) by percentage weight.
- 4.10.32.2.2 **IF** entering item(s) by volume, **THEN** obtain reference data **AND** perform the following:
- 4.10.32.2.2.1 Enter description.
- 4.10.32.2.2.2 Enter item type as volume.
- 4.10.32.2.2.3 Enter weight per unit volume from reference data.

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- 4.10.32.2.2.4 Enter quantity.
- 4.10.32.2.2.5 Assign the appropriate waste parameter(s) by percentage weight.
- 4.10.32.2.3 **IF** entering item(s) as packaging materials, **THEN** perform the following:
 - 4.10.32.2.3.1 Enter description.
 - 4.10.32.2.3.2 Enter item type as packaging.
 - 4.10.32.2.3.3 Enter weight.
 - 4.10.32.2.3.4 Enter quantity.
 - 4.10.32.2.3.5 Assign the appropriate waste parameter(s) by percentage weight.
- 4.10.32.3 After completing the RTR examination of the first side of the box, pause the audio/video recording.
 - 4.10.32.3.1 Press the red X-RAY OFF button on the x-ray controller unit panel **AND** turn the x-ray controller key to the STAND BY position.
 - 4.10.32.3.1.1 **IF** leaving the RTR control room, **THEN** remove the x-ray key **AND** maintain it under operator control **OR** store it in the master key locker.
 - 4.10.32.3.2 Press the AUTO OUT button to home the system.

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NOTE: *If cart is disabled with x-ray head in low position, not homed, system will not home when turned back on without manually manipulating up on joystick.*

4.10.32.3.3 Ensure cart is in the HOME position before disabling it.

4.10.32.3.4 Set the enable/disable key to DISABLE to disable cart movement
AND remove the key.

4.10.32.3.5 Rotate the box 180 degrees
AND place the box back on the cart.

4.10.32.3.6 Insert the cart enable/disable key
AND turn it to the ENABLE position.

4.10.32.3.6.1 **IF** the system is **NOT** in the HOME position (indicated by the AUTO OUT button illuminated), **THEN** push the AUTO OUT button.

4.10.32.3.6.2 Press the AUTO IN button and allow the cart to enter the enclosure and the bi-parting doors to close.

4.10.32.3.7 Insert x-ray controller key into key switch on x-ray control console
AND turn it to the ON position.

4.10.32.3.8 Set the kV to 100 and the mA to 2.

4.10.32.3.9 Press the green X-RAY ON button.

NOTE: *Steps in Section 4.9 and 4.10 may be repeated or performed out of sequence during the examination of the waste container.*

4.10.32.3.10 Continue examination of container per Sections 4.9 and 4.10.

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NOTE: *The weight assigned to the remaining waste is assigned by subtracting the packaging, and item(s) entered by weight/volume, from the gross weight and then distributing this remaining unassigned weight to the appropriate waste parameters by the designated percentage weight assigned for the remaining waste. Remaining waste = Gross – (Packaging + Items by Weight + Items converted from volume to weight).*

4.10.32.4 Assign the remaining waste to the appropriate waste parameter by weight percent on the remaining contents of container table.

4.10.32.4.1 In the “Result Comment” field, enter a description of the waste that was entered under the “Remaining Contents of Container Table.”

NOTE: *Following RTR, boxes with the 000 IDC are typically assigned the code UN-00A for undefined homogenous solids (S3000; see def.), UN-00B for undefined debris (S5000; see def.), or UN-00C for undefined soil/gravel (S4000; see def.).*

(HWMA/RCRA Permit)

4.10.33 Verify that the physical form of the waste is consistent with the IDC, WMC, summary category and waste stream description (as defined in RPT-TRUW-05, or for waste **NOT** covered in RPT TRUW-05, other approved applicable AK documents and reports) for the waste container and recorded correctly in WTS.

(HWMA/RCRA Permit)

4.10.33.1 **IF** the IDC is verified **AND** the historical ID found in WTS does **NOT** match the information on the container, as found in Step 4.8.4, **THEN** initiate a Type 3 NCR in accordance with MP-Q&SI-5.4.

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NOTE: *Answering the question “Is IDC Correct?” allows information required by Steps 4.10.35 and 4.10.36 to be entered.*

4.10.34 **IF** the IDC, WMC, summary category or waste stream description can **NOT** be verified,
THEN perform the following:

4.10.34.1 Place a UN-000 code for undetermined waste, UN-00A for undefined homogenous solids (S3000), UN-00B for undefined debris (S5000), or UN-00C for undefined soil/gravel (S4000), in the “Recommended Gen-IDC” field.

(HWMA/RCRA Permit)

4.10.34.2 Enter the change reason comment of undefined IDC.

(HWMA/RCRA Permit)

4.10.34.2.1 Describe the waste in sufficient detail to allow the AKE to evaluate a recommended IDC determination in the “Result Comment” field or using the “Container Markings” screen button at the bottom of the RTR screen.

4.10.34.3 Record any historical information from the container on the “Container” screen in the “Add New Container Comment” field or in the “Container Markings” button at the bottom of the general section of the RTR screen.

4.10.35 **IF** the IDC is **NOT** correct,
THEN perform the following:

(HWMA/RCRA Permit)

4.10.35.1 Enter recommended IDC,
AND assign the containers to AK review.

4.10.35.2 Enter change reason (example: % volume of contents).

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4.10.35.3 Enter any applicable comments.

4.10.35.3.1 Describe the waste in sufficient detail to allow the AKE to evaluate a recommended IDC determination in the “Add New Container Comment” field or using the “Container Markings” screen button at the bottom of the general section of the RTR screen.

4.10.35.4 Record any historical information from the container on the “Container” screen in the “Add new Container Comment” field or using the Container Markings screen button at the bottom of the general section of the RTR screen.

4.10.36 At the completion of the scan, summarize the examination by stating the operator ID, container ID, whether the IDC, WMC, and waste stream description are consistent with the AK.

(HWMA/RCRA Permit)

4.10.37 **STOP** or pause the recording as necessary.

4.10.38 **WHEN** the container on the cart has been examined, **THEN** turn off x-rays by depressing the red X-RAY OFF pushbutton located on the x-ray control unit.

4.10.39 Perform an audio/visual check of the recorded image to verify that the recording device is working properly.

(HWMA/RCRA Permit)

4.10.39.1 Enter Y/N in WTS to the question “Is the Audio/Visual Check Satisfactory?”

NOTE: *The RTR recording will be reviewed against the data reported on the RTR container data in the WTS.*

4.10.40 Perform the following to sign the RTR record:

(HWMA/RCRA Permit)

4.10.40.1 Verify that the data in WTS is correct **AND** that the audio/visual recording, match and are correct.

4.10.40.2 E-sign and save RTR record.

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- NOTE 1:** *After the burning DVD from hard drive process has started, WINDOWS may be minimized and operations continued.*
- NOTE 2:** *Typical burning of files associated with current batch is done one file at a time; multiple files can be burned at the same time.*
- NOTE 3:** *All containers burned to DVD have an audio/video check performed.*
- 4.10.41 Transfer recording files to RITA Archival System using the guidance provided in Appendix B.
- 4.10.42 Burn file of box to DVD using the guidance provided in Appendix A, Burning DVD from Hard Drive, or at the SS discretion.
- 4.10.42.1 **AFTER** “Burning DVD from Hard Drive” has started, **THEN** minimize the “Nero Essentials” window **AND** continue operations.
- 4.10.42.2 Upon completion of the burning process, check the audio and visual recording on the DVD, prior to burning the next container.
- 4.10.43 Turn the x-ray control console key to the STAND BY position.
- 4.10.43.1 **IF** leaving the RTR control room, **THEN** remove the key **AND** maintain it under operator control, **OR** store it in the master key locker.
- 4.10.44 Press the AUTO OUT button and allow the system to home.
- 4.10.45 Set the enable/disable key to DISABLE to disable cart movement **AND** remove the key.
- 4.10.46 Unload the box from the cart.

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NOTE: *For WTS batch, an automatic closure will occur after 20 boxes (22 examinations including the replicate and independent observation) are processed. WTS batch data reports contain the required contents identified by Table C3-11 of MP-TRUW-8.2, Quality Assurance Project Plan).*

4.10.47 Label the container for PCBs, as applicable, in accordance with INST-OI-24, Packaging Radioactive Waste.

(40 CFR 761)

4.10.48 **RETURN TO** Section 4.7 to examine additional waste containers.

4.11 Total System Shutdown

4.11.1 Close the x-ray shutters by pressing the X-RAY SHUTTERS switches.

NOTE 1: *The x-ray shutter indicator lights may be used to verify shutters are closed.*

NOTE 2: *The remaining activities may be performed during x-ray tube cool down.*

4.11.2 Ensure the x-ray control console key is in the STAND BY position.

4.11.3 Log off of WTS.

4.11.4 Press the AUTO OUT button to home the system.

NOTE: *To remove residual heat from the x-ray tube, the x-ray system oil cooler is to remain ON for a minimum of 5 minutes prior to performing Step 4.11.5.*

4.11.5 Turn x-ray oil cooler to OFF.

4.11.6 Exit the applicable programs.

4.11.7 Acknowledge any pop-ups, as applicable.

4.11.8 Turn the enable/disable key to DISABLE to disable cart movement **AND** remove the key, if necessary.

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- 4.11.9 Log out of Windows
AND turn OFF the RTR computers as follows:
- 4.11.9.1 Select “Turn off Computer” from the START button menu on the computer.
 - 4.11.9.2 Click on the TURN OFF button on the SHUTDOWN COMPUTER window.
- 4.11.10 Turn OFF the x-ray image monitor by depressing the POWER button.
- 4.11.11 Switch the x-ray control console key to the OFF position
AND remove the key.
- 4.11.12 Switch the operator control console key to the OFF position
AND remove the key.
- 4.11.13 Switch the E-Stop key to the OFF position
AND remove the key.
- 4.11.13.1 Turn OFF the RTR CCTV monitor
- 4.11.14 Ensure that all shutdown information has been recorded on the applicable operator log.
- 4.11.15 Return the operator control console power, E-stop reset, x-ray control console, and cart enable/disable keys to the master key locker.
- 4.12 Post-Job Review**
- 4.12.1 SS or designee: Perform a post-job review in accordance with MP-COPS-9.17.

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4.13 Abnormal and Infrequent Operations**WARNING****Abnormalities with the x-ray equipment could cause radiological exposure and injury/death.****CAUTION****Abnormalities with the x-ray equipment could cause damage to equipment.****NOTE:** *Applicable steps may be performed when needed.*

4.13.1 **IF** any abnormalities that could cause damage to equipment, personnel, or the environment are encountered with the x-ray equipment, **THEN** perform the following:

4.13.1.1 Push the red EMERGENCY STOP button.

4.13.1.2 Ensure that no personnel are in the area.

4.13.1.3 Inform the SS or designated alternate.

4.13.1.3.1 **IF** abnormality is related to a safety component, **THEN** immediately stop production operation with the RTR system **AND** generate an NCR against the system.

(ANSI-N43.3)

4.13.1.3.1.1 Notify the SS.

4.13.1.3.1.2 **GO TO** Step 4.13.14.

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4.13.1.3.2 **IF** operation has been terminated due to activation of the EMERGENCY STOP button, **THEN** obtain both Radiological Controls manager and plant shift manager (PSM) approval prior to resuming operation.

4.13.1.4 Log all abnormal conditions and malfunctions on the applicable operator log, ensuring that the log entries include the operational conditions prior to the abnormality.

4.13.2 **IF** other abnormal or infrequent operations need to be performed, **THEN GO TO** the applicable section from the following table **AND RETURN TO** this step if further activities will be performed:

Task	Section to be Performed
X-rays Fail to De-Energize	4.13.3
Constant Air Monitor Alarm in Affected Area	4.13.4
X-ray Head Fails to Energize	4.13.5
Equipment or Computer Malfunction	4.13.6
Unplanned Shutdown	4.13.7
Loss of Commercial Power	4.13.8
Breached Waste Container	4.13.9
Fire Involving the Characterization Facility	4.13.10
Motion Fault	4.13.11
Manual Extended Warm-Up	4.13.12
Entering Barcodes Manually	4.13.13
Follow-Up Steps When Stopping Production Operations with the RTR System	4.13.14
Performing Functional Verification/Post-Maintenance Testing for Mechanical Motion Only	4.13.15

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Real-Time Radiography Operations (for WIPP Certification of Boxes)**4.13.3 X-rays Fail to De-Energize**

4.13.3.1 **IF** x-rays fail to de-energize when the red OFF button is pushed as indicated by the following indications:

- Voltage and amperage meters do **NOT** drop to zero when x-ray control unit key is removed
- Images still visible when X-RAY OFF button is depressed
- Radiation field (higher than expected from box) at the entry door,

THEN complete the following steps:

4.13.3.1.1 Push the red EMERGENCY STOP button.

4.13.3.1.2 Turn the x-ray controller key to the STAND BY position.

4.13.3.1.3 Notify the SS or designated alternate.

4.13.3.1.4 Obtain permission from Radiological Controls manager and PSM before restarting the RTR.

4.13.4 Constant Air Monitor Alarm

4.13.4.1 **IF** the x-ray head is operating,
THEN perform the following steps:

4.13.4.1.1 De-energize the x-ray head by pushing the red X-RAY OFF button.

4.13.4.1.2 Turn the x-ray controller key to STAND BY **AND** remove the key.

4.13.4.1.3 Notify coworkers
AND leave the affected area immediately.

4.13.4.1.4 Inform the RCT, the SS, or the designated alternate.

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4.13.5 X-ray Head Fails to Energize

4.13.5.1 Turn the x-ray controller key to STAND BY
AND remove the key.

4.13.5.2 Ensure all interlocks are satisfied.

4.13.5.3 Reinsert the x-ray controller key
AND turn to ON position.

4.13.5.4 Attempt to generate x-rays.

4.13.5.4.1 **IF** the x-ray unit still fails to energize,
THEN perform the following steps:

4.13.5.4.1.1 Turn the x-ray controller key to
the STAND BY position.

4.13.5.4.1.2 Turn the control console power
key to the OFF position.

4.13.5.4.1.3 Notify the SS or the designated
alternate.

4.13.6 Equipment or Computer Malfunction

4.13.6.1 Push the X-RAY OFF button.

NOTE: *Applicable steps may be performed to shutdown and restart computers because of minor computer malfunctions on the VJ barcode program, RTR, and WTS systems.*

4.13.6.2 Shut down the system per Section 4.11, Total System Shutdown.

4.13.6.3 Restart the system per Section 4.2, System Startup.

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4.13.6.4 **IF** the malfunction continues,
THEN place the system in a safe condition
AND inform the SS or designated alternate.

4.13.6.4.1 Log the malfunction in the applicable operator log.

4.13.7 Unplanned Shutdown

4.13.7.1 **IF** the x-ray unit shuts down inadvertently
AND auto warm-up is **NOT** being performed,
THEN perform the following steps:

4.13.7.1.1 Contact the SS.

4.13.7.1.2 Consult with the RTR SE for guidance.

4.13.7.1.3 **IF** the unplanned shutdown **CANNOT** be corrected,
THEN perform the following steps:

4.13.7.1.3.1 Turn the x-ray controller key to the STAND BY position.

4.13.7.1.3.2 Notify the SS or designated alternate.

4.13.7.1.4 Record the shutdown ion the applicable operator log.

4.13.7.1.4.1 Include information on RTR operating status prior to the shutdown.

4.13.7.1.4.2 Inform the SS or designated alternate.

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4.13.8 Loss of Power

4.13.8.1 **IF** commercial power is lost to the RTR x-ray unit,
THEN perform the following steps:

4.13.8.1.1 Turn the x-ray controller key to the STAND
BY position.

4.13.8.1.2 Turn the control console power key to the OFF
position.

4.13.8.1.3 Inform the SS or designated alternate.

4.13.8.1.4 Log the conditions on applicable operator log.

4.13.9 Breached Waste Container

4.13.9.1 Stop x-rays.

4.13.9.2 Turn x-ray controller key to STAND BY
AND remove.

4.13.9.3 Respond per INST-OI-11, Waste Container Handling.

4.13.9.4 Notify the SS.

4.13.10 Fire Involving the Characterization Facility

4.13.10.1 Stop x-rays.

4.13.10.2 Turn x-ray controller key to STAND BY
AND remove.

4.13.10.3 Evacuate
AND inform the SS or designated alternate.

4.13.10.3.1 While exiting, pull the manual fire alarm.

4.13.11 Motion Fault

4.13.11.1 Stop x-rays.

4.13.11.2 Turn the x-ray controller key to STAND BY
AND remove key.

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4.13.11.3 Place the operator control console key in the OFF position.

4.13.11.4 After 60 seconds, activate reset keys located on the operator control console.

4.13.11.5 Press the AUTO HOME button.

4.13.12 Manual Extended Warm-up

4.13.12.1 Observe, during the warm-up time, the actual value of the current (mA) on the liquid crystal display (LCD) of the control module.

NOTE: *Considerable fluctuations of this value of the current on the LCD of the control mean that the tube is not running smoothly.*

4.13.12.2 **IF** the tube is **NOT** running smoothly,
THEN lower the tube voltage to the point where the actual value display no longer shows fluctuation beyond the normal operating value.

4.13.12.2.1 **IF** this condition is met,
THEN GO TO Step 4.13.12.3.

4.13.12.2.2 **IF** the tube continues to fluctuate beyond the normal operating value,
THEN turn off x-ray control console
AND contact the SS.

4.13.12.3 **IF** the x-ray tube has been left idle for greater than 8 weeks, or as directed by the SS or designated alternate,
THEN notify SS.

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4.13.12.4 **SS:** Notify the RTR SE to evaluate the situation prior to switching to the manual warm-up mode.

4.13.12.4.1 **SE:** Evaluate the need to implement a semi-automatic extended warm-up through the setup menu **OR** to switch to the manual warm-up mode
AND advise **SS**.

4.13.12.5 **IF** directed by the **SS**,
THEN perform the following:

4.13.12.5.1 Start warm-up at up to 210 kV.

4.13.12.5.2 Increase the voltage up to 315 kV in 10 kV increments every 15 minutes.

4.13.12.5.3 Increase the voltage above 315 kV in 10 kV increments every 20 minutes, up to 420 kV.

4.13.13 Entering Barcodes Manually

WARNING
Eye injury may occur if personnel look directly into the barcode scanner beam.

4.13.13.1 Avoid looking directly into the barcode scanner beam.

4.13.13.2 Click on “Clear All” to clear all entries displayed for the four barcodes,
OR press the “Shift” and “<<” keys simultaneously to clear the displayed entry.

4.13.13.3 Enter the barcode using the keyboard.

4.13.13.4 Press the “Shift” and “:” keys simultaneously to set the entry.

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4.13.13.5 Press the “Shift” and “>” keys simultaneously to advance to the next entry location.

4.13.13.6 **REPEAT** Steps 4.13.13.3 through 4.13.13.5 until all barcodes have been entered.

4.13.13.7 **WHEN** all the barcodes have been entered,
THEN click on CONFIRM to set the entries.

4.13.14 **Follow-Up Steps When Stopping Production Operations with the RTR System**

4.13.14.1 Turn the x-ray controller key to STAND BY
AND remove the key.

4.13.14.2 OT and SS: Log the status change and NCR number in the applicable operator log and the SS log.

4.13.14.2.1 Ensure documentation is accurate and sufficient to ensure compliance with the requirements of operational limits.

4.13.14.2.1.1 Include, as a minimum, entry conditions and actions that are taken in response to operational limits requirements.

4.13.14.3 OT and SS: Update the applicable status boards.

(MP-COPS-9.7)

4.13.14.4 **WHEN** the condition for stopping production operations has been corrected,
AND the associated NCRs have been closed,
THEN return the RTR system to production operations.

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4.13.15 **Performing Functional Verification/Post-Maintenance Testing for Mechanical Motion Only**

- 4.13.15.1 Ensure that x-rays are **NOT** generated at any time during the performance of this section.
- 4.13.15.2 Ensure Section 4.2 has been completed.
- 4.13.15.3 **IF** entry into shielded enclosure is necessary for inspection, **THEN** perform necessary steps in Section 4.2 **AND RETURN TO** Step 4.13.15.4, when complete.
- 4.13.15.4 Insert the cart enable/disable key **AND** turn it to the ENABLE position.
- 4.13.15.5 Perform manipulations of equipment as necessary to satisfy functional verification/post-maintenance testing.

5.0 **DEFINITIONS**

Home position. When the cart is completely outside of the enclosure and the x-ray manipulator and II manipulator are fully lowered.

Liquids, observable (or liquid). Liquid that can be seen by a trained radiography operator or by a trained individual performing visual examination of the waste. This term can be implemented consistently during characterization regardless of waste type.

Operable. A system, subsystem, train, component, or device shall be operable when it is capable of performing its specified safety function(s) and all the required instrumentation, controls, normal or alternate electrical power, cooling and seal water, lubrication, and other auxiliary equipment for the system, subsystem, train, component, or device to perform its specified safety function are capable of performing their related support function(s).

Radiography. A nondestructive testing method that uses x-rays to inspect and determine the physical form of waste.

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Summary Category S3000—Homogeneous Solids. Homogeneous solids, or solid process residues, are defined as solid materials, excluding soil, that do not meet the NMED criteria for classification as debris (20.4.1.800 NMAC, Adoption of 40 CFR 268, (incorporating 40 CFR §268.2[g] and [h])). Included in the series of solid process residues are inorganic process residues, inorganic sludges, salt waste, and pyrochemical salt waste. Other waste streams are included in this summary category group based on the specific waste stream types and final waste form. This summary category group is expected to contain toxic metals and spent solvents. This category includes wastes that are at least 50 percent by volume solid process residues.

Summary Category S4000—Soils/Gravel. This summary category group includes S4000 waste streams that are at least 50% by volume soil/gravel. This summary category group is expected to contain toxic metals. Soils/gravel are further categorized by the amount of debris included in the matrix.

Summary Category S5000—Debris Wastes. This summary category group includes heterogeneous waste that is at least 50% by volume materials that meet the criteria specified in 20.4.1.800 NMAC (incorporating 40 CFR §268.2 [g]). Debris means solid material exceeding a 2.36 inch (60 millimeter) particle size that is intended for disposal (particles smaller than 2.36 inches in size may be considered debris if the debris is a manufactured object and if it is not a particle of S3000 or S4000 material) and is:

- A manufactured object
- Plant or animal matter
- Natural geologic material.

Waste stream. Waste materials that have common physical form that contain similar hazardous constituents and that are generated from a single process or activity.

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6.0 REFERENCES

- (1) 20.4.1.800 NMAC, Adoption of 40 CFR Part 268
- (2) 40 CFR 268.2, Land Disposal Restrictions, Definitions Applicable in this Part
- (3) 40 CFR 761, Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Subpart D Storage and Disposal
- (4) ANSI-N43.3, General Radiation Safety Standard for Installations Using Non-Medical X-ray and Sealed Gamma Ray Sources, Energies up to 10 MeV
- (5) AMWTP HWMA/RCRA Permit
- (6) CCP-PO-003, CCP Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPAC)
- (7) Form-1268, Production Systems Access Request
- (8) GE Inspection Technologies Isovolt operating instructions
- (9) INST-MI-1002, RTR 6-Month Safety Checks for RTR System Z-213-101 and Z-213-106
- (10) INST-OI-11, Waste Container Handling
- (11) INST-OI-24, Packaging Radioactive Waste
- (12) MP-COPS-9.7, Control of Equipment and Systems Status
- (13) MP-COPS-9.17, Performing Pre-Job Briefings and Post-Job Reviews
- (14) MP-COPS-9.20, Hazardous Energy Control Processes
- (15) MP-DOCS-18.2, Records Management
- (16) MP-Q&SI-5.4, Identification of Nonconforming Conditions
- (17) MP-RS&C-6.22, Radiological Survey Program
- (18) MP-RTQP-14.4, Personnel Qualification and Certification
- (19) MP-TRUW-8.1, Certification Plan for INL Transuranic Waste
- (20) MP-TRUW-8.2, Quality Assurance Project Plan
- (21) RPT-TRUW-05, Waste Matrix Code Reference Manual

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7.0 RECORDS

Records generated by this procedure are classified in accordance with the table below and dispositioned in accordance with MP-DOCS-18.2, Records Management.

Record Description	Classification
INST-OI-81, Case File	Non-permanent WIPP/ENV1-J-1/Destroy 75 years after submittal
Form-1218, Daily RTR Safety Checks	Facility Operating Record/ENV2-a-1-a/ Destroy 5 years after Life of Facility
Form-1374, RTR Log (or eSOMS equivalent) (Applicable Operator Log)	Facility Operating Record/ENV2-a-1-a/ Destroy 5 years after Life of Facility
Form-1377, WMF-634 RTR Shielding Radiation Survey	Facility Operating Record/ENV2-a-1-a / Destroy 5 years after Life of Facility
Form-1578, Imaging Quality Indicator Verification Form for RTR	Facility Operating Record/ENV2-a-1-a/ Destroy 5 years after Life of Facility
Recording Media Log	Nonpermanent WIPP/ENV1-J-1/Destroy 75 years after submittal
Recording media	Non-permanent WIPP/ENV1-J-1/Destroy 75 years after submittal

8.0 EXHIBITS

Exhibit 1 – RTR Image Test Quality Grid

Exhibit 2 – Waste Material Parameter Descriptions

Exhibit 3 – Parameters and Weights of Commonly Identified Items

Exhibit 4 – List of Prohibited Items

Exhibit 5 – Volumes of Cylinders

Exhibit 6 – Common Liquid Measurements and Conversions

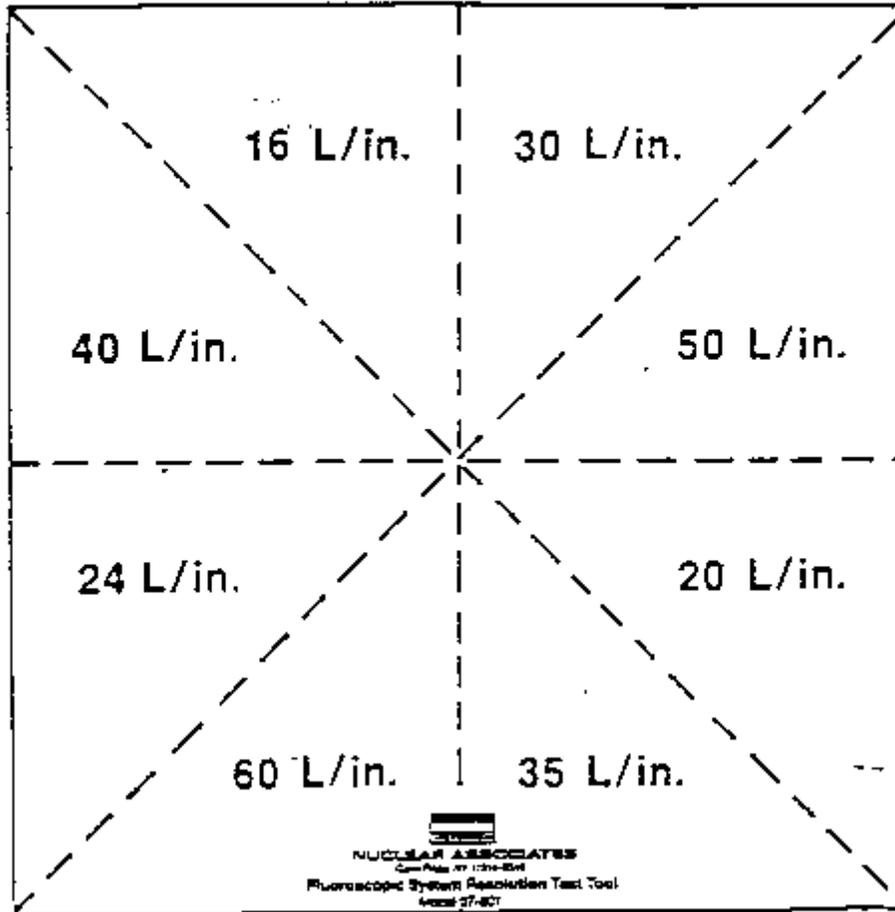
Exhibit 7 – V² Nominal Density Guidance Table

Exhibit 8 – Volume Conversion Table, Cubic Inches to Pints

Exhibit 9 – Categorizing Box Contents During RTR Examination

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Exhibit 1 – RTR Image Test Quality Grid



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Exhibit 2 – Waste Material Parameter Descriptions

Waste Material Parameter	Help Description
Iron-based metals/alloys	Iron and steel alloys in the waste; does not include the waste container materials
Aluminum-based metals/alloys	Aluminum or aluminum-based alloys in the waste material
Other metals	All other metals found in the waste materials
Other inorganic materials	Nonmetallic inorganic waste, including concrete, glass, firebrick, ceramics, sand, and inorganic sorbents
Cellulosics	Materials generally derived from high polymer plant carbohydrates. Examples are paper, cardboard, wood, cloth, etc.
Rubber	Natural or man-made elastic latex materials. Examples are surgeons' gloves, leaded rubber gloves, etc.
Plastics (waste materials)	Generally man-made materials often derived from petroleum feedstock. Examples are polyethylene, polyvinyl chloride, etc.
Organic matrix	Cemented organic resins, solidified organic liquids, and sludge
Inorganic matrix	Any homogeneous materials consisting of sludge or aqueous-based liquids that are solidified with cement, calcium silicate, or other solidification agents. Examples are wastewater treatment sludge, cemented aqueous liquids, inorganic particulate, etc.
Soil/gravel	Generally consists of naturally-occurring soil/gravel contaminated with inorganic waste materials
Steel (packaging materials)	208-L (55-gal.) drums
Plastics (packaging materials)	90-mil polyethylene drum line and plastic bags

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Exhibit 3 – Parameters and Weights of Commonly Identified Items

Item	Weight	Waste Material Parameter
55-gal drum (17 C)	See WTS List of Container Weights	Steel (packaging materials)
90 mil liner (Type I, II, III, IV)	See WTS List of Liner Weights	Plastic (packaging materials)
O-ring plastic bag found in sludge, organic setups, etc.	4 lb	Plastic (packaging materials)
Drum plastic bag	1 lb	Plastic (packaging materials)
Plastic bag for waste	1/4 lb	Plastic (waste materials)
Cardboard liner (graphite mold waste)	4 lb	Cellulosics
Fiber pack	6 lb	Cellulosics
Box fiberboard liner	15 lb	Cellulosics
Box plastic liner	5 lb	Plastic (packaging materials)
Lead Brick 2 by 4 by 8 in.	25 lb	Other metals
Leaded Rubber Glove	5.5 lb	Rubber
Leaded Rubber Apron	5.25 lb	Rubber
Liquids (Water)	8 lb/gal + (1 lb/pint)*	
Drum Lead-liner: (1/8 in. thick, 28 in. high, by 72 in. long) (0.4 lb/in. ³)	100 lb	Other metals
Drum Lead-liner: (1/16 in. thick, 28 in. high by 72 in. long)	50 lb	Other metals
Vermiculite (95 gm/liter)	0.9 lb/gal (0.125 lb/pint)	Other Inorganics
Oil-Dri (404 gm/liter)	3.36 lb/gal (0.42 lb/pint)	Other Inorganics
Poly Bottles (1 gal)	1 lb	Plastics (waste materials)
Metal Can	1/2 lb	Iron-based metals/alloys
Drum Stub bag	2 lb	Plastic Packaging (materials)
Cured Cement	9 lb/gal (1.125 lb/pint)	Other Inorganic Materials
Uncured Cement	24 lb/gal (3 lb/pint)	Other Inorganic Materials
Aquaset	9.6 lb/gal (1.21 lb/pint)	Other Inorganic Materials

* Waste Parameter depends on source of liquid organic or inorganic.

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Exhibit 4 – List of Prohibited Items

Prohibited Item	Comments
Liquids	<p>Liquid Waste is not acceptable at WIPP. Observable liquid containing PCBs is prohibited at WIPP. Liquid in the quantities delineated below is acceptable:</p> <ul style="list-style-type: none"> • Observable liquid shall be less than 1% by volume of the outermost container at the time of radiography or visual examination. • Internal containers with more than 60 milliliters or 3% by volume observable liquid, whichever is greater, are prohibited. • Containers with Hazardous Waste Number U134 assigned shall have no observable liquid. • Overpacking the outermost container that was examined during radiography or visual examination or redistributing untreated liquid within the container shall not be used to meet the liquid volume limits.
Compressed gases	Typically, aerosol cans, gas bottles, or cylinders that cannot be verified to be physically vented (e.g., a drilled hole, a removed relief valve).
Corrosives/reactives/ignitables present	Waste exhibiting the characteristic of ignitability, corrosivity, or reactivity.
Explosives	Examples include ammunition, dynamite, black powder, detonators, nitroglycerine, urea nitrate, and picric acid.
Wastes with PCBs not authorized under an EPA PCB waste disposal authorization	Light ballasts AND transformers are potential sources of PCBs in much of the waste. PCB items commingled (in direct contact with or displaying evidence of cross contamination) with residual liquids are prohibited.
Non-radionuclide pyrophorics	Examples of pyrophoric radionuclides are: metallic plutonium, americium. Examples of non-radionuclide pyrophorics or materials/waste that may cause a pyrophoric type event are: organic peroxides, sodium metal, and chlorates.
Sealed containers greater than 4 liters	Containers >4 liters are considered sealed unless the container cannot be airtight (example: fiber-packs).
Non-mixed hazardous waste	Hazardous wastes not occurring as co-contaminants with TRU mixed wastes (non-mixed hazardous wastes).
Waste incompatible with backfill, seal and panel closure material, shipping container materials or other wastes	Excessive rust, brittle materials, excessive corrosion, evidence of reaction in the waste are all potential sources for evidence that the waste is not compatible with backfill, packaging, or shipping container. Compatible waste meets the TRUCON requirement.
Sharp or heavy items not blocked or braced	Sharp items that have a reasonable potential to puncture the payload container shall be treated or protected prior to shipment. (The presence of a properly assembled rigid or fiberboard liner is considered as one method of providing protection. Padding, when applicable, is also an acceptable method of providing protection.) Heavy items shall be blocked, braced, or suitably packaged to provide puncture protection for the payload containers packaging these objects.

(HWMA/RCRA Permit; MP-TRUW-8.1; MP-TRUW-8.2; CCP-PO-003)

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Exhibit 5 – Volumes of Cylinders

Volumes of Cylinders (pints)												
Diameter (in.)												
Height (in.)	1	2	3	4	5	6	7	8	9	10	11	12
1	0.03	0.11	0.24	0.44	0.68	0.98	1.33	1.74	2.20	2.72	3.29	3.92
2	0.05	0.22	0.49	0.87	1.36	1.96	2.67	3.48	4.41	5.44	6.58	7.83
3	0.08	0.33	0.73	1.31	2.04	2.94	4.00	5.22	6.61	8.16	9.87	11.75
4	0.11	0.44	0.98	1.74	2.72	3.92	5.33	6.96	8.81	10.88	13.16	15.67
5	0.14	0.54	1.22	2.18	3.40	4.90	6.66	8.70	11.02	13.60	16.46	19.58
6	0.16	0.65	1.47	2.61	4.08	5.88	8.00	10.44	13.22	16.32	19.75	23.50
7	0.19	0.76	1.71	3.05	4.76	6.85	9.33	12.19	15.42	19.04	23.04	27.42
8	0.22	0.87	1.96	3.48	5.44	7.83	10.66	13.93	17.63	21.76	26.33	31.33
9	0.24	0.98	2.20	3.29	6.12	8.81	12.00	15.67	19.83	24.48	29.62	35.25
10	0.27	1.09	2.45	4.35	6.80	9.793	13.33	17.41	22.03	27.20	32.91	39.17
11	0.30	1.20	2.69	4.79	7.48	10.77	14.66	19.15	24.24	29.92	36.20	43.08
12	0.33	1.31	2.94	5.22	8.16	11.75	15.99	20.89	26.44	32.64	39.49	47.00
13	0.35	1.41	3.18	5.66	8.84	12.73	17.33	22.63	28.64	35.36	42.79	50.92
14	0.38	1.52	3.43	6.09	9.52	13.71	18.66	24.37	30.84	38.08	46.08	54.84
15	0.41	1.63	3.67	6.53	10.20	14.69	19.99	26.11	33.05	40.80	49.37	58.75

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Exhibit 6 – Common Liquid Measurements and Conversions

Liquid Measurements	
1.	3 tsp = 1 tbsp
2.	4 tbsp = 1/4 cup
3.	2 cups = 1 pint
4.	4 cups = 1 qt
5.	2 pints = 1 qt
6.	8 pints = 1 gal
7.	4 quarts = 1 gal
8.	Pints \times 0.473 = liters
9.	Millilitres \times 1000 = liters
10.	60 ml = .127 pints
11.	1 pint = 1 lb

Conversions		
Unit	Conversions to Pints	Weight (lb)
1 teaspoon	0.01	0.01
1 tablespoon	0.03	0.03
1/4 cup	0.13	0.13
1/3 cup	0.17	0.17
1 cup	0.5	0.5
1 pint	1	1
1 quart	2	2
1 gal	8	8

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Exhibit 7 – V² Nominal Density Guidance Table

Material	Density (kg/L)	References
Aluminum	3.0	1, 2
Cement	2.0	1
Cardboard (fiber board)	0.8	5
Copper	9.0	1, 2
Fiber board (insulating)	0.8	4
Fire Brick (90% aluminum oxide)	3.0	4
Glass	2.0	3
Glass, Bulk Density	2.0	3
Glass, Raschig Rings (0.06 kg/ring)	0.6	4
Graphite, Bulk Density	0.5	3
Gravel	2.0	3
Iron	7.5	2
Lead	11.0	1, 2
Plastic (e.g., 10 ml liner material)	0.9–1.0	Calculated
Plastic (e.g., 90 ml heavy rigid liner material)	0.9–1.0	Calculated
Rubber	0.9–2.0	2
Sand	2.0	3
Sludge	1.0–1.5	Common Knowledge
Soil	1.0–1.8	2
Stainless Steel	8.0	1
Steel	8.0	1, 2
Tantalum	17.0	2
Wood (fir, oak, pine, avg.)	1.0	3
Water	1.0	1.3

The actual density of specific metals or wood types may vary due to the type of wood or the composition of the metal alloy.

Water has a nominal density of 1 kg/L

1 kilogram = 2.2 pounds

References

1. Shigley, J. E., Mechanical Engineering Design, 3rd ed. 636
2. Marks Standard Handbook for Mechanical Engineers, 8th ed. 6-60/61
3. Perry, John H., Chemical Engineers Handbook, 3rd ed. 1549-52
4. Harbison-Walker Refractories Co., Technical Bulletin 12, HU
5. Rocky Flats procedure, 4-I19-NDT-00569

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Exhibit 8 – Volume Conversion Table, Cubic Inches to Pints

in ³	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	.04	.07	.10	.14	.17	.21	.24	.28	.31	.35	.38	.42	.45	.49	.52	.55	.59	.62	.66	.69	.73	.76
2	.07	.14	.21	.28	.35	.42	.49	.55	.62	.69	.76	.83	.9	.97	1.04	1.12	1.18	1.25	1.32	1.41.395	1.45	1.52
3	.1	.17	.31	.42	.52	.62	.73	.83	.94	1.04	1.14	1.25	1.35	1.45	1.56	1.66	1.77	1.87	1.97	2.08	2.18	2.29
4	.14	.28	.42	.55	.69	.83	.97	1.12	1.25	1.39	1.52	1.66	1.8	1.94	2.08	2.22	2.36	2.49	2.63	2.77	2.91	3.05
5	.17	.35	.52	.69	.87	1.04	1.21	1.39	1.56	1.73	1.9	2.08	2.25	2.42	2.6	2.77	2.94	3.12	3.29	3.46	3.64	3.81
6	.21	.42	.62	.83	1.04	1.25	1.45	1.66	1.87	2.08	2.29	2.49	2.7	2.9	3.12	3.32	3.53	3.74	3.95	4.16	4.36	4.57
7	.24	.49	.73	.97	1.21	1.45	1.7	1.94	2.19	2.42	2.67	2.91	3.15	3.39	3.64	3.88	4.12	4.36	4.61	4.85	5.09	5.33
8	.28	.55	.83	1.11	1.39	1.66	1.94	2.22	2.49	2.77	3.05	3.32	3.61	3.88	4.16	4.43	4.71	4.99	5.26	5.54	5.82	6.1
9	.31	.62	.94	1.25	1.56	1.87	2.18	2.49	2.81	3.12	3.43	3.74	4.05	4.36	4.68	4.99	5.3	5.61	5.92	6.23	6.66	6.86
10	.35	.69	1.04	1.39	1.73	2.08	2.42	2.77	3.12	3.46	3.81	4.16	4.5	4.85	5.19	5.54	5.89	6.23	6.58	6.92	7.27	7.62
11	.38	.76	1.14	1.52	1.9	2.29	2.67	3.05	3.43	3.81	4.19	4.57	4.95	5.33	5.71	6.1	6.48	6.86	7.24	7.62	8	8.38
12	.42	.83	1.25	1.66	2.08	2.49	2.91	3.32	3.74	4.16	4.57	4.99	5.4	5.82	6.23	6.65	7.06	7.48	7.98	8.31	8.73	9.14
13	.45	.9	1.35	1.8	2.25	2.7	3.15	3.61	4.05	4.5	4.95	5.4	5.85	6.3	6.75	7.2	7.65	8.1	8.55	9	9.45	9.9
14	.49	.97	1.45	1.94	2.42	2.9	3.39	3.88	4.36	4.85	5.33	5.82	6.3	6.79	7.27	7.76	8.24	8.72	9.21	9.7	10.18	10.67
15	.52	1.04	1.56	2.08	2.6	3.12	3.64	4.16	4.68	5.19	5.71	6.23	6.75	7.27	7.79	8.31	8.83	9.35	9.87	10.39	10.91	11.43
16	.55	1.12	1.66	2.22	2.77	3.32	3.88	4.43	4.99	5.54	6.1	6.65	7.2	7.76	8.31	8.87	9.42	9.97	10.53	11.08	11.64	12.19
17	.59	1.18	1.77	2.36	2.94	3.53	4.12	4.71	5.3	5.89	6.48	7.06	7.65	8.24	8.83	9.42	10	10.6	11.18	11.77	12.36	12.95
18	.62	1.25	1.87	2.49	3.12	3.74	4.36	4.99	5.61	6.23	6.86	7.48	8.1	8.72	9.35	9.97	10.6	11.22	11.84	12.47	13.09	13.71
19	.66	1.32	1.97	2.63	3.29	3.95	4.61	5.26	5.92	6.58	7.24	7.9	8.55	9.21	9.87	10.53	11.18	11.84	12.5	13.16	13.82	14.48
20	.69	1.39	2.08	2.77	3.46	4.16	4.85	5.54	6.23	6.92	7.62	8.31	9	9.7	10.39	11.08	11.77	12.47	13.16	13.85	14.55	15.24
21	.73	1.45	2.18	2.91	3.64	4.36	5.09	5.82	6.55	7.27	8	8.73	9.45	10.18	10.91	11.64	12.36	13.09	13.82	14.55	15.27	16
22	.76	1.52	2.29	3.05	3.81	4.57	5.33	6.1	6.86	7.62	8.38	9.14	9.9	10.67	11.43	12.19	12.95	13.71	14.48	15.24	16	16.76

- A. Multiply the cross-section volume in the table by the height of the object to get the volume of the object in pints. The cross-section volume is based on a height of 1 inch.

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Exhibit 9 – Categorizing Box Contents During RTR Examination

CATEGORY ITEM	Packaging Material	Layer of Confinement	Waste Material
Plastic Drum Bag	*	X	
90-mil Liner	X		
Small Plastic Bag Containing Waste	*	X	
Poly Bottle <4 liters			X
Fiber Pack			X
Volrath Can <4 liters			X
Metal Can <4 liters			X
Empty Plastic Bag			X
Ice Cream Carton			X
Sealed containers >4 liters		X	

* Only plastic bags (PVC or poly) in the outer two layers are considered plastic packaging materials, the others are considered plastic waste.

9.0 APPENDICES

Appendix A – Burning DVD from Hard Drive

Appendix B – Creating or Transferring Data to the RITA Archival System

Appendix C - Revision Log

AMWTP INSTRUCTION

INST-OI-81, Rev. 10

Issued: 08/23/12

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Real-Time Radiography Operations (for WIPP Certification of Boxes)**Appendix A –
Burning DVD from Hard Drive**

NOTE: *This appendix is used to provide information for burning data from the hard drive onto a DVD.*

1. Start by clicking the “Nero Essentials” icon on the desktop.
2. Highlight the data DVD button by double clicking it. (This program will burn the DVD from the hard drive.)

NOTE: *The Nero essentials will open and have a button on the right hand side of the window titled ADD.*

3. After selecting the ADD button, a folder window will open with the recorded data.
4. File the applicable file or folder.
5. Highlight the box(es) and IQI, if needed, to be burned to the DVD **AND** click the ADD button.
6. Ensure there is enough memory on the DVD for selected file. If not, insert a new DVD.
7. After all items to be burned to DVD have been added, close the folder containing all the data.
8. Hit the NEXT button.
9. Name the disc with the batch number being burned to the DVD, if necessary.
10. Ensure that “Verify data on disc after burning” and “Multi-session” boxes are checked.
11. Select the burn button. If DVD does not have enough space for selected file, then insert new DVD and continue.
12. After the burn is complete, select “OK” to “Data Verification Completed Successfully.”
13. Select NEXT.
14. Exit “Nero Essentials.”

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15. Re-insert disc and wait for “My Disc” window to open.
16. Select previously burned file and check the audio/video record for completeness.
17. Exit “My Disc” folder.
18. Create a folder with the batch number as the folder name, if necessary.
19. Move previously burned file(s) to batch folder.

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INST-OI-81, Rev. 10

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Real-Time Radiography Operations (for WIPP Certification of Boxes)**Appendix B –
Creating or Transferring Data to the RITA Archival System**

1. Double click RITA icon, if necessary.
2. If needing to create a disk, click CREATE.
 - 2.1 Select the type of disk to be created and select CREATE.

NOTE 1: *After confirming, a window will pop up informing if you are successful or if there is a problem with the creation of the disc.*

NOTE 2: *After clicking CANCEL, the program will return you to the first screen of RITA.*
 - 2.2 If information is correct, click CONFIRM.
 - 2.3 If information is incorrect, click CANCEL.
 - 2.4 Click OK to acknowledge creation of the disk ID.
3. If needing to transfer data, click TRANSFER

NOTE: *While data is transferring, the RITA window can be minimized.*

 - 3.1 Select disk ID to be transferred and select TRANSFER
 - 3.2 Input batch ID if disk is associated with a batch, and N/A if it is not.
 - 3.3 Click TRANSFER.
 - 3.4 If transfer is unsatisfactory, contact SS/subject matter expert/SE.
 - 3.5 If transfer is complete and satisfactory, click OK.

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**Appendix C –
Revision Log**

Revision Number	Date Approved	Pages Affected	Description of Revision
0	04/08/08	All	DCR-6867. Initial issue.
1	08/11/08	All	DCR-7359. Incorporated DOCS-BLUESHEET-01 changes, revised Section 2.0 to be specific to procedure, revised Sections 4.2, 4.4, 4.6, 4.7, 4.8 per upgrades to procedure, deleted Section 4.13, revised Section 7.0, updated roll-downs, replaced the magneto optical disc with recording media, added updates for the IQI, added Appendix A, made editorial changes per MP-DOCS-18.1.
2	01/29/09	Various	DCR-7644. Incorporated DSA changes and edited per MP-DOCS-18.1 and reformatted per MP-DOCS-18.4.
2 FC-1	03/19/09	7 and 41	DCR-8178. Clarification and match software terminology.
3	04/27/09	Various	DCR-8267. Incorporated changes for consistency with INST-OI-12 and to improve flow. Incorporate FC-1 (DCR-8178) to make FC permanent. Made editorial changes for consistency within document and per MP-DOCS-18.1. Incorporated DOCS-Bluesheet-02 changes (eSOMS equivalent). (Revision considered a rewrite due to number of rev bars.)
4	11/18/09	Various	DCR-8729. Incorporated 2009 DSA/TSR update.

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Revision Number	Date Approved	Pages Affected	Description of Revision
5	02/22/10	Various	DCR-9007. Changes to clarify IQI requirements.
5 FC-1	04/28/10	B1	DCR-9208. Changed RTR ratings for RTRs 101 and 106.
5 FC-2	05/10/10	Pg 5	DCR-9249. Change made to resolve CAR 49662, incorporating alternative isolation device information.
5 FC-3	06/19/10	Pgs 12, 13, and 14 B1	DCR-9376. Change made to warm-up steps and RTR 106 kV settings.
6	06/24/10	Various	DCR-9138. Incorporated DCRs-9208 -9249, and -9376 (EXCEPT for the RTR kV changes), and WIPP Permit modifications.
6 FC-1	08/02/10	Various	DCR-9454. Allow de-rate of maximum power by System Engineer and Document owner.
6 FC-2	09/30/10	Various	DCR-9568. Provides formal direction to operators.
7	12/15/10	Various	DCR-9497. Incorporated FC-1 (DCR-9454) and FC-2 (DCR-9568). Incorporate the new WIPP Hazardous Waste Permit language changes. Also corrected inconsistencies in FCs compared to OI-12 FCs.
8	06/21/11	Various	DCR-10139. Changed to Controlled Activity. Updated steps and notes to match operational changes. Added clarification to reduce NCRs and to minimize rework. Resolves CAR 54805.
9	07/03/12	Various	DCR-11144. Revised to incorporate ITG-Bluesheet-021, update document owner and equipment upgrades, including changing the II to FP.
10	08/06/12	Various	DCR-11431. Incorporated DSA changes.

Real-Time Radiography Operations (Drum)

(Controlled Activity)

Advanced Mixed Waste Treatment Project

Approved:

(Signature on file. See DCR-11428.)

Brian Warner
Characterization Lead

08/08/12

Date

AMWTP OPERATING INSTRUCTIONS		
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1.0 PURPOSE/SCOPE

The Advanced Mixed Waste Treatment Project (AMWTP) Real-Time Radiography (RTR) system is a nondestructive examination technique used to verify the physical form of the waste and the absence of liquids and containerized gases within the contents of radioactive and mixed waste containers. Container types and sizes may include 55-gal, 83-gal, and 100-gal size drums. In addition to identifying the contents of containers, the RTR also provides digital data-recording capabilities. Examination of containers verifies the specific waste matrix code (WMC) and *waste stream* (see def.) description, identifies prohibited items, and estimates each waste material parameter weight as required for disposal at the Waste Isolation Pilot Plant (WIPP). In the case of unlabeled containers, RTR is used to correlate the contents of the container with known waste types and, if possible, assign an item description code (IDC).

This document applies to the operation of the RTR and operating software.

(HWMA/RCRA Permit; MP-TRUW-8.1; MP-TRUW-8.2; CCP-PO-003)

2.0 ROLES AND RESPONSIBILITIES

Performer	Responsibilities
Operations Technician (OT)	<ul style="list-style-type: none"> • Unless otherwise specified, performs the steps in this instruction.
Shift Supervisor (SS)	<ul style="list-style-type: none"> • Makes necessary notifications • Logs status changes • Updates the applicable status boards • Performs post-job reviews.
System Engineer (SE)	<ul style="list-style-type: none"> • Evaluates conditions and advises SS.

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3.0 PRECAUTIONS AND LIMITATIONS/PREREQUISITES

3.1 Precautions and Limitations

- 3.1.1 The RTR door interlock systems, audible and visual warning signals, minimum 20-second delay function, emergency shutdown switches, and shielding shall be *operable* (see def.) when the associated RTR x-ray unit is capable of generating x-rays.

(ANSI-N43.3)

- 3.1.2 To avoid personnel exposure, the shielded enclosure must be clear of personnel before initiating x-rays.
- 3.1.2.1 When personnel are using the mirror mounted inside the shielded enclosure, they must ensure the hidden area located underneath the camera is unoccupied.
- 3.1.3 To avoid personnel exposure to x-rays and personnel injury, emergency stops to shut off x-ray generation and equipment movement are located on the operator control console (red mushroom pushbutton), and within the RTR enclosure (pull cords).
- 3.1.4 The personnel access door can be opened from inside the RTR enclosure to allow personnel egress during an emergency. If x-rays are being generated, opening the personnel door will stop generation of x-rays.
- 3.1.5 The cart enable/disable key must be switched to DISABLE, the key removed, and maintained under operator control, when loading, unloading, and rotating the cart or installing/removing the drum manipulator and when entering the enclosure.
- 3.1.6 The maximum capacity for each drum position is 1,200 lb.
- 3.1.7 The maximum capacity for the x-ray cart is 10,000 lb.
- 3.1.8 Before leaving the RTR control console unattended, the x-ray controller must be placed in STAND BY mode and the key must be removed and maintained under operator control or stored in the master key locker.

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- 3.1.9 The x-ray controller may be turned off at any time; however, if time permits, maintaining the key switch in STAND BY after periods of continuous operation will help ensure adequate cool down before switching off.
- 3.1.10 To ensure waste drums are not frozen, the waste drums must be preheated for a minimum of 72 hours at 18°C or higher during cold weather. Preheating is required October through April. The SS will determine if preheating is required outside the October through April window. After 72-hour initial preheat and the drum has not been removed from WMF-634, the temperature may fall below 18°C (in WMF-634) as long as it does not fall below 1°C for any period of time.
- (HWMA/RCRA Permit)**
- 3.1.11 For safety, personnel must stay clear of the moving cart and moving doors.
- 3.1.12 When entering the shielded enclosure following the conclusion of x-ray generation, a qualified radiological control technician (RCT) shall use a suitable, operable, calibrated survey instrument to verify that the source is in its fully-shielded condition or that the x-ray tube has been de-energized. The qualified RCT shall document this survey in accordance with MP-RS&C-6.22, Radiological Survey Program.
- 3.1.13 The x-ray enclosure interior is a very high radiation area when the x-ray generator is on. No one is ever allowed inside the enclosure while x-rays are being produced.
- 3.1.14 The RTR is an x-ray-generating device. Direct exposure to the x-ray beam may result in serious injury or death. Personnel must avoid exposure by observing all warning devices and personnel barriers.
- 3.1.15 Alternative methods for hazardous energy control are used in this procedure for servicing tasks that are routine, repetitive, and integral to the use of the equipment for production in accordance with MP-COPS-9.20, Hazardous Energy Control Processes.

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3.2 Prerequisites

3.2.1 Personnel operating the RTR are properly qualified in accordance with MP-RTQP-14.4, Personnel Qualification and Certification, by completing the qualification checklist for an RTR operator (QPOT03A0).

(HWMA/RCRA Permit; MP-TRUW-8.1)

3.2.2 The following forms are available:

- Applicable operator log
- Form-1578, Imaging Quality Indicator Verification Form for RTR
- Form-1218, Daily RTR Safety Checks.

3.2.3 Operations Technician has obtained the following items (keys are in the master key locker):

- Operator control console power key
- E-Stop reset key
- X-ray control console key
- Cart enable/disable key
- Recording media (digital video disc [DVD]), as necessary
- Image Quality Indicator (IQI) test pattern.

(HWMA/RCRA Permit; MP-TRUW-8.1)

3.2.4 Waste Tracking System (WTS) is available.

3.2.5 A pre-job brief has been performed in accordance with MP-COPS-9.17, Performing Pre-Job Briefings and Post-Job Reviews, as directed by the SS prior to performing work in this procedure.

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- 3.2.6 The following required safety checks have been verified (and logged on the applicable operator log) to be within periodicity
OR the system is being operated to perform the safety checks or other activities to restore the system to operability.

Safety Check	Performed Per	Periodicity
RTR door interlocks, warning signals, delay function, and emergency switches	INST-MI-1002, RTR 6-Month Safety Check for RTR System Z-213-101 and Z-213-106	Semiannually or following configuration changes or modifications
RTR Shielding Radiation Survey	Form-1377, WMF-634 RTR Shielding Radiation Survey	Semiannually or following configuration changes or modifications

(ANSI-N43.3)

4.0 INSTRUCTIONS

4.1 General Instructions

NOTE: *Entering the shielded enclosure may be performed at any time throughout this procedure as necessary to perform routine inspections and escort personnel for inspections or training.*

- 4.1.1 **IF** entry into the shielded enclosure is necessary at any point during the performance of this procedure,
THEN GO TO Section 4.3
AND RETURN TO the point of departure in the previous section when complete.
- 4.1.2 **IF** an abnormal or infrequent event is encountered at any point while working this procedure,
THEN GO TO Section 4.13
AND RETURN TO the point of departure in the previous section when complete.

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- 4.1.3 **GO TO** the appropriate procedure section from the following table based on the desired task to be performed,
THEN RETURN TO this step if further activities will be performed:

Task	Section
System Startup	4.2
Entry into Shielded Enclosure	4.3
Beginning of Shift Activities	4.4
Warm-up	4.5
Imaging System Check	4.6
Operation of RTR System	4.7
Moving Drums into and out of the Enclosure	4.8
Real-Time Radiography Examination Guidelines	4.9
RTR Examination and WTS Data Entry	4.10
Total System Shutdown	4.11
Post-Job Review	4.12
Abnormal and Infrequent Operations	4.13

4.2 System Startup

- 4.2.1 Ensure x-ray cooler is ON.
- 4.2.2 Insert the cart enable/disable key
AND turn to ENABLE.

NOTE: *Applicable steps may be performed to shutdown and restart computers because of minor computer malfunctions on the barcode scanner, RTR, and WTS systems.*

- 4.2.3 Ensure the electrical power strip is turned on.
- 4.2.4 Ensure the RTR computer systems are on.
- 4.2.5 Ensure all RTR system monitors are on.
- 4.2.6 Perform Windows login, as necessary.
- 4.2.7 Ensure the closed-circuit television (CCTV) monitor is turned on.

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NOTE: *The power-on lamp will be illuminated after an approximate 15-second delay.*

4.2.8 Ensure the operator control console power key is inserted into the POWER key switch

4.2.8.1 Turn the key to the RESET position
AND release.

4.2.9 Ensure the E-Stop reset key is inserted into the “E-Stop Reset” switch.

4.2.10 Double click on Barcode icon, if necessary.

4.2.11 Double click Vi3 icon, if necessary.

NOTE: *Before the control system can be operated, the system is in the HOME position (see def). The HOME position is selected by pressing the AUTO OUT pushbutton. The AUTO OUT lamp will flash while the x-ray tube head and Flat Panel Digital Radiography Imaging System (FP) are returning to the HOME positions.*

4.2.12 Press the AUTO OUT button to home the system, as applicable.

4.2.13 Insert x-ray controller key into key switch on x-ray control console
AND turn key to STAND BY position.

4.2.14 Ensure the x-ray shutters are closed.

4.2.15 **IF** this is a full system startup,
THEN enter the time of the system power up in the applicable operator log.

NOTE: *The WTS will not permit logon if Form-1268, Production Systems Access Request, is not current.*

4.2.16 Log in to the WTS RTR operation navigation screen, if necessary.

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4.3 Entry into Shielded Enclosure

NOTE: *The only activities authorized to be performed using this section are entry into the shielded enclosure to perform routine inspections or escorting personnel into the shielded enclosure for inspections and/or training.*

4.3.1 Ensure radiation survey of enclosure has been completed by a qualified RCT prior to entry into shielded enclosure.

4.3.2 **IF** system startup is required,
THEN GO TO Section 4.2.

4.3.3 Ensure cart movement has been disabled prior to enclosure entry.

4.3.3.1 Insert the cart enable/disable key
AND turn it to the ENABLE position, if necessary.

NOTE: *The following step is performed to verify the cart and other equipment are capable of moving as a pre-check to satisfy using an alternate method to hazardous energy control.*

4.3.3.2 Press the AUTO IN button and allow the cart to enter the enclosure and the bi-parting door to close, if necessary.

4.3.3.3 Home the RTR system by pressing the AUTO OUT pushbutton.

4.3.3.4 Set cart enable/disable key to DISABLE to disable cart movement.

4.3.3.5 Remove the cart enable/disable key
AND maintain under operator control.

4.3.3.6 Verify that the RTR cart is nonoperational after key removal by attempting to move cart from RTR Control Room with key removed.

4.3.3.7 Ensure that the drum manipulator is installed and is fitted with the appropriate size drum collars, if necessary.

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NOTE: *The only personnel authorized to enter the shielded enclosure under this alternate method to hazardous energy control are the OT in control of cart enable/disable and x-ray keys and any personnel being escorted by OT in control of cart enable/disable and x-ray keys.*

4.3.3.8 **IF** performing shielded enclosure inspection for any reason other than the daily inspection and completion of Form-1218,
THEN GO TO Step 4.3.3.12.

4.3.3.9 **IF** performing shielded enclosure inspection for daily inspection and completion of Form-1218,
THEN perform the following:

NOTE: *Remaining steps in this section may be performed concurrently.*

4.3.3.9.1 Inspect the shielded enclosure vault as follows:

- General cleanliness
- Foreign objects or signs of tampering with equipment
- Oil on the floor
- Drive screws on both the x-ray tube head and FP manipulators free of obstructions.

NOTE: *An IQI is required at system startup prior to examining drums and at least once every 24 hours during continuous operations.*

4.3.3.10 **IF** an IQI image verification is required,
THEN mount the IQI test pattern on the cart between the drum centerline and the FP, if necessary.

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NOTE: *It is Management's expectation that Form-1218 is not completed until the SS has reviewed it and signed on the appropriate line.*

4.3.3.11 Ensure that Form-1218 has been completed for the applicable RTR unit for the current day.

(ANSI-N43.3)

4.3.3.11.1 **IF** any item in Section I or II is unsatisfactory, **THEN** immediately take the following steps:

4.3.3.11.1.1 Stop production operations with the RTR system
AND generate an NCR on the system.

4.3.3.11.1.2 Notify the SS.

4.3.3.11.1.3 **GO TO** Section 4.13.15.

(ANSI-N43.3)

4.3.3.12 Enter the shielded enclosure to perform inspection/training as necessary.

4.4 Beginning of Shift Activities

4.4.1 **IF** Form-1218 has **NOT** been completed for the current day, **THEN GO TO** Section 4.3 to complete Form-1218 **AND RETURN TO** Step 4.4.2 when complete.

(ANSI-N43.3)

NOTE: *The WTS will not permit logon if Form-1268 is not current.*

4.4.2 Log in to the WTS RTR operation navigation screen, if necessary.

4.4.3 Double click the barcode reader icon, if necessary.

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NOTE: *An IQI is required at system startup prior to examining waste and at least once every 24 hours during continuous operations.*

4.4.4 **IF** an IQI has been completed for the current day, as evidenced on Form-1578,
THEN verify it is complete and compliant by viewing the recording and listening to the audio.

4.4.4.1 **IF** IQI is found to **NOT** be complete and compliant,
THEN notify the SS.

NOTE: *The cart will have to be out in order to mount the IQI test pattern.*

4.4.5 **IF** an IQI image verification is required,
THEN mount the IQI test pattern on the cart between the drum centerline and the FP.

4.5 Warm-up

4.5.1 Ensure Sections 4.2 through 4.4 are completed prior to RTR system operations.

NOTE: *In the event that an extended manual warm-up is necessary, personnel should consult with the SS and RTR SE for guidance. The GE Inspection Technologies Isovolt operating instructions are available for a more detailed description of operation.*

4.5.2 Ensure the x-ray shutters are closed.

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WARNING
When the x-ray generator is on, personnel in the enclosure could suffer fatal injuries.

NOTE 1: *The DOOR CLOSE button light on the operator control panel will be illuminated when the bi-parting door is closed.*

NOTE 2: *The hidden area located underneath the camera can be checked using the mirror mounted inside the shielded enclosure.*

4.5.2.1 Ensure that the enclosure is unoccupied
AND both the personnel access and the bi-parting doors are closed.

4.5.3 **GO TO** the appropriate procedure section from the following table based on the desired warm-up activities to be performed,
THEN RETURN TO this step, if further warm-up activities will be performed:

Task	Section
Start of shift OR after Daily Safety Checks Completion	4.5.4
RTR has been in continuous operation for less than 2 hours and prompts for warm-up when entering a high kV value, OR has been idle for 2-3 hours	4.5.5
RTR System has been idle for 3–4 hours	4.5.6
RTR System has been idle for >4 hours	4.5.7
Warm-up is complete	4.5.8

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NOTE: *The controller will display "Tube To Be Warmed-Up" and display options for: NO (F1), 1..2 Days (F4), 2..14 Days (F5), >14 Days (F6), and RTC auto (F7).*

4.5.4 **IF** at the start of shift
OR AFTER daily safety checks completion,
THEN cycle the key position from the ON/STANDBY position to OFF and back to ON.

NOTE: *After performing the following step, a screen prompting to "Enter Test Voltage" will appear.*

4.5.4.1 Press F6 to select >14 days.

4.5.4.2 Type 420 kV
AND press ENTER.

4.5.4.3 Press the X-RAY ON button to begin the warm-up.

NOTE: *The controller will display "Tube To Be Warmed-Up" and display options for: NO (F1), 1..2 Days (F4), 2 ..14 Days (F5), >14 Days (F6), and RTC auto (F7).*

4.5.5 **IF** the RTR system has been in continuous operation for less than 2 hours and prompts for warm-up when entering a high kV value,
OR the RTR system has had continuous idle time for 2–3 hours,
THEN cycle the key position from the ON/STANDBY position to OFF and back to ON.

NOTE: *After performing the following step, a screen prompting to "Enter Test Voltage" will appear.*

4.5.5.1 Press F4 to select 2..14 Days.

4.5.5.2 Type 420 kV
AND press ENTER.

4.5.5.3 Press the X-Ray ON button to begin the warm-up.

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NOTE: *The controller will display "Tube To Be Warmed-Up" and display options for: NO (F1), 1..2 Days (F4), 2..14 Days (F5), >14 Days (F6), and RTC auto (F7).*

4.5.6 **IF** the RTR system has been idle for 3–4 hours,
THEN cycle the key position from the ON/STANDBY position to OFF and back to ON.

NOTE: *After performing the following step, a screen prompting to "Enter Test Voltage" will appear.*

4.5.6.1 Press F5 to select 2..14 Days.

4.5.6.2 Type 420 kV
AND press ENTER.

4.5.6.3 Press the X-RAY ON button to begin the warm-up.

NOTE: *The controller will prompt for a warm up and give options for: NO (F1), 1..2 Days (F4), 2..14 Days (F5), >14 Days (F6), and RTC auto (F7).*

4.5.7 **IF** the RTR system has had continuous idle time for more than 4 hours,
THEN cycle the key position from the ON/STANDBY position to OFF and back to ON.

NOTE: *After performing the following step, a screen prompting to "Enter Test Voltage" will appear.*

4.5.7.1 Press F6 to select >14 Days.

4.5.7.2 Type 420 kV
AND press ENTER.

4.5.7.3 Press the X-RAY ON button to begin the warm-up.

4.5.8 **WHEN** the appropriate warm-up is complete,
THEN perform the following:

4.5.8.1 Follow prompts on the x-ray controller
AND turn the x-ray control console key to the STAND BY position.

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4.5.8.2 **IF** leaving the RTR control room,
THEN perform the following:

4.5.8.2.1 Remove the x-ray control console key.

4.5.8.2.2 Maintain the x-ray control console key either under the operator control or store it in the master key locker.

4.5.8.3 **IF** warm-up was performed,
THEN record the following in the applicable operator log:

- Elapsed warm-up time
- Warm-up completion time
- Any pertinent comments.

4.6 Imaging System Check

4.6.1 **IF** the RTR Imaging Transfer Application (RITA) is available,
THEN ensure a disk ID file has been created in the RITA for the current RTR batch, by double clicking RITA icon.

4.6.1.1 **IF** a disk has **NOT** been created,
THEN follow Appendix B, Creating or Transferring Data to the RITA Archival System,
AND THEN RETURN TO Step 4.6.2.

4.6.2 Verify the precision of *radiography* (see def.) prior to use by adjusting the image enough to demonstrate compliance with the quality assurance objectives (QAOs) through viewing an image test pattern.

(MP-TRUW-8.1; MP-TRUW-8.2)

4.6.3 Perform an imaging system check daily, prior to use
AND record on the applicable operator log and Form-1578.

(HWMA/RCRA Permit; MP-TRUW-8.2)

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NOTE 1: *There are a number of controls that will affect the quality of the recorded image (including IQI placement, zoom functions, Automatic Defect Enhancement (ADE) filter, window leveling x-ray focal spot) all of which can be adjusted by the OT. The intent of the IQI evaluation is to demonstrate the imaging system capability to achieve a specified resolution. During RTR imaging of waste containers, the OT has the latitude to adjust these same parameters, as needed, to obtain the best image possible.*

NOTE 2: *It is Management's expectation that Form-1218 is not completed until the SS has reviewed it and signed on the appropriate line.*

- 4.6.4 Ensure that Form-1218 has been completed for the current day for the applicable RTR unit.

(ANSI-N43.3)

- 4.6.4.1 **IF** any item in Section I or II is unsatisfactory, **THEN** take the following steps:

- 4.6.4.1.1 Stop production operations with the RTR system
AND generate an NCR on the system.

(ANSI-N43.3)

- 4.6.4.1.2 Notify the SS.

- 4.6.4.1.3 **GO TO** Section 4.13.15.

- 4.6.5 Place the cursor in the first edit box located on the screen of the barcode reader monitor.

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- 4.6.6 **IF** an IQI is required,
THEN enter the IQI number using the following format:
mmddyXXXWWQ; where mm is the month, dd is the day, yy is the year, XXX stands for IQI, WWW for the RTR System 101 (Z-213-101) or 106 (Z-213-106), and Q stands for the shift (D for day shift or N for night shift).
- 4.6.6.1 Set or advance to the next entry location by manually performing the following steps:
- 4.6.6.1.1 Press the “Shift” and “:” keys simultaneously to set the entry.
- 4.6.6.1.2 Press the “Shift” and “>” keys simultaneously to advance to the next entry location.
- 4.6.7 Select the CONFIRM button to finalize the entry.
- 4.6.8 Ensure that the x-ray system has been warmed-up and the x-ray controller is ready for operation.
- NOTE:** *The IQI will be recorded on the same recording media for the current RTR batch.*
- 4.6.9 Select “Start New Cycle” to retrieve barcode data from the barcode window, if necessary.
- 4.6.10 Select the IQI number to be recorded.
- 4.6.11 **IF** recording confirmation prompt displays correct ID for recording,
THEN click OK.
- 4.6.11.1 **IF** recording confirmation prompt displays incorrect ID,
THEN RETURN TO Step 4.6.9.
- 4.6.12 Adjust the voltage to approximately 100 kV and the current to approximately 2.0 mA, if necessary.
- 4.6.13 Ensure that the x-ray control console is in the ON position.

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- 4.6.14 Press the green X-RAY ON button.
 - 4.6.14.1 **IF** an x-ray system error message occurs during two consecutive starts/restarts,
THEN immediately notify SS/SE for instruction prior to any additional attempts to generate x-rays.
- 4.6.15 Open the x-ray shutters, as required.
- 4.6.16 Position the cart, x-ray tube-head, and FP to center the IQI test pattern.
- 4.6.17 Adjust the zoom functions, ADE filter, window leveling, kV, and mA, as needed, for image resolution and clarity to obtain a good image of the IQI.
- 4.6.18 Select red RECORD button on Debut Professional program.
- 4.6.19 Record verbal comments by speaking into the microphone.
- 4.6.20 Start IQI recording by stating the operator identification (ID), IQI number, and lines of resolution obtained.
 - 4.6.20.1 To ensure that an acceptable recording has been done, stop x-ray generation prior to viewing the recording.
 - 4.6.20.2 Verify the acceptable recording of the IQI and the audio/video recording.
 - 4.6.20.2.1 **IF** the audio/video recording was **NOT** acceptable,
THEN contact the SS.
- 4.6.21 Record IQI results and the number corresponding to the crosshatched pattern visible in both the horizontal and vertical directions on the applicable operator log (see Exhibit 1, RTR Image Test Quality Grid, for RTR image test grid figure) and Form-1578.
- 4.6.22 Record RTR settings (voltage and current) on Form-1578.

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NOTE: *Verification of the resolution is with visual confirmation by the OT. The recorded image may not represent the actual image due to degradation from the recording.*

- 4.6.23 **IF** the resolution is less than 16 lines/inch,
THEN contact the SS
AND troubleshoot.
- 4.6.24 Press the red X-RAY OFF button on the x-ray controller unit panel, if applicable,
AND turn the x-ray control console key to the STAND BY position.
- 4.6.25 **IF** leaving the RTR control room,
THEN perform the following:
- 4.6.25.1 Remove the x-ray control console key.
- 4.6.25.2 Maintain the x-ray control console key either under the operator control or store it in the master key locker.

4.7 Operation of RTR System

- 4.7.1 Ensure that no NCRs exist against the RTR system.
- 4.7.2 Check initial conditions as follows:
- 4.7.2.1 Ensure that Sections 4.2 through 4.6 are completed prior to RTR system operations.

NOTE 1: *The RTR system cannot detect frozen liquids and therefore frozen waste drums cannot be examined. To ensure that a waste drum is not frozen, the waste is preheated for a minimum of 72 hours at 18°C or higher during cold weather. Preheating is required from October through April. The SS will determine if preheating is required outside the October through April window.*

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NOTE 2: *After drum has met the 72-hour preheat requirement and has not been moved out of WMF-634, the temperature may fall below 18°C (inside WMF-634) for any period of time, as long as it does not fall below 1°C.*

4.7.2.2 **IF** preheating is required,
THEN ensure that the waste package has been preheated for a minimum of 72 hours at 18°C or higher, per WTS.

4.8 Moving Drums into and out of the Enclosure

NOTE: *Steps in this section may be completed out of sequence, concurrently, or as needed.*

- 4.8.1 Home the RTR system by pressing the AUTO OUT pushbutton, if needed.
- 4.8.2 Set enable/disable key to DISABLE to disable cart movement, if needed.
- 4.8.3 Remove the barcode enable/disable key, if needed
AND maintain under operator control.
- 4.8.4 Ensure that the drum manipulator is installed and is fitted with the appropriate size drum collars.
- 4.8.5 Verify, by visual inspection, that a candidate drum is linked to the correct historical data by comparing tamper-indicating device, D-number and/or historical ID, as applicable, between the actual drum and the historical data display in WTS, as available.
- 4.8.5.1 **IF** the correct link is confirmed,
THEN GO TO Step 4.8.6.
- 4.8.5.2 **IF** the correct link is **NOT** confirmed,
THEN notify the SS or acceptable knowledge expert (AKE).
- 4.8.5.2.1 **IF** SS or AKE are unable to correct link,
THEN record all historical information from the container in the WTS Container Marking screen (which is accessible from the RTR screen or the AMWTP Container screen).

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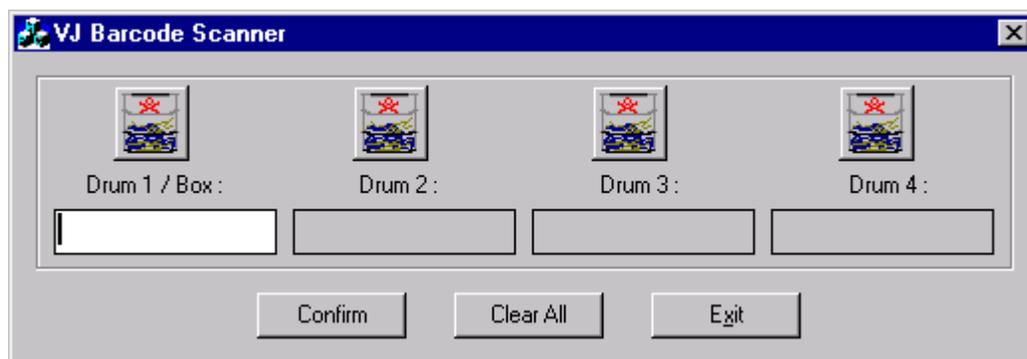
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- 4.8.6 Load drums onto the cart as applicable.
- 4.8.7 Ensure that the drums loaded onto the RTR have been received to the equipment using WTS.
- 4.8.8 Perform a barcode cycle, as necessary, by performing the following:
- 4.8.8.1 Ensure the Windows login is complete.
 - 4.8.8.2 Double click the barcode reader icon, if necessary.
 - 4.8.8.3 **IF** unwanted barcodes are present, **THEN** select CLEAR ALL button.
 - 4.8.8.4 Place the cursor in the first edit box located on the screen of the barcode reader window, if necessary.

**WARNING**

Eye injury may occur if personnel look directly into the barcode scanner beam.

- 4.8.8.5 Scan the barcode of drum No. 1 **AND** visually confirm the correct barcode has populated, taking care to **NOT** look directly into the barcode reader.

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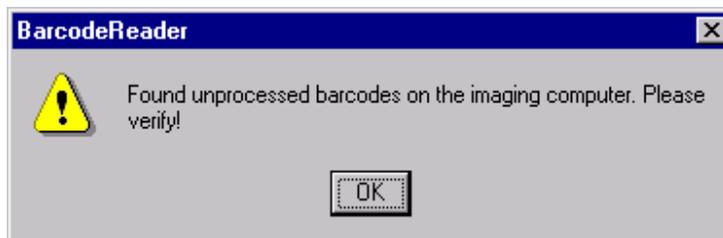
Real-Time Radiography Operations (Drum)

4.8.8.6 **IF** additional drums have been loaded,
THEN scan the remaining drums
AND press the CONFIRM button.

4.8.8.7 **IF** the barcode does **NOT** scan,
THEN perform Section 4.13.14
AND RETURN TO Step 4.8.9.

NOTE 1: *If the system finds unused barcodes from previous scans either in a previous session or the CONFIRM button was selected prior to the CLEAR ALL button, the software will display a warning message stating that it found unused barcodes.*

NOTE 2: *The unused barcodes will be displayed in sequence. However, the cursor will move to the first edit box so that the OT can overwrite the older text. The CLEAR ALL button is used to clear the text in the edit boxes. The cursor is displayed in the first edit box.*



NOTE 3: *Selecting the CONFIRM button will communicate the scanned barcodes to the RTR (imaging) computer.*

4.8.8.8 Select the CONFIRM button.

4.8.9 Insert the cart enable/disable key
AND turn it to the ENABLE position.

4.8.10 Ensure that the appropriate drum position is selected.

4.8.11 Home the RTR cart system by pressing the AUTO OUT pushbutton, if necessary.

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- 4.8.12 Press the AUTO IN button and allow the cart to enter the enclosure and the bi-parting door to close.
- 4.8.13 Ensure that the x-ray system has been warmed up and the x-ray controller is ready for operation.
- 4.8.14 In the Vi3 program, select “Start New Cycle” to retrieve barcode data from the barcode window, if necessary.
- 4.8.15 **IF** the barcode data has already been retrieved for the cycle of drums being examined,
THEN select “Select Next Drum,” if necessary.
- 4.8.16 **IF** recording confirmation prompt displays correct ID for recording,
THEN click OK.
- 4.8.16.1 **IF** recording confirmation prompt displays incorrect ID,
THEN RETURN TO Step 4.8.14.
- 4.8.17 Ensure a disk ID file has been created in RITA for the current RTR batch, by double clicking RITA icon.
- 4.8.17.1 **IF** a disk has **NOT** been created,
THEN follow Appendix B
AND THEN RETURN TO Step 4.8.18.
- NOTE:** *It is Management’s expectation that Form-1218 is not completed until the SS has reviewed it and signed on the appropriate line.*
- 4.8.18 Ensure that Form-1218 has been completed for the current day for the applicable RTR unit.

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Real-Time Radiography Operations (Drum)**WARNING**

When the x-ray generator is on, personnel in the enclosure could suffer fatal injuries.

NOTE: *The hidden area located underneath the camera can be checked using the mirror mounted inside the shielded enclosure.*

- 4.8.19 Ensure that the enclosure is unoccupied
AND both the personnel access door and the bi-parting doors are closed.
- 4.8.20 Insert x-ray control console key into x-ray control console
AND turn it to the ON position, if necessary.
- 4.8.21 Set the x-ray controller to 100 kV and 2 mA.
- 4.8.22 Press the green X-RAY ON button, if necessary.
 - 4.8.22.1 **IF** an x-ray system error message occurs during two consecutive starts/restarts,
THEN immediately notify SS/SE for instruction prior to any additional attempts to generate x-rays.
- 4.8.23 Adjust kV and mA as appropriate.
 - 4.8.23.1 Open x-ray shutters, as necessary.

NOTE: *At any time, the control room operator can select "Single" mode to enable the x-ray head and FP to be raised or lowered independent of each other, up to a maximum of 5 inches. This will produce an oblique image.*

- 4.8.24 Ensure that the DUAL position is selected to provide synchronized movement of the x-ray head and FP.
- 4.8.25 Ensure that the desired drum is in view of x-ray image by viewing screen parameter (i.e., 1/4 position; one of four drums).
- 4.8.26 Select red RECORD button on Debut Professional program.

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4.9 Real-Time Radiography Examination Guidelines

NOTE 1: *Complete scans of the waste drums are required. A complete drum scan is defined as across the entire top, down through the center to the very bottom, across the entire bottom, and up the side of the container. 100% of each container is scanned to meet the radiography quality assurance objective for completeness. A 55-gallon drum over-packed into a larger container needs to be the focus of the RTR inspection for characterization purposes. The overpack container needs to be scanned to determined treatment options. All the data is collected and evaluated to complete the WTS and have a complete scan.*

(MP-TRUW-8.1; MP-TRUW-8.2)

NOTE 2: *Exhibits 2, Waste Material Parameter Descriptions; 3, Parameters and Weights of Commonly Identified Item; 6, Volume Conversions for Liquids in 55-Gallon Drums; 7, Volumes of Cylinders; 8, Common Liquid Measurements and Conversions; 9, V² Nominal Density Guidance Table; 10, Volume Conversion Table, Cubic Inches to Pints; 11, Volume Conversion for Partial 55-Gallon Drum (in pints); and 12, Categorizing Drum Contents During RTR Examination, may be used, as needed, as an aid during inspections.*

NOTE 3: *Sections 4.9 and 4.10, and steps within these sections, may be performed concurrently, out of sequence, or repeated during the examination of the waste container, as applicable. All the required data will be captured in WTS and on the audio/visual record. WTS will not save the record if any of the required data is not populated in WTS.*

NOTE 4: *The replicate scan is conducted by a qualified RTR OT who was not involved in the original scan of the waste container and documented in WTS.*

4.9.1 Perform replicate scan on one waste drum per day or once per testing batch, whichever is less frequent, under uniform conditions and procedures.

(MP-TRUW-8.1; MP-TRUW-8.2)

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NOTE: *The independent observation is conducted by a qualified RTR OT who was not involved in the original scan of the waste container and documented in WTS.*

4.9.2 Perform an independent observation on one waste drum (which must **NOT** be the same drum that was used for the replicate scan) once per day or once per testing batch, whichever is less frequent, under uniform conditions and procedures.

(MP-TRUW-8.1; MP-TRUW-8.2)

4.9.3 Adjust Image Enhancement System.

4.9.3.1 Ensure that the X-RAY/FP VERTICAL SPEED CONTROL and the ROTATIONAL SPEED CONTROL are adjusted for speeds that are appropriate for the waste container to be examined.

4.9.3.2 Increase or decrease the x-ray kV and/or mA as needed.

4.9.3.3 Adjust the zoom functions, as required, to characterize small objects.

NOTE: *The RTR examination is recorded in both the WTS and in the audio/video record. All characterization activities are required to be announced in the audio/video record.*

(HWMA/RCRA Permit)

4.9.3.4 Adjust window leveling as needed to achieve desired penetration and image quality.

4.9.3.5 Rotate drums clockwise or counterclockwise, as needed.

NOTE: *Changing the direction of the examination (jogging the drum rotator [clockwise or counterclockwise]) may help to identify certain features of the waste matrix.*

4.9.3.6 Shake drums along the horizontal axis to detect the presence of liquids.

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NOTE: *X-ray generation is stopped prior to switching the focus (filament) between Broad and Fine.*

4.9.3.7 Use the Broad or Fine focus (filament), as appropriate.

NOTE: *Two measuring annotations are available, the linear measurement and the protractor tool to help assist the operator with waste characterization.*

4.9.3.8 **IF** drums contain high-density material (e.g., Rocky Flats Environmental Technology Site [RFETS] IDC-001, -002, -003, -004, -007),
OR the image is difficult to see,
THEN perform the following:

4.9.3.8.1 Switch the x-ray filters to 0, 1, 2, or 3, as necessary.

4.9.3.8.2 Mask exposed portions of the image with the x-ray shutters.

NOTE: *The ADE filter is meant to be a tool to help the OT discern details in objects and guide the OT to areas for further examination under the primary window leveling tool. While the filter is active, the OT will notice a delay and choppiness for objects in motion.*

4.9.3.8.3 Apply ADE filter as needed.

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4.10 RTR Examination and WTS Data Entry

NOTE 1: *Nonconformance reports (NCRs) are not required to be generated as part of a replicate or operator independent observation examination.*

NOTE 2: *An audio/video recording of the radiography examination and a validated radiography data form in the WTS will be obtained for 100% of the waste containers subject to radiography. The contents of the waste container will be described in sufficient detail on the audio/video record to provide an adequate inventory of the waste container contents in the audio/video record narrative.*

(MP-TRUW-8.1; MP-TRUW-8.2)

NOTE 3: *The RTR examination is recorded in both the WTS and in the audio/video record.*

(HWMA/RCRA Permit)

4.10.1 Enter as an introduction for the examination of the waste container the operator identification, container ID, IDC, WMC, and waste stream description as defined in RPT-TRUW-05, Waste Matrix Code Reference Manual, in the audio/video record, or for waste **NOT** covered in RPT-TRUW-05 or other approved applicable acceptable knowledge (AK) documents and reports.

4.10.2 Verify the correct container number.

NOTE: *Step 4.10.3 may be performed by either typing in the drum number and using F8 to query the information or selecting the appropriate drum number from the list of values and clicking the mouse in the "Recording ID" field.*

4.10.3 Enter the container ID number in WTS
AND query the container information.

4.10.4 Verify that the container data and analysis information have auto-populated in the container information section of the WTS RTR record (i.e., batch number, container type, RTR date).

4.10.5 **IF** any of the required fields are **NOT** populated,
THEN contact the SS for guidance.

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- 4.10.6 Verify that the “Equipment” field for the processing area for WTS has auto-populated.
- 4.10.7 Verify the current procedure and revision number.
- 4.10.8 **IF** the revision number of the procedure is incorrect in WTS, **THEN** enter the procedure number and current revision used to conduct the examination in the “Result Comment” field in WTS.
- 4.10.9 Ensure the Recording ID is correct.
- 4.10.10 Enter the identification in the format: WXXXyy-nnnnn; where W stands for RTR system one (Z-213-101) or two (Z-213-106), XXX stands for RTR, yy is the year, and nnnnn is the disk number.

NOTE: *The QAO for precision at RTR is verified upon satisfactory completion of an IQI test at least once every 24 hours or upon system start-up as specified in Step 4.6, by verifying that the audio/video record of the IQI has been recorded and by answering YES to the question: “Is the Image Quality Indicator Satisfactory?”*

- 4.10.11 Enter YES/NO in WTS to the question “Is the Image Quality Indicator Satisfactory?”

(MP-TRUW-8.1; MP-TRUW-8.2)

- 4.10.12 Ensure that the replicate is completed on one drum per day or once per testing batch, whichever is least frequent, as on the applicable operator log and in WTS.

(MP-TRUW-8.1; MP-TRUW-8.2)

- 4.10.12.1 **IF** Debut Professional program “File already exists replace existing file?” pops up, **THEN** answer NO.
- 4.10.13 Ensure that a qualified RTR OT who was **NOT** involved in the original scan performs the replicate scan.

(MP-TRUW-8.1; MP-TRUW-8.2)

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NOTE: *The independent observation is performed by viewing the recording from a waste container (not the replicate), and documenting the results on a radiography analysis sheet in WTS. The independent observation is performed without reference to the original radiography analysis sheet in WTS.*

4.10.14 Ensure that the independent observation analysis is completed on one drum (not the replicate) per day or once per testing batch, whichever is least frequent, as documented on the applicable operator log and in WTS.

(MP-TRUW-8.1; MP-TRUW-8.2)

4.10.15 Ensure that a qualified RTR OT who was **NOT** involved in the original scan of the waste performs the independent observation.

(MP-TRUW-8.1; MP-TRUW-8.2)

NOTE: *The purpose of checking the visual class inspection form is to assist the RTR OT in looking for pinhole(s) and/or weakness in the container wall.*

4.10.16 **IF** the visual class inspection form is available in WTS, **THEN** review the form to see the container classification **AND** look for pinhole(s) and/or weakness in the container wall.

4.10.16.1 **IF** pinholes and/or weakness are found, **THEN** perform the following:

4.10.16.1.1 Notify the SS.

4.10.16.1.2 Document the finding in WTS.

4.10.16.1.3 Handle the container as directed by the SS.

NOTE: *Although cardboard liners do offer protection for sharp objects, as determined by the RTR operator, they are not considered as “liners” for headspace gas drum age criteria and are considered as cellulosic waste.*

4.10.17 Determine whether a plastic or a 90-mil liner is present and enter the appropriate answer (YES/NO) in WTS.

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4.10.18 **IF NO** liner is present,
THEN GO TO Step 4.10.23.

4.10.19 Enter in WTS whether the liner lid is present.

NOTE 1: *The liner is considered punctured if there is a minimum 0.3-inch diameter unblocked opening in the liner and/or if any set of vent holes in the filter are below the liner lid, above the waste, and unobstructed.*

NOTE 2: *When the liner is punctured, the deformed liner answer will not affect the exam plan for the container because the deformed liner does not affect the headspace gas sampling (HGAS) data since the liner is verified punctured.*

4.10.20 **IF** the liner is punctured,
THEN enter YES in “Liner Punctured” field.

4.10.20.1 Enter NO in “Liner Lid Deformed or Warped” field
AND GO TO Step 4.10.22.

4.10.21 **IF** the liner is **NOT** punctured or it **CANNOT** be verified punctured,
THEN enter NO in “Liner Punctured” field
AND enter either YES or NO in “Liner Lid Deformed or Warped” field based on the RTR operator’s judgment.

(CCP-PO-003; MP-TRUW-8.2)

4.10.21.1 Initiate an NCR in accordance with MP-Q&SI-5.4,
Identification of Nonconforming Conditions.

4.10.21.2 **IF** the drum has been processed through HGAS as indicated on the task list,
THEN add comments to the NCR for impact to the HGAS data.

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4.10.22 Enter the appropriate liner type in WTS, as listed in table below:

Liner Type	Description
I	Straight wall liner with a rolled lip to the inside
II	Tapered shoulder liner with a slip fit cap, closure sealed with metal band
III	Tapered shoulder liner with a metal bolt closure ring
IV	Straight wall liner with a slip fit lid
Plastic	Plastic liner approximately 35 mil in thickness
Other	Any other type of liner type that is NOT identified above

4.10.23 Enter the fill factor for the waste container (in percent) in WTS, using Exhibit 4, Fill Factor, to estimate fill percentage.

NOTE: *The “twisted and tied” or “zipped and tied” closure methods are entered as “twisted and taped.”*

4.10.24 Enter the closure method(s) for the waste container and inner packages in WTS.

(CCP-PO-003)

NOTE: *Sealed containers >4 liters are considered a layer of confinement.*

4.10.25 Determine the layers of confinement for the waste container **AND** enter in WTS.

(CCP-PO-003)

4.10.26 Enter the presence of liquids by selecting YES in WTS.

(HWMA/RCRA Permit)

4.10.27 Enter the volume and location of liquids in WTS.

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NOTE 1: Observable liquid (*see def.*) in association with an identified polychlorinated biphenyl (PCB) item or PCB waste is considered PCB-contaminated liquid and is dispositioned for treatment or special-case waste (SCW).

NOTE 2: Observable liquid in association with waste streams identified in RPT-TRUW-05 as having U134 (hydrofluoric acid) present, are prohibited from shipment to WIPP. These containers will be dispositioned for treatment or SCW.

4.10.28 **IF** observable liquid is prohibited as defined in Exhibit 5, List of Prohibited Items,
OR is equal to or greater than 4.4 pints,
THEN record the presence of prohibited liquids in WTS by selecting YES.

**(HWMA/RCRA Permit MP-TRUW-8.1; MP-TRUW-8.2)
 CCP-PO-003)**

4.10.29 **IF** observable liquid is noted
AND the total liquid is **NOT** prohibited,
THEN enter NO for prohibited liquids.

NOTE: *Item 10 of Exhibit 8 provides a conversion for milliliters (mL) to pints.*

4.10.30 **WHEN** *internal containers* (*see def.*) with observable liquid are present,
THEN enter YES for internal container with liquid.

4.10.31 **IF** prohibited liquids are identified,
THEN initiate an NCR in accordance with MP-Q&SI-5.4.

(HWMA/RCRA Permit)

4.10.31.1 Select the NCR, RTR Characterization for Liquids, and the applicable "Liquids Identified" category as observed in the RTR examination.

NOTE: *When the selection is YES, the exam plan is updated to a disposition of liquid absorbent addition.*

4.10.32 Document if the waste container is a liquid absorbent candidate drum as evidenced by liquid on top of the waste.

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4.10.33 Document the absence or presence of sharp or non-braced objects that could be a puncture hazard to the waste container in WTS.

NOTE 1: *The rigid liner provides protection from sharp or non-braced objects that could be a puncture hazard to the waste container.*

NOTE 2: *Sharp or non-braced objects that are not protected will be treated through super compaction or payload overpack as implemented through the task list; therefore, NCRs are not required to ensure remediation.*

(CCP-PO-003)

4.10.34 Document in WTS if sharp or non-braced objects are protected.

4.10.35 Document the absence or presence of PCBs in WTS by performing the following:

(HWMA/RCRA Permit)

4.10.35.1 **IF** PCBs are **NOT** present,
THEN document NO for PCBs present in WTS.

(40 CFR 761)

NOTE 1: *Polychlorinated biphenyls in Summary Category S5000 (see def.) are prohibited in any amount.*

NOTE 2: *Only Summary Category S3000 (see def.) and S4000 (see def.) containers without liquid will be answered as "Yes Acceptable" for PCBs present.*

4.10.35.2 Document S5000 containers with any amount of PCBs as "Yes - Prohibited"
AND initiate an NCR in accordance with MP-Q&SI-5.4.

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- 4.10.35.3 **IF** PCBs present is “Yes - Acceptable”
AND the WMC is a Summary Category Group 3000/4000 container,
THEN document the non-prohibited PCBs by performing the following:
- 4.10.35.3.1 Document a description of non-prohibited PCB(s) in the PCB comment field.
 - 4.10.35.3.2 Document weight of non-prohibited PCBs in the “PCB Mass” field.
 - 4.10.35.3.3 Ensure that the non-prohibited PCBs are included in the waste container inventory with a description, item weight, and assignment to the applicable waste parameters field.
- 4.10.35.4 **IF** prohibited PCBs present are “Yes - Prohibited,”
THEN perform the following:
- 4.10.35.4.1 Document a description of prohibited PCBs in the PCB comment field.
 - 4.10.35.4.2 Document the net weight of the drum in the “PCB Mass” field.
 - 4.10.35.4.3 Ensure that the prohibited PCBs are included in the waste container inventory with a description, item weight, and assignment to the applicable waste parameters.
 - 4.10.35.4.4 Initiate an NCR in accordance with MP-Q&SI-5.4.

(MP-TRUW-8.1)

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NOTE: *The notation of the items in the following step is not a WIPP requirement. However, the presence of any of these, when applicable, is entered into the Comments field in the event that assay reveals the waste to be a candidate for Nevada National Security Site (NNSS) Waste Acceptance Criteria.*

(DOE/NV-325)

4.10.35.5 Document the presence of the following in the “Result Comment” field in WTS to support NNSS Waste Acceptance Criteria requirements:

- Etiological agents (e.g., blood, medical waste)
- Radioactive sealed sources (e.g., radiation instrument check sources, smoke detectors)
- Animal carcasses.

NOTE: *Mercury is not prohibited unless the criteria for prohibited observable liquid are exceeded.*

4.10.36 Document in WTS the absence or presence of the following:

- Mercury
- Lead, and in what form
- Wet cell batteries.

NOTE 1: *Lead content needs to be identified and listed as a hazardous material in the data package prepared for each WIPP certifiable container (e.g., leaded rubber gloves, lead aprons, lead bricks).*

NOTE 2: *Containers with lead liners (lead tape, shielding), and/or impenetrable objects that prevent full examination of the contents to verify the absence of prohibited items will be subject to visual examination (VE) and rejected for lead shielding by the RTR OT. Waste Tracking System will update the exam plan to require VE of the waste.*

(MP-TRUW-8.2)

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NOTE 3: *When examining containers that have waste that prevents full examination of a waste item (e.g., dense items such as check weights, concrete, and calorimeter cans) or of the remaining contents that may inhibit full examination, AK information may have determined that VE would not provide additional relevant information for that container (e.g., an aggregate of bulk-loaded dense sludge).*

(MP-TRUW-8.1; MP-TRUW-8.2)

NOTE 4: *Lead shielding cannot be used to shield an item or waste container to meet external surface dose rates.*

(MP-TRUW-8.1)

4.10.36.1 **IF** a container is lead-lined, lead taped, and/or has impenetrable objects that prevent full examination, **THEN** initiate RTR NCR in accordance with MP-Q&SI-5.4.

4.10.36.2 **IF** items in the container are shielded so that they could limit surface dose readings and affect assay results, **THEN** initiate NCR for shielded items in accordance with MP-Q&SI-5.4.

4.10.36.3 **IF** any of the items listed in Step 4.10.36 are detected, **THEN** enter a comment in the appropriate comment field in WTS.

4.10.37 Document in WTS the presence of prohibited items in the waste, if any, using Exhibit 5.

(MP-TRUW-8.1; MP-TRUW-8.2; CCP-PO-003)

4.10.38 **IF** any prohibited items are present, in accordance with Exhibit 5, **THEN** perform the following:

4.10.38.1 Initiate an NCR in accordance with MP-Q&SI-5.4.

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4.10.39 Examine the waste

AND enter data into WTS with the description, weight, and the assignment to the appropriate waste parameters by performing the following:

4.10.39.1 Select item(s) from look-up table when appropriate
AND enter quantity.

4.10.39.2 **IF** item is **NOT** shown on look-up table,
THEN perform **ONE** of the following to add the waste item(s) to the container inventory:

4.10.39.2.1 **IF** entering item(s) by weight,
THEN perform the following:

4.10.39.2.1.1 Enter description.

4.10.39.2.1.2 Enter item type as weight.

4.10.39.2.1.3 Enter weight.

4.10.39.2.1.4 Enter quantity.

4.10.39.2.1.5 Assign the appropriate waste parameter(s) by percentage weight.

4.10.39.2.2 **IF** entering item(s) by volume,
THEN perform the following, referring to Exhibits 6, 7, 9, 10, and 11:

4.10.39.2.2.1 Enter description.

4.10.39.2.2.2 Enter item type as volume.

4.10.39.2.2.3 Enter weight per unit volume.

4.10.39.2.2.4 Enter quantity.

4.10.39.2.2.5 Assign the appropriate waste parameter(s) by percentage weight.

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4.10.39.2.3 **IF** entering item(s) as packaging materials, **THEN** perform the following:

4.10.39.2.3.1 Enter description.

4.10.39.2.3.2 Enter item type as packaging.

4.10.39.2.3.3 Enter weight.

4.10.39.2.3.4 Enter quantity.

4.10.39.2.3.5 Assign the appropriate waste parameter(s) by percentage weight.

NOTE: *The weight assigned to the remaining waste is assigned by subtracting the packaging, and item(s) entered by weight/volume, from the gross weight and then distributing this remaining unassigned weight to the appropriate waste parameters by the designated percentage weight assigned for the remaining waste. Remaining waste = Gross – (Packaging + Items by Weight + Items converted from volume to weight).*

4.10.39.3 Assign the remaining waste to the appropriate waste parameter by weight percent on the “Remaining Contents of Container Table.”

4.10.39.3.1 In the “Result Comment” field, enter a description of the waste that was entered under the “Remaining Contents of Container Table.”

(MP-TRUW-8.1)

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NOTE: *Following RTR, drums with the 000 IDC are typically assigned the UN-00A for undefined homogenous solids (S3000), UN-00B for undefined debris (S5000), or UN-00C for undefined soil/gravel (S4000).*

(HWMA/RCRA Permit)

4.10.40 Verify that the physical form of the waste is consistent with the IDC, WMC, summary category, and waste stream description (as defined in RPT-TRUW-05, or for waste **NOT** covered in RPT-TRUW-05, other approved applicable AK documents and reports) for the waste container **AND** recorded correctly in WTS.

(MP-TRUW-8.1; MP-TRUW-8.2)

4.10.40.1 **IF** the IDC is verified **AND** the historical ID found in WTS does **NOT** match the information on the container, as found in Step 4.8.5,
THEN initiate a Type 3 NCR in accordance with MP-Q&S-5.4.

NOTE: *Answering the question “Is IDC Correct allows information required by Steps 4.10.41 and 4.10.42 to be entered.*

4.10.41 **IF** the IDC, WMC, summary category, or waste stream description **CANNOT** be verified,
THEN perform the following:

4.10.41.1 Place a UN-000 code for undetermined waste, UN-00A for undefined homogenous solids (S3000), UN-00B for undefined debris (S5000), or UN-00C for undefined soil/gravel (S4000) in the “Recommended Gen-IDC” field.

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4.10.41.2 Enter the change reason comment of undefined IDC.

4.10.41.2.1 Describe the waste in sufficient detail to allow the AKE to evaluate a recommended IDC determination in the “Result Comment” field or using the “Container Markings” screen button at the bottom of the general section in the RTR screen.

4.10.41.3 Record any historical information from the container on the “AMWTP Container Screen” in the “Add New Container Comment” field,
OR use the CONTAINER MARKINGS button found at the bottom of the “AMWTP Container Screen,” or the CONTAINER MARKINGS button at the bottom of the “General” tab in the RTR screen.

NOTE: *An IDC change is not required if the proposed change is to another IDC within the same direct-ship waste stream (e.g., BN-304: Mound Debris: IDCs MD-801, -802, -803, -804, -805, -810, -813, -814, -825, -827, and -848; BN-211: RFP filter debris waste: IDCs RF-335, -338, -376, and -490, etc.).*

4.10.42 **IF** the IDC is **NOT** correct,
THEN perform the following:

4.10.42.1 Enter recommended IDC
AND assign the containers to AK review.

4.10.42.2 Enter change reason (example: % volume of contents).

4.10.42.3 Enter any applicable comments.

4.10.42.3.1 Describe the waste in sufficient detail to allow the AKE to evaluate a recommended IDC determination in the “Result Comment” field or using the CONTAINER MARKINGS screen button at the bottom of the general section in the RTR screen.

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- 4.10.42.4 Record any historical information from the container on the “AMWTP Container Screen” in the “Add New Container Comment” field,
OR use the CONTAINER MARKINGS button found at the bottom of the “AMWTP Container Screen,” or the CONTAINER MARKINGS button at the bottom of the “General” tab in the RTR screen.
- 4.10.43 **WHEN** the scan is complete,
THEN summarize the examination by stating the operator identification, container ID, and whether the IDC, WMC, and waste stream description are consistent with the AK.
- 4.10.44 **WHEN** examinations are complete,
THEN press the red X-RAY OFF button.
- 4.10.45 **STOP** or pause the recording as necessary.
- 4.10.46 Perform an audio/visual check of the recorded image to verify that the recording device is properly working.
- 4.10.46.1 Enter Y/N in WTS to the question “Is the Audio/Visual Check Satisfactory?”
- NOTE:** *The RTR recording will be reviewed against the data reported on the RTR container data in the WTS.*
- 4.10.47 Perform the following to sign the RTR record:
- 4.10.47.1 Verify that the data in WTS is correct
AND that the audio/visual recordings match and are correct.
- 4.10.47.2 E-sign
AND save RTR record.
- 4.10.47.3 Check audio and video recording.
- 4.10.48 Transfer recording files to the RITA Archival System using the guidance provided in Appendix B.

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- NOTE 1:** *After the burning DVD from hard drive process has started, WINDOWS may be minimized and operations continued.*
- NOTE 2:** *Typical burning of files associated with current batch is done one file at a time; multiple files can be burned at the same time.*
- NOTE 3:** *All containers burned to DVD have an audio/video check performed.*
- 4.10.49 If needed, burn file of drum to DVD using the guidance provided in Appendix A, Burning DVD from Hard Drive, or at the SS discretion.
- 4.10.49.1 **WHEN** “Burning DVD from Hard Drive” has started,
THEN minimize the “Nero Essentials” window
AND continue operations.
- 4.10.49.2 Upon completion of the burning process, check audio and visual recording on the DVD, prior to burning the next container.
- 4.10.49.3 **IF** additional drums that need to be examined are on the cart,
THEN advance the cart to the next drum
AND RETURN TO Step 4.8.13.
- 4.10.50 **WHEN** all containers on the cart have been examined,
THEN ensure x-rays are turned off by depressing the red X-RAY OFF pushbutton located on the x-ray control unit.
- 4.10.51 Turn the x-ray control console key to the STAND BY position.
- 4.10.51.1 **IF** leaving the RTR control room,
THEN perform the following:
- 4.10.51.1.1 Remove the x-ray control console key.
- 4.10.51.1.2 Maintain it either under operator control
OR store it in the master key locker.
- 4.10.52 Press the AUTO OUT button and allow the system to home.
- 4.10.53 Set the enable/disable key to DISABLE to disable cart movement
AND remove the key.
- 4.10.54 Unload drums from the cart.

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NOTE: *For a WTS batch, an automatic closure will occur after 20 drums (22 examinations including the replicate and independent observation) are processed. Waste Tracking System batch data reports contain the required contents identified by Table C3-11 of MP-TRUW-8.2, Quality Assurance Project Plan.*

4.10.55 Label the container for PCBs, as applicable, in accordance with INST-OI-24, Packaging Radioactive Waste.

4.10.56 **RETURN TO** Section 4.7 to examine additional waste containers.

4.11 Total System Shutdown

4.11.1 Close the x-ray shutters by pressing the x-ray shutters switches.

NOTE 1: *The x-ray shutter indicator lights may be used to verify shutters are closed.*

NOTE 2: *The remaining activities may be performed during x-ray tube cool down.*

4.11.2 Ensure that the x-ray power key is in the STAND BY position.

4.11.3 Log off of WTS.

4.11.4 Press the AUTO OUT button to home the system.

NOTE: *To remove residual heat from the x-ray tube, the x-ray system oil cooler needs to remain ON for a minimum of 5 minutes prior to performing Step 4.11.5.*

4.11.5 Turn x-ray oil cooler to OFF.

4.11.6 Exit the applicable programs.

4.11.7 Acknowledge pop-ups, as applicable.

4.11.8 Turn the enable/disable key to DISABLE to disable cart movement **AND** remove the key, if necessary.

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- 4.11.9 Log out of Windows
AND turn OFF the RTR computers as follows:
- 4.11.9.1 Select Turn off computer from the START button menu on the computer.
 - 4.11.9.2 Click on the TURN OFF button on the “Shutdown Computer” window.
- 4.11.10 Turn OFF all RTR monitors.
- 4.11.11 Switch the x-ray control console key to the OFF position
AND remove the key.
- 4.11.12 Switch the operator control console key to the OFF position
AND remove the key.
- 4.11.13 Switch the E-Stop key to the OFF position
AND remove the key.
- 4.11.13.1 Turn OFF the RTR CCTV monitor.
- 4.11.14 Ensure that all shutdown information has been recorded on the applicable operator log.
- 4.11.15 Return the operator control console power, E-stop reset, x-ray control console, and cart enable/disable keys to the master key locker.
- 4.12 Post-Job Review**
- 4.12.1 SS or Designee: Perform a post-job review in accordance with MP-COPS-9.17.

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Real-Time Radiography Operations (Drum)**4.13 Abnormal and Infrequent Operations****WARNING**

Abnormalities with the x-ray equipment could cause radiological exposure and injury/death.

CAUTION

Abnormalities with the x-ray equipment could cause damage to equipment.

NOTE: *Applicable steps may be performed when needed.*

4.13.1 **IF** any abnormalities that could cause damage to equipment, personnel, or the environment are encountered with the x-ray equipment, **THEN** perform the following:

4.13.1.1 Push the red EMERGENCY STOP button.

4.13.1.2 Ensure that no personnel are in the area.

4.13.1.3 Inform the SS or designated alternate.

4.13.1.3.1 **IF** abnormality is related to a safety component, **THEN** immediately stop production operation with the RTR system, **AND** generate an NCR against the system.

(ANSI-N43.3)

4.13.1.3.1.1 Notify the SS:

4.13.1.3.1.2 **GO TO** Step 4.13.15.

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- 4.13.1.3.2 **IF** operation has been terminated due to activation of the EMERGENCY STOP button, **THEN** obtain both Radiological Controls manager and plant shift manager (PSM) approval prior to resuming operation.
- 4.13.2 Log all abnormal conditions and on the applicable operator log, ensuring that the log includes the operational conditions prior to the abnormality.
- 4.13.3 **IF** other abnormal or infrequent operations need to be performed, **THEN GO TO** the applicable section from the following table **AND RETURN TO** this step if further activities will be performed:

Task	Section to be Performed
X-rays Fail to De-energize	4.13.4
Constant Air Monitor Alarm	4.13.5
X-ray Head Fails to Energize	4.13.6
Equipment or Computer Malfunction	4.13.7
Unplanned Shutdown	4.13.8
Loss of Power	4.13.9
Breached Waste Container	4.13.10
Fire Involving the Characterization Facility	4.13.11
Motion Fault	4.13.12
Manual Extended Warm-Up	4.13.13
Entering Barcodes Manually	4.13.14
Follow-Up Steps When Stopping Production Operations with the RTR System	4.13.15
RTR Shielding Radiation Survey	4.13.16
Performing Functional Verification/Post-Maintenance Testing for Mechanical Motion Only	4.13.17

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4.13.4 X-Rays Fail to De-Energize

4.13.4.1 **IF** x-rays fail to de-energize when the red OFF button is pushed as indicated by the following indications:

- Voltage and amperage meters do **NOT** drop to zero when x-ray control unit key is removed
- Images still visible when X-RAY OFF button is depressed
- Radiation field (higher than expected from drums) at the entry door,

THEN complete the following steps:

4.13.4.1.1 Push the red EMERGENCY STOP button.

4.13.4.1.2 Turn the x-ray controller key to the STAND BY position.

4.13.4.1.3 Notify the SS or designated alternate.

4.13.4.1.4 Obtain permission from Radiological Controls manager and PSM before restarting the RTR.

4.13.5 Constant Air Monitor Alarm

4.13.5.1 **IF** the x-ray head is operating,
THEN perform the following steps:

4.13.5.1.1 De-energize the x-ray head by pushing the red X-RAY OFF button.

4.13.5.1.2 Turn the x-ray controller key to STAND BY **AND** remove the key.

4.13.5.1.3 Notify coworkers
AND leave the affected area immediately.

4.13.5.1.4 Inform the RCT, the SS, or the designated alternate.

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4.13.6 X-Ray Head Fails to Energize

- 4.13.6.1 Turn the x-ray controller key to STAND BY
AND remove the key.
- 4.13.6.2 Ensure that all interlocks are satisfied.
- 4.13.6.3 Reinsert x-ray controller key
AND turn to ON position.
- 4.13.6.4 Attempt to generate x-rays.
 - 4.13.6.4.1 **IF** the x-ray unit still fails to energize,
THEN perform the following steps:
 - 4.13.6.4.1.1 Turn the x-ray controller key to the STAND BY position.
 - 4.13.6.4.1.2 Turn the control console power key to the OFF position.
 - 4.13.6.4.1.3 Notify the SS or the designated alternate.

4.13.7 Equipment or Computer Malfunction

- 4.13.7.1 Push the x-ray OFF button.
- NOTE:** *Applicable steps may be performed to shutdown and restart computers because of minor computer malfunctions on the VJ barcode program, RTR, and WTS systems.*
- 4.13.7.2 Shut down the system per Section 4.11, Total System Shutdown.
- 4.13.7.3 Restart the system per Section 4.2, System Startup.
- 4.13.7.4 **IF** the malfunction continues,
THEN place the system in a safe condition
AND inform the SS or designated alternate.
- 4.13.7.5 Log the malfunction in the applicable operator log.

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4.13.8 Unplanned Shutdown

4.13.8.1 **IF** the x-ray unit shuts down inadvertently
AND auto warm-up is **NOT** being performed,
THEN perform the following steps:

4.13.8.1.1 Contact the SS.

4.13.8.1.2 Consult with the RTR SE for guidance.

4.13.8.1.3 **IF** the unplanned shutdown **CANNOT** be corrected,
THEN perform the following steps:

4.13.8.1.3.1 Turn the x-ray controller key to the STAND BY position.

4.13.8.1.3.2 Notify the SS or designated alternate.

4.13.8.1.4 Record the shutdown on the applicable operator log.

4.13.8.1.4.1 Include information on RTR operating status prior to the shutdown.

4.13.8.1.4.2 Inform the SS or designated alternate.

4.13.9 Loss of Power

4.13.9.1 **IF** commercial power is lost to the RTR x-ray unit,
THEN perform the following steps:

4.13.9.1.1 Turn the x-ray controller key to the STAND BY position.

4.13.9.1.2 Turn the control console power key to the OFF position.

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4.13.9.1.3 Inform the SS or designated alternate.

4.13.9.1.4 Log the conditions on the applicable operator log.

4.13.10 Breached Waste Container

4.13.10.1 Stop x-rays.

4.13.10.2 Turn x-ray controller key to STAND BY
AND remove.

4.13.10.3 Respond per INST-OI-11, Waste Container Handling.

4.13.10.4 Notify the SS.

4.13.11 Fire Involving the Characterization Facility

4.13.11.1 Stop x-rays.

4.13.11.2 Turn x-ray controller key to STAND BY
AND remove.

4.13.11.3 Evacuate
AND inform the SS or designated alternate.

4.13.11.3.1 While exiting, pull the manual fire alarm.

4.13.12 Motion Fault

4.13.12.1 Stop x-rays.

4.13.12.2 Turn the x-ray controller key to STAND BY
AND remove key.

4.13.12.3 Place the operator control console key in the OFF position.

4.13.12.4 After 60 seconds, activate reset keys located on the operator control console.

4.13.12.5 Press the AUTO OUT button.

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Real-Time Radiography Operations (Drum)**4.13.13 Manual Extended Warm-Up**

4.13.13.1 Observe, during the warm-up time, the actual value of the current (mA) on the liquid crystal display (LCD) of the control module.

NOTE: *Considerable fluctuations of this value of the current on the LCD of the control mean that the tube is not running smoothly.*

4.13.13.2 **IF** the tube is **NOT** running smoothly,
THEN lower the tube voltage to the point where the actual value display no longer shows fluctuation beyond the normal operating value.

4.13.13.2.1 **IF** this condition is met,
THEN GO TO Step 4.13.13.3.

4.13.13.2.2 **IF** the tube continues to fluctuate beyond the normal operating value,
THEN turn off x-ray control console
AND contact the SS.

4.13.13.3 **IF** the x-ray tube has been left idle for greater than 8 weeks, or as directed by the SS or designated alternate,
THEN notify SS.

4.13.13.4 SS: Notify the RTR SE to evaluate the situation prior to switching to the manual warm-up mode:

4.13.13.4.1 SE: Evaluate the need to implement a semiautomatic extended warm-up through the setup menu
OR to switch to the manual warm-up mode
AND advise SS.

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4.13.13.5 **IF** directed by the SS,
THEN perform the following:

4.13.13.5.1 Start warm-up at up to 210 kV.

4.13.13.5.2 Increase the voltage up to 315 kV in 10 kV increments every 15 minutes.

4.13.13.5.3 Increase the voltage above 315 kV in 10 kV increments every 20 minutes, up to 420 kV.

4.13.14 Entering Barcodes Manually**WARNING**

Eye injury may occur if personnel look directly into the barcode scanner beam.

4.13.14.1 Avoid looking directly into the barcode scanner beam.

4.13.14.2 Click on “Clear All” to clear all entries displayed for the four barcodes,
OR press the “Shift” and “<” keys simultaneously to clear the displayed entry.

4.13.14.3 Enter the barcode using the keyboard.

4.13.14.4 Press the “Shift” and “:” keys simultaneously to set the entry.

4.13.14.5 Press the “Shift” and “>” keys simultaneously to advance to the next entry location.

4.13.14.6 **REPEAT** Steps 4.13.14.3 through 4.13.14.5 until all barcodes have been entered.

4.13.14.7 **WHEN** all the barcodes have been entered,
THEN click on CONFIRM to set the entries.

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4.13.15 Follow-Up Steps When Stopping Production Operations with the RTR System

4.13.15.1 Turn the x-ray controller key to STAND BY
AND remove the key.

4.13.15.2 OT and SS: Log the status change and NCR number in the applicable operator log and the SS log.

4.13.15.2.1 Ensure documentation is accurate and sufficient to ensure compliance with the requirements of operational limits.

4.13.15.2.1.1 Include, as a minimum, entry conditions and actions that are taken in response to operational limits requirements.

4.13.15.2.2 OT and SS: Update the applicable status boards.

(MP-COPS-9.7)

4.13.15.2.3 **WHEN** the condition for stopping production operations has been corrected,
AND the associated NCRs have been closed,
THEN return the RTR system to production operations.

4.13.16 RTR Shielding Radiation Survey

4.13.16.1 Ensure Sections 4.2 through 4.5 are complete.

4.13.16.2 Ensure the cart is in the shielded enclosure.

4.13.16.3 Ensure that the RTR enclosure is unoccupied
AND enclosure door is closed.

NOTE: *X-ray shutters may be adjusted at any time during the performance of the shield survey as directed by INST-RS&C-6.22.4, RTR Shielding Radiation Survey.*

4.13.16.4 Adjust the x-ray shutters as directed by
INST-RS&C-6.22.4.

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- 4.13.16.5 Insert the x-ray controller key into x-ray controller **AND** turn it to the ON position, if necessary.
- 4.13.16.6 Set the x-ray controller to 100 kV and 2 mA.
- 4.13.16.7 Ensure the area in the tracks in front of the enclosure door is clear of personnel and posted prior to x-ray generation.
- 4.13.16.8 Position the x-ray head/drum turntable as directed by INST-RS&C-6.22.4.
- 4.13.16.9 Press the X-RAY ON button, if needed.
- 4.13.16.10 Adjust x-ray system power level or stop generation of x rays as directed by INST-RS&C-6.22.4.
- 4.13.16.11 **REPEAT** Steps 4.13.16.1 through 4.13.16.10, as necessary, to complete unscattered surveys of the shielded enclosure.
- 4.13.16.12 **IF** un-scattered surveys are complete, **THEN** return the cart to the HOME position **AND** load the “RTR Shielding Test Drum” onto the cart as directed by INST-RS&C-6.22.4.
- 4.13.16.13 **REPEAT** Steps 4.13.16.1 through 4.13.16.10 as necessary to complete the scattered surveys of the shielded enclosure.
- 4.13.16.14 **IF** the RTR shielding radiation survey is complete, **THEN** return the cart to HOME position **AND** remove the shielding test drum from the cart.
- 4.13.17 Performing Functional Verification/Post-Maintenance Testing for Mechanical Motion Only**
- 4.13.17.1 Ensure that x-rays are **NOT** generated at any time during the performance of this section.
- 4.13.17.2 Ensure Section 4.2 has been completed.
- 4.13.17.3 **IF** entry into shielded enclosure is necessary for inspection, **THEN** perform necessary steps in Section 4.3 **AND RETURN TO** Step 4.13.17.4 when complete.

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- 4.13.17.4 Insert the cart enable/disable key
AND turn it to the ENABLE position.
- 4.13.17.5 Perform manipulations of equipment as necessary to satisfy functional verification/post-maintenance testing.

5.0 DEFINITIONS

Breach. Any physical degradation in the structural soundness of a container that could potentially lead to a *release* (see def.) of contamination. A breach is a hole in the container that can lead to leaks, *spills* (see def.), or releases.

HOME position. When the cart is completely outside of the enclosure and the x-ray manipulator and II manipulator are fully lowered.

Internal container. For purposes of this document, a container inside the outermost container examined during radiography. Drum liners, liner bags, plastic bags used for contamination control, capillary-type labware, and debris not designed to hold liquid at the time of original waste packaging are not internal containers for the purposes of WIPP acceptance.

(MP-TRUW-8.1; MP-TRUW-8.2)

Liquids, observable (or liquid). Liquid that can be seen by a trained radiography operator or by a trained individual performing VE on the waste. This term can be implemented consistently during characterization regardless of waste type.

Operable. A system, subsystem, train, component, or device shall be operable when it is capable of performing its specified safety function(s) and all the required instrumentation, controls, normal or alternate electrical power, cooling and seal water, lubrication, and other auxiliary equipment for the system, subsystem, train, component, or device to perform its specified safety function are capable of performing their related support function(s).

Radiograph/Radiography. A non-destructive testing method that uses x-rays to inspect and determine the physical form of waste.

Release. Any identifiable waste that has spilled, leaked, poured, emitted, emptied, discharged, injected, pumped, escaped, leached, dumped, or disposed of into environment media and is not contained by permitted secondary containment, or other permitted engineering controls; (for e.g., air borne radiological contamination inside of a Type II module, or waste spilled onto the road between buildings).

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Spills. Waste including packaged waste (e.g., polybags or bottles) that has discharged, escaped, emptied, leached, etc. out of its container and has contacted other surfaces, for example, material from inside the primary container that has left its container surface and has contacted any other surface. In addition, a spill is any radiological contamination found outside a posted contamination area, high contamination area, or airborne radioactivity area, or radiological contamination found in a posted area that exceeds suspension limits of the work control document.

Summary Category S3000 – Homogeneous Solids. Homogeneous solids, or solid process residues, are defined as solid materials, excluding soil, that do not meet the NMED criteria for classification as debris (20.4.1.800 NMAC, Adoption of 40 CFR 268, (incorporating 40 CFR 268.2, Land Disposal Restrictions, Definitions Applicable in this Part [g] and [h]). Included in the series of solid process residues are inorganic process residues, inorganic sludges, salt waste, and pyrochemical salt waste. Other waste streams are included in this summary category group based on the specific waste stream types and final waste form. This summary category group is expected to contain toxic metals and spent solvents. This category includes wastes that are at least 50% by volume solid process residues.

Summary Category S4000 – Soils/Gravel. This summary category group includes S4000 waste streams that are at least 50% by volume soil/gravel. This summary category group is expected to contain toxic metals. Soils/gravel are further categorized by the amount of debris included in the matrix.

Summary Category S5000 – Debris Wastes. This summary category group includes heterogeneous waste that is at least 50% by volume materials that meet the criteria specified in 20.4.1.800 NMAC, (incorporating 40 CFR 268.2 [g]). Debris means solid material exceeding a 2.36-inch (60 mL) particle size that is intended for disposal and is:

1. A manufactured object
2. Plant or animal matter
3. Natural geologic material.

Waste stream. Waste materials that have common physical form, contain similar hazardous constituents, and are generated from a single process or activity.

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6.0 REFERENCES

- (1) 20.4.1.800 NMAC, Adoption of 40 CFR Part 268
- (2) 40 CFR 268.2, Land Disposal Restrictions, Definitions Applicable in this Part
- (3) 40 CFR 761, Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Subpart D Storage and Disposal
- (4) ANSI-N43.3, General Radiation Safety Standard for Installations Using Non-Medical X-ray and Sealed Gamma Ray Sources, Energies up to 10 MeV
- (5) AMWTP HWMA/RCRA Permit
- (6) CCP-PO-003, CCP Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPAC)
- (7) DOE/NV-325, Nevada National Security Site Waste Acceptance Criteria
- (8) Form-1268, Production Systems Access Request
- (9) GE Inspection Technologies Isovolt operating instructions
- (10) INST-MI-1002, RTR 6-Month Safety Checks for RTR System Z-213-101 and Z-213-106
- (11) INST-OI-11, Waste Container Handling
- (12) INST-OI-24, Packaging Radioactive Waste
- (13) INST-RS&C-6.22.4, RTR Shielding Radiation Survey
- (14) MP-COPS-9.7, Control of Equipment and Systems Status
- (15) MP-COPS-9.17, Performing Pre-Job Briefings and Post-Job Reviews
- (16) MP-COPS-9.20, Hazardous Energy Control Processes
- (17) MP-DOCS-18.2, Records Management
- (18) MP-Q&SI-5.4, Identification of Nonconforming Conditions
- (19) MP-RS&C-6.22, Radiological Survey Program

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- (20) MP-RTQP-14.4, Personnel Qualification and Certification
- (21) MP-TRUW-8.1, Certification Plan for INL Transuranic Waste
- (22) MP-TRUW-8.2, Quality Assurance Project Plan
- (23) RPT-TRUW-05, Waste Matrix Code Reference Manual

7.0 RECORDS

Records generated by this procedure are classified in accordance with the table below and dispositioned in accordance with MP-DOCS-18.2, Records Management.

Record Description	Classification
INST-OI-12, Case File	Non-permanent WIPP/ENV1-J-1 / Destroy 75 years after submittal
Form-1218, Daily RTR Safety Checks	Facility Operating Record/ENV2-a-1-a / Destroy 5 years after Life of Facility
Form-1374, RTR Log, or eSOMS equivalent (Applicable Operator Log)	Facility Operating Record/ENV2-a-1-a / Destroy 5 years after Life of Facility
Form-1377, WMF-634 RTR Shielding Radiation Survey	Facility Operating Record/ENV2-a-1-a / Destroy 5 years after Life of Facility
Form-1578, Imaging Quality Indicator Verification Form for RTR	Facility Operating Record/ENV2-a-1-a / Destroy 5 years after Life of Facility
Recording Media Log	Non permanent WIPP/ENV1-J-1 / Destroy 75 years after submittal
Recording Media	Non-permanent WIPP/ENV1-J-1 / Destroy 75 years after submittal

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8.0 EXHIBITS

Exhibit 1 – RTR Image Test Quality Grid

Exhibit 2 – Waste Material Parameter Descriptions

Exhibit 3 – Parameters and Weights of Commonly Identified Items

Exhibit 4 – Fill Factor

Exhibit 5 – List of Prohibited Items

Exhibit 6 – Volume Conversions for Liquids in 55-Gallon Drums

Exhibit 7 – Volumes of Cylinders

Exhibit 8 – Common Liquid Measurements and Conversions

Exhibit 9 – V² Nominal Density Guidance Table

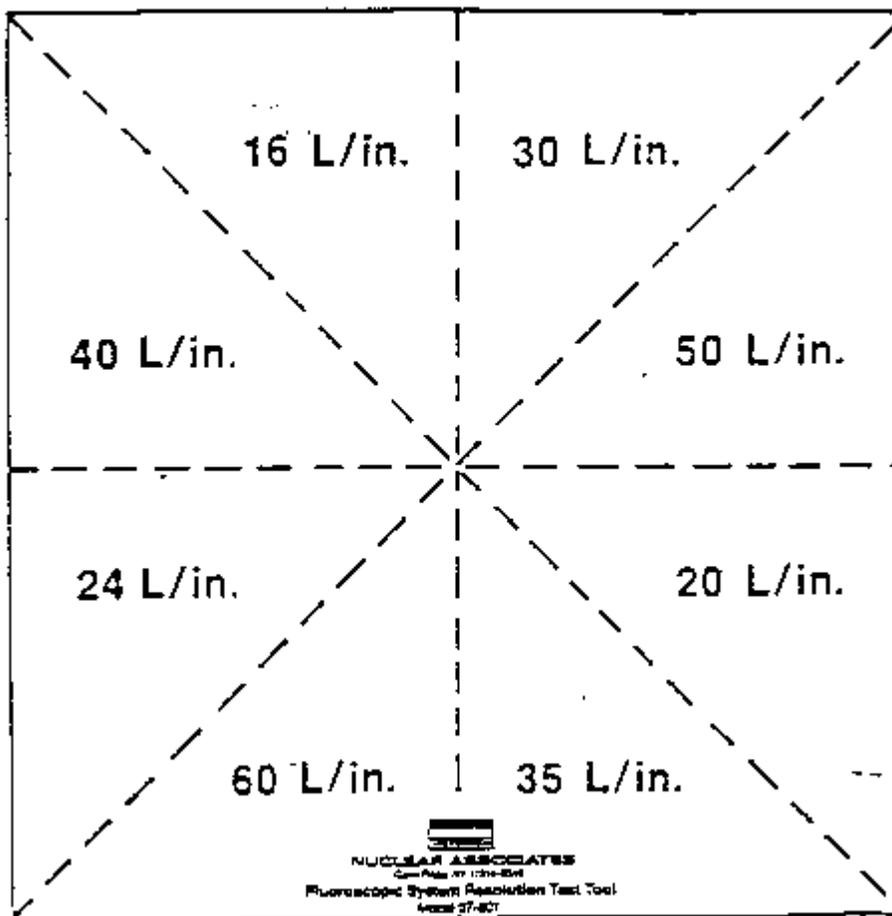
Exhibit 10 – Volume Conversion Table, Cubic Inches to Pints

Exhibit 11 – Volume Conversion for Partial 55-Gallon Drum (in pints)

Exhibit 12 – Categorizing Drum Contents During RTR Examination

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Exhibit 1 – RTR Image Test Quality Grid



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Exhibit 2 – Waste Material Parameter Descriptions

Waste Material Parameter	Help Description
Iron-based metals/alloys	Iron and steel alloys in the waste; does not include the waste container materials
Aluminum-based metals/alloys	Aluminum or aluminum-based alloys in the waste material
Other metals	All other metals found in the waste materials
Other inorganic materials	Nonmetallic inorganic waste, including concrete, glass, firebrick, ceramics, sand, and inorganic sorbents
Cellulosics	Materials generally derived from high polymer plant carbohydrates Examples are paper, cardboard, wood, cloth, etc.
Rubber	Natural or man-made elastic latex materials. Examples are surgeons' gloves, leaded rubber gloves, etc.
Plastics (waste materials)	Generally man-made materials often derived from petroleum feedstock. Examples are polyethylene, polyvinyl chloride, etc.
Organic matrix	Cemented organic resins, solidified organic liquids, and sludge
Inorganic matrix	Any homogeneous materials consisting of sludge or aqueous-based liquids that are solidified with cement, calcium silicate, or other solidification agents. Examples are wastewater treatment sludge, cemented aqueous liquids, inorganic particulate, etc.
Soil/gravel	Generally consists of naturally-occurring soil/gravel contaminated with inorganic waste materials
Steel (packaging materials)	208-L (55-gal.) drums
Plastics (packaging materials)	90-mil polyethylene drum line and plastic bags

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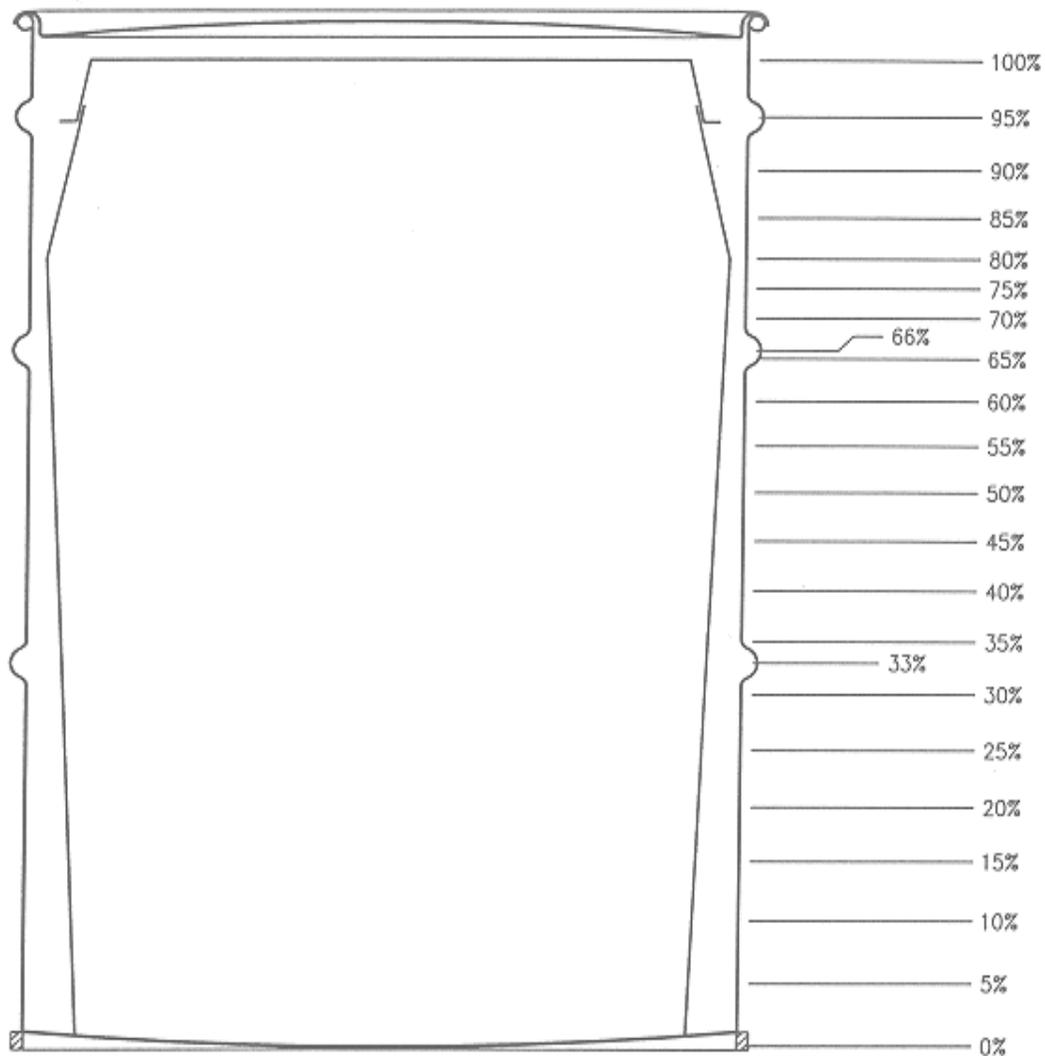
Exhibit 3 – Parameters and Weights of Commonly Identified Items

Item	Weight	Waste Material Parameter
55-gal drum (17 C)	See WTS List of Container Weights	Steel (packaging materials)
90 mil liner (Type I, II, III, IV)	See WTS List of Liner Weights	Plastic (packaging materials)
O-ring plastic bag found in sludge, organic setups, etc.	4 lb	Plastic (packaging materials)
Drum plastic bag	1 lb	Plastic (packaging materials)
Plastic bag for waste	1/4 lb	Plastic (waste materials)
Cardboard liner (graphite mold waste)	4 lb	Cellulosics
Fiber pack	6 lb	Cellulosics
Box fiberboard liner	15 lb	Cellulosics
Box plastic liner	5 lb	Plastic (packaging materials)
Lead brick 2 by 4 by 8 in.	25 lb	Other metals
Leaded rubber glove	5.5 lb	Rubber
Leaded rubber apron	5.25 lb	Rubber
Liquids (water)	8 lb/gal+ (1 lb/pint)*	
Drum lead-liner: (1/8 in. thick, 28 in. high, by 72 in. long) (0.4 lb/in. ³)	100 lb	Other metals
Drum Lead-liner: (1/16 in. thick, 28 in. high by 72 in. long)	50 lb	Other metals
Vermiculite (95 gm/liter)	0.9 lb/gal (0.125 lb/pint)	Other inorganics
Oil-Dri (404 gm/liter)	3.36 lb/gal (0.42 lb/pint)	Other inorganics
Poly bottles (1 gal)	1 lb	Plastics (waste materials)
Metal can	1/2 lb	Iron-based metals/alloys
Drum stub bag	2 lb	Plastic Packaging (materials)
Cured cement	9 lb/gal (1.125 lb/pint)	Other Inorganic Materials
Uncured cement	24 lb/gal (3 lb/pint)	Other Inorganic Materials
Aquaset	9.6 lb/gal (1.21 lb/pint)	Other Inorganic Materials

* Waste parameter depends on source of liquid organic or inorganic.

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Exhibit 4 – Fill Factor



Percentage is to be based on all waste contents (including bags and absorbent) in the drum.

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Exhibit 5 – List of Prohibited Items

Prohibited Item	Comments
Liquids	<p>Liquid waste is not acceptable at WIPP. Observable liquid containing PCBs is prohibited at WIPP. Liquid in quantities delineated below is acceptable.</p> <ul style="list-style-type: none"> • Observable liquid shall be less than 1% by volume of the outermost container at the time of radiography or visual examination. • Internal containers with more than 60 milliliters or 3% by volume observable liquid, whichever is greater, are prohibited. • Containers with Hazardous Waste Number U134 assigned shall have no observable liquid. • Overpacking the outermost container that was examined during radiography or visual examination or redistributing untreated liquid within the container shall not be used to meet the liquid volume limits.
Compressed gases	Typically, aerosol cans, gas bottles, or cylinders that cannot be verified to be physically vented (e.g., a drilled hole, a removed relief valve).
Corrosives/reactives/ignitables present	Waste exhibiting the characteristic of ignitability, corrosivity, or reactivity.
Explosives	Examples include ammunition, dynamite, black powder, detonators, nitroglycerine, urea nitrate, and picric acid.
Wastes with PCBs not authorized under an EPA PCB waste disposal authorization	Light ballasts and transformers are potential sources of PCBs in much of the waste. PCB items commingled (in direct contact with or displaying evidence of cross-contamination) with observable liquid is prohibited.
Non-radionuclide pyrophorics	Example of pyrophoric radionuclides are: metallic plutonium, americium. Examples of non-radionuclide pyrophorics or materials/waste that may cause a pyrophoric type event are: organic peroxides, sodium metal, and chlorates.
Sealed containers greater than 4 liters	Containers >4 liters are considered sealed unless the container cannot be airtight (example: fiber-packs).
Non-mixed hazardous waste	Hazardous wastes not occurring as co-contaminants with transuranic mixed wastes (non-mixed hazardous wastes).
Waste incompatible with backfill, seal and panel closure material, shipping container materials or other wastes	Excessive rust, brittle materials, excessive corrosion, evidence of reaction in the waste are all potential sources for evidence that the waste is not compatible with backfill, packaging, or shipping container.
Sharp or heavy items not blocked or braced	Sharp items that have a reasonable potential to puncture the payload container shall be treated or protected prior to shipment. (The presence of a properly assembled rigid or fiberboard liner is considered as one method of providing protection. Padding, when applicable, is also an acceptable method of providing protection.) Heavy items shall be blocked, braced, or suitably packaged to provide puncture protection for the payload containers packaging these objects.

(HWMA/RCRA Permit; MP-TRUW-8.1; MP-TRUW-8.2; CCP-PO-003)

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Exhibit 6 – Volume Conversions for Liquids in 55-Gallon Drums

Volume Conversions for Liquid			
Inches	Gallons	Pints	Pounds
1.0	1.5	12	12
1.5	2.25	18	18
2.0	3.0	24	24
2.5	3.75	30	30
3.0	4.50	36	36
3.5	5.25	42	42
4.0	6.0	48	48
4.5	6.75	54	54
5.0	7.5	60	60
5.5	8.25	66	66
6.0	9.0	72	72
6.5	9.75	78	78
7.0	10.5	84	84
7.5	11.25	90	90
8.0	12.0	96	96
8.5	12.75	102	102
9.0	13.5	108	108
9.5	14.25	114	114
10.0	15.0	120	120

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Exhibit 7 – Volumes of Cylinders

Volumes of Cylinders (pints)												
Diameter (in.)												
Height (in.)	1	2	3	4	5	6	7	8	9	10	11	12
1	0.03	0.11	0.24	0.44	0.68	0.98	1.33	1.74	2.20	2.72	3.29	3.92
2	0.05	0.22	0.49	0.87	1.36	1.96	2.67	3.48	4.41	5.44	6.58	7.83
3	0.08	0.33	0.73	1.31	2.04	2.94	4.00	5.22	6.61	8.16	9.87	11.75
4	0.11	0.44	0.98	1.74	2.72	3.92	5.33	6.96	8.81	10.88	13.16	15.67
5	0.14	0.54	1.22	2.18	3.40	4.90	6.66	8.70	11.02	13.60	16.46	19.58
6	0.16	0.65	1.47	2.61	4.08	5.88	8.00	10.44	13.22	16.32	19.75	23.50
7	0.19	0.76	1.71	3.05	4.76	6.85	9.33	12.19	15.42	19.04	23.04	27.42
8	0.22	0.87	1.96	3.48	5.44	7.83	10.66	13.93	17.63	21.76	26.33	31.33
9	0.24	0.98	2.20	3.29	6.12	8.81	12.00	15.67	19.83	24.48	29.62	35.25
10	0.27	1.09	2.45	4.35	6.80	9.793	13.33	17.41	22.03	27.20	32.91	39.17
11	0.30	1.20	2.69	4.79	7.48	10.77	14.66	19.15	24.24	29.92	36.20	43.08
12	0.33	1.31	2.94	5.22	8.16	11.75	15.99	20.89	26.44	32.64	39.49	47.00
13	0.35	1.41	3.18	5.66	8.84	12.73	17.33	22.63	28.64	35.36	42.79	50.92
14	0.38	1.52	3.43	6.09	9.52	13.71	18.66	24.37	30.84	38.08	46.08	54.84
15	0.41	1.63	3.67	6.53	10.20	14.69	19.99	26.11	33.05	40.80	49.37	58.75

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Exhibit 8 – Common Liquid Measurements and Conversions

Liquid Measurements	
1.	3 tsp = 1 tbsp
2.	4 tbsp = 1/4 cup
3.	2 cups = 1 pint
4.	4 cups = 1 qt
5.	2 pints = 1 qt
6.	8 pints = 1 gal
7.	4 quarts = 1 gal
8.	Pints \times 0.473 = liters
9.	Millilitres \times 1,000 = liters
10.	60 ml = .127 pints
11.	1 pint = 1 lb

Conversions		
Unit	Conversions to Pints	Weight (lb)
1 teaspoon	0.01	0.01
1 tablespoon	0.03	0.03
1/4 cup	0.13	0.13
1/3 cup	0.17	0.17
1 cup	0.5	0.5
1 pint	1	1
1 quart	2	2
1 gal	8	8

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Exhibit 9 – V² Nominal Density Guidance Table

Material	Density (kg/L)	References
Aluminum	3.0	1, 2
Cement	2.0	1
Cardboard (fiber board)	0.8	5
Copper	9.0	1, 2
Fiber board (insulating)	0.8	4
Fire Brick (90% aluminum oxide)	3.0	4
Glass	2.0	3
Glass, Bulk Density	2.0	3
Glass, Raschig Rings (0.06 kg/ring)	0.6	4
Graphite, Bulk Density	0.5	3
Gravel	2.0	3
Iron	7.5	2
Lead	11.0	1, 2
Plastic (e.g., 10 ml liner material)	0.9–1.0	Calculated
Plastic (e.g., 90 ml heavy rigid liner material)	0.9–1.0	Calculated
Rubber	0.9–2.0	2
Sand	2.0	3
Sludge	1.0–1.5	Common Knowledge
Soil	1.0–1.8	2
Stainless Steel	8.0	1
Steel	8.0	1, 2
Tantalum	17.0	2
Wood (fir, oak, pine, avg.)	1.0	3
Water	1.0	1, 3

The actual density of specific metals or wood types may vary due to the type of wood or the composition of the metal alloy.

Water has a nominal density of 1 kg/L

1 kilogram = 2.2 pounds

References

1. Shigley, J. E., Mechanical Engineering Design, 3rd ed. 636
2. Marks Standard Handbook for Mechanical Engineers, 8th ed. 6-60/61
3. Perry, John H., Chemical Engineers Handbook, 3rd ed. 1549-52
4. Harbison-Walker Refractories Co., Technical Bulletin 12, HU
5. Rocky Flats procedure, 4-I19-NDT-00569

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Exhibit 10 – Volume Conversion Table, Cubic Inches to Pints

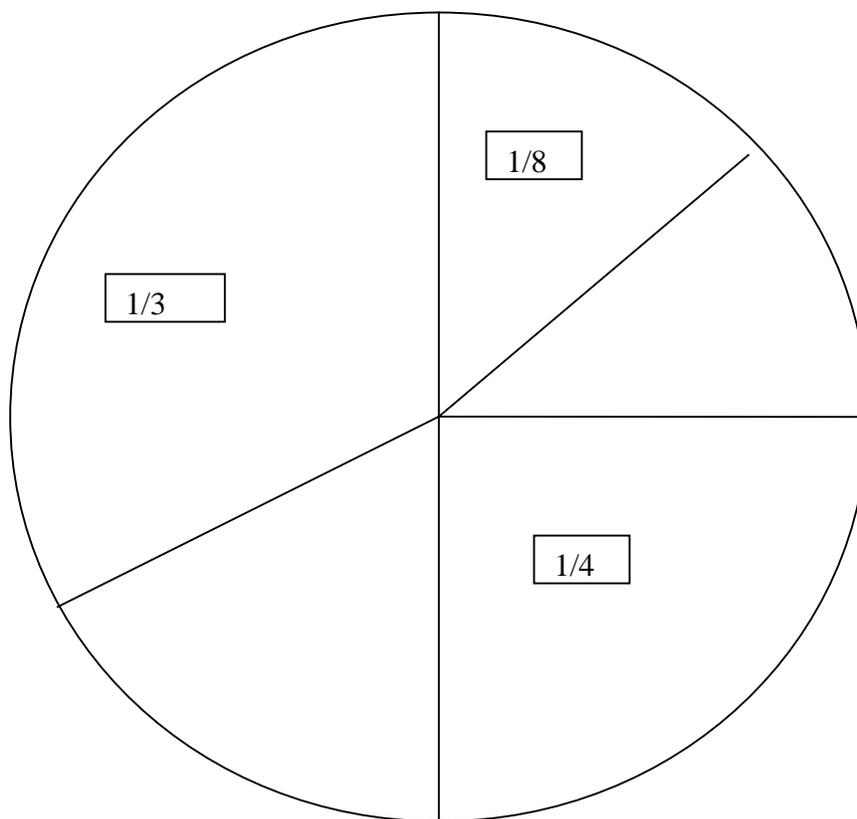
in ³	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	.04	.07	.10	.14	.17	.21	.24	.28	.31	.35	.38	.42	.45	.49	.52	.55	.59	.62	.66	.69	.73	.76
2	.07	.14	.21	.28	.35	.42	.49	.55	.62	.69	.76	.83	.9	.97	1.04	1.12	1.18	1.25	1.32	1.41.395	1.45	1.52
3	.1	.17	.31	.42	.52	.62	.73	.83	.94	1.04	1.14	1.25	1.35	1.45	1.56	1.66	1.77	1.87	1.97	2.08	2.18	2.29
4	.14	.28	.42	.55	.69	.83	.97	1.12	1.25	1.39	1.52	1.66	1.8	1.94	2.08	2.22	2.36	2.49	2.63	2.77	2.91	3.05
5	.17	.35	.52	.69	.87	1.04	1.21	1.39	1.56	1.73	1.9	2.08	2.25	2.42	2.6	2.77	2.94	3.12	3.29	3.46	3.64	3.81
6	.21	.42	.62	.83	1.04	1.25	1.45	1.66	1.87	2.08	2.29	2.49	2.7	2.9	3.12	3.32	3.53	3.74	3.95	4.16	4.36	4.57
7	.24	.49	.73	.97	1.21	1.45	1.7	1.94	2.19	2.42	2.67	2.91	3.15	3.39	3.64	3.88	4.12	4.36	4.61	4.85	5.09	5.33
8	.28	.55	.83	1.11	1.39	1.66	1.94	2.22	2.49	2.77	3.05	3.32	3.61	3.88	4.16	4.43	4.71	4.99	5.26	5.54	5.82	6.1
9	.31	.62	.94	1.25	1.56	1.87	2.18	2.49	2.81	3.12	3.43	3.74	4.05	4.36	4.68	4.99	5.3	5.61	5.92	6.23	6.66	6.86
10	.35	.69	1.04	1.39	1.73	2.08	2.42	2.77	3.12	3.46	3.81	4.16	4.5	4.85	5.19	5.54	5.89	6.23	6.58	6.92	7.27	7.62
11	.38	.76	1.14	1.52	1.9	2.29	2.67	3.05	3.43	3.81	4.19	4.57	4.95	5.33	5.71	6.1	6.48	6.86	7.24	7.62	8	8.38
12	.42	.83	1.25	1.66	2.08	2.49	2.91	3.32	3.74	4.16	4.57	4.99	5.4	5.82	6.23	6.65	7.06	7.48	7.98	8.31	8.73	9.14
13	.45	.9	1.35	1.8	2.25	2.7	3.15	3.61	4.05	4.5	4.95	5.4	5.85	6.3	6.75	7.2	7.65	8.1	8.55	9	9.45	9.9
14	.49	.97	1.45	1.94	2.42	2.9	3.39	3.88	4.36	4.85	5.33	5.82	6.3	6.79	7.27	7.76	8.24	8.72	9.21	9.7	10.18	10.67
15	.52	1.04	1.56	2.08	2.6	3.12	3.64	4.16	4.68	5.19	5.71	6.23	6.75	7.27	7.79	8.31	8.83	9.35	9.87	10.39	10.91	11.43
16	.55	1.12	1.66	2.22	2.77	3.32	3.88	4.43	4.99	5.54	6.1	6.65	7.2	7.76	8.31	8.87	9.42	9.97	10.53	11.08	11.64	12.19
17	.59	1.18	1.77	2.36	2.94	3.53	4.12	4.71	5.3	5.89	6.48	7.06	7.65	8.24	8.83	9.42	10	10.6	11.18	11.77	12.36	12.95
18	.62	1.25	1.87	2.49	3.12	3.74	4.36	4.99	5.61	6.23	6.86	7.48	8.1	8.72	9.35	9.97	10.6	11.22	11.84	12.47	13.09	13.71
19	.66	1.32	1.97	2.63	3.29	3.95	4.61	5.26	5.92	6.58	7.24	7.9	8.55	9.21	9.87	10.53	11.18	11.84	12.5	13.16	13.82	14.48
20	.69	1.39	2.08	2.77	3.46	4.16	4.85	5.54	6.23	6.92	7.62	8.31	9	9.7	10.39	11.08	11.77	12.47	13.16	13.85	14.55	15.24
21	.73	1.45	2.18	2.91	3.64	4.36	5.09	5.82	6.55	7.27	8	8.73	9.45	10.18	10.91	11.64	12.36	13.09	13.82	14.55	15.27	16
22	.76	1.52	2.29	3.05	3.81	4.57	5.33	6.1	6.86	7.62	8.38	9.14	9.9	10.67	11.43	12.19	12.95	13.71	14.48	15.24	16	16.76

Multiply the cross-section volume in the table by the height of the object to get the volume of the object in pints. The cross-section volume is based on a height of 1 inch.

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Exhibit 11 – Volume Conversion for Partial 55-Gallon Drum (in pints)

Volume	1/8	1/4	1/3	1/2	2/3	3/4
1 st chime	18	36	48	73	97	109
2 nd chime	37	74	97	147	198	221
Full drum	55	110	145	220	295	330



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Exhibit 12 – Categorizing Drum Contents During RTR Examination

CATEGORY ITEM	Packaging Material	Layer of Confinement	Waste Material						
Plastic Drum Bag	*	X							
90-mil Liner	X								
Small Plastic Bag Containing Waste	*	X							
Poly Bottle <4 liters			X						
Fibre Pak			X						
Volrath Can <4 liters			X						
Metal Can <4 liters			X						
Empty Plastic Bag			X						
Ice Cream Carton			X						
Sealed containers >4 liters		X							

* Only plastic bags (PVC or poly) in the outer two layers are considered plastic packaging materials, the others are considered plastic waste.

9.0 APPENDICES

Appendix A – Burning DVD from Hard Drive

Appendix B – Creating or Transferring Data to the RITA Archival System

Appendix C – Revision Log

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**Appendix A –
Burning DVD from Hard Drive**

NOTE: *This appendix is used to provide information for burning data from the hard drive onto a DVD.*

1. Start by clicking the “Nero Essentials” icon on the desktop.
2. Highlight the data DVD button by double clicking it. (This program will burn the DVD from the hard drive.)

NOTE: *The Nero essentials will open and have a button on the right hand side of the window titled ADD.*

3. After selecting the ADD button, a folder window will open with the recorded data.
4. Find the applicable file or folder.
5. Highlight the drum(s) and IQI, if needed, to be burned to the DVD **AND** click the ADD button.
6. Ensure there is enough memory on the DVD for selected file. If not, insert a new DVD.
7. After all items to be burned to DVD have been added, close the folder containing all the data.
8. Hit the NEXT button.
9. Name the disc with the batch number being burned to the DVD, if necessary.
10. Ensure that “Verify data on disc after burning” and “Multi-session” boxes are checked.
11. Select the BURN button. If DVD does not have enough space for selected file, then insert new DVD and continue.
12. After the burn is complete, select OK to “Data Verification Completed Successfully.”

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13. Select NEXT.
14. Exit “Nero Essentials.”
15. Re-insert disc.
16. Select previously burned file
AND check the audio/video record for completeness.
17. Exit folder.
18. Create a folder with the batch number as the folder name, if necessary.
19. Move previously burned file(s) to batch folder.

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**Appendix B –
Creating or Transferring Data to the RITA Archival System**

- 1 Double click RITA icon, if necessary.
- 2 If needing to create a disk, click CREATE.
 - 2.1 Select the type of disk to be created and select CREATE.

NOTE 1: *After confirming, a window will pop up informing if you are successful or if there is a problem with the creation of the disc.*

NOTE 2: *After clicking CANCEL, the program will return you to the first screen of RITA.*
 - 2.2 If information is correct, click CONFIRM.
 - 2.3 If information is incorrect, click CANCEL.
 - 2.4 Click OK to acknowledge creation of the disk ID.
- 3 If needing to transfer data, click TRANSFER.

NOTE: *While data is transferring, the RITA window can be minimized.*

 - 3.1 Select disk ID to be transferred and select TRANSFER.
 - 3.2 Input batch ID if disk is associated with a batch, and N/A if it is not.
 - 3.3 Click TRANSFER.
 - 3.4 If transfer is unsatisfactory, contact SS/subject matter expert/SE.
 - 3.5 If transfer is complete and satisfactory, click OK.

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**Appendix C –
Revision Log**

Revision Number	Date Approved	Pages Affected	Description of Revision
0	08/01/02	All	Initial issue. DCR-1254 – Issued for formal validation during commissioning activities.
1	09/06/02	All	DCR-1469-Editorial changes throughout document, added new step 4.5.9 to avoid overselect situation, added steps to Section 4.9, Deleted Step 4.7.3.3.11
2	10/22/02	Page 12, 55, 57 and 58	DCR-1655. Updated Section 4.2.2, Changed reference from OI-09 to OI-11, Made Steps 4.10.2.10.2 through 4.10.2.10.11 substeps of 4.10.2.10.1
3	10/31/02	Pages 19, 26, 27, & 29	DCR-1684. Updated Sections 4.7.1 and 4.7.3 to clarify warm-up requirements.
4	12/11/02	Pages 15-18 & 57-58	DCR-1800, New Step 4.5.4, Changed steps to eliminate excessive exiting and entering of the control room and to provide more accurate instruction.
5	01/09/03	Various	DCR-1874. Changed to reflect software changes.
6	01/28/03	27	DCR-2014, Minor Change to replace Steps 4.7.3.2.9 and 4.7.3.2.10, which were erroneously removed from Revision 5.
7	02/14/03	Various	DCR-2057, updated to address key control, provide a hand-off for manual batching, provide clarification, and address sequencing changes.
8	3/20/03	Pg 19	DCR-2131, Minor Change - Removed Note at beginning of Section 4.7 which allowed steps to be performed out of sequence.
9	03/27/03	All	DCR-2126, Minor change to amend date form DOE Approves Retrieval Operations Start-up to 03/28/03 and Editorial update to Records Section.
10	05/02/03	Various	DCR-2235, Incorporate WIPP review comments.
11	05/08/03	Various	DCR-2254, Added Form number and title that was inadvertently omitted.
12	06/27/03	Various	DCR-2267, Revised to include waste items in the comment area and a verification of the task plan disposition.

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13	7/28/03	Pg A2	DCR 2375 – Minor Change, Correct conversion for Oil-Dry.
14	7/31/03	Pg 24, 33, 51	DCR-2386 – Minor Change, Clarification of step and update location for recording Independent Observation.
15	9/25/03	Various	DCR-2439 – Revised to include additional manual batch data report details for CAR 03-072, WIPP audit A-03-05 recommendations 28 (IDC and prohibited item confirmation at the end of the scan) and 29 (recording the image system check), delete references to EDF-199 and replaced with 5232-RPT-TRUW-05, AMWTP Waste Matrix Code Reference Manual. Revised minor operational requirements.
16	01/13/04	Various	DCR-2542. Added clarification of TRU and ITR requirements and corrected caution statements. Incorporated operational changes.
17	02/19/04	Pg 39	DCR-2716. Step below Item E was revised.
18	07/15/04	Various	DCR-2787. The changes are being made to clarify the intent/use of the IQI test pattern, improve the sequencing of steps, and clarify instructions. Form-1578, Imaging Quality Indicator Verification Form For RTR, was created and references added to procedure. Added new Section 4.11, Initiating RTR Nonconformance Report. Added new Steps 4.2.6 and 4.7.3.8.34 to meet part of the WIPP-WAP-B1-3b(2) requirement.
19	1/12/05	Revised entire document.	DCR-3277. Deleted Steps 4.2.6, 4.7.3.3.8.34, 4.7.3.11 and Section 4.10. Incorporated Field Change DCR-3286. Editorial changes (moved non-action/information only statements in steps to notes, moved action statements from notes to steps, and broke up steps that had more than one action, capitalized exact titles on operating buttons, added a reference to reference section of report called out in procedure appendix) made to reflect requirements of MP-DOCS-18.1, Developing Written Work Instructions. Per CBFO's direction, changes were made throughout this procedure to ensure it is consistent with the approved changes made to INST-FOI-17. Made additional changes per VEE and CBFO's direction.

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20	01/20/05	Pages 22 and 39	DCR-4108. Corrected E-Stop button callout in both steps. Minor change.
21	02/07/05	Various	DCR-4124. In Steps 4.8.18 and 4.8.19, wording was changed from "Console to key" to "E-Stop Reset key." Steps 4.8.10.1 and 4.10.47 were changed for process accuracy. Changed Steps 4.10.48 and 4.10.49.
22	03/08/05	Various	DCR-4195. Made itemized changes to procedure. Corrective action from CBFO Audit A-05-08, CAR 05-013 (AMWTP CAR 12800).
23	08/17/05	Various	DCR-4378. Incorporated Field Change, DCR 4346. Revised to reflect upgrade from Pantak X-ray equipment to GE X-ray equipment.
24	01/17/06	Section 4.10	DCR-4638. Add new step for PCB labeling requirement. Revise current Exhibit 6, change PCB definition, and correct Exhibit numbers. Incorporate FC-1, DCR-4638-1. Add steps concerning candidate drum link. Incorporate FC-2, DCR-4747.
25	2/13/06	Exhibit 12 and 4.7.42	DCR-4757. Add Exhibit 12, Categorizing Drum Contents During RTR Examination.
26	04/27/06	Page 27	DCR-4977. Revised Step 4.7.18 for clarification.
27	5/24/06	Various	DCR-5002. Change to support SCR-2320.
28	06/19/06	Various	DCR-5074. Incorporate changes consistent with annual DSA update implementation (new prerequisite after Step 3.2.2).
28 FC-1	7/5/06	Various	DCR-5127. Clarifying x-ray warm-up steps
29	9/21/06	Various	DCR-5335. Incorporate FC-1 and incorporate changes to satisfy CAR-23463 (CB+FO CAR 06-36)
29 FC-1	10/19/06	Page 56	DCR-5495. Updated Exhibit 5, List of Prohibited Items.
29 FC-2	10/24/06	Page 56	DCR-5503. Superseded Rev 29, FC-1, DCR-5495. Changed Exhibit 5, List of Prohibited Items, Compressed Gases.
29 FC-3	11/21/06	Page 20	DCR-5564. Placed Step 4.5.26 before Step 4.5.25.

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30	12/04/06	Various	DCR-5523. Incorporated DCR-5503 and DCR-5564 permanent field changes. Deleted steps no longer required because of software update. Added information for job debriefings and for Nevada National Security Site (NNSS) requirements. Made changes identified during limited field use validation.
31	12/06/06	Page V	DCR-5601. Deleted incorrect sentence from description in Revision Log, Revision Number 30. Incorrect reference made due to error on DCR processed for Rev. 30.
31FC-1	12/18/06	24, 34	DCR-5632. Added wording to allow for proper references when running ARP and other waste streams.
31 FC-2	3/19/07	7, 39	DCR-5834. Added wording for clarification.
31 FC-3	06/05/07	21, 25, 24	DCR-6025. Clarified step and provided flexibility for use of procedure.
31 FC-4	06/07/07	Title page	DCR-5702. Deleted "(Controlled Activity)" and added "(General Use)."
32	07/17/07	Page 24, 34 and 35	DCR-6209. Incorporated DCR-5632 (FC-1), DCR-5834 (FC-2), DCR-6025 (FC-3), and DCR-5702 (FC-4) changes. SCR-2363 eliminates the need for an NCR at certain points in Sections 4.7.40 and 4.7.41.
32 FC-1	11/30/07	Pages 30 & 58	DCR-6630. For WAPP clarification.
33	12/19/07	Various	DCR-6482. Periodic Review. Add notes and steps to clarify containers and prohibited items. Update Roles and Responsibilities, References and Records sections. Edit notes, steps, warnings and cautions per MP-DOCS-18.1. Incorporate DCR-6630.
33 FC-1	12/21/07	Page 17	DCR-6682. Added "or comments field" to Step 4.5.6.2.1.1.
33 FC-2	01/24/08	Page 29	DCR-6737. Change to step 4.2.27 for residual liquid in S3000.
33 FC-3	02/01/08	Pages 3 and 17	DCR-6740. Steps 3.1.13 and 4.4.1.2. Changes to clarify preheat requirements for drums located in WMF-634,

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34	02/25/08	Various	DCR-6767. Incorporated changes per DCR-6737 (FC-1), -6682 (FC-2), and -6740 (FC-3).
34 FC-1	3/15/08	Various	DCR-6930. Added steps for clarification to ensure prerequisites are complete.
34 FC-2	03/24/08	Various	DCR-6952. Delete 34 FC-1 and add steps to correct problems with flow.
35	04/03/08	Various	DCR-6866. Incorporated changes in support of transportation transition to CCP.
36	06/19/08	Various	DCR-7191. Updated procedure due to RTR computer system upgrade.
36 FC-1	07/04/08	Pages 13, 36	DCR-7316. Deleted words and steps no longer required due to new system configuration.
37	07/30/08	Various	DCR-7308. Incorporated FC-1 (DCR-7316). Added steps/revised steps for consistency to upgrades to system. Revised Appendix A to add clarification. Updated TSR rolldown references; editorial/formatting changes per MP-DOCS-18.1, MP-DOCS-18.4. Incorporated Blue Sheet changes per DCR-6811 for Ops restructuring.
38	07/31/08	Appendix A Step 4	DCR-7414. Correct typographical error in Step 4 of Appendix A. "File" should be "Find".
39	12/01/08	Various	DCR-7586. Added note, revised Exhibit 5 regarding residual liquids with U134 present, and edited per MP-DOCS-18.1.
40	01/28/09	Various	DCR-7902. DSA changes incorporated.
40 FC-1	03/19/09	Pg 7 & 40	DCR-8177. Clarification and match software terminology.
41	08/22/09	Various	DCR-8555. Incorporate permanent field change (DCR-8177), and added DOCS-BLUESHEET-02 changes.
42	11/18/09	Various	DCR-8725. Incorporated 2009 DSA/TSR update. Added Appendix B.
43	02/22/10	Various	DCR-9006. Changes to ensure IQI has been completed and is compliant, to ensure 55-gal drums overpacked into larger containers have an RTR scan, and editing per MP-DOCS-18.1 and editorial consistency.

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43 FC-1	04/21/10	B1	DCR-9193. Change kV ratings of RTR-101
43 FC-2	04/28/10	B1	DCR-9205. Change kV ratings for RTR-106
43-FC-3	05/10/10	Pg 4	DCR-9209. Added Step 3.1.22 to resolve CAR 49662, incorporating alternative isolation device information to procedure.
43-FC-4	06/19/10	Pgs 13, 14 and B1	DCR-9375. Changed warm-up steps and RTR kV values RTR-106.
44	06/24/10	Various	DCR-9136. Incorporated DCRs-9193, -9205, -9209 and -9375 EXCEPT did not incorporate changes to the RTR kV values; also incorporated WIPP Permit modifications.
44 FC-1	08/02/10	12, 13, 14, B1	DCR-9451. Revise steps 4.3.1.3.2, 4.3.1.4.2, 4.3.1.5.2, 4.3.1.6.2 and Appendix B to be able to down-rate RTR.
44 FC-2	09/13/10	Pages 7-9	DCR-9517. Allow Operator to complete section 4.1 regardless if the equipment is on or off when the operator uses this procedure.
44 FC-3	09/15/10	Pgs 11, 43	DCR-9534. Gives formalized direction, redirects an oncoming operator to the proper step.
44 FC-4	09/16/10	Pgs 9, 11	DCR-9543. Provides formal direction for operators.
44 FC-5	09/17/10	Various	DCR-9549. Provide guidance if steps already completed. Re-sequenced if steps already completed. Re-sequenced drum loading steps for safer operation.
45	09/21/10	Various	DCR-9494. Incorporated FCs 1 through 5 (DCRs-9451; 9517; 9534; 9543; 9549) as permanent.
45 FC-1	09/23/10	Various	DCR-9560. Incorporated changes to allow operators to restore programs required to perform an audio/video recording; delete appendix B, add reference to "or eSOMS equivalent" when referencing Form-1374.; update kV values where appropriate.
46	12/17/10	Various	DCR-9676. Incorporate Revision 45 FC-1 (DCR-9560) and the WIPP Permit Renewal.
47	06/21/11	Various	DCR-10137. Changed to Controlled Activity. Updated steps and notes to match operational changes. Added clarification to reduce duplicate NCRs and to minimize rework. Resolves CAR 54805.

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47 FC-1	01/09/12	Pg. 33	DCR-10727. Provide direction for scanning LLW/MLLW through RTR.
47 FC-2	01/12/12	Pg. 33	DCR-10738. FC-1 not required (deleted)
47 FC-3	03/05/12	A2 of A2	DCR-10990. Delete reference to "my disc" file.
48	07/03/12	Various	DCR-10810. Incorporated DCR-10990, and ITG-BLUESHEET-019 to provide cross-walk of titles from BBWI to ITG. Changes made for clarification regarding Form-1218, to clarify the requirements for prohibited liquids, and for an alternate means of LO/TO for energy isolation.
48 FC-1	07/10/12	Pg. 15	DCR-11441. Provided allowance for RITA not available.
49	08/08/12	Various	DCR-11428. Implemented DSA changes and 48 FC-1 (DCR-11441).

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