TITLE: ADMINISTRATIVE PROCEDURE
PROCESS CONTROL PROGRAM

APPROVED: for PLANT MANAGER JUN 23 1988 DATE 6-23-88 EFFECTIVE DATE

1.0 SCOPE

1.1 The purpose of the Process Control Program (PCP) is to define the necessary program guidance used at DCPP to ensure that SOLID RADIOACTIVE WASTE MANAGEMENT activities, in packaging radioactive waste for disposal, conform to the Code of Federal and State Regulations and the Waste Burial Site License Criteria.

1.2 This procedure and changes thereto require PSRC review.

2.0 RESPONSIBILITIES

2.1 Plant Manager has the overall responsibility for the Solid Radioactive Waste activities at DCPP.

2.2 Manager of Chemistry and Radiation Protection is responsible for the implementation of the requirements of this procedure.

2.3 Radwaste Engineer is responsible for the development and review of procedures relating to the requirements of this procedure.

2.4 The Radwaste Foreman is responsible for the implementation of procedures relating to the requirements of this procedure.

2.5 QC is responsible for verification of compliance with the Quality requirements.

3.0 PREREQUISITES

3.1 This procedure with the attachments and any changes thereto requires review by the Plant Staff Review Committee and submission to the US NRC in the Semi-annual Effluent Report for the period in which the changes were made.

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4.0 INSTRUCTIONS

4.1 GENERAL

It is the policy of Pacific Gas and Electric Company to conscientiously apply emphasis and attention to those activities associated with generation, processing, packaging, storage and disposal of radioactive waste generated at the Diablo Canyon Power Plant and to maintain a high level of assurance that radioactive waste products meet or exceed the applicable Federal and State regulations and the Radioactive Waste Burial Site License Criteria.

4.2 WET WASTE

4.2.1 LIQUID/WET WASTE

Liquid / Wet wastes at DCPP are processed to a condition meeting shipping and disposal criteria. These criteria include requirements for immobilization, stability and limits on Free Standing Water (FSW). Specific instructions on processing and required FSW limits are contained in plant procedures and/or qualified vendor procedures. These procedures are to be approved by the PSRC prior to implementation.

4.2.2 CONTAINERS, SHIPPING CASKS AND PACKAGING

Solid radioactive waste is processed, packaged and shipped in accordance with DCPP procedures and/or qualified vendor procedures which have been approved by the PSRC. These procedures provide specific instructions which ensure the container, shipping casks and packaging methods comply with the applicable Code of Federal Regulations, State Regulations and the Radioactive Waste Burial Site License Criteria.

4.2.3 SHIPPING AND DISPOSAL

Solid radioactive waste is prepared, loaded and shipped to a Federal and/or State Licensed Radioactive Waste Disposal Facility (Burial Ground) in accordance with DCPP procedures and/or qualified vendor procedures which have been approved by the PSRC. These procedures provide specific instructions which ensure the shipments meet the intended Burial Site License Requirements as well as applicable Federal and State Regulations.

4.2.4 LABORATORY MIXING OF SAMPLES

Qualified vendor procedures approved by the PSRC provide written instructions on sampling, processing and handling waste for the determination of process parameters prior to the actual full scale solidification. These procedures contain the description of the laboratory mixing methods used for these samples.

4.2.5 SOLIDIFICATION PROCESS

Qualified vendors used by DCPP for radioactive waste solidification are required to provide the Process Control Program and written procedures. These procedures and changes thereto must be approved by the PSRC prior to use. Further, the vendors are required to have a topical report, as referenced, on the waste forms which will be solidified at DCPP. This topical report should demonstrate compliance with the NRC requirements for waste form. These documents should include:

a. Description of the solidification process
b. Type of solidification used
c. Process control parameters
d. Parameter boundary conditions
e. Proper waste form properties
f. Specific instructions to ensure the systems are operated within established process parameters.

4.2.6 SAMPLING PROGRAM FOR SOLIDIFICATION

Vendors, utilized by DCPP for radioactive waste solidification, are required to include in their approved procedures, requirements to sample at least every tenth batch of the same waste type to ensure solidification and to provide actions to be taken if a sample fails to verify solidification. After a test specimen failure, initial test specimens from three consecutive batches of that waste type must demonstrate solidification before testing requirements of every tenth batch can be resumed. Verification of such sampling is to be accomplished by completing Form 69-10350, "Processing Control Program (PCP) Verification". These forms will be maintained in the Chemistry and Radiation Protection Department and the Records Management System (RMS). These procedures and changes thereto must be approved by the PSRC prior to use.

4.2.7 WASTE FORM VERIFICATION

Vendors utilized by DCPP to process wet wastes are required to include in their procedures provisions to verify that the solidification and/or FSW Criteria in the Federal and State regulations and the Burial Site License Criteria are met for the specific type of waste being processed. These procedures and changes thereto must be approved by the PSRC prior to use.

4.2.8 CORRECTIVE ACTIONS FOR FREE STANDING WATER

Vendors utilized by DCPP to process wet wastes are required to include in their approved procedures provisions for correcting processed waste in which free standing water in excess of the FSW Criteria is detected. These procedures and changes thereto must be approved by the PSRC prior to use.

4.2.9 EXOTHERMIC PROCESSES

Vendors utilized by DCPP for radioactive waste solidification are required to include in their approved procedures specific process control parameters for exothermic solidification methods that must be met before capping the container. These procedures and changes thereto must be approved by the PSRC prior to use.

4.3 OILY WASTE

Oily wastes at DCPP are processed in accordance with approved vendor procedures. These procedures specify the proper methods to treat oily wastes to comply with Federal and State regulations and applicable Burial Site License Criteria. These procedures and changes thereto must be approved by the PSRC prior to use.

4.4 SPECIAL CASES

Based upon previous industry experience, DCPP foresees the potential for situations arising that may be beyond existing plant capabilities. Anticipating this possibility, provisions are made herein to accommodate such situations in a timely manner by using special techniques or processes. These special cases would be controlled as follows:

4.4.1 Implementing procedures would be developed comparable to those used for normal plant solid waste activities based on the guidance of this PCP and incorporating the applicable provisions for process control and testing.

4.4.2 The implementing procedure would receive PSRC approval prior to use.

4.4.3 Use of this provision and supporting information would be included in the next Semi-annual Effluent Report to the NRC.

4.5 REMEDIAL ACTIONS

4.5.1 For waste forms which do not meet Federal, State and burial site regulations and requirements; suspension of shipment of the inadequately processed waste and correction of the PCP, procedures or processing equipment shall be performed as necessary to prevent recurrence.

4.5.2 For waste forms not prepared in accordance with the PCP, testing of the waste to verify shipping and burial site requirements shall be performed and appropriate administrative action taken to prevent recurrence.

5.0 REFERENCES

5.1 Title 10 Code of Federal Regulations

5.2 NUREG 0472 and 0473

5.3 NUREG-0800, 11.4 US NRC Standard Review Plan Solid Waste Management Systems

5.4 AP C-253S1, "Dewatering Control Program."

5.5 AP C-257, "Mobile Service Operating Procedure for Low-Level Radioactive Waste Processing."

6.0 ATTACHMENTS

6.1 LN Technologies, Corp. Procedure SS-042, "Process Control Program for Radwaste Solidification Service at Diablo Canyon Power Plant," Rev. A.

6.2 Topical Report TR-002, "10CFR61 Qualified Radioactive Waste Forms," Rev. 1.

6.3 LN Technologies, Corp. Procedure GS-007, "Temperature Indicating Device Comparison Test," Rev. A.

6.4 LN Technologies, Corp. Procedure GS-006, "Calibration for a Triple Beam Balance," Rev. A

NOTE: The above attachments are maintained in Document Control Master File, Catalog No. TK 9400/LNT-1.

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NOTE: The above attachments are maintained in Document Control Master File, Catalog No. TK 9400/LNT-1.

6.6 Form 69-10350, "Process Control Program (PCP) Verification", 11/85.

ATTACHMENT 1

CHANGES TO THE PROCESS CONTROL PROGRAM

8708280

TITLE: CHEMICAL ANALYSIS PROCEDURE
OFF-SITE DOSE CALCULATIONS

APPROVED: John D Townsend 4/22/88 4-22-88
PLANT MANAGER DATE EFFECTIVE DATE

1.0 SCOPE

This procedure describes the methodology for the following:

Effluent Type	T.S.	Technical Specification Surveillance Requirement	Implements
Liquids	4.3.3.9.1	Determination of alarm/trip set-points for RE-18, RE-23, RE-3 and RE-16	10 CFR20, App.B, Table II, Col. 2
Gases	4.3.3.10	Determination of alarm/trip setpoints for RE-22, RE-14A, 14B and RE-27	10CFR20, App.B, Table II, Col. 1
Liquids	4.11.1.1.1 4.11.1.1.2	Pre-release analyses of effluents Post-release analysis of effluents	10CFR20, App. B, Table II, Col. 2
Liquids	4.11.1.2	Dose calculations	10CFR50, App. I
Liquids	4.11.1.3.1	Dose projections	10CFR50, App I.
Gases	4.11.2.1.1	Dose rate calculations, Noble Gases, Total Body and Skin	10CFR20, App. B, Table II, Col.1
Gases	4.11.2.1.2	Dose rate calculations, Iodines, Particulates and Radionuclides other than Noble Gases, per organ, per age group	10CFR20, App. B, Table II, Col. 2
Gases	4.11.2.2	Noble Gas Air Dose Calculations	10CFR50, App. I
Gases	4.11.2.3	Iodines, Particulates, and Radio-nuclides other than Noble Gases Organ Dose Calculations per age group	10CFR50, App. I
Gases	4.11.2.4.1	Noble Gases Iodines, Particulates, and Radionuclides other than Noble Gases, Dose Projection	10CFR50, App. I
Liquids and Gases	4.11.4.1 and 6.9.1.6	Cumulative Dose from: Liquids, Noble Gases Iodines; Particulates; and Radionuclides other than Noble Gases per age group, per organ	40CFR190
Direct Radiation	4.11.4.2	Direct Radiation Dose Rate and Dose Calculations to unrestricted areas due to plant and high radwaste storage sky-shine.	40CFR190

The calculational methodology for doses are based on models and data that make it unlikely to substantially underestimate the actual exposure of an individual through any of the appropriate pathways. Tables containing the values for the various parameters used in these expressions are also included. This procedure, and any changes thereto, requires PSRC review.

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3.0 DISCUSSION

This procedure is used in support of the portion of the Appendix A Technical Specifications that deals with routine radioactive liquid and gaseous releases to the unrestricted area. Limits are based on the dose commitment to a member of the general public related to the release of radionuclides through either direct or indirect exposure (e.g. submersion in a cloud of radioactive Noble Gases, radionuclides deposited on the ground, direct radiation from radionuclides stored on site, inhalation of radionuclides or ingestion of radionuclides via a food pathway such as milk, meat, vegetable or fish, etc.).

4.0 RESPONSIBILITY

4.1 The Chemistry and Radiation Protection Department Manager is the overseeing authority of responsibility for ensuring that the off-site dose calculational procedure (ODCP) meets all Technical Specification requirements with regards to calculated doses delivered by the plant to the unrestricted area surrounding the site.

4.2 The Sr. Radiochemistry Engineer assumes the overall responsibility for ensuring that this procedure's program is followed and implemented where appropriate, especially in regards to Technical Specification requirements.

4.3 The Radiochemistry Effluents Engineer has the responsibility of correct and timely implementation of all the procedure's calculational methodology, where appropriate, for each radioactive effluent released. Further more this engineer is responsible for: reviewing the results; cross (spot) checking the calculations; and maintaining an updated archive of post release calculated doses for semiannual report purposes.

4.4 The Sr. Chemistry and Radiation Protection Systems Analyst assures that any supporting computer software is maintained current and compatible with the procedure's calculational methodology and that the computer hardware is maintained operable at all times.

4.5 The Radiochemistry staff engineer provides an independent oversight of the effluents program's ODCP to: confirm compliance with Tech. Specs.; provide technical support; recommend or design improvements to the dose calculational methodology and the effluent program control; and investigate longterm planning toward effluent related activities and their associated dose calculations.

5.0 INSTRUCTIONS

5.1 Liquid Effluents

5.1.1 Dose calculation (T.S. 3.11.1.2).

The dose contributions to the total body and each individual organ (bone, liver, thyroid, kidney, lung and GI-LLI) of the maximum exposed individual (adult) for, say, m radioactive liquid releases shall be calculated for all radionuclides identified in those m liquid effluents released to unrestricted areas using the following expression:

$$D_o = \frac{1}{300} \sum_{j=1}^{m} \frac{V_j}{F(j)} \sum_{i=1}^{n(j)} A_{io} C_{ij} \qquad (1)$$

where:

D_o = The cumulative dose to the total body or an organ "o" from the liquid effluents for the total time covering those m releases.

where:

A_{io} = Composite dose parameter for the total body or an organ "o" of an adult for nuclide i, for salt water site, in mrem/hr per μCi/ml (refer to Table 6.1).

V_j = The volume of the jth release in gal. In the case of a batch release it is simply the volume in the batch tank released. For other releases this is the flowrate used multiplied by the actual release time.

C_{ij} = The average concentration of radionuclide i in the liquid effluent passing thru RE-18, RE-3, RE-16 or RE-23 (or from any liquid stream entering the circulating water discharge) as sampled and analyzed for in the "j^{th}" release source, in μCi/ml.

$\frac{1}{300}$ = Product of the near field average dilution and mixing factor with 1/60 (hr/min). The applicable factor for this mixing and near field dilution during any liquid release at DCPP's site specific discharge structure to any marine organism or dose point was selected as 1/5.[1]

F(j) = The total dilution water flowrate during the time of "j^{th}" release, in gpm.

n(j) = # nuclides i in "j^{th}" release.

5.1.2 Maximum Permissible Concentration (MPC) calculation (T.S. 3.11.1.1.)

a. The MPC_j for the identified mixture of radionuclides in the "j^{th}" batch of liquids is calculated as follows:

$$MPC_j = \frac{\sum_{i=1}^{n} C_{ij}}{\sum_{i=1}^{n} \frac{C_{ij}}{MPC_{ij}}}$$

[1]Refer to the FSAR, Section 11.2.8, "Dilution Factors".

where:

MPC_j = The unrestricted area total undiluted MPC for the "j^{th}" particular mixture of identified radionuclides, in µCi/ml.

MPC_{ij} = The MPC in unrestricted area water for radionuclide i, in general, in µCi/ml (from 10CFR20, Appendix B, Table II, Column 2.).

b. The overall MPC for a combination of discharges (e.g., simultaneous discharge of a batch of liquid radwaste, discharge of steam generator blowdown, discharge of oily water separator via the turbine building sump, and discharge of condensate demineralizer regenerate waste also via the turbine building sump) is calculated by reapplication of the above equation using the total concentration for the pathway and its associated MPC:

$$MPC_{overall} = \frac{\sum_{j=1}^{n} \phi_j C_j}{\sum_{j=1}^{n} \frac{\phi_j C_j}{MPC_j}}$$

where:

$MPC_{overall}$ = The unrestricted area MPC for the current radionuclide mixture for concurrent j discharges (in µCi/ml.)

C_j = The total activity concentration for the "jth" individual stream in µCi/ml.

MPC_j = The total MPC for the "jth" individual mixture (or stream) determined as seen above, in µCi/ml.

ϕ_j = The ratio of an individual discharge "j^{th}" pathway flow rate to the sum total of all individual undiluted pathway flow rates.

5.1.3 High Alarm Set Point (HASP) Determinations (for Rad Monitors).

High Alarm Set Points are determined from the expressions in this section. These expressions enable determination of the appropriate maximum alarm setpoint for each liquid effluent pathway (i.e., liquid radwaste system, steam generator blowdown and turbine building sump effluents) conservatively taking into account not only existing and concurrent discharges, but also the improbable discharge of an imaginary batch resembling the RCS. The High Alarm Set Points are designed such that the combined total C/MPC at the point of entry into the environment (ocean in this case) will never exceed unity.

Each of the independent liquid effluent pathways to the common entry point to the environment (namely at "outfall"), are treated basically the same. There are four separate entities considered in the HASP determinations all of which introduce realistic conservatism. First, there is the effect of concurrent releases from the other possible independent liquid effluent sources. This is manifested by the so-called "dilution flowrate reduction term", ΔF. This is addressed for each separate monitor/release pathway in Appendix 1. Secondly using this entity along with the actual release per pre-release analysis, (already in progress or scheduled) there is then yielded the term, $\frac{C_j}{MPC_j} \frac{F_j}{F-\Delta F_j}$ which is expressed to reduce the "1" (unity) in the max. allowed $\frac{C}{MPC}$ at the outfall (ocean). Next, this remainder, namely, $1 - \frac{C_j}{MPC_j} \frac{F_j}{F-\Delta F_j}$, is then allotted to an imaginary release from the most conservative of possible sources, namely one that is scaled in the same isotopic mix proportions as a recent RCS sampling which has been decayed 24 hours (with exception that H3 is not scaled). Also, since all liquid effluent radiation monitors are only gross gamma sensitive, then all non-gamma concentrations must be scaled according to their gamma counterparts in the same mix. Lastly, and very important, is the fact that an uncertainty correction term (called "I&C uncertainty factor") from the monitor's manufacturer specifications is conservatively applied to the final calculated HASP value.