

ATTACHMENT 8

STP 1 & 2 RADIOACTIVE WASTE PROCESS CONTROL PROGRAM

(Provided Electronically)

STI 31663584	OPGP03-ZO-0017	Rev. 5	Page 1 of 16
Radioactive Waste Process Control Program			
Quality	Non Safety-Related	Usage: Available	Effective Date: 10/22/03
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PREPARER	TECHNICAL	USER	COGNIZANT ORGANIZATION

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Radioactive Waste Process Control Program**1.0 Purpose and Scope**

- 1.1 The purpose of the Process Control Program is to provide reasonable assurance that the processing and packaging of wet and dry radioactive wastes will be accomplished in accordance with specifications set forth by the disposal facility, as well as state and federal regulations.
- 1.2 The Process Control Program contains the sampling, testing methodology, analyses, current formulas, and administrative controls to which dewatering, solidification, encapsulation, and packaging of wet and dry radioactive waste is assured.
- 1.3 Solidification and encapsulation are not currently utilized at STPEGS. Applicable vendor Topical Reports and Process Control Programs and implementing procedures require Plant Operations Review Committee (PORC) approval prior to utilizing these processes. All references to these processes, within the context of this procedure are intended to provide some guidance for the future review of such proposed techniques.
- 1.4 Changes to the Process Control Program and all implementing procedures shall be done in accordance with reference 2.4 and Addendum 1.

2.0 References

- 2.1 OPOP02-WS-0002, Waste Transfer to the Portable Solidification System.
- 2.2 OPRP03-ZR-0001, Determination of Radioactive Material Curie Content, Reportability, DOT Sub-Type and Waste Classification.
- 2.3 10CFR61, Licensing Requirements for Land Disposal of Radioactive Material
- 2.4 Technical Requirements Manual (TRM)
- 2.5 STPEGS Operation's Quality Assurance Plan (OQAP)
- 2.6 OPRP03-ZR-0010, Dry Active Waste Operations.
- 2.7 U. S. Nuclear Regulatory Commission, Technical Position on Waste Form, Rev. 1, January 1991.
- 2.8 OPRP03-ZR-0009, 10CFR61 Sampling and Analysis Program.
- 2.9 OPRP03-ZR-0002, Radioactive Waste Shipments.
- 2.10 OPRP03-ZM-0003, Receipt Verification of High Integrity Containers.

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- 2.11 U. S. NRC Generic Letter 91-02, Reporting Mishaps Involving LLW Forms Prepared for Disposal.
- 2.12 IEN 84-72, Clarification of Conditions For Waste Shipments Subject to Hydrogen Gas Generation.
- 2.13 O&MR-193, Combustible Gases in Irradiated Organic Ion Exchange Resins.
- 2.14 IEN 83-14, Dewatered Spent Ion Exchange Resin Susceptibility to Exothermic Chemical Reaction.
- 2.15 IEN 90-50, Minimization of Methane Gas in Plant Systems and Radwaste Shipping Containers.
- 2.16 O&MR-240, Biological Growth in Spent Resin Produced Carbon Dioxide Pressurization of Casks.
- 2.17 IEN 90-66, Incomplete Draining and Drying of Shipping Casks.
- 2.18 IEN 79-19, Packaging of Low-Level Radioactive Waste For Transport and Burial.

3.0 Definitions

- 3.1 **WASTE BATCH:** Any Quantity of waste stream feed material that is from a single source (e.g., a storage tank) that is processed as a single batch, even though it may be subdivided into more than one unit (e.g., liner), and that possesses unvaried, single operation characteristics. Once a batch is isolated, the addition of any new waste constitutes a new batch. This does not preclude the combination of several waste batches or waste types in a single container used for shipping purposes.
- 3.2 **WASTE TYPE:** A waste stream that consists of a unique combination of radionuclide content, distribution, and physical characteristics.

4.0 Responsibilities

- 4.1 The Health Physics Division is responsible for ensuring that:
 - 4.1.1 Personnel including vendors involved in the radioactive waste program are trained and qualified in accordance with site procedures, the DOT and NRC regulatory requirements, license requirements for the particular waste burial site, and in STP methods for transfer, packaging, and transport of radioactive material. (reference 2.18)
 - 4.1.2 Process Control Program is implemented in accordance with this procedure.

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- 4.1.3 The volume of radioactive waste generated is minimized, and that such waste is processed into acceptable chemical and physical form for transfer to the vendors processing equipment and ultimately to the waste burial facility (reference 2.18).
- 4.1.4 Revisions of vendor procedures or Topical Reports affecting waste form stability or burial acceptance should be reviewed and approved by PORC to update plant procedures or processes as appropriate.
- 4.2 The Nuclear Assurance and Licensing Department is responsible for the review and inspection of the radioactive waste programs in accordance with site procedures.
- 4.3 The Plant Operations Department (or vendor) is responsible for ensuring:
 - 4.3.1 That the general design of the processing equipment is in accordance with the vendors Topical Report.
 - 4.3.2 That operability is demonstrated prior to initial startup of the vendor's equipment.
 - 4.3.3 That processing equipment is operated and inspected in accordance with the approved plant and/or vendor's operating procedures and the approved process control program.

5.0 Notes and Precautions

- 5.1 A potential exists for the generation of combustible quantities of hydrogen for waste forms such as resins, binders, waste sludge, and wet filters, where water and/or organic substances could radiolytically generate combustible gases. Generic requirements are included in NRC Certificates of Compliance to preclude the possibility of significantly reducing packaging effectiveness.
 - 5.1.1 Combustible gas criteria will generally be met if the waste does not exceed low specific activity concentrations and the waste is shipped within 10 days of preparation or the secondary container has been vented within 10 days of shipment. (reference 2.12)
 - 5.1.2 To reduce the effects of radiation on organic resins, a limit of 10 Ci/cubic foot for radionuclide loading shall not be exceeded (reference 2.13).

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- 5.2 Strong oxidizing agents can cause exothermic reactions when mixed with organic resins (reference 2.14).
- 5.2.1 If for any reason oxidizing agents are suspected of being introduced into a resin batch, then the Supervisor, Radiological Services Team shall be notified immediately.
- 5.2.2 Resin temperatures shall be monitored during the dewatering process in order to detect and prevent exothermic reactions.
- 5.3 Bacterial processes can produce methane and carbon dioxide which may pressurize containers that are not venting properly or shipping casks during transport (references 2.15 and 2.16).
- 5.4 The volume of water drained from liners and casks used to ship radioactive materials should be quantified.

6.0 Procedure

6.1 General Requirements

- 6.1.1 All processing of wet radioactive waste shall be performed under an approved process control program for the type of waste being processed.
- 6.1.1.1 Each process shall be described by a topical report approved by the NRC.
- 6.1.1.2 Qualification testing for solidification processes shall conform to the various criteria in reference 2.7.
- 6.1.2 All documents submitted in support of vendor processes, process implementing procedures and revisions thereto, shall be reviewed and approved by the Plant Operations Review Committee (PORC) prior to work starting.
- 6.1.3 All High Integrity Containers (HICs) used at STP for disposal of radioactive waste shall be approved for the type of waste being processed. This approval will be based on the chemical and physical limitations of the container and each HIC will be certified that it meets the acceptance criteria set by the disposal site being used.
- 6.1.4 Receipt, inspection, and handling of HICs shall be performed in accordance with reference 2.10.
- 6.1.5 Reference 2.8 provides instructions for developing scaling factors necessary for ensuring compliance with 10CFR61.

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- 6.1.6 Preparation of manifest and shipping paperwork shall be performed in accordance with reference 2.9.
 - 6.1.7 The respective vendor Process Control Program should contain a description and diagram of the process system parameters.
 - 6.1.8 Alternate solidification parameters shall be approved by the responsible Division Manager and shall be documented in accordance with the vendor or STP Process Control Program.
 - 6.1.9 Dewatering of cartridge filters in HICs shall be performed in accordance with vendor or site specific procedures or prior to placement in containers that do not have installed dewatering internals.
 - 6.1.10 In general, waste containing incidental or trace amounts of absorbed oil is acceptable, provided the oil does not exceed 1% by waste volume in a container.
 - 6.1.11 References to Technical Specification requirements are listed in Addendum 2.
- 6.2 Dewatering Process Control Program
- 6.2.1 Sampling
 - 6.2.1.1 A representative sample of a waste batch shall be obtained in accordance with applicable procedures (Reference 2.1). This sample will be used for analysis of radionuclides and to determine the presence of oil in the batch of waste.
 - 6.2.1.2 Samples for cartridge filters shall be obtained in accordance with reference 2.8.
 - 6.2.1.3 Irradiated hardware shall be handled in accordance with reference 2.2.
 - 6.2.2 Waste classification
 - 6.2.2.1 Waste shall be classified prior to shipping a container. The classification will be performed as outlined in reference 2.2.
 - 6.2.2.2 If the waste classification requires the waste batch or waste type to be classified as a stable waste form, then the waste shall be buried in a container designed to ensure structural stability. (Reference 2.3)

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6.2.2.3 Vendor supplied or site specific dewatering records may be used to record the dewatering information. Waste oil content, if applicable, should also be recorded in the comments section of the dewatering record.

6.3 Solidification Process Control Program

6.3.1 Sampling

6.3.1.1 A representative sample of the waste batch shall be obtained in accordance with procedures (Reference 2.1). The sample will be used to determine:

- the actual process formulation for test and full scale solidification.
- radionuclide content and quantity of oil in the batch of waste.
- alternate solidification formulas for any test specimen failing to verify solidification, in accordance with the surveillance requirements of Addendum 1.

6.3.1.2 Record all information pertaining to process formulation and oil content in accordance with the approved Process Control Program.

6.3.2 Waste Classification: Prior to solidification, a waste classification shall be performed. This shall determine the appropriate vendor Process Control Program, final waste form package, and frequency of test specimen preparation.

6.3.3 Test Specimen Solidification

6.3.3.1 The vendor will perform a test solidification of the waste batch in accordance with the vendors Process Control Program. The surveillance requirements of Addendum 1 must be satisfied.

6.3.3.2 For high activity waste being solidified, where handling of the production test sample could result in personnel radiation exposure that is inconsistent with the ALARA principles, a non-radioactive test sample having essentially the same physical and chemical characteristics may be solidified.

6.3.3.3 If pretreatment of the batch of waste is necessary, the test sample shall have the required pretreatment prior to test sample solidification. This includes pH adjustment of the waste.

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6.3.3.4 If the oil content of the waste batch is greater than 1% by volume, secure solidification operations and notify responsible Supervision.

6.4 Encapsulation Process Control Program

6.4.1 Sampling: A representative sample of the waste to be encapsulated shall be obtained. This sample will be used to determine radiocluclide content.

6.4.2 Waste Classification

6.4.2.1 Prior to encapsulation a waste classification will be performed as outlined in reference 2.2.

6.4.2.2 If the waste classification requires a stable waste form, then an approved encapsulation Process Control Program shall be used. If an approved Process Control Program is not available then the item may be buried in a high integrity container (Reference 2.7). The calculation to determine the amount of encapsulation material required should also take radiation levels into consideration.

6.5 Dry Active Waste (DAW) Process Control Program

6.5.1 Sampling: A sample of the waste is not necessary if an accurate nuclide distribution for the DAW waste type has been established through the 10CFR61 Sampling and Analysis Program (Reference 2.8).

6.5.2 Waste Classification: A waste classification shall be performed prior to shipment as outlined in reference 2.2.

6.5.3 Packaging and Handling: DAW will be segregated, prepared for shipment, and packaged in accordance with reference 2.6.

7.0 Acceptance Criteria

7.1 Dewatering Process Control Program

7.1.1 The container shall be considered acceptable if it meets the dewatering limitation set forth in the vendor's Process Control Program or site specific procedure, the disposal site requirements for free standing liquids and oil, complies with state regulations, and 10 CFR Parts 20, 61, and 71.

7.1.2 The limit(s) shall be recorded on the vendor supplied dewatering record or on site specific data sheets.

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- 7.2 Solidification Process Control Program
- 7.2.1 Test samples for Class A waste products will be considered acceptable if they meet all of the following:
- 7.2.1.1 The free standing liquid requirements as per the disposal facility, state, regulations, 10CFR61, and limitations set forth in the vendor's Process Control Program.
 - 7.2.1.2 Disposal site requirement for oil content.
 - 7.2.1.3 Stability requirements such that it is evident from the physical appearance that the test sample will maintain its shape if removed from the container (i.e., a free standing monolith).
- 7.2.2 The test samples for Class B and C waste products will be considered acceptable if they meet all of the following:
- 7.2.2.1 The free standing liquid requirements as per the disposal facility, state regulations, 10CFR61, and limitations set forth in the vendor's Process Control Program.
 - 7.2.2.2 Disposal site requirements for oil content.
 - 7.2.2.3 The specimens are free of significant visible defects, such as cracking, spalling or disintegration.
 - 7.2.2.4 Satisfy the short term (24-hour verification) compression strength requirements in accordance with reference 2.7.
- 7.2.3 Once the test sample demonstrates an acceptable waste form and the waste classification is acceptable for near surface burial, solidification of a full-scale waste form may be performed as per formulas stated in the vendor's Process Control Program.
- 7.2.4 Sufficient test samples should be prepared and retained to satisfy the long term surveillance requirements of reference 2.7.
- 7.3 Encapsulation Process Control Program: The waste form will be considered acceptable if it meets the test requirements as outlined in the vendor's Process Control Program and the free standing liquid requirements as per the disposal facility, state regulations, and 10CFR61.

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- 7.4 Dry Active Waste Process Control Program: The waste form will be considered acceptable if it meets the free standing liquid requirements for the disposal site, state regulations, 10CFR61, and the waste processor, if applicable.
- 7.5 Reporting of Unacceptable Conditions:
- 7.5.1 Waste form mishaps should be reported to the NRC's Director of the Division of Low-Level Waste Management and Decommissioning and the designated State disposal site regulatory authority within 30 days of knowledge of the incident as per reference 2.11.
- 7.5.2 For any such waste form mishap occurrence, the affected waste form should not be shipped off-site until approval is obtained from the disposal site regulatory authority.
- 7.5.3 Such mishaps include, but are not necessarily limited to, the following:
- 7.5.3.1 The failure of high integrity containers used to ensure structural stability. Such failure may be evidenced by changed container dimensions, cracking, or injury from mishandling (e.g., dropping or impacting against another object).
- 7.5.3.2 The misuse of high integrity containers, as evidenced by a quantity of free liquid greater than one percent of the volume of the waste, an excessive void space within the container, or other misuse as prohibited by 10CFR61.56.
- 7.5.3.3 The production of a solidified Class B or C waste form that has any of the following characteristics;
- greater than 0.5 percent volume of free liquid.
 - concentrations of radionuclides greater than the concentrations demonstrated to be stable in the waste form in qualification testing accepted by the regulatory agency.
 - greater or lessor amounts of solidification media than were used in qualification testing accepted by the regulatory agency.
 - contains chemical ingredients not present or accounted in qualification testing accepted by the regulatory agency.
 - shows instability evidenced by crumbling, cracking, spalling, voids, softening, disintegration, nonhomogeneity, or change in dimensions.

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- evidences processing phenomena that exceed the limiting processing conditions identified in applicable topical reports or process control programs, such as foaming, excessive temperature, premature or slow hardening, production of volatile material, etc.

8.0 Documentation

8.1 Documents generated in the execution of the Process Control Program shall be retained by Records Management in accordance with requirements of the respective implementing procedure.

8.2 Major changes to the solid radwaste treatment systems shall be documented in the Annual Radioactive Effluent Release Report in accordance with Addendum 1.

8.3

9.0 Support Documents

9.1 Addendum 1 - Radioactive Effluents - Solid Waste

9.2 Addendum 2 - Licensed Based Requirements

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1.0 Definitions

MEMBER(S) OF THE PUBLIC

MEMBER(S) OF THE PUBLIC

An individual in a controlled or unrestricted area. However, an individual is not a member of the public during any period in which the individual receives an occupational dose.

OPERABLE - OPERABILITY

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).

SITE BOUNDARY

That line beyond which the land is neither owned, nor leased, nor otherwise controlled by the licensee.

UNRESTRICTED AREA

Any area access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, and any area used for residential quarters.

2.0 Responsibilities

All changes to this procedure shall conform to the requirements of Technical Requirements Manual 6.13. [ITS - Deleted - 10CFR50.59].

3/4.0 Controls and Surveillance Requirements

3/4.1-10 (Not used)

3/4.11.1/2 (Not used)

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3/4.11.3 Solid Radioactive Wastes

Controls

- 3.11.3 Radioactive wastes shall be solidified or dewatered in accordance with the PROCESS CONTROL PROGRAM to meet shipping and transportation requirements during transit, and disposal site requirements when received at the disposal site.

Applicability: At all times

Action:

- a. With SOLIDIFICATION or dewatering not meeting disposal site and shipping and transportation requirements, suspend shipment of the inadequately processed wastes and correct the PROCESS CONTROL PROGRAM, the procedures, and/or the Solid Waste System as necessary to prevent recurrence.
- b. With SOLIDIFICATION or dewatering not performed in accordance with the PROCESS CONTROL PROGRAM, test the improperly processed waste in each container to ensure that it meets burial ground and shipping requirements and take appropriate administrative action to prevent recurrence.
- c. The provisions of Technical Specification 3.0.3 are not applicable.

Surveillance Requirements

- 4.11.3 SOLIDIFICATION of at least one representative test specimen from at least every tenth batch of NRC Class A wet radioactive wastes (e.g., filter sludges, spent resins, evaporator bottoms, boric acid solutions, and sodium sulfate solutions), and solidification of at least one representative test specimen from each batch of waste that is required to meet 10CFR61 structural stability criteria shall be verified in accordance with the PROCESS CONTROL PROGRAM:
- a. If any test specimen fails to verify SOLIDIFICATION, the SOLIDIFICATION of the batch under test shall be suspended until such time as additional test specimens can be obtained, alternative SOLIDIFICATION parameters can be determined in accordance with the PROCESS CONTROL PROGRAM, and a subsequent test verifies SOLIDIFICATION. SOLIDIFICATION of the batch may then be resumed using the alternative SOLIDIFICATION parameters determined by the PROCESS CONTROL PROGRAM.

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- b. If the initial test specimen from a batch of NRC Class A waste fails to verify SOLIDIFICATION, the PROCESS CONTROL PROGRAM shall provide for the collection and testing of representative test specimens from each consecutive batch of the same type of wet waste until at least three consecutive initial test specimens demonstrate SOLIDIFICATION. The PROCESS CONTROL PROGRAM shall be modified as required, as provided in Technical Requirements Manual 6.13 [ITS - Deleted - 10CFR50.59], to assure SOLIDIFICATION of subsequent batches of waste; and
- c. With the installed equipment incapable of meeting Specification 3.11.3 or declared inoperable, restore the equipment to OPERABLE status or provide for contract capability to process wastes as necessary to satisfy all applicable transportation and disposal requirements.

3/4.11.3 Solid Radioactive Wastes-Bases

This control implements the requirements of 10CFR50.36a and General Design Criterion 60 of Appendix A to 10CFR Part 50. The process parameters included in establishing the PROCESS CONTROL PROGRAM may include, but are not limited to, waste type, waste pH, waste/liquid/SOLIDIFICATION agent/catalyst ratios, waste oil content, waste principal chemical constituents, and mixing and curing times.

5.0 Site (Not used)

6.0 Administrative Controls

6.1-14 (Not Used)

6.15 Major Changes to Solid Radwaste Treatment Systems*

6.15.1 Licensee-initiated major changes to the Radwaste Treatment Systems:

- a. Shall be reported to the Commission in the Annual Radioactive Effluent Release Report for the period in which the evaluation was reviewed by the PORC. The discussion of each change shall contain:
 - 1) A summary of the evaluation that led to the determination that the change could be made in accordance with 10CFR50.59;
 - 2) Sufficient detailed information to totally support the reason for the change without benefit of additional or supplemental information;

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- 3) A detailed description of the equipment, components, and processes involved and the interfaces with other plant systems;
 - 4) An evaluation of the change, which shows the predicted releases of radioactive materials in liquid and gaseous effluents and/or quantity of solid waste that differ from those previously predicted in the license application and amendments thereto;
 - 5) An evaluation of the change, which shows the expected maximum exposures to a MEMBER OF THE PUBLIC in the UNRESTRICTED AREA and to the general population that differ from those previously estimated in the License application and amendments thereto;
 - 6) A comparison of the predicted releases of radioactive materials, in liquid and gaseous effluents and in solid waste, to the actual releases for the period prior to when the change is to be made;
 - 7) An estimate of the exposure to plant operating personnel as a result of the change; and
 - 8) Documentation of the fact that the change was reviewed and found acceptable by the PORC.
- b. Shall become effective upon review and acceptance by the PORC.

* Licensees may choose to submit the information called for in this Specification as part of the annual FSAR update.

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<u>Item</u>	<u>Reference/Section</u>		<u>Subject</u>
1)	Technical Requirements Manual, Section 1.24	[ITS - Deleted]	Definition of Process Control Program
2)	OQAP Section 6.5.1.6 k	[ITS - Deleted]	PORC responsibility to review Process Control Program
3)	OQAP Section 6.5.1.7	[ITS - Deleted]	Plant Manager approval
4)	OQAP Section 6.5.2.8.i	[ITS - Deleted]	NSRB audits of Process Control Program
5)	Technical Requirements Manual, Section 6.8.1.e	[ITS - Deleted]	Procedures implementing the Process Control Program
6)	OQAP Section 6.9.1.4	[ITS - 5.63]	Reporting of data in the Semiannual Radioactive Effluent Release Report
7)	OQAP Section 6.10.3 o	[ITS - Deleted]	Record retention for reviews of the Process Control Program
8)	Technical Requirements Manual, Section 6.13	[ITS - Deleted]	Documentation of changes to the Process Control Program