Wolf Creek Nuclear Operating Corporation
Procedure, AP 31A-100, Revision 8,
"Solid Radwaste Process Control Program"

WOLF CREEK
NUCLEAR OPERATING CORPORATION

AP 31A-100

SOLID RADWASTE PROCESS CONTROL PROGRAM

Responsible Manager

Manager Radiation Protection

Revision Number	8
Use Category	Information
Administrative Controls Procedure	Yes
Management Oversight Evolution	No
Program Number	25A

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1.0 PURPOSE

1.1 This procedure provides instructional guidance and a description of the solid waste Process Control Program (PCP). The PCP describes the methods used for processing wet low-level radioactive waste into a waste form acceptable for disposal, in accordance with 10 CFR 61 requirements, at a licensed land disposal facility.

2.0 SCOPE

2.1 This procedure describes current and planned practice for sampling, sample evaluation, classification, processing and packaging of radioactive material. This procedure does not address irradiated hardware which will be managed on a case-by-case basis under the direction of the Manager Radiation Protection. System descriptions and operating practices are described in the following steps.

2.2 Waste Steam Identification - The station had initially identified eight different waste streams and treats each separately for classification purposes. The identification listing may be consolidated, expanded and streams deleted at the discretion of radwaste management without revising the PCP.

EXAMPLES

For Information Only

- o Dry Active Waste (DAW)
- o Tubular Ultra Filtration/Reverse Osmosis Process Waste
- o Steam Generator Blowdown Bead Resin
- o Chemical and Volume Control System Bead Resin (1) (CVCS)
- o Reactor Coolant System Filters
- o Ultra Filtration Skid Waste
- o Spent Fuel Pool Filters
- o Radwaste Resins
- o Steam Generator Blowdown Filters (2)

(1) May contain combination of CVCS, Diversified, and Spent Fuel Pool Resins

(2) May be disassembled and components handled as DAW

2.3 Non-Waste Stream Identification - The station has identified two different sources and treats each separately for classification purposes.

- o Non-irradiated material removed from the Spent Fuel Pool.
- o Any other radioactive material generated by the station.

2.4 Disposition of Radioactive Material Sent to a Vendor for Intermediate Processing - Practices include sending radioactive material packages generated by the station to Energy Solutions, Studsvik or other vendors for volume reduction (VR)/processing instead of directly to a burial site.

2.4.1 This procedure addresses the requirements for 10 CFR 61.55 (Waste Classification) for radioactive material sent to vendor facilities.

2.4.2 This procedure does NOT address the requirements for 10 CFR 61.56 (Waste Characteristics), since the final processing and packaging are performed at the vendor facilities.

2.4.3 Possible types of radioactive material include, but are NOT limited to the following:

- o DAW
- o Surface Contaminated Objects
- o Bead Resins and Charcoal
- o Cartridge Filters
- o Contaminated Oil
- o Contaminated Soil

2.5 Disposition of Waste Sent Directly to a Burial Site - This procedure addresses both the 10 CFR 61.55 and 61.56 requirements for the waste streams listed in Step 2.2.

2.6 Waste Management Practices

2.6.1 DAW

- o This waste stream consists of plastic, wood, paper, metal, cloth, etc. generated at various locations within the station.
- o The material may be sent to intermediate processors or directly to a burial site.

- The station may preprocess DAW by compacting.
- Practices include shipping DAW classified as either SCO or LSA in numerous possible containers, such as:
  - 30 to 85 gallon drums
  - B-25 type boxes
  - SeaLand containers
  - Large liners
- Prepacking inspection criteria includes the removal of liquid, protective clothing and equipment, paints, solvents, lead, instruments, gages and other valuable plant equipment.

2.6.2 Steam Generator Blowdown Bead Resin (S/G BD)

- This waste stream consists of only S/G blowdown resin. The depleted resins are sluiced from the individual processing vessels to the S/G Blowdown Resin Storage Tank and then to a CNSI 6-80 or 8-120 High Integrity Container (HIC), OR any other container approved by the Health Physics Radwaste Shipper (HPRS).
- Once a container is full or the transfer has been terminated, the filter media (charcoal) and resins are then dewatered per RPP 07-131, BEAD RESIN/ACTIVATED CARBON DEWATERING PROCEDURW FOE CNSI 14-215 OR SMALLER LINERS. Compliance with freestanding water criteria is in accordance with the vendor waste acceptance criteria and/or 10CFR61.
- Practice may include shipping resins directly to a burial site or to a volume reduction processor for incineration or release.

2.6.3 Chemical and Volume Control System Bead Resin (CVCS)

- This waste stream consists of CVCS, various Diversified Technologies media and Spent Fuel Pool resins. The depleted charcoal filter media and resins are sluiced from the individual processing vessels to a common Spent Resin Storage Tank. The media is then transferred in a batch mode to a CNSI 6-80 or 8-120 HIC, OR any other container approved by Health Physics Radwaste Shipper.

- Once a container is full or the transfer has been terminated, the filter media (charcoal) and resins are then dewatered per RPP 07-131, BEAD RESIN/ACTIVATED CARBON DEWATERING PROCEDURE FOR CNSI 14-215 OR SMALLER LINERS. Compliance with freestanding water criteria is in accordance with the vendor waste acceptance criteria and/or 10CFR61.

- Practice may include shipping resins directly to a burial site or to a volume reduction processor.

2.6.4 Cartridge Filters

- This category includes several waste streams which were defined in Step 2.2 and includes all filters generated by the station.

- Filters are removed from service based on operating parameters determined by the Operations Department.

- The filter housings are drained prior to filter removal. The filters are then gravity drained prior to being placed into an intermediate storage container OR the final disposal container.

- With containers equipped with a dewatering internal, a final dewatering verification is performed on the disposal container after it has been loaded with filters. Compliance with freestanding water criteria is in accordance with the vendor waste acceptance criteria and/or 10CFR61.

- Absorbent material may be added to the disposal liner after final dewatering verification at the discretion of the HPSR.

- Practice may include shipping filters to a volume reduction processor.

2.6.5 Tubular Ultra Filtration/Reverse Osmosis Waste

- This waste stream may consist of either dried solids in a standard 55-gallon drum or Drum Dryer Hold-Up Tank liquid waste.

- The material may be sent to intermediate processors or directly to a burial site. In the case of the liquid waste, additional processing is required.

2.6.6 Solidification/Encapsulation Methods

- o Present and planned practice is NOT to solidify or encapsulate any waste streams.
- o Wet wastes (filters and resins) are dewatered to less than 0.5 percent or 1 percent by volume depending on the container type. Wet waste sent to a vendor for additional processing will be dewatered in accordance with the vendor waste acceptance criteria

2.6.7 Operation and Maintenance of dewatering Systems and Equipment

- o Present and planned practice is to utilize station personnel to operate and maintain dewatering systems and equipment using station procedures.
- o All disposal liners are manufactured by and purchased from QA approved vendors.

2.6.8 High Integrity Container Usage

- o High Integrity Containers (fabricated from high density cross-linked polyethylene) may be used as the disposal package for any waste.

3.0 REFERENCES AND COMMITMENTS

3.1 References

3.1.1 WCGS Technical Requirements (TR 5.5.4)

3.1.2 RPP 07-101, CONTROL OF RADIOACTIVE MATERIAL MANAGEMENT SOFTWARE AND DATA BASES

3.1.3 RPP 07-123, PREPARATION AND SHIPMENT OF RADIOACTIVE WASTE AND MATERIAL

3.1.4 RPP 07-131, BEAD RESIN/ACTIVATED CARBON DEWATERING PROCEDURE FOR CNSI 14-215 OR SMALLER LINERS

3.1.5 10 CFR 20, "Standard For Protection Against Radiation"

3.1.6 10 CFR 61, "Licensing Requirements for Land Disposal of Radioactive Waste"

3.1.7 10 CFR 71, "Packaging and Transportation of Radioactive Materials"

3.1.8 40 CFR 302, "Reportable Quantity Adjustment - Radionuclides"

3.1.9 49 CFR 171, "General Information, Regulations, and Definitions"

3.1.10 49 CFR 172, "Shippers' General Requirements for Shipments and Packaging"

3.1.11 49 CFR 177, "Carriage by Public Highway"

3.1.12 USNRC Branch Technical Position on Radioactive Waste Classification, May 1983

3.1.13 USNRC Branch Technical Position on Waste Form, January 1991

3.1.14 USNRC Branch Technical Position on Concentration Averaging and Encapsulation, Revision in Part To Waste Classification Technical Position, January 1995

3.1.15 NRC Bulletin No. 79-19, "Packaging of Low Level Radioactive Waste for Transport and Burial"

3.1.16 NRC Information Notice No. 80-24, "Low Level Radioactive Waste Burial Criteria"

3.1.17 NRC Information Notice No. 83-33, "Non-Representative Sampling of Contaminated Oil"

3.1.18 NRC Information Notice No. 85-92, "Surveys of Wastes Before Disposal from Nuclear Reactor Facilities"

3.1.19 NRC Information Notice No. 86-20, "Low Level Radioactive Waste Scaling Factors, 10 CFR 61"

3.1.20 NRC Information Notice No. 88-101, "Shipment of Contaminated Equipment Between Nuclear Power Stations"

3.1.21 WMG-SW-006, "Computer Software Quality Assurance Program"

3.1.22 WMG-QA-001, "Quality Assurance Program"

3.1.23 WMG-P-065 "RADMAN Operating Manual"

3.1.24 RADMAN Computer Code, Main Topical Report to the USNRC

3.1.25 WMG-P-069, "FILTRK Operating Procedure"

3.1.26 WMG-P-070, "RAMSHP Operating Procedure"

3.1.27 WMG-P-075, "OSM Operating Procedure"

3.1.28 WMG Report #9006, "Computer Program Dose to Curie Methodology Verification and Validation"

3.1.29 U.S. Nuclear Regulatory Commission, "Radiological Effluent Technical Specifications for PWRs," NUREG-0472

3.1.30 NRC Guidelines for Preparation and Implementation of Solid Waste Process Control Program "DRAFT," Revision 4, October 1986

3.1.31 FO-AD-002, "Operating Guidelines for Use of Polyethylene High Integrity Containers"

3.1.32 FO-AD-023, "Bead Resin/Activated Carbon Dewatering Procedure for CNSI 14-215 or Smaller Liners"

3.1.33 NRC Generic Letter No. 91-02, "Reporting Mishaps Involving LLW Forms Prepared For Disposal"

3.1.34 WMG-9217, "10 CFR 61 Practice Assessment at Wolf Creek Generating Station, 1992"

3.1.35 AP 25-001, RADIATION PROTECTION QUALITY PROGRAM REQUIREMENTS

3.1.36 Letter from Rodney Wingard to Jimmy Still concerning the disposal of dried solids (HP 01-00601)

3.2 Commitments

3.2.1 None

4.0 DEFINITIONS

4.1 Abbreviations

4.1.1 Activity/A_2/g - Package activity divided by (A_2) divided by gram

4.1.2 BTP - Branch Technical Position

4.1.3 CNSI - Chem Nuclear System, Inc.

4.1.4 HPRS - Health Physics Radwaste Shipper

4.1.5 LLD - Lower Limit of Detection

4.1.6 MCA - Multi-Channel Analyzer

4.2 Activity Correction Factor

4.2.1 The µCi/cc or µCi/g values may have to be corrected (plus or minus) if the waste stream specific 10 CFR 61 sample results (independent laboratory) and the replicate in-house specific activity values differ by more than 20 percent, and the differences cannot be resolved to the satisfaction of the HPSR. Alternatively, the dose-to-curie characterization methodology can be used without applying correction factors.

4.3 As Generated Waste

4.3.1 Radioactive waste generated at a frequency contrary to the sampling requirements of waste classes A, B or C.

4.4 Batch

4.4.1 An isolated quantity of feed waste to be processed having essentially constant physical and chemical characteristics. (The addition or removal of water will not be considered to create a new batch).

4.5 Chelating Agents

4.5.1 EDTA, DTPA, hydroxyl-carboxylic acids, citric acid, carbolic acid and glucinic acid.

4.6 Confirmatory Analysis

4.6.1 Verification of Gross radioactivity measurements using MCA and independent laboratory sample data.

4.7 Density Correction

4.7.1 Density corrections may be required to convert sample data reported in µCi/g to µCi/cc or vice versa when comparing sample data with unlike units.

4.8 Dewatered Waste

4.8.1 Dewatered Waste refers to wet waste that has been processed by means other than solidification, encapsulation, or absorption to meet the free standing liquid requirements of 10 CFR 61.56 (a)(3) and (b)(2).

4.9 Encapsulation

4.9.1 Encapsulation is a means of providing stability for certain types of waste by surrounding the waste by an appropriate encapsulation media.

4.10 Gamma-Spectral Analysis

4.10.1 Also known as IG, MCA, GE/Li and gamma spectroscopy.

4.11 Gross Radioactivity Measurements

4.11.1 More commonly known as Dose to Curies conversion for packaged waste characterization and classification.

4.12 Health Physics Radwaste Shipper or HPRS

4.12.1 The person designated to sign the shipment manifest and has been trained in the DOT and NRC regulatory requirements within the last three years.

4.13 Homogeneous

4.13.1 Of the same kind or nature; essentially alike. Most waste streams are considered to have the radioactivity distributed throughout for purposes of waste classification.

4.14 Legacy Waste

4.14.1 Radioactive waste generated from past Plant processes.

4.15 Low-Level Radioactive Waste (LLW)

4.15.1 Those low-level radioactive wastes containing source, special nuclear, or by-product material that are acceptable for disposal in a land disposal facility. For the purposes of this definition, low-level radioactive waste has the same meaning as in the Low-Level Waste Policy Act, that is, radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or by-product material as defined in Section 113.(2) of the Atomic Energy Act (uranium or thorium tailings and waste).

4.16 Measurement of Specific Radionuclides

4.16.1 More commonly known as core sample or package sample using MCA data for packages waste characterization and classification.

4.17 Operable

4.17.1 A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).

4.18 Pre-qualification Program

4.18.1 The testing program implemented to demonstrate that the proposed method of wet waste processing will result in a waste form acceptable to the land disposal facility.

4.19 QA Verification Sample

4.19.1 A representative sample of the waste that is tested to demonstrate control of the waste processing. The sample shall be obtained from at least every tenth batch of each type of wet radioactive waste processed for stabilization.

4.20 Quality Assurance/Quality Control

4.20.1 As used in this document, "quality assurance" comprises all those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to control of the physical characteristics and quality of a material structure, component, or system to predetermined requirements.

4.21 Sampling Plan

4.21.1 A sampling program implemented to ensure that representative samples from the feed waste and the final waste form are obtained and tested for conformance with parameters stated in the PCP and waste form acceptance criteria.

4.22 Scaling Factor

4.22.1 A dimensionless number which relates the concentration of an easy to measure nuclide (gamma emitter) to one which is difficult to measure (beta/alpha emitters).

4.23 Shipping Paper

4.23.1 At WCGS the shipping paper consists of an NRC form 540 and 541(or equivalent). Additional documentation may be provided (i.e., bill of lading) but is not consecutively numbered as part of the shipping papers.

4.24 Significant Quantity

4.24.1 For purposes of sample evaluation, waste classification and manifesting radionuclides on shipping papers, the following radionuclide limits shall be considered significant:

- Any LLD value for a 10 CFR Part 20, Appendix G required radionuclide.
- Any radionuclide representing greater than 5 percent of the relative A_2 fraction hazard.
- Any real value for a radionuclide specifically listed in 10 CFR Part 61.55.
- Any radionuclide representing greater than 1 percent of the total activity.
- Any radionuclide greater than 0.5 RQ value.

4.25 Special Nuclides

4.25.1 RADMAN Computer Code user term for 10 CFR Part 20, Appendix G required nuclides.

4.26 Stability

4.26.1 As used in this document, "stability" means structural stability. Stability requires that the waste form maintain its structural integrity under the expected disposal conditions.

4.27 Waste Container

4.27.1 A vessel of any shape, size, and composition used to contain the final or intermediate processed waste.

4.28 Waste Form

4.28.1 Waste in a stable waste form or container acceptable for disposal at a licensed disposal facility.

4.29 Waste Processing

4.29.1 Changing, modifying, packaging the commercial nuclear power plant generated wet radioactive waste into a form that is acceptable to a disposal facility.

4.30 Waste Stream

4.30.1 A station specific and constant source of waste with a distinct radionuclide content and distribution.

4.31 Waste Type

4.31.1 A single packaging configuration tied to a specific waste stream, or multiple package types tied to the same waste stream.

5.0 RESPONSIBILITIES

5.1 Health Physics Radwaste Shipper is responsible for:

5.1.1 Implementing this procedure.

5.1.2 Ensuring that radioactive waste is classified and characterized in accordance with 10 CFR 61.55 receiving facility criteria.

5.1.3 Designating other approved procedures (if required) to be implemented in the packaging of any specific batch of waste.

6.0 PROCEDURE

6.1 The precautions/limitations of this procedure are listed below.

6.1.1 All plant personnel that have any involvement with the RADMAN, TRASHP, and FILTRK computer codes shall be familiar with its functions, operation, and maintenance.

6.1.2 Only authorized personnel will characterize or package radioactive waste or radioactive materials.

6.1.3 Radioactive materials shall be handled in accordance with applicable Radiation Protection Procedures.

6.1.4 Pressure and heat may be encountered during the operation of liquid waste processing systems.

1. Caution must be exercised during disassembly and disconnection of lines or equipment and valve realignments.

6.1.5 Each HIC is matched with specific closure components and seals at time of manufacture.

1. All components are identified using a common serial number.

2. Should components become mismatched, contact the HPSR for instructions prior to use.

6.1.6 Waste must NOT be packaged for disposal in cardboard or fiberboard boxes.

6.1.7 Liquid waste must be solidified or packaged in sufficient absorbent material to absorb twice the volume of the liquid.

6.1.8 Solid waste containing liquid shall contain as little free standing and non-corrosive liquid as is reasonably achievable, but in no case shall the liquid exceed 1 percent of the volume in HIC's and 0.5% in a steel liner.

6.1.9 Waste must NOT be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water.

6.1.10 Waste must NOT contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste. This does NOT apply to radioactive gaseous waste packaged in accordance with Step 6.1.12 of this section.

6.1.11 Waste must NOT be pyrophoric. Pyrophoric materials contained in waste shall be treated, prepared, and packaged to be non-flammable.

6.1.12 Waste in a gaseous form must be packaged at a pressure that does not exceed 1.5 atmospheres at 20°C. Total activity must not exceed 100 curies per container.

6.1.13 Waste containing hazardous, biological, pathogenic, or infectious material must be treated to reduce to the maximum extent practicable the potential hazard from the non-radiological materials.

6.1.14 All data entries should use three significant figures only (i.e., X.XXE-x). IF more significant figures are provided, round off to generate three significant figures.

6.1.15 Use only those isotopes reported as real values, ignore all isotopes reported as LLD values, except those nuclides listed in Step 6.6.7.

6.1.16 Ignore all radioisotopes with half-lives less than eight (8) days based on I-131.

6.1.17 Revisions to this procedure shall be documented with form APF 15C-004-01, DOCUMENT REVISION REQUEST and shall contain: (Step 3.1.1)

1. Sufficient information to support the change together with the appropriate analyses or evaluation justifying the change(s).

   AND

2. A determination that the change will maintain the overall conformance of the waste product to existing requirements of Federal, State, or other applicable regulations.

6.2 Special equipment, material, and parts needed to perform tasks are shown below.

6.2.1 Required tools and equipment will vary depending on the specific process and waste container that is used.

6.2.2 The various tools and equipment, which may be required, are detailed in the vendor procedures listed in Section 3.0.

6.3 Prerequisites before beginning work with this procedure.

6.3.1 Ensure that a current set of DOT, NRC and burial site regulations is maintained at the station and is available for reference.

6.3.2 Ensure that representative sample data is on file for each waste stream. Data is considered to be current if it meets the following:

1. The waste stream must be sampled at least every two years for NRC Class A waste.

2 The waste stream must be sampled at least every year for NRC Class B or C waste. Exceptions are:

a.legacy waste

b.as generated waste

3. Non-waste radioactive material shall be sampled on a fuel cycle or as generated basis with (non-irradiated) fuel pool material differentiated from balance of plant material.

6.3.3 A training program shall be developed and implemented for personnel having responsibilities related to waste processing operations to ensure the waste processing shall be performed within the requirements of the PCP.

1. Personnel will be trained to the extent equal to their responsibilities. WCGS credits training provided in accordance with standards or regulations of other federal agencies, such as the Occupational Safety and Health Administration or the Environmental Protection Agency.

2. The training program shall be repeated and the personnel requalified on a periodic schedule, not to exceed three years.

3. The individual's training records shall be maintained and available for audit and inspection.

6.3.4 Additional requirements for contracted vendors processing waste.

1. Management shall review vendor(s) topical reports.

NOTE

The PCP does NOT have to include the vendors Topical Report if it has NRC approval, or has been previously submitted to the NRC.

a. This review will assure the vendors operations and requirements are compatible with the responsibilities and operation of the plant.

b. The training requirements and records listed in Step 6.3.3 also apply to contracted vendors.

c. The station shall maintain copies of records to verify training of vendor personnel.

6.4 Procedure For Performing Work

6.4.1 Methods and frequency for determining the radionuclide concentration for each waste stream.

1. Ensure samples are representative of the final waste form.

2. Determine the base line density for each waste stream (NOT applicable for DAW and filters). The density is determined by waste weight and volume.

NOTE

For WCGS, waste stream radionuclide content is considered to be distributed throughout for purpose of waste classification.

6.4.2 Treat each waste stream separately for classification purposes.

6.4.3 Send all NRC Class A waste samples to an independent laboratory for gamma, beta and alpha analysis at least once every two years.

1. Perform an in-house analysis for gamma emitting radionuclides for each sample sent to an independent lab for future comparison.

2. Periodically perform in-house analysis for gamma emitting nuclides for comparison to the current data base values for gamma emitters (the current data base is usually based on the most recent independent laboratory results).

6.4.4 Send all NRC Class B and C waste samples to an independent laboratory for gamma, beta and alpha analysis at least once a year, except as defined in 6.3.2. The additional steps required are identical to substeps 1 and 2 of Step 6.4.3.

6.4.5 Determine the status (real value, LLD or not present) of the 10 CFR 20 Appendix G required nuclides for each waste stream from the recent independent laboratory data.

6.4.6 Document and track all samples per RPP 07-101, CONTROL OF RADIOACTIVE MATERIAL MANAGEMENT SOFTWARE AND DATA BASES.

6.5 Current and planned practice for each waste stream is as follows:

6.5.1 DAW

1. Obtain composite smears from various contaminated areas of the plant periodically or at a minimum biennially and analyze (IG) them in-house for gamma emitters. Sample periodicity should be based on the conditions outlined in Step 6.8.

2. Compare the results of the samples to the database to ensure adequacy of sample frequency.

3. Send the most recent group of composite smears to an independent laboratory for analysis biennially or more often IF determined necessary by HPRS.

4. Maintain records for all samples for nuclide identification, distribution and scaling factors.

NOTE

The specific activity (µCi/cc or µCi/g) is NOT required since all characterization/classification calculations are performed using a dose/curie methodology which only relies on fractional abundance.

5. Both in-house and independent laboratory results are normally reported in µCi/sample.

6. Forward the results from the independent laboratory to the HP Dosimetry/Calibration Lab for evaluation on RPF 01-405-05, "DETERMINATION OF DETECTABLE VS. NON-DETECTABLE ACTIVITY FOR RELEASE FROM THE RCA".

6.5.2 S/G Blowdown Resin

1. Obtain several (as determined by the HPRS) composite samples from the resin transfer line during liner loading operations on an "as generated" basis.

NOTE

Each liner is considered a different batch for sampling and classification purposes.

2. Analyze the samples in-house (IG) and retain the results for future comparison to the replicate independent laboratory results.

3. Send the samples to an independent laboratory for analysis biennially or as generated.

4. Maintain records for all samples for nuclide identification, distribution and scaling factors.

5. Both in-house independent laboratory results are normally reported in the same units (µCi/g or µCi/cc).

6.5.3 CVCS Resin

1. The sampling procedure is exactly the same as listed above for S/G Blowdown Resin in Step 6.5.2 except the analysis frequency is annual or as generated.

6.5.4 Filters

1. Obtain samples from each individual filter waste stream defined in Step 2.2 on an annual OR as generated basis.

NOTE

Samples may be taken from the actual filter media, from a smear of the filter media, from a smear of the filter housing, or a crud sample, as determined by the HPSR. The preferred method is the crud sample.

2. Perform an in-house (IG) analysis of the sample (or replicate sample) and retain the output record for future comparison to the independent laboratory results.

3. Send the sample to an independent laboratory for analysis once per year or more often if determine necessary by the HPRS.

4. Maintain records for all samples for nuclide identification, distribution and scaling factors.

NOTE

CORRECTIVE ACTION FOR ADJUSTING Co-58 SCALING FACTORS FOR FILTERS DURING CRUD BURSTS ENCOUNTERED WITH CHEMICAL INJECTIONS AND 100% LOAD REJECTIONS

5. The Co-58 scaling factors should be adjusted when the total radioactivity increases for filters during the above conditions, the activity increase is primarily Co-58 not Co-60, if the scaling factors are not adjusted the filters can be overestimated for NRC waste classification.

   a. Step 1, Obtain a filter sample.

   b. Step 2, Count the sample in-house, it is not necessary to perform an independent laboratory analysis.

   c. Step 3, Divide the Co-58 value by the Co-60 value, this is the scaling factor.

   d. Step 4, Obtain a hard copy of the Part 61 filter waste stream.

e. Step 5, Apply the Step 3 scaling factor to the database Co-60 value.

f. Step 6, Create a new (crud burst) Part 61 waste stream with the new Co-58 value.

g. Step 7, Characterize filters.

NOTES

- **Document that there are two Part 61 waste streams for the same filters depending on operating conditions.**
- **The specific activity (µCi/cc or µCi/g) is not required since all characterization/classification calculations are performed using a dose/curie methodology which only relies on fractional abundance.**

6. Both in-house and laboratory results are normally reported in µCi/sample.

6.5.5 Tubular Ultra Filtration/Reverse Osmosis Waste

1. Obtain a sample from the waste stream on an annual or as generated basis.

2. Perform an in-house (IG) analysis of the sample (or replicate sample) and retain the output record for future comparison to the independent laboratory results.

3. Send the sample to an independent laboratory for analysis once per year or more often if determine necessary by the HPRS.

4. Maintain records for all samples for nuclide identification, distribution and scaling factors.

6.6 Sample Evaluation

6.6.1 Infrequent or Abnormal Waste Types

1. Infrequent or abnormal waste types that may be generated must be evaluated on a case-by-case basis.

2. The HPRS will determine if the waste can be correlated to an existing waste stream.

3. If the radioactive material cannot be correlated to an existing waste stream, the HPRS shall determine specific off-site sampling and analysis requirements necessary to properly classify the material.

6.6.2 Examples of these radioactive materials include, but are not limited to:

- o Contaminated Soil
- o Contaminated Oil
- o Special Filters or Resin
- o A mixture of radioactive material types in one container.

6.6.3 Requirements for analysis to be performed by an off-site vendor are as follows:

1. All sample results must reference the quantity received.
2. All sample results shall be decay corrected to a reference date provided by the station which is normally the sample date.
3. The sample results shall be reported in µCi/sample, µCi/g or µCi/cc as determined the HPSR.

NOTE

Outside analysis is NOT performed for any radionuclides with a half-life less than eight days.

6.6.4 The vendor shall perform analysis for the following radionuclides listed in Table 1 of 10 CFR 61.55.

1. C-14, Tc-99, I-129, Pu-241, Cm-242 and the following alpha emitting transuranics (TRUs) with half-lives greater than five years, Np-237, Pu-238, Pu-239/240, Pu-242, Am-241, and Cm-243/244.

   a. Additionally Ni-59 and Nb-94 are required for Rx cavity and fuel pool filters.

NOTE

If evaluation of several sets (i.e., three or more) of waste stream specific historical sample data shows that some TRUs with half-life greater than five years are consistently reported as LLD values, sample analysis may be discontinued for those specific radionuclides.

2. Analysis for the "activated metal" radionuclides listed in Table 1 of 10 CFR Part 61 are only required for the fuel pool filters and reactor cavity filters waste streams identified at WCNOC.

3. It is NOT necessary to contract for an offsite vendor to perform analysis for enriched uranium or other naturally occurring radionuclides not delineated in this procedure.

4. Radionuclides listed in Table 1 of 10 CFR 61.55 shall be specifically identified and the quantities reported on shipping manifests if they are significant for purposes of classification.

6.6.5 The vendor shall perform analysis for the following radionuclides listed in Table 2 of 10 CFR 61.55.

1. H-3, Co-60, Ni-63, Sr-90 and Cs-137

2. Radionuclides listed in Table 2 of 10 CFR 61.55 shall be specifically identified and the quantities reported on shipping manifests if they are significant for purposes of classification.

6.6.6 The vendor shall perform analysis for the following radionuclides NOT listed in Table 1 or Table 2 of 10 CFR 61.

1. Activation Products - Cr-51, Mn-54, Fe-55, Co-58, Fe-59, Sb-124, Sb-125, Zn-65, Ag-110M and any other nuclides identified in significant quantities by in-house IG equipment.

2. Fission Products - Zr-95, Nb-95, Ru-103, Ru-106, Cs-134, Ce-141, Sr-89, Ce-144 and any other nuclides identified in significant quantities by in-house IG equipment.

6.6.7 A waste stream specific database must include the following radionuclides, even if they are reported as LLD values:

1. H-3, C-14, Tc-99, I-129 required by 10 CFR 20 Appendix G (H-3 is considered real or LLD for DAW because "not present" cannot be substantiated).

2. Co-60, Cs-137, and Ce-144 (only if TRUs are reported) required by the RADMAN computer code. They are used as the primary scaling radionuclides.

3. The HPRS can change the base scaling radionuclides.

NOTE

Samples sent to offsite laboratories for analysis should contain sufficient activity to determine the presence of transuranic nuclides. The minimum recommended sample activity level is 50,000 dpm. If that level cannot be attained, the highest activity should be used for offsite analysis.

6.7 Sample Analysis and Comparison

6.7.1 Whenever a sample is sent off-site for analysis, count the same sample (or replicate) in-house with the station IG system.

NOTE

Isotopic results that are not considered statistically positive at the 99.9% confidence level are considered "suspect" values and shall be discarded as necessary.

6.7.2 Comparison of on-site versus off-site analysis shall be evaluated to identify and resolve any discrepancies. As a minimum, the comparison shall include:

- Specific activity by gamma emitting radionuclides. (NOT applicable for DAW or filter samples.)
- Co-60/Cs-137 Ratio
- Presence or absence of radionuclides
- Predominant radionuclides

- o Individual radionuclide fractional abundance
- o Scaling factors

6.7.3 Records of on-site and off-site sample analysis and evaluations by waste stream are maintained by the HPRS.

6.7.4 IF a comparison between the in-house and independent laboratory results shows a variance of 20 percent or greater for specific activity, the MCA results may be adjusted until the discrepancy is resolved. Reported MDC should be consistent with the measurement uncertainty. The relative uncertainty (1σ) of the measurement should be ~30% at the MDC and should get smaller as the measured concentration increases above the MDC level.

1. Any discrepancies should be resolved (if possible) in-house or with the independent laboratory as soon as possible.
2. The use of these activity correction factors is only valid if other conditions defined in Step 6.7.2 above compare favorably, otherwise the sample set should be considered suspect and the data should not be used. This would require another sample as soon as possible.

6.7.5 Radionuclides with a half-life less than eight days are also ignored from internal MCA reports.

6.7.6 New sample data shall be periodically obtained and evaluated.

6.7.7 New sample data may be either off-site analysis or in-house MCA analysis.

6.7.8 Once a database has been established, based on off-site analysis, the MCA results are primarily used as a "flag" to obtain and send additional samples off-site. Exceptions to this may occur during crud burst situations were it is necessary to adjust the scaling factor relationship of the activation products. An example would be the $^{58}Co/^{60}Co$ ratio after hydrogen peroxide additions.

6.7.9 The RADMAN analyze utility program may be utilized to evaluate multiple sets of data.

NOTE

Isotopic results that are NOT considered statistically positive at the 99.9% confidence level are considered "suspect" values and shall be discarded as necessary.

6.7.10 Several comparisons to the existing database shall be considered when evaluating new sample data.

1. Radionuclide fractional abundance and scaling factor relationships
2. Specific activity by radionuclide
3. Swings in driving classifications radionuclides
4. Radionuclides present in database, but NOT present in new sample or vice versa
5. Total activity by sample set

6.8 Sample Frequency

6.8.1 The following may require increased sampling:

1. Increase in failed fuel fraction as determined by:
   - o D.E.I. 25% of Technical Specification limit
   - o Increase of I-131/I-133
   - o Np-239 greater than 0.01 μCi/cc in reactor coolant
   - o Significant increase in gross alpha sample results on any type of smear survey
2. Crud burst during 100% load rejection or chemical cleaning
3. Extended reactor shutdown (>90 days)
4. Changes to liquid waste processing, such as bypassing filters, utilizing filters or a change in ion exchange media

6.9 Scaling Factors

6.9.1 WCGS has established an inferential measurement program, whereby, concentrations of radioisotopes which cannot be readily measured are estimated through ratioing to concentrations of radioisotopes which can be readily measured.

6.9.2 Scaling factors have been developed on a facility and waste stream specific basis, and are periodically confirmed through direct measurements.

6.9.3 Correlations between measured and inferred radionuclides are currently as follows, but can be changed at HPRS discretion:

1. Ce-144 to transuranic nuclides
2. Co-60 to activation product nuclides and C-14
3. Cs-137 to fission product nuclides

6.10 Waste Classification

NOTE

The volume and mass of the waste form (not the waste container) is used for most waste classification calculations.

6.10.1 Determine the waste classification (Class A stable or unstable, Class B, Class C) by the concentration of certain radionuclides in the final waste form as listed in 10 CFR 61.55.

6.10.2 Determine the radionuclide concentrations per RPP 07-123 PREPARATION AND SHIPMENT OF RADIOACTIVE WASTE AND MATERIAL, as follows:

1. DAW - "Gross Radioactivity Measurements" in conjunction with the RADMAN computer code or hand calculations
2. Filters - "Gross Radioactivity Measurements" in conjunction with the FILTRK computer code or hand calculations
3. All other waste streams - "Direct Measurement of Individual Radionuclides" in conjunction with the RADMAN computer code or hand calculations

6.11 Quality Control For Sampling And Classification

6.11.1 The RADMAN computer code provides a mechanism to assist WCGS in conducting a quality control program to aid in compliance with the waste classification requirements listed in 10 CFR 61.55.

6.11.2 Management audits of the WCNOC Sampling and Classification Program shall be performed in accordance with the approved self assessment schedule.

6.11.3 The audits are performed and documented by any of the following:

*Health Physics Department

*Subject Matter Experts

*Quality Assurance Department

OR

*Qualified Vendors

6.12 Non-Waste Classification

6.12.1 Determine the radioactive material classification (Excepted Package, LSA, SCO, Type A, >Type A or Type B) by the total activity or activity as listed in DOT regulations and the receiver's radioactive material licenses.

6.12.2 Determine the radionuclide concentrations per RPP 07-123 PREPARATION AND SHIPMENT OF RADIOACTIVE WASTE AND MATERIAL, as follows:

1. Non-irradiated material removed from the spent fuel pool - "Gross Radioactivity Measurements," "Direct Measurement of Individual Radionuclides", or "Measurement of Surface Contamination Levels" for non-radioactive material contaminated with radioactive material in conjunction with the RAMSHP computer code or hand calculations.

2. Any other radioactive material generated by the station - The same methods listed for fuel pool material may be used with a separate radionuclide database.

6.13 Processing General Requirements

NOTE

The dewatering capabilities are verified by vendor Topical Reports or operating and testing procedures.

6.13.1 Verify the wastes contain only trace amounts of drainable liquid, and in NO case may the volume of free liquid exceed one percent of the waste volume when wastes are disposed of in containers designed to provide stability.

NOTE

The following verification is performed on a case-by-case basis for each package using independent laboratory data and MCA data in conjunction with computer codes or hand calculations.

6.13.2 Verify that resins are NOT processed that have loadings which will produce greater than 1.0 E+8 rads (350 μCi/cc) total accumulated dose. This only applies to two radionuclides, Cs-137 and Sr-90.

6.13.3 The as generated waste must be compatible with the disposal container.

6.14 Processing Requirements During Dewatering Operations

6.14.1 Perform all dewatering operations per RPP 07-131, BEAD RESIN/ACTIVATED CARBON DEWATERING PROCEDURE FOR CNSI 14-215 OR SMALLER LINERS.

NOTE

This procedure may only be used to dewater CNSI's 14-215 or smaller liners containing bead-type ion exchange resins and activated carbon with less than 1 percent oil.

6.14.2 Complete form RPF 07-131-01, HIC DEWATERING COMPLETION RECORD, for each liner prior to final closure.

6.14.3 Form RPF 07-131-01, HIC DEWATERING COMPLETION RECORD, must be included in the shipping paperwork package with the shipment.

6.14.4 The final transfer/dewatering cycle shall be counted as the first pumping cycle IF after the transfer is completed, the liner is dewatering per this procedure.

6.14.5 Final dewatering verification is determined by the following:

1. 1% Free-Standing Water or Less

   a. After a minimum of two (2) pumping cycles for bead resins or five (5) cycles for activated carbon, a measured volume of less than five (5) gallons on the next eight (8) hours of pumping shall be the acceptance criteria.

   b. IF five (5) gallons or more are collected, the waiting/pumping cycle shall be repeated until less than five (5) gallons are collected.

2. 0.5% Free-Standing Water or Less

   a. After a minimum of five (5) pumping cycles for bead resins or eight (8) pumping cycles for activated carbon, a measured volume of less than two (2) gallons on the next eight (8) hours of pumping shall be the acceptance criteria.

   b. IF two (2) gallons or more are collected, the waiting/pumping cycle shall be repeated until less than two (2) gallons are collected.

6.15 Packaging General Requirements

NOTE

The following general requirements are normally verified by review of a HIC's Certificate of Compliance (C of C) and State/NRC approval.

6.15.1 Ensure that the waste is in a container or structure that provides stability after disposal.

6.15.2 Ensure that the container is resistant to degradation caused by radiation effects.

6.15.3 Ensure the container is resistant to bio-degradation.

6.15.4 Verify that the container will remain stable under the compressive loads inherent in the disposal environment.

6.15.5 Verify that the container will remain stable if exposed to moisture or water after disposal.

6.15.6 Ensure that the "as generated" waste is compatible with the container.

6.16 Packaging Vendor Requirements

6.16.1 Perform all inspection, handling and loading operations per vendor procedure, FO-AD-002.

NOTE

Prior to use, each user will have on file within Chem-Nuclear System, Inc. Regulatory Affairs Department a "Polyethylene High Integrity Container Certification Statement."

6.16.2 IF required, complete form FO-AD-002 HIC USER'S CHECKLIST, and transmit it to the vendor and maintain a copy on file.

6.16.3 Complete form FO-AD-002 HIC USER'S CHECKLIST, for each HIC liner as required.

6.16.4 Include Form FO-AD-002 HIC USER'S CHECKLIST, in the shipping paperwork package with the shipment as required.

6.16.5 Storage Conditions

NOTES

- **Containers stored out-of-doors in direct sunlight must be used within one year of fabrication.**
- **The design of the storage facility must preclude the possibility of a wet or damp environment and any prolonged exposure of the container to any source of ultraviolet light.**

1. Ensure that containers are stored out of direct sunlight (if possible) and away from any other sources of ultraviolet radiation.
2. Store all containers in such a way that the bottom is flat and that no weight is located over the manway/fill port area.
3. Each container shall be stored with its designated closure assemblies to prevent mismatching.
4. Following filling and closure of the container, it may be stored on-site prior to shipment for burial.

6.16.6 Inspection Prior To Use

1. Visually inspect thread and seal areas to verify they are free of foreign matter that could impair the seal or thread engagement.

2. Visually inspect the exterior surfaces for damage that may have occurred during transport or storage that could lessen container integrity.

6.16.7 Handling And Lift Requirements

NOTE

Due to the nature of the container material, some bowing and deformation may be evident during lifting.

1. Use only lift band(s), lift lugs and slings provided with the liner for lifting.

2. Inspect the underdrain assembly prior to use if the container was dropped or banged against another object.

6.17 Additional Energy Solutions Containerized Waste Facility Requirements

6.17.1 Each package of waste must be clearly labeled to identify whether it is Class A, Class B, or Class C waste, in accordance with 10 CFR 61.55.

6.17.2 All waste received at the CWF facility must be disposed in approved disposal overpacks.

6.17.3 Void spaces within the waste and between the waste and its packaging shall be reduced to the extent practicable, but in NO case shall the container less than 215 cubic foot be less than eighty-five percent (85%) full.

NOTE

The acceptable void space depends upon the volume of the disposal container. This criteria is outlined in the Energy Solutions Waste Acceptance Criteria.

6.17.4 HPRS must apply for a variance request prior to shipment.

7.0 RECORDS

7.1 The following QA Records are generated by this procedure.

7.1.1 Completed HIC USER'S CHECKLIST (FO-AD-002)

7.1.2 Completed CERTIFICATION STATEMENT FOR DISPOSAL OF POLYETHYLENE HIGH INTEGRITY CONTAINERS (FO-AD-002)

7.2 The following Non-QA Record is generated by this procedure.

7.2.1 Completed POLYETHYLENE HIGH INTEGRITY CONTAINER CERTIFICATION STATEMENT (FO-AD-002)

8.0 FORMS

8.1 FO-AD-002, HIC USER'S CHECKLIST

8.2 FO-AD-002, CERTIFICATION STATEMENT FOR DISPOSAL OF POLYETHYLENE HIGH INTEGRITY CONTAINERS

8.3 FO-AD-002, POLYETHYLENE HIGH INTEGRITY CONTAINER CERTIFICATION STATEMENT

- END -

ATTACHMENT A
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TECHNICAL REQUIREMENTS (SECTION 5.5.4)

Process Control Program (PCP)

The PCP shall contain the current formulas, sampling, analyses, test, and determinations made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61, and 71, State regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.

Changes to the PCP:

1. Shall be documented and records of reviews performed shall be retained as required by the Quality Program Manual Section 17.9. This documentation shall contain:

   a. Sufficient information to support the change together with the appropriate analyses or evaluations justifying the change(s) and

   b. A determination that the change will maintain the overall conformance of the solidified waste product to existing requirements of Federal, State, or other applicable regulations.

2. Shall become effective after review and acceptance by the Plant Safety Review Committee and the approval of the Plant Manager.

- END -