

CCP-TP-189

Revision 1

CCP

Box Segmented Gamma System (BSGS) Operating Procedure

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APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	04/30/2008	Initial issue.
1	10/08/2009	Revised to remove direct reference to the site interface document, to remove the prerequisite action to check the status of the fire water bladder, and to clarify some operational steps.

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1.0 PURPOSE

This procedure provides instructions for startup, operations, and shutdown of the Box Segmented Gamma System (BSGS) using Canberra Nondestructive Assay 2000 (NDA2000).

1.1 Scope

This procedure applies to personnel responsible for operating and/or supervising the operations of the BSGS.

2.0 REQUIREMENTS

2.1 References

Baseline Documents

- Canberra Industries, Inc., Publication No. 9231594, NDA2000 Users Manual (corresponding to current software version)
- Canberra Industries, Inc., Publication No. 9231595, NDA2000 Technical Reference Manual (corresponding to current software version)
- Document No. 38845, Box Gamma System, Hardware Reference Manual
- CCP-PO-002, *CCP Transuranic Waste Certification Plan*

Reference Documents

- CCP-QP-002, *CCP Training and Qualification Plan*
- CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*
- CCP-QP-008, *CCP Records Management*
- CCP-QP-011, *CCP Notebooks and Logbooks*
- CCP-TP-190, *CCP Box Segmented Gamma System Calibration Procedure*
- CCP-TP-193, *CCP Data Reviewing, Validating, and Reporting Procedure for the Nondestructive Assay Box Counters*

2.2 Training Requirements

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

2.3 Precautions and Limitations

2.3.1 Quality Control (QC) checks use radioactive sealed sources. The physical position of the sources within the matrix container must be preserved to ensure repeatability.

2.3.2 Personnel working around the BSGS conveyor, door closure, and moving equipment must observe warning devices and postings.

2.3.3 Radioactive calibration sources/standards are to be treated and controlled as sealed radioactive sources in accordance with Host site requirements.

2.3.4 The High Purity Germanium (HPGe) detectors are cooled with Liquid Nitrogen (LN). LN may cause burns to exposed skin due to its extremely cold temperature. Wear appropriate personal protective equipment (PPE) as defined by Host site requirements when filling detector dewars.

2.3.5 **IF** a HPGe detector has warmed up due to a lack of LN, **THEN** a waiting period of at least eight hours will be observed after the initial LN fill.

NOTE

The steps in section 2.4 may be performed in any order.

2.4 Prerequisite Actions

2.4.1 Equipment Bay

- Verify in the NDA Operational Logbook that the HPGe detectors have contained LN for at least eight hours before the high voltage (HV) is applied.
- Ensure Emergency Stops are inactivated.
- Ensure that the security cage door is closed and locked.
- Ensure equipment and moving parts are clear of personnel or obstructions.

2.4.2 Control Room

- Ensure the Temperature Stabilizer for the sodium iodide (NaI) detectors is displaying $40^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$.
- Ensure the HV Inhibit Indicator lights on each DSA 1000 are off, indicating the HPGe detectors have sufficient LN.
- Ensure the Equipment Bay door is closed and locked.
- Ensure the Light Stacks are operational.
- Ensure that the Programmable Logic Controller (PLC) Cabinet is turned on and operational (e.g., supplies system power and provides troubleshooting capability, etc.).

2.5 Software

- [A] NDA2000, Waste Assay
- [B] Genie 2000, Gamma Acquisition and Analysis

3.0 RESPONSIBILITIES

NOTE

The Nondestructive Assay (NDA) Operator and the NDA Lead Operator (LO) may be the same individual. The NDA LO may perform NDA Operator tasks and functions at any time.

3.1 NDA Operator

3.1.1 Performs routine startup, normal operations, and shutdown of the BSGS.

3.1.2 Notifies the NDA LO of abnormal or nonconforming conditions.

3.2 NDA Lead Operator (LO)

3.2.1 Provides supervision of the overall operation of the BSGS.

3.2.2 Ensures that operations are performed in a manner consistent with this procedure as well as site safety requirements.

3.2.3 Investigates and resolves non-routine occurrences.

3.3 NDA Expert Analyst (EA)

3.3.1 Evaluates conditions detrimental to quality.

3.3.2 Provides technical supervision and data evaluation for radioassays.

3.3.3 Prepares and issues Six-month Weekly Interfering Matrix Report.

3.4 Vendor Project Manager (VPM)

3.4.1 Oversees Central Characterization Project (CCP) operations.

4.0 PROCEDURE

NOTE

The NDA Operator, performing the daily operations below, has a level of proficiency such that routine instrument troubleshooting adjustments (e.g., adjustment of instrument gain, offset) can be performed without need for intervention by the NDA LO. In all cases, when a simple instrument adjustment of this type becomes necessary, these actions, as well as the reasons why they were taken, must be documented in the NDA Operational Logbook in accordance with CCP-QP-011, *CCP Notebooks and Logbooks*. In the event that the BSGS requires a higher level of troubleshooting effort, the NDA LO is notified and collaborates with the NDA Operator so that any BSGS operations problems are resolved and the BSGS is restored to its correct operating condition. The NDA LO and CCP VPM must be notified prior to any maintenance or troubleshooting that is not encompassed by procedure. These actions are documented in the NDA Operational Logbook in accordance with CCP-QP-011.

4.1 BSGS Startup

NOTE

The motion warning horn will sound for five seconds prior to any mechanism movement. The yellow light will be on during conveyor movement. The green light will illuminate indicating assay in progress. The blue light is illuminated when the transmission source shutter is OPEN. If the system detects an error in the PLC operation, the yellow, blue, and green lights will flash ON and OFF repeatedly. If an Emergency Stop is activated, then the red light will stay on while the yellow, blue, and green lights will flash on and off.

NOTE

BSGS Startup steps 4.1.1 through 4.1.7 may be performed as required.

4.1.1 Ensure the following configurations:

- There are NO obstructions in the BSGS sample chamber OR on the conveyors
- The power is ON to the UPS unit(s)
- The Reference Pulser Power Toggle switches are ON
- The Digital Spectrum Analyzer units are powered ON
- Both surge protector power strips are ON
- The Main Power Rotary Switch on the PLC Cabinet is in the ON position

- 4.1.2 Initialize the PLC by performing the following:
- [A] Turn the Mechanical Control Switch (MCS) to the Manual position
 - [B] Rotate the Override Reset clockwise for approximately 5 seconds AND release to initialize the system
 - [C] Turn the MCS to the Computer position
- 4.1.3 Boot up and logon to the BSGS computer:
- 4.1.4 Start NDA2000
- 4.1.5 Turn on the HPGe detector HV by performing the following:
- [A] Select Hardware Setup.
 - [B] Select High Voltage Supplies.
 - [C] Select Turn ON.

CAUTION

The DSA units and detectors must warm up and stabilize for at least one hour after the power and HV are applied.

- 4.1.6 Ensure that the 1-hour stabilization requirement has been met as documented in the NDA Operational Logbook in accordance with CCP-QP-011.
- 4.1.7 Ensure Air Compressor is purged each operational day by performing the following:
- [A] Turn MCS to Manual position.
 - [B] Select Manual on the PLC touch screen.
 - [C] Select Misc. on the PLC touch screen.
 - [D] Select Compressor Drain on the PLC touch screen.
 - [E] **WHEN** purge is complete,
THEN turn MCS to the Computer position.

4.2 Nal Standardization

NOTE

A Nal Standardization is performed at the beginning of each operational day. It may be performed more frequently if a change is suspected. The Nal Standardization is performed without a container on the conveyor or in the counting chamber.

4.2.1 Inspect equipment and moving parts to ensure that they are clear of personnel or obstructions.

4.2.2 Ensure the Nal detectors and transmission sources are in the proper position to achieve standardization.

4.2.3 Perform Nal Standardization using NDA2000.

[A] Select Assay.

[B] Select Routine Assay.

[C] Select QC Check (Nal) Standardization.

[D] Ensure the following information is displayed on the Assay – Routine screen:

- Container Type: <Home>
- Geometry: Default Geometry
- Disable Load/Unload: Checked
- Count Time: (e.g., 60 s)
- Live: Unselected
- Real: Selected
- Source: Attenuators Closed
- Mode: Normal Scan
- Automatic: Unselected
- Fixed: Selected (1)

4.2.4 Select Start Assay.

NOTE

Batch Data Reports (BDRs) will be uniquely numbered using the following convention unless otherwise specified within the Batch Narrative Summary: SRLBCXXXX, where SR=Savannah River; LBC=Large Box Counter; XXXX=unique sequence number (e.g., SRLBC0001, SRLBC0002, etc.).

4.2.5 Enter the following information in the Item Information screen:

- [A] Item ID: (e.g., QC Check Nal)
- [B] Description 1: (e.g., Nal Standardization)
- [C] Description 2: (e.g., N/A)
- [D] Location: (e.g., SRS, E Area)
- [E] Comment: (e.g., N/A)
- [F] Matrix Type: Default
- [G] Percent Full: 100%
- [H] Gross Weight: 0.00 kilogram (kg)
- [I] Density: (automatically calculated by NDA2000)
- [J] Certificate File: Co-60

4.2.6 Select Done.

4.2.7 **IF** necessary repeat steps 4.2.3[A] through 4.2.6 no more than two times to achieve standardization. **AND** record every iteration in the NDA Operational Logbook in accordance with CCP-QP-011.

4.2.8 **IF** standardization is NOT achieved after a third iteration, **THEN** perform the following:

- [A] Contact the NDA LO.

NDA LO

- [B] Evaluate the nature of the failure, consulting with the NDA EA as necessary.

- [C] Instruct the NDA Operator to mitigate the problem, note the problem in the NDA Operational Logbook, **AND** return to step 4.2.3, in order to repeat the NaI Standardization.

NDA Operator

- 4.2.9 **WHEN** standardization is achieved,
THEN print the Quality Assurance (QA) Last Results Report (see Attachment 1, QA Last Results Report, for an example).
- 4.2.10 Print name, sign, and date the QA Last Results Report for inclusion in the BDR.

4.3 QC Check Background

NOTE

A QC Check Background is performed at least once per day, usually at the beginning of the counting session. It may be performed more frequently if a change in the background is suspected. The QC Check Background is used to identify changes in the background level that might affect the sample results. The QC Check Background is performed without a container on the conveyor.

- 4.3.1 Ensure the Reference Pulsers for the HPGe detectors are at 1500 ± 0.3 kiloelectron Volt (keV)
- 4.3.2 Ensure the detectors are in the proper position to perform the QC Check Background.
- 4.3.3 Perform the QC Check Background using NDA 2000:
- [A] Select Assay.
- [B] Select Routine Assay.
- [C] Select QC Check Background.
- [D] Ensure the following information is displayed on the Assay – Routine screen:
- Container Type: <Home>
 - Geometry: Default Geometry
 - Disable Load/Unload: Checked
 - Count Time: (e.g., 1200 s)

- Live: Unselected
- Real: Selected
- Mode: Normal Scan
- Automatic: Selected
- Fixed: Unselected (1)

4.3.4 Select Start Assay.

4.3.5 Enter the following information in the Item Information screen:

[A] Item ID: (e.g., QC Check BKGD)

[B] Description: (e.g., QC Check Background 9-11-07)

[C] Comment: (e.g., SRS, E Area)

4.3.6 Select Done

4.3.7 **IF** any error condition occurs during the count,
THEN select Abort, note the failure in the NDA Operational
Logbook in accordance with CCP-QP-011, **AND** notify the NDA LO.

NOTE

The report may contain two different types of flags: Above the boundary [Ab] or Below the boundary [Be]. The boundary values are nonstatistically determined values.

4.3.8 **WHEN** the analysis is complete,
THEN select View Last Assay Report button on the NDA2000
screen, **AND** observe the QA Last Results Report for any flags
(i.e., Above [Ab], or Below [Be]).

4.3.9 **IF** any of the values on the QA Last Results Report indicate an Ab,
or Be flag,
THEN perform the following:

[A] STOP WORK, note the failure in the NDA Operational
Logbook in accordance with CCP-QP-011, **AND** notify the
NDA LO and VPM.

NDA LO

- [B] Evaluate the nature of the failure, consulting with the NDA EA as necessary, **AND** determine if a Nonconformance Report (NCR) is required.
- [C] **IF** an NCR is required, **THEN** initiate an NCR in accordance with CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*, **AND DO NOT** resume operations until the NCR disposition is approved.
- [D] **IF** an NCR is **NOT** required, **THEN** instruct the NDA Operator to mitigate the problem, note the resolution in the NDA Operational Logbook in accordance with CCP-QP-011, **AND** return to step 4.3.1 in order to repeat the QC Check Background.

NDA Operator

4.3.10 Print the QA Last Results Report(s).

4.3.11 Print name, sign, and date the QA Last Results Report(s) for inclusion in the BDR.

4.4 QC Daily Performance Check

NOTE

A QC Daily Performance Check is performed at least once per day at the beginning of the operational day, prior to assaying waste containers.

Results of the measurement may contain several types of flags. The [In] or Investigative flag indicates a result that is outside the 2-Sigma limits, but within the 3-Sigma limits. The [Ac] or Action flag indicates a result that is outside of the 3-Sigma limits. An [Ab] or Above flag indicates a result is above the boundary, while a [Be] or Below flag indicates a result is below the boundary.

4.4.1 Ensure all detectors and transmission sources are in the proper position for the container being assayed.

4.4.2 Ensure the performance check container is loaded onto the conveyor or on the rotator if the container is a drum.

4.4.3 Activate the drum rotator, if required.

4.4.4 Perform the QC Daily Performance Check using NDA2000.

- [A] Select Assay.
- [B] Select Routine Assay.
- [C] Select QC Daily Performance Check.
- [D] Ensure the following information is displayed on the Assay – Routine screen:
 - Container Type: 55 US Gal. Drum
 - Geometry: Default Geometry
 - Disable Load/Unload: Unchecked
 - Count Time: (e.g., 1200 s)
 - Live: Unselected
 - Real: Selected
 - Mode: Normal Scan
 - Automatic: Selected
 - Fixed: Unselected

4.4.5 Select Start Assay.

4.4.6 Enter the following on the Item Information screen:

- [A] Item ID: (e.g., QC Perf Check)
- [B] Description 1: (e.g., Daily Performance Check)
- [C] Description 2: (e.g., N/A)
- [D] Location: (e.g., SRS, E Area)
- [E] Comment: (e.g., N/A)
- [F] Matrix Type: Default
- [G] Percent Full: 100%
- [H] Gross Weight: (as appropriate)
- [I] Density: (automatically calculated by NDA2000)

[J] Certificate File: (as appropriate)

4.4.7 Select Done.

4.4.8 **IF** any error conditions occur during the count,
THEN click on Abort, note the failure in the NDA Operational
Logbook in accordance with CCP-QP-011, **AND** notify the NDA LO.

4.4.9 **WHEN** the analysis is complete,
THEN select View Last Assay Report button on the NDA2000
screen, **AND** observe the Summed Spectrum QA Last Results
Report for any deviation/flag (i.e., Investigate [In], Action [Ac],
Above [Ab], or Below [Be]).

NOTE

A Calibration Verification will be performed for any of the following occurrences:

- Major system repairs and/or modifications
- Replacement of the measurement system's components, (e.g., detector, neutron generator, or supporting electronic components that have the capacity to affect data)
- Significant changes to the system's software
- Relocation of the system
- Failure of certain QC measurements

4.4.10 **IF** any value on the summed spectrum QA Last Results Report
indicates an Investigate [In] flag,
THEN notify the NDA LO.

[A] Evaluate the cause of the Investigate [In] flag with the NDA
LO and NDA EA, as necessary.

[A.1] **IF** this is the first or second Investigate [In] flag and a
corrective action has been identified,
THEN correct the condition, note the condition and
corrective action in the NDA Operational Logbook in
accordance with CCP-QP-011, **AND** repeat
steps 4.4.4 through 4.4.10

[A.2] **IF** this is the third Investigate [In] flag OR an
Investigate [In] flag that can **NOT** be corrected,
THEN proceed to step 4.4.11[A]

4.4.11 **IF** any of the values on the Summed Spectrum QA Last Results Report indicate an [Ab] Above or [Be] Below flag, or an [Ac] Action flag,

THEN perform the following:

[A] STOP WORK, **AND** notify the NDA LO and VPM.

[B] As required, initiate an NCR in accordance with CCP-QP-005 **AND DO NOT** resume operations until disposition of the NCR is approved, **AND** a Calibration Verification Report is prepared in accordance with CCP-TP-190, *CCP Box Segmented Gamma System Calibration Procedure*.

[C] Note the problem in the NDA Operation Logbook in accordance with CCP-QP-011.

4.4.12 **IF** the values on the Summed Spectrum QA Last Results Report **DO NOT** indicate any flags, **THEN** print the QA Last Results Report(s).

4.4.13 Print name, sign, and date the QA Last Results Report(s) for inclusion in the BDR.

4.4.14 Inactivate the drum rotator, if required.

4.4.15 Ensure the container (and drum rotator, if required) is unloaded from the conveyor, as necessary.

4.5 Weekly Interfering Matrix Measurement

NOTE

Radioactive standards are selected such that, over a six-month period, the operating range of the assay system is verified and will be documented in a report every six months. These measurements are performed using surrogate waste containers which reflect the type of waste (e.g., debris, sludge) currently being assayed. An interfering matrix measurement will be performed weekly when the system is in operation.

4.5.1 Obtain a surrogate container as directed by the NDA LO.

4.5.2 Ensure Sections 4.2, 4.3, and 4.4 have been completed during the operational day.

4.5.3 Ensure the detectors and transmission sources are in the proper position for the container being assayed.

- 4.5.4 Ensure the Weekly Interfering Matrix container is loaded on the load side of the conveyor or on the rotator if the container is a drum.
- 4.5.5 Activate the drum rotator, if required.
- 4.5.6 Ensure the MCS is in the Computer position.
- 4.5.7 Perform the assay using NDA2000:
- [A] Select Assay.
 - [B] Select Routine Assay.
 - [C] Select Assay - Item Count 1 (w/Nal Emission).
 - [D] Ensure the following information is displayed on the Assay – Routine screen:

NOTE

The appropriate container, either a 55-gallon drum, a Standard Waste Box (SWB), or a Standard Large Box (SLB)-2, will be selected as Container Type. Each container type will have a specific count time as determined by the NDA EA.

- Container Type: (as appropriate)
- Geometry: Default Geometry
- Disable Load/Unload: Unchecked
- Assay Count Time: (as appropriate)
- Live: Unselected
- Real: Selected
- Transmission Source: Attenuators Closed
- Transmission Count Time: (as appropriate)
- Mode: Normal Scan
- Automatic: Selected
- Fixed: Unselected

[E] Select Start Assay.

[F] Enter the following information in the Item Information screen:

[F.1] Item ID: (e.g., Weekly Interfering Matrix Container ID)

[F.2] Description 1: Date (e.g., 01-15-08)

[F.3] Description 2: (e.g., N/A)

[F.4] Location: (e.g. SRS, E area)

[F.5] Comment: (e.g. N/A)

[F.6] Matrix Type: Default

NOTE

The NDA LO will provide information on the Percent Full, Gross Weight, Sample Type, and Declaration.

[F.7] Percent Full: (as appropriate)

[F.8] Gross Weight: (as appropriate)

[F.9] Sample Type: (as appropriate)

[F.10] Declaration: (as appropriate)

[F.11] Density: (Automatically calculated by NDA2000)

4.5.8 Select Done.

4.5.9 **IF** any error conditions occur during the count,
THEN select Abort, note the failure in the NDA Operational
Logbook in accordance with CCP-QP-011, **AND** notify the NDA LO.

NOTE

The NDA EA will prepare an evaluation report at six-month intervals documenting the weekly interfering matrix container measurements results. This report summarizes the matrices and ranges that have been tested, notes any operational problems, and includes an evaluation of system performance during that period.

4.5.10 Inactivate the drum rotator, if required.

4.5.11 Ensure the container (and drum rotator, if required) is unloaded from the conveyor.

NDA EA

4.5.12 Plot the results of the Weekly Interfering Matrix measurement on the appropriate Control Chart (see Attachment 3, Weekly Interfering Matrix Control Chart, for an example), **AND** forward the Weekly Interfering Matrix Control Chart to the BSGS Operator for inclusion in the BDR.

4.6 Routine Container Assay

4.6.1 Ensure Sections 4.2, 4.3, and 4.4 have been completed during the operational day.

4.6.2 **IF** the waste container to be assayed is **NOT** in the Acceptable Knowledge Tracking Spreadsheet (AKTS), **THEN DO NOT** assay the container and contact the NDA LO for direction to proceed.

NOTE

Different container types require different detector and transmission source positions.

4.6.3 Ensure all detectors and transmission sources are in the proper position for the container being assayed.

4.6.4 Ensure the container is loaded on the load side of the conveyor or on the rotator if the container is a drum.

4.6.5 Activate the drum rotator, as required.

4.6.6 Perform assay using NDA2000:

[A] Select Assay.

[B] Select Routine Assay.

[C] Select the appropriate count type (e.g., Item Count 1 w/Nal Emission).

[D] Ensure the following information is displayed on the Assay – Routine screen:

NOTE

The appropriate container, either a 55-gallon drum, a SWB, or a SLB-2, will be selected as Container Type. Each container type will have a specific count time as determined by the NDA EA.

- Container Type: (as appropriate)
- Geometry: Default Geometry
- Disable Load/Unload: Unchecked
- Assay Count Time: (as appropriate)
- Live: Unselected
- Real: Selected
- Transmission Source: Attenuators Closed
- Transmission Count Time: (as appropriate)
- Mode: Normal Scan
- Automatic: Selected
- Fixed: Unselected

[E] Select Start Assay.

NOTE

The net weight may be substituted for the gross weight if the tare weight is set to 0.0 kg.

[F] Enter the following information in the Item Information screen:

[F.1] Item ID: Container ID (e.g., SWB511211)

[F.2] Description 1: BDR number

[F.3] Description 2: (e.g., N/A)

[F.4] Location: (e.g., SRS, E Area)

[F.5] Comment: (e.g., N/A)

[F.6] Matrix Type: (as appropriate)

- [F.7] Percent Full: (from Host site or NDE)
- [F.8] Gross Weight: (from Host site or NDE)
- [F.9] Density: (automatically calculated by NDA2000)
- [F.10] Declaration: (appropriate to type of waste)

4.6.7 Select Done.

4.6.8 **IF** any error conditions occur during the count,
THEN click on Abort, note the failure in the NDA Operational
Logbook in accordance with CCP-QP-011, **AND** notify the NDA LO.

4.6.9 **WHEN** the analysis is complete,
THEN select the View Last Assay Report button on the NDA2000
screen, **AND** review the results for completeness.

NOTE

Corrected total Pu-239 fissile gram equivalent (FGE) is used for criticality control and will be reported as the sum of the analyzed value plus two times its associated total measurement uncertainty (TMU), expressed in terms of one standard deviation. Corrected total Pu-239 equivalent activity will be reported as the analyzed value plus the TMU at 2-sigma. The NDA results will be reviewed against Host site requirements as specified in the Host site interface document and appropriate personnel notified as required.

NOTE

The Radioassay Data Sheet may be printed as a preliminary data sheet to accommodate the Host site.

4.6.10 **IF** the preliminary corrected total Pu-239 FGE or Pu-239 equivalent activity exceeds the Host site requirements, as specified in the appropriate Interface Document,
THEN perform the following:

- [A] STOP WORK.
- [B] DO **NOT** move the container.
- [C] Notify appropriate personnel as specified in the Host site interface document.
- [D] Notify the NDA LO and VPM, **AND DO NOT** proceed without NDA LO concurrence.

- [E] Print a preliminary copy of the Radioassay Data Sheet to be provided to the Host site, as necessary.

WARNING

In order to prevent the risk of personnel exposure, the container must NOT be moved until proper disposition has been determined by the Host site.

4.6.11 **IF** the preliminary Radioassay Data Sheet indicates that the corrected Pu-239 equivalent activity, **AND** the corrected total Pu-239 FGE is less than the Host site requirements, as specified in the appropriate Interface Document, **THEN** mark the appropriate NDA system on the Container Traveler, **AND** initial and date.

4.6.12 Ensure the container (and drum rotator, if required) is unloaded from the conveyor.

4.6.13 Repeat steps 4.6.2 through 4.6.12 for each production container.

WARNING

When filling the detectors with LN, a face shield, safety glasses, and cryogenic gloves must be worn. The filling process shall be performed with the enclosure doors OPEN to prevent asphyxiation hazard.

4.7 Detector LN Transfer (as required)

4.7.1 Ensure that the South door of the BSGS enclosure is unlocked and open.

4.7.2 Don the required PPE for transferring LN.

4.7.3 Connect the LN transfer hose between the LN supply tank and the detector to be filled.

4.7.4 Open the valve on the LN supply tank to allow the LN to flow to the detector.

4.7.5 **WHEN** the fill is complete, **THEN** close the valve of the LN supply tank.

4.7.6 **WHEN** LN transfer is complete, allow the LN transfer hose to warm up, **THEN** disconnect the LN transfer hose from the Detector Dewar.

4.7.7 **IF** any additional detectors are being filled,
THEN repeat steps 4.7.3 through 4.7.6 for each additional detector.

4.7.8 Doff the required PPE for transferring LN.

4.7.9 Close the BSGS South door, as necessary.

4.8 System Shutdown

NOTE

During normal operations, some electronic components will not be shut down at the end of the shift.

4.8.1 Perform the following operations using NDA2000, as necessary:

[A] Select Hardware Setup.

[B] Select High Voltage Supplies.

[C] Select Turn OFF.

4.8.2 CLOSE NDA2000 and any supporting programs, **AND** shut down the computer, if required.

4.8.3 Turn the Reference Pulser Power Toggle switches OFF, if required.

4.8.4 Shut down the conveyor by rotating the Main Power Rotary Switch to OFF, if required.

5.0 RECORDS

5.1 Records generated during the performance of this procedure are maintained as QA records in accordance with CCP-QP-008, *CCP Records Management*. The records are the following:

5.1.1 QA/Lifetime

- [A] QA Last Results Report (flows into CCP-TP-193, *CCP Data Reviewing, Validating, and Reporting Procedure for the Nondestructive Assay Box Counters*).
- [A.1] Background Check
- [A.2] NaI Standardization
- [A.3] Daily Performance Check
- [B] Weekly Interfering Matrix Control Chart (flows into CCP-TP-193)
- [C] Radioassay Data Sheet (flows into CCP-TP-193)
- [D] Raw Data (CDs-primary and backup) (flows into CCP-TP-193)
- [E] Six-month Weekly Interfering Matrix Report

Attachment 1 – QA Last Results (Example)

Last Measurement Q.A. Report 4/13/09 8:36:24 AM Page 1

***** G E N I E Q U A L I T Y A S S U R A N C E *****

Last Results Report
4/13/09 8:36:24 AM

QA File: S:\QA\CNTR0001_DCAT0002_PROC00AG
Sample ID: QC Check NaI
Sample Quantity: 1.0000E+000
Sample Date: 1/16/07 4:21:28 PM
Measurement Date: 4/13/09 8:34:26 AM
Elapsed Live Time: 53.0 seconds
Elapsed Real Time: 60.0 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
PkCntr 1332 keV NaI1 (ch [0.00+/-0.00])	4.4081E+002	0.00 < : : : >
PkFWHM 1332 keV NaI1 (ke [0.00+/-0.00])	7.0488E+001	0.00 < : : : >
Pk cps 1332 keV NaI1 [UD: 1.0582E+004+/-59.000]	1.0543E+004	-6.5943E-001 < : : : >
Pulser PkCntr NaI1 (ch) [UD: 1.1740E+003+/-30.000]	1.1861E+003	4.0207E-001 < : : : >
Pulser Pk cps NaI1 [UD: 1.0000E+002+/- 1.000]	1.0091E+002	9.1264E-001 < : : : >

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
 SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
 UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
 BS = Measurement Bias Test (In = Investigate, Ac = Action)

Operator name: _____ Date: _____

ITR name: _____ Date: _____

Attachment 1 – QA Last Results Report (Example) (Continued)

Last Measurement Q.A. Report 4/13/09 9:14:51 AM Page 1

***** G E N I E Q U A L I T Y A S S U R A N C E *****

Last Results Report
4/13/09 9:14:51 AM

QA File: S:\QA\CNTR0001_DCAT0001_PROC00AI
Sample ID: QC Check BKGD
Sample Quantity: 1.0000E+000
Sample Date: 4/13/09 8:54:04 AM
Measurement Date: 4/13/09 8:54:24 AM
Elapsed Live Time: 1189.2 seconds
Elapsed Real Time: 1200.0 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags				
		< LU	: SD	: UD	: BS >	
Gamma QC Background SS [0.00+/-0.00]	3.8555E+002	<	:	:	:	>
Pulser Pk centroid SS (c [0.00+/-0.00]	1.5828E+004	<	:	:	:	>
Pulser Pk FWHM SS (keV) [0.00+/-0.00]	8.2152E-001	<	:	:	:	>
Pulser Pk cps SS [0.00+/-0.00]	3.9864E+002	<	:	:	:	>

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
 SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
 UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
 BS = Measurement Bias Test (In = Investigate, Ac = Action)

Operator name: _____ Date: _____

ITR name: _____ Date: _____

Attachment 1 – QA Last Results Report (Example) (Continued)

Last Measurement Q.A. Report 4/13/09 9:53:32 AM Page 1

***** G E N I E Q U A L I T Y A S S U R A N C E *****

Last Results Report
4/13/09 9:53:32 AM

QA File: S:\QA\CNTR0001_DCAT0001_PROC00AI
Sample ID: QC Perf Check
Sample Quantity: 1.0000E+000
Sample Date: 3/27/08 2:40:22 PM
Measurement Date: 4/13/09 9:32:57 AM
Elapsed Live Time: 1159.8 seconds
Elapsed Real Time: 1200.0 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
PkCntr 81 keV SS (ch) [0.00+/-0.00]	8.5556E+002	0.00 < : : : >
PkFWHM 81 keV SS (keV) [0.00+/-0.00]	7.5616E-001	0.00 < : : : >
PkCntr 662 keV SS (ch) [0.00+/-0.00]	6.9804E+003	0.00 < : : : >
PkFWHM 662 keV SS (keV) [0.00+/-0.00]	1.5810E+000	0.00 < : : : >
Activ Cs137 SS (uCi) [UD: 3.4880E+001+/- 0.390]	3.4396E+001	-1.2408E+000 < : : : >

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
 SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
 UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
 BS = Measurement Bias Test (In = Investigate, Ac = Action)

Operator name: _____ Date: _____

ITR name: _____ Date: _____

Attachment 2 – Radioassay Data Sheet (Example)

Radioassay Data for SWB0058 4/13/2009 1:58:48 PM Page 7

***** Radioassay Data Sheet *****

Engine Version: TMU Gamma 1.5

Count Sequence Number: 2058 Batch Number: SRLBC0009
Assay Instrument: WSRS Gamma Box Co Location: SRS, E Area
Analysis Method: CCP-TP-189 v 0 Software Version: NDA 2000 V.5.2
Item ID: SWB0058 Analysis Date: 4/13/2009

NID identified fiducial nuclide Pu-239
Source of isotopics: MEASURED

Net Weight 94000.0 g
Pu mass 3.54E+000 +- 3.19E-001 g
TRU Alpha Activity 3.23E-001 +- 2.09E-002 Ci
TRU Activity Concentration 3.43E+003 +- 2.23E+002 nCi/g
Pu-239 Equivalent Activity 3.30E-001 +- 2.10E-002 Ci
Pu-239 FGE 3.31E+000 +- 3.18E-001 g
Decay heat 1.02E-002 +- 6.51E-004 W

Nuclide	Mass g	Activity Ci	Activity Uncert. Ci	MDA Ci
SR90	5.74E-010	7.93E-008	1.48E-008	0.00E+000
CS137	9.01E-010	7.93E-008	1.48E-008	7.53E-008
U233	<LLD	<LLD	0.00E+000	6.25E-004
U234	<LLD	<LLD	0.00E+000	0.00E+000
U235	0.00E+000	0.00E+000	0.00E+000	7.10E-008
NP237	5.69E-004	4.06E-007	3.08E-008	1.45E-007
PU238	6.07E-004	1.05E-002	1.16E-003	7.35E-005
U238	<LLD	<LLD	0.00E+000	3.50E-006
PU239	3.29E+000	2.07E-001	2.00E-002	1.45E-003
PU240	2.40E-001	5.51E-002	5.37E-003	3.86E-004
AM241	1.44E-002	5.01E-002	3.06E-003	1.67E-003
PU241	4.07E-003	4.23E-001	4.13E-002	2.96E-003
PU242	1.20E-003	4.78E-006	6.65E-007	0.00E+000

Errors quoted at 1.000 sigma

Operator: _____ Date: _____

ITR: _____ Date: _____

Attachment 3 – Weekly Interfering Matrix Control Chart (Example)

