PROCESS CONTROL PROGRAM
(PCP)

SEQUOYAH NUCLEAR PLANT

REVISION 0

PLANT MANAGER _____ DATE: _____

PORC REVIEW _____ DATE: 3-2-90

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1.0 INTRODUCTION

1.1 Scope

This Process Control Program (PCP) applies to radioactive waste solidification and dewatering of wet solid radioactive wastes generated as a result of the operation and maintenance of Sequoyah Nuclear Plant (SQN). This PCP does not apply to the treatment of mixed radioactive and hazardous wastes.

1.2 Purpose

The PCP provides the controls necessary to ensure that disposal criteria are met by SQN processing techniques, or by vendor supplied systems, if used for dewatering or solidification.

2.0 DEFINITIONS

2.1 Absorb - To take liquid in through pores, or as if through pores or interstices of a material.

2.2 Absorbent - Media or material used to absorb liquid.

2.3 Batch - An isolated quantity of waste to be processed having constant physical and chemical characteristics.

2.4 Container - The primary receptacle in which processed wastes (dewatered, solidified, or absorbed) are packaged for disposal.

2.5 Dewatered - Wet solid wastes which have had excess water removed.

2.6 Free Liquid - Uncombined liquid not bound by the solid matrix of the solid waste mass; capable of flowing.

2.7 Homogeneous - Of uniform composition; the waste is uniformly distributed throughout the container.

2.8 Liquid waste - For the purposes of this PCP, any aqueous or non-aqueous radioactive liquid which requires solidification or absorption before disposal. This may include oils, chemicals, water or other liquids unsuitable for inplant cleanup or treatment.

2.9 Mixed waste - Low-level radioactive wastes containing chemical constituents which are hazardous under Environmental Protection Agency regulations in 40 CFR Part 261.

2.10 Solidification agent - Material which, when mixed in prescribed proportions with liquid or wet solid wastes, can form a free-standing product with no free liquid.

2.11 Solidification - Shall be the conversion of wet radioactive wastes into a form that meets shipping and burial ground requirements.

2.12 Stability - A property of the waste form such that it is able to maintain its structural integrity under the expected disposal conditions; stabilized waste should maintain its gross physical properties and identity over a 300 year period.

2.13 Wet solid wastes - Evaporator concentrates, filter aid sludge, bead ion exchange resins, and other sludges or slurries consisting of liquids with a high insoluble solid content.

3.0 REFERENCES

3.1 Code of Federal Regulations (CFR) Title 10, Parts 20, 61, and 71 (10 CFR 20, 10 CFR 61, and 10 CFR 71) - Energy

3.2 Code of Federal Regulations (CFR) Title 49 (49 CFR) - Transportation

3.3 Sequoyah Nuclear Plant Final Safety Analysis Report, Chapter 11.5

3.4 Sequoyah Nuclear Plant Technical Specifications

3.5 TVA Office of Nuclear Power Radioactive Material Shipment Manual (RMSM)

3.6 Nuclear Regulatory Commission (NRC) Low-Level Waste Licensing Branch Technical Position on Radioactive Waste Classification, May 1983, Rev. 0

3.7 Nuclear Regulatory Commission (NRC) Technical Position on Waste Form, May 1983, Rev. 0

3.8 Solidification Topical Report References

3.8.1 4313-01354P-01-A, Chem-Nuclear Systems, Inc., Mobile Cement Solidification System

3.8.2 Chem-Nuclear Systems, Inc., Topical Report, Waste Form Certification Program

Report I: PMC Binder Chemistry
Report II: Pozzolanic Binder Chemistry
Report III: Cement Binder Chemistry

3.8.3 Test Results, Waste Form PWR-80, Chem-Nuclear Systems, Inc.

3.8.4 Test Results, Waste Form In-Situ P-14, Chem-Nuclear Systems, Inc.

3.9 Solidification Vendor Procedures

3.9.1 CNSI, SD-OP-003-492, Process Control Program for CNSI Cement Solidification Units at Sequoyah

3.9.2 CNSI, SD-OP-022, Operating Procedure for CNSI Portable Cement Solidification Unit No. 24 (PSU-C-24)

3.9.3 CNSI, SD-OP-026-492, Process Control Program for Cement/Oil Solidification at TVA Sequoyah

3.9.4 CNSI, SD-OP-048, Operating Procedure for In-Situ Solidification of Suspended Objects

3.10 Dewatering Topical Report References

3.10.1 DW-11118-01-P-A, Chem-Nuclear Systems, Inc., CNSI Dewatering Control Process Containers

3.11 Dewatering Vendor Procedures

3.11.1 CNSI, FO-OP-023, Bead Resin/Activated Carbon Dewatering Procedure for CNSI 14-215 or Smaller Liners

3.11.2 CNSI, FO-OP-19, Polyethylene High Integrity Container Overpack Handling Procedure

3.11.3 CNSI, FO-AD-002, Operating Guidelines for Use of Polyethylene High Integrity Containers

4.1 Waste Streams

Eight general waste streams have been identified at SQN. These are Primary Resin, Secondary Resin, Radwaste Resin, Sludges and Evaporator Concentrates, Oil, Miscellaneous Chemical Wastes, Filter Elements, and Dry Active Waste (DAW). This PCP is not normally applicable to DAW. Other waste streams may be established based upon plant operating characteristics.

Primary resins are collected in the spent resin storage tank for blending, decay, and storage. Primary resin sources are Chemical and Volume Control System (CVCS) letdown demineralizers, boric acid evaporator demineralizers, and fuel pool demineralizers.

Secondary resin sources are condensate polisher resins and steam generator blowdown demineralizers.

Radwaste resins are contained in the portable radwaste demineralizers. These demineralizers are fed by several streams including floor drain wastes, equipment drain wastes, laundry and hot shower wastes, and chemical wastes.

Evaporator concentrates are produced by the condensate demineralizer waste evaporator (radwaste evaporator originally designed to process condensate polisher regenerate waste). Sources to this evaporator are the same as to the portable radwaste demineralizers and include floor drain wastes, equipment drain wastes, laundry and hot shower wastes, and chemical wastes. Additionally, the evaporator will process condensate polisher regenerate waste if primary to secondary leakage prevents direct release of this waste.

Oil and miscellaneous chemicals are contaminated with radioactivity from various areas within the plant as a result of normal operation and maintenance.

Filter elements are disposed as radwaste from operation and maintenance of systems throughout the plant. These systems include the reactor coolant system, boron recovery system, fuel pool purification system, and radwaste.

DAW is generated within the plant regulated areas and is not appropriately attributed to the above-mentioned waste streams. DAW normally includes paper, plastic, wood, metal, and other such material generated as a result of the operation and maintenance of the plant.

4.2 Waste Form

Wet solid radioactive wastes consist of bead resins, filter aids (such as activated charcoals or carbons), evaporator concentrates, and slurries or sludges.

Wastes which may require solidification may include, but are not limited to, liquids which cannot be processed using installed plant systems, evaporator concentrates, oils, chemicals, aqueous filter media, and decontamination wastes.

Wastes are processed as appropriate to ensure that the minimum physical characteristics required by 10 CFR 61 and disposal site criteria are met. All Class B and Class C waste is stabilized. Class A liquid wastes may be either solidified or packaged in sufficient absorbent material to absorb twice the volume of the liquid, as appropriate to the specific disposal site criteria or license requirements. On occasion, Class A waste (such as aqueous filter media with a concentration > 1 uCi/cc of isotopes with half-lives > 5 years) may be solidified or stabilized.

The solid radwaste system shall be used, as applicable, in accordance with a Process Control Program to process wet radioactive wastes to meet shipping and burial ground requirements.

Tests are performed on those wastes which are solidified to ensure the adequacy of the solidification agent and/or procedural technique. The Process Control Program shall be used to verify the solidification of at least one representative test specimen from at least every tenth batch of each type of wet radioactive waste (e.g., filter sludges, spent resins, evaporator bottoms, boric acid solutions, and sodium sulfate solutions).

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.

With the provisions of the process control program not satisfied, suspend shipments of defectively processed, or defectively packaged solid radioactive wastes from the site. If the initial test specimen from a batch of 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

4.2 Waste Form (continued)

the same type of wet waste until at least 3 consecutive initial test specimens demonstrate solidification. The Process Control Program shall be modified as required, as provided in section 11.0 of this manual, to assure solidification of subsequent batches of waste. Defectively processed or defectively packed solid radioactive waste shall not be shipped to the disposal site until the waste is reprocessed or repackaged to meet shipping, disposal site, State and Federal requirements. The provisions of Technical Specification 3.0.3 and 3.0.4 are not applicable.

4.3 Waste Classification

Scaling factors which relate hard-to-measure isotopes to key isotopes commonly measured at SQN have been developed for each waste stream. These scaling factors are used in the classification of the waste for disposal. Scaling factors may be developed on an as needed basis depending on changing plant operational conditions. Updates are performed at least every two years for waste normally considered to be Class A, on an annual basis for other wastes, or when the scaling factors are considered to be high or low by a factor of ten.

Radionuclide concentrations are determined by direct measurement. Samples or smears, as appropriate, of standard waste streams are sent offsite for analysis. An inferential measurement program is then established whereby concentrations of radioisotopes which cannot be readily measured are projected through ratioing to concentrations of similar behaving isotopes which can be readily measured. Scaling factors are developed on a waste stream specific basis. Scaling factors are periodically reconfirmed through sampling and analysis in accordance with reference 3.6. DAW samples or area smears are taken to establish the relative percent abundance of isotopes for the DAW waste stream. Plant procedures are in place to ensure compliance with 10 CFR 61.55 and 61.56.

Batch samples, evaporator concentrates samples, or sludge samples are collected for radiochemical analysis prior to processing the waste for shipment.

Materials which do not fit within the scope of existing scaling factors and waste streams are sampled. The samples are sent offsite for analysis and development of scaling factors prior to disposal of the materials.

4.4 Waste Containers

High Integrity Containers (HICs) manufactured by Chem-Nuclear Systems, Inc. (CNSI) are normally used for packaging primary and radwaste resin and filters, as required for stability. The containers are discussed in a topical report dated December 1983 entitled, "Chem-Nuclear Systems, Inc., Topical Report Polyethylene High Integrity Containers CNSI-HIC-14571-01-NP." CNSI carbon steel liners are used for packaging secondary and radwaste resins, and solidifying evaporator concentrates, as allowed by stability requirements.

5.0 CAPABILITY TO MEET 10 CFR 50 APPENDIX I

The dewatering and solidification processes do not cause any direct releases to the environment. Offgas from the processes is processed through the auxiliary building ventilation system described in the FSAR.

6.0 SHIPMENT MANIFESTS

6.1 Manifest Preparation

Manifests are prepared for each shipment of radioactive waste for disposal. Procedures for manifest preparation implement the specific requirements of 10 CFR 20.311, Transfer for Disposal and Manifests.

6.2 Manifest Tracking

Acknowledgment of receipt for each shipment to a disposal site is sent to SQN Radwaste Section by the disposal site. Shipments for which acknowledgment is not received within the time limits allowed in 10 CFR 20.311 are traced by the TVA Office of Nuclear Power, Corporate Water and Waste Processing Department.

7.0 ADMINISTRATIVE CONTROLS

7.1 Procedures and Surveillance

Detailed procedures are maintained by SQN which cover plant process systems, waste packaging, and shipment requirements. Surveillance Instructions are used to verify that requirements for solidification are met.

Programmatic guidance is provided through the TVA Office of Nuclear Power, Water and Waste Processing Department. The Water and Waste Processing Department maintains the Radioactive Material Shipment Manual.

7.2 Quality Assurance/Quality Control

Quality assurance audits are conducted by the SQN site Quality Assurance organization, and by the Corporate Quality Assurance organization. Audit findings are reviewed by SQN management, ensuring prompt corrective actions when needed.

7.2 Quality Assurance/Quality Control (continued)

Quality control measures include site review of all radwaste vendor procedures before use and verification by SQN personnel of end points or acceptance criteria in vendor procedures. Quality control of solidification methods is performed through controlled testing of a minimum of one sample from each batch to be solidified. Proportions of solidification agents are established which meet the standards for waste form and free liquid criteria.

7.3 Training

Personnel involved in processing radioactive waste for shipment are trained in site procedures, regulatory requirements, and disposal site criteria applicable to the individual's responsibilities. Training and retraining sessions are held when needed to support operations. Retraining is required on an annual basis to maintain qualification. Personnel found not complying with procedures may have their qualifications revoked by the Radwaste Manager. Qualifications may be reestablished through completion of retraining, and approval of the Radwaste Manager.

7.4 Retention of Records

Records are maintained to furnish documentation of items or activities affecting quality. Quality assurance records are stored in accordance with plant and corporate instructions. Retention times for radwaste records are established in the Radioactive Material Shipment Manual.

8.0 WASTE TREATMENT

8.1 Evaporator Concentrates Solidification

Waste is transferred to the cement solidification fillhead through an appropriately sized flexible hose. Flow to the liner is controlled by a pneumatically- controlled valve. The hose is connected to the fillhead by quick disconnect fittings. A remote television monitor is used to monitor the waste level in the steel liner and a temperature recorder is used to monitor temperature in the liner during transfer, chemical addition, and the solidification exotherm. The vent from the fillhead is connected to a portable scrubber and a HEPA unit.

8.2 Solidification of Sludges, Oil, and Miscellaneous Aqueous and Chemical Wastes

The same solidification unit is used for solidifying sludges, oil, and miscellaneous aqueous and chemical wastes. The unit has the same plant/equipment interfaces except that the waste is not normally transferred to the liner through installed plant equipment. Liquid wastes are normally pumped from a storage container to the liner with an air-driven diaphragm pump.

8.3 Miscellaneous Solid Waste Encapsulation

Encapsulation of miscellaneous waste is accomplished by loading waste in a basket inside the solidification liner. The premixed cement formula is then transferred to the liner from a cement truck.

8.4 Spent Resin

Spent resin is dewatered to meet the free-standing water limitations of licensed disposal facilities. Resin can also be solidified.

8.5 Filter Element

Radioactive filter elements are air-dried for a minimum of 48 hours. The elements are then visually inspected to ensure the filter is dry. If the filters require stabilization by the disposal site license, the filters are disposed of either in a high integrity container or encapsulated. If the filters do not require stabilization, they may be disposed as DAW.

9.0 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORTS

The Semiannual Radioactive Effluent Release Reports include the following information for each type of solid waste identified in Regulatory Guide 1.21, Revision 1, Table 3, Part A, which is shipped offsite during the report period:

a. Total volume of containers,

b. Total curie quantity (specify whether determined by measurement or estimate),

c. Principal radionuclides (specify whether determined by measurement or estimate),

d. Type of quantity (e.g., LSA, Type A, Type B, etc.)

NOTE: Additional information to be included involving liquid and gaseous releases is described in the Offsite Dose Calculation Manual (ODCM).

9.0 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORTS (continued)

The Semiannual Radioactive Effluent Release Report shall include any changes to the Process Control Program made during the reporting period. It includes the type of solidification agent used, if applicable.

The Semiannual Radioactive Effluent Release Report includes major changes to radioactive waste treatment systems in accordance with section 10.0.

10.0 LICENSEE INITIATED MAJOR CHANGES TO THE RADIOACTIVE WASTE SYSTEMS (LIQUID, GASEOUS AND SOLID):*

Shall be reported to the Commission in the Semiannual Radioactive Effluent Release Report for the period in which the evaluation was reviewed in accordance with Technical Specification 6.5.1A. The discussion of each change shall contain:

a. a summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR 50.59;

b. sufficient detailed information to totally support the reason for the change without benefit of additional or supplemental information;

c. a detailed description of the equipment, components and processes involved and the interfaces with other plant systems;

d. an evaluation for 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;

e. an evaluation of the change which shows the expected maximum exposures to individual in the unrestricted area and to the general population that differ from those previously estimated in the license application and amendments thereto;

f. 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 changes are to be made;

*Submittal information required by this section may be made as part of the annual FSAR update.

10.0 LICENSEE INITIATED MAJOR CHANGES TO THE RADIOACTIVE WASTE SYSTEMS (LIQUID, GASEOUS AND SOLID):* (continued)

g. an estimate of the exposure to plant operating personnel as a result of the change; and

h. documentation of the fact that the change was reviewed and found acceptable in accordance with Technical Specification 6.5.1A.

Shall become effective upon review and acceptance in accordance with Technical Specification 6.5.1A.

11.0 LICENSEE INITIATED CHANGES TO THE PCP

Shall be submitted to the Commission in the Semiannual Radioactive Effluent Release Report for the period in which the change(s) was made. This submittal shall contain:

a. sufficiently detailed information to totally support the rationale for the change without benefit of additional or supplemental information,

b. a determination that the change did not reduce the overall conformance of the solidified waste product to existing criteria for solid wastes; and

c. documentation of the fact that the change has been reviewed and found acceptable in accordance with Technical Specification 6.5.1A.

Shall become effective upon review and approval in accordance with Technical Specification 6.5.1A.

APPENDIX A

LOCATION AND ARRANGEMENT OF EQUIPMENT

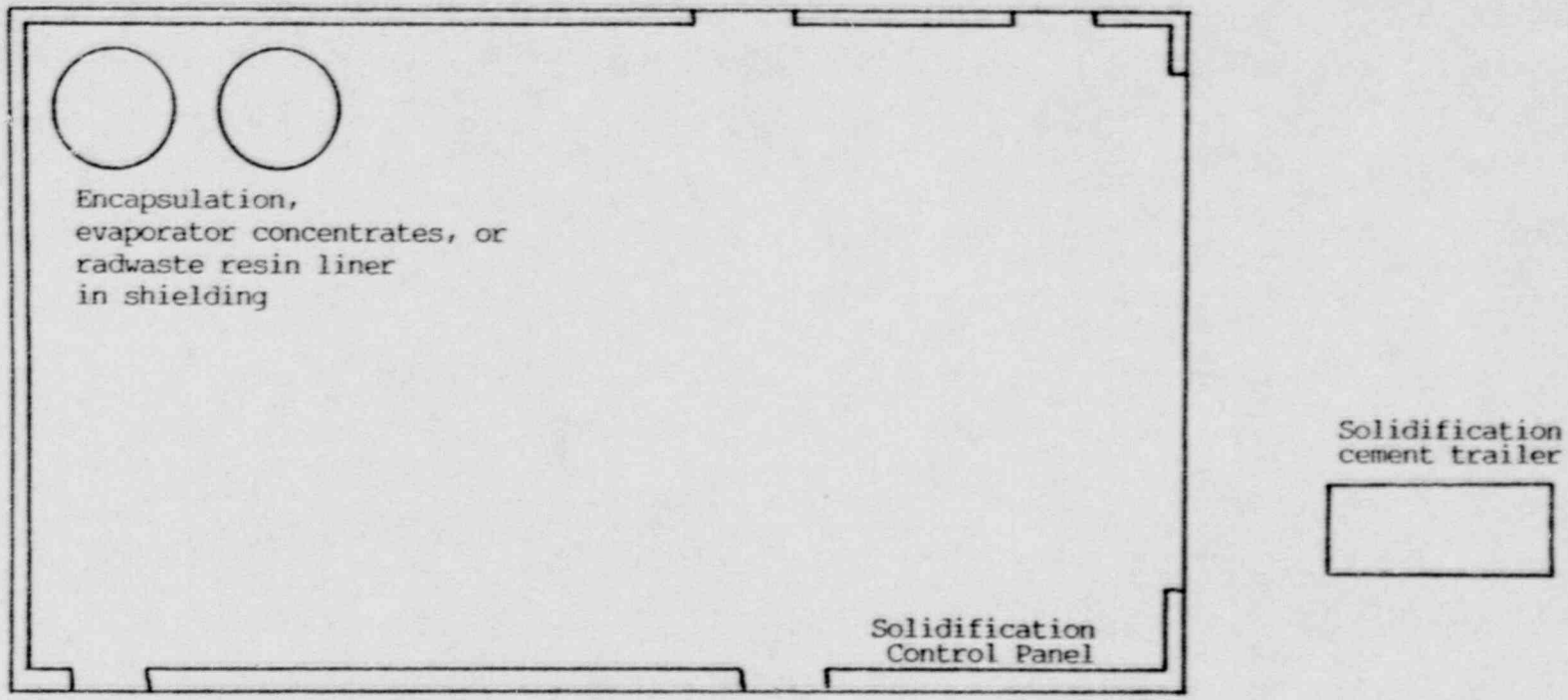

FIGURE 1

LAYOUT FOR DEWATERING RADWASTE RESIN,
CEMENT SOLIDIFICATION OF WET WASTES,
OR ENCAPSULATING MISCELLANEOUS RADWASTE
IN THE AUXILIARY BUILDING RAILROAD BAY

PLAN ELEVATION 706'

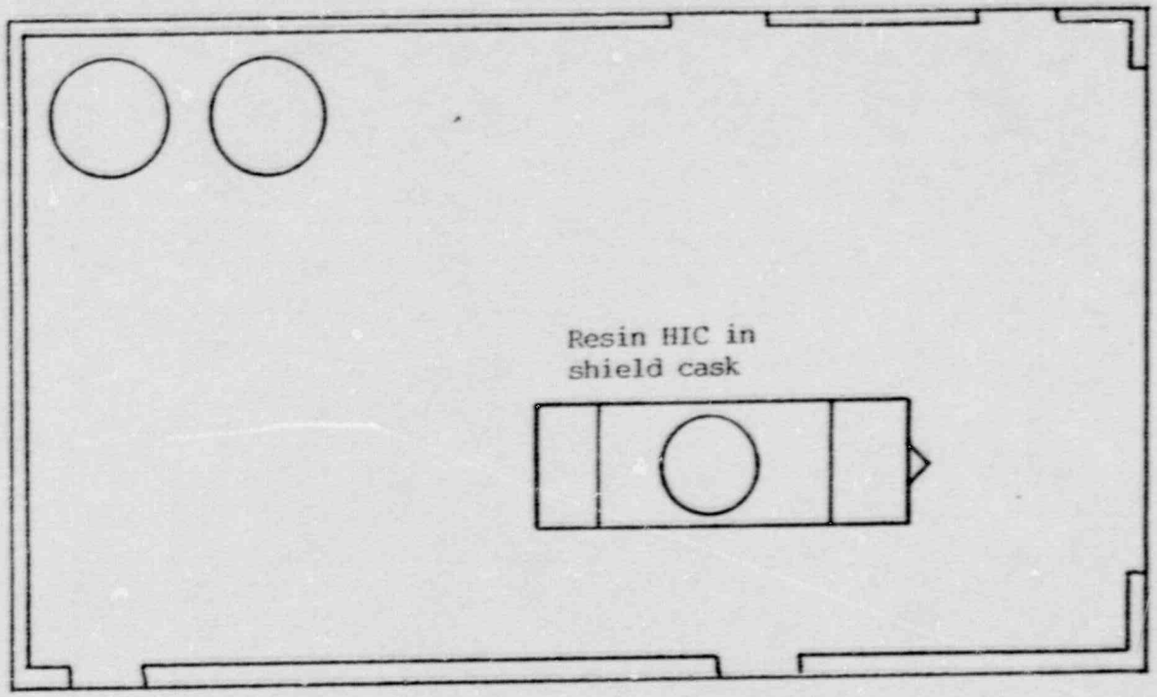

FIGURE 2

LAYOUT FOR DEWATERING PRIMARY RESIN
IN THE AUXILIARY BUILDING RAILROAD BAY

PLAN ELEVATION 706'

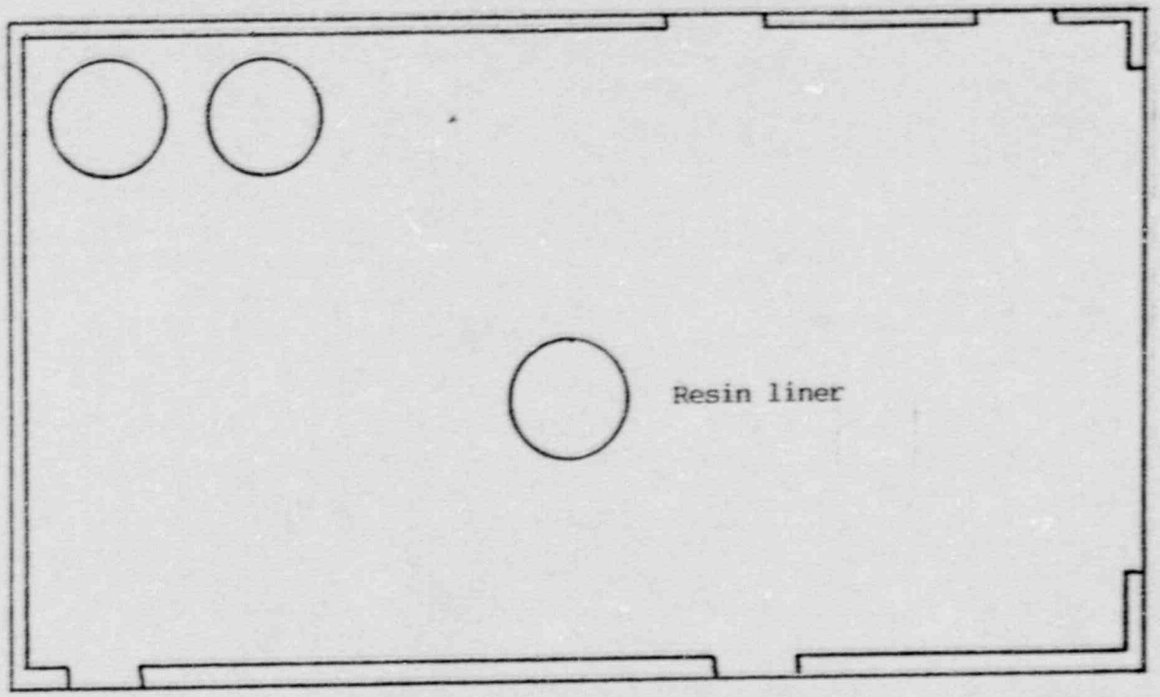

FIGURE 3

LAYOUT FOR DEWATERING SECONDARY RESIN
IN THE AUXILIARY BUILDING RAILROAD BAY

PLAN ELEVATION 706'

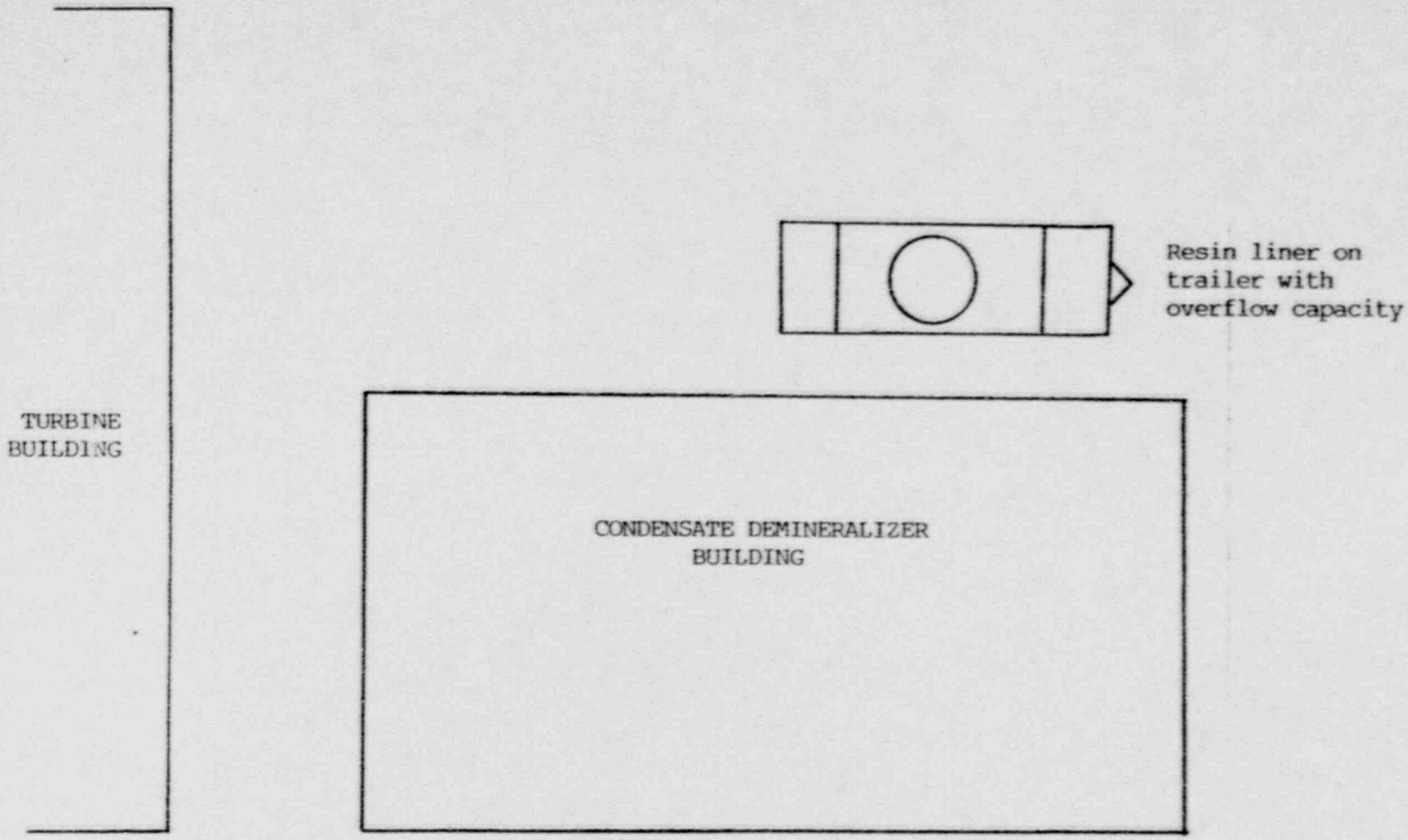

FIGURE 4

LAYOUT FOR DEWATERING SECONDARY RESIN
AT THE CONDENSATE DEMINERALIZER BUILDING

PLAN ELEVATION 701'

APPENDIX B

EXCEPTIONS TO OR DEVIATIONS FROM VENDOR TOPICAL REPORTS

APPENDIX B

EXCEPTIONS OR DEVIATIONS TAKEN TO CNSI TOPICAL REPORT DATED DECEMBER 1983.

SQN dewaters bead resin and activated carbon using Chem-Nuclear Procedures FO-OP-023, "Bead Resin/Activated Carbon Dewatering Procedure for CNSI 14-215 or Smaller Liners." The dewatering system was fabricated by TVA to meet the equipment specifications in FO-OP-023 and Topical Report CNSI-DW-11118-01-NP. The TVA dewatering system differs from the Chem-Nuclear system in that:

(a) SQN's system has no offgas collector. The containers are open to the auxiliary building railroad bay during filling and dewatering. Air from this room is normally discharged through the Auxiliary Building ventilation system as described in the FSAR.

(b) The valves on the pump suction manifold are manually operated. The system is not operated remotely. However, primary resin containers are enclosed behind a shielded wall or inside a shielded cask during filling and dewatering to keep radiation levels in the vicinity of the system near background.

(c) There is no automatic level control in the TVA dewatering system. Level is determined by visual observations and by level indicating instrumentation in the liner.