

ZionSolutions, LLC

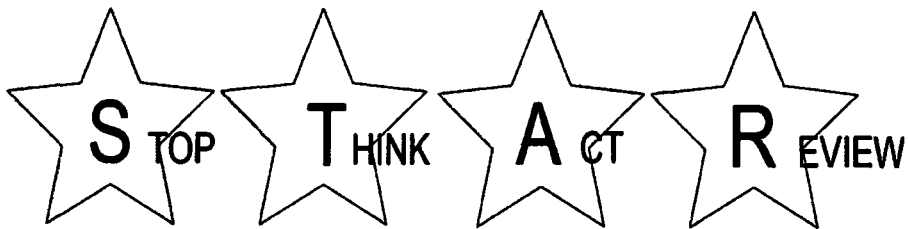
ZS-2013-0176: Attachment 8 – ZS-WM-123 Process Control Program Requirements



Process Control Program Requirements

February 11, 2011

ZionSolutions Project



Summary of Changes in this Revision:

- Rev. 0 – This is initial issuance of this procedure.

Table of Contents

1. PURPOSE AND SCOPE	4
1.1. PURPOSE	4
1.2. SCOPE	4
2. RESPONSIBILITIES	4
2.1. Transportation Coordinator's - are responsible for:	4
3. DEFINITIONS	4
4. MAIN BODY	5
4.1. Limitations	5
4.2. Procedure	5
5. REFERENCES	7
6. RECORDS	8
6.1. None	8
7. ATTACHMENTS	8
7.1. Attachment #1, "Verification of Existing Valid Contract for Solidification and Dewatering."	8
8. FORMS	8

1. **PURPOSE AND SCOPE**

1.1. **PURPOSE**

This procedure provides the requirements to ensure the *ZionSolutions* PROCESS CONTROL PROGRAM process parameters are established to provide reasonable assurance that all low-level radioactive waste (LLRW) processed at *ZionSolutions* will meet or exceed any and all acceptance criteria for processing, packaging, shipment, and burial of LLRW in licensed burial facilities and as required by 10CFR Parts 20, 61, 71. *ZionSolutions* utilizes an approved EnergySolutions Process Control Program.

1.2. **SCOPE**

This procedure is applicable to all low-level radioactive waste processed at *ZionSolutions*. This criterion includes all Department of Transportation (DOT), Nuclear Regulatory Commission (NRC), State, and licensed burial facilities rules and regulations for the processing, packaging, shipping, and burial of LLRW.

2. **RESPONSIBILITIES**

2.1. **Transportation Coordinator's** - are responsible for:

- Implementation of this procedure.

3. **DEFINITIONS**

3.1. **Process Control Program (PCP)**: Shall contain the current formulas, sampling, analyses, tests and determinations to be made to ensure that the 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:

- 10CFR Parts 20, 61 and 71
- State regulations
- Burial ground requirements
- Other requirements governing the shipping and disposal of radioactive waste

The majority of PCP scope deals with, but is not limited to, solidified wastes. Documents listed in the References Section of this procedure may be useful in providing more detailed clarification of the PCP program.

3.2. **Solidification**: The conversion of radioactive liquid, resin and sludge wastes from liquid systems into a solid form that meets shipping and burial site requirements.

3.3. **Stabilized**: The use of an approved container for burial to provide an acceptable waste form.

3.4. **Dewatering**: The process in which excess water is removed from the waste to meet the burial site acceptance criteria.

4. **MAIN BODY**

4.1. **Limitations**

- 4.1.1 The content of a High Integrity Container (HIC) containing resins or dewatered wet wastes shall not contain greater than or equal to 500 curies. (Reference 5.12)
- 4.1.2 **Solid Radioactive Waste Requirements:** The basis for the functionality of the solid radwaste system is to ensure the system will be available for use whenever solid radwaste require processing and packaging prior to being shipped offsite. These solid radioactive waste requirements implement the requirements of 10CFR 50.36a and General Design Criteria 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, mixing and curing times.
- 4.1.1 **Liquid LLRW Requirements for Vendors:** ZionSolutions requires that all vendors who process liquid LLRW at the Zion Site meet all EnergySolutions quality standards and shall use an NRC approved PROCESS CONTROL PROGRAM Topical report. Furthermore, the vendor solidification/stabilization media must be approved by the licensed burial sites.

4.2. **Procedure**

- 4.2.1 The Radwaste System shall be verified:
 - 1.) At least once per quarter by verification the Solid Radwaste System has been operated in accordance with the Process Control Program, **OR**
 - 2.) At least once annually by verification of the existence of a valid contract for solidification to be performed by a contractor in accordance with a Process Control Program specifying:
 - A. The method and frequency of analyses to verify solidification of radioactive waste.
 - B. The actions to be taken if solidification **IS NOT** verified.
 - C. Document by completing Attachment 1, "Verification of Existing Valid Contract for Solidification and Dewatering."
- 4.2.2 The Solid Radwaste System shall be used, as applicable, in accordance with a PROCESS CONTROL PROGRAM for the solidification and packaging of wet radioactive wastes to meet shipping and burial ground requirements.
 - 1.) These requirements shall be applicable at all times.
 - 2.) **IF** the provisions of the process control program **ARE NOT** satisfied, **THEN** shipments of potentially defective processed or packaged solid radioactive wastes from the site shall be suspended.

CAUTION:

Do **NOT** lift a HIC that contains greater than or equal to 500 curies.

4.2.3 To ensure compliance with offsite dose limits during a design basis HIC handling accident, ENSURE each HIC containing resins or dewatered wet waste contains less than 500 curies. (Reference 5.12)

- 1.) **IF** a HIC is determined to contain greater than or equal to 500 curies, **THEN** ENSURE activity is processed to another HIC BEFORE any handling Or lifting activities.

4.2.4 The Process Control Program shall consist of: (reference 5.13)

- 1.) PCP-FO-AD-022, Ecodex Precoat/Powdex/Solka-Floc/Diatomaceous Earth/Zeolite Dewatering Procedure.
- 2.) PCP-FO-OP-023, Bead Resin / Activated Carbon Dewatering Procedure for CNSI 14-195 or Smaller Liners.

4.2.5 Changes to the Process Control Program:

- 1.) SHALL be documented and records of reviews performed shall be retained as required by Permanently Defueled Technical Specifications (PDTs) 5.9.1 (Qualified Technical Review). The documentation shall contain:
 - A. Sufficient information to support the change together with the appropriate analyses or evaluations justifying change(s).
 - 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:
 - A. The ZionSolutions Decommissioning Plant Manager's approval.
- 3.) SHALL be submitted to the NRC in the Annual Radioactive Effluent Release Report for the period in which the change was made (including change in vendor).

4.2.6 The Annual Radioactive Effluent Release Report:

- 1.) SHALL be in the format of Regulatory Guide 1.21 (June 1974).
- 2.) SHALL be summarized on an annual basis.
- 3.) SHALL include the following information for each type of solid waste shipped offsite during the report period:
 - Container Volume

- Total Curie Quantity (specify whether determined by measurement or estimate)
- Principal radionuclide's (specify whether determined by measurement or estimate).
- Type of waste (e.g., spent resin, compacted dry waste, evaporator bottoms, etc.).
- Type of container (e.g., LSA, Type A, Type B, Large Quantity).
- Solidification Agent (e.g., cement, urea formaldehyde).
- Dates of shipment and disposition (if shipped offsite)

5. REFERENCES

- 5.1. SOI-69, "Solid Waste Disposal."
- 5.2. Defueled Safety Analysis Report (DSAR), 5.3, "Radioactive Waste Handling Accident."
- 5.3. Permanently Defueled Technical Specifications (PDTs):
 - 5.6.2, Radioactive Effluent Controls Program
 - 5.7.3, Radioactive Effluent Release Report
 - 5.9.1, Qualified Technical Review
- 5.4. 10CFR20, 10CFR50.36a, General Design Criteria 60 of Appendix A to 10CFR50, 10CFR61, and 10CFR71.
- 5.5. Regulatory Guide 1.21, Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants, Revision 1 (June 1974)
- 5.6. South Carolina Department of Health and Environmental Control Radioactive Material License No. 097 for Chem-Nuclear Systems, Inc., Barnwell Waste Management Facility.
- 5.7. ZS-WM-128, "Generation Of The Annual Radioactive Effluent Release Report."
- 5.8. NRC Branch Technical Position On Waste Form and Waste Classification, Rev.1, dated January 1991 (PCP Information).
- 5.9. Zion Station Calculation No. 22N-0-119M-0001, Rev. 1, "Dose Effects on Radwaste Handling Accident Involving a HIC."
- 5.10. PCP-FO-AD-022, Ecodex Precoat/Powdex/Solka-Floc/Diatomaceous/Earth/Zeolite Dewatering Procedure."
- 5.11. PCP-FO-OP-023, Bead Resin/ Activated Carbon Dewatering Procedure for CNSI 14-195 or Smaller Liners.
- 5.12. NRC SER For Amendment 180/167 (PDTs).

5.13. 295-201-97-CAQD-121605 (Zion Corrective Action).

6. **RECORDS**

None.

7. **ATTACHMENTS**

7.1. Attachment #1, "Verification of Existing Valid Contract for Solidification and Dewatering."

8. **FORMS**

None.

ATTACHMENT 1
Verification of Existing Valid Contract for Solidification and Dewatering
Page 1 of 1

I _____ on _____, have verified the existence of a valid
(Transportation Coordinator) (Date)
contract to solidify or dewater waste by a Contractor at *ZionSolutions*. The contract
expires on _____.
(Date)

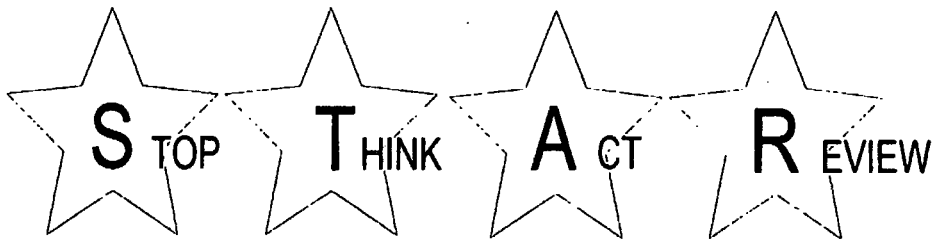
Note: When completed this document is to go to *ZionSolutions* File for filing with ZS-WM-123 package.



Process Control Program Requirements

August 14, 2012

ZionSolutions Project



Summary of Changes in this Revision:

- Rev. 1 – Provides requirements to ensure ZionSolutions Process Control Program parameters are established.

Table of Contents

1. PURPOSE AND SCOPE	4
2. RESPONSIBILITIES	4
3. DEFINITIONS	4
4. MAIN BODY	6
4.1. Limitations	6
4.2. Procedure	8
5. REFERENCES	17
6. RECORDS	18
7. ATTACHMENTS	18
7.1. Attachment 1, "Verification of Existing Valid Contract for Solidification and Dewatering"	18
7.2. Attachment 2, "Minimum Review Criteria for Solidification Processes"	18
7.3. Attachment 3, "Waste Types Suitable for Dewatering"	18
7.4. Attachment 4, "Prohibited Materials."	18
8. FORMS	18

1. **PURPOSE AND SCOPE**

1.1. **PURPOSE**

This procedure provides the requirements to ensure the *ZionSolutions* PROCESS CONTROL PROGRAM process parameters are established to provide reasonable assurance that all low-level radioactive waste (LLRW) processed at *ZionSolutions* will meet or exceed any and all acceptance criteria for processing, packaging, shipment, and burial of LLRW in licensed burial facilities and as required by 10CFR Parts 20, 61, 71.

1.2. **SCOPE**

This procedure is applicable to all low-level radioactive waste processed at *ZionSolutions*. This criterion includes all Department of Transportation (DOT), Nuclear Regulatory Commission (NRC), State, and licensed burial facilities rules and regulations for the processing, packaging, shipping, and burial of LLRW.

2. **RESPONSIBILITIES**

2.1. **Waste Operations Manager** – is responsible for:

- Maintaining the Process Control Program and its overall implementation.
- Ensure that waste is processed and packaged in accordance with procedures that implement this program.

2.2. **Quality Assurance Manager** - is responsible for:

- Implements Quality Control hold points and independent verifications in implementing procedures to assure that regulatory requirements and disposal site criteria are satisfied.
- QA/QC Requirements.

2.3. **EnergySolutions Waste Processor/Operator** – is responsible for:

- Providing documentation of satisfactory processing by documenting completed *EnergySolutions* procedures and check sheets.

2.4. **Broker/Shipper's** - are responsible for:

- Implementation of this procedure.

3. **DEFINITIONS**

- 3.1. *Batch*: A fixed volume of wet waste with essentially uniform physical, chemical, and radiological properties. A single batch of wet waste maybe dewatered in several containers. An isolated tank of agitated wet waste is an example of a batch.

- 3.2. *Disposal Facility*: An off-site facility for the disposal of radioactive waste which is licensed for that purpose by the host state and/or the NRC.
- 3.3. *Dewatering*: The process in which excess water is removed from the waste to meet the burial site acceptance criteria.
- 3.4. *Dry Active Waste (DAW)*: Radioactive Waste that is typically paper, wood, plastic, trash, air filters, metal, soil, concrete, asphalt, and used plant components, which without processing, contains essentially no free liquid.
- 3.5. *Irradiated Hardware*: Neutron activated non-fuel-bearing components.
- 3.6. *Item*: Any level of unit assembly, including structures, systems, subsystems, and subassemblies, components, part, or material.
- 3.7. *Mishap*: The misuse or failure of Class B or C waste forms or high integrity containers that require evaluation for reportability in accordance with NRCs Technical Position on Waste Form, Rev.1, January 1999 and NRC Generic Letter 91-02.
- 3.8. *Process Control Program (PCP)*: Shall contain the current formulas, sampling, analyses, tests and determinations to be made to ensure that the 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:
 - 10CFR Parts 20, 61 and 71
 - 49CFR Parts 171-178
 - State regulations
 - Burial ground requirements
 - Other requirements governing the shipping and disposal of radioactive waste

The majority of PCP scope deals with, but is not limited to, wet wastes. Documents listed in the References Section of this procedure may be useful in providing more detailed clarification of the PCP program.

- 3.9. *Radioactive Waste Package*: The packaging together with its radioactive contents as presented for transport.
- 3.10. *Radioactive Waste Packaging*: The assembly of components necessary to ensure compliance with the packaging requirements of 49CFR and 10CFR71. It may consist of one or more containers, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, tie-down system, and auxiliary equipment may be designated as part of the packaging.
- 3.11. *Radioactive Material*: Byproduct material, source material, special nuclear material, and technologically enhanced naturally occurring radioactive material (NORM) as defined in regulation. This includes, but is not limited to: station generated radioactive waste, radioactive material to be shipped to another licensee, and spent fuel.

- 3.12. *Radioactive Material (for shipping purposes only)*: Material having a specific and total activity as defined in 49CFR §173.436. If the material is not radioactive for the purposes of hazardous material Class 7 transport, it is not subject to the requirements of 49CFR173. However, this is not considered free release criteria or considered non-radioactive under the provisions of 10CFR20.
- 3.13. *Radioactive Waste (Radwaste or Waste)*: Radioactive Material that has no further economic value and is to be shipped to a decontamination, volume reduction, or disposal facility.
- 3.14. *Radioactive Waste System(s)*: Radioactive waste systems begin at the interface valve(s) in each line from other systems provided for collecting wastes that may contain radioactive materials and include related instrumentation and control systems. The radioactive waste system terminates at the point of controlled discharge to the environment, at the point of recycle to the primary or secondary water storage, or at the point of packaged solid wastes prior to shipment offsite to a licensed disposal facility.
- 3.15. *Stabilized*: The use of an approved container or process to provide an acceptable waste form. Some waste forms themselves are inherently stable.
- 3.16. *Temporary System*: Systems intended for short-term duration and subsequent removal once they have completed their specific task or tasks. This does not include permanent systems, consumables, or vehicles and casks used to pick up/delivery service. Mobile radioactive waste processing systems to support decommissioning activities are examples of temporary systems.
- 3.17. *Waste Stream*: An individual, specific type or source of radioactive waste and its associated process that exhibit similar radionuclide distributions.
- 3.18. *Wet Waste*: Radioactive Waste containing free standing liquids or packaged underwater. Wet waste is usually solidified, encapsulated, or dewatered before shipping for disposal. Wet waste being sent to a processor may still contain water. Examples include radioactively spent resin, liquid filters, sludge oil, decontamination fluids, and irradiated hardware packaged underwater.

4. MAIN BODY

4.1. Limitations

- 4.1.1 ZionSolutions does not plan to solidify waste for direct transfer to a disposal facility. If on-site solidification is required, an outside vendor will perform that function under the vendor's PCP, which will be reviewed and approved by Waste Operations prior to commencing any solidification activities:
 - 1.) Any proposed solidification process shall be evaluated for acceptability and applicability to the waste stream intended for solidification on a case-by-case basis.

- 2.) The vendor PCP will be evaluated by Waste Operations Management prior to implementation and receive review and approval in accordance with applicable *ZionSolutions* procedures. The review will identify that there is sufficient supporting documentation of the vendor's PCP to give assurance that the final product will meet or exceed all requirements for transport and disposal, and that sufficient procedural controls exist to assure safe operations.
- 3.) Solidification procedures shall be reviewed and approved in accordance with *ZionSolutions* procedures.
- 4.1.2 The content of a High Integrity Container (HIC) containing resins or dewatered wet wastes shall not contain greater than or equal to 500 curies. (Reference 5.12)
- 4.1.3 Radioactive Waste Requirements: The basis for the functionality of the radioactive waste system is to ensure the system will be available for use whenever radioactive waste requires processing and packaging prior to being shipped offsite. These radioactive waste requirements implement the requirements of 10CFR §50.36a and General Design Criteria 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, mixing and curing times.
- 4.1.4 Liquid LLRW Requirements for Vendors: *ZionSolutions* requires that all vendors who process liquid LLRW meet all *EnergySolutions* quality standards and shall use an NRC approved PROCESS CONTROL PROGRAM Topical report. Furthermore, the vendor solidification/stabilization media must be approved by the licensed burial sites.
- 4.1.5 The process control activities described in this program and the high integrity containers (HICs) and liners referenced in the NRCs radioactive waste packaging Certificate of Compliance (C of C) are QA approved. Process or equipment failures are subject to the requirements of 10CFR21, "Reporting of Deficiencies and Noncompliance."
- 4.1.6 During the processing or dewatering of Class B or C waste, deviations from the process control parameters or acceptable waste form properties shall be evaluated for reportability as "mishaps". Failures during qualification testing are not considered "mishaps" and are not reportable events. Mishaps shall be reported to the NRC within 30 days of knowledge of the event and approval from the disposal site shall be obtained prior to shipment.
- 4.1.7 Liquid wastes will be solidified in accordance with the NRC Technical Position on Waste Form, Rev. 1, January 1999; Waste Form Technical Position, Rev. 1, and the applicable disposal site criteria prior to disposal. (See Attachment 2 for details).
- 4.1.8 Containers, shipping casks, and methods of packaging will meet applicable federal regulations, e.g., 10CFR71 and 49CFR173, Subpart I.

- 4.1.9 Waste classification will meet the requirements of 10CFR61 and disposal site criteria.
- 4.1.10 Procedures or other administrative controls/documents shall assure that the radioactivity content transferred to any one liner or HIC will not result in exceeding the design basis site boundary dose calculated in Reference 5.16.

4.1. Procedure

4.1.1 Review and Qualification of Solidification Processes

- 1.) *ZionSolutions* does not plan to solidify or encapsulate waste for direct transfer to a disposal facility. If on-site solidification or encapsulation is required, an outside vendor will perform that function under the vendor's PCP, which will be reviewed and approved as follows:
 - A. Any proposed solidification process shall be evaluated for acceptability and applicability to the waste stream intended for solidification on a case by case basis
 - B. The vendor PCP will be evaluated by Waste Operations Management prior to implementation and receive review and approval in accordance with applicable *ZionSolutions* procedures. The review shall identify that there is sufficient supporting documentation of the vendor's PCP to give assurance that the final product will meet all requirements for transport and disposal, and that sufficient procedural controls exist to assure safe operations.
 - C. Solidification procedures shall be reviewed and approved in accordance with applicable *ZionSolutions* procedures.

4.1.2 High Integrity Containers (HICs)

- 1.) A HIC may be used to provide stability in lieu of the requirement for waste form stability. HICs must meet applicable regulatory and disposal site requirements and procedures for their use shall be reviewed and approved by Waste Operations Management prior to their use
- 2.) The qualification criteria for HICs include:
 - A. The container design shall be qualified in accordance with the NRC Branch Technical Position on Waste Form, (Rev. 1, 1991) and the requirements of the disposal facility. If applicable, the regulatory agency for the disposal facility shall issue a Certificate of Compliance (C of C) or otherwise approve the design.
 - B. Plant and vendor procedures shall meet the fabrication, testing, inspection, and maintenance, preparation for use, filling, storage, handling, and transportation and disposal requirements of the applicable certificate of compliance.

- C. Waste processed in HICs may utilize the HIC as the stable waste form to meet the stability and free liquid requirements of 10 CFR §61.56 and the disposal facility. However, the process control parameters for the waste processing shall be controlled to within the limitations of the C of C on the HIC (typically temperature or chemical limitations in the C of C may require additional controls in the process).
- 3.) Approved procedures support the control of materials that are prohibited in HICs containing radioactive waste. Prohibited materials are specific to the HIC qualification and certification but Attachment 4, "Prohibited Materials" provides a typical listing.

4.1.3 Reportable Events

- 1.) Mishaps involving the container or solidification process shall be evaluated for reportability under 10 CFR 21. Also, mishaps involving the HIC during or after processing and deviation from prescribed process control parameters for solidification shall be evaluated for reportability. In Generic Letter 91-02, the NRC expressed specific interest in reporting the following circumstances:
- A. Failure of a High Integrity Container used to ensure a stable waste form. Changed container dimensions, cracking or damage from mishandling can be evidence of container failure.
- B. The presence of free liquids in excess of 1% of the waste volume or excessive void space within the container. Such misuse is prohibited by 10 CFR §61.56 (b) (2).
- C. A solidified Class B or C waste form that has any of the following characteristics:
- Contains free liquids in quantities exceeding 0.5% of the volume of the waste.
 - Contains waste with radionuclides in concentrations exceeding those considered during waste form qualification testing accepted by the regulatory agency, which could lead to errors in assessment of waste class.
 - Contains significantly different waste loading than was used in the qualification testing accepted by the regulatory agency.
 - Contains chemical ingredients not present in qualification testing accepted by the regulatory agency, and those quantities are sufficient to unacceptably degrade the waste product.
 - Shows instability evidenced by crumbling, cracking, spalling, voids, softening, disintegration, non-homogeneity, or dimensional changes.

- Evidence of processing phenomenon that exceed the limiting processing conditions identified in the applicable topical reports on process control plans, e.g., foaming, temperature extremes, premature or slow hardening, and production of volatile material.
- D. Mishaps shall be documented using the station corrective action process.
- E. Mishaps may be subject to a 30 day reporting criteria and require approval of the disposal facility prior to transport.

4.1.4 Cartridge Filter Elements

- A. Cartridge filter elements may be shipped for off-site processing and disposal. The vendor's processes should be reviewed to ensure compliance with the applicable disposal site criteria and 10 CFR 61 requirements.
- B. Cartridge filter elements may be processed on-site for direct disposal. Cartridge filter elements shall be processed using an approved dewatering system in accordance with approved procedures. The dewatering process shall be tested and the methodology accepted as meeting the applicable burial site criteria and 10 CFR 61 requirements.
- C. The processing procedures for filters dewatered on-site for direct disposal shall be reviewed and approved in accordance with applicable procedures.
- D. Class A filters requiring stabilization and Class B and Class C filters shall be disposed of in an approved HIC or a solidified matrix that satisfies the stabilized waste form criteria of 10 CFR §61.56(b).
- E. The packaging of cartridge filters for disposal shall be in accordance with the Reference 5.12.

4.1.5 Demineralizer Resins

- A. Depleted resins may be shipped for off-site processing and disposal. The vendor's processes should be reviewed to ensure compliance with the applicable disposal site criteria and 10 CFR 61 requirements.
- B. Depleted resins may be processed on-site for direct disposal. Depleted resins shall be processed using an approved dewatering system in accordance with approved procedures. The dewatering process shall be tested and the methodology accepted as meeting the applicable burial site criteria and 10 CFR 61 requirements.
- C. The processing procedures for depleted resins dewatered on-site for direct disposal shall be reviewed and approved in accordance with applicable procedures.

- D. Acceptable waste types suitable for processing and dewatering on-site are listed in Attachment C. Resin types or waste forms not specifically listed shall be reviewed and approved by Waste Operations Management prior to use.
- E. A valid 10 CFR 61 analysis will be used to determine the radionuclide distribution. This information along with waste volume per package, weight per package, and package size will be used to determine the liner's specific activity.
- F. The package's total activity may be based on a dose rate to curie conversion factor or extrapolation of the sample analysis consistent with the waste classification methodology explained later in this procedure.
- G. Class A waste resins requiring stabilization and Class B and Class C waste resins shall be disposed of in an approved HIC or a solidified matrix that satisfies the stabilized waste form criteria of 10 CFR §61.56(b).
- H. Other methods of processing resins shall be reviewed and approved by Waste Operations Management prior to implementation.

4.1.6 Dry Active Waste (DAW)

- A. DAW is typically packaged into boxes, gondola railcars, intermodal containers, or C-vans and shipped to a licensed vendor that processes the DAW for final disposal or shipped directly to a licensed disposal facility.
- B. DAW is examined prior to packaging to screen out items that may conflict with a vendor's ability to process the material or the disposal site criteria.
- C. Removal of prohibitive items such as liquids or items found in DAW that would compromise the integrity of the package are removed and separated for special handling.
- D. Controls and/or inspection criteria are established for the receipt and prior-to-use inspections of transport containers and disposal containers for DAW packages shipped directly for disposal.

4.1.7 Irradiated Metal/Hardware

- A. Verification of suitability for disposal shall be determined through collaboration with the processing or disposal facility. Special characterization methodology may be required for components and a review and approval by the disposal facility prior to shipment is likely. The packaging of irradiated object(s) for direct disposal may be limited by the package or cask used for transport. Shipping and disposal documentation shall be reviewed by Waste Operations Management and deemed acceptable by the processing or disposal facility prior to shipment.
- B. IF the material is recycled or processed prior to disposal, the material will be packaged for transport in accordance with 49 CFR, 10 CFR, and any limitations of the package or transport cask. Disposal is based on the vendor's process control program.

4.1.8 Incinerable Fluids

- A. Fluids that are capable of being incinerated (e.g. hydraulic fluids, lubricating oils, etc.) may be shipped to a processor that is licensed to perform that activity.
- B. The vendor will be evaluated and approved by Waste Operations Management prior to implementation. Disposal is based on the vendor's process control program.
- C. In the process, the fluid is typically consumed and the resultant activity captured for disposal or released under the vendor's license. The vendor may return any material that cannot be processed for disposal to *ZionSolutions*.

4.1.9 Sludges/Bottoms

- A. Wet wastes that are not capable of being incinerated may be processed by a vendor licensed to process, concentrate and/or solidify wet wastes. Processing resulting in on-site solidification is subject to the process controls for solidification discussed earlier.
- B. The vendor may return any material that cannot be processed for disposal to *ZionSolutions*.

4.1.10 Prohibited Waste Constituents

- 1.) No radioactive waste capable of detonation or of explosive decomposition or reaction will be shipped for disposal per 10 CFR §61.56 (a) (4). Components containing explosive materials, such as some automatic valves (e.g. fire protection valves on Halon and/or CO₂ systems), should be identified and the removal or disposal of these valves controlled by the work control process.

- 2.) No radioactive waste capable of generating toxic gases, vapors, or fumes will be shipped for disposal per 10 CFR §61.56 (a) (5).
- 3.) No radioactive waste that is pyrophoric will be shipped for disposal per 10 CFR §61.56 (a) (6).
- 4.) Control of the generation of these types of waste is provided through the use of approved *ZionSolutions* procedures.

4.1.11 Mixed Waste

- 1.) No mixed waste will be submitted for disposal per 10 CFR §61.56 (a) (8) unless properly treated.
- 2.) *ZionSolutions* will ship its mixed waste inventory to licensed and permitted facilities for processing prior to disposal.
- 3.) The vendor will be evaluated by Waste Operations Management prior to implementation. Disposal is based on the vendor's process control program.
- 4.) The vendor's processes will also be reviewed to ensure compliance with 40 CFR requirements.
- 5.) Control of the generation of mixed waste is provided through approved *ZionSolutions* procedures.
- 6.) Material safety data sheets (MSDS) on consumable materials are maintained for chemicals used on site.

4.1.12 Waste Characterization

Approved *ZionSolutions* procedures shall specify the method of waste classification to meet the requirements of 10 CFR §61.55. These procedures shall include the collection of data, computational methods, computer codes, etc. The following is a synopsis of the methodology employed and required elements of the procedures.

- 1.) Individuals performing the calculations described in this section and the reviewer of those calculations shall be specifically approved to perform that function by the Waste Operations Manager/Designee and/or otherwise qualified through an approved qualification program in accordance with station procedures. Approval, in lieu of specific qualification, should be based on experience at other nuclear facilities and/or demonstrated proficiency with the types of calculations or computer codes required.
- 2.) Radioactive waste streams are sampled and/or assessed biannually, prior to shipment, or after any evolution that may affect the distribution of radionuclides by a factor of ten (10) in waste streams for Class A, B, and C waste as defined in 10 CFR §61.55. An assay of beta, gamma and alpha emitting radionuclides will be performed.

- 3.) An approved outside laboratory is used by *ZionSolutions* to analyze waste streams to determine the distribution and activity of radionuclides listed in Tables 1 and 2 of 10 CFR 61.
- 4.) For resin wastes, isotopic analysis is normally performed on samples of resin obtained prior to or during processing. Representative resin samples are analyzed for gamma components and appropriate scaling factors are applied to key gamma radionuclides (such as Co-60 or Cs-137) to determine the specific activity of difficult to measure radionuclides expected in the waste stream based on a prior laboratory analysis. The total activity present in a container is calculated based on the specific activity and the volume or weight of the waste in the container or dose rate to curie conversion calculations.
- 5.) For containers of cartridge filters, dose rate to curie conversion calculations are performed on each filter or batch of filters to determine the total gamma activity present. Scaling factors are applied to key gamma radionuclide curie content to determine the activity of those radionuclides not measured by gamma analysis or dose rate measurement.
- 6.) For DAW, dose rate to curie conversion calculations are performed to determine the total gamma emitter activity present in a container.
- 7.) Computational methods (including computer codes used to perform waste classification) shall be verified and validated by an individual as described in 4.2.12.1 as follows:
 - A. An individual shall review the computational methods basis document or manual.
 - B. The reviewer shall ensure technical accuracy, technical adequacy, reasonableness of assumptions, and traceability of data.
 - C. Calculation results shall be benchmarked against other verified methods to prove reasonable agreement.
 - D. Initial reviews and benchmark results shall be documented.
 - E. The verification / validation shall be reviewed and approved prior to implementation of the method.
- 8.) Calculations to determine curie content and waste classification of radioactive waste performed by means other than computer codes (i.e. manual calculations, etc.) shall be checked by a qualified individual as defined in 4.2.12.1, other than the originator, who shall be responsible to check and document the following:
 - A. Check the appropriateness of the application of the computational method;
 - B. Check assumptions and input data for reasonableness;

- C. Perform a sufficient number of checks of the calculations to reasonably test accuracy and consistency of the results, OR,
 - D. Perform a check of the results by comparison with other similar calculations,
- 9.) Calculation methodology to assess the concentration of radionuclides for waste disposal shall incorporate the guidance provided in the NRC's "Final Branch Technical Position on Concentration Averaging and Encapsulation", January 1995.

4.1.13 PCP Document and Procedure Control

- 1.) Changes to the Process Control Program:
 - A. SHALL be documented and records of reviews performed shall be retained as required by Permanently Defueled Technical Specifications (PDTS) 5.9.1 (Qualified Technical Review). The documentation shall contain:
 - i. Sufficient information to support the change together with the appropriate analyses or evaluations justifying change(s).
 - ii. 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.
 - B. SHALL become effective after review and acceptance by:
 - i. Waste Operations Management will control revision of this PCP. Changes to the program that may result from changes in vendor processes or plant activities should be identified to and reviewed by Waste Operations Management. Waste Operations Management and an Independent Safety Reviewer must review and approve changes to this procedure prior to submittal to the *ZionSolutions* Decommissioning Plant Manager.
 - ii. The *ZionSolutions* Decommissioning Plant Manager provides final document approval prior to issue and implementation.
- 2.) New process qualifications or changes in an existing process may be implemented prior to updating this procedure, provided the technical evaluation and approvals for that process are documented.
- 3.) Radiation Protection Management and Waste Operations Management should ensure that required changes are incorporated to this procedure as appropriate for planned activities.

- 4.) Waste shipment manifests and supporting documentation shall be retained until license termination plus 10 years. Support documents may include the analysis or a reference to the analysis used in the determination of the total activity contained in the disposal package.
- 5.) SHALL be submitted to the NRC in the Annual Radioactive Effluent Release Report for the period in which the change was made (including change in vendor).

4.1.14 The Radioactive Waste System shall be verified:

- 1.) At least annually by verification the Solid Radioactive Waste System has been operated in accordance with the Process Control Program, **OR**
- 2.) At least once annually by verification of the existence of a valid contract for solidification, dewatering, or processing is to be performed by a contractor in accordance with a Process Control Program specifying:
 - A. The method and frequency of analyses to verify solidification of radioactive waste.
 - B. The actions to be taken if solidification **IS NOT** verified.
 - C. Document by completing Attachment 1, "Verification of Existing Valid Contract for Solidification and Dewatering."

4.1.15 The Solid Radioactive Waste System shall be used, as applicable, in accordance with a PROCESS CONTROL PROGRAM for the solidification and packaging of wet radioactive wastes to meet shipping and burial ground requirements.

- 1.) These requirements shall be applicable at all times.
- 2.) **IF** the provisions of the Process Control Program **ARE NOT** satisfied, **THEN** shipments of potentially defective processed or packaged solid radioactive wastes from the site shall be suspended.

CAUTION:

Do **NOT** lift a HIC that contains greater than or equal to 500 curies.

4.1.16 To ensure compliance with offsite dose limits during a design basis HIC handling accident, ENSURE each HIC containing resins or dewatered wet waste contains less than 500 curies. (Reference 5.16)

- 1.) **IF** a HIC is determined to contain greater than or equal to 500 curies, **THEN** ENSURE activity is processed to another HIC BEFORE any handling or lifting activities.

4.1.17 The Process Control Program shall consist of: (reference 5.17 and 5.18)

- 1.) PCP-FO-AD-022, Ecodex Precoat/Powdex/Solka-Floc/Diatomaceous Earth/Zeolite Dewatering Procedure.
- 2.) PCP-FO-OP-023, Bead Resin / Activated Carbon Dewatering Procedure for CNSI 14-195 or Smaller Liners.

4.1.18 The Annual Radioactive Effluent Release Report:

- 1.) SHALL be submitted prior to May 1st of each year in accordance with T.S. 5.7.3.
- 2.) SHALL be in the format of Regulatory Guide 1.21 (Current revision).
- 3.) SHALL be summarized on an annual basis.
- 4.) SHALL include the following information for each type of solid waste shipped offsite during the report period:
 - Container Volume
 - Total Curie Quantity (specify whether determined by measurement or estimate)
 - Principal radionuclide's (specify whether determined by measurement or estimate).
 - Type of waste (e.g., spent resin, compacted dry waste, evaporator bottoms, etc.).
 - Type of container (e.g., LSA, Type A, Type B).
 - Solidification Agent (e.g., cement, urea formaldehyde).
 - Dates of shipment and disposition (if shipped offsite)

5. REFERENCES

- 5.1. Code of Federal Regulations, Title 10, "Energy", Appendix G to Part 20, "Requirements for Transfers of Low-Level Radioactive Waste Intended for Disposal at Licensed Land Disposal Facilities and Manifests."
- 5.2. Code of Federal Regulations, Title 10, "Energy", Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."
- 5.3. Code of Federal Regulations, Title 10, "Energy", Part 71, "Packaging and Transfer of Radioactive Material."
- 5.4. Code of Federal Regulations, Title 49, "Transportation", Sub Chapter C – Hazardous Materials Regulations, Part 173, "Shippers – General Requirements for Shipments."

- 5.5. NRC Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants.
- 5.6. NRC Generic Letter 91-02, "Reporting Mishaps Involving LLW Forms Prepared for Disposal."
- 5.7. Permanently Defueled Technical Specifications (PDTs).
- 5.8. 10CFR20, 10CFR50.36a, General Design Criteria 60 of Appendix A to 10CFR50, 10CFR61, and 10CFR71.
- 5.9. Regulatory Guide 1.21, Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants, Revision 2 (June 2009).
- 5.10. ZRP 6100-06, "Generation Of The Effluent and Waste Disposal Annual Report."
- 5.11. NRC Branch Technical Position On Concentration Averaging and Encapsulation, dated January 1995.
- 5.12. NRC Branch Technical Position On Waste Form, Rev.1, dated January 1991.
- 5.13. Zion Station Calculation No. 22N-0-119M-0001, Rev. 1, "Dose Effects on Radwaste Handling Accident Involving a HIC."
- 5.14. PCP-FO-AD-022, Ecodex Precoat/Powdex/Solka-Floc/Diatomaceous/Earth/Zeolite Dewatering Procedure."
- 5.15. PCP-FO-OP-023, Bead Resin/ Activated Carbon Dewatering Procedure for CNSI 14-195 or Smaller Liners.
- 5.16. 295-201-97-CAQD-121605 (Zion Corrective Action).

6. RECORDS

- 6.1. None.

7. ATTACHMENTS

- 7.1. Attachment 1, "Verification of Existing Valid Contract for Solidification and Dewatering"
- 7.2. Attachment 2, "Minimum Review Criteria for Solidification Processes"
- 7.3. Attachment 3, "Waste Types Suitable for Dewatering"
- 7.4. Attachment 4, "Prohibited Materials."

8. FORMS

- 8.1. None.

ATTACHMENT 1
Verification of Existing Valid Contract for Solidification and Dewatering
Page 1 of 1

I _____ on _____, have verified the existence of a valid
(Broker/Shipper) (Date)
contract to solidify or dewater waste by a Contractor at *ZionSolutions*. The contract
expires on _____.
(Date)

Note: When completed this document is to go to *ZionSolutions* File for filing with ZS-WM-123 package.

ATTACHMENT 2
Minimum Review Criteria for Solidification Processes

*Qualification of the solidification matrix shall be by test of non-radioactive simulated samples or actual samples of wet waste in accordance with the NRC Technical Position on Waste Form, Rev. 1, dated January, 1991. Successful qualification test results of physically and chemically similar wet waste (i.e. type tests) are acceptable. The qualification criteria shall include:

- A description of the acceptable waste form properties (free liquid, stability, etc.) determined by 10 CFR 61.56 and the applicable disposal facility requirements;
- Provisions for waste characterization;
- A discussion of the process control parameters important for assuring that the process will result in an acceptable waste form such as solidification agents, chemical additions, mixing ratios, mixing time, drying time and temperature. Acceptable ranges or boundary conditions for each parameter should be identified;
- Identification of measurement and test instrumentation and QC hold points required to monitor the process or verify that the process is operating within the acceptable range of the process control parameters specified above. The instrumentation shall be periodically calibrated with calibrations traceable to NIST;
- A procedure for sampling of the solidification process that will verify for each batch of wet wastes that the process control parameters result in complete solidification with no free liquids. If the sample fails to verify solidification, the procedure shall specify what actions are to be taken. Samples shall be clearly labeled and retrievable either up to the time of disposal or for long term storage and testing (6 and 12 months) as required for problem waste streams identified in Appendix A of the NRC's Technical Position on Waste Form;
- Identification of QC provisions to verify the absence of free liquid in each container processed. If free liquid is detected, the procedure shall ensure that free liquid is eliminated prior to shipment to a disposal facility. The presence of greater than 0.5 percent by volume of free liquid after the solidification of Class B or C waste forms shall be reviewed for reportability;
- For exothermic processes, a description of the process control parameters that must be satisfied prior to capping the container.

ATTACHMENT 3
Waste Types Suitable for Dewatering

- 1.0 Any common polystyrene-based bead ion exchange resins not included in the listing above are acceptable for dewatering subject to the following conditions:
- * The resin shall have a moisture content of less than or equal to 57 percent when shipped from the supplier to the plant.
 - * Mixtures of resins shall have a weighted average of "as shipped" moisture contents less than or equal to 57 percent.
- 3.0 The bead ion exchange resins qualified above shall also satisfy the following criteria to be acceptable for dewatering:
- * If oil or grease is detected in the media, the spent resin will be evaluated to quantify that the media contains less than 1% oil or grease by container volume.
 - * The media shall not contain significant quantities of corrosion products that could inhibit dewatering capabilities.
 - * The media shall not contain significant amounts of organic contaminants that could inhibit dewatering capabilities.
 - * Physical degradation of the media shall be limited to that due to routine water demineralization and resin transfer operations.
- 4.0 Miscellaneous metals and irradiated hardware are acceptable for dewatering as long as the shape does not create the potential to trap water.

ATTACHMENT 4
Prohibited Materials

Material Not Compatible with Polyethylene HIC

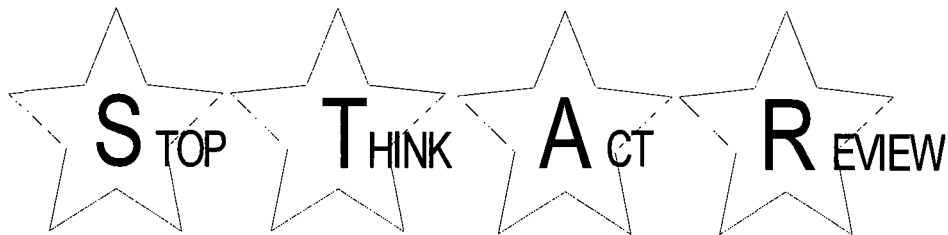
Acetone	Ethyl Butyrate	Nitrobenzene
Amyl Acetate	Ethyl Chloride	Octyl Cresol
Amyl Chloride	Ethyl Ether	Oleic Acid
Aqua Regia	Ethylene Chloride	Oleum
Benzene	Ethylene Chlorohydrin	Petroleum Ether
Bromine Liquid	Ethylene Dichloride	Phenol
Camphor Oil	Fluorine	Propylene Dichloride
Carbon Disulfide	Furfural	Sulfuric Acid (60%)
Carbon Tetrachloride	Furfuryl Alcohol	Tetrahydrofurane
Chloride Liquid	Fuel Oil	Tetralin
Moist Chlorine Gas	Gasoline	Titanium Tetrachloride
Chlorobenzene	Hydrofluoric Acid (conc.)	Toluene
Chloroform	Methyl Bromide	Trichloroethylene
Chlorosulfonic Acid	Methyl Chloride	Turpentine
Cyclohexanone	Methyl Ethyl Ketone (MEK)	Xylene
Dimethylamine	Methylene Chloride	
Ethyl Acetate	Nitric Acid (conc.)	

NOTE: High integrity containers shall not be subjected to concentrated free standing oil. However, this does not prohibit the materials in the HIC from containing incidental or trace amounts of oil or petroleum based materials which have been absorbed in the waste materials, provided that the amount of absorbed oil and petroleum based materials does not exceed one percent (1%) by waste volume in the container.

Process Control Program Requirements

March 5, 2013

ZionSolutions Project



Summary of Changes in this Revision:

- Rev. 2- Updated list of references to revision of regulatory guide revisions as described in ODCM. Updated references to reflect new procedural guidance. Edited wording of reporting requirements to reflect requirements of Rev 1 of Regulatory Guide 1.21. Two minor editorial changes.

1. PURPOSE AND SCOPE.....4

2. RESPONSIBILITIES.....4

3. DEFINITIONS4

4. MAIN BODY.....6

 4.1. Limitations6

 4.2. Procedure8

5. REFERENCES.....18

6. RECORDS18

7. ATTACHMENTS19

8. FORMS19

1. PURPOSE AND SCOPE

1.1. PURPOSE

This procedure provides the requirements to ensure the *ZionSolutions* PROCESS CONTROL PROGRAM process parameters are established to provide reasonable assurance that all low-level radioactive waste (LLRW) processed at *ZionSolutions* will meet or exceed any and all acceptance criteria for processing, packaging, shipment, and burial of LLRW in licensed burial facilities and as required by 10CFR Parts 20, 61, 71.

1.2. SCOPE

This procedure is applicable to all low-level radioactive waste processed at *ZionSolutions*. This criterion includes all Department of Transportation (DOT), Nuclear Regulatory Commission (NRC), State, and licensed burial facilities rules and regulations for the processing, packaging, shipping, and burial of LLRW.

2. RESPONSIBILITIES

2.1. Waste Operations Manager – is responsible for:

- Maintaining the Process Control Program and its overall implementation.
- Ensure that waste is processed and packaged in accordance with procedures that implement this program.

2.2. Quality Assurance Manager - is responsible for:

- Implements Quality Control hold points and independent verifications in implementing procedures to assure that regulatory requirements and disposal site criteria are satisfied.
- QA/QC Requirements.

2.3. EnergySolutions Waste Processor/Operator – is responsible for:

- Providing documentation of satisfactory processing by documenting completed *EnergySolutions* procedures and check sheets.

2.4. Broker/Shipper's - are responsible for:

- Implementation of this procedure.

3. DEFINITIONS

3.1. **Batch** - A fixed volume of wet waste with essentially uniform physical, chemical, and radiological properties. A single batch of wet waste maybe dewatered in several containers. An isolated tank of agitated wet waste is an example of a batch.

3.2. **Disposal Facility** - An off-site facility for the disposal of radioactive waste which is licensed for that purpose by the host state and/or the NRC.

- 3.3. **Dewatering** - The process in which excess water is removed from the waste to meet the burial site acceptance criteria.
- 3.4. **Dry Active Waste (DAW)** - Radioactive Waste that is typically paper, wood, plastic, trash, air filters, metal, soil, concrete, asphalt, and used plant components, which without processing, contains essentially no free liquid.
- 3.5. **Irradiated Hardware** - Neutron activated non-fuel-bearing components.
- 3.6. **Item** - Any level of unit assembly, including structures, systems, subsystems, and subassemblies, components, part, or material.
- 3.7. **Mishap** - The misuse or failure of Class B or C waste forms or high integrity containers that require evaluation for reportability in accordance with NRCs Technical Position on Waste Form, Rev.1, January 1999 and NRC Generic Letter 91-02.
- 3.8. **Process Control Program (PCP)** - Shall contain the approved formulas, sampling, analyses, tests and determinations to be made to ensure that the 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:
- 10CFR Parts 20, 61 and 71
 - 49CFR Parts 171-178
 - State regulations
 - Burial ground requirements
 - Other requirements governing the shipping and disposal of radioactive waste

The majority of PCP scope deals with, but is not limited to, wet wastes. Documents listed in the References Section of this procedure may be useful in providing more detailed clarification of the PCP program.

- 3.9. **Radioactive Waste Package** - The packaging together with its radioactive contents as presented for transport.
- 3.10. **Radioactive Waste Packaging** - The assembly of components necessary to ensure compliance with the packaging requirements of 49CFR and 10CFR71. It may consist of one or more containers, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, tie-down system, and auxiliary equipment may be designated as part of the packaging.
- 3.11. **Radioactive Material** - Byproduct material, source material, special nuclear material, and technologically enhanced naturally occurring radioactive material (NORM) as defined in regulation. This includes, but is not limited to: station generated radioactive waste, radioactive material to be shipped to another licensee, and spent fuel.

- 3.12. **Radioactive Material (for shipping purposes only)** - Material having a specific and total activity as defined in 49CFR §173.436. If the material is not radioactive for the purposes of hazardous material Class 7 transport, it is not subject to the requirements of 49CFR173. However, this is not considered free release criteria or considered non-radioactive under the provisions of 10CFR20.
- 3.13. **Radioactive Waste (Radwaste or Waste)** - Radioactive Material that has no further economic value and is to be shipped to a decontamination, volume reduction, or disposal facility.
- 3.14. **Radioactive Waste System(s)** - Radioactive waste systems begin at the interface valve(s) in each line from other systems provided for collecting wastes that may contain radioactive materials and include related instrumentation and control systems. The radioactive waste system terminates at the point of controlled discharge to the environment, at the point of recycle to the primary or secondary water storage, or at the point of packaged solid wastes prior to shipment offsite to a licensed disposal facility.
- 3.15. **Stabilized** - The use of an approved container or process to provide an acceptable waste form. Some waste forms themselves are inherently stable.
- 3.16. **Temporary System** - Systems intended for short-term duration and subsequent removal once they have completed their specific task or tasks. This does not include permanent systems, consumables, or vehicles and casks used to pick up/delivery service. Mobile radioactive waste processing systems to support decommissioning activities are examples of temporary systems.
- 3.17. **Waste Stream** - An individual, specific type or source of radioactive waste and its associated process that exhibit similar radionuclide distributions.
- 3.18. **Wet Waste** - Radioactive Waste containing free standing liquids or packaged underwater. Wet waste is usually solidified, encapsulated, or dewatered before shipping for disposal. Wet waste being sent to a processor may still contain water. Examples include radioactively spent resin, liquid filters, sludge oil, decontamination fluids, and irradiated hardware packaged underwater.

4. **MAIN BODY**

4.1. **Limitations**

- 4.1.1 ZionSolutions does not plan to solidify waste for direct transfer to a disposal facility. If on-site solidification is required, an outside vendor will perform that function under the vendor's PCP, which will be reviewed and approved by Waste Operations prior to commencing any solidification activities:
- 1.) Any proposed solidification process shall be evaluated for acceptability and applicability to the waste stream intended for solidification on a case-by-case basis.

- 2.) The vendor PCP will be evaluated by Waste Operations Management prior to implementation and receive review and approval in accordance with applicable *ZionSolutions* procedures. The review will identify that there is sufficient supporting documentation of the vendor's PCP to give assurance that the final product will meet or exceed all requirements for transport and disposal, and that sufficient procedural controls exist to assure safe operations.
- 3.) Solidification procedures shall be reviewed and approved in accordance with *ZionSolutions* procedures.
- 4.1.2 The content of a High Integrity Container (HIC) containing resins or dewatered wet wastes shall not contain greater than or equal to 500 curies. (Reference 5.12)
- 4.1.3 Radioactive Waste Requirements: The basis for the functionality of the radioactive waste system is to ensure the system will be available for use whenever radioactive waste requires processing and packaging prior to being shipped offsite. These radioactive waste requirements implement the requirements of 10CFR §50.36a and General Design Criteria 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, mixing and curing times.
- 4.1.4 Liquid LLRW Requirements for Vendors: *ZionSolutions* requires that all vendors who process liquid LLRW meet all *EnergySolutions* quality standards and shall use an NRC approved PROCESS CONTROL PROGRAM Topical report. Furthermore, the vendor solidification/stabilization media must be approved by the licensed burial sites.
- 4.1.5 The process control activities described in this program and the high integrity containers (HICs) and liners referenced in the NRC's radioactive waste packaging Certificate of Compliance (C of C) are QA approved. Process or equipment failures are subject to the requirements of 10CFR21, "Reporting of Deficiencies and Noncompliance."
- 4.1.6 During the processing or dewatering of Class B or C waste, deviations from the process control parameters or acceptable waste form properties shall be evaluated for reportability as "mishaps". Failures during qualification testing are not considered "mishaps" and are not reportable events. Mishaps shall be reported to the NRC within 30 days of knowledge of the event and approval from the disposal site shall be obtained prior to shipment.
- 4.1.7 Liquid wastes will be solidified in accordance with the NRC Technical Position on Waste Form, Rev. 1, January 1999; Waste Form Technical Position, Rev. 1, and the applicable disposal site criteria prior to disposal. (See Attachment 2 for details).
- 4.1.8 Containers, shipping casks, and methods of packaging will meet applicable federal regulations, e.g., 10CFR71 and 49CFR173, Subpart I.

- 4.1.9 Waste classification will meet the requirements of 10CFR61 and disposal site criteria.
- 4.1.10 Procedures or other administrative controls/documents shall assure that the radioactivity content transferred to any one liner or HIC will not result in exceeding the design basis site boundary dose calculated in Reference 5.16.

4.2. Procedure

4.2.1 Review and Qualification of Solidification Processes

- 1.) *ZionSolutions* does not plan to solidify or encapsulate waste for direct transfer to a disposal facility. If on-site solidification or encapsulation is required, an outside vendor will perform that function under the vendor's PCP, which will be reviewed and approved as follows:
 - A. Any proposed solidification process shall be evaluated for acceptability and applicability to the waste stream intended for solidification on a case by case basis
 - B. The vendor PCP will be evaluated by Waste Operations Management prior to implementation and receive review and approval in accordance with applicable *ZionSolutions* procedures. The review shall identify that there is sufficient supporting documentation of the vendor's PCP to give assurance that the final product will meet all requirements for transport and disposal, and that sufficient procedural controls exist to assure safe operations.
 - C. Solidification procedures shall be reviewed and approved in accordance with applicable *ZionSolutions* procedures.

4.2.2 High Integrity Containers (HICs)

- 1.) A HIC may be used to provide stability in lieu of the requirement for waste form stability. HICs must meet applicable regulatory and disposal site requirements and procedures for their use shall be reviewed and approved by Waste Operations Management prior to their use
- 2.) The qualification criteria for HICs include:
 - A. The container design shall be qualified in accordance with the NRC Branch Technical Position on Waste Form, (Rev. 1, 1991) and the requirements of the disposal facility. If applicable, the regulatory agency for the disposal facility shall issue a Certificate of Compliance (C of C) or otherwise approve the design.
 - B. Plant and vendor procedures shall meet the fabrication, testing, inspection, and maintenance, preparation for use, filling, storage, handling, and transportation and disposal requirements of the applicable certificate of compliance.

- C. Waste processed in HICs may utilize the HIC as the stable waste form to meet the stability and free liquid requirements of 10 CFR §61.56 and the disposal facility. However, the process control parameters for the waste processing shall be controlled to within the limitations of the C of C on the HIC (typically temperature or chemical limitations in the C of C may require additional controls in the process).
- 3.) Approved procedures support the control of materials that are prohibited in HICs containing radioactive waste. Prohibited materials are specific to the HIC qualification and certification but Attachment 4, "Prohibited Materials" provides a typical listing.

4.2.3 Reportable Events

- 1.) Mishaps involving the container or solidification process shall be evaluated for reportability under 10 CFR 21. Also, mishaps involving the HIC during or after processing and deviation from prescribed process control parameters for solidification shall be evaluated for reportability. In Generic Letter 91-02, the NRC expressed specific interest in reporting the following circumstances:
- A. Failure of a High Integrity Container used to ensure a stable waste form. Changed container dimensions, cracking or damage from mishandling can be evidence of container failure.
- B. The presence of free liquids in excess of 1% of the waste volume or excessive void space within the container. Such misuse is prohibited by 10 CFR §61.56 (b) (2).
- C. A solidified Class B or C waste form that has any of the following characteristics:
- Contains free liquids in quantities exceeding 0.5% of the volume of the waste.
 - Contains waste with radionuclides in concentrations exceeding those considered during waste form qualification testing accepted by the regulatory agency, which could lead to errors in assessment of waste class.
 - Contains significantly different waste loading than was used in the qualification testing accepted by the regulatory agency.
 - Contains chemical ingredients not present in qualification testing accepted by the regulatory agency, and those quantities are sufficient to unacceptably degrade the waste product.
 - Shows instability evidenced by crumbling, cracking, spalling, voids, softening, disintegration, non-homogeneity, or dimensional changes.

- Evidence of processing phenomenon that exceed the limiting processing conditions identified in the applicable topical reports on process control plans, e.g., foaming, temperature extremes, premature or slow hardening, and production of volatile material.
- D. Mishaps shall be documented using the station corrective action process.
- E. Mishaps may be subject to a 30 day reporting criteria and require approval of the disposal facility prior to transport.

4.2.4 Cartridge Filter Elements

- A. Cartridge filter elements may be shipped for off-site processing and disposal. The vendor's processes should be reviewed to ensure compliance with the applicable disposal site criteria and 10 CFR 61 requirements.
- B. Cartridge filter elements may be processed on-site for direct disposal. Cartridge filter elements shall be processed using an approved dewatering system in accordance with approved procedures. The dewatering process shall be tested and the methodology accepted as meeting the applicable burial site criteria and 10 CFR 61 requirements.
- C. The processing procedures for filters dewatered on-site for direct disposal shall be reviewed and approved in accordance with applicable procedures.
- D. Class A filters requiring stabilization and Class B and Class C filters shall be disposed of in an approved HIC or a solidified matrix that satisfies the stabilized waste form criteria of 10 CFR §61.56(b).
- E. The packaging of cartridge filters for disposal shall be in accordance with the Reference 5.12.

4.2.5 Demineralizer Resins

- A. Depleted resins may be shipped for off-site processing and disposal. The vendor's processes should be reviewed to ensure compliance with the applicable disposal site criteria and 10 CFR 61 requirements.
- B. Depleted resins may be processed on-site for direct disposal. Depleted resins shall be processed using an approved dewatering system in accordance with approved procedures. The dewatering process shall be tested and the methodology accepted as meeting the applicable burial site criteria and 10 CFR 61 requirements.
- C. The processing procedures for depleted resins dewatered on-site for direct disposal shall be reviewed and approved in accordance with applicable procedures.

- D. Acceptable waste types suitable for processing and dewatering on-site are listed in Attachment C. Resin types or waste forms not specifically listed shall be reviewed and approved by Waste Operations Management prior to use.
- E. A valid 10 CFR 61 analysis will be used to determine the radionuclide distribution. This information along with waste volume per package, weight per package, and package size will be used to determine the liner's specific activity.
- F. The package's total activity may be based on a dose rate to curie conversion factor or extrapolation of the sample analysis consistent with the waste classification methodology explained later in this procedure.
- G. Class A waste resins requiring stabilization and Class B and Class C waste resins shall be disposed of in an approved HIC or a solidified matrix that satisfies the stabilized waste form criteria of 10 CFR §61.56(b).
- H. Other methods of processing resins shall be reviewed and approved by Waste Operations Management prior to implementation.

4.2.6 Dry Active Waste (DAW)

- A. DAW is typically packaged into boxes, gondola railcars, intermodal containers, or C-vans and shipped to a licensed vendor that processes the DAW for final disposal or shipped directly to a licensed disposal facility.
- B. DAW is examined prior to packaging to screen out items that may conflict with a vendor's ability to process the material or the disposal site criteria.
- C. Removal of prohibitive items such as liquids or items found in DAW that would compromise the integrity of the package are removed and separated for special handling.
- D. Controls and/or inspection criteria are established for the receipt and prior-to-use inspections of transport containers and disposal containers for DAW packages shipped directly for disposal.

4.2.7 Irradiated Metal/Hardware

- A. Verification of suitability for disposal shall be determined through collaboration with the processing or disposal facility. Special characterization methodology may be required for components and a review and approval by the disposal facility prior to shipment is likely. The packaging of irradiated object(s) for direct disposal may be limited by the package or cask used for transport. Shipping and disposal documentation shall be reviewed by Waste Operations Management and deemed acceptable by the processing or disposal facility prior to shipment.
- B. IF the material is recycled or processed prior to disposal, the material will be packaged for transport in accordance with 49 CFR, 10 CFR, and any limitations of the package or transport cask. Disposal is based on the vendor's process control program.

4.2.8 Incinerable Fluids

- A. Fluids that are capable of being incinerated (e.g. hydraulic fluids, lubricating oils, etc.) may be shipped to a processor that is licensed to perform that activity.
- B. The vendor will be evaluated and approved by Waste Operations Management prior to implementation. Disposal is based on the vendor's process control program.
- C. In the process, the fluid is typically consumed and the resultant activity captured for disposal or released under the vendor's license. The vendor may return any material that cannot be processed for disposal to *ZionSolutions*.

4.2.9 Sludges/Bottoms

- A. Wet wastes that are not capable of being incinerated may be processed by a vendor licensed to process, concentrate and/or solidify wet wastes. Processing resulting in on-site solidification is subject to the process controls for solidification discussed earlier.
- B. The vendor may return any material that cannot be processed for disposal to *ZionSolutions*.

4.2.10 Prohibited Waste Constituents

- 1.) No radioactive waste capable of detonation or of explosive decomposition or reaction will be shipped for disposal per 10 CFR §61.56 (a) (4). Components containing explosive materials, such as some automatic valves (e.g. fire protection valves on Halon and/or CO₂ systems), should be identified and the removal or disposal of these valves controlled by the work control process.

- 2.) No radioactive waste capable of generating toxic gases, vapors, or fumes will be shipped for disposal per 10 CFR §61.56 (a) (5).
- 3.) No radioactive waste that is pyrophoric will be shipped for disposal per 10 CFR §61.56 (a) (6).
- 4.) Control of the generation of these types of waste is provided through the use of approved *ZionSolutions* procedures.

4.2.11 Mixed Waste

- 1.) No mixed waste will be submitted for disposal per 10 CFR §61.56 (a) (8) unless properly treated.
- 2.) *ZionSolutions* will ship its mixed waste inventory to licensed and permitted facilities for processing prior to disposal.
- 3.) The vendor will be evaluated by Waste Operations Management prior to implementation. Disposal is based on the vendor's process control program.
- 4.) The vendor's processes will also be reviewed to ensure compliance with 40 CFR requirements.
- 5.) Control of the generation of mixed waste is provided through approved *ZionSolutions* procedures.
- 6.) Material safety data sheets (MSDS) on consumable materials are maintained for chemicals used on site.

4.2.12 Waste Characterization

Approved *ZionSolutions* procedures shall specify the method of waste classification to meet the requirements of 10 CFR §61.55. These procedures shall include the collection of data, computational methods, computer codes, etc. The following is a synopsis of the methodology employed and required elements of the procedures.

- 1.) Individuals performing the calculations described in this section and the reviewer of those calculations shall be specifically approved to perform that function by the Waste Operations Manager/Designee and/or otherwise qualified through an approved qualification program in accordance with station procedures. Approval, in lieu of specific qualification, should be based on experience at other nuclear facilities and/or demonstrated proficiency with the types of calculations or computer codes required.
- 2.) Radioactive waste streams are sampled and/or assessed biannually, prior to shipment, or after any evolution that may affect the distribution of radionuclides by a factor of ten (10) in waste streams for Class A, B, and C waste as defined in 10 CFR §61.55. An assay of beta, gamma and alpha emitting radionuclides will be performed.
- 3.) An approved outside laboratory is used by *ZionSolutions* to analyze waste streams to determine the distribution and activity of radionuclides listed in Tables 1 and 2 of 10 CFR 61.

- 4.) For resin wastes, isotopic analysis is normally performed on samples of resin obtained prior to or during processing. Representative resin samples are analyzed for gamma components and appropriate scaling factors are applied to key gamma radionuclides (such as Co-60 or Cs-137) to determine the specific activity of difficult to measure radionuclides expected in the waste stream based on a prior laboratory analysis. The total activity present in a container is calculated based on the specific activity and the volume or weight of the waste in the container or dose rate to curie conversion calculations.
- 5.) For containers of cartridge filters, dose rate to curie conversion calculations are performed on each filter or batch of filters to determine the total gamma activity present. Scaling factors are applied to key gamma radionuclide curie content to determine the activity of those radionuclides not measured by gamma analysis or dose rate measurement.
- 6.) For DAW, dose rate to curie conversion calculations are performed to determine the total gamma emitter activity present in a container.
- 7.) Computational methods (including computer codes used to perform waste classification) shall be verified and validated by an individual as described in 4.2.12.1 as follows:
 - A. An individual shall review the computational methods basis document or manual.
 - B. The reviewer shall ensure technical accuracy, technical adequacy, reasonableness of assumptions, and traceability of data.
 - C. Calculation results shall be benchmarked against other verified methods to prove reasonable agreement.
 - D. Initial reviews and benchmark results shall be documented.
 - E. The verification / validation shall be reviewed and approved prior to implementation of the method.
- 8.) Calculations to determine curie content and waste classification of radioactive waste performed by means other than computer codes (i.e. manual calculations, etc.) shall be checked by a qualified individual as defined in 4.2.12.1, other than the originator, who shall be responsible to check and document the following:
 - A. Check the appropriateness of the application of the computational method;
 - B. Check assumptions and input data for reasonableness;
 - C. Perform a sufficient number of checks of the calculations to reasonably test accuracy and consistency of the results, OR,

- D. Perform a check of the results by comparison with other similar calculations,
- 9.) Calculation methodology to assess the concentration of radionuclides for waste disposal shall incorporate the guidance provided in the NRC's "Final Branch Technical Position on Concentration Averaging and Encapsulation", January 1995.

4.2.13 PCP Document and Procedure Control

- 1.) Changes to the Process Control Program:
 - A. SHALL be documented and records of reviews performed shall be retained as required by Permanently Defueled Technical Specifications (PDTs) 5.9.1 (Qualified Technical Review). The documentation shall contain:
 - i. Sufficient information to support the change together with the appropriate analyses or evaluations justifying change(s).
 - ii. 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.
 - B. SHALL become effective after review and acceptance by:
 - i. Waste Operations Management will control revision of this PCP. Changes to the program that may result from changes in vendor processes or plant activities should be identified to and reviewed by Waste Operations Management. Waste Operations Management and an Independent Safety Reviewer must review and approve changes to this procedure prior to submittal to the *ZionSolutions* Decommissioning Plant Manager.
 - ii. The *ZionSolutions* Decommissioning Plant Manager provides final document approval prior to issue and implementation.
- 2.) New process qualifications or changes in an existing process may be implemented prior to updating this procedure, provided the technical evaluation and approvals for that process are documented.
- 3.) Radiation Protection Management and Waste Operations Management should ensure that required changes are incorporated to this procedure as appropriate for planned activities.
- 4.) Waste shipment manifests and supporting documentation shall be retained until license termination plus 10 years. Support documents may include the analysis or a reference to the analysis used in the determination of the total activity contained in the disposal package.

- 5.) SHALL be submitted to the NRC in the Annual Radioactive Effluent Release Report for the period in which the change was made (including change in vendor).

4.2.14 The Radioactive Waste System shall be verified:

- 1.) At least annually by verification the Solid Radioactive Waste System has been operated in accordance with the Process Control Program, **OR**
- 2.) At least once annually by verification of the existence of a valid contract for solidification, dewatering, or processing is to be performed by a contractor in accordance with a Process Control Program specifying:
 - A. The method and frequency of analyses to verify solidification of radioactive waste.
 - B. The actions to be taken if solidification **IS NOT** verified.
 - C. Document by completing Attachment 1, "Verification of Existing Valid Contract for Solidification and Dewatering."

4.2.15 The Solid Radioactive Waste System shall be used, as applicable, in accordance with a PROCESS CONTROL PROGRAM for the solidification and packaging of wet radioactive wastes to meet shipping and burial ground requirements.

- 1.) These requirements shall be applicable at all times.
- 2.) **IF** the provisions of the Process Control Program **ARE NOT** satisfied, **THEN** shipments of potentially defective processed or packaged solid radioactive wastes from the site shall be suspended.

CAUTION:

Do **NOT** lift a HIC that contains greater than or equal to 500 curies.

4.2.16 To ensure compliance with offsite dose limits during a design basis HIC handling accident, ENSURE each HIC containing resins or dewatered wet waste contains less than 500 curies. (Reference 5.16)

- 1.) **IF** a HIC is determined to contain greater than or equal to 500 curies, **THEN** ENSURE activity is processed to another HIC BEFORE any handling or lifting activities.

4.2.17 The Process Control Program shall consist of: (reference 5.14 and 5.15)

- 1.) PCP-FO-AD-022, Ecodex Precoat/Powdex/Solka-Floc/Diatomaceous Earth/Zeolite Dewatering Procedure.
- 2.) PCP-FO-OP-023, Bead Resin / Activated Carbon Dewatering Procedure for CNSI 14-195 or Smaller Liners.

4.2.18 The Annual Radioactive Effluent Release Report:

- 1.) SHALL be submitted prior to May 1st of each year in accordance with T.S. 5.7.3.
- 2.) SHALL be in the format of Regulatory Guide 1.21, Revision 1- (Table 3). Also shown in reference 5.10 (Attachment 3.)
- 3.) SHALL be summarized on an annual basis.
- 4.) SHALL include the following information for each type of solid waste and irradiated fuel shipped offsite during the report period:
 - A. Spent resins, filter sludges, evaporator bottoms.
 - B. Dry compressible waste, contaminated equipment etc.
 - C. Irradiated components.
 - D. Other (furnish description).
 - i. Indicate the following information for each type of waste listed above (A – D):
 - Total Volume in cubic meters.
 - Total Radioactivity in Curies (specify whether determined by measurement or estimate)
 - Principal radionuclide's (specify whether determined by measurement or estimate).
 - Type of container (e.g., LSA, Type A, Type B).
 - Solidification Agent (e.g., cement, urea formaldehyde).
 - Dates of shipment and disposition. Identify the number of shipments, the mode of transport, and the destination.
 - The disposition of irradiated fuel shipments. Identify the number of shipments, the mode of transport, and the destination.
 - Estimates of the total error associated with certain total values. (See Table 3 of reference 5.9 or Attachment 3 of reference 5.10).

5. REFERENCES

- 5.1. Code of Federal Regulations, Title 10, "Energy", Appendix G to Part 20, "Requirements for Transfers of Low-Level Radioactive Waste Intended for Disposal at Licensed Land Disposal Facilities and Manifests."
- 5.2. Code of Federal Regulations, Title 10, "Energy", Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."
- 5.3. Code of Federal Regulations, Title 10, "Energy", Part 71, "Packaging and Transfer of Radioactive Material."
- 5.4. Code of Federal Regulations, Title 49, "Transportation", Sub Chapter C – Hazardous Materials Regulations, Part 173, "Shippers – General Requirements for Shipments."
- 5.5. NRC Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants."
- 5.6. NRC Generic Letter 91-02, "Reporting Mishaps Involving LLW Forms Prepared for Disposal."
- 5.7. Permanently Defueled Technical Specifications (PDTs).
- 5.8. 10CFR20, 10CFR50.36a, General Design Criteria 60 of Appendix A to 10CFR50, 10CFR61, and 10CFR71.
- 5.9. Regulatory Guide 1.21, Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants, Revision 1 (June 1974).
- 5.10. ZS-RP-109-001-002, "Generation of the Annual Radioactive Effluent Release Report (ARERR)."
- 5.11. NRC Branch Technical Position On Concentration Averaging and Encapsulation, dated January 1995.
- 5.12. NRC Branch Technical Position On Waste Form, Rev.1, dated January 1991.
- 5.13. Zion Station Calculation No. 22N-0-119M-0001, Rev. 1, "Dose Effects on Radwaste Handling Accident Involving a HIC."
- 5.14. PCP-FO-AD-022, Ecodex Precoat/Powdex/Solka-Floc/Diatomaceous/Earth/Zeolite Dewatering Procedure."
- 5.15. PCP-FO-OP-023, Bead Resin/ Activated Carbon Dewatering Procedure for CNSI 14-195 or Smaller Liners.
- 5.16. 295-201-97-CAQD-121605 (Zion Corrective Action).

6. RECORDS

None

7. ATTACHMENTS

- 7.1. Attachment 1 - Verification of Existing Valid Contract for Solidification and Dewatering
- 7.2. Attachment 2 - Minimum Review Criteria for Solidification Processes
- 7.3. Attachment 3 - Waste Types Suitable for Dewatering
- 7.4. Attachment 4 - Prohibited Materials.

8. FORMS

None

ATTACHMENT 1
Verification of Existing Valid Contract for Solidification and Dewatering
Page 1 of 1

I _____ on _____, have verified the existence of a valid
(Broker/Shipper) (Date)
contract to solidify or dewater waste by a Contractor at *ZionSolutions*. The contract
expires on _____.
(Date)

Note: When completed this document is to go to *ZionSolutions* File for filing with ZS-WM-123 package.

ATTACHMENT 2
Minimum Review Criteria for Solidification Processes

*Qualification of the solidification matrix shall be by test of non-radioactive simulated samples or actual samples of wet waste in accordance with the NRC Technical Position on Waste Form, Rev. 1, dated January, 1991. Successful qualification test results of physically and chemically similar wet waste (i.e. type tests) are acceptable. The qualification criteria shall include:

- A description of the acceptable waste form properties (free liquid, stability, etc.) determined by 10 CFR 61.56 and the applicable disposal facility requirements;
- Provisions for waste characterization;
- A discussion of the process control parameters important for assuring that the process will result in an acceptable waste form such as solidification agents, chemical additions, mixing ratios, mixing time, drying time and temperature. Acceptable ranges or boundary conditions for each parameter should be identified;
- Identification of measurement and test instrumentation and QC hold points required to monitor the process or verify that the process is operating within the acceptable range of the process control parameters specified above. The instrumentation shall be periodically calibrated with calibrations traceable to NIST;
- A procedure for sampling of the solidification process that will verify for each batch of wet wastes that the process control parameters result in complete solidification with no free liquids. If the sample fails to verify solidification, the procedure shall specify what actions are to be taken. Samples shall be clearly labeled and retrievable either up to the time of disposal or for long term storage and testing (6 and 12 months) as required for problem waste streams identified in Appendix A of the NRC's Technical Position on Waste Form;
- Identification of QC provisions to verify the absence of free liquid in each container processed. If free liquid is detected, the procedure shall ensure that free liquid is eliminated prior to shipment to a disposal facility. The presence of greater than 0.5 percent by volume of free liquid after the solidification of Class B or C waste forms shall be reviewed for reportability;
- For exothermic processes, a description of the process control parameters that must be satisfied prior to capping the container.

ATTACHMENT 3

Waste Types Suitable for Dewatering

- 1.0 Any common polystyrene-based bead ion exchange resins not included in the listing above are acceptable for dewatering subject to the following conditions:
 - * The resin shall have a moisture content of less than or equal to 57 percent when shipped from the supplier to the plant.
 - * Mixtures of resins shall have a weighted average of "as shipped" moisture contents less than or equal to 57 percent.
- 2.0 The bead ion exchange resins qualified above shall also satisfy the following criteria to be acceptable for dewatering:
 - * If oil or grease is detected in the media, the spent resin will be evaluated to quantify that the media contains less than 1% oil or grease by container volume.
 - * The media shall not contain significant quantities of corrosion products that could inhibit dewatering capabilities.
 - * The media shall not contain significant amounts of organic contaminants that could inhibit dewatering capabilities.
 - * Physical degradation of the media shall be limited to that due to routine water demineralization and resin transfer operations.
- 3.0 Miscellaneous metals and irradiated hardware are acceptable for dewatering as long as the shape does not create the potential to trap water.

ATTACHMENT 4
Prohibited Materials

Material Not Compatible with Polyethylene HIC

Acetone	Ethyl Butyrate	Nitrobenzene
Amyl Acetate	Ethyl Chloride	Octyl Cresol
Amyl Chloride	Ethyl Ether	Oleic Acid
Aqua Regia	Ethylene Chloride	Oleum
Benzene	Ethylene Chlorohydrin	Petroleum Ether
Bromine Liquid	Ethylene Dichloride	Phenol
Camphor Oil	Fluorine	Propylene Dichloride
Carbon Disulfide	Furfural	Sulfuric Acid (60%)
Carbon Tetrachloride	Furfuryl Alcohol	Tetrahydrofurane
Chloride Liquid	Fuel Oil	Tetralin
Moist Chlorine Gas	Gasoline	Titanium Tetrachloride
Chlorobenzene	Hydrofluoric Acid (conc.)	Toluene
Chloroform	Methyl Bromide	Trichloroethylene
Chlorosulfonic Acid	Methyl Chloride	Turpentine
Cyclohexanone	Methyl Ethyl Ketone (MEK)	Xylene
Dimethylamine	Methylene Chloride	
Ethyl Acetate	Nitric Acid (conc.)	

NOTE: High integrity containers shall not be subjected to concentrated free standing oil. However, this does not prohibit the materials in the HIC from containing incidental or trace amounts of oil or petroleum based materials which have been absorbed in the waste materials, provided that the amount of absorbed oil and petroleum based materials does not exceed one percent (1%) by waste volume in the container.