On 3/27/95, Jim Field informed me that D. Gardiner said not to talk to his staff. J. Field said to talk with D. Gardiner directly before CMRG meeting.

On 3/27/97, at the second session, the CMRG reviewed my memo MNTS 95-021

On 4/3/95, Jim Field says I received a complaint by D. Gardiner on DQ 95-12. That I handled myself well at the CMRG meeting.

On 4/10/95, J. Field instructs me to be more flexible on DQ 95-012."This is how I get a bad reputation by taking unpopular positions".

On 4/17/95, I inform Jim Field that I would be flexible as long as I did not have to sign.

On 4/24/95, the CMRG reviewed DQ 95-12 rev 1 which concluded that the Instrument Channel Calibration and Instrument Channel Test surviellance requirements have not been met.(Ref to page 6 of dispo.). The disposition was made by co worker and Principle I&C Engineer Bob Fraser. Steve Redeker was very concerned by B. Fraser's conclusion and asked D. Gardiner to supply a supplemental disposition to show there was no violation of the ODCM or Tech. Specs. As can be seen by a review of the Commitment Tracking System Report, the CMRG assigned Tech. Services, RP/Chem and Licensing actions as stated on the Commitment Tracking System Report (Please refer to the CTS report).

On 4/4/95 memo RPM 95-35, is issued. It describes that since RG 1.21 allows calibration to be done in accordance with the manufacture's instructions. (refer to R.G. 1.21, 11c- "calibrations"). Since there was no calibration instruction in the Flowmeter Equipment manual then it was therefore calibrated in accordance and thus no violation. **This is a very misguided and erroneous conclusion! RG 1.21 also states "or they may may be specially written in-house procedures to include special methods or items of equipment not covered elsewhere." This is the case here.** The referenced equipment manual, M19.32-2, "BIF Instructions #305 Flow Watch Meter" does not prescribe any post startup calibration for the flow meter or the totalizer. The DQ 95-012 rev 1 disposition by B. Fraser clearly shows the technical need for a calibration. The vendor stated a need in telecon dated 3/28/95. It is bad administrative practice to have an Radiation Protection staff member make such an important technical evaluation on the requirements of an instrument to be calibrated. I have over 15 years as an I&C engineer and have worked on this instrument for at least 10 years. The totalizer was a separate channel which required a periodic check of its accuracy. the manufacturer used a correction factor to adjust its readout. DQ 95-039 showed that the 10% error reported to the NRC was exceeded.

On 5/8/98, the CMRG and Plant Manager, Stev e Redeker, made a very serious mistake in judgment to overrule a valid technical analysis with an invalid one based on an erroneous interpretation of RG 1. 21 Please refer to Steve Redeker's annotation of page 6 of DQ 95-012 rev 1.. This was motivated by a strong intention to avoid having to report a violation in Tech. Spec Table 4.19. The evidence in this DQ 95-012 indicates either incompetence , neglect and/or deliberate attempt to avoid reporting a Tech Spec. Violation. The assignment of RP to make a technical evaluation on surveillance requirements when Tech. Services is oversee the surveillance program is extraordinary to say the least. To over rule the expertise of senior I&C engineers by justifying it on a scanty equipment manual is very suspicious considering that the alternative was dealing with a Tech. Spec. violation. I believe the technical evaluation described was clearly understandable. I believe some CMRG members may not have understand the technical merit and choose to vote with Steve Redeker and D. Gardiner who was the RP supervisor and may have the necessary technical knowledge. I believe that Steve Redeker influence as the Plant Manger on the other CMRG members and the fact if there was a quorum that they all could not be held accountable was a deciding factor in the CMRG vote.

3.0 OTHER CONCERNS

Due to a lack of the necessary time that was available to me to prepare this presentation I will submit other significant allegations with supporting evidence.at a later time. I intend to submit these by 9/28/98.

Please contact me if you need clarification, more information, have questions or other concerns. Please inform of any preliminary conclusions and their basis so that I may respond if necessary. I would like to discuss my concerns with the NRC's or its contractor who is expert in these technical areas of concerns..

Thank you

J Saum 8/20/98

James N Saum

ATTACHMENTS

1.0 PRW 39211
2.0 PRW-37638
3.0 SOMMER'S REPORT
4.0 MNTS 97-031
5.0 MEMO IDT-049
6.0 RP 305.09A REV 5
7.0 MNTS 97-0033
8.0 IDT 97-052
9.0 MNTS 97-037
10.0 MDR RP 305.09A REV 6
11.0 SURVEILLANCE REPORT 97-S-034
12.0 SURVEILLANCE REPORT 98-S-041
13.0 PDQ 97-082
14.0 NCR NOTICE OF TECH SPEC VIOLATION D 6.11
15.0 DQ 98-026
16.0 RP 305.09A REV 10
17.0 PDQ 95-012 PACKAGE WITH VARIOUS MEMOS
18.0 RSAP-1308
19.0 R.G 1.21
20.0 DQ 95-039
21.0 IE CIRCUALR 81-07

MULTI-DISCIPLINE REVIEW / APPROVAL LIST

DATE: 2/9/98	PROCEDURE No [illegible]	REV [illegible]
PROCEDURE TITLE: Removal of [illegible]		

REVIEWER				CONCURRENCE	
SEQUENCE	AREA	NAME	M/S	SIGNATURE FOR	DATE
	DAGM	DEPUTY AGM, OPERATIONS	252		
	MPC&D	MGR PLANT CLOSURE & DECOM	257		
	TS	TECHNICAL SERVICES SUPT	231		
	TS	SURVEILLANCE SCHEDULER	253		
	QA	NUC QUALITY ASSURANCE	251		
	MTC	MAINTENANCE SUPERINTENDENT	253		
	OPS	OPERATIONS SUPERINTENDENT	236		
	SEC	SECURITY OPERATIONS SPVR	210		
(3	RP	RP / CHEM SUPERINTENDENT	244	[illegible]	-/9/98
	MPC&D	DECOMM PROJECT MANAGER	257		
	PUR	PURCHASING & CONTRACTS	50		
	MPC&D	PRC / MSRC COORDINATOR	258		
	[illegible]	[illegible]		[illegible]	[illegible]
	[illegible]	[illegible]		[illegible]	[illegible]

QUESTION

Does this procedure LBD change require (1) a change to an LBD (2) development of new procedures, and or (3) revision(s) to existing procedure(s)?

Does this procedure LBD change or other resulting procedure LBD changes require scheduling on the Master Surveillance Schedule per RSAP 1601?

17 -- Does this procedure LBD change impact the Cross Index System in RSAP 1601

If the answer to any of the above questions is YES then the Qualified Reviewer must [illegible]

EXHIBIT 7

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DEVIATION FROM QUALITY FORM

PAGE ___ OF ___

DQ # 95-0039
REV # 1

PROBLEM DISPOSITION
ASSIGNED DEPARTMENT

19. DISPOSITION:

☐ ACCEPT-AS-IS ☐ REPAIR ☐ REWORK ☐ REPLACE
☐ INTERIM ACCEPT-AS-IS ☐ NOT A NONCONFORMANCE ☐ NON-HARDWARE
☒ DOCUMENT CHANGE

20. PROBLEM ANALYSIS AND RESOLUTION: (PROVIDE CAUSE, EXTENT, REMEDIAL AND PREVENTIVE ACTIONS UNDER SEPARATE HEADINGS)

See Cont. Sheet -

21. DISPOSITION BY:

NAME: Jim Sawin EXT: 4987 DEPT: TS

SIGNATURE: J. Sawin DATE: 6/7/95

FOR ACCEPT-AS-IS OR REPAIR ONLY (NOT REQUIRED FOR NON-HARDWARE)

22. DESIGN OR DRAWING: ☐ Y ☐ N 23. RELATED DCPs OR TRANS. NO. ___

24. CALC No.: ___ 25. TEST No.: ___

26. ASME CODE: ☐ Y ☐ N

ANII

27. ANII/ANI REVIEW: ___ DATE: ___

ASSIGNED DEPARTMENT

28. COMMENTS:

EXHIBIT 9
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CMRG

29. TREND CODE: ___

ADM-261 REV. 1 (RSAP-1310)

25. PROBLEM ANALYSIS AND RESOLUTION:

CAUSE:

The cause of the totalizer being out of spec. (o.o.s.) was due to a procedural deficiency in SP 482 Rev. 8 which established the first totalizer calibration procedure as a result of DQ 95-0012. SP 482 Rev. 8 should have applied a correction factor as described below in the Remedial Action section.

Historically, there has been a reluctance at this plant to use correction factors when recording instrument readings. Therefore, the devise should have been originally specified and procured to have a means of adjusting and calibrating the totalizer without the use of a correction factor.

EXTENT:

The extent of this problem is limited to this particular instrument. The totalizer's indicated flow was found to be 8.38% less than actual flow thereby underestimating the amount of dilution water used for ODCM dose calculations (i.e., in the conservative direction).

The combined effluent 30 day average flows reported monthly to the California Regional Water Quality Control Board were also underestimated. However, no limits have been placed on the amount or rate of the combined effluent waste water released or the accuracy of this flow measurement by the Board in the NPDES permit.

REMEDIAL ACTION:

Revise the surveillance procedures associated with the totalizer, SP 482 and SP 524, to incorporate a Correction Factor (CF). The CF will be applied to the totalizer indication to correct for the difference between actual and indicated total flow. Once the CF has been determined per the totalizer calibration procedure a tolerance will be applied for future calibration checks, thereby reducing the number of revisions to the CF. If the totalizer drifts outside of this tolerance a new CF will be posted and the impact of the o.o.s. condition should be evaluated by a subsequent DQ disposition. The CF will be on a placard posted on the instrument and will be recorded when taking totalizer readings. The totalizer readings will be multiplied by the CF to obtain the corrected readings. This method will ensure that the reported estimated totalizer accuracy of 10% to the NRC in the Semi-Annual report is maintained.

Review CAP-0008, CAP-0006, and RT-CDS-0001 for necessary revisions in applying the totalizer CF. Revise affected procedures accordingly.

PREVENTATIVE ACTION:

The revised SPs as described above should minimize future totalizer o.o.s. conditions.

Note: Per the long term repair disposition of DQ 95-0017, the totalizer will be replaced with a new instrument.

DEVIATION FROM QUALITY FORM

PAGE ___ OF ___

DQ # 95-0039
REV # 1

PROBLEM DISPOSITION
ASSIGNED DEPARTMENT

19. DISPOSITION:

☐ ACCEPT-AS-IS ☐ REPAIR ☐ REWORK ☐ REPLACE

☐ INTERIM ACCEPT-AS-IS ☐ NOT A NONCONFORMANCE ☐ NON-HARDWARE

☒ DOCUMENT CHANGE

20. PROBLEM ANALYSIS AND RESOLUTION: (PROVIDE CAUSE, EXTENT, REMEDIAL AND PREVENTIVE ACTIONS UNDER SEPARATE HEADINGS)

See Continuation Sheet

21. DISPOSITION BY:

NAME: Jim Sauer EXT: 4587 DEPT: TS

SIGNATURE: [signature] DATE: 6/26/95

FOR ACCEPT-AS-IS OR REPAIR ONLY (NOT REQUIRED FOR NON-HARDWARE)

22. DESIGN OR DRAWING: ☐ Y ☐ N 23. RELATED DCPs OR TRANS. NO. ___

24. CALC No.: ___ 25. TEST No.: ___

26. ASME CODE: ☐ Y ☐ N

ANII

27. ANII/ANI REVIEW: ___ DATE: ___

ASSIGNED DEPARTMENT

28. COMMENTS:

EXHIBIT 9
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CMRG

29. TREND CODE: ___

ADM-261 REV. 1 (RSAP-1310)

CONTINUATION SHEET
DQ 95-0039 Rev. 1

25. PROBLEM ANALYSIS AND RESOLUTION:

CAUSE:

The acceptance criteria of SP.482 Rev. 8 for the totalizer is a tolerance of 7% at the 9,000 gpm calibration point . This tolerance was based on ensuring a totalizer accuracy of 10%. The totalizer accuracy of 10% was determined by taking the square root of the sum of the squares of the errors involved including a calibration tolerance of 7%. This basis is stated in a memo from Dennis Gardiner to the CMRG (RPM 95-35) as follows: " The error reported for the total volume of dilution water listed in the Semi-annual Radiological Effluent Report is +/- 10%. This error was determined from the criteria of SP.482 Refueling Interval Plant Waste Water Flow Loop 95108 Calibration, Step 6.9.11 which states "verify actual flows are +/- 10% of indicated flows." Note, however, that the statement is incorrect by assuming that the calibration tolerance of 10% would yield an accuracy of 10%. This is not true since there are other errors in the system other than the 10% tolerance. Moreover, the referenced tolerance of 10% applied to the Flow Recorder not the Totalizer. However, the idea is correct in that the calibration tolerance is a primary factor in determining the estimated system accuracy.

The cause of the totalizer being out of spec. (o.o.s.) was due to trying to achieve the desired 10% totalizer accuracy which was previously reported to the NRC in the Semi-annual Report without the use of a correction factor as suggested in DQ 95-0012 Rev 1. The desired totalizer accuracy will therefore be increased to +/- 20% to avoid the use of a correction factor.

Historically, there has been a reluctance at this plant to use correction factors when recording instrument readings. Therefore, the device should have been originally specified and procured to have a means of adjusting and calibrating the totalizer without the use of a correction factor.

EXTENT:

The extent of this problem is limited to this particular instrument. The totalizer's indicated flow was found to be 8.38% less than actual flow thereby underestimating the amount of dilution water used.(i.e., in the conservative direction).

The combined effluent 30 day average flows reported monthly to the California Regional Water Quality Control Board were also underestimated. However, no limits have been placed on the amount or rate of the combined effluent waste water released or the accuracy of this flow measurement by the Board in the NPDES permit.

REMEDIAL ACTION:

1) Revise the surveillance procedures associated with the totalizer, SP 482 and SP 524, to increase the totalizer tolerances for a 20% totalizer estimated accuracy.

2) Report a 20% estimated accuracy for the total volume of dilution water parameter in the next Semi-annual Report.

3) Reperform the totalizer calibration (Step 6.12) per the revised SP. 482. The actual flow data from the previously performed SP 482 may be transferred to the revised procedure for this purpose.

PREVENTATIVE ACTION:

The revised SPs as described above should minimize future totalizer o.o.s. conditions.

Note: Per the long term repair disposition of DQ 95-0017, the totalizer will be replaced with a new instrument.

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: Jim Field

DATE: June 21, 1995
RPM 95-067

FROM: Dennis Gardiner

SUBJECT: **SP 482 REFUELING INTERVAL PLANT WASTE WATER FLOW LOOP 95108 CALIBRATION AND SP 524 QUARTERLY CHANNEL TEST OF WASTE WATER FLOW RATE TOTALIZER**

The effort that went into the proposed revisions to SP 482 and SP 524 is greatly appreciated, but the revisions may not be necessary. There is no requirement for a specific accuracy for the waste water flow device other than that we impose on ourselves. The NRC only requires us to report the estimated accuracy of the measurement. The accuracy of the Totalizer as recently measured is acceptable to the Radiation Protection/Chemistry Group.

It is acknowledged that the total error for the reported volume of waste water leaving the site could be a number greater than 10% if a correction factor is not applied or other action is not taken. Rather than calculate a correction factor, I would propose that RP/Chem establish an accuracy requirement of 20% for the total effluent waste water flow measurement and that SP 482 and SP 524 need only verify that the instrument error portion of the total error will not result in exceeding a total error of 20%.

RP/Chem has reviewed previous effluent reports and finds that the total error recently calculated for the total waste water volumes reported has no impact on any previously reported off-site dose projections.

The review also revealed that several different error numbers for the total effluent volumes have been reported over the years.

Although not required by Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs - Effluent Streams and the Environment", in consideration of the extraordinary effort Technical Services and Instrument and Control has put into determining the accuracy of the waste water flow device, RP/Chem will use a 20% accuracy value in future reports and acknowledge that a more rigorous method

of error determination has been used to determine this value than the methods used to determine the error reported in previous reports.

cc:
Steve Nicolls
Einar Ronningen
RIC 2A.750

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Revision 1
June 1974

U.S. ATOMIC ENERGY COMMISSION

REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

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

A. INTRODUCTION

General Design Criterion 60, "Control of releases of radioactive materials to the environment," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires that the nuclear power plant design include means to control the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, including anticipated operational occurrences.

General Design Criterion 64, "Monitoring radioactivity releases," requires that nuclear power plant designs provide means for monitoring effluent discharge paths for radioactivity that may be released from normal operations, including anticipated operational occurrences, and from postulated accidents.

Section 20.106, "Concentrations in effluents to unrestricted areas," of 10 CFR Part 20, "Standards for Protection Against Radiation," provides that a licensee shall not release to an unrestricted area, radioactive materials in concentrations which exceed limits specified in 10 CFR Part 20 or as otherwise authorized in a license issued by the Commission. Section 20.201, "Surveys," of 10 CFR Part 20 further requires that a licensee conduct surveys of concentrations of radioactive materials as necessary to demonstrate compliance with AEC regulations.

Paragraph (a)(2) of §50.36a, "Technical specifications on effluents from nuclear power reactors," of 10 CFR Part 50 provides that technical specifications for each license will include a requirement that the licensee submit a report to the Commission within 60 days after January 1 and July 1 of each year which specifies the quantity of each of the principal radionuclides released to unrestricted areas in liquid and in gaseous effluents during the previous 6 months of operation, and such other information as may be required by the Commission to estimate maximum potential annual radiation doses to the public resulting from effluent releases.

Paragraph (c) of §20.1, "Purpose," of 10 CFR Part 20 states that every reasonable effort should be made by AEC licensees to maintain radiation exposure, and releases of radioactive materials in effluents to unrestricted areas, as far below the limits specified in Part 20 as practicable, i.e., as low as is practicably achievable, taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety and in relation to the utilization of atomic energy in the public interest.

This guide describes programs acceptable to the Regulatory staff for measuring, reporting, and evaluating releases of radioactive materials in liquid and gaseous effluents and guidelines for classifying and reporting the categories and curie content of solid wastes. Other programs for the reporting of operating information, including abnormal occurrences, are presented in Regulatory Guide 1.16, "Reporting of Operating Information." In some cases, specific programs should be supplemented because of individual plant design features or other factors. The need for supplemental or modified programs will be determined on a case-by-case basis.

The Advisory Committee on Reactor Safeguards has been consulted concerning this guide and has concurred in the regulatory position.

USAEC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the AEC Regulatory staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

Published guides will be revised periodically, as appropriate, to accommodate comments and to reflect new information or experience.

Copies of published guides may be obtained by request indicating the divisions desired to the U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Director of Regulatory Standards. Comments and suggestions for improvements in these guides are encouraged and should be sent to the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Chief, Public Proceedings Staff.

The guides are issued in the following ten broad divisions:

1. Power Reactors
2. Research and Test Reactors
3. Fuels and Materials Facilities
4. Environmental and Siting
5. Materials and Plant Protection
6. Products
7. Transportation
8. Occupational Health
9. Antitrust Review
10. General

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B. DISCUSSION

Information on the identity and quantity of radionuclides in liquid and gaseous effluents and solid wastes from light-water-cooled nuclear power plants, together with meteorological data representative of principal release points, are needed:

1. For evaluation by the licensee and the Regulatory staff of the environmental impact of radioactive materials in effluents and solid wastes, including estimates of the potential annual radiation doses to the public;
2. To ascertain whether AEC regulatory requirements and limiting conditions of operation have been met and whether concentrations of radioactive materials in liquid and gaseous effluents have been kept as low as practicable;
3. For evaluation by the licensee and the Regulatory staff of the adequacy and performance of containment, waste treatment methods, and effluent controls.

It is essential to have a degree of uniformity in the methods used for measuring, evaluating, recording, and reporting data on radioactive material in effluents and solid wastes. The methods described in this guide provide a uniform basis for comparison of data from different sources and permit the preparation of consistent summaries of data for use by the Regulatory staff as bases for the assessment of a licensee's effluent controls and the potential environmental impact of radioactive materials in effluents and solid wastes.

This guide outlines general guidelines for monitoring and reporting programs. Detailed specifications for sampling and analysis of effluents are not included since they need to be tailored to the requirements of each specific plant. Standardized methods for monitoring, sampling, and analysis should be used to the extent practicable. The following is an example of a standard which is appropriate for these purposes.

The American National Standards Institute (ANSI) has developed a standard[1] which includes general principles and guidance for sampling airborne radioactive materials.

To assure uniformity of interpretation, the following definitions of terms used in this guide are provided:

Abnormal releases -unplanned or uncontrolled release of radioactive material from the site boundary.

Batch releases—discontinuous release of gaseous or liquid effluent which takes place over a finite period of time, usually hours or days.

Continuous release—release of gaseous or liquid effluent which is essentially uninterrupted for extended periods during normal operation of the facility.

Determined (or a determination)—a quantitative evaluation of the release or presence of radioactive material under a specific set of conditions. A determination may be made by direct or indirect measurements. In some cases it may not be practical to make direct measurements of specific radionuclides in effluent or waste; e.g., the concentrations may be too low for measurement in a reasonable or practical volume of sample, certain nuclides may be masked by other radionuclides in the sample, or as in the case of solid or concentrated wastes, it may be difficult to obtain a representative sample. Under these circumstances, it may be more appropriate to calculate releases using previously established ratios with those nuclides which are readily measurable. Such a procedure would constitute a determination.

Elevated release point—the point of release of gaseous waste for which credit was given as such in the determination of the technical specification limit for that release point.

Ground-level release point—the point of release for gaseous waste which is treated in the technical specifications as having zero height.

This guide, which is a revised and rewritten version of Regulatory Guide 1.21 (issued as Safety Guide 21 December 29, 1971), describes acceptable programs for measuring, evaluating, and reporting release of radioactive material in liquid and gaseous effluents and solid wastes from nuclear power plants. It also provides guidelines for calculating potential annual radiation doses to individuals and populations using appropriate models and parameters and pertinent recorded effluent and meteorological data. Significant changes from the previous version are identified below:

1. There has been a major change in the format of this guide. The more detailed recommendations concerning radionuclide measurements are presented in Appendix A and the reporting recommendations are indicated in Appendix B.
2. In many cases the criteria for sensitivity of effluent measurements have been modified to reflect as low as practicable dose considerations in the offsite environs; i.e., the sensitivity of effluent measurements should be sufficient to detect concentrations which, when dispersed in the offsite environs, would result in a dose to individuals of a small fraction of natural background radiation.
3. Some changes have been made in the frequency of analysis for certain radionuclides in several categories of effluents.

ANSI N.13.1-1969, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities." Copies may be obtained from the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

4. Provisions for monitoring and reporting of solid wastes and for reporting of meteorological measurements, categories not considered in the earlier guide, have been included.
5. Provisions for applying the measured meteorological and effluent data to acceptable dose models[2,3] in calculating potential doses to individuals and populations, and for reporting of these dose estimates have been included.

C. REGULATORY POSITION

1. Meteorology

A knowledge of meteorological conditions in the vicinity of the nuclear plant is essential to make valid estimates of maximum potential annual radiation doses resulting from radioactive materials released in gaseous effluents. Meteorological measurements should be made in accordance with the guidance set forth in Regulatory Guide 1.23 (Safety Guide 23), "Onsite Meteorological Programs." A summary report of the meteorological measurements taken during each calendar quarter in the 6-month period should be submitted with the semiannual Effluent and Waste Disposal Report as joint frequency distributions of wind direction and wind speed by atmospheric stability class in the format presented in Table 4A of Appendix B to this guide.

Hourly meteorological data for batch releases should be recorded for the periods of actual release, and quarterly summaries should be reported separately from the summaries of all observations taken during each quarter. The batch release data and the quarterly summaries of all observations should each be given in the format presented in Table 4A of Appendix B.

For abnormal releases, hourly meteorological data should be recorded for the periods of actual release and should be included in the quarterly summaries of batch releases.

2. Location of Monitoring

All major and potentially significant paths for release of radioactive material during normal reactor operation, including anticipated operational occurrences, should be monitored. Measurements of effluent volume, rates of release, and specific radionuclides should be made, insofar as practicable, at the point(s) which would provide data that are the most representative of effluent releases to the plant environs. For those effluent discharge points which have input from two or more contributing sources within the plant, monitoring of the major contributing sources should also be considered from the standpoint of more effective process and effluent control. In many cases, monitoring of each of the major contributing sources may be a preferable or more sensitive alternative to monitoring the total effluent release when dilution with other less concentrated effluent streams makes the resultant effluent concentrations too low for accurate measurements.

3. Type of Monitoring

The type of monitoring selected, including the frequency, duration, and methods of measurement, depends to a large degree on the objectives of the monitoring program. Effluent monitoring is required to (a) demonstrate compliance with technical specification and/or 10 CFR Part 20 effluent limits, (b) allow evaluation of the performance of containment, waste treatment, and effluent controls, and (c) permit evaluation of environmental impact and estimation of the potential annual radiation doses to the public. Because radiation dose is dependent on the radionuclide(s) to which the individual is exposed, monitoring programs should provide accurate information on the identity and quantity of specific radionuclides in effluents and wastes.

4. Gross Radioactivity Measurements

Gross radioactivity measurements alone are generally not acceptable for showing compliance with effluent release limits. However, gross radioactivity measurements are often the only practicable means of continuously monitoring effluents and therefore are acceptable under certain specified conditions. Gross radioactivity measurements are acceptable for the purpose of quantifying radioactivity (a) when gross total radioactivity concentrations are a small fraction of the maximum permissible concentrations (MPCs) for "unidentified mixtures" as specified in the notes of Appendix B to 10 CFR Part 20 or (b) when gross radioactivity measurements are shown to be truly indicative of the actual quantity and/or concentration of radionuclides released.

5. Measurements of Specific Radionuclides

Measurements should be made to identify specific radionuclides in batch releases prior to their release to the environment. In those cases where analysis of specific radionuclides such as strontium-89 and strontium-90 cannot be made prior to release, representative samples should be collected from each

[2] Draft Regulatory Guide 1.AA, "Calculation of Annual Average Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Implementing Appendix I," Draft Regulatory Guide 1.DD, "Methods for Estimating Atmospheric Dispersion of Gaseous Effluents from Routine Releases," and Draft Regulatory Guide 1.EE, "Analytical Models for Estimating Radioisotope Concentration in Different Water Bodies", in Attachment to Concluding Statement, Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low as Practicable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactors, Docket RM-50-2, USAEC, February 20, 1974.

[3] "Final Environmental Statement–Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as Practicable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents," WASH-1258, Vol. 1, Directorate of Regulatory Standards, USAEC, July 1973.

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batch of effluents for the purpose of analysis at some later time. The use of composite samples is acceptable, and analyses of such samples should be performed at scheduled frequencies.

Measurements should be made to quantify specific radionuclides in continuous releases by analyses of grab samples collected at scheduled frequencies. The frequency of radionuclide analyses should be based on the degree of variance of the concentrations and mixture compositions from an established norm. Continuous monitoring data as well as grab sample data should be the bases for identifying this variance.

• Frequent comparisons should be made between gross radioactivity measurements of continuous monitors and analyses of specific radionuclides. These comparisons should be the bases for calibrating continuous monitors to establish relationships between monitor readings and concentrations or release rates of radionuclides in continuous effluent releases.

6. Representative Samples

A sample should be representative of the bulk stream or volume of effluent from which it is taken. Provisions should be made to assure that representative samples are obtained from well-mixed streams or volumes of effluent by the selection of proper sampling equipment, the proper location of sampling points, and the development and use of proper sampling procedures.

Prior to sampling, large volumes of liquid waste should be mixed in as short a time interval as practicable to assure that any sediments or particulate solids are distributed uniformly in the waste mixture. Sample points should be located where there is a minimum of disturbance of flow due to fittings and other physical characteristics of the equipment and components. Sample nozzles should be inserted into the flow or liquid volume to ensure sampling the bulk volume of pipes and tanks. Sample lines should be flushed for a sufficient period of time prior to sample extraction in order to remove sediment deposits and air and gas pockets. Periodically, a series of samples should be taken during the interval of discharge to determine whether any differences exist as a function of time and to assure that individual samples are indeed representative of the effluent mixture.

The general principles for obtaining valid samples of airborne radioactive material, the methods and materials for gas and particle sampling, and the guides for sampling from ducts and stacks contained in ANSI N13.1-1969 [1] are generally acceptable and provide adequate bases for the design and conduct of monitoring programs for airborne effluents.

7. Composite Samples

To be representative of the average quantities and concentrations of radioactive materials released in liquid and in particulate form in gaseous effluents, samples for compositing should be collected in proportion to the rate of flow of the effluent stream or in proportion to the volume of each batch of effluent releases. Prior to analysis, the composite should be thoroughly mixed so that the sample is representative of the average effluent release.

Periods of collection for composites should be as short as practicable to preclude the loss of radioactive material by deposition on walls of the sample container or volatilization of potentially volatile material. Periodic checks should be performed to identify any such changes in composite samples.

8. Time between Collection and Analysis

Measurements should be made as soon as practicable after collection to minimize loss of short-lived radionuclides by decay. Measurement of longer-lived radionuclides sometimes can be simplified by allowing sufficient time before their analysis for the decay of short-lived radionuclides.

Procedures should be instituted for handling, packaging, and storing samples to assure that loss of radioactive materials or other factors causing sample deterioration do not invalidate the analysis.

9. Corrections for Decay

Decay corrections should be made as though the effluent were released uniformly throughout the sampling period unless it is shown that most of the effluent was released during a particularly short interval. The exact time or time intervals of sample collection should be recorded. To estimate radioactive decay in composite or pooled samples, weighting should be applied to the delay time of each portion and to the quantity of each portion in relation to the total quantity of the sample.

10. Sensitivity

The sensitivity limits given for radioactivity analyses in Appendix A of this guide are based on the potential significance in the environment of the quantities of radioactive materials released. For some radionuclides, lower detection limits than those given herein may be readily achievable and when measurements below the stated sensitivity limits are attained, the results should be recorded and reported.

For certain mixtures of gamma-emitting nuclides, it may not be possible to measure certain radionuclides at the stated sensitivity limits when other radionuclides are present in the sample in much greater concentrations. Also, it may not be possible to measure certain radionuclides whose gamma ray yields are low (e.g., Kr-85, Cr-51, etc.) at the stated sensitivity limits. Under these circumstances, and in the case of radionuclides

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which have no gamma rays and weak beta radiation (e.g., Fe-55, Ni-63, etc.), it may be more appropriate to calculate releases of such radionuclides using measured ratios of these radionuclides to those radionuclides which are routinely identified and measured. Measurements should be made periodically to establish and assure the continued validity of the ratios used. Any reported data determined by this method should be clearly identified.

11. Accuracy of Measurements

a. Errors in Measurements

An estimate should be made of the error associated with measurement of radioactive materials in effluents and solid wastes. Counting statistics can provide an estimate of the minimum error involved in radioactivity analyses. Counting statistics (e.g., one-sigma counting error) should be included in the records of measurements, since they provide a readily calculable estimate of the statistical uncertainty due to counting.

The total or maximum error associated with the effluent measurement will include the cumulative errors resulting from the total operation of sampling and measurement. Because it may be very difficult to assign error terms for each parameter affecting the final measurement, detailed statistical evaluations of error are not suggested. The objective should be to obtain an overall estimate of the error associated with measurements of radioactive materials released in liquid and gaseous effluents and solid waste.

b. Quality Controls

Control checks and tests should be applied to the analytical process by the use of blind duplicate analyses of selected effluent samples and by cross-check analysis of selected samples with an independent laboratory. Quality controls should also be applied to the entire sample-collection procedure to assure that representative samples are obtained and that samples are not changed or affected prior to their analysis because of handling or because of their storage environment.

c. Calibrations

Individual written procedures should be prepared and utilized for specific methods of calibrating radiological monitoring systems and measuring equipment. Calibration practices for ancillary equipment and systems are described in Regulatory Guide 1.23, "Onsite Meteorological Programs," and elsewhere,[1] and where appropriate, they should be utilized and included as a part of the written procedures. Calibration procedures may be compilations of published standard practices or manufacturers' instructions that accompany purchased equipment or they may be specially written in-house to include special methods or items of equipment not covered elsewhere. Calibration procedures should identify the specific equipment or group of instruments to which the procedures apply.

Calibrations of measuring equipment should be performed using reference standards certified by the National Bureau of Standards or standards that have been calibrated against standards certified by the National Bureau of Standards. Calibration standards should have the necessary accuracy, stability, and range required for their intended use.

Calibrations should generally be performed at regular intervals. Frequency of calibration should be based on the reproducibility and time stability of the system. An instrument system that gives a relatively wide range of readings when calibrated against a given standard should be recalibrated at more frequent intervals than one which gives measurements within a more narrow range. In many cases, it would be more appropriate to calibrate measuring equipment before and after use in addition to or instead of calibration at arbitrarily scheduled intervals. Calibration of measuring equipment before and after use permits detection of any erroneous readings or malfunctions that may have occurred during use. Any monitoring system or individual measuring equipment should be recalibrated or replaced whenever it is suspected of being out of adjustment, excessively worn, or otherwise damaged and not operating properly. Functional checks, i.e., routine checks performed to demonstrate that a given instrument is in working condition and functioning properly, may be performed using radioactive sources that are not standards.

Continuous radioactivity monitoring systems should be calibrated against appropriate standards and the relationship established between concentration and monitor readings over the full range of the readout device. Adequacy of the system should be judged on the basis of reproducibility, time stability, and sensitivity. Periodic inservice calibrations should also be performed to relate monitor "readings" to the concentrations and/or release rates of radioactive material in the monitored release path. These calibrations should be based on the results of analyses for specific radionuclides in grab samples from the release path.

12. Expression of Results of Measurements

a. Units

The information and data on effluent releases included in reports to the Commission should be expressed in the units given in Appendix B of this guide and reported in the form given in paragraphs b and c below.

b. Significant Figures

To avoid ambiguity, significant figures should be used in recording the results of effluent

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measurements. When several numbers are multiplied or divided together, the result should be rounded off to as few significant figures as are present in the factor with the fewest significant figures. When numbers are added or subtracted, the number with the fewest decimal places, not necessarily the fewest significant figures, puts the limit on the number of places that may justifiably be carried in the sum or difference.

For the purpose of reporting in the format of Appendix B of this guide, numerical values should be rounded off to three figures.

c. **Numerical Values**

Results of measurements, including percentages, should be reported in external floating point form, using the letter "E" to denote the exponent to the base 10. For example: 2% should appear as 2.00E+00; 0.00032 should appear as 3.20E-04; 157.6 should appear as 1.58E+02; 2.67 should appear as 2.67E+00.

The term "not detected" should not be used. If radioactivity in the sample(s) is less than the maximum sensitivity of measurement, the value should be reported as less than the maximum sensitivity. For example, if the maximum sensitivity is 3×10^{-9} μCi/ml, the values should be reported as <3.00E-09.

13. Radiological Impact on Man

Estimations of doses to individuals and populations are necessary for the assessment of the radiological impact on man from the operation of nuclear power plants. Dose calculations should be made using the measured effluent and meteorological data and acceptable dose models such as those provided in draft regulatory guides for implementation of numerical guides.[2] To the extent that they are not inconsistent with the models provided in these draft guides, other dose models such as those given in WASH-1258[3] or those used for calculating the estimated dose values given in the licensee's Environmental Report are also acceptable as bases for making dose calculations.

14. Other Provisions

The provisions and principles presented in Appendices A and B of this guide are acceptable to the Regulatory staff as bases for measuring and reporting of radioactive materials in liquid and gaseous effluents and solid wastes from nuclear power plants, as well as for estimating doses to individuals and populations in the offsite environs.

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APPENDIX A

MEASURING RADIOACTIVE MATERIALS IN LIQUID AND GASEOUS EFFLUENTS AND SOLID WASTE

This appendix describes a monitoring program that is acceptable to the Regulatory staff. The frequencies of sampling and analysis and the types of measurements described are considered to be the minimum acceptable. In some cases, this program should be supplemented with additional measurements because of individual plant design features or other factors. The need for supplemental or modified programs is determined on a case-by-case basis.

A. GASEOUS EFFLUENTS

Continuous monitoring should be conducted along principal gaseous effluent discharge paths. The radionuclide composition and quantities and concentrations of radioactive material in gaseous effluents should be determined and recorded. For the periods of release, the records should also show, on an hourly basis, the existing meteorological conditions of wind direction, wind speed, and atmospheric stability which are representative of conditions at the principal points of release (see Regulatory Guide 1.23, "Onsite Meteorological Programs").

The single Poisson (one sigma) error for discrete measurements should be less than 50 percent for release rates at the design objective level, less than 30 percent at twice the design objective release rate, and less than 20 percent at eight times the design objective release rate.

1. Fission and Activation Gases

During the release of gaseous wastes from the primary system waste gas holdup system, the effluent monitor should be operating and set to alarm and to initiate the automatic closure of the waste gas discharge valve before the limits specified in the technical specifications are exceeded.

a. Continuous Releases

For reactors which release gases continuously, a sample of the gaseous effluent should be analyzed within one month after the date of initial criticality of the reactor and at least weekly thereafter to determine the identity and quantity of the principal radionuclides being released. A similar analysis of samples should be performed following each refueling, process change, or other occurrence that could alter the mixture of radionuclides. For those processes or other conditions that change significantly (e.g., when the average daily gross radioactivity release rate equals or exceeds that given in the technical specifications or when the steady-state gross radioactivity release rate increases by 50% over the previous steady-state release rate at the same power level), an analysis should be done following each change until it is shown that a pattern exists that can be used to predict the isotopic composition of the effluent. In addition, radionuclide analyses should be performed when continuous monitoring shows an unexplained variance from an established norm which may be indicative of a change in the concentration and composition. The norm should be established as a range of readings that may be expected due to normal operating conditions including anticipated operational occurrences.

The calibration of continuous gross radioactivity monitoring systems should be performed by normalizing against the results of specific radionuclide analyses using established ratios of the respective radionuclides to total activity. When calibrated in this fashion, the gross radioactivity measurements obtained from continuous monitors may be used to determine the total quantity of radioactivity released.

b. Batch Releases

For reactors which release gases intermittently, an analysis should be made of a representative sample of each planned release prior to discharge to determine the identity and quantity of the principal radionuclides released. Continuous monitoring should also be conducted at appropriate points to obtain information on the quantity and pattern of abnormal releases.

c. Sensitivity

For those discharge points which have input from two or more contributing sources within the plant, separate monitoring of the major sources should be performed as a more sensitive alternative to monitoring the composite effluent stream when bulk dilution results in concentrations too low for accurate measurements.

The sensitivity of gross radioactivity measurements of fission and activation gases, as a minimum, should be sufficient to permit measurement of a small fraction of the activity which would result in (1) an annual air dose of 10 millirads due to gamma radiation at any location near ground level at or beyond the site boundary and (2) an annual air dose of 20 millirads due to beta radiation at any location near ground level at or beyond the site boundary.

The sensitivity of analysis for each of the principal radioactive gases in representative samples of gaseous effluents should be such that concentrations of 10^{-4} μCi/cc are measurable.

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2. Iodines

a. Monitoring

A representative sample from the principal discharge paths should be drawn continuously through an iodine sampling device. The sample collected in the device should be analyzed at least weekly for iodine-131. An analysis should also be made monthly or more often for iodine-133 and iodine-135.

The results of these analyses should be used as the basis for recording, evaluating, and reporting the quantities of radioiodines released during the sampling period. In estimating releases for periods when analyses were not performed, the average of the two adjacent data points spanning this period should be used. These estimates should be included in the effluent records and reports; however, they should be clearly identified as estimates, and the method used to obtain these data should be described.

b. Sensitivity

The sensitivity of the analysis of radioiodines should be sufficient to permit measurement of a small fraction of the activity which would result in annual exposures of 15 millirems to the thyroid of individuals in unrestricted areas.

3. Particulates

a. Monitoring

A representative sample from the discharge paths should be drawn continuously through a particulate filter. Measurements should be made on these filters to determine the quantities of radionuclides with half-lives greater than 8 days that are released in particulate form to the environment.

(1) The particulate filters should be changed and analyzed at least weekly for the principal gamma-emitting nuclides (at least for the radionuclides barium-lanthanum-140 and iodine-131). When quantities of released radioactive materials are at low levels, precluding accurate measurement of principal radionuclides, gross beta radioactivity measurements should be made as a basis for estimating the quantity of radioactive material released in the week.

(2) A quarterly analysis for strontium-89 and strontium-90 should be made on a composite of all filters from each sampling location collected during the quarter.

(3) A monthly analysis for gross alpha radioactivity should be made on a composite of all filters collected during the month from each sampling location.

The results of these analyses should be used as the basis for recording and reporting the quantities of radioactive material in particulate form released during the sampling period. In estimating releases for periods when analyses were not performed, the average of the two adjacent data points spanning this period should be used. These estimates should be included in the effluent records and reports; however, they should be clearly identified as estimates, and the method used to obtain these data should be described.

b. Sensitivity

The sensitivity of analysis for radioactive material in particulate form should be sufficient to permit measurement of a small fraction of the activity which would result in annual exposures of 15 millirems to any organ of an individual in an unrestricted area.

4. Tritium

a. Monitoring

The release of tritium to the atmosphere should be determined for each batch released on an intermittent basis, and at least monthly for continuous releases.

b. Sensitivity

The sensitivity of analysis of tritium released to the atmosphere should be such that a concentration of 10^{-6} μCi/cc (of air) is measurable.

B. LIQUID EFFLUENTS

During the release of radioactive wastes, the effluent control monitor should be set to alarm and to initiate automatic closure of the waste discharge valve prior to exceeding the limits specified in the technical specifications.

Continuous monitoring should be provided for liquid effluent releases. The radionuclide mixture of liquid effluents should be determined and recorded. For the period(s) of release, the records should also show the volume of water used to dilute the liquid effluent and the resultant concentrations at the point(s) of release to unrestricted areas. If the effluent passes into a flowing stream, data on the average flow of the stream during periods of effluent release should be collected and reported in the Supplemental Information section of the report. (See Effluent and Waste Disposal Semiannual Report, Appendix B.)

The single Poisson (one sigma) error for discrete measurements should be less than 50 percent for release rates at the design objective level, less than 30 percent at twice the design objective release rate, and less than 20 percent at eight times the design objective release rate.

1. Batch Releases

a. A representative sample of each batch of liquid effluent released should be analyzed for the principal gamma-emitting radionuclides.

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When operational or other limitations preclude specific gamma radionuclide analysis of each batch, gross radioactivity measurements should be made to estimate the quantity and concentrations of radioactive material released in the batch, and a weekly sample composited from proportional aliquots from each batch released during the week should be analyzed for the principal gamma-emitting radionuclides.

b. A monthly sample composited from proportional aliquots from each batch released during the month should be analyzed for tritium and gross alpha radioactivity.

c. A representative sample from at least one representative batch per month should be analyzed for dissolved and entrained fission and activation gases.

d. A quarterly sample composited from proportional aliquots from each batch released during the three-month period should be analyzed for strontium-89 and strontium-90.

The results of these analyses should be used as the basis for recording and reporting the quantities of radioactive material released in liquid effluents during the sampling period. In estimating releases for a period when analyses were not performed, the average of the two adjacent data points spanning this period should be used. Such estimates should be included in the effluent records and reports; however, they should be clearly identified as estimates, and the method used to obtain these data should be described.

2. **Continuous Releases**

For continuous releases (e.g., secondary plant leakage), in addition to continuous monitoring, a representative sample of the liquid effluent should be analyzed at least weekly to determine the identity and quantity of the principal gamma-emitting radionuclides being released. Analysis for other specific radionuclides should be conducted in accordance with 1 above.

3. **Sensitivity**

The sensitivities of analyses of radioactive materials in liquid effluents should be sufficient to permit the measurement of concentrations of 10^{-7} μCi/ml by gross radioactivity measurements, 5×10^{-7} μCi/ml of each gamma-emitting radionuclide, 10^{-5} μCi/ml of each of the dissolved and entrained gaseous radionuclides, 10^{-7} μCi/ml of gross alpha radioactivity, 10^{-5} μCi/ml of tritium, and 5×10^{-8} μCi/ml of strontium-89 and strontium-90.

C. SOLID WASTE

The total curie quantity and radionuclide composition of the solid waste shipped offsite should be determined. Provisions should be made to monitor and to limit the curie quantity of material and the maximum radiation level of each package of solid waste in order to reduce radiation exposure to personnel and to meet the regulatory requirements of 10 CFR Part 71, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Material under Certain Conditions," and of the Department of Transportation. Monitoring of solid wastes in storage and preparatory to shipment should be performed to provide assurance that the radiation levels from waste in storage and in transport do not exceed regulatory limits.

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APPENDIX B

EFFLUENT AND WASTE DISPOSAL REPORT

This appendix describes the data and information that should be included in effluent and waste disposal reports. The data and information should be reported in a format similar to that given in Tables 1 through 4 and the Supplemental Information sheet. Except as noted, effluent and solid waste data should be summarized on a quarterly basis, although in some cases more detailed data may be needed. The need for reporting of additional data to the Commission will be determined on a case-by-case basis.

The reporting method includes the use of uniform notation for numerical values and generally defined guidance for reporting certain supplemental information. Data from licensee's effluent and waste disposal reports are compiled, and summary reports of nuclear power plant effluents are prepared by the Commission. The supplemental information reduces errors in processing and compiling of report data.

In the report, a separate section should contain a discussion of the radiological impact of facility operation on man. Calculations and estimates of potential doses to individuals and population doses should be summarized for the report (6-month) period, although in some cases more detailed data may be needed. The need for these additional data to be reported to the Commission is determined on a case-by-case basis.

Meteorological data during continuous releases should be submitted in the format presented in Table 4A. (Also see Regulatory Guide 1.23.) Data on meteorological conditions during batch releases should be reported separately in the same format. For the purpose of this guide, abnormal releases should be treated as batch releases, and the meteorological data obtained during abnormal releases should be included in the batch release report.

A. SUPPLEMENTAL INFORMATION

1. Regulatory Limits

The technical specification limits for radioactive materials released in liquid and gaseous effluents should be included in each report. If changes are made in limiting conditions of operation during the report period, the appropriate limits and dates should be included.

2. Maximum Permissible Concentrations

The maximum permissible concentrations (MPC) used to calculate permissible release rates and concentrations for air and water should be included in each report (if appropriate), i.e., the MPC used in accordance with technical specifications and/or derived from the use of Notes to Appendix B, 10 CFR Part 20.

3. Average Energy

The release rate limits for fission and activation gases in gaseous effluents are usually based on the average energy ($\bar{E}$) of the radionuclide mixture in the effluent. The $\bar{E}$ value for the gamma and beta energies per disintegration that is used should be included in the report.

4. Measurements and Approximations of Total Radioactivity

A summary description should be provided of the method(s) used to determine or measure total radioactivity in effluent releases (total here means the overall gross curie quantity). For example, gross radioactivity measurements (gross beta and/or gross gamma) may be used to approximate total radioactivity in effluents, and/or analyses of specific radionuclides in selected or composited samples may be used to determine the radionuclide composition of the effluent. A summary description of the methods used for estimating overall errors associated with radioactivity measurements should also be provided.

5. Batch Releases

The report should provide information relating to batch releases of liquid and gaseous effluents which are discharged to the environment. This information should include the number of releases, total time period for batch releases, and the maximum, mean, and minimum time period of release.

6. Abnormal Releases

The number of abnormal releases of radioactive material to the environment should be reported. The total curies of radioactive materials released as a result of abnormal releases should be included.

This information should be reported separately for liquid and gaseous releases. The activity values should also be included, as appropriate, in Tables 1 and 2. Hourly meteorological data should be recorded for the periods of actual release and included in the quarterly summaries for batch releases in the format given in Table 4A.

B. GASEOUS EFFLUENTS

Summary information should be reported in the formats of Tables 1A through 1C. Table 1A values

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should include the sums of all sources of release, i.e., routine and abnormal releases, continuous and batch, elevated and ground level. The reported percent of technical specification limits should be based on the combined releases from multiple sources as given in the technical specifications. This also applies to the releases from multireactor sites.

For reactors that have technical specification limits for more than one principal point of release, separate radionuclide data should be reported for each of these release points. Data should be separated by release height, i.e., elevated or ground level, and these data should be further subdivided by release mode, i.e., continuous or batch mode. (See Tables 1B and 1C.)

Estimates of the total error associated with certain total values should be provided in each report. (See Table 1A.) These error values should be the best effort at an overall estimate of the errors associated with the totals in the report.

Report the following information as indicated by Tables 1A through 1C.

1. **Gases**

a. Quarterly sums of total curies of fission and activation gases released.

b. Average release rates (μCi/sec) of fission and activation gases for the quarterly periods covered by the report.

c. Percent of technical specification limit for releases of fission and activation gases. This should be calculated in accordance with technical specification limits.

d. Quarterly sums of total curies for each of the radionuclides determined to be released, based on analyses of fission and activation gases. The data should be categorized by (1) elevated releases, batch and continuous modes, and (2) ground-level releases, batch and continuous modes. (See Tables 1B and 1C.)

2. **Iodines**

a. Quarterly sums of total curies of iodine-131 released.

b. Average release rate (μCi/sec) of iodine-131.

c. Percent of technical specification limit for iodine-131.

d. Quarterly sums of total curies of each of the isotopes, iodine-131, iodine-133, and iodine-135 determined to be released. (See B.1.d above and Tables 1B and 1C.)

3. **Particulates**

a. Quarterly sums of total curies of radioactive material in particulate form with half-lives greater than 8 days determined to be released.

b. Average release rate (μCi/sec) of radioactive material in particulate form with half-lives greater than 8 days.

c. Percent of technical specification limit for radioactive material in particulate form with half-lives greater than 8 days.

d. Quarterly sums of total curies for each of the radionuclides in particulate form determined to be released based on analyses performed. (See B.1.d above and Tables 1B and 1C.)

e. Quarterly sums of total curies of gross alpha radioactivity determined to be released.

4. **Tritium**

a. Quarterly sums of total curies of tritium determined to be released in gaseous effluents.

b. Average release rate (μCi/sec) of tritium.

c. Percent of appropriate technical specification or MPC limits for tritium.

C. LIQUID EFFLUENTS

Summary information should be reported in the formats of Tables 2A and 2B. Table 2A values should include the quarterly sums of all releases of radioactive materials in liquid effluents, i.e., routine and abnormal occurrences, continuous and batch. The reported percent of technical specification limits should be based on the combined releases from multiple sources as given in the technical specifications. This also applies to the releases from multireactor sites.

Estimates of the total error associated with certain total values should be provided in each report. (See Table 2A.) These error values should be the best effort at an overall estimate of the errors associated with the totals in the report.

Report the following information, as indicated by Tables 2A and 2B.

1. **Mixed Fission and Activation Products**

a. Quarterly sums of total curies of radioactive material determined to be released in liquid effluents (not including tritium, dissolved and entrained gases, and alpha-emitting material). (See Table 2A.)

b. Average concentrations (μCi/ml) of mixed fission and activation products (C.1.a above) released to unrestricted areas, averaged over the quarterly periods covered by the report.

c. Percent of applicable limit of average concentrations released to unrestricted areas (C.1.b above). Include the limit used and the bases in the supplemental report information.

d. Quarterly sums of total curies for each of the radionuclides determined to be released in liquid effluents, based on analyses performed. Data should be separated by type of release mode, i.e., continuous or batch. (See Table 2B.)

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2. **Tritium**

a. Quarterly sums of total curies of tritium determined to be released in liquid effluents.

b. Average concentrations (μCi/ml) of tritium released in liquid effluents to unrestricted areas, averaged over the quarterly periods covered by the report.

c. Percent of applicable limit of average concentrations released to unrestricted areas (C.2.b above), i.e., percent of 3×10^{-3} μCi/ml. Include the limit and the bases in the supplemental report information.

3. **Dissolved and Entrained Gases**

a. Quarterly sums of total curies of gaseous radioactive material determined to be released in liquid effluents.

b. Average concentrations (μCi/ml) of dissolved and entrained gaseous radioactive material released to unrestricted areas, averaged over the quarterly periods covered by the report.

c. Percent of technical specification limit of average concentrations released to unrestricted areas (C.3.b above). Include the limit used and the bases in the supplemental report information.

d. Quarterly sums of total curies for each of the radionuclides determined to be released as dissolved and entrained gases in liquid effluents.

4. **Alpha Radioactivity**

Quarterly sums of total curies of gross alpha-emitting material determined to be released in liquid effluents.

5. **Volumes**

a. Quarterly sums, in liters, of total measured volume, prior to dilution, of liquid effluent released.

b. Quarterly sums of total determined volume, in liters, of dilution water used during the period of the report.

6. **Stream Flow**

Where the effluent passes into a flowing stream, data on the average flow of the stream during periods of effluent release should be collected and reported in the Supplemental Information section of the report.

D. SOLID WASTE

The following information should be reported for shipments of solid waste and irradiated fuel transported from the site during the report period:

1. The semiannual total quantity in cubic meters and the semiannual total radioactivity in curies for the categories or types of waste. (See Table 3.)

a. Spent resins, filter sludges, evaporator bottoms;
b. Dry compressible waste, contaminated equipment, etc.;
c. Irradiated components, control rods, etc.;
d. Other (furnish description).

2. An estimate of the major nuclide composition in the categories of waste in D.1 above.

3. The disposition of solid waste shipments. (Identify the number of shipments, the mode of transport, and the destination.)

4. 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 should be provided in each report. (See Table 3.) These error values should be the best effort of an overall estimate of the errors associated with the totals in the report.

E. RADIOLOGICAL IMPACT ON MAN

Potential doses to individuals and populations should be calculated using measured effluent and meteorological data. A semiannual summary report should be submitted containing the following information:

1. Total body and significant organ doses to individuals in unrestricted areas from receiving-water-related exposure pathways.
2. Total body and skin doses to individuals exposed at the point of maximum offsite ground-level concentrations of radioactive materials in gaseous effluents.
3. Organ doses to individuals in unrestricted areas from radioactive iodine and radioactive material in particulate form from all pathways of exposure.
4. Total body doses to individuals and populations in unrestricted areas from direct radiation from the facility.
5. Total body doses to the population and average doses to individuals in the population from all receiving-water-related pathways.
6. Total body doses to the population and average doses to individuals in the population from gaseous effluents to a distance of 50 miles from the site. If a significantly large population area is located just beyond 50 miles from the site, the dose to this population group should be considered.

F. METEOROLOGICAL DATA

The report should include the cumulative joint frequency distribution of wind speed, wind direction, and atmospheric stability for the quarterly periods. Similar data should be reported separately for the meteorological conditions during batch releases. (See Regulatory Guide 1.23 and Tables 4A and 4B in this appendix.)

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EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT

Supplemental Information

Facility _____ Licensee _____

1. **Regulatory Limits**

   a. Fission and activation gases:
   b. Iodines:
   c. Particulates, half-lives >8 days:
   d. Liquid effluents:

2. **Maximum Permissible Concentrations**

   Provide the MPCs used in determining allowable release rates or concentrations.
   a. Fission and activation gases:
   b. Iodines:
   c. Particulates, half-lives >8 days:
   d. Liquid effluents:

3. **Average Energy**

   Provide the average energy ($\bar{E}$) of the radionuclide mixture in releases of fission and activation gases, if applicable

4. **Measurements and Approximations of Total Radioactivity**

   Provide the methods used to measure or approximate the total radioactivity in effluents and the methods used to determine radionuclide composition
   a. Fission and activation gases
   b. Iodines
   c. Particulates
   d. Liquid effluents

5. **Batch Releases**

   Provide the following information relating to batch releases of radioactive materials in liquid and gaseous effluents

   a. **Liquid**

      1. Number of batch releases
      2. Total time period for batch releases
      3. Maximum time period for a batch release
      4. Average time period for batch releases
      5. Minimum time period for a batch release
      6. Average stream flow during periods of release of effluent into a flowing stream

   b. **Gaseous**

      1. Number of batch releases
      2. Total time period for batch releases
      3. Maximum time period for a batch release
      4. Average time period for batch releases
      5. Minimum time period for a batch release

6. **Abnormal Releases**

   a. **Liquid**

      1. Number of releases
      2. Total activity released

   b. **Gaseous**

      1. Number of releases
      2. Total activity released

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TABLE 1A

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (YEAR)

GASEOUS EFFLUENTS—SUMMATION OF ALL RELEASES

	Unit	Quarter	Quarter	Est. Total Error, %
A. Fission & activation gases				
1. Total release	Ci	. E	. E	. E
2. Average release rate for period	μCi/sec	. E	. E	
3. Percent of Technical specification limit	%	. E	. E	
B. Iodines				
1. Total iodine-131	Ci	. E	. E	. E
2. Average release rate for period	μCi/sec	. E	. E	
3. Percent of technical specification limit	%	. E	. E	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	. E	. E	. E
2. Average release rate for period	μCi/sec	. E	. E	
3. Percent of technical specification limit	%	. E	. E	
4. Gross alpha radioactivity	Ci	. E	. E	
D. Tritium				
1. Total release	Ci	. E	. E	. E
2. Average release rate for period	μCi/sec	. E	. E	
3. Percent of technical specification limit	%	. E	. E	

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TABLE 1B

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (YEAR)

GASEOUS EFFLUENTS—ELEVATED RELEASE

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
1. Fission gases					
krypton-85	Ci	. E	. E	. E	. E
krypton-85m	Ci	. E	. E	. E	. E
krypton-87	Ci	. E	. E	. E	. E
krypton-88	Ci	. E	. E	. E	. E
xenon-133	Ci	. E	. E	. E	. E
xenon-135	Ci	. E	. E	. E	. E
xenon-135m	Ci	. E	. E	. E	. E
xenon-138	Ci	. E	. E	. E	. E
Others (specify)	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
unidentified	Ci	. E	. E	. E	. E
Total for period	Ci	. E	. E	. E	. E
2. Iodines					
iodine-131	Ci	. E	. E	. E	. E
iodine-133	Ci	. E	. E	. E	. E
iodine-135	Ci	. E	. E	. E	. E
Total for period	Ci	. E	. E	. E	. E
3. Particulates					
strontium-89	Ci	. E	. E	. E	. E
strontium-90	Ci	. E	. E	. E	. E
cesium-134	Ci	. E	. E	. E	. E
cesium-137	Ci	. E	. E	. E	. E
barium-lanthanum-140	Ci	. E	. E	. E	. E
Others (specify)	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
unidentified	Ci	. E	. E	. E	. E

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TABLE 1C

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (YEAR)

GASEOUS EFFLUENTS—GROUND-LEVEL RELEASES

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
1. Fission gases					
krypton-85	Ci	. E	. E	. E	. E
krypton-85m	Ci	. E	. E	. E	. E
krypton-87	Ci	. E	. E	. E	. E
krypton-88	Ci	. E	. E	. E	. E
xenon-133	Ci	. E	. E	. E	. E
xenon-135	Ci	. E	. E	. E	. E
xenon-135m	Ci	. E	. E	. E	. E
xenon-138	Ci	. E	. E	. E	. E
Others (specify)	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
unidentified	Ci	. E	. E	. E	. E
Total for period	Ci	. E	. E	. E	. E
2. Iodines					
iodine-131	Ci	. E	. E	. E	. E
iodine-133	Ci	. E	. E	. E	. E
iodine-135	Ci	. E	. E	. E	. E
Total for period	Ci	. E	. E	. E	. E
3. Particulates					
strontium-89	Ci	. E	. E	. E	. E
strontium-90	Ci	. E	. E	. E	. E
cesium-134	Ci	. E	. E	. E	. E
cesium-137	Ci	. E	. E	. E	. E
barium-lanthanum-140	Ci	. E	. E	. E	. E
Others (specify)	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
unidentified	Ci	. E	. E	. E	. E

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TABLE 2A

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (YEAR)

LIQUID EFFLUENTS—SUMMATION OF ALL RELEASES

	Unit	Quarter	Quarter	Est. Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	. E	. E	. E
2. Average diluted concentration during period	μCi/ml	. E	. E	
3. Percent of applicable limit	%	. E	. E	
B. Tritium				
1. Total release	Ci	. E	. E	. E
2. Average diluted concentration during period	μCi/ml	. E	. E	
3. Percent of applicable limit	%	. E	. E	
C. Dissolved and entrained gases				
1. Total release	Ci	. E	. E	. E
2. Average diluted concentration during period	μCi/ml	. E	. E	
3. Percent of applicable limit	%	. E	. E	
D. Gross alpha radioactivity				
1. Total release	Ci	. E	. E	. E
E. Volume of waste released (prior to dilution)	liters	. E	. E	. E
F. Volume of dilution water used during period	liters	. E	. E	. E

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TABLE 2B

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (YEAR)

LIQUID EFFLUENTS

		CONTINUOUS MODE		BATCH MODE	
Nuclides Released	Unit	Quarter	Quarter	Quarter	Quarter
strontium-89	Ci	. E	. E	. E	. E
strontium-90	Ci	. E	. E	. E	. E
cesium-134	Ci	. E	. E	. E	. E
cesium-137	Ci	. E	. E	. E	. E
iodine-131	Ci	. E	. E	. E	. E
cobalt-58	Ci	. E	. E	. E	. E
cobalt-60	Ci	. E	. E	. E	. E
iron-59	Ci	. E	. E	. E	. E
zinc-65	Ci	. E	. E	. E	. E
manganese-54	Ci	. E	. E	. E	. E
chromium-51	Ci	. E	. E	. E	. E
zirconium-niobium-95	Ci	. E	. E	. E	. E
molybdenum-99	Ci	. E	. E	. E	. E
technetium-99m	Ci	. E	. E	. E	. E
barium-lanthanum-140	Ci	. E	. E	. E	. E
cerium-141	Ci	. E	. E	. E	. E
Other (specify)	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
	Ci	. E	. E	. E	. E
unidentified	Ci	. E	. E	. E	. E
Total for period (above)	Ci	. E	. E	. E	. E
xenon-133	Ci	. E	. E	. E	. E
xenon-135	Ci	. E	. E	. E	. E

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TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (YEAR)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of waste	Unit	6-month Period	Est. Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3 Ci	. E . E	. E
b. Dry compressible waste, contaminated equip, etc.	m^3 Ci	. E . E	. E
c. Irradiated components, control rods, etc.	m^3 Ci	. E . E	. E
d. Other (describe)	m^3 Ci	. E . E	. E

2. Estimate of major nuclide composition (by type of waste)

a.	%	. E
	%	. E
	%	. E
b.	%	. E
	%	. E
	%	. E
c.	%	. E
	%	. E
	%	. E
d.	%	. E
	%	. E
	%	. E

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination

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TABLE 4A

HOURS AT EACH WIND SPEED AND DIRECTION [a]

PERIOD OF RECORD:

STABILITY CLASS:

ELEVATION:

Wind Direction	Wind Speed (mph) at 10m Level						
	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N							
NNE							
NE							
ENE							
E							
ESE							
SE							
SSE							
S							
SSW							
SW							
WSW							
W							
WNW							
NW							
NNW							
VARIABLE							

Total
Periods of calm (hours):
Hours of missing data:

[a] In the table, record the total number of hours of each category of wind direction for each calendar quarter. Provide similar tables separately for each atmospheric stability class and elevation.

TABLE 4B

CLASSIFICATION OF ATMOSPHERIC STABILITY

Stability Classification	Pasquill Categories	$\sigma\theta$[a] (degrees)	Temperature change with height (°C/100m)
Extremely unstable	A	25.0	<-1.9
Moderately unstable	B	20.0	-1.9 to -1.7
Slightly unstable	C	15.0	-1.7 to -1.5
Neutral	D	10.0	-1.5 to -0.5
Slightly stable	E	5.0	-0.5 to 1.5
Moderately stable	F	2.5	1.5 to 4.0
Extremely stable	G	1.7	>4.0

[a] Standard deviation of horizontal wind direction fluctuation over a period of 15 minutes to 1 hour. The values shown are average for each stability classification.

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SACRAMENTO MUNICIPAL UTILITY DISTRICT
INTEROFFICE MEMORANDUM

TO: Jim Field

DATE: July 24, 1997
MNTS 97-0031

FROM: Jim Saum

SUBJECT: IMPROPER USAGE OF COUNT RATE SURVEY INSTRUMENTS

Current plant Radiation Protection Procedures for controlling and free releasing contamination by usage of count rate survey instruments would allow the free release of contaminated materials if followed. The friskers do not have the MDA to detect contamination in allowed conditions.

cc: RIC

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: Steve Redeker

DATE: July 24, 1997

IDT 97-049

FROM: Dennis Gardiner

SUBJECT: MNTS 97-0031

I have reviewed the Rancho Seco procedures, NRC Guidance and recent NRC inspection reports and determined that the procedures and techniques being used to monitor materials for "Free Release" to unrestricted areas are in compliance with NRC requirements. It should be noted that this specific area was reviewed in the last NRC inspection (97-02) and found to be acceptable. Please refer to page 7 of the attached NRC inspection. No further investigation into this matter is planned unless specific regulatory non-compliance is brought to my attention.

Noted.
SRedeker
7/24/97

cc: Bill Wilson
Jim Field
RIC 2A.750

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52307

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

APR 25 1997

Richard Ferreira, Assistant General Manager
Energy Supply and Chief Engineer
Sacramento Municipal Utility District
6201 'S' Street
Sacramento, California 95852

SUBJECT: NRC INSPECTION REPORT 50-312/97-02

Dear Mr. Ferreira:

An NRC inspection was conducted March 31- April 3, 1997, at your Rancho Seco Nuclear Generating Station facility. The enclosed report presents the scope and results of that inspection.

The areas reviewed during this inspection included the incremental decommissioning activities in the turbine building, radiation protection, spent fuel pool activities, and quality assurance.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be placed in the NRC Public Document Room (PDR).

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

Dwight D. Chamberlain

for Ross A. Scarano, Director
Division of Nuclear Materials Safety

Docket No.: 50-312
License No.: DPR-54

EXHIBIT 9
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building was being conducted under Radiation Work Permit 97-13, "Dismantlement, Survey, and Decon of the Secondary System," dated January 27, 1997.

The inspector toured the turbine building and observed work in progress. Workers were performing decommissioning safely. Radiation protection technicians responsible for contamination surveys of material being removed from the site were performing the free release surveys. Both direct pancake probe and smear surveys were being conducted adequately. The inspector reviewed the "Incremental Decommissioning Radiation Monitoring Log" from January 28 to March 27, 1997, which recorded the contamination levels, if any, of tools and equipment being "Free Released" from the Rancho Seco site. [redacted]

(2) Control of Radiation Sources

The inspector reviewed Procedure RP.305.11, "Radioactive Material (Source) Handling," to determine if licensee personnel controlled the use of radiation detection check sources in accordance with procedural requirements. The inspector reviewed the "Source Use Log" used by technicians between February 12 and April 4, 1997. During whole-body counter daily checks, the Source Use Log documented each time a radiation source was checked out and checked in by a dosimetry technician. The inspector observed a dosimetry technician complete the log and examined the storage cabinet where the radiation sources were secured. The inspector toured the calibration and source storage room in the auxiliary building where the majority of the licensee's radiation detection instrument sources were located. During tours of the spent fuel area, the inspector noted that process radiation monitors that had internal check sources located within the instrument housings were conspicuously marked and labeled. The inspector determined that the licensee accounted for radiation check sources in compliance with Procedure RP.305.11.

(3) Routine Radiological Surveys

The inspector reviewed records of routine facility radiation and contamination surveys which had been performed in accordance with Procedure RP.305.8A, "Routine and Radiation Work Permit Survey." This procedure provided requirements for radiation and contamination surveys. The licensee routinely performed radiation and contamination surveys in the auxiliary building, the restricted area access control point, and the turbine building. The results of the survey records reviewed by the inspector indicated that contamination and radiation levels were generally at background. The inspector determined, based on the results of the licensee's facility surveys, that radioactive material was adequately controlled within the confines of plant systems. The inspector concluded that the licensee controlled radioactive material in compliance with 10 CFR Part 20, the Permanently Defueled Technical Specifications, and Procedure RP.305.8A.

SACRAMENTO MUNICIPAL UTILITY DISTRICT
INTEROFFICE MEMORANDUM

TO: Dennis Gardiner

DATE: July 28, 1997
MNTS 97-0033

FROM: Jim Saum J Saum

SUBJECT: MEETING MINUTES ON USAGE OF COUNT RATE SURVEY INSTRUMENTS

Thank you for the time and consideration for hearing my concerns regarding the usage of count rate survey instruments used to detect both fixed and loose contamination. Attached please find a copy of the outline of our discussion and supporting calculations.

I was pleased to find you were in agreement with my calculations, findings and recommendations. I would be glad to offer assistance in the preparation or review of the operating and test procedures which if followed would guarantee the detection of contamination levels. This remedy would not require much expense and would of great benefit to the District in avoiding future liability caused by the free releasing of contamination.

cc with attachment:

Steve Redeker
Jim Field
RIC

QUESTIONS/RECOMMENDATIONS (7/28/97)

Loose:

1.0 What frisker response time mode is used for measuring smears for loose contamination?

2.0 What is the MDA for a frisker in the fast and slow modes?

3.0 What is the max. background level to achieve an MDA for loose contamination in each mode?

4.0 Is there a minimum count time required? If so what is it?

Fixed:

5.0 What is the max. allowed background for a frisker used in monitoring fixed contamination?

5.1 What is the fixed contamination limit in cpm and dpm?

5.2 What response modes are used for fixed?

6.0 In the attachment to IE Circular 81-07, " Sensitivity of Portable Beta-Gamma Survey Instruments by Sommers", does he find that there is a wide variation of time responses of friskers from the manufacture's specification?

6.1 Per the above report, at a frisking rate of 2 inches per sec (5 cm/sec), in the fast mode, what is the max background to achieve a 95% alarm frequency rate for 5000 dpm?

6.2 Per this report what is the affect on the frisker's sensitivity of the fast and slow response modes?

Recommendations:

1.0 Establish/revise procedures for using friskers to monitor contamination. See 3.0 below

1.1 For example, prohibit the slow mode for fixed surveys, establish max backgrounds, minimum count times and setpoints for loose and ensure the slow mode is used, compensate for instrument accurcies, etc.

2.0 Establish procedures for calibrating the detectors with the rate meters. Include a check of the friskers response times.

3.0 Establish a test procedure that will verify the MDA and the ability of the friskers to detect both fixed and

loose contamination under reasonable worst case conditions. Use the test results for establishing procedural limits to ensure contamination requirements are met.

MDA Calc 7/28/97

Per RP.311.V1.01

$$MDCR = 4.66\sqrt{\frac{R_b}{2RC}} \quad (eq\ 1.)$$

From RM-14 Equipment manual
a 90% deflection response time
is 22 sec in slow mode
2.2 sec in fast mode

$$\rightarrow V = V_f\left(1 - e^{-t/\tau}\right) \qquad \tau = RC = \text{Time constant}$$

$$\frac{V}{V_f} = .9 = 1 - e^{-22/\tau} \quad (eq\ 2)$$

$$\ln .1 = \frac{-22}{\tau} \Rightarrow \tau = 9.5\ \text{sec (slow)}$$
$$.95\ \text{sec (fast)}$$

MDA in fast mode (smear only; Loose Contamination)

assume 300 cpm background

$$MDCR = 4.66\sqrt{\frac{300\ \text{cpm}}{2(.95\ \text{sec})\left(\frac{1\ \text{min}}{60\ \text{sec}}\right)}} = \underline{\underline{454\ \text{cpm}}}$$

assume 13.1% detector eff. (ref memo RPC-97-049 Bruce Rogers to File)
(ie $\frac{13.1\ \text{cpm}}{100\ \text{dpm}}$

$$MDA = \frac{454\ \text{cpm}}{} \Big| \frac{100\ \text{dpm}}{13.1\ \text{cpm}} = \underline{\underline{3466\ \text{dpm}}}$$

Loose Limit is 1000 dpm/100 m^2 per RP 305.09A

3466 dpm > 1000 dpm !!

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MDA in fast mode (cont)

max background for 1000 dpm ?

$$MDA = \frac{MDCR \times 100}{det\ eff.} \quad (eq\ 3)$$

$$1000\ dpm \left(\frac{13.1}{100}\right) = MDCR = 130\ cpm$$

$$MDCR = 4.66 \sqrt{\frac{R_{b\,max}}{2(.95\,sec)\left(\frac{1}{60}\right)}} = 130\ cpm$$

$$\rightarrow \left(\frac{130}{4.66}\right)^2 2(.95)\left(\frac{1}{60}\right) = R_{b\,max}$$

$$= \boxed{25\ cpm}$$ Max Background fast mode

at typical backgrounds today (i.e. 50 cpm) fast mode

$$MDCR = 4.66 \sqrt{\frac{50}{2(.95)\frac{1}{60}}} = 185\ cpm$$

$$MDA = \frac{185 \mid 100\ dpm}{13.1\ dpm} = 1414\ dpm$$

1414 dpm > 1000 dpm !!
in fast mode @ 50 cpm BKgnd

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MDA in Slow Mode (Smear only)

assume 300 cpm background

$$MDCR = 4.66\sqrt{\frac{300\ cpm}{2(9.5sec)\frac{min}{60sec}}} = 144\ cpm$$

det eff = 13.1

$$MDA = \frac{144}{13.1}\Big|\frac{100}{} = 10.99\ dpm$$

$$\boxed{10.99\ dpm > 1000\ dpm\ !!}$$

in slow w/ 300 cpm

max background in slow mode?

from eq 3 MDCR = 130 cpm for 1000 fpm

$$MDCR = 4.66\sqrt{\frac{R_{b\,max}}{2(9.5)\frac{1}{60}}}$$

$$\left(\frac{130}{4.66}\right)^2 2(9.5)\frac{1}{60} = R_{b\,max}$$

$$= 250\ cpm$$ max background for slow mode

At typical background 50 cpm (slow)

$$MDCR = 4.66\sqrt{\frac{50}{2(9.5)\frac{1}{60}}} = 59\ cpm$$

$$MDA = \frac{59}{}\Big|\frac{100}{13.1} = \underline{\underline{450\ dpm}}$$

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Minimum Count Time in Slow mode
For To achieve 100 cpm > Background (50cpm)
for 1000dpm source

$$\frac{1000\ dpm}{100\ dpm} \Big| \frac{13.1\ cpm}{} = 130\ cpm$$

$$\% \text{ deflection} = \frac{100\ cpm}{130\ cpm} = 77\%$$

from eq 2:

$$.77 = 1 - e^{\frac{-t}{9.5\,sec}}$$

$$\ln .23 = \frac{-t}{9.5} \rightarrow t = \boxed{14\ sec}$$

min COUNT Time for 1000dpm w/ 50cpm BK IN SLOW MODE

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Fixed Contamination:

Source residence time at 5cm/sec (2 in/sec) is 1sec (ref: Sorrento) ideal (in center)

assume a 5000 dpm source

Fast Mode

$$\frac{V}{V_f} = 1 - e^{-\frac{1\,sec}{.95\,sec}} = .65 \text{ deflection}$$

$(1 - .35)$

$$5000\,dpm \left| \frac{131\,cpm}{100\,dpm} \right. = 655\,cpm$$

$$655 \times .65 = \boxed{425\,cpm > 100\,cpm \quad 600D}$$

assume a 5000 dpm source IN S/low Mode

$$\frac{V}{V_f} = 1 - e^{-\frac{1\,sec}{9.5\,sec}} = .1 \text{ deflection}$$

$1 - (.9)$

from above $655\,cpm \times .1 = 65\,cpm$

$$\boxed{65\,cpm < \underline{\underline{100\,cpm}}\ !!}$$

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Control and Instrumentation

Edited by E. W. Hagen

Sensitivity of Portable Beta–Gamma Survey Instruments

By J. F. Sommers*

Abstract: *Development of a new generation of portable radiation survey instruments and application of the "as low as practicable" (ALAP) philosophy have presented a problem of compliance with guides for radioactive contamination control. Isolated, low-level, discrete-particle beta–gamma contamination is being detected with the new instruments. To determine the limits of practicability requires, in turn, the determination of the limits of detection of these surface contaminants. The data and calculations included in this article indicate the source detection frequencies that can be expected using the new generation of survey instruments. The author concludes that, in low-population groups of discrete particles, about 5000 dis/min of beta activity per particle is the minimum level of activity per particle which is applicable for confident compliance with surface contamination-control guides. Lower control levels are possible with additional development of instruments or through high-cost changes in radiation survey and contamination-control methods. Additional analyses are required for assessment of the hazard caused by widely dispersed discrete-particle contaminants.*

The common, historical way to classify surface radioactive contamination has developed into standard definitions, limits, and control guides which, in some instances, are difficult, if not impossible, to apply.

In general, the definition of "removable" radioactive contamination must be inferred from guides[1] and regulations[2] on the significance of the quantity of radioactive materials removed. "Fixed" contamination, although not as uniquely defined, is, by inference, the radioactive contaminants that remain on a surface after the surface has been checked and found to have less than some defined removable contamination level. There are many minor variations of these definitions, but these will suffice to outline a major problem that applied health physicists have to verify compliance with radioactive surface contamination limits and guides.

In recent years the lowering of limits and the emphasis on as low as practicable[3] (ALAP) hazard control has encouraged commercial development of more sensitive survey instruments, the big improvement being detectors with thin windows. Peripheral features, such as audible alarms with adjustable set points, external speakers (instead of earphones), and selectable meter time constants, are common. However, the strong commercial competition to supply this type of instrumentation, the extreme competition for funds that could be used to improve radiation protection equipment, and the health physicists' reluctance or inability to provide adequate specifica-

*John F. Sommers received degrees in mathematics (B.A., 1948) and physics (B.S., 1950) from the University of Wyoming and was elected to the National Honorary Physics Society, Sigma Pi Sigma, in 1949. Under an AEC fellowship grant, he earned a certificate in radiological physics from the Oak Ridge Institute of Nuclear Studies for work at Vanderbilt University and Oak Ridge National Laboratory during 1950 and 1951. Since 1951, he has been associated with the Idaho National Engineering Laboratory (INEL) (formerly the National Reactor Testing Station) as technical assistant and as manager of Applied Health Physics in the safety groups of the prime contractors for AEC. At present, he is supervisor of the Radiological Engineering Section in the Safety Division of Aerojet Nuclear Company, the prime operating contractor for the Energy Research and Development Administration (ERDA) at INEL, where he is directly involved in development and application of a positive-action ALAP (as low as practicable) program for control of radiation hazards in INEL nuclear facilities.

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THEORY

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tions have left something to be desired in quality and overall performance of many of the instruments.

Although present beta–gamma contamination-control practices are more rigorous than in the past, there is still less than complete control of low-activity low-density particulate sources within the operating areas. In a typical situation the highest density of these particles, outside of contamination-control zones, may be on the order of one detectable particle per 10^2 to 10^3 ft^2. The particles are removable beta–gamma activity, but because of the large areas involved, the multiple types of surfaces on which they are deposited, and the low area density of the particles, they are not subject to detection with any sensible frequency using the smear or wipe technique. Thus survey instruments must be used to detect and measure the activity of the removable particles.

The particles tend to be trapped and concentrated on certain types of surfaces, such as mopheads and acrylic fiber rugs. From these deposits it has been determined that the specific activities of most of the particles range from about 2×10^3 to 2×10^4 dis/min. In order to determine why the particles escape detection and control within the operating areas, experimenters devised a rigorous test to determine the expected frequency of detection of the particles using standard survey methods. The results of these experiments have shown that the main hope for improvement lies in the development of more sensitive survey instruments and portal monitors and the development and application of contamination-control methods similar to those used in facilities where the much more hazardous alpha-emitting materials are handled.

THEORY

The ability of a count-rate meter to provide reliable information for detection of small-diameter sources during surveys for radioactive contaminants depends upon a number of factors. These factors, for any given type and energy of radiation sources, are the specific activity of the sources, the influence of background radiation, the instrument time constant, the source–detector geometry, and the relative source–detector velocities. When an alarm set point is used to indicate the presence of radioactive sources, investigation shows that the sensitivity of the instrument is increased by setting the alarm set point as low as possible without causing alarms due to the fluctuations of background; the response of the count-rate meter is modified from the equilibrium count rate when source residence time under the detector is on the same order of magnitude of or less than the time constant of the meter; the count rate of the instrument increases as the source–window distance decreases; and the response of the count-rate meter increases as the source residence time under the detector window increases.

On the basis of the approximate Gaussian distribution of a count rate around the true average count rate, an alarm set point A has a probability p of being reached and causing an alarm due to an average background count rate B during a counting interval T that can be expressed as

$$A = (1 - e^{-T/\tau})(B + k|T^{-1/2} B^{1/2}|) \qquad (1)$$

where τ is the time constant of the count-rate meter and k is a constant that uniquely defines the probability of alarm.[4] The term $1 - e^{-T/\tau}$ (the fraction of equilibrium count rate obtained during T) is limited by design considerations of count-rate meters to the accuracy of the meter output. Most instruments have 1% (of full-scale reading) or larger accuracy limits. For this reason the value of $0.99 = 1 - e^{-T/\tau}$ has been assigned for this study. Knowing the value of τ allows solution for T, and the solution is used in the second term of Eq. 1. This solution can be thought of as the practical, constant, integrating interval observed by the count-rate meter.

The approximate response of an instrument to small-diameter sources can be calculated by defining standard survey conditions and relating them to the response characteristics of the instrument. For these calculations the velocity vector v of a flat circular window of the detector is assumed to be parallel to the surface being surveyed, and the velocity is held constant. The sources passing under the window of the detector bisect the circular projection of the window on the surface. The beta-counting efficiency of the instrument is assumed to be positive and constant when a source resides in the circular projection of the window on the surface; otherwise, the efficiency for counting the source is zero. This latter assumption may cause significant perturbations of experimental data from calculated data when source–window distances are larger than 2.5 cm. Gamma-counting efficiencies, the same order of magnitude as the beta-counting efficiencies, may also cause significant perturbation of experimental results, depending on the detector shielding configuration and effectiveness. The ideal source residence time t is assumed to be equal to the window diameter d divided by the velocity vector v. Under field conditions, t will usually be less than the ideal value

because the source velocity vector will hardly ever exactly bisect the circular window projection on the surface being surveyed.

Using the ideal survey conditions and an average background count rate B, a source with a net equilibrium count rate S will cause a count rate as large as, or larger than, A, with a probability P_i that is uniquely defined by the constant K_i when the source residence time under the window is t and the time-dependent meter response term is $1 - e^{-t/\tau}$. The count rate A can then be expressed as

$$A \leq (1 - e^{-t/\tau})\,(B + S + K_i|t^{-1/2}(B + S)^{1/2}|) \quad (2)$$

By substitution of the alarm set-point count rate A from Eq. 1 into Eq. 2 and rearrangement, the source strength is found to be

$$S \geq \left(\frac{1 - e^{-T/\tau}}{1 - e^{-t/\tau}}\right)(B + k|T^{-1/2}\,B^{1/2}|) - (B + K_i|t^{-1/2}(B + S)^{1/2}|) \quad (3)$$

Analysis of Eq. 3 shows that P_i is the probability, or time-dependent frequency, that S will cause an alarm when K_i is positive, and $(1 - P_i)$ is the probability that the alarm will be actuated when K_i is negative. Solutions for S can be obtained using selected values of K_i, B, τ, t, and T.

METHODS

In order to determine expected alarm-actuation frequencies during standard contamination surveys, experimenters established the following conditions. These conditions would also allow an experimental check of the calculated alarm-actuation probabilities that occur when the source strength, background, instrument time constants, and source residence time are changed.

Commercially available (two manufacturers) portable survey instruments were used as models for the calculations and experiments. Selectable time constants of 0.0159 and 0.159 min were calculated from the manufacturers' quoted time-response characteristics: "90% of the equilibrium count rates in 2.2 or 22 seconds." Survey velocities between 2.4 and 15 cm/sec were selected for analysis, velocities that cause the source residence times under the 5-cm-diameter detector windows to range from 0.33 to 2.1 sec. Cesium-137 sources having small diameter and low backscatter were used experimentally for verification of calculated data: these sources are counted with an efficiency of 0.1 count per beta at ½ in. from the center of 1.7 mg/cm², 5-cm-diameter windows of "pancake"-type semishielded Geiger-Mueller tubes. Extrapolation of the data to other beta emitters is a practical exercise; i.e., from Evans,[5] beta transmission factors through 3.0 mg/cm² (air plus window) were calculated and shown to be greater than 72% for betas with energy spectra having maximum-energy betas (E_{max}) greater than 0.2 MeV. Thus ^{137}Cs betas, with a mean $E_{max} \cong 0.58$ MeV, provide a beta-counting efficiency from the thin-window detectors which is typical of beta emitters with E_{max} greater than 0.2 MeV. Also, background and source size data are presented in counts per minute, so that changes in beta energies of sources and/or source–window distances can be normalized, using observed counting efficiencies, to the calculated data presented in this article.

With some manipulation of Eq. 3, a computer program was used to obtain an iterative set of solutions for S that are accurate to within 1% of the true values. The alarm set points were determined using Eq. 1. Selections of background count rates, relative detector–source velocities, and the instrument time constant were arbitrary but within the ranges chosen for investigation. Values of K_i were chosen to provide known probabilities of alarm actuation.

An extensive set of experimental data was obtained by moving calibrated sources past the detector windows at measured velocities and source–window distances to check the validity of the calculations. The same experimental setup to determine source detection frequencies was used with the audio (speaker) output of the survey meters. The use of audio output during contamination surveys is a well-known practice and will not be described further.

When the experimental and calculated source detection frequencies were compared, it became apparent that the time constants of the commercial survey instruments were not equal to specified values. Variations were noted between instruments of one model and between the different alarm set points on the other model. By measuring the buildup of the indicated count rates to 90% of equilibrium, we were able to determine the actual time constant on the instruments for any particular alarm set point.

The experimental data were obtained on an instrument that exhibited the advertised time constants. However, the poor (time-dependent response) performance of these instruments as a group has caused us to abandon the alarm set-point method for source detection under field conditions.

RESULTS

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RESULTS

Alarm set points vs. background count rate were calculated from Eq. 1. These are illustarted in Fig. 1 for time constants of 0.0159 and 0.159 min. The k value selected, 4.89, uniquely defines the probability of an alarm being caused by a constant average background as 5×10^{-7} min^{-1}.

Figure 2 shows that the short-time-constant set point is more sensitive for source detection, even though the long-time-constant set point is the lowest. The relative difference between the two becomes less as the source residence time increases.

Figure 3 illustrates the improved sensitivity to be expected as the source residence time increases (detector velocity decreases). The set point is obtained from Eq. 1 or Fig. 1. Note that with a source residence time of 1 sec (5 cm/sec), it takes 5000 betas/min (500 counts/min) at a background of 60 counts/min to cause an alarm 90% of the time. As a practical illustration, if an individual surveys himself at 10 cm/sec, it will take about 3 min for him to survey half the surface area of his body, and the particles he discovers with a 90% confidence level will have a beta-emission rate of about 9000 per minute (900 counts/min).

Figure 4 illustrates the benefit of selecting low-background areas to perform contamination surveys. As indicated by Eq. 1, the alarm set point has to be changed each time the background changes, and, if the time constant is not dependable (known), the set point may not be correct. Changing background count rates are a common occurrence in our operations, and our inability to make time-constant determinations in the field has caused us to abandon the alarm set-point method for contamination surveys.

Figure 5 shows that the calculational method of determining source detection frequencies using the alarm set point is valid in comparison with experimental data. Both the time constant and the alarm set point were verified on the instrument used. In practice, there would be some ambiguity in the setting of the alarm owing to the crude alarm set-point dial furnished on this model instrument.

Figure 6 compares calculated alarm-actuation frequencies with experimental data on audio-output source detection frequencies at an average background of 120 counts/min and a relative surface–window velocity of 15 cm/sec. Using the speaker output method, smaller sources are detected with the same frequency that is obtained using the alarm set-point method. The improvement is about a factor of 3.

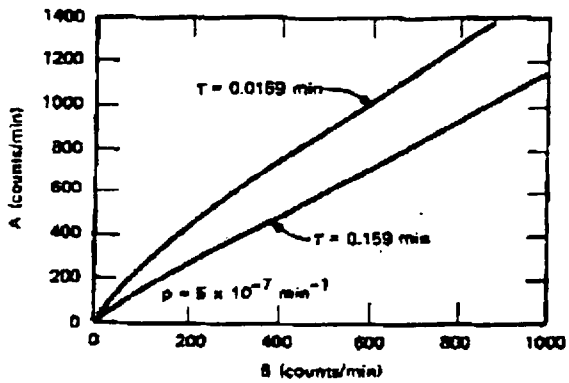

Fig. 1 Effect of background on the optimum alarm set point.

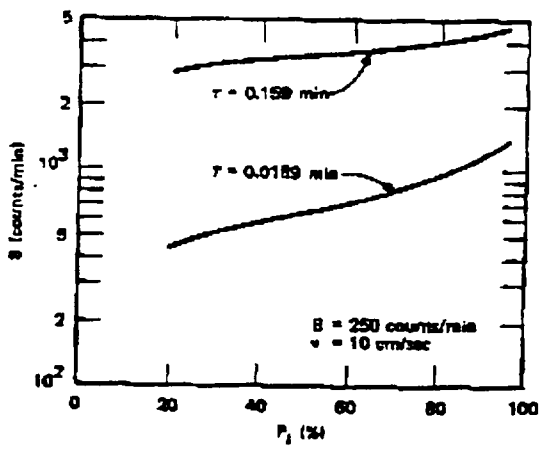

Fig. 2 Effect of instrument time constant on source detection frequency.

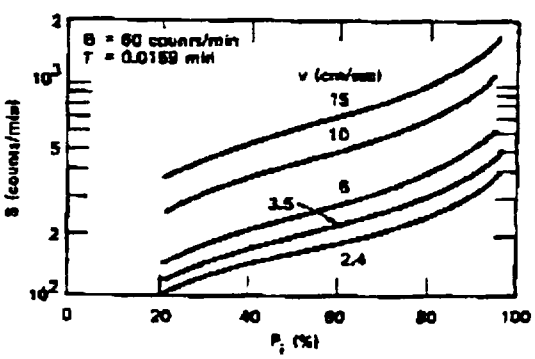

Fig. 3 Effect of probe velocity on source detection frequency.

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Figure 7 shows a similar comparison using a detector velocity of 3.5 cm/sec. Here, the difference in detection frequencies narrows, and the alarm set-point method becomes better than the audio detection method for the larger sources at this low survey velocity.

Figure 8 compares experimental audio-output data for three different survey velocities at 120 counts/min background. The difference in source detection frequencies is surprisingly small when compared with the alarm-actuation method. This is explained by the adaptability of the human audio response; i.e., the effective time constant (human) adapts, within bounds, to the source size that can be detected with a given survey velocity and background count rate. Note that at 500 counts/min (5000 betas/min), the source detection frequencies appear to converge at about 80%. The results shown are averages of over 100 observations per datum point from two or more experienced surveyors. The largest variations in the data occurred between individuals; i.e., the largest variables were caused by the physical and psychological conditioning

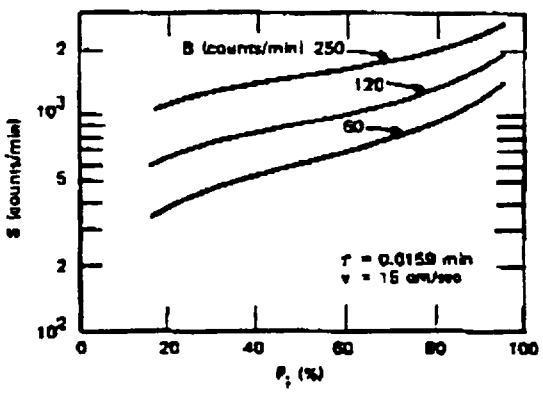

Fig. 4 Effect of background on source alarm-actuation frequency.

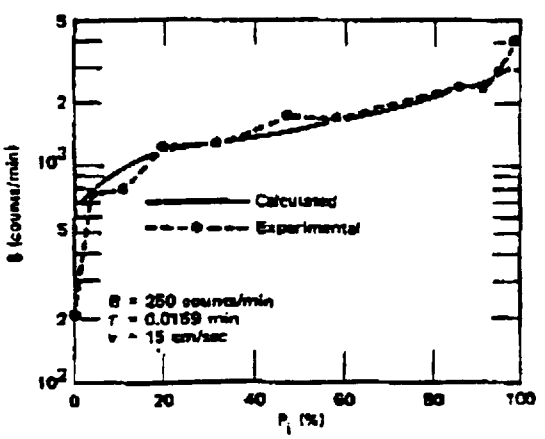

Fig. 5 Comparison of experimental and calculated data on source detection frequencies.

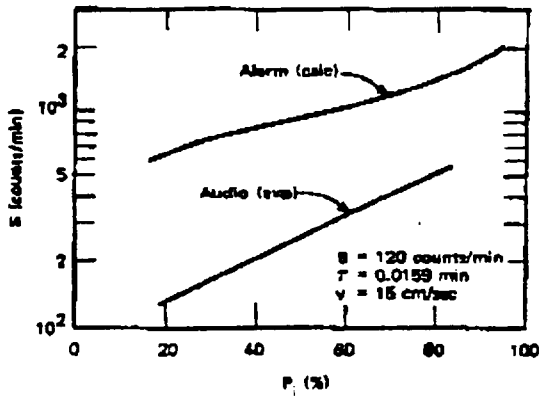

Fig. 6 Comparison of source detection frequencies using alarm set-point and audio detection methods.

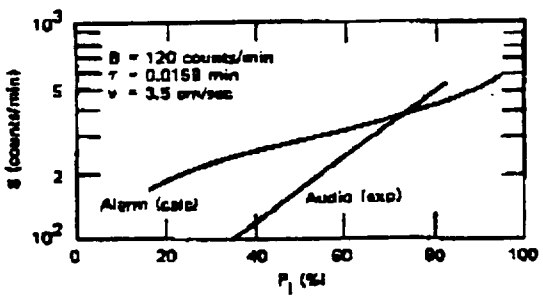

Fig. 7 Comparison of source detection frequencies using alarm and audio detection methods.

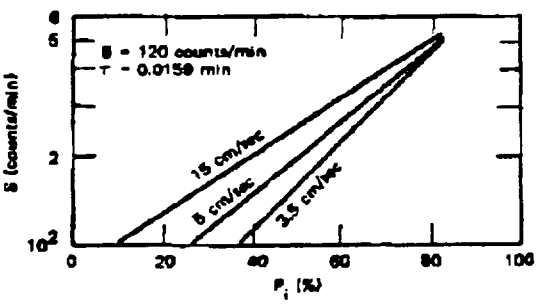

Fig. 8 Comparison of audio source detection frequencies and velocities.

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EXHIBIT 9
PAGE 349 OF 596 PAGE(S)

of the surveyors. The lower detection frequencies have been ignored because of the statistical deviations that occurred. The time consumed to obtain reliable data at the higher detection frequencies was considerable, and, as our interest is in setting high-confidence-level control criteria, it was considered not practicable to obtain good, small source, detection-frequency statistics.

DISCUSSION AND CONCLUSIONS

A method has been shown whereby detection frequencies of small-diameter radioactive sources can be calculated for portable survey instruments that have known time constants and alarm set points. Source detection frequencies are strongly dependent upon (1) source strength, (2) survey velocities, (3) background activity, (4) detector sensitivity, and (5) the time constant of the survey meter. With activity of a large-area uniform surface, the survey velocity and the time constant of the survey meter are immaterial (within reasonable bounds). The calculations show that, even under the most rigorous conditions (survey velocities <2.5 cm/sec), small-diameter sources emitting 3000 betas/min can only be detected in low-background areas with a confidence of about 90% using the alarm set-point method. At more sensible survey velocities of 10 to 15 cm/sec, it takes sources emitting 10,000 to 15,000 betas/min to provide the same detection frequency using the alarm set-point detection method.

At the higher probe velocities investigated, source detection frequencies are larger using the audio output rather than the alarm set-point method. With small-diameter sources emitting 5000 betas/min, source detection frequency at 120 counts/min background is about 80% using the speaker output, regardless of the survey velocities between 3.5 to 15 cm/sec. With 3000 beta/min sources, the speaker detection frequency, using the slowest survey velocity (3.5 cm/sec), is only about 65%. At this velocity the alarm set-point method is as good as or better than the audio method with sources larger than 3500 betas/min. Although most of the experimental data were obtained at only one background level (120 counts/min), it is apparent that it is not practical to set contamination-control limits on discrete particles of beta–gamma activity much below 5000 betas/min if we are to have confidence in our ability to detect discrete-particle sources before they escape the contamination-control areas.

These results then pose several problems. Are the particles of beta–gamma activity that escape detection, and thus control, a health hazard of consequence? Krebs[6] and Healy[7] have presented arguments on the relative hazards of discrete-particle and small-area sources in relation to more diffuse sources. However, the data used involved higher specific activity than that of the particles we have been observing. Healy has published[8] a comprehensive resuspension hazards analysis for diffuse contaminants which is difficult to apply to the low-density particle population we observe. Good hazards analyses are needed on the resuspension of discrete particles in the size range under discussion. Development of portable instruments for surveying large areas with a practical expenditure of time and effort appears possible, but it will take time and money to design, develop, and make them commercially available. In the meantime, the advisory, standards, and regulation agencies need to look at the control guides and limits to assure that the conservatism applied using the ALAP philosophy is, in fact, *practicable* for compliance with the equipment and methods available to the industry. For this particular problem (low-density discrete particles of removable beta–gamma activity), I suggest that removable contamination be defined in two categories, "uniform" and "dispersed," and then resuspension factors applied that have some reality in the calculation of exposure hazards. This is the only way at this time that the industry has any hope for practicable compliance with contamination-control limits.

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2. Department of Transportation, Hazardous Materials Regulations of the Department of Transportation, *Code of Federal Regulations*, Title 49, 173.397, effective Sept. 13, 1973.
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7. J. W. Healy, A Proposed Interim Standard for Plutonium in Soils, USAEC Report LA-5483-MS, Appendix C, Los Alamos Scientific Laboratory, January 1974.
8. J. W. Healy, Surface Contamination: Decision Levels, USAEC Report LA-4558-MS, Los Alamos Scientific Laboratory, September 1971.

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: Jim Saum

DATE: July 29, 1997
IDT 97-052

FROM: Dennis Gardiner

SUBJECT: MNTS 97-0033

Bill Wilson and I have requested that Steve Nicolls and Bruce Rogers review your calculations and recommendations regarding the use of count rate survey instruments. They are responsible for the portable radiation detection instruments program at Rancho Seco. Mike Braun of Quality Assurance has also been asked to review your calculations and recommendations.

The current procedures used for monitoring materials for contamination are adequate when coupled with the fact that only radiation protection technicians that meet the qualification requirements for ANSI N18.1-1971 are permitted to free release material from the controlled areas at Rancho Sec. Your recommendation will be reviewed for applicability to program improvements.

We have full time, highly trained and experienced individuals maintaining the portable radiation detection instruments program at Rancho Seco and therefore, we are not in need of your assistance in this area at the present time. We are in need of your assistance in long standing problems with the installed radiation monitoring system including problems with the Rm-11, R-15106, R-15546 and maintenance of the portions of the Victoreen System that are still required by plant procedures. We will soon have a staff augmentation contract in place to provide engineering assistance if you are in need of technical assistance in maintaining the installed radiation monitoring system.

cc: Steve Redeker
Jim Field
Bill Wilson
RIC

SACRAMENTO MUNICIPAL UTILITY DISTRICT
INTEROFFICE MEMORANDUM

TO: Dennis Gardiner

DATE: August 12, 1997
MNTS 97-0037

FROM: Jim Saum

SUBJECT: RESPONSE TO MEMO IDT 97-052 (ATTACHED)

This is formal notice that I deny the following inferences and innuendo in the subject memo. As you know, the long standing problems with the radiation monitoring system referenced in your subject memo were not assigned to me to resolve until 7/23/97 and then only in part. I can assure you that if these problems had been assigned to me at an earlier date they would have been resolved at that time. The inference made in the subject memo that I am in need of engineering and technical assistance in solving these problems is without a basis and is considered to be derogatory.

The communication problem with R-15106 has been a long standing problem with many failed attempts by the Maintenace Department to resolve over the years. I repeatedly, over the years, offered my assistance to the I&C maintenance group and my supervisor, Jim Field, to correct the communication problems with R-15106. But they, like you, have continuously declined my offer to help. On 7/23/97, after the first PDQ (PDQ 97-0024) on this problem was initiated, I received my first assignment to resolve this problem. Now that this problem has been assigned to me it will be resolved soon.

As to the RM-11 failures stated in the subject memo, I became aware of this problem only after the PICS project initiated. Maintenance and the CMRG (without my input or knowledge) initiated a resolution to the problem by replacing the RM-11 computer by the PICS computer as part of the PICS Design Change Package. This DCP (R94-002) was assigned to another engineer. I was not involved in this decision nor did I or would I have recommended such a change due to the cost ineffectiveness, the new potential problems this change entails, and the untimely resolution. However, after the decision was made I volunteered my assistance in designing and testing the GA radiation monitoring portion of the PICS project. My supervisor, Jim Field, agreed to let me assist. The design and test procedure were completed over a year ago, and installation and testing is pending completion of the current on going PICS testing. It appears, however, that this option will not be completely successful since it eliminates many desired features of the old RM-11 system as well as creating additional problems.

Additionally, contrary to your memo, the problem with R-15546A has not been long standing. The spare sample flow instrument was sent back for recalibration after it was found out of specification. When returned again I discovered that the vendor did not recalibrate the instrument as stated. Only after these events, on 7/23/97, was I first assigned to assist resolving the problem described in PDQ 97-0036. I participated in

a source inspection of the vendor last week and will submit a resolution which will allow R-15546A to be returned to service shortly.

If you believe any of the statements in this memo to be incorrect, please notify me in writing as soon as possible.

cc with attachment:

Steve Redeker
Jim Field
RIC

CTS #: 51766 Rev:

System: CDS

XREF: PDQ #: DQ #: 95-0012 CCTS #: LRSL #:

Title: ODCM SURVEILLANCES NEVER PERFORMED FOR WASTE WATER FLOW RATE TOTALIZER FQI 95108

Agency: SMUD

Resp Dept: Tech Svcs
Manager: Field, J.
Phone: 4038
Mail Stop: 231
Assigned:
Area:

Origin Dt: 02/09/95
Originatr: Saum, J.
Orig Dept: Tech Svcs
Storage Box:

Status : Closed
Priority : 3
Mig Pri :
NRC Report:
CTS STage : Closed
Stage Date: 03/06/96
Stage Dept: Tech Svcs
Stage Due Date: 11/30/95
Final Due Date: 11/30/95
Due Date Rev:
Sched Start:
Sched Finish:
Actual Start:
Actual Finish: 03/05/96

QA Req'd? :
Licensing Req'd? :
Reportable? : N
CCTS Closure? :
Hardware/Software: S

Description: The surveillances required by the ODCM (CAP-0002, Attachment 14), have never been performed for the Waste Water Flow Rate Totalizer (FQI-95108). Also, these surveillances were required by Tech Spec 4.19 when it was in effect, but were also never performed. Data from FQI-95108 has been used for 10 CFR 50, Appendix I dose calculations and various effluent reporting requirements.

Requirements: RP/Chem is to provide input for the development of the DQ Disposition. Quality is to perform a reportability review. Tech Services is to perform an evaluation to establish totalizer error/accuracy. RP/Chem to evaluate the totalizer accuracy for impact on effluent release reporting. Tech Services is to revise procedures SP.482, SP.524, and SP.2 as specified in the DQ Disposition.

Response: RP/Chem provided their DQ Disposition input and evaluated the impact of totalizer accuracy on effluent release reporting as required by the CMRG (see memo RPC 95-082). Quality provided their reportability evaluation in memo NL 95-008. Based on the DQ Disposition, specifically the memo RPC 95-082 evaluation, Quality concludes that this DQ condition is not Reportable. Tech Services completed a calculation and established a flow meter accuracy in SMUD Calculation Z-CDS-10285. Also, Tech Services revised Procedures SP.2 (Revision 19), SP.482 (Revision 10), and SP.524 (Revision 8) as required.

Comments: The CMRG reviewed this item on 02/20/95, determined that the Problem Description needs revision and that Tech Services and RP/Chem are to work out the problems. The Problem Description has too much editorializing and some incorrect conclusions. This item was tabled until the next CMRG meeting. The CMRG reviewed revision 1 to the PDQ 95-0012 Problem Description on 02/27/95, determined this item is a DQ, and assigned an action to Tech Services and RP/Chem to perform a DQ Disposition, due 04/01/95. Tech Services is to address the Cause and the SP inadequacies, and RP/Chem is to address the dose assessment implications for the Extent section, the accuracy of the instrument, and things done which indicate the totalizer is working. Also, Quality is to review this DQ for reportability regarding the old Tech Spec section 4.19 requirements. The CMRG reviewed and approved, with comment, the DQ Disposition on 03/20/95, but, based on subsequent information, the CMRG Chairman decided to table this item until the next CMRG meeting. The CMRG reviewed this item on 03/27/95, and determined more information is required to complete the DQ Disposition. The DQ Disposition is to include CMRG comments and specific Remedial Actions discussed during the meeting. The CMRG reviewed and discussed the Disposition on 04/24/95, and suggested changes that were accepted by the DQ Dispositioner. Also, RP/Chem is to develop a memo in Disposition format that adresses the ODCM violation issue. RP/Chem conducted an investigation that determined no ODCM violation occurred. The CMRG reviewed and approved, with comment, the final Disposition on 05/08/95. The CMRG assigned actions to RP/Chem and Tech Services, due 11/30/95.

EXHIBIT 9
PAGE 33 OF 526 PAGE(S)

Related Documents: Document:	Rev:	CTS Code:	CCTS Type:
SP.524 PRO		O	Originating Document
SP.428 AND SP.2 PRO		X	Cross Reference
CAP.0002 (ODCM)		X	Cross Reference
RPC950058		C	Closure Document
NL95008		C	Closure Document
MNTS950021		X	Cross Reference
REG GUIDE 1.21		X	Cross Reference
RPM950035		X	Cross Reference
RPC950082		C	Closure Document
SMUD CALC Z-CDS-I0285		C	Closure Document
DCP R96-0006		C	Closure Document
SP.2, REV. 19, PRO		C	Closure Document
SP.482, REV. 10, PRO		C	Closure Document
SP.524, REV. 8, PRO		C	Closure Document

COMMITMENT COVER SHEET

☐ New
☐ Change CTS # _____

CTS #: 51766
REV. #: ~~0~~ 1
DATE: 2/14/95

IDENTIFICATION - Originator #4-8 CTS/CCTS Only

1. Originator
Name: Richard Mannheimer Ext: 4916 Mail Stop: 250
Signature: Richard Mannheimer Dept: Licensing Date: 2/14/95

2. Source Documents (Attachments): Rev. 1 RM 2/27/95
☐ PDQ # ☒ DQ # 95-0012, ☐ CCTS # _____ ☐ LRSL # _____
☐ CAR (*) _____ ☐ OTHERS (SPECIFY) _____

3. Brief Title: ODCM surveillances never performed for Waste Water Flow Rate Totalizer FQI 951

4. Description: _____

5. Related Documents: (O = Originating, X = Cross Ref. C = Closure) N/A

Document	Type	Document	Type

6. Agency: _____
7. Priority: _____ 8. Reportable: Y N

DISPOSITION AND APPROVAL Commitment Mgmt. Review Group

9. ☐ Hardware ☒ Software 10. Regulatory Due Date: Y ☒ Date: Original _____ Revised _____
11. Priority 3 12. Applicable Systems CDS

13. APPROVED:

	DEPARTMENT	DUE DATE
☐ Potential 10 CFR 21 / Reportability Review	LIC	
☐ PDQ Initiate W/R		
☐ PDQ Action		
☒ DQ Disposition (Procedural aspects → TS; Date assignment aspects → RP/Chem)	TS	4/1/95
☐ Accepted DQ Disposition/Close		
☒ Accepted DQ Dispo/Action	TS	11/30/95 SOR 5/8/95
☐ Study		
☐ Design		
☐ Implement		
☐ Disapproved/Canceled		
☐ N/A in POL Phase		
☐ Superseded by CTS #		

Will Control Room change occur as a result of the design change? Y N
2/27/95
Date

Chairman, Commitment Management Review Group: Steve Weldon SWeldon 5/8/95

CMRG Comments: Quality to review for reportability re: old TS requirements.
5/8/95 - Totalizer accuracy is recognized to be about 8-10% & considering the minimal significance relative to ODCM reporting 6 mos duedate is appropriate SW 5/8/95

CTS

ECN # _____ DCP # _____

ENTERED	DATE	VALIDATE	DATE	ENTERED	DATE	VALIDATE	DATE
RM	2/27/95	Not Required	RM	RM	5/8/95	N/A RM	5/8/95

NOTE: (*) CMRG approval not required. 2/27/95
ADM-256 Rev. 7

EXHIBIT 9
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POTENTIAL DEVIATION FROM QUALITY FORM

PDQ# 95-0012
REV# 1

PROBLEM IDENTIFICATION
ORIGINATOR

1. DATE OF OCCURRENCE: / / TIME OF OCCURRENCE: ____ AM PM
2. DATE OF IDENTIFICATION: 2/9/95 TIME OF IDENTIFICATION: 10:00 AM PM
3. TIME SS NOTIFIED: 1630 AM PM 4. DEADLINE ASSIGNED BY SS: 1700 AM PM
5. SS NAME: DAN COMSTOCK
6. SYSTEM: CDS 7. EQUIPMENT ID: FQI-9510 8
8. EQUIPMENT NAME: Waste Water Flow Totalizer 9. QUALITY CLASS: 2
10. PROBLEM DESCRIPTION:

See attached Cont. Sheet

11. ASSOCIATED DCP, WR OR OTHER DOCUMENTS: SP2, SP482, SP524
12. AFFECTED DRAWINGS: N/A 13. P.O./CONTRACT: N/A
14. ORIGINATOR NAME: Jim Saum EXT: 4987 MAILSTOP: 231
ORIGINATOR SIGNATURE: J Saum DEPT: TS DATE: 2/23/95
15. EQUIPMENT OPERATES IN PRESENT CONFIGURATION (FOR CONFIGURATION DISCREPANCIES): ☐Y ☐N
SUPERVISOR NAME: JIM FIELD EXT: 4038 MAILSTOP: 231
SUPERVISOR SIGNATURE: J J Field DATE: 2/23/95

OPERATIONS REVIEW

16. POTENTIALLY REPORTABLE CONDITION: ☐Y ☒N PURSUANT TO: ____
17. TECH SPEC VIOLATION: ☐Y ☒N OPERABLE: ☐Y ☐N ☒NA CLEARANCE TAG REQ'D ☐Y ☒N
JUSTIFY IF NO LER REQUIRED: Not reportable per OAP-0064. This problem may have resulted in some inaccurate ODCM dose calculations in the past.
18. SS NAME: DAN COMSTOCK
SS SIGNATURE: DE Comstock DATE: 2/23/95 TIME: 1650 AM PM

EXHIBIT 9

ACM-129 REV. 10 (RSAP-1308)

10. PROBLEM DESCRIPTION:

The ODCM Surveillance Requirements stated in CAP-002, Attachment 14, for the Waste Water Flow Totalizer (FQI-95108) have never been complied with. Previously, this requirement was stated in Tech. Spec., Table 4.19. This Tech. Spec. requirement was also never met.

The totalizer which is a component of the Waste Water Flow Rate Device was never calibrated, channel checked, or channel tested. It was always assumed to be Operable. Only the Flow Rate instrumentation was ever surveilled (ref. SP.2, SP.524, SP.482)

The data taken from totalizer instrument FQI-95108 has been used for the ODCM Appendix I dose calculations and in assessing our waste water volume per our National Pollutant Discharge Elimination System (NPDES) permit.

REQUIREMENTS:

1) The ODCM, step 6.14.1, surveillance requirement item 2, states, " Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated Operable by performance of the INSTRUMENT CHANNEL CHECK, SOURCE CHECK, INSTRUMENT CHANNEL CALIBRATION AND CHANNEL TEST at the frequencies shown in Attachment 14.

   Attachment 14, Item 2, requires a Daily Channel Check, 18 mo. Channel Calibration, and Quarterly Channel Test for the Waste Water Flow Rate and Totalizer.

2) NPDES Permit CA0004758, Standard Provisions and Reporting Requirements for Waste Discharge Requirements; section C "Provisions for Monitoring", paragraph 6 states, "All monitoring and analysis instruments and devices used by the Discharger to fulfill the prescribed monitoring program shall be maintained and calibrated as necessary, at least yearly, to ensure their continued accuracy."

VIOLATIONS:

1) The totalizer FQI-95108 has never been surveilled per the above ODCM requirement or the previous Tech Spec. Table 4.19 requirement.

2) The totalizer FQI-95108 which has been used for monitoring waste water discharge has never been maintained or calibrated to ensure its continued accuracy per the NPDES provisions for monitoring.

Disposition Part 1

DEVIATION FROM QUALITY FORM

DQ # 95-0012
REV # 1

PROBLEM DISPOSITION ASSIGNED DEPARTMENT

19. DISPOSITION:

☐ ACCEPT-AS-IS ☐ REPAIR ☐ REWORK ☐ REPLACE
☐ INTERIM ACCEPT-AS-IS ☐ NOT A NONCONFORMANCE ☐ NON-HARDWARE
■ DOCUMENT CHANGE

20. PROBLEM ANALYSIS AND RESOLUTION: (PROVIDE CAUSE, EXTENT, REMEDIAL AND PREVENTIVE ACTIONS UNDER SEPARATE HEADINGS)

See attached.

21. DISPOSITION BY:

NAME: R. A. FRASER EXT: 4912 DEPT: TS

SIGNATURE: R A Fraser DATE: 5/8/95

FOR ACCEPT-AS-IS OR REPAIR ONLY (NOT REQUIRED FOR NON-HARDWARE)

22. DESIGN OR DRAWING: ☐ Y ☐ N 23. RELATED DCPs OR TRANS. NO. _____

24. CALC No.: _____ 25. TEST No.: _____

26. ASME CODE: ☐ Y ☐ N

ANII

27. ANII/ANI REVIEW: _____ DATE: _____

ASSIGNED DEPARTMENT

28. COMMENTS:

EXHIBIT 9
PAGE 359 OF 396 PAGE(S)

CMRG

29. TREND CODE: P3

20. PROBLEM ANALYSIS AND RESOLUTION

REQUIREMENT #1

Cause

The surveillance requirements for the waste water flow rate meter are correct as specified. The ODCM indicates that these requirements apply to the "Waste Water Flow Rate and Totalizer" which can be interpreted to mean that these two devices require an independent calibration, channel test and channel check. However, SP.482, REFUELING INTERVAL PLANT WASTE WATER FLOW LOOP 95108 CALIBRATION, SP.524, QUARTERLY CHANNEL TEST OF WASTE WATER FLOW RATE TOTALIZER and SP.2, DAILY INSTRUMENT CHECKS AND SYSTEM VERIFICATION, do not include steps to independently calibrate, channel test or channel check the flow totalizer (FQI-95108), respectively. This may be a result of either:

1) the fact that, as described below, the totalized does not have an independent adjustment to allow its output to be electrically or mechanically adjusted, or

2) the fact that the vendor manual does not suggest any method for performing a totalizer calibration, or

3) the assumption that those who drafted the requirement included the "totalizer" with the "waste water flow rate" as one line item for clarification and did not intend for it to be calibrated separately from the flow rate, or

4) a combination of the above.

The waste water flow rate meter, BIF FLO-WATCH METER Series 305 (Manual M19.32-2), is a combination flow recorder and flow totalizer. There are two calibration adjustments, the span adjust (travel adjustment slide) and the index adjust screw (micrometer screw). The span adjust establishes the total span of the recorder. The index adjust screw adjusts the flow recorder chart needle to match the actual measured flow rate.

The two calibration adjustments are located on the "transmitter" unit of the meter (see Attachment 1). The transmitter contains a cam driven by a synchronous motor, a trip arm which is operated by the cam, a trip lever which is controlled by the trip arm and a mercury switch which is operated by a magnet positioned on the end of the trip lever. The index adjust screw controls the positioning of the trip arm with respect to the cam. As the cam rotates through one revolution (every 60 seconds) the trip arm will ride on the cam for a fraction of the 60 seconds. The length of time the trip arm rides on the cam is proportional to the mechanical

flow rate signal provided by the level of the float in the float well. While the trip arm is on the cam it causes the mercury switch to close (via the trip lever) during which time two functions occur. First a reed relay picks up to provide 25 volts to the clutch of the power positioner (receiver) which controls the positioning of the recorder needle to record flow rate. Second, at the same time the 25 volts is applied to the power positioner clutch, a second reed relay picks up to energize the drive motor for the totalizer.

Therefore, the index screw adjustment which controls the calibration of the recorder needle via the mercury switch also controls the totalizer. There is no independent adjustment for the totalizer. The totalizer is a counter geared directly to a constant speed motor which operates whenever the mercury switch is closed.

Memo RPC 94-058, Einar T. Ronningen to CTS Coordinator, dated March 14, 1995 (Attachment 2), refers to a telephone conversation with Roger Peterson which supports the fact that there is no separate electrical or mechanical adjustment for the flow totalizer. However, in a subsequent telephone conversation with Mr. Peterson on March 28, 1995 (Attachment 3), he goes on to say that the totalizer should be compared to the calibrated flow rate over a given time period to verify its output is within a specified tolerance. If it is not within tolerance it should be replaced or a correction factor should be applied to all readings.

The definition of Instrument Channel Calibration as defined in both the Technical Specifications and the ODCM reads, in part, as:

> "An INSTRUMENT CHANNEL CALIBRATION is a test, and adjustment (if necessary), to establish that the channel output responds with acceptable range and accuracy to known values of the parameter which the channel measures or an accurate simulation of these values."

Comparing the output of the totalizer to a calibrated flow rate over time and applying a correction factor, if necessary, constitutes a calibration of the totalizer output. If a correction factor is used, that correction factor technically becomes the "adjustment".

For surveillance purposes, the "Waste Water Flow Rate and Totalizer" has been considered as one instrument requiring a single Instrument Channel Calibration and Instrument Channel Test. Technically, however, the flow rate recorder and the totalizer are actually two separate channels within the one "instrument". Each channel receives the same calibrated flow rate input but provide different outputs.

The totalizer output data is being used for reporting purposes without verifying the output is within an acceptable tolerance. The tolerance has been assumed to be ±10% which is the tolerance specified in SP.482 and SP.524.

The only way to determine the accuracy of the totalizer output is to compare it to the calibrated input over a given time period. This process then becomes an instrument channel calibration or instrument channel test (as appropriate). If it is outside the acceptable tolerance, the totalizer can either be replaced or the output adjusted (with a correction factor) to bring it within acceptable tolerance.

See Note① below

Because the output accuracy of the totalizer has not been periodically verified, the Instrument Channel Calibration and Instrument Channel Test surveillance requirements for the "Waste Water Flow Rate and Totalizer" have not been satisfied by SP.482 and SP.524.

SP.2, Data Sheet 1, Step 1.2, is used to perform the Channel Check of the "Wastewater Flow Totalizer/Recorder FR-95108". This implies that the totalizer as well as the chart recorder are checked to be functional although it does not specifically separate the two devices. Per Memo RPC 95-058, the totalizer is verified to be operable on a daily basis (monday through friday) by RP/Chem. If it is overlooked during the performance of SP.2, the check performed by RP/Chem would identify a failure of the totalizer. These checks also provide documentation that the totalizer is being maintained. Therefore, I believe the Channel Check surveillance requirement for the Waste Water Flow Rate and Totalizer has been satisfied. However, as indicated below, SP.2 will be revised to document that a channel test is performed on both the totalizer and the flow rate recorder.

Extent

This issue affects only the Waste Water Flow Rate Meter (FR-95108/FQI-95108).

Remedial Action

Perform an evaluation to establish totalizer error.

With the totalizer accuracy established, it should be determined what impact, if any, the error in totalizer output has on past effluent release reporting.

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~~Fee~~ SIL 5/8/95 Note① This determination ("surveillance requirements not satisfied") does not consider the NRC's guidance in RG 1.21, thus is not complete. RP/Chem is responsible for ODCM compliance determination and reviewed this situation in light of RG 1.21 in memo RPC 95-082. CMRG concurs with RPC 95-082 "not

Preventive Action

To satisfy totalizer surveillance requirements, the following actions will be taken:

1. SP.482, REFUELING INTERVAL PLANT WASTE WATER FLOW LOOP 95108 CALIBRATION, will be revised to add steps comparing the change in totalizer reading to a specific flow rate over an appropriate time period to assure the totalizer is functioning within a specified tolerance.

2. SP.524, QUARTERLY CHANNEL TEST OF WASTE WATER FLOW RATE TOTALIZER, will also be revised to add steps comparing the totalizer to a specific flow rate over an appropriate period of time to assure the totalizer is functioning within a specified tolerance.

3. SP.2, DAILY INSTRUMENT CHECKS AND SYSTEMS VERIFICATION, will be revised to specifically verify the operability of the totalizer as well as the chart recorder.

REQUIREMENT #2

Cause

The California Regional Water Quality Board, Standard Provisions and Reporting Requirements for Waste Discharge Requirements, Section C, paragraph 6, specifies:

> "All monitoring and analysis instruments and devices used by the Discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary, at least yearly, to ensure their continued accuracy."

One of the "constituents" listed as part of the "COMBINED EFFLUENT MONITORING" for NPDES Permit No. CA0004758 is flow.

However, unlike the other "constituents", there are no limits on the amount of flow that can be released. Flow is monitored for information purposes and has no affect on the sampling results of the other constituents which do have "prescribed" limits. Therefore flow is not considered when determining "compliance" with the NPDES permit.

Even though flow is not considered when determining compliance with the NPDES permit, the Waste Water Flow Rate Meter (FR-95108/FQI-95108) is being maintained. Surveillance Procedure SP.524 performs a quarterly channel test which ensures that the flow rate recorder is in calibration. During the performance of the channel test, if it is determined the flow

rate recorder is out of calibration, the corrective action is to perform SP.482 to recalibrate it. Therefore, the flow rate recorder has been determined to be in calibration on a quarterly basis which has satisfied the intent of the calibration requirement.

Extent

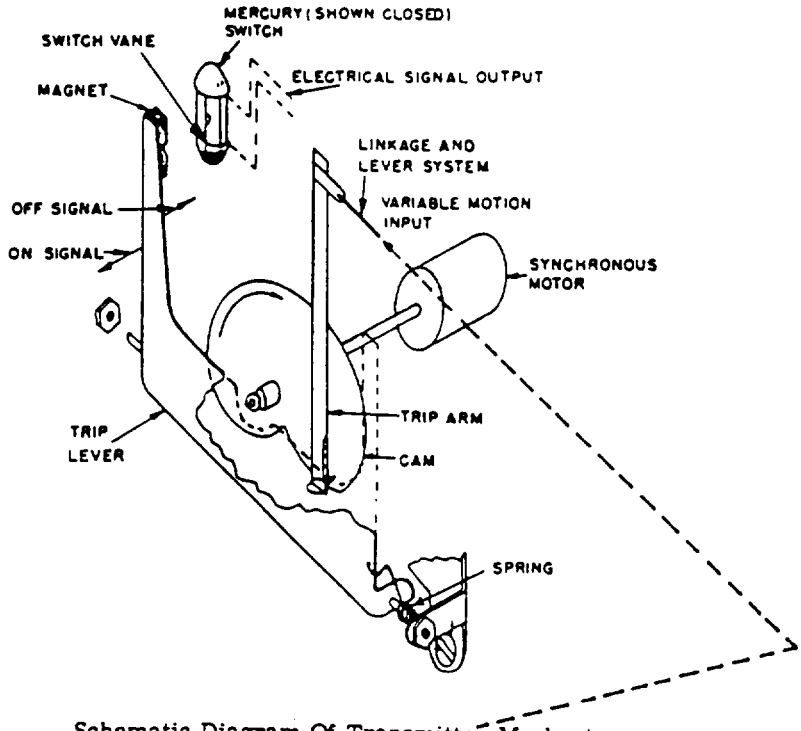
This issue affects only the Waste Water Flow Rate Meter (FR-95108/FQI-95108).

Remedial Action

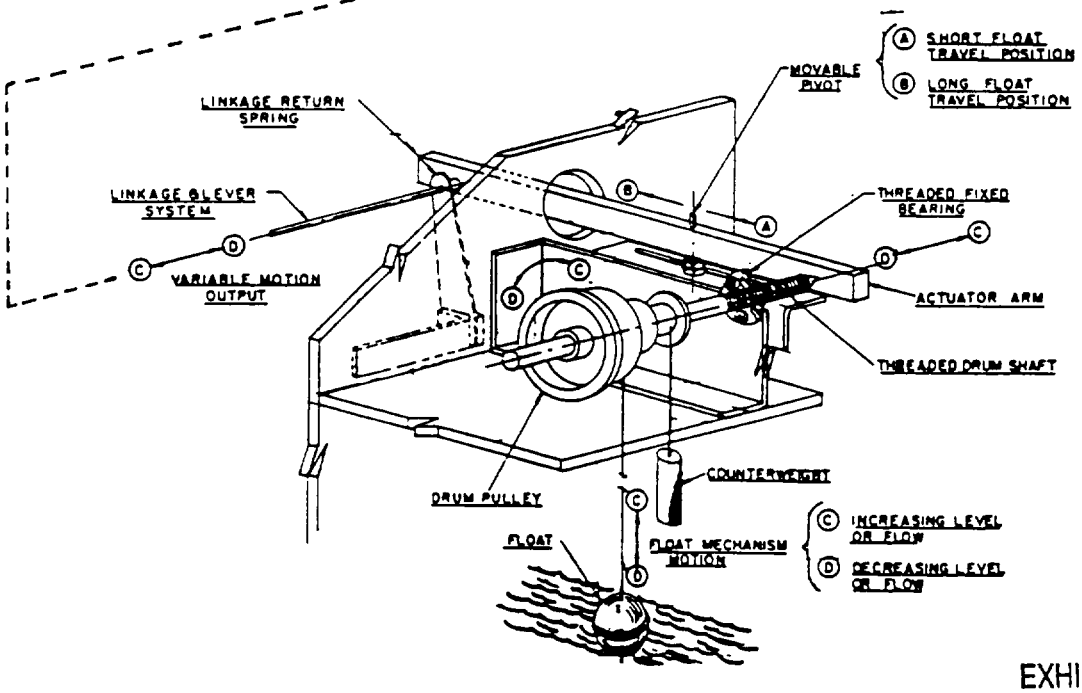
Since total flow is not considered when determining "compliance" with the NPDES permit, no remedial action is required.

Preventive Action

None required.



Schematic Diagram Of Transmitter Mechanism



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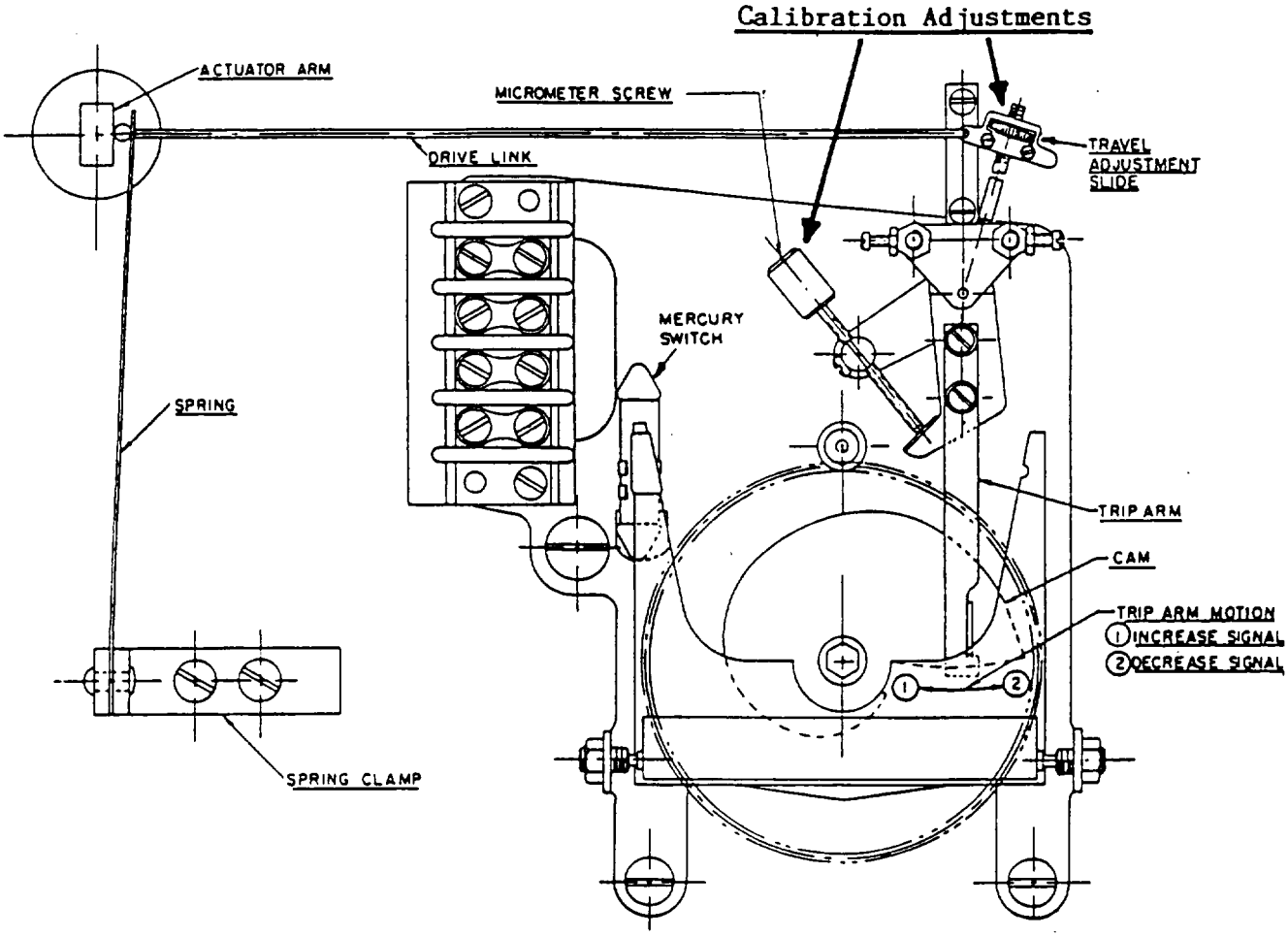
Schematic Diagram Of Float Operated Parts



Transmitter

EXHIBIT 9
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SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: CTS Coordinator

DATE: March 14, 1995
RPC 94-058

FROM: Einar T. Ronningen ETR/PDJ

SUBJECT: CTS #51766, PDQ 95-0012

The decision that PDQ 950012 is a DQ has been made, but there remains a question of a violation of requirements. The assertion that the flow totalizer has never been calibrated separately from the flow rate indicator is a fact. The claim that this is a violation of any requirement is in question, and, because of PDQ 95-0012, it is a question which can only be resolved by management decision. The PDQ raises two questions which are key in determining the potential impact of this PDQ:

1). Is there a requirement to calibrate the totalizer separately from the flow rate instrument?

2). Did the manufacturer intend for the totalizer to be calibrated separately from the flow rate indicator?

The answer to the first question can be found through research into the origination of the requirement as it exists today. The current requirement exists in the Offsite Dose Calculation Manual (ODCM), and was previously located in the Technical Specifications in identical form. The requirement is listed as a single requirement for the "Waste Water Flow Rate and Totalizer". It is a matter of interpretation as to whether this requirement reflects a single instrument, or 2 separate instruments, with a requirement for separate calibrations, channel checks, etc for each of the 2 instruments. The interpretation of the requirement must be based upon the intentions of the drafters of the requirement. The best indication of the intentions can be found in Proposed Amendment 155 to the Technical Specifications, which was approved by the NRC and issued as Amendment 98 to the Technical Specifications. This amendment created the requirement in its current form. The proposed amendment submitted to the NRC contained a discussion which detailed the change. This discussion included the statement: "Clarification (of the technical specification) is made to indicate that a totalizer is used to measure total flow downstream of the dilution flow." Comment in parentheses added for clarity. In light of this statement, it is reasonable to assume that the totalizer function of the instrument was not "forgotten", but, rather, was the unique function of the instrument which was addressed for clarification.

This new requirement (which is the current requirement) became effective when Amendment 98 to the Technical Specifications was issued on 3/17/88 (first submitted to the NRC as PA-155 on 6/30/87). During the same time period, SP.482, Refueling Interval Plant Waste Water Flow Loop 95108 Calibration, was generated (rev. 0 effective 12/23/87). Consider that the emphasis of the Technical Specification change in Amendment 98 was directed towards the totalizer function, and also consider that the calibration SP for the instrument was issued at virtually the same time. With those two considerations in mind, it does not seem reasonable to presume that the requirement to calibrate the totalizer function was ignored or forgotten, but rather that it was not considered to be a separate part of the requirement.

The second question is best addressed by review of the vendor manual provided with the instrument, and input from the manufacturer. It should be kept in mind that the question is not one of ability to calibrate the instrument (a separate issue), but the need to calibrate the instrument. The "pre-starting" procedure of the manual includes detailed descriptions of how to check and adjust (in other words, calibrate) the portion of the instrument which indicates flow rate, but there is no corresponding description concerning the totalizer portion. In fact, the only description for the totalizer which can be found states: "Make no adjustments to totalizer other than to check security of electrical connectors."

The attached telecon form documents a discussion with a technical representative of a BIF instrument distributor. The professional, technical opinion of the individual contacted was that the totalizer was an integral part of the instrument, and could not be calibrated separately from the flow rate portion of the instrument.

The technical manual and input from a technical representative both indicate that calibration of the totalizer separately from the flow rate indicator is not intended by the manufacturer.

In order for a violation of a requirement to have occurred, the answers to both previously posed questions must be "yes". It is difficult to determine all factors precisely, but best evidence seems to indicate that the answer to at least one of the questions must be "no", and that therefore, no violation occurred.

CTS 51766 requires a disposition by RP/Chem and Tech Services. The CTS assigns the Cause to Tech Services, and the Extent to RP/Chem. As a result of the discussion above, there are no Preventive or Corrective Actions to be taken by RP/Chem, and these aspects of the disposition will not be addressed by RP/Chem.

EXTENT OF DQ 95-0012

There has been no violation of the former Technical Specification or current ODCM Technical Requirement for the Waste Water Flow Rate and Totalizer. Also, there is no evidence to suggest that the accuracy of the instrument (presumed to be ±10% for dose calculations) is in question. Therefore, reconsideration of any liquid effluent calculation performed in the past is not warranted.

The operability of the totalizer portion of the instrument is checked daily (Monday through Friday) by observing and recording differences between the current and previous totalizer readings. This check, which is administratively controlled by RP/Chem, is similar to the Instrument Channel Check Surveillance (part of SP.2, performed daily) required to be performed on the instrument, which simply checks for flow indication. Although it is possible that only the totalizer portion of the instrument fails, leaving the flow rate portion in perfect working order, this scenario is unlikely. The totalizer portion of the instrument is relatively simple compared to the rest of the instrument. The likelihood of a failure affecting only the totalizer is much less than a failure which incapacitates the entire instrument. This principle forms the basis of the current requirements, and is backed up by an operational history of the instrument dating back to plant construction. In any case, a failure specific to the totalizer would still leave the flow rate indicator functional, which records a time-history of the flow rate. The flow rate time-history could be easily integrated to determine the total flow during any given time period. In summation, the totalizer operability is checked daily, chances of a totalizer-only failure are small, and the impact of such a failure is nil.

Additional formalization of the totalizer operability checks is not recommended, and is not necessary. The preceding paragraph is a discussion about totalizer function, and is not a commitment to check the totalizer operability daily, or any other commitment.

This completes the RP/Chem actions required by this CTS item.

cc: RIC 2A.750

TELECON WITH:

Roger Peterson of the Stuart Peterson Co., Vacaville, CA.
(707) 447-0185

Who Initiated Call	Who Was Contacted	Date
Einar T. Ronningen	Roger Peterson	3/8/95

REASON FOR CALL: PDQ 95-0012, seeking information about the Waste Water Flow Rate and Totalizer.

RESOLUTION REACHED: I spoke to Mr. Roger Peterson of the Stuart Peterson Co. which sells and services BIF instruments. Mr. Peterson is a former employee of the BIF Instrument Company, an affiliate of General Signal Corporation. I asked if calibration of the totalizer should occur separately from the flow rate portion of the instrument. He stated that there was only a single calibration for the instrument, involving adjustment to the flow rate device. He went on to indicate that performing this calibration was a calibration of the entire instrument, including the totalizer, and there is not a separate calibration involving just the totalizer function of the instrument.

TELEPHONE CONVERSATION LOG

Call To/~~From~~ Roger Peterson **Phone** (707) 447-0185

Stuart Peterson, Inc., Vacaville, Ca.

Made/~~Received~~ By Jim Saum/Bob Fraser **Date** 3/28/95 **Time** 0900

Subject/Reference Calibration of the BIF FLO-WATCH METER (FR-95108/FQI-95108)

Summary Calibration of the totalizer portion of the FLO-WATCH METER was discussed. As part of that discussion Mr. Peterson stated that the totalizer should be compared against the flow rate over time to calibrate the totalizer. He also stated that if the totalizer output does not meet the required tolerance it should be replaced or a correction factor applied in order to maintain a specified accuracy.

Follow-Up Required

EXHIBIT 9

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☐ FILE INT.

RM 5/4/95

Secondary Disposition (Part 2) RP/chem

DEVIATION FROM QUALITY FORM

DQ # 95-0012
REV # 1

PROBLEM DISPOSITION ASSIGNED DEPARTMENT

19. DISPOSITION:

☐ ACCEPT-AS-IS ☐ REPAIR ☐ REWORK ☐ REPLACE

☐ INTERIM ACCEPT-AS-IS ☐ NOT A NONCONFORMANCE ☐ NON-HARDWARE

☒ DOCUMENT CHANGE

20. PROBLEM ANALYSIS AND RESOLUTION: (PROVIDE CAUSE, EXTENT, REMEDIAL AND PREVENTIVE ACTIONS UNDER SEPARATE HEADINGS)

See Attached

21. DISPOSITION BY:

NAME: Einar Ronningen EXT: 4467 DEPT: RP/chem

SIGNATURE: EI/CF DATE: 5-4-95

FOR ACCEPT-AS-IS OR REPAIR ONLY (NOT REQUIRED FOR NON-HARDWARE)

22. DESIGN OR DRAWING: ☐ Y ☐ N 23. RELATED DCPs OR TRANS. NO. _____

24. CALC No.: _____ 25. TEST No.: _____

26. ASME CODE: ☐ Y ☐ N

ANII

27. ANII/ANI REVIEW: _____ DATE: _____

ASSIGNED DEPARTMENT

28. COMMENTS:

EXHIBIT 9
PAGE 372 OF 506 PAGE(S)

CMRG

29. TREND CODE: P3

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: Dennis Gardiner

DATE: May 2, 1995
RPC 95-082

FROM: Einar T. Ronningen ETR ~~Disposition Part 2~~ RM 5/4/95

SUBJECT: DQ 95-0012, REV. 1, BLOCK 20: PROBLEM ANALYSIS AND RESOLUTION ~~Page 2 of 3~~

This memo is a supplement to the Problem Analysis and Resolution provided by Technical Services. This memo will address only those aspects involved with interpreting the relevant material in the Offsite Dose Calculation Manual (ODCM). The current surveillance requirements for FI-95108 are found in the ODCM. The identical surveillance requirements were located in Technical Specifications Appendix A (Tech Specs) until removed and placed into the ODCM in 1992. Only the requirements in the ODCM will be addressed, because it will be shown that current requirements, and therefore the previous requirements, are and have been met.

Cause

DQ 95-0012 reports a potential deviation from quality in that a separate totalizer calibration has not been previously performed when calibrating FI-95108. The waste water flow device has been previously calibrated in accordance with the manufacturers instructions which is specifically allowed by NRC Regulatory Guide 1.21, i.e., the ODCM requirement has not been violated.

Requirement 1: Fulfilling ODCM surveillance requirements for the totalizer function separate from the flow rate function of FI-95108 (noted below as "instrument" or "the instrument").

Regulatory Interpretation: The one-line entry in the ODCM does not imply separate surveillance requirements for the two functions of this instrument. The basis for this interpretation is Regulatory Guide 1.21 which states in section 11. Accuracy of Measurements, part c. Calibrations: "... Calibration procedures may be compilations of published standard practices or manufacturers' instructions that accompany purchased equipment or they may be specially written in-house to include special methods or items of equipment not covered elsewhere. ...". This is interpreted to mean that calibration procedures provided in the vendor-supplied manual are sufficient to fulfill

surveillance requirements. The calibration procedure in the supplied vendor manual does not include calibration of the totalizer function of the instrument, only the flow rate function. Therefore, the ODCM surveillance requirements have been met according to Reg. Guide 1.21, because the procedure in the vendor manual for calibration of the instrument has been fulfilled at the frequencies required by the ODCM. Also note that addition of a separate check/calibration of the totalizer generated in-house will not violate Reg. Guide 1.21, which allows for (but does not require) user-written procedures for methods not otherwise provided for.

Extent

~~This problem~~ affects only the instrument. Although not related to the subject of the PDQ, ~~documentation for the~~ accuracy of this instrument is needed.

Refer to TS portion of disposition SJR 5/8/95

Remedial Actions

No remedial ~~actions~~ are necessary for the subject matter of this PDQ. However, determination ~~and documentation~~ of the accuracy of the instrument is needed.

Refer to TS portion of disposition 5/8/95 SJR

Preventive Actions

To prevent confusion about totalizer surveillance requirements, as well as to improve the Radiological Effluents Program, the following actions should be taken:

1). SP.482, REFUELING INTERVAL PLANT WASTE WATER FLOW LOOP 95108 CALIBRATION, should be revised to add steps comparing the change in totalizer reading to a specific flow rate over an appropriate time period to assure the totalizer is functioning within a specified tolerance.

2). SP.524, QUARTERLY CHANNEL TEST OF WASTE WATER FLOW RATE TOTALIZER, should be revised to add steps comparing the totalizer to a specific flow rate over an appropriate period of time to assure the totalizer is functioning within a specified tolerance.

3). SP.2, DAILY INSTRUMENT CHECKS AND SYSTEMS VERIFICATION, should be revised to specifically verify the operability of the totalizer as well as the chart recorder.

Refer to TS portion of disposition 5/8/95 SJR

EXHIBIT 9

cc: RIC 2A.750

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: CMRG

DATE: April 4, 1995
RPM 95-35

FROM: DENNIS GARDINER

SUBJECT: PDQ 95-0012

RSAP-0101, Nuclear Organization Responsibilities and Authorities, assigns the responsibility of implementing the Off-site Dose Calculation Manual (ODCM) and the requirements of the California Water Quality Control Board NPDES Permit to the RP/Chem Superintendent. After an extensive review of the potential violation reported in PDQ 95-0012, it is my technical judgement that none of the requirements of the ODCM or the NPDES Permit have been violated.

Potential Violation 1 - The Totalizer FQI-95108 has never been surveilled per the ODCM requirement or the previous Tech. Spec Table 4.19 requirement.

> Extent: The ODCM does not differentiate the Totalizer from the flow rate portion of the device. Regulatory Guide 1.21, Measuring, Evaluating and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Material in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants, permits calibration of measurement instruments in accordance with manufacturer's instructions that accompany purchased equipment. The waste water flow rate and totalizer device has been calibrated in accordance with the manufacturer's instructions. No violation of the ODCM has occurred.

Potential Violation 2 - The Totalizer FQI-95108 which has been used for monitoring waste water discharge has never been maintained or calibrated to ensure its continued accuracy per the NPDES provisions for monitoring.

> Extent: The waste water flow rate and totalizer device has been maintained and calibrated in accordance with the manufacturer's instructions. Compliance with the provisions of the NPDES is shown by the analysis of grab samples. The waste water flow rate and totalizer device is not used to show compliance with any NPDES permit limit or specification. No violation of the NPDES permit has occurred.

Discussion: The RP/Chem group records the waste water flow rate and totalizer readings daily (Mon-Fri). Failure of the totalizer to operate would therefore be known and a work request would be written. There are no accuracy requirements for the total volume of waste water discharged reported in the Semi-annual Radiological Effluents Report or the NPDES Permit Self Discharger Report. Section 11.a of Regulatory Guide 1.21 states, "Because it may be very difficult to assign error terms for each parameter affecting the final measurement, detailed statistical evaluations of error are not suggested. The objective should be to obtain an overall estimate of the error associated with measurements of radioactive materials released in liquid and gaseous effluents and solid waste."

The error reported for the total volume of dilution water listed in the Semi-annual Radiological Effluents Report is ± 10%. This error was determined from the criteria of SP.482, Refueling Interval Plant Waste Water Flow Loop 95108 Calibration, Step 6.9.11 which states "verify actual flows are ± 10% of indicated flows."

cc: RIC 2A.750

DATE: 3/20/95

MNTS 95-021

TO: Jim Field

FROM: Jim Saum

SUBJECT: DQ 95-0012 REV. 1 DISPOSITION; FQI-95108

I have reviewed the subject disposition and have discussed it with Bob Fraser. My partial comments are as follows:

1. The Remedial Action section states incorrectly that, " no surveillance requirement has been violated".

Proof:

The definition for an Instrument Channel Calibration is defined in the ODCM section 4.15 as follows:

"An instrument channel calibration is a test, and adjustment (if necessary), to establish that the channel **output** responds with acceptable range and accuracy to known values of the parameter which the channel measures or an accurate simulation of these values. Calibration shall encompass the **entire** channel, including equipment actuation, alarm, or trip and shall be deemed to include the channel text."

The current SP. 482 rev. 7," R.I. PLANT FLOW LOOP 95108 CALIBRATION", does not check the totalizer **output** to known values of the parameter which the channel measures (i.e., total flow). The SP rather **ASSUMES** that since the transmitter/flow recorder is calibrated and since there is no adjustment is provided for the totalizer device that the totalizer is therefore calibrated.

After discussing this point with Bob Fraser, Bob now agrees that the totalizer has not been calibrated in the past per the ODCM definition and therefore the surveillance requirements have not been met in the past.

2) A review of past chart recordings (e.g. one chart for each year of plant operations) is necessary in order to determine the inaccuracies of the totalizer since no calibration has been performed heretofore. The charts have totalizer and flow rate recordings. A review of this data would determine if the totalizer was calibrated to stated accuracies reported to the NRC. A system accuracy calc. would determine the tolerance allowed to the totalizer which would still render the system accuracy to be within bounds as reported to the NRC.

3) A System Accuracy Calculation should be performed to ensure that the reported accuracies to the NRC are indeed accurate. Note: allowing a tolerance of +/- 10% for the totalizer calibration check, as proposed in draft revs of SP. 482 would result in a

system inaccuracy greater than 10% (10% is reported to the NRC in the semiannual report), since there are additional inaccuracies in the system which need to be considered.

Therefore, it is recommended that the disposition be revised to accurately dispose of this problem.

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: Steve Redeker

DATE: March 2, 1995
NL 95-008

FROM: Jerry Delezenski/Richard Mannheimer RM

SUBJECT: **REPORTABILITY REVIEW OF DQ 95-0012 REGARDING OLD TECH SPEC 4.19 REQUIREMENTS**

As the CMRG requested, Licensing reviewed the reportability issue related to DQ 95-0012. This issue concerns the reportability of Tech Spec violations discovered several years after the fact. Based on a review of NRC reportability regulations and guidance (i.e., 10 CFR 50.73, NUREG 1022, Supplement 1, and Supplement 2), Licensing concludes that a violation of Tech Specs discovered after the fact is reportable to the NRC as an LER.

Even though a given Tech Spec is no longer present in the current Tech Specs, Licensing believes, based on NRC reportability regulations and guidance, a violation of an old Tech Spec discovered today is still reportable to the NRC as an LER.

Licensing can not make a reportability determination for DQ 95-0012 without knowing whether or not specific surveillance activities were ever required for the Totalizer portion of the Waste Water Flow Rate and Totalizer instrument. Licensing must know if (1) the original Tech Spec surveillance requirements were intended to be applied to the Totalizer and (2) was it technically acceptable/adequate to perform surveillance activities only on the Flow Rate portion of the Waste Water Flow Rate and Totalizer instrument to demonstrate operability? Also, if some surveillances did apply to the Totalizer, is there any documentation to show that the required surveillances were routinely accomplished (e.g., recorded totalizer readings following releases could be considered a Channel Check)?

If surveillances were required for the Totalizer and no documentation exists to show the necessary surveillance activities were performed, Licensing would conclude that this situation would be reportable and an LER would be required. On the other hand, Licensing would conclude that this situation would <u>not</u> be reportable to the NRC if performance of past surveillances are adequate to show Waste Water Flow Rate and Totalizer operability.

cc: RIC
CTS Coordinator
Jim Field

COMMITMENT CLOSURE FORM

TO: CTS Coordinator

CLOSURE INFORMATION RESPONSIBLE DEPARTMENT

1. CTS NO: 51766

2. Source Documents (Attachments):

☐ PDQ # ■ DQ # 95-0012 ☐ CCTS # _____ ☐ LRSL # _____

☐ CAR _____ ☐ Others (Specify) _____

3. Responsible Department Manager

Name: Jim Field Date: 3/5/96

Signature: [signature]

Description of Response or Action Taken: The flow rate totalizer (FQI-95108) associated with this DQ has been replaced per DCP R95-0006 with liquid effluent flow meter FIRQ-95108. A loop accuracy calculation was done per Calculation Z-CDS-I0285 for FIRQ-95108. Surveillance procedures SP.2, SP.482 and SP.524 were revised to reflect the new flow meter per revisions 19, 10 and 8 respectively.

Closure Documentations (List): Copies of DCP R96-0006 Commitment Cover Sheet, CTS 51916 Report and Calculation Z-CDS-I0285 cover sheet.

Is Documentation Attached? ■ Yes ☐ No

LICENSING REVIEW

4. Licensing Review

Name: _____ Date: _____

Signature: _____

Licensing Review Comments: _____

Commitment Closure Type:

☐ Complete ☐ N/A in POL Phase ☐ Enduring ☐ Recurring

CTS

RM — ENTERED — 3/6/96 — DATE

N/A — VALIDATE — RM — 3/6/96 — DATE

ADM-258 Rev. 4

EXHIBIT 9

PAGE 380 OF 386 PAGE(S)

SMUD CALCULATION COVER SHEET

SACRAMENTO MUNICIPAL UTILITY DISTRICT ☐ 6201 S Street, P.O. Box 15830, Sacramento CA 95852-1830 (916) 452-3211

SUBJECT: Loop Accuracy for the Liquid Effluent Flow Meter (FIRQ-95108)	CALC. NO.: Z-CDS-I0255
	FILE NO.: N/A
	QUALITY CLASS: 2
SHEET 1 OF 16	SEISMIC CATEGORY: N/A

RECORD OF ORIGINAL ISSUE AND REVISIONS			SMUD ORIGINATED CALCS			TECHNICAL SVCS. SUPERINTENDENT	
REV. NO.	REVISION DESCRIPTION	DATE	ORIG.	CKR.	SUPVY. REVIEW	ENG.	TS SUPT.
0	Original Issue	11/6/95	JS	RCL	JJF		

RESULTS OF CHECKER REVIEW

ITEM DESCRIPTION		ORIG. ISSUE	REVISION NO.					
MUST INITIAL ONE: FINAL RESULT NUMERICAL DIFFERENCES ARE NOT SIGNIFICANT; NO CORRECTIONS NECESSARY.	INITIAL	RCL						
MUST INITIAL ONE: FINAL RESULT NUMERICAL DIFFERENCES ARE SIGNIFICANT. NECESSARY CORRECTIONS ARE MADE.	INITIAL	N/A						
CHECK MADE BY ATTACHED ALTERNATE CALCULATIONS. _____ SHEETS	INITIAL							
	DATE							
REVIEWED FOR IMPACT	OPS. PROC.	N/A						
	MAINT. PROC.	N/A						

EXHIBIT 9

PAGE 381 OF 506 PAGE(S)

ORIGINATOR	Jim Swan	J Swan	JS		10/31/95
CHECKER	Ron Lawrence	RCL Lawrence	RCL		11/6/95
SUPVY. REVIEW	Jim Field	JJ Field	JJF		11/6/95
ENGINEER					
TS SUPT.					

SH. # R95-0006

COMMITMENT COVER SHEET

☒ New
☐ Change CTS # _____

CTS #: 51916
REV. #: _____
DATE: 9/21/95

IDENTIFICATION - Originator #4-8 CTS/CCTS Only

1. Originator

Name: Jim Swum Ext: 4987 Mail Stop: 231

Signature: J Swum Dept: TS Date: 9/21/95

2. Source Documents (Attachments):

☐ PDQ # ~~☒ DQ # 95-0017~~ ☐ CCTS # _____ ☒ LRSL # 51916

☐ CAR (*) _____ ☐ OTHERS (SPECIFY) _____

3. Brief Title: Replace Effluent Flow meter

4. Description: Existing Flow meter FR-95108 will be replaced with the new Flow METER FIRA 95108

5. Related Documents: (O = Originating, X = Cross Ref; C = Closure)

Document	Type	Document	Type

6. Agency: _____

7. Priority: _____ 8. Reportable: Y N

DISPOSITION AND APPROVAL Commitment Mgmt. Review Group

9. ☐ Hardware ☐ Software 10. Regulatory Due Date: Y N Date: Original _____ Revised _____

11. Priority 3 12. Applicable Systems _____

13. APPROVED:

	DEPARTMENT	DUE DATE
☐ Potential 10 CFR 21 / Reportability Review	LIC	
☐ PDQ Initiate W/R		
☐ PDQ Action		
☐ DQ Disposition		
☐ Accepted DQ Disposition/Close		
☐ Accepted DQ Dispo/Action		
☐ Study		
☐ Design		
☒ Implement	TS	10/3/95
☐ Disapproved/Canceled		
☐ N/A in POL Phase		
☐ Superseded by CTS #		

DCP CLOSED
ON JAN 17 1996
RANCHO SECO DOCUMENT CONTROL

Will Control Room change occur as a result of the design change? Y N

Chairman, Commitment Management Review Group _____ Date 9/25/95

CMRG Comments: Replacement of this monitor is tracked as #1 site priority on daily site work list.

CTS

ECN # _____ DCP # _____

ENTERED	DATE	VALIDATE	DATE	ENTERED	DATE	VALIDATE	DATE
RAD	9/25/95	N/A	N/A				

EXHIBIT 9
PAGE 2 OF 2

27425

SH.5
R95-0006

Printed:
09/25/95
10:01:05

Rancho Seco Nuclear Generating Station
Commitment Tracking System
General CTS Report
STDRPT1

Page: 1
Report: CTS
Version: 080390
Table: CTS

CTS #: 51916 Rev:

System: CDS

XREF: PDQ #: DQ #: CCTS #: LRSL #: 51916

Title: REPLACE EFFLUENT FLOW METER FR-95108

Agency: SMUD

Resp Dept: Tech Svcs
Manager: Field, J.
Phone: 4038
Mail Stop: 231
Assigned:
Area:

Origin Dt: 09/20/95
Originatr: SALM, J.
Orig Dept: Tech Svcs
Storage Box:

WORKING COPY

Status : Open
Priority : 3
Mig Pri :
NRC Report:
CTS STage : Implement
Stage Date: 09/25/95
Stage Dept: Tech Svcs
Stage Due Date: 10/31/95
Final Due Date: 10/31/95
Due Date Rev:
Sched Start:
Sched Finish:
Actual Start:
Actual Finish:

QA Req'd? :
Licensing Req'd? :
Reportable? :
CCTS Closure? : A
Hardware/Software: H

Description: Existing flow meter FR-95108 will be replaced with the new flow meter FIRQ-95108.
Requirements:
Response:
Comments: CNRG reviewed this item on 9/25/95 and assigned action to Tech Services to issue and close the DCP to perform the work, due 10/31/95.

Related Documents: Document: Rev: CTS Code: CCTS Type:
DQ 95-0017 x : Cross Reference
:

DCP CLOSED
ON JAN 17 1996
RANCHO SECO
DOCUMENT CONTROL

EXHIBIT 9
PAGE 383 OF 506 PAGE(S)

COMMITMENT CLOSURE FORM

TO: CTS Coordinator

CLOSURE INFORMATION RESPONSIBLE DEPARTMENT

1. CTS NO: 51766

2. Source Documents (Attachments):

☐ PDQ # ☒ DQ # 95-0012 ☐ CCTS # _____ ☐ LRSL # _____

☐ CAR _____ ☐ Others (Specify) _____

3. Responsible Department Manager

Name: Dennis E. Gardiner Date: 3-14-95

Signature: DE Gardiner

Description of Response or Action Taken: Investigated the problem as described in the PDQ and determined that no actions are necessary.

Closure Documentations (List): RPC-95058

Is Documentation Attached? ☒ Yes ☐ No

LICENSING REVIEW

4. Licensing Review

Name: _____ Date: _____

Signature: _____ EXHIBIT 9

PAGE 384 OF 506 PAGE(S)

Licensing Review Comments: _____

Commitment Closure Type:

☐ Complete ☐ N/A in POL Phase ☐ Enduring ☐ Recurring

CTS

RM	3/15/95	Not Required	RM 3/15/95
ENTERED	DATE	VALIDATE	DATE

ADM-258 Rev. 4

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: CTS Coordinator

DATE: March 14, 1995
RPC 94-058

FROM: Einar T. Ronningen ETR/PDQ

SUBJECT: CTS #51766, PDQ 95-0012

The decision that PDQ 950012 is a DQ has been made, but there remains a question of a violation of requirements. The assertion that the flow totalizer has never been calibrated separately from the flow rate indicator is a fact. The claim that this is a violation of any requirement is in question, and, because of PDQ 95-0012, it is a question which can only be resolved by management decision. The PDQ raises two questions which are key in determining the potential impact of this PDQ:

1). Is there a requirement to calibrate the totalizer separately from the flow rate instrument?

2). Did the manufacturer intend for the totalizer to be calibrated separately from the flow rate indicator?

The answer to the first question can be found through research into the origination of the requirement as it exists today. The current requirement exists in the Offsite Dose Calculation Manual (ODCM), and was previously located in the Technical Specifications in identical form. The requirement is listed as a single requirement for the "Waste Water Flow Rate and Totalizer". It is a matter of interpretation as to whether this requirement reflects a single instrument, or 2 separate instruments, with a requirement for separate calibrations, channel checks, etc for each of the 2 instruments. The interpretation of the requirement must be based upon the intentions of the drafters of the requirement. The best indication of the intentions can be found in Proposed Amendment 155 to the Technical Specifications, which was approved by the NRC and issued as Amendment 98 to the Technical Specifications. This amendment created the requirement in its current form. The proposed amendment submitted to the NRC contained a discussion which detailed the change. This discussion included the statement: "Clarification (of the technical specification) is made to indicate that a totalizer is used to measure total flow downstream of the dilution flow." Comment in parentheses added for clarity. In light of this statement, it is reasonable to assume that the totalizer function of the instrument was not "forgotten", but, rather, was the unique function of the instrument which was addressed for clarification.

This new requirement (which is the current requirement) became effective when Amendment 98 to the Technical Specifications was issued on 3/17/88 (first submitted to the NRC as PA-155 on 6/30/87). During the same time period, SP.482, Refueling Interval Plant Waste Water Flow Loop 95108 Calibration, was generated (rev. 0 effective 12/23/87). Consider that the emphasis of the Technical Specification change in Amendment 98 was directed towards the totalizer function, and also consider that the calibration SP for the instrument was issued at virtually the same time. With those two considerations in mind, it does not seem reasonable to presume that the requirement to calibrate the totalizer function was ignored or forgotten, but rather that it was not considered to be a separate part of the requirement.

The second question is best addressed by review of the vendor manual provided with the instrument, and input from the manufacturer. It should be kept in mind that the question is not one of ability to calibrate the instrument (a separate issue), but the need to calibrate the instrument. The "pre-starting" procedure of the manual includes detailed descriptions of how to check and adjust (in other words, calibrate) the portion of the instrument which indicates flow rate, but there is no corresponding description concerning the totalizer portion. In fact, the only description for the totalizer which can be found states: "Make no adjustments to totalizer other than to check security of electrical connectors."

The attached telecon form documents a discussion with a technical representative of a BIF instrument distributor. The professional, technical opinion of the individual contacted was that the totalizer was an integral part of the instrument, and could not be calibrated separately from the flow rate portion of the instrument.

The technical manual and input from a technical representative both indicate that calibration of the totalizer separately from the flow rate indicator is not intended by the manufacturer.

In order for a violation of a requirement to have occurred, the answers to both previously posed questions must be "yes". It is difficult to determine all factors precisely, but best evidence seems to indicate that the answer to at least one of the questions must be "no", and that therefore, no violation occurred.

CTS 51766 requires a disposition by RP/Chem and Tech Services. The CTS assigns the Cause to Tech Services, and the Extent to RP/Chem. As a result of the discussion above, there are no Preventive or Corrective Actions to be taken by RP/Chem, and these aspects of the disposition will not be addressed by RP/Chem.

EXTENT OF DQ 95-0012

There has been no violation of the former Technical Specification or current ODCM Technical Requirement for the Waste Water Flow Rate and Totalizer. Also, there is no evidence to suggest that the accuracy of the instrument (presumed to be ±10% for dose calculations) is in question. Therefore, reconsideration of any liquid effluent calculation performed in the past is not warranted.

The operability of the totalizer portion of the instrument is checked daily (Monday through Friday) by observing and recording differences between the current and previous totalizer readings. This check, which is administratively controlled by RP/Chem, is similar to the Instrument Channel Check Surveillance (part of SP.2, performed daily) required to be performed on the instrument, which simply checks for flow indication. Although it is possible that only the totalizer portion of the instrument fails, leaving the flow rate portion in perfect working order, this scenario is unlikely. The totalizer portion of the instrument is relatively simple compared to the rest of the instrument. The likelihood of a failure affecting only the totalizer is much less than a failure which incapacitates the entire instrument. This principle forms the basis of the current requirements, and is backed up by an operational history of the instrument dating back to plant construction. In any case, a failure specific to the totalizer would still leave the flow rate indicator functional, which records a time-history of the flow rate. The flow rate time-history could be easily integrated to determine the total flow during any given time period. In summation, the totalizer operability is checked daily, chances of a totalizer-only failure are small, and the impact of such a failure is nil.

Additional formalization of the totalizer operability checks is not recommended, and is not necessary. The preceding paragraph is a discussion about totalizer function, and is not a commitment to check the totalizer operability daily, or any other commitment.

This completes the RP/Chem actions required by this CTS item.

cc: RIC 2A.750

TELECON WITH:

Roger Peterson of the Stuart Peterson Co., Vacaville, CA.
(707) 447-0185

Who Initiated Call	Who Was Contacted	Date
Einar T. Ronningen	Roger Peterson	3/8/95

REASON FOR CALL: PDQ 95-0012, seeking information about the Waste Water Flow Rate and Totalizer.

RESOLUTION REACHED: I spoke to Mr. Roger Peterson of the Stuart Peterson Co. which sells and services BIF instruments. Mr. Peterson is a former employee of the BIF Instrument Company, an affiliate of General Signal Corporation. I asked if calibration of the totalizer should occur separately from the flow rate portion of the instrument. He stated that there was only a single calibration for the instrument, involving adjustment to the flow rate device. He went on to indicate that performing this calibration was a calibration of the entire instrument, including the totalizer, and there is not a separate calibration involving just the totalizer function of the instrument.

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: Dennis Gardiner

DATE: April 4, 1995
RPC 95-065

FROM: Einar T. Ronningen ETR

SUBJECT: DQ 95-0012, REV. 1

The problem statement in this PDQ claims that there have been two violations have occurred regarding the totalizer portion of FI-95108. Revision 0 of this PDQ was written in an attempt to prompt a report to the NRC. Actually, the problem statement of Rev. 0 was written in an attempt to show that this was such a severe violation that it should be interpreted to be included in the 4-hour reportable section of 10 CFR 50.72. The fact that a statement of violations which had occurred was included, and the way the author made claims in Rev. 0 in an attempt to prompt a 4-hour report to the NRC, combined with the fact that, even when presented with clear proof to the contrary, the author of the PDQ still insists that a violation has occurred, indicates clearly that the author has a hidden agenda. Management should attempt to discover this hidden agenda and deal with it with the individual, instead of wasting the time of many others in this organization who have had to spend valuable time researching what is clearly not a problem. There are, in fact, no violations which have occurred, as will be shown below. PDQ 95-012 should have been voided at step 6.2.2.2 of RSAP-1308.

FI-95108 IS A SINGLE INSTRUMENT.

The Waste Water Flow Rate and Totalizer is one, single, integrated instrument. Treatment of the instrument in any other way is technically incorrect, and it will be treated as a single instrument throughout this discussion, and will be referred to as "the instrument".

3 Key factors proving that a violation of the ODCM has not occurred:

1). THE INSTRUMENT PRODUCES ONLY ONE SIGNAL FROM THE MEASUREMENT DEVICE.

The instrument takes only a single measurement from the flow stream. This measurement produces only ONE signal, which is split and provides two indications. It has been stated before, and will repeated here, and will be stated in the future as many times as it takes to get the point across: the instrument was not manufactured to provide for separate

calibrations for the flow rate and totalizer portions of the instrument. Details of the calibration have been stated in two previous documents (RPC 95-058 and the disposition of this DQ) and no further discussion is warranted.

2). TOTALIZER NOT CALIBRATABLE ACCORDING TO ODCM DEFINITION.

As stated in memo MNTS 95-021, the totalizer portion of the instrument has not been calibrated according to the ODCM definition (see MNTS 95-021 for the exact definition). To paraphrase the definition: "An instrument channel calibration is a test, and adjustment, to establish the accuracy of the instrument." It has been shown beyond a shadow of a doubt that the totalizer portion of the instrument is not adjustable, therefore the instrument cannot be calibrated according to the ODCM definition.

The first part of the verbatim definition from the ODCM: "An instrument channel is a test, and adjustment (if necessary), to establish....." (emphasis added). IMPORTANT: the phrase "if necessary" included in the definition should not be interpreted to mean "if the ability for adjustment exists". This statement is included so that an instrument does not have to be adjusted during the calibration process, if it is indicating correctly. The ODCM definition of channel calibration implies that the capability for adjustment of an instrument is an integral part of the calibration process, therefore, a separate calibration of the totalizer, which cannot be adjusted, is impossible according to the ODCM definition.

3). ODCM DOES NOT CONTAIN SEPARATE REQUIREMENTS FOR THE FLOW RATE AND TOTALIZER.

Attachment 14 to the ODCM lists the surveillance requirements for the liquid effluent instruments. Similarly, Attachment 17 lists the surveillance requirements for the gaseous effluent instruments. Unlike the instruments listed in Attachment 14, which are instruments which require, and are only capable of, a single calibration for the entire instrument, the instruments listed in Attachment 17 have components which are independently calibrated (and independently calibratable). Comparison of the two attachments should make it clear that each instrument, and components of each instrument, that have separate, independent surveillance requirements are listed separately. The title of each of the instruments does not dictate the surveillance requirements, nor should interpretation of the title of an instrument be used to determine the surveillance requirements. EACH REQUIREMENT IS CLEARLY LISTED IN THE ODCM AS A ONE-LINE ENTRY. ANY OTHER INTERPRETATION IS INCORRECT.

It should be clear by now that there has been no violation of the ODCM surveillance requirements. Two other issues were addressed in MNTS 95-021, and although they are not part of the information important for DQ 95-012, they are addressed below in accordance with MSRC request.

Item 2) in MNTS 95-021 indicates that a review of historical chart recordings is necessary since no calibration has been performed. All required calibrations have been performed. No additional calibration has been, or is, required to be performed, and review of historical data is not warranted. Further discussion in MNTS 95-021 states that the charts have totalizer and flow rate recordings. This statement is inconsistent with the author's previous treatment of this instrument as containing two separate components. In the manner discussed above, i.e., that the title of the instrument is the "Waste Water Flow Rate and Totalizer", then yes, the chart does contain recordings of a "flow rate and totalizer" indication. However, the author uses the terms "flow rate" and "totalizer" as if they are separate instruments throughout the memo, indeed as the basis for the PDQ. The charts which are produced by the instrument record only the instantaneous flow rate. When the author of MNTS 95-021 states that "the charts have totalizer and flow rate recordings", it seems as though the author assumes that the charts contain recordings of the two separate indications of this instrument, and this is clearly not the case. The total flow could be determined by integrating the curve of the flow rate on the chart, but this would be tedious, time consuming, and the calculation itself would introduce enough inaccuracies to make the comparison of past totalizer and flow rate indications impractical and meaningless.

Item 2) and Item 3) address the accuracy of the totalizer portion of the instrument. It is difficult to address these items directly, since they are full of false assumptions and errors. They will be addressed as best as possible and a discussion of the instrument and its accuracy will also be presented.

ACCURACY OF THE INSTRUMENT

The accuracy of this instrument is reported to the NRC in the Semiannual Radioactive Effluent Release Report (SRERR) (soon to be changed to an annual report). The governing document for this report is Reg 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. Part C., Regulatory Position, subpart 11.a., Errors In Measurement, is quoted here:

"An estimate should be made of the error associated with measurement of radioactive materials in effluents and solid wastes. ...

The total or maximum error associated with the effluent measurement will include the cumulative errors resulting from the total operation of sampling and measurement. Because it may be very difficult to assign error terms for

each parameter affecting the final measurement, detailed statistical evaluations of error are not suggested. The objective should be to obtain an overall estimate of the error associated with measurements of radioactive materials released in liquid and gaseous effluents and solid waste."

It should be emphasized here that the reported accuracy is an estimate. This is another reason why review of historical data is not warranted. What if the accuracy of the instrument was determined to be different than that claimed for a given report? What actions would be taken? The answer is that there would be no actions. There are no limits associated with reporting the volume of water released, or the error associated with it. On the other hand, the totalizer volume is used directly in dose calculations, but there is no accuracy claimed for the reported dose. As long as dose calculations are being discussed, consider the sheer number of assumptions and the potential errors which go into a liquid dose calculation: irrigation durations; transportation times; amounts of meat, fish, and vegetation consumed; percent of forage consumed by meat and milk animals that is irrigated, etc. ad infinitum. These examples represent only a few of the vast numbers of assumptions which are used go in dose calculations. The point is that even if the totalizer indication was off by 10.5 % or 11 % instead of the claimed 10 %, the effect on dose calculations is relatively small. This is not to be taken that the instrument's reported accuracy is an offhand "guess" or stab in the dark, but is soundly based upon the actual calibration requirements of the instrument. This is merely presented as a discussion on the relative importance (or lack thereof) of the reported accuracy of the instrument.

MNTS 95-021 states something about "System Accuracy" and that some components in some "system" add up to be greater than the reported accuracy estimate of ±10 %. The estimated ±10 % error is reported for the volume of dilution water used during a reporting period (each calendar quarter is considered a reporting period). This volume is the totalizer reading, and nothing but the totalizer reading. There is no "system" which provides additional inaccuracies.

It has clearly been shown that, for at least 3 reasons, the totalizer is an integral part of FI-95108, and has no separate calibration requirements. Because of this, no violation of ODCM requirements has occurred. Additionally, the accuracy of the instrument is not in question, precisely because all calibration requirements have been met. The disposition to DQ 95-0012 should remain unchanged.

cc: RIC 2A.750

POTENTIAL DEVIATION FROM QUALITY FORM

PDQ# 95-0012
REV# Ø

PROBLEM IDENTIFICATION
ORIGINATOR

1. DATE OF OCCURRENCE: / / TIME OF OCCURRENCE: ____ AM PM
2. DATE OF IDENTIFICATION: 2/9/95 TIME OF IDENTIFICATION: 10:00 AM PM
3. TIME SS NOTIFIED: 4:00 AM PM 4. DEADLINE ASSIGNED BY SS: 5:00 AM PM
5. SS NAME: W Holton
6. SYSTEM: CDS 7. EQUIPMENT ID: FQI-95108
8. EQUIPMENT NAME: Wastewater Flow Totalizer 9. QUALITY CLASS: 2
10. PROBLEM DESCRIPTION:
See attached cont. Sheet.

- REVISED -

CONCURRENCE	SIGNATURE	DATE
QE SUPERVISOR		

11. ASSOCIATED SCP, WR OR OTHER DOCUMENTS: SP2, SP482, SP524
12. AFFECTED DRAWINGS: N/A 13. P.O./CONTRACT: N/A
14. ORIGINATOR NAME: Jim Saum EXT: 4987 MAILSTOP: 231
ORIGINATOR SIGNATURE: J Saum DEPT: TS DATE: 2/13/95
15. EQUIPMENT OPERATES IN PRESENT CONFIGURATION (FOR CONFIGURATION DISCREPANCIES): ☐Y ☐N NA
SUPERVISOR NAME: JIM FIELD EXT: 4038 MAILSTOP: 231
SUPERVISOR SIGNATURE: J J Field DATE: 2/13/95

OPERATIONS REVIEW

16. POTENTIALLY REPORTABLE CONDITION: ☐Y ☒N PURSUANT TO: ____
17. TECH SPEC VIOLATION: ☐Y ☒N OPERABLE: ☒Y ☐N ☐NA CLEARANCE TAG REQ'D ☐Y ☒N
JUSTIFY IF NO LER REQUIRED: Not reportable per EAP 064

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18. SS NAME: W Holton
SS SIGNATURE: W Holton DATE: 2/13/95 TIME: 1700 AM PM

CONTINUATION SHEET
PDQ 95-0012 Rev 0

10. PROBLEM DESCRIPTION:

The ODCM Surveillance Requirements stated in CAP-002, Attachment 14, for the Waste Water Flow Totalizer (FQI-95108) have never been complied with. Previously, this requirement was stated in Tech. Spec., Table 4.19. This Tech. Spec. requirement was also never met.

The totalizer which is a component of the Waste Water Flow Rate Device was never calibrated, channel checked, or channel tested. It was always assumed to be Operable. Only the Flow Rate instrumentation was ever surveilled (ref. SP.2, SP.524, SP.482)

The data taken from totalizer instrument FQI-95108 has been used for the ODCM Appendix I dose calculations and in assessing our waste water quality per our National Pollutant Discharge Elimination System (NPDES) permit.

There has been the possibility for a significant error associated with this instrument between actual total liquid flow discharged from the plant and that which has been indicated or derived from the totalizer FQI-95108. **This error could have resulted in an underestimation the dose received to the public and the amount of pollution discharged to the public.** An unofficial calibration check recently performed by a plant engineer and technician has revealed a -8.5% error between the totalizer reading and the flow rate readings on the recorder chart paper (i.e., conservative: the totalizer was indicating 8.5% less than what the recorder total yields thereby underestimating the amount of dilution water for appendix I dose calcs). However, in the past there could have been times when the totalizer was overestimating the amount of dilution flow.

REQUIREMENTS:

1) The ODCM, step 6.14.1, surveillance requirement item 2, states, " Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated Operable by performance of the INSTRUMENT CHANNEL CHECK, SOURCE CHECK, INSTRUMENT CHANNEL CALIBRATION AND CHANNEL TEST at the frequencies shown in Attachment 14.

   Attachment 14, Item 2, requires a Daily Channel Check, 18 mo. Channel Calibration, and Quarterly Channel Test for the Waste Water Flow Rate and Totalizer.

2) NPDES Permit CA0004758, Standard Provisions and Reporting Requirements for Waste Discharge Requirements; section C "Provisions for Monitoring", paragraph 6 states, "All monitoring and analysis instruments and devices used by the

Discharger to fulfill the prescribed monitoring program shall be maintained and calibrated as necessary, at least yearly, to ensure their continued accuracy."

VIOLATIONS:

1) The totalizer FQI-95108 has never been surveilled per the above ODCM requirement or the previous Tech Spec. Table 4.19 requirement.

2) The totalizer FQI-95108 which has been used for monitoring pollutants has never been maintained or calibrated to ensure its continued accuracy per the NPDES provisions for monitoring.

SACRAMENTO MUNICIPAL UTILITY DISTRICT

Surveillance Report

Surveillant:	Michael L. Braun	**Report No.:** 97-S-034
Surveilled Dept.:	Rad Prot/Chemistry Incremental Decom	**Functional Code:** NA
Surveillance Period:	June 23 - 24, 1997	**Tech. Spec. No.:** D6.11, D6.8.1m
		10CFR50 App. B Criteria: VII

Surveillance Objectives:

1. Verify implementation of the Incremental Decommissioning Action Plan (IDAP) Programs for Radiological, Radwaste, and Process Control Programs as described in paragraph "A" below.

A. Subject, activity, or areas surveyed:

1. Follow up on the two open issues from the decommissioning meeting held on June 4, 1997:

   a) entry into the decommissioning area by persons not associated with the actual dismantlement, and

   b) RP techs using colored spray paint to mark and identify dismantled items.

B. Surveillance Results

1. Dennis Gardiner and Wayne Hawley held a decommissioning meeting on June 4, 1997. There were two unresolved issues from that meeting. The first was the sporadic entries into the decommissioning area by individuals who were not associated with the actual dismantlement. Most of these entries were made by persons performing SOARs or QA surveillances.

2. I toured the perimeter of first floor of the Turbine Building and found that at each entrance a red sign was posted stating "Incremental Decommissioning In Progress. Authorized Personnel Only. Notify Dennis Gardiner or Buck Watson For Other Than Authorized Personnel." It was clear from this sign that access to the area was limited to those individuals who had first contacted Dennis Gardiner or Buck Watson.

3. At the next morning meeting on June 5, 1997, Dennis Gardiner made an announcement that access to the decommissioning area must be limited. Anyone not associated with the actual dismantlement must contact Dennis or Buck prior to entry. Dennis asked that this announcement be made to each plant worker.

4. The next Watts Happening, dated June 9, 1997, stated on the front page: "**SAFETY**: There are often significant hazards in the Turbine Building associated with Incremental Decommissioning and the Asbestos Remediation Project. No one should enter any of the barricaded areas without authorization of the work site supervisor. You are not authorized to enter a barricaded area because you are doing a SOAR, a Surveillance, a safety audit, etc. The work site supervisor needs to you are entering the barricaded area. Failure to follow these directions could result in a serious injury or death."

5. I spoke to Dennis and Buck about a week after these announcements had been made. They stated that there has been a significant drop in the number of individuals into the decommissioning area. They have been writing SOARs in the area themselves and are willing to accommodate individuals who have safety concerns and wish to enter the area for a SOAR.

6. We also discussed the use of colored spray by the RP techs. The crew found that this was a beneficial practice and wished to continue it. I asked whether there was a need to designate the meaning of the paint in a writing such as the RWP. Dennis and Buck responded that the new access policy has limited entry into the area to only those individuals who are either knowledgeable of the meaning of the paint or are being escorted and have the meaning explained to them. It does not appear that the meaning of the paint needs to be put in writing because the work crew has not shown any confusion over it. The only concern for confusion was with respect to other individuals who were occasionally entering the area for SOARs or QA audits and who didn't understand. Now that the access policy is being enforced there is no longer the concern of uninformed individuals coming into the area. Thus, no written policy is needed at this time.

7. I discussed with Dennis and Buck the need for occasional entries by QA to perform surveillances. Some of these entries must be unannounced so that impromptu checks can be made of the crew's compliance with safety and RWP requirements. We agreed that some window of time must be allowed on occasions for QA surveillances of this nature.

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8. <u>CONCLUSION:</u>

The red signs on the entrances to the decommissioning area make it clear that either Dennis Gardiner or Buck Watson must be contacted prior to entry. Enforcement of this policy is necessary for the individual's safety and to minimize distractions to the

work crew. The recent announcements at the morning meeting and in the Watts Happening have resulted in a significant decrease in individuals entering the area. Occasionally a window of time must be afforded for QA personnel to perform impromptu surveillances with respect to safety and RWP compliance.

To continue compliance with this access policy there must be periodic checks made of the area to ensure that each entrance has the same set of signs and that the barricade tags are legible and are hung along the entirety of the rope.

9. Personnel Contacted: Dennis Gardiner
Buck Watson

Michael L. Braun 6/26/97 — Surveillant/Date

Willy Kogel 6/26/97 — Quality Supervisor/Date

Distribution:

RIC
S. Redeker
J. Delezenski
D. Gardiner
J. Field
T. Tucker
G. Roberts
W. Wilson

REVISION SUMMARY:

11→

1. Include reference to 10 CFR 72.75 reportability requirements.

2. Remove reference to non-existent procedure step 6.1.1.2.

3. Editorially update position titles and add Section 8, Attachments.

←

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THIS PROCEDURE / MANUAL IS MAINTAINED BY DOCUMENT CONTROL - PROCEDURE ... REFLECTS THE LATEST REVISION.
ASSIGNED TO MANUAL # 46

3.0 REFERENCES AND COMMITMENT DOCUMENTS

3.1 References

3.1.1 Rancho Seco Quality Manual, Sections XV and XVI

3.1.2 RSAP-0306, Data Control for Master Equipment List

3.1.3 RSAP-1310, Deviation from Quality

3.1.4 RSAP-0311, Set Point Change Control

3.1.5 RSAP-0500, Rancho Seco Procedure Control

3.1.6 RSAP-0601, Nuclear Records Management

3.1.7 RSAP-0803, Work Request

3.1.8 RSAP-0808, QC Inspection

3.1.9 RSAP-1306, Audits and Surveillances

3.1.10 OAP-0064, Reporting/Notification

3.1.11 RSAP-0903, External Plant Reports

3.1.12 RSAP-0912, 10 CFR 21 Reporting of Nuclear Plant Defects or Noncompliances

3.1.13 SDP 501-1, Accident Notification, Investigation and Reporting

3.1.14 RSAP-1804, Safe Clearance Procedure

3.1.15 RSAP-0260, Commitment Tracking

3.2 Commitment Documents

3.2.1 NRC Inspection Report 86-21

3.2.2 LER 85-12

3.2.3 Deleted - does not apply in PDM.

3.2.4 CCTS Item No. 890418003

3.2.5 CCTS Item No. 890420001

5.2.2 Perform actions assigned by CMRG to resolve the condition and initiate applicable process documents (Work Request, procedure changes, etc.) or return to CMRG with a justification for continued processing as a DQ.

5.4 PDQ Coordinator

5.4.1 Administratively control, process, and track PDQs and DQs using Commitment Tracking System (CTS).

5.4.2 Present PDQs to CMRG for screening.

5.4.3 Advise CMRG on procedural requirements and related PDQs.

5.5 Commitment Management Review Group (CMRG)

5.5.1 Administers the PDQ program.

5.5.2 Screens and assigns PDQs to departments for action.

5.5.3 Resolves disputes about PDQs.

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6.0 PROCEDURE

NOTE

This procedure addresses initiation, CMRG screening, and processing of PDQs. Instructions for DQs are in RSAP-1310.

6.1 General

6.1.1 Use black ball point pen; make corrections by lining through, initialing and dating entry.

6.1.2 Use continuation sheet for additional space, and number entries to correspond to blocks on form.

6.1.3 Attach additional documentation (8-1/2" x 11"). Label using an alphabetic designator and page numbers.

6.1.4 Once a PDQ is written, work may proceed on hardware items if the work is not related to the nonconforming condition.

NOTE

See Attachment 4 for detailed instructions on filling out the PDQ form.

6.3 Shift Supervisor Action

6.3.1 Take any necessary immediate corrective actions upon notification of the problem.

6.3.2 Resolve unclear or incorrect PDQs with the Originator or his Supervisor.

6.3.3 Perform Reportability and Operability Review.

6.3.3.1 Use guidelines in OAP-0064 to determine whether the condition is potentially reportable under 10 CFR 20, 10 CFR 50.9(b), 10 CFR 50.72, 10 CFR 50.73, 10 CFR 72.75, 10 CFR 73.71, 10 CFR 100, or 10 CFR 140. [Commitments 3.2.4, 3.2.5]

6.3.3.2 If reportable, fill out Notification and Reportability Worksheet; attach to PDQ.

6.3.3.3 If NRC telephone notification is made, complete the NRC Telephone Notification form; attach to PDQ.

6.4 PDQ Coordinator Action

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6.4.1 Newly Initiated PDQs

6.4.1.1 Check the PDQ log daily, pick up PDQs from the Control Room, and enter pertinent data into the Commitment Tracking System (CTS) for CMRG screening.

6.4.1.2 If PDQ is determined potentially reportable, send copy of PDQ, Notification and Reportability Worksheet, and NRC Telephone Notification forms to Licensing to process in accordance with RSAP-0903.

6.4.1.3 If the PDQ involves a violation of the plant Technical Specifications (the PDTS), provide a copy of the PDQ to the PRC Coordinator for PRC review.

6.4.2 PDQs Screened by CMRG

6.4.2.1 Enter pertinent data into CTS and issue a "Working Copy" to the responsible department for action.

6.6.1 Perform actions assigned by CMRG, initiate appropriate documents, and forward completed documentation and closure form to PDQ Coordinator.

> NOTE
>
> The Responsible Department Supervisor assures that actions taken resolve the problem, and that documentation is appropriate and complete.

6.7 Revising a PDQ

> NOTE
>
> Do NOT reopen a closed PDQ. Write a new one and reference the closed PDQ.

6.7.1 Identify revisions with a sequential revision number and revision bar in the right margin.

6.7.2 Forward revised PDQ to PDQ Coordinator, who will present the revision and original to CMRG for review.

6.8 Cancelling a PDQ

6.8.1 The Originator, the Supervisor who signed the PDQ, or the Shift Supervisor may cancel a PDQ before CMRG screens it.

6.8.2 The individual cancelling the PDQ shall:

(1) Notify the originator (if not the same).

(2) Notify the PDQ Coordinator, and forward documents completed to date.

6.8.3 The PDQ Coordinator shall cancel the PDQ in the Commitment Tracking System.

11-- 6.8.4 CMRG may cancel PDQs.

EXAMPLES OF CONDITIONS REQUIRING PDQs

NOTE

THESE EXAMPLES are presented to assure PDQs are initiated when required. This list is NOT meant to be all inclusive or restrain an individual from writing a PDQ. "When in doubt, write it out."

- Material plant hazard which results in a potentially unsafe condition.
- Abnormal or unexpected wear
- Bypassing QC/ANII Hold Points
- Conditional release of nonconforming items
- Deficiencies found in design documents for installed items
- Discrepancies between as built and design documents
- Indeterminate conditions
- Items in the warehouse found to be nonconforming
- Items installed without required documentation
- Manufacturer defects or physical defects in material, components, or systems
- Potentially reportable events or conditions (NRC and State)
- Procedure or training violations
- Repetitive failures or adverse trends
- Technical Specification violations

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EXAMPLES OF CONDITIONS THAT DO NOT REQUIRE PDQs

NOTE

The procedures listed provide an alternate means to resolve a problem.

- Conditions found during the implementation of WR that can be corrected within the scope of the WR. (Unplanned, unexpected, un-analyzed events or conditions must be documented on PDQs)
- Degradation of plant equipment which is expected or is the result of normal wear. (Handle per RSAP-0803)
- Past work that does not meet current requirements but can be made to conform to current requirements by rework or replacement. (Handle per RSAP-0803)
- Violations of purely administrative procedures like Daily Time Reporting, Information Service Request, etc. (i.e., procedures that have no impact on plant systems or equipment).
- Plant/Organizational Betterment/Preliminary Change Descriptions (Handle per RSAP-0260)
- Discrepancy between as-built and MEL. (Handle per RSAP-0306)
- Set point change. (Handle per RSAP-0311)
- Procedure changes/Procedure discrepancies. (Handle per RSAP-0500)
- Entry into Technical Specification LCO.
- Rancho Seco Safety Manual procedure violations. (Handle in accordance with District Safety Manual procedure 8-03).

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POTENTIAL DEVIATION FROM QUALITY FORM AND COMPLETION INSTRUCTIONS (Continued)

POTENTIAL DEVIATION FROM QUALITY FORM

PAGE ___ OF ___

CONTINUATION SHEET	PDQ # _____ REV # _____
BLOCK NO.	CONTINUATION

TYPICAL

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ADM-29 REV 10 (RSAP-1308)

POTENTIAL DEVIATION FROM QUALITY FORM AND COMPLETION INSTRUCTIONS (Continued)

BLOCK NUMBER	COMPLETED BY	INSTRUCTIONS
********** PROBLEM IDENTIFICATION SECTION **********		
12	Originator	List affected drawings. If drawing are not affected, then enter "N/A".
13	Originator	List affected P.O./Contract Numbers. If P.O. numbers are not affected, then enter "N/A".
14	Originator	Print Name and provide required information. Enter date that this form was completed.
15	Originator's Supervisor	For configuration discrepancies indicate if the equipment operates under present configuration. Print Name and provide the required information. Enter the date that this form was signed.
********** OPERATIONS REVIEW SECTION **********		
NOTE:	Originator or PDQ Coord.	Enter the PDQ Number from the PDQ Log
16	Shift Supv	If the problem identified is a Potentially Reportable Condition in accordance with OAP-0064, then check the "Y" box, otherwise check the "N" box. If the "N" box is checked then provide justification for this determination.
17	Shift Supv	Indicate if the condition is a Technical Specification violation, Operable, Clearance Tag, and LER not required justification.
18	Shift Supv	Print name, sign and provide required information.

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SCOPE OF REVISION:

1. Add Clarification for the fixed contamination limit
2. Reduced background limit to 100cpm.
3. Added desirable conditions for free-releasing of material:

1 PURPOSE

1.1 Define the requirements for the removal of non-contaminated AND radioactively contaminated tools and equipment from controlled areas of the plant.

1.2 This procedure does not apply to the removal of other items such as greases, lubricants, etc., which is described in RP.305.09.

1.3 This procedure also includes the requirements for monitoring tools, equipment and other items for Decommissioning activities.

2 REFERENCES/COMMITMENT DOCUMENTS

2.1 References

2.1.1 NRC IE Circular 81-07: Control of Radioactive Contaminated Material

2.1.2 RP.305, Radiation Protection Plan

2.1.3 RP.305.04, Radiation Work Permits

2.1.4 RP.305.07, Area Definitions, Posting, and Requirements

2.1.5 RP.305.09, Contamination Limits and Control for Plant Surfaces

2.1.6 RP.305.09B, Personnel Contamination Monitoring

2.1.7 RP.305.09C, Decontamination Procedures

2.1.8 RP.305.09E, Hot Particle Controls

2.1.9 RP.305.22, Departmental Training and Qualifications.

2.1.10 RP.309.II.09, Segregation and Release of Non Contaminated Waste

2.1.11 IE Information Notice No. 85-92: Surveys of Wastes Before Disposal From Nuclear Reactor Facilities

2.2 Commitments Documents

2.2.1 Notice of Violation, NRC letter of March 3, 1983

3 DEFINITIONS

3.1 FREE RELEASE Releasing an item from all radiological controls after demonstrating it to be below the limits specified in RP.305.09A.

3.2 HOT PARTICLES Highly radioactive, (activity greater than 5000 ccpm at 0.5 inches with an RM-14 equipped with an HP-260 probe or equivalent) discrete, small particles of either irradiated fuel fragments or neutron-activated corrosion and wear products.

3.3 CONTROLLED AREAS A Radiological Controlled Area as defined by RP.305.07 or other areas as determined by Radiation Protection that are established to control Radioactive Materials or radiation.

3.4 RELEASED MATERIAL STORAGE AREA An area or container labeled as such indicating that the contents meet the free release criteria of RP.305.09A.

4 PREREQUISITES

4.1 All personnel performing this work shall read, sign, and comply with the RWP requirements in accordance with RP.305.04.

4.2 RP Techs must be qualified in accordance with RP.305.22 prior to being permitted to perform or oversee the work of others performing Free Release Surveys.

4.3 Personnel performing work (i.e. free releasing material) shall review applicable RP Incremental Decommissioning Package Information Sheet (RAD 248).

5 PRECAUTIONS

None

6 PROCEDURE

INDEX

6.1 Contamination Limits

6.1.1 Loose Contamination Limit

6.1.2 Fixed Contamination Limit

6.2 Removal of Items from Contaminated Areas of the Plant.

6.3 Free Release of Items from Controlled Areas of the Plant

6.1 Contamination Limits

Tools and equipment are not Free Releasable if greater than the limits specified below. Surveys are performed by personnel per prerequisite 4.2.

> ***NOTE:***
> When free releasing material, the use of an instrument that has an audible response should also be used. The audible response can be used as an aid in indicating the presence of contamination above the release limit.

6.1.1 Loose Contamination Limit

> ***NOTE:***
> When counting smears using an RM-14 with an HP-260 (or equivalent) to determine loose surface contamination consideration needs to be given to the length of time a smear is counted because of the background count rate. Per RP.311.VI.01, a frisker on slow response reaches 90% deflection in 22 seconds. With a 200 cpm background the Minimum Detectable Count Rate (MDCR) is 109 cpm. For a 150 cpm background the MDCR is 94 cpm and for a background of 100 cpm the MDCR is 70 cpm. Because of this, smear counting with a frisker should be conducted in a background of 100 cpm or less.

6.1.1.1 The Beta Gamma loose surface contamination limit is 1000 dpm/ 100 cm^2. For large surface area (Maslin) smears, the limit is 750 ccpm/ ft^2 Beta Gamma in accordance with RP.305.09.

6.1.1.2 The loose Alpha surface contamination limit is 20 dpm/ 100 cm^2.

> ***NOTE:***
>
> Alpha contamination surveys need only be performed if there is reason to believe that alpha contamination is present or suspected of being present.

6.1.2 Fixed Contamination Limit

The fixed contamination limit is non-detectable fixed Beta Gamma contamination as measured with an RM 14 with an HP 260 probe (or equivalent).

> ***NOTE:***
>
> Instrumentation that can be used to monitor for fixed contamination is listed in RP 311, Radiation Detection Instruments Manual. All of the instruments that can be used to monitor for fixed contamination meet or exceed the minimum sensitivity requirement of 5,000 dpm/100 cm^2 as recommended in NRC I.E. Circular 81-07. If, when surveying material there is an indication of the presence of radioactivity, then the material will be considered contaminated and will <u>not</u> be free released.

6.1.2.1 Move the detector not more than 2 inches per second at a distance of no more than one half inch from the surface being surveyed.

6.1.2.2 When frisking items for release from radiological controls, the background must be ≤100 cpm.

> *NOTE:*
>
> It is desirable to have the following conditions when establishing survey areas for the free releasing of material:
>
> 1. Low background radiation areas, preferably in the 20 cpm to 40 cpm range, if practical.
> 2. Low background noise areas to minimize noise distractions.
> 3. Areas of minimal visual/work activity distractions.

6.2 <u>Removal of Items from Contaminated Areas of the Plant</u>

6.2.1 Remove items from Hot Particle Zones in accordance with RP.305.09E.

6.2.2 Items to be removed from a Contaminated Area must be surveyed by a Radiation Protection Technician prior to removal from the area OR be bagged or wrapped, at the Step-Off-Pad and taken to a Control Point or other designated survey area. (Control Points may be established in various areas of the plant.)

6.2.2.1 The individual responsible for the items found to be contaminated in excess of the limits of 6.1.1, bags or wraps the items.

6.2.2.2 Items known (or suspected) to contain Hot Particles must be wrapped under the supervision of an RP Technician.

6.2.3 (RP Tech) Label the item in accordance with RP.305.07.

6.2.3.1 (RP Tech) Identify and handle material contaminated with Hot Particles in accordance with RP.305.09E.

6.2.3.2 (RP Tech) Survey the outside of the wrapping to ensure that it is less than the limit of 6.1.1.1.

6.2.3.3 All material that is removed from areas with known or suspected Alpha contamination greater than the limit of 6.1.1.2 shall be monitored for Alpha.

6.2.4 Items less than the loose contamination limit, but in excess of the fixed contamination limit do not have to be wrapped, but must be identified with a Radioactive Material Tag, label or tape unless under the direction of a Radiation Protection Technician. These items shall not be removed from the Radiological Controlled Area or other temporary controlled area without permission from RP and their use controlled by an RWP per RP.305.04.

6.2.5 All personnel with tools and/or equipment, under their control, that are contaminated in excess of the limits of section 6.1.1 are responsible for ensuring that they are decontaminated in accordance with RP.305.09C prior to being Free Released.

6.2.5.1 When items require special decontamination, the person or group responsible for the item contacts RP Supervision for assistance.

6.2.6 Tools normally used in Contaminated Areas are maintained in the Auxiliary Building Tool Room, the Hot Machine Shop, or in specific marked storage areas set aside for this purpose.

6.2.6.1 Consider ALARA, (i.e. dose rate and contamination levels of tools versus location and duration of use) prior to using tools from these areas.

6.2.6.2 Tools contaminated with up to 10,000 dpm/ 100 cm^2 loose contamination and < 2 mR/hr (contact) fixed Beta Gamma contamination will be properly labeled, stored in the above specified areas, and reused under RWP control.

6.2.6.3 Items that cannot be decontaminated below 10,000 dpm/ 100 cm^2 loose contamination and/or < 2 mR/hr (detector center < 2 inches) fixed contamination will be bagged, labeled properly, and placed in specified areas established for radioactive material storage.

6.3 Free Release of Items from Radiological Controlled Areas or Other Controlled Areas of the Plant

6.3.1 Free Release Criteria

6.3.1.1 All materials being free released from a controlled area must be demonstrated to be less than the limits of 6.1 by an RP Technician or an individual trained to monitor for contamination that is under the direct supervision of an RP Technician.

6.3.1.2 Small personal items (Security badges, dosimeters) that have successfully been monitored in accordance with RP.305.09B are exempt from additional Free Release monitoring.

6.3.1.3 When surveying large areas or components, additional techniques such as gridding should be used to minimize the possibility of missing areas that are required to be surveyed.

6.3.2 Do not place Contamination and Radiation Release Tags on equipment and/or tools SUSPECTED of being contaminated, AND that by design, cannot be surveyed to demonstrate that internal contamination does not exist in inaccessible areas, unless authorized by an Inaccessible Surface Contamination Evaluation Form (RAD-247).

6.3.2.1 Equipment or tools, which can not be surveyed internally, are not Free Releasable, and are treated as contaminated until demonstrated otherwise. An Inaccessible Surface Contamination Evaluation Form (RAD-247) shall be completed and approved by RP Supervision to document the methods used to monitor and free release any Category 2 material with inaccessible surfaces.

> ***NOTE:***
> Inaccessible Surface Contamination Evaluation Forms (RAD-247) are not required for systems and components not suspected of being contaminated (Category 1 components).

6.3.2.2 In accordance with USNRC IE Circular 81-07, an evaluation may be performed on material, based on the survey results at the openings, to determine if the material is non-contaminated and capable of being Free Released.

6.3.3 Use of Contamination and Radiation Release Tags.

> ***NOTE:***
> One Release Tag may be used for several items in the same container.

6.3.3.1 Tools left at the Radiological Controlled Area exit are surveyed by an RP Tech and are identified by a Contamination and Radiation Release tag (Enclosure 8.1) to indicate that the item(s) have been surveyed. The items are then placed outside the Radiological Controlled Area.

6.3.3.2 When filling out a Release Tag the RP Tech will complete, print name, and sign the tag.

6.3.3.3 When used, Release Tags are removed before the material leaves the restricted area and may be removed as soon as the material is moved from controlled area exit point.

6.3.3.4 Contamination and Radiation Release tags are also used to identify materials that have been surveyed for free release. Per RP.305.08A, items may be marked with an RP Tech's initials or the use of a Release Tag or by placing material in a released material storage bin or area.

6.3.4 Trash being removed from the Radiological Controlled Area for Free Release will be monitored in accordance with RP.309.II.09.

6.3.4.1 Trash that is being accumulated in other controlled areas is normally surveyed prior to leaving that area.

6.3.5 Removal of Contaminated Items from the Radiological Controlled Area or other controlled areas.

6.3.5.1 An item that is above the loose contamination limit of 6.1.1, yet must be removed to or transported through uncontrolled areas of the plant, may be removed provided the item is properly bagged/wrapped OR if the exterior is clean, all openings are sealed, AND is labeled in accordance with RP.305.07 and is controlled by an RWP. The radiological condition of the bagged/wrapped item should be displayed on the outside of the wrapping. (Commitment: Ref. 2.2.1)

6.3.5.2 If work is to be performed on items referenced in 6.3.5.1, the area where the activity is to be performed shall be posted in accordance with RP.305.07 and the work will be performed using an RWP.

6.3.5.3 A RP Tech must supervise the radiation control measures taken to complete the work.

6.4 Notification signs and labels.

6.4.1 Other notification signs and labels such as the label shown as Enclosure 8.5 may be used as tools to communicate information to workers.

6.4.2 To identify material that needs to be surveyed, "Equipment Pending Final Release" signs or tags (Enclosure 8.5) are used to designate equipment or materials that do not require posting per RP.305.07 but have not been surveyed to qualify for free release.

7 RECORDS

The following individual/packaged documents and related correspondence completed as a result of the performance or implementation of this procedure are records. They shall be transmitted to Records Management in accordance with RSAP 0601, Nuclear Records Management.

7.1 Incremental Decommissioning Radiation Monitoring Log (RAD-245)

7.2 Inaccessible Surfaces Contamination Evaluation (RAD-247).

7.3 RP Incremental Decommissioning Package Information Sheet (RAD 248).

8 ENCLOSURES

8.1 Contamination and Radiation Release Tag

8.2 Incremental Decommissioning Radiation Monitoring Log (RAD-245) and instructions

8.3 Inaccessible Surfaces Contamination Evaluation (RAD-247) and instructions.

8.4 RP Incremental Decommission Package Information Sheet (RAD 248).

8.5 Equipment Pending Final Release Notice

INCREMENTAL DECOMMISSIONING RADIATION MONITORING LOG INSTRUCTIONS

1 Equipme[illegible]ms and components removed during incremental decommiss[illegible]ill be monitored for radiation and contamination as determined by RP Superv[illegible]. The results of the survey will be recorded on a incremental decommissioning radiation monitoring log sheet or a survey map similar to enclosure 8.1 of RP.305.08a.

2 Survey types

1.1 Category 0

Category 0 signifies that either no surveys are required or cursory surveys are required, as determined by RP Supervision. This category typically applies to equipment, systems, components, or materials that by their history or location are not considered to have a possibility of contamination.

1.2 Category 1

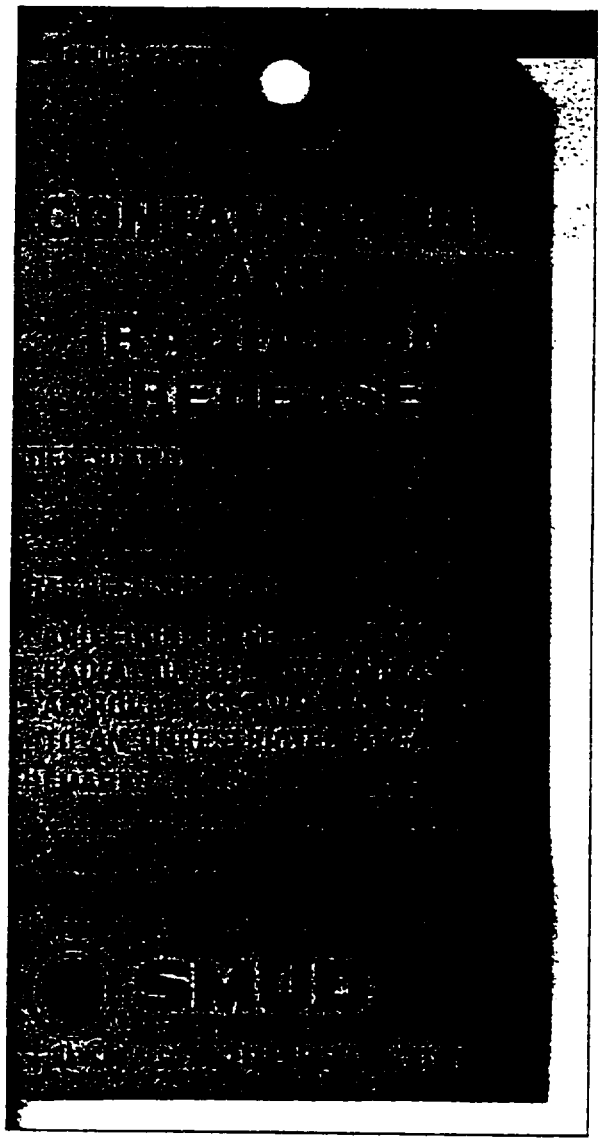
Category 1 surveys consist of external radiation and contamination monitoring including accessible openings. Category 1 surveys are performed on systems not known or suspected of being contaminated.

1.3 Category 2

Category 2 surveys consist of external and internal radiation and contamination monitoring or monitoring that will demonstrate that the external and internal surfaces meet the free release criteria of RP.305.09A Section 6.1. Category 2 surveys are required for systems known or suspected of being contaminated. In evaluating the radioactivity on inaccessible surfaces (e.g., Pipes, drain lines, and duct work), measurements at other appropriate access points may be used for evaluating contamination provided the contamination levels at the accessible locations can be demonstrated to be representative of the potential contamination at the inaccessible surfaces. Otherwise, the material should not be released for unrestricted use.

CONTAMINATION AND RADIATION RELEASE TAG

(Sample)



(Green & black)

Enclosure 8.1

1.4 Category 3

Category 3 surveys consist of a radiation survey on contact with a container or pallet of clean monitored material using an Eberline PRM.7 (or equivalent) meter. Clean monitored material is normally placed in an area or container labeled "released material storage area" until the Category 3 survey is performed. Category 3 surveys should be performed on all aggregate quantities of materials released for unrestricted use following a Category 1 survey. Any survey reading 5 μr/hr above background should be investigated.

Incremental Decommissioning Radiation Monitoring Log

Date: _____ IDT Package No. _____

Item Description	System Code	Size	Quantity	Units	Contamination Levels: Loose ~~SAC~~ Activity	Loose ~~SAC~~ Units[2]	Fixed ~~SAC~~ Activity (ccpm)	Bkg. (cpm)	Inst. Code[2]	Disposition (R, D, W, H or specify)[3]	Initial

Instrument Data

Code[2]	Model #	Serial #	Calib. Due
A			
B			
C			

Surveyor Data

Print Name	Signature	Initial

Remarks

NOTES 1 - "D" equals 100cpm, "C" = ccpm/ft²
2 - Match the code of the instrument used with the appropriate instrument data
3 - "R" unreleased, "D" release to disposal, "W" release to recycle stock, "H" release to HAZ. waste

Reviewed By: _____ Date: _____

RAD-246 (Rev. 3)

Page 1 of 1

INACCESSIBLE SURFACES CONTAMINATION EVALUATION INSTRUCTIONS

1. NRC IE Circular No. 81-07, Control of Radioactively Contaminated Material, states "In evaluating the radioactivity on inaccessible surfaces (e.g., pipes, drain lines, duct work), measurements at other appropriate access points may be used for evaluating contamination provided the contamination levels at the accessible locations can be demonstrated to be representative of the potential contamination at the inaccessible surfaces." RAD-247 is used to document such evaluations.

2. Part 1 is completed by a Chem-Rad Decommissioning Technician (RP Tech.). Accessible locations and the results of radiation and contamination surveys are documented in Part 1.

3. Part II is completed by RP Supervision or someone designated in writing by RP Supervision to be qualified to complete Part II. Only a member of RP Supervision can sign the approval line of Part II.

4. RAD-247 is retained as a nuclear record.

ISCE _____ - _____
YR. NO.

INACCESSIBLE SURFACES CONTAMINATION EVALUATION

PART I

Material to be evaluated: _____

System(s): _____

Describe accessible surface and radiological survey results: _____

Describe inaccessible surfaces: _____

Completed by: _____ Date: _____

PART II

System(s) contamination history: _____

Recommendation:

☐ Handle as radioactive waste

☐ Demonstrate that accessible locations are representative of the potential contamination at inaccessible surfaces using the following methods: _____

Completed by: _____ Date: _____

Approved by: _____ Date: _____

rad-247

TYPICAL

INSTRUCTIONS FOR RP INCREMENTAL DECOMMISSIONING PACKAGE INFORMATION SHEET (RAD-248)

Radiation Protection completed the RAD-248 forms when an Incremental Decommissioning Package is being prepared. RAD-248's may be revised as additional information becomes available during system dismantlement.

All RP personnel assigned to provide radiation protection coverage or radioactive waste management tasks will review and sign the RAD-248 for each package they are working on. RP Supervision will also have any revised RAD-248 read by the affected RP personnel.

RP INCREMENTAL DECOMMISSIONING PACKAGE INFORMATION SHEET

DATE_____ I.D. PKG. NO. _____ Rev#_____

Package Description:

System/Operating Description:

Component Description:

Contamination Present: Yes / No Internal / External

Radiation Survey Requirements:

Category 0 Category I Category II

ISCE Sheet Required: Yes / No

If Yes, ISCE Sheet #(s): _____

Completed by: _____ Approved by: _____

Review Signatures/Date:

_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ _____

☐ ADDITIONAL PAGES ATTACHED

TYPICAL

EQUIPMENT PENDING FINAL RELEASE NOTICE

(SAMPLE)

(YELLOW AND BLACK)

EXHIBIT 9
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POTENTIAL DEVIATION FROM QUALITY FORM

PDQ# 98-0026
REV# ____

PROBLEM IDENTIFICATION
ORIGINATOR

1. DATE OF OCCURRENCE: 4/30/98 TIME OF OCCURRENCE: ≈ 1130 AM PM
2. DATE OF IDENTIFICATION: 4/30/98 TIME OF IDENTIFICATION: ____ AM PM
3. TIME SS NOTIFIED: 0830 AM PM 4. DEADLINE ASSIGNED BY SS: ____ AM PM
5. SS NAME: D. Tipton
6. SYSTEM: NA 7. EQUIPMENT ID: NA
8. EQUIPMENT NAME: NA 9. QUALITY CLASS: ____
10. PROBLEM DESCRIPTION:
metal shipment set of the metal Recycler radiation Detector

EXHIBIT ____
PAGE ____ OF ____ PAGE(S)

11. ASSOCIATED DCP, WR OR OTHER DOCUMENTS: ____
12. AFFECTED DRAWINGS: ____ 13. P.O./CONTRACT: ____
14. ORIGINATOR NAME: W Wilson EXT: 4884 MAILSTOP: N403
ORIGINATOR SIGNATURE: W Wilson DEPT: RP/Chem DATE: 5/4/98
15. EQUIPMENT OPERATES IN PRESENT CONFIGURATION (FOR CONFIGURATION DISCREPANCIES): ☐ Y ☐ N
SUPERVISOR NAME: W Wilson EXT: 4884 MAILSTOP: N403
SUPERVISOR SIGNATURE: W Wilson DATE: 5/4/98

OPERATIONS REVIEW

16. POTENTIALLY REPORTABLE CONDITION: ☐ Y ☒ N PURSUANT TO: ____
17. TECH SPEC VIOLATION: ☐ Y ☒ N OPERABLE: ☐ Y ☐ N ☒ NA CLEARANCE TAG REQ'D ☐ Y ☒ N
JUSTIFY IF NO LER REQUIRED:
Not reportable per OAP-0064

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18. SS NAME: Dennis Tipton
SS SIGNATURE: D Tipton DATE: 5/4/98 TIME: 0931 AM PM

5537A

DEVIATION FROM QUALITY FORM

DQ # 98-0026
REV # 0

PROBLEM DISPOSITION
ASSIGNED DEPARTMENT

19. DISPOSITION:

☐ ACCEPT-AS-IS ☐ REPAIR ☐ REWORK ☐ REPLACE
☐ INTERIM ACCEPT-AS-IS ☐ NOT A NONCONFORMANCE ☒ NON-HARDWARE
☐ DOCUMENT CHANGE

20. PROBLEM ANALYSIS AND RESOLUTION: (PROVIDE CAUSE, EXTENT, REMEDIAL AND PREVENTIVE ACTIONS UNDER SEPARATE HEADINGS)

See Attached

21. DISPOSITION BY:

NAME: Bill Wilson EXT: ___ DEPT: RP\Chem
SIGNATURE: W Wilson 6/8/98 Sal Nicolls for W. Wilson DATE: 5/28/98

FOR ACCEPT-AS-IS OR REPAIR ONLY (NOT REQUIRED FOR NON-HARDWARE)

22. DESIGN OR DRAWING: ☐ Y ☐ N 23. RELATED DCPs OR TRANS. NO. ___

24. CALC No.: ___ 25. TEST No.: ___

26. ASME CODE: ☐ Y ☐ N

ANII

27. ANII/ANI REVIEW: ___ DATE: ___

ASSIGNED DEPARTMENT

28. COMMENTS:

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CMRG

29. TREND CODE: P3

ADM-261 REV. 1 (RSAP-1310)

DQ-980026

DISCUSSION:

On April 30,1998, a shipment of scrap metal that was sent to the Simms Metal recycle facility alarmed the Simms truck radiation monitors. The shipment was driven through the entrance truck monitor causing the monitor to alarm. The truck was then driven through the exit truck monitor which alarmed. The truck was then driven for the second time through the entrance truck monitor which didn't alarm. This truck monitor response actually passed the Simms procedure for accepting the shipment, but to be conservative; Rancho Seco and Simms management had the shipment returned

CAUSE:

Implementation of Regulatory guidance (NRC IE Circular 81-07 & Information Notice 85-92) for radiation surveys on potentially free-releasable material do not meet the sensitivity that the Simm's aggregate quantity truck monitor achieves for detecting extremely low levels of radioactivity.

EXTENT:

This is the only free-released shipment that was returned because it alarmed a truck monitor and the initial monitoring for free-release was found to have conformed to the applicable regulatory standards and Rancho Seco Radiation Protection Program requirements.

One prior shipment alarmed the Simms monitors and was returned to Rancho Seco. This incident was documented under PDQ 97-0082. The shipment was found to have one piece of metal that had not been completely surveyed.

REMEDIAL ACTIONS:

INITIAL ACTIONS:

Plant management halted shipment of Incremental Decommissioning material on April 30, 1998.

Upon return of the shipment to the site, both the truck driver and site personnel performed an aggregate quantity survey of the truck contents with independent microRem/hour meters. No readings above background were found.

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The load of scrap metal was then emptied and site personnel surveyed the truck and empty dumpster with microRem/hour meters. No readings above background were found.

Based on these initial findings, RP concluded that an aggregate quantity of radioactive material at levels near the sensitivity of the Rancho Seco survey instrumentation had most likely alarmed the Simm's truck monitor.

RE-SURVEY:

RP technicians performed a re-survey of the material that had alarmed the Simms truck monitor. The intent of the re-survey was to locate the cause of the alarms. This factor contributed to slower than normal surveys and resulted in the detection of small amounts of fixed contamination.

Because the RP technicians who re-surveyed the material knew that the shipment had alarmed the Simm's monitor, the technicians believed that the material had to be contaminated. Management observations found that in spite of instructions to perform surveys as specified in RP procedures (i.e., 2 inches/ second at one-half inch distance) the technicians conducted slower, deliberate "search and find" surveys. This re-survey effort was done such that if the survey instrument had any needle fluctuation or audible click, the technician held the instrument detector in a stationary position for an extended period. This "non-routine, increased surveying time period" essentially increased the instrument sensitivity to more than the minimum required based on regulatory guidance, thereby allowing very low levels of activity to be detected.

RP conducted the re-survey effort in an outside area that had a background of 20 to 40 cpm. There were 178 pieces of metal in the shipment with a total surface area of 446,400 in^2. Detectable contamination was found on approximately three percent of the total material surface area.

Surface Area (in^2)	ccpm *	Activity (Bq)
36	200	294
77	100	313
5848	70	16690
4321	50	8624
3111	30	3805
124	20	102
Total Area = 13427 (in^2)		**Total Activity = 29828 Bq or 0.81 microcurie**

* ccpm = corrected counts per minute = total cpm – background cpm

The Incremental Decommissioning Team is to process the suspect material by re-surveying, decontaminating, and/or free-releasing the material, as appropriate.

TEST SURVEY:

The majority of the contaminated material had areas with indicated counts from 60 to 80 ccpm. One piece of the material had an indicated count of up to 200 ccpm in a background of 20 to 40 cpm when the detector was held stationary at a single location. This 200 ccpm piece was subsequently "test surveyed" (see below) in a background area similar to the initial free-release survey, resulting in a detected activity less than 100 ccpm.

Selected pieces of the re-surveyed material was placed in an area with a background of 80 to 120 cpm and was surveyed again by several technicians. This test survey consisted of (1) the one piece that had the 200 ccpm indicated activity identified during the re-survey effort, (2) two pieces that had 20 to 80 ccpm indicated activity, and (3) two pieces that had no indication of any detectable activity. The results of this survey indicated that none of the material had areas of activity greater than 100 ccpm when surveyed per RP procedures. Also, the survey results for each piece varied from technician to technician. This finding is expected and is consistent with the Sommers article that is an attachment to IE Circular 81-07.

The re-survey and test survey results show that in a lower background area with a heightened awareness, low levels of activity are much more likely to be detected than under normal, higher background conditions with technicians using survey techniques consistent with regulatory guidance and Rancho Seco procedures.

Another factor to consider is the variable judgement in meter interpretation by technicians. Even when using a consistent monitoring method for surveying material, survey results will vary from technician to technician.

SUPPLEMENTAL INFORMATION:

When the material was initially monitored for free-release using Rancho Seco RP procedures, the material met the criteria for release to an unrestricted area. After the material was returned to the site and monitored at slower scan rates and in lower background areas than the original surveys, technicians detected some low levels of activity.

The initial monitoring for free-release occurred in the NPS Fab Shop. This area is used for cutting metal from the Moisture Separator Reheaters (MSR's) into segments so the material may be packaged for disposal, decontaminated on-site, or surveyed for free-release, as appropriate.

During the investigation, Rancho Seco management noted varying environmental conditions that were encountered during radiation survey work. Management determined the following environmental conditions could impact the quality of radiation survey performance:

a. Sources of noise distractions; such as cutting material with torches, use of overhead cranes, and operation of forklifts.

b. Visual distractions associated with the above referenced noise sources.

c. Background radiation fluctuations.

REGULATORY GUIDANCE:

NRC IE Circular No. 81-07 (IE 81-07) provides guidance for an acceptable survey program for release of material to unrestricted areas. The IE 81-07 attachment written by J. F. Sommers describes the statistical nature of a survey program and the need for a low background to increase the likelihood of identifying areas of contamination. For the program described, the chance of source identification at the 100 ccpm level is less than 100% even with a low background (20-40 cpm) level. For a higher background level, it is less likely that a small area source at 100 ccpm would be detected. Based on the Sommers studies, IE 81-07 concludes the amount of undetected activity would not result in a significant dose. IE 81-07 states:

1) "For potential undetected contamination of discrete items and materials below 5000 dpm/100 cm^2 the potential dose to any individual will be significantly less than 5 mRem/year even if the accumulation of numerous items contaminated at this level is considered."

2) "Taking into consideration the practicality of conducting surface contamination surveys, contamination control limits should not be set below 5000 dpm/100 cm^2 total and 1000 dpm/100 cm^2 removable."

3) "The ability to detect minute, discrete particle depends on the activity level, background, instrument time constant, and survey scan speed."

4) "The contamination monitoring using portable survey instruments or laboratory measurements should be performed with instrumentation and techniques (survey scanning sped, counting times, background radiation levels) necessary to detect 5000/ dpm.100 cm^2 and 1000 dpm/100 cm^2 removable beta/gamma contamination."

Also, the Sommers article states:

> "The largest variables were caused by the physical and psychological conditioning of the surveyors."

RANCHO SECO FIXED CONTAMINATION SURVEY PROGRAM

The Rancho Seco survey program verifies that survey instruments and detectors are sensitive to 5000 dpm/100 cm^2 per IE 81-07. For survey instrumentation, the sensitivity is based on the Minimum Detectable Count Rate (MDCR) calculation found in RP.311.VI.01 for each type of instrument. For Frisker type instruments, the MDCR is based on slow response (22 seconds), 90% deflection of the instrument and the background reading. In a background of 100cpm, the MDCR is 77cpm. For Cesium-137with a HP-210 probe, this MDCR is equivalent to a frisker sensitivity of 770 dpm. The sensitivity of the instruments are verified with the use of an NIST traceable source set using a Cs-137 source with an expected response of 100 ccpm.

CONCLUSION:

In conclusion the material in this shipment was below 5000 dpm/100 cm^2 and passed an acceptable free-release survey based on the conditions that existed at the time of the initial survey.

A general area dose rate survey on the material (microRem meter at ~30 cm) indicated <1 microRem/hour (i.e., not detectable above background). No health and safety hazard exists from this material. Due to the;

(1) large number of pieces in the shipment,

(2) dispersed nature and small fraction of total surface area (~3%) of the very low levels of contamination found on the shipment pieces,

(3) indeterminate potential exposure pathway, and

(4) fact that this material was to be recycled, mixed with other material, and melted down for an eventual unknown future use,

the dose analysis presented in NRC IE Circular 81-07 is applicable and bounding for this shipment. IE Circular 81-07 provides the following, applicable dose analysis:

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$\frac{2 \text{ dpm in}^2}{.785 \text{ in}^2 \; 20.2 \text{ cm}^2} \; 100 = 5355 \text{ dpm}/100 \text{ cm}^2 \times \frac{1}{19} = 5394$

"Based on the studies of residual radioactivity limits for decommissioning (NUREG-0613 and NUREG-0707), it can be concluded that surfaces uniformly contaminated at levels of 5,000 dpm/100cm^2 (beta-gamma activity from nuclear power reactors) would result in potential doses that total less than 5 mrem/yr. Therefore, it can be concluded that for the potentially undetected contamination of discrete items and materials at levels below 5,000 dpm/100 cm^2, the potential dose to any individual will be significantly less than 5 mrem/yr. even if the accumulation of numerous items contaminated at this level is considered."

For comparison, common sources of radiation that members of the public are exposed to are as follows:

Chest X-ray	15-30 mRem per X-ray
Naturally occurring background	300-400 mRem/yr.
Round trip air flight, LA to London	4 mRem/ yr.
Global fallout	4 mRem/ yr.

PREVENTIVE ACTION

1. Revise RP procedures to include the following guidance when establishing survey areas for the free-release of material:

   a) Choose low background radiation areas, preferably in the 20 to 40 cpm range, if practical.

   b) Choose low background noise areas to minimize noise distractions.

   c) Choose areas of minimal visual/work activity distractions.

2 Complete installation of the truck monitor prior to resuming shipment of Incremental Decommissioning material.

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: CTS Coordinator

DATE: March 5, 1998

RPM 98-029

FROM: William Wilson WW

SUBJECT: **DQ 9 -082 DISPOSITION, REV. 2**

PROBLEM DESCRIPTION

Summary

On December 22, 1997, a routine shipment of scrap metal was sent to a metal recycler off site containing radioactive contamination above the limits allowed for free release by Rancho Seco administrative procedures.

Detailed Discussion

About 0800 on 12/22/97 a shipment of scrap metal on a flat bed trailer left site for transport to a scrap metal recycler. An Aggregate Quantity radiation survey (μR/hr) of all the material in the shipment was performed prior to the shipment leaving site. The results of the survey indicated that there were no radiation levels detectable above the background level of 6 μR/hr. Upon arrival at the recycler, the truck was passed through the radiation detector at the site. The detector alarmed, indicating the presence of radioactivity. At this time, District personnel directed that the shipment be returned to Rancho Seco. The shipment returned at about 1130 on 12/22/97.

All of the material in the shipment remained on the trailer during the entire duration that the shipment was off site. Upon return to Rancho Seco, the material in the shipment was observed and surveyed. The material in the shipment consisted of parts of the large auxiliary boiler, including some concrete-like refractory material. This refractory material was tested by gamma spectroscopy and found to contain naturally occurring radioactivity (e.g., radium, actinium). District personnel determined that the refractory material was the most likely cause of the alarm.

During a follow-up survey on 12/23/97, a small section on one piece in the shipment was found to have fixed contamination of plant origin on its surface. The contaminated material in this instance is a portion of a pipe nipple (about 2 square inches of surface area) on an end bell from the large auxiliary boiler. The end bell was placed on the flat bed trailer with the pipe nipple side facing up, and was not in contact with other materials or the trailer during shipment.

Poorly conducted communications are an underlying theme in many of the factors that allowed this incident to occur. First, there was some miscommunication between two technicians that led one technician to mistakenly mark the item as "clean" even though 100% of the accessible surfaces had not been surveyed as required. The first technician performed a preliminary survey only on the end of a pipe protruding from the end bell. When survey activities were

transferred to another technician, this second technician thought that the required survey of 100% of the accessible surfaces had been performed. This second technician then did a spot check of the end bell, and finding no contamination, marked the end bell segment, indicating the item was ready to be free released from the site.

This sequence of miscommunication was compounded by the fact that there were no survey results documented for the various components of the large boiler. The lack of detailed, documented survey results was due to the poor communications between supervision and technicians concerning the required surveys and the desired survey documentation. The technicians believed that only a single line entry into the survey log was to be made for all of the large boiler components, and supervisions expectations were that technicians should have documented the survey results of each auxiliary boiler segment.

CAUSE

The following factors led to the release of the contaminated item.

1. Poor communication transferring responsibility for material between 2 RP technicians. Technician "A" thought that Technician "B" reported the item clean, then Technician "A" spot checked the item and marked it "clean". Technician "B" says that no survey results were communicated.
2. Inadequate procedures regarding identification of material, or storage areas for material, surveyed as "free released". There was no written or verbal instruction that allowed applying free release markings only by the technician who performed the survey. Also, there was inadequate procedural guidance concerning documentation of surveys.
3. No detailed survey documentation was produced. This was caused by confusion over the required survey documentation and poor communications between technicians and supervision. Poor communications and the lack of a questioning attitude contributed to this incident.

EXTENT

A. Extent of the Problem of Free Releasing Contaminated Material

The remainder of the material contained in the shipment that had one segment with one small area of contamination was re-surveyed. No other material from this shipment was found to be contaminated. As of 1/28/98, 100% of other material still on-site, that had previously been surveyed and free released for eventual recycle or disposal off-site, was re-surveyed and found to be acceptable for free release. This previously surveyed, on-site material consisted of about 3000 ft^3 of miscellaneous scrap materials contained in dumpsters; various fans, pumps, valves, and motors; two 3,000 gallon tanks; four 6' × 6' × 6' dehumidifiers; four 4' × 6' control panels; two 15' long by 2.5' diameter lube oil cooler shells, one 15' × 12' × 10' metal shack, and the returned auxiliary boiler shipment and other auxiliary boiler segments not yet shipped. Based

on the re-survey results documented above, high confidence exists that no other contaminated material has been released from the site.

Interviews with the technicians responsible for free releasing material from the plant indicated that each technician normally marks only the materials and items that they have personally surveyed. The technicians could not recall any other instance of marking an item that they had not personally surveyed.

The location of the contamination on the exterior of the end bell suggested that the insulation that had been on the end bell might be contaminated. A search for the insulation began, and the bags containing the insulation from the large boiler end bell were found. They had not yet left site for disposal, even though they were found marked with green paint. The bags of insulation were opened and the material was surveyed, and some fixed contamination on the insulation was found. There were 4 (four) slightly contaminated pieces found, each about 2" X 2" X 3". The activity on the material ranged from 500 to 1000 ccpm at 1/2".

Investigation into the insulation revealed another sequence of events exacerbated by miscommunication. The worker who removed the insulation from the end bell did not follow the standard practice of having the insulation surveyed by a RP Technician as it is removed. This was done without direction from RP supervision or knowledge of the insulation survey requirements.. This situation is unique because the interviews conducted with the personnel involved revealed that this is the only time that insulation was removed from a component without an RP technician present.

The removal and bagging of four pieces of slightly contaminated auxiliary boiler insulation material occurred due to inadequate communications and procedural deficiencies. Standard practice is to remove insulation with RP Techs present so the RP Techs can survey each piece of insulation before it is placed into bags. A worker, without communicating with supervision and RP Techs, removed and bagged the insulation because the worker thought this was part of his assigned tasks. Later an RP Tech did an *Aggregate Quantity* survey of the bags and marked them as free released. The RP Tech did this because of the standard practice associated with removing insulation (i.e., RP Tech present during removal so the insulation can be properly surveyed prior to being bagged for free release). The RP Tech who marked the bags following performance of an *Aggregate Quantity* survey assumed the material in the bags had been previously surveyed for free release. Therefore, as discussed above, inadequate procedures that did not require RP Techs to survey and mark material for free release for only those items they personally surveyed contributed to an RP Tech marking the bags of insulation for free release.

The incident involving contaminated insulation in a bag marked with green spray paint share the same root causes of: miscommunication among and between the various workers, and between workers and supervision; inadequate procedures for material control, and failure to understand and follow the standard practice of surveying insulation while it is being removed. Because the contamination on the insulation is directly associated with the contamination on the end bell, and the causes involved in these two cases share a common theme, the disposition of the insulation incident is considered to be included in this disposition.

B. Extent of the Radiological Hazards Associated with this Occurrence

Upon determination that the shipment contained radioactive material of plant origin, an evaluation was made of the potential impact the radioactive material could have had on the general public. First, the material was analyzed and determined to be about 0.0042 microcuries of Cs-137. Secondly, the potential impact on an individual member of the public was determined.

The three ways that radioactive material can impact a human are through direct radiation from the material, ingestion of the material, or inhalation of the material. The direct radiation pathway results in a whole body exposure of less than 1 mrem if exposed to this material continuously for one year. This is due to the small size of the contaminated area (about 2 in^2) and the small amount of radioactive material present. The impact to a single human of ingesting the entire amount of radioactive material present also results in a dose of less than 1 mrem (internal dose)[Note 1]. The results are the same for inhalation of this material: less than 1 mrem (internal dose)[Note 1] due to inhalation of the entire quantity of radioactive material present in this case.

To put this impact in perspective, the average annual dose in the United States from natural background sources of radioactivity is about 300 mrem. A single chest x-ray exposes an individual to 15-30 mrem in a few seconds. In this case, the total impact on a single human being having inhaled and ingested the material, and being externally exposed to it for an entire year, is less than 1 mrem.

REMEDIAL ACTIONS

On 12/22/97, the truck monitor at the scrap metal facility alarmed, and the shipment was returned to Rancho Seco on 12/22/97. On 12/23/97 plant personnel re-surveyed the shipment and found the contamination on the end bell segment. Immediately after this discovery, plant management ceased further off-site shipments of material.

On 12/24/97, plant management stopped free release surveying so RP program improvements could be evaluated.

Completed re-survey of all material from Incremental Decommissioning still on site, that was designated as "clean", and awaiting off site shipment, after instructing the technicians that only the individual surveying the material may apply markings or make log entries indicating it is free released.

PREVENTIVE ACTIONS

Several actions are being taken to prevent the reoccurrence of this problem, and are listed below:

1. An instrument with equivalent sensitivity to the truck monitors used by the scrap metal facilities will be procured and used on all shipments. The procurement of this instrument will be expedited, however, free release of material from the site will not be contingent on procurement of this instrument.
2. Material handling and free release procedures will be strengthened. Changes will include:
   a). More formal methods of marking materials will be added to procedures, e.g., painting of a unique identifier, such as the surveyor's initials, on "clean" items to improve personnel accountability. This will be to the extent possible and appropriate to the size and quantity of the material, and;
   b). Requiring that only the individual performing the free release survey is allowed to mark the item as free released.
3. Make procedure changes to require defining survey requirements for each system or component in each ID package (e.g., in this instance, define the special handling requirements for the naturally occurring radioactive material found in the system). Also require formal acknowledgment of survey requirements by the Radiation Protection personnel handling the material.
4. Establish an Employee Action Team to evaluate the effectiveness of, and develop improvements for, processing potentially radioactive material. Results of this action will be considered enhancements. Restart of work is not contingent on completion of the improvement items that stem from this action.
5. Quality Assurance will document a review of their Incremental Decommissioning oversight and use this information to reduce the risk of reoccurrence of similar events. This information will be used to strengthen QA oversight of Incremental Decommissioning. Restart of survey activities is not contingent upon implementation of these activities.
6. Change RP.305.09A (Removal of Tools and Equipment From Controlled Areas) to clarify what is standard practice for monitoring and releasing material and to further define the 100 ccpm release criterion.
7. Upgrade the initial and refresher GET training program for radiation workers to address what is expected of personnel when material is being processed for free release, including lessons learned from this incident.

Note 1: Inhalation and ingestion impacts calculated using EPA Guidance Report Number 11

cc: RIC 2A.750

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT ☐ P. O. Box 15830, Sacramento CA 95852-1830, (916) 452-3211
AN ELECTRIC SYSTEM SERVING THE HEART OF CALIFORNIA

MPC&D 98-032

March 5, 1998

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Docket No. 50-312
Rancho Seco Nuclear Station
License No. DPR-54

RESPONSE TO NOTICE OF VIOLATION 98-01

Attention: Document Control Desk

In NRC Inspection Report 50-312/98-01, the Sacramento Municipal Utility District (the District) received a Notice of Violation related to activities conducted at the Rancho Seco Nuclear Station. In accordance with 10 CFR 2.201, the District provides the enclosed response to Notice of Violation 50-312/98001-01.

Members of your staff requiring additional information or clarification may contact Jerry Delezenski at (916) 452-3211, extension 4914.

Sincerely,

Steve J. Redeker
Manager
Plant Closure & Decommissioning

cc w/Encl: E. W. Merschoff, NRC, Arlington, Texas
S. Weiss, NRC, Rockville

EXHIBIT 9
PAGE 440 OF 506 PAGE(S)

NRC Statement of Violation:

Rancho Seco Technical Specification D6.11 states, "Procedures for personnel radiation protection shall be prepared consistent with the requirements of 10 CFR 19 and 10 CFR 20, and shall be approved, maintained and adhered to for all operations involving personnel radiation exposure." 10 CFR 20.1501(a) states, "Each licensee shall make or cause to be made, surveys that (1) may be necessary for the licensee to comply with the regulations in this part; and (2) are reasonable under the circumstances to evaluate (i) the extent of radiation levels; and (ii) concentrations or quantities of radioactive material; and (iii) the potential radiological hazards that could be present.

Contrary to the above, on December 22, 1997, a shipment of scrap metal, in the form of an auxiliary boiler, was released from the Rancho Seco site without having been surveyed. Low levels of contamination were discovered on the boiler at a local scrap yard by a truck monitoring system at the entrance to the facility. The boiler was subsequently returned to the Rancho Seco site.

This is a Severity Level IV violation (Supplement IV).

District Response

Admission or Denial of Violation

The District acknowledges that the violation occurred as stated, with two minor clarifications.

First, the NRC Statement of Violation, as written, could lead one to believe that the entire auxiliary boiler scrap metal shipment was not surveyed. Actually, only one piece of scrap metal, composing a small portion of the shipment, was not properly surveyed for free release. Workers had cut up the auxiliary boiler into several segments in preparation for its disposal. Each segment was properly surveyed and free released for disposal, except for the auxiliary boiler end bell segment. Radiation Protection Technicians (RP Techs) had performed a preliminary survey on this segment during auxiliary boiler disassembly. This cursory survey was designed to identify any significant contamination on the end bell segment and was not intended to be the basis for free release of this segment. A survey of the end bell segment on December 23, 1997, after it was returned to Rancho Seco, identified one small area (about two square inches) of low level radioactive contamination (2,000 counts per minute (cpm) at ½ inch) on a pipe nipple.

Admission or Denial of Violation (Continued)

Second, use of the word 'contamination' in the NRC Statement of Violation could lead one to believe that the truck monitor at the recycle facility alarmed because of contamination of plant origin. Actually, the likely cause of the truck monitor alarming is the presence of refractory material on the auxiliary boiler tubes, which was part of the shipment. This refractory material contains naturally occurring isotopes of radium and actinium, which are not licensed materials.

Reason for Violation

The reasons the violation occurred are:

(1) Inadequate communication between RP Techs;
(2) Inadequate communication between RP Techs and RP Supervision; and
(3) Insufficient detail in RP procedures used to free release surveyed material.

Discussion of Violation

At about 8:00 am, on December 22, 1997, a shipment of scrap metal on a flat bed trailer left the Rancho Seco site for transport to a local scrap metal recycle facility. The shipment consisted of the large auxiliary boiler cut up into several segments that were loaded onto a flat bed trailer. RP Techs performed an *Aggregate Quantity* survey prior to the shipment leaving the site. The *Aggregate Quantity* survey indicated no detectable radiation levels above background (6 μR/hr).

At the recycle facility, the shipment passed through a whole truck radiation monitor. The monitor alarmed, indicating the potential presence of radioactive material. To confirm this initial monitor response, the truck passed through the monitor two more times, causing the monitor to alarm both times. The recycle facility notified the District of the alarm condition. The District directed that the shipment be returned to Rancho Seco. At about 11:30 am, on December 22, 1997, the truck returned with the entire shipment. The scrap metal material remained on the trailer the whole time the shipment was not at Rancho Seco. Upon return of the truck, plant personnel initiated a re-survey of the entire shipment to investigate the cause of the alarm.

On December 23, 1997, during the re-survey effort, RP Techs found one small area (approximately two square inches) on the outside surface of the auxiliary boiler end bell segment that had fixed contamination of plant origin. The contaminated area was on a pipe

Discussion of Violation (Continued)

nipple protruding from the end bell segment..This slightly contaminated end bell segment had been placed on the flat bed trailer with the pipe nipple side facing up. Therefore, the contaminated area was not in contact with other material or the flat bed trailer during the shipment.

A survey of the slightly contaminated end bell pipe nipple indicated a radiation reading of 2000 cpm at ½". The shipment re-survey results determined that no other segment on the shipment contained radioactive material of plant origin. But, the re-survey effort did confirm the auxiliary boiler tubes had refractory material that contained naturally occurring isotopes of radium and actinium. Survey results of the refractory material indicated a radiation level range from seven to 11 μR/hr above background. It is likely that the large amount of refractory material contained within the auxiliary boiler shipment caused the recycle facility truck monitor to alarm.

District personnel evaluated the quantity of radioactive material contained within the small contaminated area on the end bell pipe nipple and conservatively estimated the amount to be 0.0042 μCi of Cs-137. District personnel then calculated the potential exposure impact this quantity of radioactive material could have on a person. The calculations considered the *Direct*, *Inhalation*, and *Ingestion* pathways. The District determined that the potential dose impact to a person exposed to 0.0042 μCi of Cs-137 via the *Inhalation* and *Ingestion* pathways was less than 1 mrem whole body. Also, the District determined the potential dose impact for the *Direct* exposure pathway was less than 1 mrem, assuming continuous exposure to the contamination for one year.

To put this potential dose impact (less than 1 mrem whole body) into perspective, the average annual dose to an individual in the United States from natural background sources is about 300 mrem whole body. A single chest X-ray exposes an individual to 15 to 30 mrem in a few seconds.

Considering the location of the end bell segment contamination, RP Supervision concluded that the insulation in the area around the end bell pipe nipple could also have slight contamination. RP personnel conducted a search for the insulation and found the bags containing the auxiliary boiler insulation in the auxiliary boiler dismantlement work area. RP personnel conducted a survey of the insulation material and found four pieces that were slightly contaminated. These pieces were approximately 2" x 2" x 3", and the survey results for this material ranged from 500 to 1,000 cpm at 1/2". This material was in bags marked as having been surveyed for free release. District management expanded the incident investigation to include the improperly marked insulation as well as the auxiliary boiler end bell segment.

Cause of Violation

As stated above, the violation occurred because there was:

1. Inadequate communication between RP Techs;
2. Inadequate communication between RP Techs and RP Supervision; and
3. Insufficient detail in RP procedures used to free release surveyed material.

First, a lack of communication between two RP Techs caused one technician to mistakenly mark and free release the slightly contaminated auxiliary boiler end bell segment. This segment did not receive a 100% survey of external and accessible surfaces, required by procedure RP.305.09A. The first technician performed only a preliminary survey at the time of the disassembly of the end bell segment from the auxiliary boiler. This cursory survey only looked for obvious contamination on the end bell segment.

Survey activities for the auxiliary boiler were then transferred to a second RP Tech, who thought that the required 100% survey for free release of the end bell segment had been performed. This second technician then did a spot check of the end bell segment, and, finding no contamination, marked the item indicating it was ready to be free released from the site. Thus, a lack of communication between the two RP Techs caused the end bell segment to not receive the required free release survey.

The other communication deficiency that contributed to not performing a 100% survey on the end bell segment was poor communication between RP Techs and RP Supervision as to the detail of the auxiliary boiler survey documentation. The actual survey documentation for the auxiliary boiler consisted of RP Techs making a single line entry into the Incremental Decommissioning Radiation Monitoring Log. RP Supervision's expectations were that RP Techs should have documented the survey results of each auxiliary boiler segment. Documenting the survey results of each auxiliary boiler segment would have resulted in enhanced RP Tech accountability and an additional administrative barrier that could have prevented this incident.

RP procedures had insufficient detail regarding identification of free released material. Standard RP practice has RP Techs surveying and marking material as free released for only those items the RP Techs personally surveyed. But, RP program procedures did not include specific requirements for RP Techs to survey and then mark for free release only those items they personally surveyed. Plant management has always emphasized strict procedural compliance. Therefore, this procedural deficiency contributed to a breakdown in the standard practice during the auxiliary boiler survey work.

Cause of Violation *(Continued)*

The removal and bagging of four pieces of slightly contaminated auxiliary boiler insulation material occurred due to inadequate communications and procedural deficiencies. Standard practice is to remove insulation with RP Techs present so the RP Techs can survey each piece of insulation before it is placed into bags. A worker, without communicating with supervision and RP Techs, removed and bagged the insulation because the worker thought this was part of his assigned tasks. Later an RP Tech did an *Aggregate Quantity* survey of the bags and marked them as free released. The RP Tech did this because of the standard practice associated with removing insulation (i.e., RP Tech present during removal so the insulation can be properly surveyed prior to being bagged for free release). The RP Tech who marked the bags following performance of an *Aggregate Quantity* survey assumed the material in the bags had been previously surveyed for free release. Therefore, as discussed above, inadequate procedures that did not require RP Techs to survey and mark material for free release for only those items they personally surveyed contributed to an RP Tech marking the bags of insulation for free release.

Since the reasons for the auxiliary boiler insulation contamination incident are the same as the reasons for the slightly contaminated auxiliary boiler end bell segment incident, the corrective action discussion below also applies to the contaminated insulation incident.

Corrective Actions Taken and Results Achieved

In compliance with the Rancho Seco Corrective Action Program, the Radiation Protection group wrote a Potential Deviation from Quality (PDQ) 97-0082 in response to this incident and plant management designated this incident a Deviation from Quality (DQ). Plant management assigned the Radiation Protection group an action to determine the cause and extent of the incident and the appropriate remedial and preventive corrective actions necessary to prevent recurrence of this incident.

On December 23, 1997, in response to the detection of the contamination, plant management ceased shipping waste material off-site. Also, on December 24, 1997, plant management stopped free release surveying so they could evaluate the existing program for improvement. Management took these actions to prevent any possibility of improperly surveyed material from leaving the site or leaving a radiological controlled area.

On December 30, 1997, RP Supervision and the Incremental Decommissioning Team Leader conducted training with District and contract Radiation Protection personnel to:

1. Re-enforce the standard RP practice that surveyed material with a measured and reproducible radiation level above background is considered radioactive and is not free releasable;

Corrective Actions Taken and Results Achieved *(Continued)*

2. Clarify that the 100 cpm above background criteria is a minimum required survey equipment sensitivity and is not a free release detection limit;
3. Convey to RP Techs that they must use a survey map or survey log to document surveys performed;
4. Train RP Techs on the appropriate level of survey documentation expected for various survey job examples (e.g., a large component cut up into segments that may be free releasable should have a survey documented for each segment)
5. Instruct RP Techs that they are to mark material for free release only for material that they personally performed the radiation survey.

Following this training, RP personnel began re-surveying material that had been cleared for free release but was still on-site. As of January 28, 1998, RP Techs re-surveyed and verified 100% of the material marked for free release that remained on-site was acceptable for free release. This re-surveyed material included:

1. Approximately 3,000 ft^3 of miscellaneous scrap material that had been placed in dumpsters;
2. Various fans, pumps, valves, and motors;
3. Two 3,000 gallon tanks;
4. Four 6' x 6' x 6' dehumidifiers;
5. Four 4' x 6' control panels;
6. Two 15' long by 2.5' diameter lube oil cooler shells;
7. One 15' x 12' x 10' metal shack; and
8. The returned auxiliary boiler shipment and other auxiliary boiler segments not yet shipped.

The RP group revised procedures RP.305.08A, "Normal and Radiation Work Permit Surveys," and RP.305.09A, "Release of Materials from the Radiological Controlled Area," to address in RP procedures the December 30, 1997, training information provided to RP personnel.

On January 15, 1998, RP Supervision and the Incremental Decommissioning Team Leader provided additional training to District and contract RP personnel on the initial RP procedure program changes and one significant, subsequent program change. This subsequent program change centered on the new Incremental Decommissioning Package (IDP) Information Worksheet that RP Supervision now prepares for each IDP. This worksheet provides IDP job summary information, historical radiological information on

Corrective Actions Taken and Results Achieved *(Continued)*

the systems involved in the IDP, and survey requirements. The program requires RP personnel involved in IDP work to read and familiarize themselves with the IDP Information Worksheet. This program enhancement provides greater assurance that RP personnel assigned to IDP work will (1) perform and properly document the required surveys, (2) properly identify and dispose of free releasable and contaminated material, and (3) communicate adequately so poor communication will not cause contaminated material to leave the site.

To implement this program change, the RP group revised procedure RP.305.09A to add the RP IDP Information Worksheet. Also, the Technical Services group revised plant administrative procedure RSAP-1900, "Incremental Decommissioning Control," to require RP personnel to review the IDP Information Worksheet for system radiological information and survey requirements.

Based on implementation of the above corrective actions, plant management removed the self imposed restrictions on (1) surveying material for free release and (2) off-site shipment of free release material. Also, based on the re-survey results, interviews with RP Techs and this Notice of Violation investigation, Rancho Seco management concludes the lack of proper surveys on the end bell and associated insulation do not indicate other failures to perform free release surveys.

Corrective Actions to be Taken to Avoid Further Violations

To continue to identify RP program improvements, Rancho Seco management initiated the Incremental Decommissioning Employee Action (IDEA) Team. The IDEA Team is evaluating the effectiveness of, and developing improvements in, radiological material management for dismantlement activities. The IDEA Team includes first line personnel directly involved in identifying, controlling, and handling contaminated and free releasable material. The Team began meeting on February 2, 1998, meets weekly, and is expected to be active for several months. Plant management will form similar action teams on an as needed basis to (1) evaluate the effectiveness of changes to the RP and Incremental Dismantlement programs and (2) develop additional program enhancements.

Also, the RP group is upgrading the initial and refresher General Employee Training (GET) that the District requires for radiation workers at Rancho Seco. Individuals requiring access to radiologically controlled areas will now receive enhanced training. For example, individuals who have not worked at Rancho Seco as a radiation worker will receive a walking tour through the plant coupled with instruction on (1) material removal from systems and (2) the various handling, survey, and disposal requirements associated

Corrective Actions to be Taken to Avoid Further Violations *(Continued)*

with removed material, including lessons learned from Incremental Decommissioning experiences. The enhanced GET training will improve radiation worker knowledge of dismantlement activities and radiological controls used at Rancho Seco.

Quality Assurance (QA) program improvements include performing periodic surveillances beginning in March 1998, to independently verify material radiation survey results. Other areas of QA program improvement are:

1. QA group involvement in the IDEA Team;
2. Implementation of IDEA Team findings affecting the QA area; and
3. Continued integration of RP program changes into QA surveillance and audit plans.

Plant management began the process to obtain a truck monitor at Rancho Seco to provide additional assurance that radioactive material of plant origin does not inadvertently leave the Rancho Seco site. This monitor will be used as a final check on shipments that contain free released material. The RP group issued a purchase request for a truck monitor on January 28, 1998.

Date When Full Compliance will be Achieved

The District completed the necessary actions to achieve full compliance (i.e., perform required survey on auxiliary boiler segment) on December 23, 1997. The District is obtaining a truck monitor on an expedited basis and expects installation during the middle part of 1998. The IDEA Team, upgraded GET training, and QA program improvement items are on-going activities.

J. Field

SPECIAL PRC MEETING AGENDA

MEETING NO. 2290

Large Conference Room - 2:00 pm

DAY OF: February 5, 1998

ITEM NO.:

1. DQ 97-0082 Disposition, Rev. 1 "Scrap Metal Tripped SIMS Truck Monitor"
   NAME: Bill Wilson EXTENSION: 4884

EXHIBIT 9
PAGE 449 OF 506 PAGE(S)

SMUD RANCHO SECO COMMITMENT TRACKING SYSTEM

General CTS Report

04-Feb-98

CTS #:	52488 REV:	STATUS:	Open
SYSDSC:	N/A	PRIORITY:	1
XREF: PDQ:	DQ #: 97-0082 CCTS #: LRSL #:		
TITLE:	SCRAP METAL SHIPPED TO SIMS SET OFF THEIR WHOLE TRUCK R	CTS STAGE:	Accepted Dispo
AGENCY:	SMUD	STAGE DATE:	2/4/98
RESP DEPT:	RP/EM/EP/Chem	STAGE DEPT:	RP/EM/EP/Chem
MANAGER:	Gardiner, D.	STAGE DUE DATE	2/15/98
PHONE:	4362	FINAL DUE DATE:	3/3/98
MAIL STOP:	244	ACTUAL FINISH:	
ASSIGNED:		REPORTBL:	N
		CCTS CLOSURE:	
STORAGE BOX:		HARDWARE/SOFTWARE	S

DESCRIPTION: Radiation detector at SIMMS alarmed as the large auxiliary boiler steam drum passed through the detector.

REQUIREMENTS: RP/CHEM is to: (1) Resurvey material on-site that is designated as 'clean' and is awaiting shipment off-site after RP Technicians instructed that only the individual that performs the survey on material may apply markings or make log entries indicating material is free of radioactive material; (2) Strengthen material handling and free-release procedures to include more formal methods for marking materials, improve personnel accountability, and require only the individual performing the survey is allowed to mark an item as free released or place an item in a designated free release survey storage area; (3) Procure and use survey equipment similar to the truck monitor at the scrap metal yard on all shipments once instrument is obtained and installed; (4) Make procedure changes to require defining survey requirements for each system or component in each IDP package and formal acknowledgement of survey requirements by the RP personnel handling the material; (5) Ensure personnel involved in dismantlement activities are aware of who is in charge, what each persons responsibilities are, including supervision; (6) Revise RP.305.09A to proceduralize the standard practice for monitoring and releasing material (i.e., implementation of the 100 ccpm release criteria); and (7) Enhance Radiation Worker training program beyond Category II training with hands-on training regarding what is expected of personnel when material is being processed for free release. QUALITY is to: (1) Establish an Employee Action Team to evaluate effectiveness of, and develop improvements for, material processing; and (2) Document QA's oversight effort related to Incremental Decommissioning, and use this information to reduce risk of similar events occurring again and to stregthen QA oversight activities.

RESPONSE:

COMMENTS: The CMRG reviewed this item on 12/24/97, determined it is a DQ, reviewed and accepted an accompanying Interim DQ Disposition, and documented the CMRG's findings in memo MPC&D 97-195. The CMRG assigned a Final DQ Disposition action to RP/Chem, due 12/31/97. The CMRG reviewed a draft of the final DQ Disposition, made comments, but did not approve the Disposition on 01/13/98. The CMRG reviewed the final DQ Disposition on 01/14/98, approved the Disposition with comment, and assigned actions to RP/Chem and Quality with variou due dates (01/20/98 to 04/15/98). The CMRG reviewed and approved Revision 1 to the DQ Disposition, with comment, on 02/02/98, and assigned actions to RP/Chem and Quality, due within similar time frame for the Rev. 0 actions (i.e., 02/15/98 to 05/15/98).

DOCUMENT	DOCUMENT CODE
RPM980002	Originating Document
RPM980002, REV. 1	Originating Document
MPC&D970195	Cross Reference

EXHIBIT 9

COMMITMENT COVER SHEET

☐ New
☐ Change CTS # _____

CTS #: 52488
REV. #: 0
DATE: 12/24/97

IDENTIFICATION - Originator #4-8 CTS/CCTS Only

1. Originator

Name: Wally Koepke Ext: 4652 Mail Stop: N502

Signature: W Koepke Dept: Quality Date: 12/24/97

2. Source Documents (Attachments):

☑ PDQ # ☒ DQ # 97-0082 ☐ CCTS # _____ ☐ LRSL # _____

☐ CAR (*) _____ ☐ OTHERS (SPECIFY) _____

3. Brief Title: Scrap metal trucked to SIMS Scrap Metal set off their radiation monitor

4. Description: _____

5. Related Documents: (O = Originating, X = Cross Ref, C = Closure) N/A

Document	Type	Document	Type

6. Agency: _____

7. Priority: _____ 8. Reportable: Y N

DISPOSITION AND APPROVAL Commitment Mgmt. Review Group

9. ☐ Hardware ☒ Software 10. Regulatory Due Date: Y N Date: _____ Original _____ Revised

11. Priority 1 12. Applicable Systems N/A

13. APPROVED:

	DEPARTMENT	DUE DATE
☐ Potential 10 CFR 21 / Reportability Review	UC	
☐ PDQ Initiate W/R		
☐ PDQ Action _____		
☒ DQ Disposition	RP	12/31/97
☐ Accepted DQ Disposition/Close		
☒ Accepted DQ Dispo/Action _____	RP	3/5/98
☐ Study		
☐ Design		
☐ Implement		
☐ Disapproved/Canceled		
☐ N/A in POL Phase		
☐ Superseded by CTS # _____		

Y N Will Control Room change occur as a result of the design change?

Chairman, Commitment Management Review Group — Date 12/24/97

CMRG Comments: Accepted Interim Disposition
CMRG Accepted Disposition Revision 1 on 2/2/98 RM
(with comment) 2/4/98

CTS

ECN # _____ DCP # _____

ENTERED	DATE	VALIDATE	DATE	ENTERED	DATE	VALIDATE	DATE
RM	12/29/97	N/A		RM	2/4/98	N/A	

NOTE: (*) CMRG approval not required.
ADM-256 Rev. 7

EXHIBIT 9
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POTENTIAL DEVIATION FROM QUALITY FORM

PAGE 1 OF __

PDQ# 97-082
REV# Ø

PROBLEM IDENTIFICATION
ORIGINATOR

1. DATE OF OCCURRENCE: 12/22/97 TIME OF OCCURRENCE: 1015 AM PM
2. DATE OF IDENTIFICATION: 12/22/97 TIME OF IDENTIFICATION: 1015 AM PM
3. TIME SS NOTIFIED: 1300 AM PM 4. DEADLINE ASSIGNED BY SS: 1600 AM PM
5. SS NAME: A FRASER
6. SYSTEM: RDM 7. EQUIPMENT ID:
8. EQUIPMENT NAME: Aux Boiler STEAM DRUM 9. QUALITY CLASS: N A
10. PROBLEM DESCRIPTION:
Radiation detector at Sim's metal alarmed as the large Aux Boiler STEAM DRUM passed through the detector.

11. ASSOCIATED DCP, WR OR OTHER DOCUMENTS: NA
12. AFFECTED DRAWINGS: NA 13. P.O./CONTRACT: NA
14. ORIGINATOR NAME: W Wilson EXT: 6884 MAILSTOP: N403
ORIGINATOR SIGNATURE: W Wilson DEPT: RP/Chem DATE: 12/22/97
15. EQUIPMENT OPERATES IN PRESENT CONFIGURATION (FOR CONFIGURATION DISCREPANCIES): ☐Y ☐N
SUPERVISOR NAME: W Wilson EXT: 6884 MAILSTOP: N403
SUPERVISOR SIGNATURE: W Wilson DATE: 12/22/97

OPERATIONS REVIEW

16. POTENTIALLY REPORTABLE CONDITION: ☐Y ☒N PURSUANT TO:
17. TECH SPEC VIOLATION: ☐Y ☒N OPERABLE: ☐Y ☐N ☒NA CLEARANCE TAG REQ'D ☐Y ☒N
JUSTIFY IF NO LER REQUIRED:
As of this time steam drum returned to site for further evaluation. Not reportable pending outcome of evaluation.

18. SS NAME: Al Fraser
SS SIGNATURE: Al Fraser DATE: Dec 22 97 TIME: 1330 AM PM

ADM-129 REV. 10 (RSAP-1308)

EXHIBIT 9
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DEVIATION FROM QUALITY FORM

PAGE ___ OF ___

DQ # 97-0082
REV # 0

PROBLEM DISPOSITION ASSIGNED DEPARTMENT

19. DISPOSITION:

☐ ACCEPT-AS-IS ☐ REPAIR ☐ REWORK ☐ REPLACE

☐ INTERIM ACCEPT-AS-IS ☐ NOT A NONCONFORMANCE ☒ NON-HARDWARE

☐ DOCUMENT CHANGE

20. PROBLEM ANALYSIS AND RESOLUTION: (PROVIDE CAUSE, EXTENT, REMEDIAL AND PREVENTIVE ACTIONS UNDER SEPARATE HEADINGS)

See Memo RPM 98-002, Revision 1, Attached
(DQ 97-0082 Disposition, Revision 1)

21. DISPOSITION BY:

NAME: William Wilson EXT: 4884 DEPT: RP/Chem

SIGNATURE: W Wilson DATE: 2/4/98

FOR ACCEPT-AS-IS OR REPAIR ONLY (NOT REQUIRED FOR NON-HARDWARE)

22. DESIGN OR DRAWING: ☐ Y ☐ N 23. RELATED DCPs OR TRANS. NO. ___

24. CALC No.: ___ 25. TEST No.: ___

26. ASME CODE: ☐ Y ☐ N

ANII

27. ANII/ANI REVIEW: ___ DATE: ___

ASSIGNED DEPARTMENT

28. COMMENTS:

CMRG

29. TREND CODE: H-1

ADM-261 REV. 1 (RSAP-1310)

EXHIBIT 9
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SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: CTS Coordinator

DATE: February 2, 1998

RPM 98-002, Rev. 1

FROM: William Wilson

SUBJECT: **DQ 97-082 DISPOSITION, REV. 1**

PROBLEM DESCRIPTION

Summary

On December 22, 1997, a routine shipment of scrap metal was sent to a metal recycler off site containing radioactive contamination above the limits allowed for free release by Rancho Seco administrative procedures.

Detailed Discussion

About 0800 on 12/22/97 a shipment of scrap metal on a flat bed trailer left site for transport to a scrap metal recycler. An Aggregate Quantity radiation survey (μR/hr) of all the material in the shipment was performed prior to the shipment leaving site. The results of the survey indicated that there were no radiation levels detectable above the background level of 6 μR/hr. Upon arrival at the recycler, the truck was passed through the radiation detector at the site. The detector alarmed, indicating the presence of radioactivity. At this time, District personnel requested that the shipment be returned to Rancho Seco. The shipment returned at about 1130 on 12/22/97.

All of the material in the shipment remained on the trailer during the entire duration that the shipment was off site. Upon return to Rancho Seco, the material in the shipment was observed and surveyed. The material in the shipment consisted of parts of the large auxiliary boiler, including some concrete-like refractory material. This refractory material was tested by gamma spectroscopy and found to contain naturally occurring radiation (e.g., radium, actinium). The presence of the radiation is due to the materials that were used to construct the refractory material. District personnel determined that this was the cause of the alarm.

During a follow-up survey, a small section on one piece in the shipment was found to have fixed contamination of plant origin on its surface. The contaminated material in this instance is a portion of a pipe nipple (about 2 square inches of surface area) on an end bell from the large auxiliary boiler. The end bell was placed on the flat bed trailer with the pipe nipple side facing up, and was not in contact with other materials or the trailer during shipment.

Poorly conducted communications are an underlying theme in many of the factors that allowed this incident to occur. First, there was some miscommunication between two technicians that led one technician to mistakenly mark the item as "clean" even though 100% of the accessible surfaces had not been surveyed as required. The first technician had performed a survey only on the end of a pipe protruding from the end bell. When survey activities were transferred to

another technician, this second technician thought that the required survey of 100% of the accessible surfaces had been performed. This second technician then did a spot check of the end bell, and finding no contamination, applied green paint indicating the item was ready to be free released from the site.

This sequence of miscommunication was compounded by the fact that there were no survey results documented for the various components of the large boiler. The lack of documented survey results was due to the poor communications between supervision and technicians concerning the required surveys and the desired survey documentation. Poor verbal communications between supervision and technicians, and between the technicians themselves, led the technicians to believe that: only a single line entry into the survey log was to be made for all of the large boiler components, and; the single line entry would be made when the large boiler dismantlement/survey work was completed.

The actual survey requirements had been made clear. Supervision had, in accordance with procedure, prepared an Inaccessible Surfaces Contamination Evaluation (ISCE) sheet to describe to the technicians special survey requirements for the large boiler. The 3 technicians involved with work on the large boiler at this time had in fact read the ISCE sheet, even though there was no procedural requirement for the technicians to read the ISCE sheets.

CAUSE

The following factors led to the release of the contaminated item.

1. Poor communication transferring responsibility for material between 2 RP technicians. Technician "A" thought that Technician "B" reported the item clean, then Technician "A" spot checked the item and marked it "clean". Technician "B" says that no survey results were communicated.
2. Inadequate procedures regarding identification of material, or storage areas for material, surveyed as "free released". There was no written or verbal instruction that allowed applying free release markings only by the technician who performed the survey.
3. No survey documentation was produced. This was caused by confusion over the required survey documentation, poor field supervision, and poor communications between technicians and supervision.
4. Inadequate RP field supervision (i.e., deficient in the needed questioning attitude and not aggressive enough interfacing with technicians and checking on field activities). Better field supervision should have revealed the other causes prior to the incident occurring.
5. Some technicians were unclear regarding lines of responsibility for RP practices in Incremental Decommissioning. This occurred because the former Radiation Protection Manager (RPM) is the Incremental Decommissioning project manager, and there is a new RPM.

EXTENT

A. Extent of the Problem of Free Releasing Contaminated Material

The rest of the material contained in the shipment with the item of concern was also resurveyed, and no other material was found to be contaminated. As of 1/28/98, 100% of the material has been surveyed, and all of the material was found to be acceptable for free release. These materials consisted of about 3000 ft^3 of miscellaneous scrap materials which had been placed in dumpsters; and various fans, pumps, valves, and motors. Also resurveyed were two 3,000 gallon tanks, four 6' × 6' × 6' dehumidifiers, four 4' × 6' control panels, two 15' long by 2.5' diameter lube oil cooler shells, and one 15' × 12' × 10' metal shack.

Interviews with the technicians responsible for free releasing material from the plant indicated that this was a unique incident, and that each technician normally marks only the materials and items that they have personally surveyed. The technicians could not recall any other instance of marking an item that they had not personally surveyed. The long duration of the work on the large boiler (several months) combined with the experiences from the small boiler provided a unique set of circumstances which became clear during interviews with the technicians involved. The interviews indicated that the confusion over the monitoring requirements of the large boiler was not typical of the communications which normally occur. The confusion occurred because the small boiler was expected to be contaminated and extensive tube splitting and inaccessible area monitoring was performed, with very little contamination being found. Based on this experience, the approach taken on inaccessible area surveys on the large boiler was changed. This change between the small and large boiler introduced the uncertainty, and is unique: no other Incremental Decommissioning work has involved the significant, complex, and extensive dismantlement as have the boilers, where one component was handled differently than the rest due to the experience gained on the first component.

The location of the contamination on the exterior of the end bell suggested that the insulation that had been on the end bell might be contaminated also. A search for the insulation began, and the bags containing the insulation from the large boiler end bell were found. They had not yet left site for disposal, even though they were found marked with green paint. The bags of insulation were opened and the material was surveyed, and some contaminated insulation was found. There were 4 (four) pieces found, each about 2" X 2" X 3". The activity on the material ranged from 500 to 1000 ccpm at 1/2".

Investigation into the insulation revealed another sequence of events exacerbated by miscommunication. The radwaste handler that removed the insulation from the end bell had no knowledge of the ISCE sheet provided for the large boiler. The same radwaste handler had been involved with removing insulation from small boiler components, and finding the end bell of the large boiler removed from the larger structure and sitting on the ground, and being a hard worker, decided to remove the insulation from the end bell of the large boiler. However, this was done without direction from supervision or knowledge of the status of the insulation. In fact, the insulation on the large boiler end bell had not yet been surveyed. The radwaste handler did not understand the survey requirements for this material, or the fact that the

insulation removed from the small boiler had been surveyed prior to removal. This situation is unique because the interviews conducted with the personnel involved revealed that this is the only time that insulation was removed from a component without an RP technician present.

At about the same time that the insulation was being removed from the end bell, contract workers were cleaning up broken refractory material that had been removed from the structure of the large boiler. The refractory material was surveyed as it was removed, but some of the material had broken during handling. These pieces of broken refractory material, which had already been surveyed, were placed into the same type of bags as the insulation material, and the bags containing both types of material ended up in the same vicinity. After many bags of the broken refractory material had accumulated, the supervisor working in the field for Incremental Decommissioning asked RP to perform whatever appropriate surveys were needed to free release some of the bags to reduce the accumulation of the material. At this point, no surveys were required to remove the bags of surveyed refractory material from the area and place the bags into containers for disposal. However, when requested to aid in removing some of the accumulating material, the RP technician performed a check (μR/hr) on each bag, and finding them acceptable, marked the bags with green paint. The RP technician did not realize that some of the bags contained unsurveyed (by direct frisk) insulation material.

The incident involving contaminated insulation in a bag marked with green spray paint is separate from the events that resulted in the release of contamination off site on the large boiler end bell. However, they share the same root causes of: miscommunication among and between the various workers, and between workers and supervision; inadequate procedures for material control, and; failure to understand and follow the standard practice of surveying insulation while it is being removed. They also share confusion about misapplying the experiences with the small boiler to the large boiler. Both of these incidents are limited to this single occurrence.

Because the contamination on the insulation is directly associated with the contamination on the end bell, and the causes involved in these two cases share a common theme, the disposition of the insulation incident is considered to be included in this disposition. As the previous discussion shows for these two related occurrences, the causes are similar. The extent of the contaminated metal incident includes the extent of the insulation material, but not vice versa. The extent of the insulation material is much more limited than the contaminated metal because of the personnel involved. The contaminated metal incident occurred under the direct involvement of an RP technician, while the insulation incident did not: the insulation material was placed into bags for free release without being surveyed (by direct frisk) by an RP technician. Also, the remedial and preventive actions for the two occurrences overlap. Therefore, a disposition for the insulation separate from this disposition is not necessary.

B. Extent of the Radiological Hazards Associated with this Occurrence

Upon determination that the shipment contained radioactive material of plant origin, an evaluation was made of the potential impact the radioactive material could have had on the general public. First, the material was analyzed and determined to be about 0.0042

microcuries of Cs-137. Secondly, the potential impact on an individual member of the public was determined.

The 3 ways that radioactive material can impact a human are through direct radiation from the material, ingestion of the material, or inhalation of the material. The direct radiation pathway results in a whole body exposure of less than 1 mrem if exposed to this material continuously over the course of a year. This is due to the small size of the contaminated area (about 2 in^2) and the small amount of radioactive material present. The impact to a single human of ingesting the entire amount of radioactive material present also results in a dose of less than 1 mrem (internal dose)[Note 1]. The results are the same for inhalation of this material: less than 1 mrem (internal dose)[Note 1] due to inhalation of the entire quantity of radioactive material present in this case.

To put this impact in perspective, the average annual dose in the United States from natural background sources of radioactivity is about 300 mrem. A single chest x-ray exposes an individual to 15-30 mrem in a few seconds. In this case, the total impact on a single human being having inhaled and ingested the material, and being externally exposed to it for an entire year, is less than 1 mrem.

REMEDIAL ACTIONS

As soon as the alarm occurred at the scrap metal facility, the material was returned to site. All of the material in the shipment was surveyed, and the problem was found. Until implementation of an approved resolution to this problem, no material of Incremental Decommissioning origin will be allowed to be released from the site or the off site Training Building.

PREVENTIVE ACTIONS

Several actions are being taken to prevent the reoccurrence of this problem, and are listed below:

1. In conjunction with the Remedial Actions, the material from Incremental Decommissioning still on site, currently designated as "clean", and awaiting off site shipment will be resurveyed to ensure the status of the material prior to free release of the material, after instructing the technicians that only the individual surveying the material may apply markings or make log entries indicating it is free released.
2. An instrument with equivalent sensitivity to the truck monitors used by the scrap metal facilities will be procured and used on all shipments. The procurement of this instrument will be expedited, however, free release of material from the site will not be contingent on procurement of this instrument.
3. Material handling and free release procedures will be strengthened. Changes will include:
   a). More formal methods of marking materials will be added to procedures, e.g., painting of a unique identifier, such as the surveyor's initials, on "clean" items to

improve personnel accountability. This will be to the extent possible and appropriate to the size and quantity of the material, and;

b). Requiring that only the individual performing the free release survey is allowed to mark the item as free released, or if not marked, to place it in a designated free release survey storage area.

4. Make procedure changes to require defining survey requirements for each system or component in each ID package (e.g., in this instance, define the special handling requirements for the naturally occurring radioactive material found in the system). Also require formal acknowledgment of survey requirements by the Radiation Protection personnel handling the material.
5. Ensure personnel involved in dismantlement activities, including the IDP Team Leader and the RPM and other RP Supervision, are aware of (1) who is in charge, (2) what each worker's responsibilities are, and (3) what supervision's responsibilities are (i.e., having a more questioning attitude, checking on field activities).
6. Establish an Employee Action Team to evaluate the effectiveness of, and develop improvements for, material processing. Results of this action will be considered enhancements. Restart of work is not contingent on completion of the improvement items that stem from this action.
7. Quality Assurance will document a review of their Incremental Decommissioning oversight and use this information to reduce the risk of reoccurrence of similar events. This information will be used to strengthen QA oversight of Incremental Decommissioning. Restart of survey activities is not contingent upon implementation of these activities.
8. Change RP.305.09A (Removal of Tools and Equipment From Controlled Areas) to clarify what is standard practice for monitoring and releasing material. Also further define the 100 ccpm release criterion.
9. Incorporate into the Radiation Worker training program, after the Category II class, further hands-on training on what is expected of personnel when material is being processed for free release (i.e., only material that has been surveyed can be placed in dumpsters or on trucks).

Note 1: Inhalation and ingestion impacts calculated using EPA Guidance Report Number 11

cc: RIC 2A.750

ENCLOSURE 1

NOTICE OF VIOLATION

Sacramento Municipal Utility District
Rancho Seco Nuclear Generating Station

Docket No.: 50-312
License No.: DPR-54

During an NRC inspection conducted on January 5-8, 1998, one violation of NRC requirements was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," NUREG-1600, the violation is listed below:

> Rancho Seco Technical Specification D6.11 states, "Procedures for personnel radiation protection shall be prepared consistent with the requirements of 10 CFR 19 and 10 CFR 20, and shall be approved, maintained and adhered to for all operations involving personnel radiation exposure." 10 CFR 20.1501(a) states "Each licensee shall make or cause to be made, surveys that (1) may be necessary for the licensee to comply with the regulations in this part; and (2) are reasonable under the circumstances to evaluate (i) the extent of radiation levels; and (ii) concentrations or quantities of radioactive material; and (iii) the potential radiological hazards that could be present.
>
> Contrary to the above, on December 22, 1997, a shipment of scrap metal, in the form of an auxiliary boiler, was released from the Rancho Seco site without having been surveyed. Low levels of contamination were discovered on the boiler at a local scrap yard by a truck monitoring system at the entrance to the facility. The boiler was subsequently returned to the Rancho Seco site.
>
> This is a Severity Level IV violation (Supplement IV).

Pursuant to the provisions of 10 CFR 2.201, Sacramento Municipal Utility District is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with a copy to the Regional Administrator, Region IV, 611 Ryan Plaza Drive, Suite 400, Arlington, Texas 76011, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and (4) the date when full compliance will be achieved. Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response to the Director, Office of Enforcement, United States Regulatory Commission, Washington, DC 2055-0001.

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: File

DATE: January 8, 1998
IDT 98-002

FROM: Dennis Gardiner

SUBJECT: UPDATE ON INVESTIGATION OF MATERIALS RELEASED ABOVE RELEASE LIMITS

This memo is to document training conducted between 12/30/97 and 1/8/97 with all of the SMUD and Contract Personnel assigned to the RP/Chem Group. The training provided was to explain that a radiation and contamination clearance (free release) marking or labeling could only be applied by the qualified technician that had actually performed the required radiation and contamination surveys. Surveys of materials are to be documented by survey maps or entries in the radiation monitoring log.

The RP/Chem Group was thanked for reporting the condition that was found. It is important that we continue to have an atmosphere where everyone knows that they can tell the truth.

cc: RIC 2A.750

3

PROCEDURE CHANGE REQUEST AND APPROVAL

TEMP CHANGE NO.

Page ___ of ___

INITIATE

PROCEDURE NO: RP.305.09A REV: 6

PROCEDURE TITLE: Removal of Tools & Equipment from ~~Radiologically~~ Controlled Areas

PROCEDURE ACTION: NEW ___ REVISION X EDITORIAL ___

VOID ___ SUPERSEDED BY: ___

REASON FOR CHANGE: NRC audit recommendations

DESCRIPTION OF CHANGE: See Revision Summary

ORIGINATOR: Steve Nicolls MS: N403 DATE: 8-14-97

RESPONSIBLE DEPARTMENT AUTHORIZATION: Dan Neals DATE: 8-14-97

TEMP CHANGE

TEMPORARY CHANGE TO BE MADE PERMANENT? YES ___ NO ___

IF NOT TO BE MADE PERMANENT ENTER EXPIRATION DATE: ___

APPROVED: ___ DATE: ___

CERTIFIED FUEL HANDLER OR PLANT ENGINEER

APPROVED: ___ DATE: ___

SHIFT SUPERVISOR

DOC. CONTROL INITIAL ___ DATE: ___

(FINAL APPROVAL MUST BE OBTAINED WITHIN 14 DAYS)

APPROVAL

APPROVED: W. Wilson DATE: 8/18/97

AREA SUPERVISOR (RSAPs, SPIPs, SPLAN, EPIPs, EPLAN, ODCM, REMP, PCP, STP, RSOM, DFPP - PLANT MANAGER

FORWARD TO PRC COORDINATOR

APPROVED: [illegible] DATE: 8/20/97

PLANT REVIEW COMMITTEE

RECOMMENDED APPROVAL BY MSRC: YES ___ NO X

REVIEWED: N/A DATE: ___

MANAGEMENT SAFETY REVIEW COMMITTEE

REV. 10

EXHIBIT 9

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PROCEDURE TITLE: Removal of Tools and Equipment from Controlled Areas

REVIEWER				CONCURRENCE	
SEQUENCE	AREA	NAME	M/S	SIGNATURE/FOR	DATE
	DAGM	DEPUTY AGM, OPERATIONS	252		
	MPC&D	MGR PLANT CLOSURE & DECOM	257		
	TS	TECHNICAL SERVICES SUPT	231		
	TS	SURVEILLANCE SCHEDULER	253		
	QA	NUC QUALITY ASSURANCE	251		
	MTC	MAINTENANCE SUPERINTENDENT	253		
	OPS	OPERATIONS SUPERINTENDENT	236		
	SEC	SECURITY OPERATIONS SPVR	210		
2	RP	RP / CHEM SUPERINTENDENT	244	W Wilson	9/9/97
	MPC&D	DECOMM PROJECT MANAGER	257		
	PUR	PURCHASING & CONTRACTS	50		
	MPC&D	PRC / MSRC COORDINATOR	258		
1	RP	RAD HEALTH SUPERVISOR	N403	[illegible]	9/9/97

QUESTION	YES/NO
Does this procedure/LBD change require (1) a change to an LBD, (2) development of new procedures, and/or (3) revision(s) to existing procedure(s) ?	NO
Does this procedure/LBD change or other resulting procedure/LBD changes require scheduling on the Master Surveillance Schedule per RSAP-1601 ?	NO
17-- Does this procedure/LBD change impact the Cross-Index System in RSAP-1601 ?	NO

If the answer to any of the above questions is YES, then the Qualified Reviewer must coordinate the required procedure/LBD change(s) with the affected group(s). If this procedure/LBD change requires a change to an LBD, then the Qualified Reviewer shall ensure the resulting LBD change(s) are tracked on CTS per RSAP-0901. If this procedure/LBD change requires new or revised procedures for implementation, then the Qualified Reviewer shall ensure the required new procedure and/or procedure revision actions are placed on the appropriate Department tracking system or on CTS.

REVIEW DETERMINATION: [signature] DATE: 9-9-97

(QUALIFIED REVIEWER WHO SIGNED THE 50.59)

ADM-004, Rev. 17

EXHIBIT 9

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NOTE:
When free releasing material, the use of an instrument that has an audible response should also be used. The audible response can be used as an aid in indicating the presence of contamination above the release limit.

6.1.1. Loose Contamination Limit

NOTE:
When counting smears using an RM-14 with an HP-260 (or equivalent) to determine loose surface contamination consideration needs to be given to the length of time a smear is counted because of the background count rate. Per RP.311.VI.01, a frisker on slow response reaches 90% deflection in 22 seconds. With a 200 cpm background the Minimum Detectable Count Rate (MDCR) is 109 cpm. For a 150 cpm background the MDCR is 94 cpm and for a background of 100 cpm the MDCR is 70 cpm. Because of this , smear counting with a frisker should be conducted in a background of 100 cpm or less and not to exceed 150 cpm with the instrument on slow response.

6.1.1.1. The Beta Gamma loose surface contamination limit is 1000 dpm/ 100 cm^2. For large surface area (Maslin) smears, the limit is 750 ccpm/ ft^2 Beta Gamma in accordance with RP.305.09.

6.1.1.2. The loose Alpha surface contamination limit is 20 dpm/ 100 cm^2.

NOTE:
Alpha contamination surveys need only be performed if there is reason to believe that alpha contamination is present or suspected of being present.

6.1.2. Fixed Contamination Limit

The fixed contamination limit is 100 corrected counts per minute (ccpm) fixed Beta Gamma contamination as measured with an RM 14 with an HP 260 probe (or equivalent). (COMMITMENT: Ref. 2.2.2)

6.1.2.1. Move the detector not more than 2 inches per second at a distance of no more than one half inch from the surface being surveyed.

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PROCEDURE NUMBER RP. 305. 09 A REVISION NUMBER 7

PROCEDURE TITLE Removal of Tools and Equipment from Connection Arts

EXHIBIT 9

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REVIEW RESULTS

Explain any "No" response in Comments section below.

(1)	Complies with current administrative requirements (e.g.; applicable procedure writing guidelines, format and content specifications, Protection of 10 CFR 73.21 Safeguards Information Program, management policies).	[X] Yes [ ] No
(2)	Complies with the ALARA Program and current licensing and design basis documents (e.g.; Tech Specs, DSAR, Quality Manual, Emergency Plan, Physical Security Plan, System Design Basis, etc.).	[X] Yes [ ] No
(3)	References, definitions, and terms identified in the body of the procedure are valid.	[X] Yes [ ] No
(4)	Technically accurate (i.e.; can accomplish stated purpose as written).	[X] Yes [ ] No
(5)	Functionally adequate (i.e.; can be safely and efficiently performed as written).	[X] Yes [ ] No
(6)	Procedure is complete and without any outstanding temporary changes.	[X] Yes [ ] No
(7)	Procedure reflects the current condition of the unit.	[X] Yes [ ] No

COMMENTS _____

Reviewer _____ *Signature* DENNIS GARDNER *Name Printed* 9.9.97 *Review Date*

FINAL DISPOSITION

Level Department Superintendent (Signature/Date

PROCEDURE CHANGE REQUEST AND APPROVAL

TEMP CHANGE NO: ____ Page ____ of ____

PROCEDURE NO: RP 305.09 A REV: 7

PROCEDURE TITLE: Removal of Tools and Equipment from Controlled Areas

INITIATE

PROCEDURE ACTION: NEW ____ REVISION X EDITORIAL ____

VOID ____ SUPERSEDED BY: ____

REASON FOR CHANGE: ADD RAS - 247, clarify NRC commitment item

DESCRIPTION OF CHANGE: ADD RAS -247 AND INSTRUCTION

ORIGINATOR: DENNIS E. GUDDICK MS: N403 DATE: 9-9-97

RESPONSIBLE DEPARTMENT AUTHORIZATION: [signature] DATE: 9-9-97

TEMP CHANGE

TEMPORARY CHANGE TO BE MADE PERMANENT? YES ____ NO ____

IF NOT TO BE MADE PERMANENT ENTER EXPIRATION DATE: ____

APPROVED: ____ DATE: ____

CERTIFIED FUEL HANDLER OR PLANT ENGINEER

APPROVED: ____ DATE: ____

SHIFT SUPERVISOR

DOC CONTROL: INITIAL ____ DATE: ____

(FINAL APPROVAL MUST BE OBTAINED WITHIN 14 DAYS)

APPROVAL

APPROVED: W Wilson DATE: 9/9/97

AREA SUPERVISOR (RSAPs, SPIPs, SPLAN, EPIPs, EPLAN, OOCM, REMP, PCP, STP, RSOM, DFPP - PLANT MANAGER)

FORWARD TO PRC COORDINATOR

APPROVED: Richard Thomas Lemei DATE: 9/10/97

PLANT REVIEW COMMITTEE

RECOMMENDED APPROVAL BY MSRC: YES ____ NO X

REVIEWED: N/A DATE: ____

MANAGEMENT SAFETY REVIEW COMMITTEE

ADM-013 REV. 10

EXHIBIT 9

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PROCEDURE No.: RP.305.09A REV: 6

RE: Removal of Tools & Equipment From Controlled Areas

REVIEWER				CONCURRENCE	
SEQUENCE	AREA	NAME	M/S	SIGNATURE/FOR	DATE
	DAGM	DEPUTY AGM, OPERATIONS	252		
	MPC&D	MGR PLANT CLOSURE & DECOM	257		
	TS	TECHNICAL SERVICES SUPT	231		
	TS	SURVEILLANCE SCHEDULER	253		
	QA	NUC QUALITY ASSURANCE	251		
	MTC	MAINTENANCE SUPERINTENDENT	253		
	OPS	OPERATIONS SUPERINTENDENT	236		
	SEC	SECURITY OPERATIONS SPVR	210		
2	RP	RP / CHEM SUPERINTENDENT	244	W W Wilson	8/18/97
	MPC&D	DECOMM PROJECT MANAGER	257		
	PUR	PURCHASING & CONTRACTS	50		
	MPC&D	PRC / MSRC COORDINATOR	258		
1	RP/Chem	Dennis Gardiner	N403	D Gardiner	8-18-97

QUESTION	YES/NO
Does this procedure/LBD change require (1) a change to an LBD, (2) development of new procedures, and/or (3) revision(s) to existing procedure(s) ?	No
Does this procedure/LBD change or other resulting procedure/LBD changes require scheduling on the Master Surveillance Schedule per RSAP-1601 ?	No
17-- Does this procedure/LBD change impact the Cross-index System in RSAP-1601 ?	No

If the answer to any of the above questions is YES, then the Qualified Reviewer must coordinate the required procedure/LBD change(s) with the affected group(s). If this procedure/LBD change requires a change to an LBD, then the Qualified Reviewer shall ensure the resulting LBD change(s) are tracked on CTS per RSAP-0901. If this procedure/LBD change requires new or revised procedures for implementation, then the Qualified Reviewer shall ensure the required new procedure and/or procedure revision actions are placed on the appropriate Department tracking system or on CTS.

REVIEW DETERMINATION: [illegible] DATE: 8-14-97

(QUALIFIED REVIEWER WHO SIGNED THE 50.59)

ADM-004, Rev. 17

EXHIBIT 9

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SCOPE OF REVISION:

1. Add Enclosure 8.2 and instructions.

THIS PROCEDURE MANUAL IS MAINTAINED BY DOCUMENT CONTROL - PROCEDURE [illegible] REFLECTS THE LATEST REVISION.
ASSIGNED TO MANUAL # 1

1 PURPOSE

1.1 Define the requirements for the removal of non contaminated AND radioactively contaminated tools and equipment from controlled areas of the plant.

1.2 This procedure does not apply to the removal of other items such as greases, lubricants, etc., which is described in RP.305.09.

2 REFERENCES/COMMITMENT DOCUMENTS

2.1 References

2.1.1 NRC IE Circular 81-07: Control of Radioactive Contaminated Material

2.1.2 RP.305, Radiation Protection Plan

2.1.3 RP.305.04, Radiation Work Permits

2.1.4 RP.305.07, Area Definitions, Posting, and Requirements

2.1.5 RP.305.09, Contamination Limits and Control for Plant Surfaces

2.1.6 RP.305.09B, Personnel Contamination Monitoring

2.1.7 RP.305.09C, Decontamination Procedures

2.1.8 RP.305.09E, Hot Particle Controls

2.1.9 RP.305.22, Departmental Training and Qualifications.

2.1.10 RP.309.II.09, Segregation and Release of Non Contaminated Waste

2.2 Commitments Documents

2.2.1 Notice of Violation, NRC letter of March 3, 1983

2.2.2 IE Information Notice No. 85-92: Surveys of Wastes Before Disposal From Nuclear Reactor Facilities

3 DEFINITIONS

3.1 FREE RELEASE Releasing an item from all radiological controls after proving it to be below the limits specified in RP.305.09A.

3.2 HOT PARTICLES Highly radioactive, (activity greater than 5000 ccpm at 0.5 inches with an RM-14 equipped with an HP-260 probe or equivalent) discrete, small particles of either irradiated fuel fragments or neutron activated corrosion and wear products.

4 PREREQUISITES

4.1 All personnel performing this work shall read, sign, and comply with the RWP requirements in accordance with RP.305.04.

4.2 RP Techs must be qualified in accordance with RP.305.22 prior to being permitted to perform Free Release Surveys.

5 PRECAUTIONS

None

6 PROCEDURE

INDEX

6.1 Contamination Limits
6.1.1 Loose Contamination Limit
6.1.2 Fixed Contamination Limit
6.2 Removal of Items from Contaminated Areas of the Plant.
6.3 Free Release of Items from Controlled Areas of the Plant

6.1 Contamination Limits

Tools and equipment are not Free Releaseable if greater than the limits specified below. Surveys are performed by a qualified RP Tech.

6.1.1 Loose Contamination Limit

6.1.1.1 The Beta Gamma loose surface contamination limit is 1000 dpm/100cm2. For large surface area (Maslin) smears, the limit is 750 ccpm/ft2 Beta Gamma in accordance with RP.305.09.

> *NOTE*
> Alpha contamination surveys need only be performed if there is reason to believe that alpha contamination is present or suspected of being present.

6.1.1.2 The loose Alpha surface contamination limit is 20 dpm/100cm2.

6.1.2 Fixed Contamination Limit

The fixed contamination limit is 100 corrected counts per minute (ccpm) fixed Beta Gamma contamination as measured with an RM 14 with an HP 260 probe (or equivalent). (COMMITMENT: Ref. 2.2.2)

6.1.2.1 Move the detector not more than 2 inches per second at a distance of no more than one half inch from the surface being surveyed.

6.1.2.2 When frisking items for release from radiological controls, the background should be <100 cpm and must be <300 cpm.

6.2 Removal of Items from Contaminated Areas of the Plant

6.2.1 Remove items from Hot Particle Zones in accordance with RP.305.09E.

6.2.2 Items to be removed from a Contaminated Area must be surveyed by a Radiation Protection Technician prior to removal from the area OR be bagged or wrapped, at the Step-Off-Pad and taken to a Control Point or other designated survey area. (Control Points may be established in various areas of the plant during heavy work periods.)

6.2.2.1 The individual responsible for the items found to be contaminated in excess of the limits of 6.1.1, bags or wraps the items.

6.2.2.2 Items known (or suspected) to contain Hot Particles must be wrapped under the supervision of an RP Technician.

6.2.3 (RP Tech) Label the item in accordance with RP.305.07.

6.2.3.1 (RP Tech) Identify and handle material contaminated with Hot Particles in accordance with RP.305.09E.

6.2.3.2 (RP Tech) Survey the outside of the wrapping to ensure that it is less than the limit of 6.1.1.1.

6.2.3.3 All material that is removed from areas with known or suspected Alpha contamination greater than the limit of 6.1.1.2 shall be monitored for Alpha.

6.2.4 Items less than the limit of 6.1.1, but in excess of the limits of 6.1.2 do not have to be wrapped, but must be identified with a Radioactive Material Tag, label or tape. These items shall not be removed from the Radiological Controlled Area without permission from RP Supervision and their use controlled by an RWP per RP.305.04.

6.2.5 All personnel with tools and/or equipment, under their control, that are contaminated in excess of the limits of section 6.1.1 are responsible for ensuring that they are decontaminated in accordance with RP.305.09C prior to being Free Released.

6.2.5.1 When items require special decontamination, the person or group responsible for the item contacts RP Supervision for assistance.

6.2.6 Tools normally used in Contaminated Areas are maintained in the Auxiliary Building Tool Room, the Hot Machine Shop, or in specific marked storage areas set aside for this purpose.

6.2.6.1 Consider ALARA, (i.e. dose rate and contamination levels of tools versus location and duration of use) prior to using tools from these areas.

6.2.6.2 Tools contaminated with up to 10,000 dpm/100 cm^2 loose contamination and < 2 mr/hr (contact) fixed Beta Gamma contamination will be properly labeled, stored in the above specified areas, and reused under RWP control.

6.2.6.3 Items which cannot be decontaminated below 10,000 dpm/100 cm^2 loose contamination and/or < 2 mr/hr (detector center < 2 inches) fixed contamination will be bagged in a yellow bag, labeled properly, have a SAVE tag attached and placed in specified areas established for radioactive material storage. (The item owner/user is responsible for completing and attaching the SAVE tag).

6.3 Free Release of Items from Radiological Controlled Areas of the Plant

6.3.1 Free Release Criteria

6.3.1.1 All materials being removed from the Radiological Controlled Area must be surveyed by an RP Tech to be less than the limits of 6.1 (Commitment: Ref. 2.2.1).

6.3.1.2 Small personal items (Security badges, dosimeters) that have successfully been monitored in accordance with RP.305.09B are exempt from additional Free Release monitoring.

6.3.2 Do not place Contamination and Radiation Release Tags on equipment and/or tools SUSPECTED of being contaminated, AND that by design, cannot be surveyed to insure that internal contamination does not exist in inaccessible areas.

6.3.2.1 Equipment or tools which can not be surveyed internally are not Free Releasable, and are treated as contaminated until proven otherwise.

6.3.2.2 In accordance with USNRC IE Circular 81-07, an evaluation may be performed on material, (that by nature of it's use would not be suspected of being contaminated) based on the survey results at the openings to determine the material non contaminated and capable of being Free Released.

6.3.3 Use of Contamination and Radiation Release Tags.

NOTE
One Release Tag may be used for several items in the same container.

6.3.3.1 (RP Tech) Identifies all items with a Contamination and Radiation Release Tag (Enclosure 8.1) that are not immediately claimed upon completion of the release survey, and places outside the Radiological Controlled Area.

6.3.3.2 When filling out a Release Tag the RP Tech will complete, print name, and sign the tag.

6.3.3.3 (Worker) Removes the tag after the item leaves the Radiological Controlled Area and/or prior to disposal or use.

6.3.4 Trash being removed from the Radiological Controlled Area for Free Release will be monitored in accordance with RP.309.II.09.

6.3.5 Removal of Contaminated Items from the Radiological Controlled Area.

6.3.5.1 An item that cannot be Free Released, yet must be removed to or transported through the uncontrolled areas of the plant, may be removed provided the item is properly bagged/wrapped OR if the exterior is clean, all openings are sealed, AND is labeled in accordance with RP.305.07 and is controlled by an RWP.

6.3.5.2 If work is to be performed on items referenced in 6.3.5.1, the area where the activity is to be performed shall be posted in accordance with RP.305.07.

6.3.5.3 A RP Tech must supervise the radiation control measures taken to complete the work.

7 RECORDS

The following individual/packaged documents and related correspondence completed as a result of the performance or implementation of this procedure are records. They shall be transmitted to Records Management in accordance with RSAP 0601, Nuclear Records Management.

→← Incremental Decommissioning Radiation Monitoring Log (RAD-245)

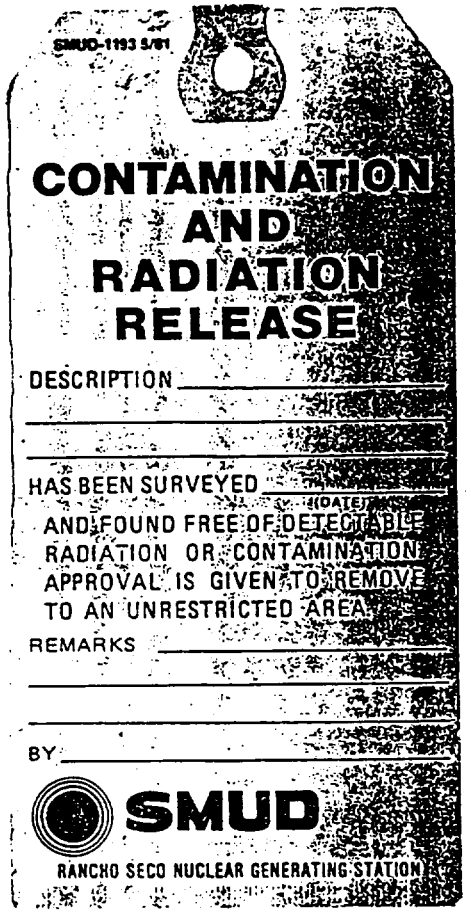
8 ENCLOSURES

8.1 Contamination and Radiation Release Tag

→← 8.2 Incremental Decommissioning Radiation Monitoring Log (RAD-245) and instructions

CONTAMINATION AND RADIATION RELEASE TAG

(Sample)



(Green & black)

→ INCREMENTAL DECOMMISSIONING RADIATION MONITORING LOG INSTRUCTIONS

1. All equipment, systems and components removed during Incremental Decommissioning will be monitored for radiation and contamination. The results of the survey will be recorded on a Incremental Decommissioning Radiation Monitoring Log sheet or a survey map similar to Enclosure 8.1 of RP.305.08A.

2. Survey types

2.1. Category 1

Category 1 surveys consist of external radiation and contamination monitoring including accessible openings. Category 1 surveys are performed on systems not known or suspected of being contaminated.

2.2. Category 2

Category 2 surveys consist of external and internal radiation and contamination monitoring or monitoring that will demonstrate that the external and internal surfaces meet the Free Release criteria of RP 305.09A Section 6.1. Category 2 surveys are required for systems known or suspected of being contaminated. In evaluating the radioactivity on inaccessible surfaces (e.g., pipes, drain lines, and duct work), measurements at other appropriate access points may be used for evaluating contamination provided the contamination levels at the accessible locations can be demonstrated to be representative of the potential contamination at the inaccessible surfaces. Otherwise, the material should not be released for unrestricted use.

2.3. Category 3

Category 3 surveys consist of a radiation survey on contact with a container or pallet of clean monitored material using an Eberline PRM.7 (or equivalent) meter. Clean monitored material is normally placed in an area or container labeled "Released Material Storage Area" until the Category 3 survey is performed. Category 3 surveys should be performed on all aggregate quantities of materials released for unrestricted use following a Category 1 survey. Any survey reading 5 μr/hr above background should be investigated. ←

Incremental Decommissioning Radiation Monitoring Log

Date: _____

IDT Package No. _____

Item Description	System Code	Size	Quantity	Units	Contamination Levels				Inst. Code[2]	Disposition (R, D, W, H or specify)[3]	Initial
					Loose βγ		Fixed βγ	Bkg.			
					Activity	Units[1]	Activity (dpm)	(cpm)			

SAMPLE

Instrument Data

Code[2]	Model #	Serial #	Calib. Due
A			
B			
C			

Surveyor Data

Print Name	Signature	Initial

Remarks

Reviewed By: _____ Date: _____

NOTES: 1 – "D" =dpm/100cm², "C" =cpm/ft²
2 – Match the code of the instrument used with the appropriate instrument data
3 – "R" =released "D" =sent to decont "W" =sent to radwaste "H" =sent to haz. waste

RAD-345 (Rev. 0)

Page 1 of 1

ATTACHMENT TO PRW 37638
TECHNICAL AND QUALITY REQUIREMENTS

TECHNICAL AND QUALITY REQUIREMENTS:

1) This purchase order is for certified radioactive calibration standards. These standards shall consist of the Cs-137 radionuclide which is representative of the dominate nuclide for contamination in the plant and in rad waste according to the RP Dept. These sources will be used to calibrate Count Rate Instruments listed in Fiq. 1 of RP.311 Rev. 3. The calibration procedures have not been written yet, however, they will be per the guidelines of ANSI N323-1978; "Radiation Protection Instruments Test and Calibration" and IN 93-30. The primary purpose of this Countrate Instrumentation is to determine if there is contamination by measuring swipes and with area probes. The definitions of contamination are in RP 305.09A and 10 CFR 20.205(b)(2). The requested Calibration Sources shall be representATive of swipes taken from a 100 cm^2 area. These swipes are 2 inches in diameter with a 2 Pi steradian emission with an active diameter of about 1.5 inches. These sources will not be able to determine the area probe detector efficiencies used for monitoring floors or other areas directly since they do not represent that geometry.

2) These standards are used as part of the Rad. Waste Control and are subject to Quality per RSQM sections II, IV, VII and RSAP-0409.

3) Per RSQM Section VII section 4.1 (a) and 4.2, the supplier shall be on the Approved Supplier List.

4) A RIDR is required.

5) A Certificate of Calibration shall accompany the standards. This certification shall include the following data:

   * Source ID Number

   * Reference time

   * Radionuclide

   * Total Activity

   * Overall or Total Uncertainty of measurement associated with each radionuclide of +/- 5% with a 99.7% confidence.

   * A statement of NIST traceabily

EXHIBIT 9
PAGE 478 OF 506 PAGE(S)

ITEM NO.	QUANTITY	UNIT OF MEAS.	Q CLASS	MATERIAL CODE	FOR STOCK Y-N	MIN STK	DESCRIPTION Name, Type, Size, Composition, Rating, Codes, Etc.	ACCOUNTING INFORMATION AREA	DISTRIBUTION	COST ELEM	PROP UNIT	ESTIMATED UNIT PRICE
1	2	EA	2RW		N		Set of Beta (Cs-137) Standard Sources, Class 2 with a stated overall uncertainty of +/- 5% with a 99.7% confidence, planchet geometry with an active diameter of 36mm and an overall diameter of 47mm and 3mm thick, homogeneous distribution, NIST traceable, Amersham PN: WRS-3. (or equivalent)	604	465030	333		$3,275
							One source ~~1000~~ 1200 dpm (~~16.7~~ 20.0 Bq) (+20%, +0%)					
							One source 2500 dpm (41.7 Bq) (+/- 30%)					
							One source 25,000 dpm (416.7 Bq) (+/- 30%)					
							One source 250,000 dpm (4166.7 Bq) (+/- 30%) (see cont. Sheet)					
							One Source ~~2,500,000~~ 2,220,000 dpm (~~41666.7~~ 37,000 Bq) (+/- 30%)					

EXHIBIT 9 PAGE 479 OF 506 PAGE(S)

MATERIAL SAFETY DATA SHEET REQUIRED: ☐ YES ☒ NO (SEE SDP 705-1)
MATERIAL SAFETY DATA SHEET ON FILE: ☐ YES ☒ NO, IF "YES" DATE:

IS REQUEST FOR M&TE ☐ YES ☒ NO
IF "YES" FORWARD TO CAL LAB M.S. 242

TOTAL ESTIMATED PRICE $ 6,550.0

CONTRACT NO.: 1
REASON FOR PURCHASE:
RECOMMENDED SUPPLIER: AMERSHAM
LOCATION: 1-800-323-6695
WRN:
ECN:
SYSTEM I.D.:
ITEMS REQUIRED FOR OUTAGE ☐ YES ☐ NO
☒ RIDR ATTACHED
INITIALS: JS
QUALITY CL ☐ I ☒ II ☐ III ☐ FP ☒ RW
DATE NEEDED: 6/2/97
DELIVER TO: Rancho Seco
NOTIFY: Bruce Rogers
MAIL STOP: N403 EXT: 4853
PROCUREMENT LEVEL ☐ I ☐ II ☐ III ☐ IV N/A
CME NO. N/A
SPECIFICATION NO.
DRAWING NO.
PLANT EQUIP. I.D.
EQ ITEM ☐ YES ☒ NO
PROC. ENGR. DATE 5/6/97
PREPARED BY: B Rogers / J Sawm
RESP CENTER
DATE
SUPV. APPROVAL DATE 5-6-97
QA DATE 5/6/97
DEPARTMENT: Nuclear RP/CHEMISTRY
EXT. 4853
ADMINISTRATIVE DATE 5/6/97
EQ USE
DATE

SMUD-1611 1/87

PURCHASE REQUISITION
(CONTINUATION SHEET)

PRW 31650

ITEM NO.	QUANTITY	UNIT OF MEAS.	Q CLASS	MATERIAL CODE	FOR STOCK Y-N	MIN STK	DESCRIPTION Name, Type, Size, Composition, Rating, Codes, Etc.	ACCOUNTING INFORMATION AREA	DISTRIBUTION	COST ELEM	PROP UNIT	ESTIMATED UNIT PRICE
							A Certificate of Calibration					
							shall accompany these standards.					
							This certificate shall include					
							the following data:					
							* source ID number					
							* Reference time					
							* Radionuclide					
							* Total Activity					
							* Overall or Total Uncertainty					
							of measurement associated					
							with each radionuclide of					
							+/- 5% with a 99.7 confidence					
							* A statement of NIST traceability					
							* Dimensions					
							* Surface Emission Rate					
							* Date of Leak test					
							This Purchase is Subject					
							to Quality. ~~See attached~~					
							~~Tech. & Qual Requirements~~					

EXHIBIT 2 PAGE 480 OF 506 PAGE(S)

SMUD-1611a 12/86

CSR ATTACHMENT

PRW
~~CSR~~ NO. 37638

[ ] Commercial Grade
[X] QA Class 2
[ ] QA Class 3
[ ] 10CFR71/72 Important to Safety

PART SUBSTITUTION

PS2A [X] The supplier shall not substitute other items for the items requested without specific written District approval prior to shipment.

SDR [X] If the supplier identifies a change, nonconformance, or seeks waivers from other requirements of this Purchase Order, the supplier shall describe such conditions on the attached Supplier Disposition Request (SDR). This information shall be transmitted, in writing, to Rancho Seco Plant Procurement.

MARKING & TAGGING INSTRUCTIONS

MT1 [X] Shipping containers or cartons are to be clearly marked or tagged with the Purchase Order Number. Packing slips to be shipped with order.

MT1B [ ] All items to be packaged individually and identified with the specific part number or all items of a given part number to be packaged together and identified with the specific part number and the following:

MT02 [ ] Material Specification, Description or Composition

MT03 [ ] Lot or Batch Control Number

MT04 [ ] Heat Number or Code

MT05 [ ] Serial Number/Part or Piece Number

MT06 [ ] Shelf Life - Supplier shall not ship any item which has less than _____ (Yr/Mo) remaining shelf life at time of shipment. The supplier shall provide shelf-life data by any one of the following methods:

- Expiration Date
- Cure date and material composition

If the above requirements are not met, the material will be shipped back to the supplier at the supplier's expense.

MT6A [ ] The supplier is unable to meet the requirements for shelf-life information. Shelf-life must be determined by Materials Engineering evaluation (via SLDS).

SHIPPING INSTRUCTIONS

SH02 [X] Supplier shall provide packaging and shipping methods for protection from the effects of temperature extreme, humidity and in-transit shocks and jarring.

[ ] Other Requirements _____

Engineer _____ Date 5/6/97

MTL-006 REV. 11

RECEIVING INSPECTION DATA REPORT
Ref: RSAP-0808

17 RIDR # QA- 9970

DATE RECEIVED

18 SHIPMENT STATUS [ ] FULL SHIPMENT [ ] PARTIAL (#) FINAL [ ]

1 QUALITY CLASS 1 2 3 FP RW

2 PROCUREMENT LEVEL I II III IV

19 CONTRACT/P.O./C/N # 3 PRW/SRRE 37638

20 VENDOR NAME AMERSHAM

21 SHIPPING POINT

4 SPEC./DWG 5 MODEL # 6 ECN # 7 WR #

22 COMPONENT NAME Beta Cs-137 Standard Sources

23 LINE ITEM #'s 1

25 PDQ # 12 SIDR#/PO SUPPORTING TESTING

EQ ITEM 8 Yes [ ] No [X]

9 MEE #

10 IN STORAGE MAINTENANCE ITEM Yes [ ] No [ ]

14 ASL Verification (Applicable for Procurement Level I & II ONLY)

Supplier/Supplier Location is listed in the ASL: YES X NO ___

****

The signatures below signify that this RIDR complies with the requirements of RSAP-0808 and its referenced Procurement Documents.

Jim Sawm [signature] 5/7/87

13 PREPARED BY PROCUREMENT ENG DATE

15 QE Review Required Yes [ ] No [X] (No = QC to release) W Koepke 5/7/87

16 APPROVED BY Quality Engineer DATE

26 QC INSPECTOR (Print) SIGN DATE

28 CONDITIONAL RELEASE YES [ ] NO [ ]

27 COMMENTS: _____

29 ANI Review of ASME Code Items - SIGN DATE

30 MATERIAL RELEASED FOR USE (Quality)

ADM-100 Rev. 4

EXHIBIT 9

17 RIDR# QA- 9970

REQUIRED YES 11	NO	INSPECTION CRITERIA	ACCEPTABLE 24	APPLICABLE LINE ITEM	PDQ NO. 25
		I. Visual Inspection			
[X]		a. Physical Damage	[ ]	_____	_____
[X]		b. Cleanliness	[ ]	_____	_____
[X]		c. Accountability	[ ]	_____	_____
		NOTE: 1) Record on attached P.O. quantities received. 2) For reverification, record quantities/PN's/SN/s.			
[X]		d. Identity and Marking	[ ]	_____	_____
		Verify that identification and markings on the packaging and/or material received are in accordance with the applicable purchase order, quantity requirements, specifications, and part number.			
		II. Mechanical			
[ ]	[ ]	a. Dimensional Conformance	[ ]	_____	_____
		Per: _____			
[ ]	[ ]	b. Permanent Material Stamping Requirements Per Code _____	[ ]	_____	_____
[ ]	[ ]	1. Record Heat No.(s) on Attached P.O.: [ ] Stenciled (Tubing Only) [ ] Stamped# (May be done on receipt) [ ] Tagged			
[ ]	[ ]	2. Manufacturer name or symbol (Record)	[ ]	_____	_____
[ ]	[ ]	3. Size_____	[ ]	_____	_____
[ ]	[ ]	4. Grade_____	[ ]	_____	_____
[ ]	[ ]	5. Service rating is_____	[ ]	_____	_____
[ ]	[ ]	6. Material type_____	[ ]	_____	_____
[ ]	[ ]	7. ASME Class_____	[ ]	_____	_____
[ ]	[ ]	8. Other:_____	[ ]	_____	_____
[ ]	[ ]	c. Protective Covers and Seals	[ ]	_____	_____
		Specify: _____			
[ ]	[ ]	d. Coatings and Preservatives	[ ]	_____	_____
		Specify:_____			

26 _____ QC Inspector / Date

RECEIVING INSPECTION DATA REPORT

17 RIDR# QA-9970

REQUIRED YES 11	NO	INSPECTION CRITERIA	ACCEPTABLE 24	APPLICABLE LINE ITEM	PDQ NO. 25
		III. Electrical			
[ ]	[ ]	a. Cable Marking	[ ]		
		Specify:			
[ ]	[ ]	b. Verify reel marking "Stand Reel on Rim Only:	[ ]		
[ ]	[ ]	c. Verify reel metal tag securely attached and contains following information:	[ ]		
		[ ] 1. Contract No.	[ ]		
		[ ] 2. Item No.	[ ]		
		[ ] 3. Reel No.	[ ]		
		[ ] 4. Length of cable	[ ]		
		[ ] 5. Size of Conductor	[ ]		
		[ ] 8. Other:	[ ]		
[ ]	[ ]	d. Soldering	[ ]		
[ ]	[ ]	e. Overheating discoloration	[ ]		
[ ]	[ ]	f. Printed circuit boards	[ ]		
[ ]	[ ]	g. Lugging	[ ]		
			RECEIVED YES NO		
		IV. Special Tests To Be Performed At Time of Receipt			
[ ]	[ ]	a. Contact _____ Department			
		Ext. _____ to perform Test Procedure			
		(Time and date of call) _____)			
[ ]	[ ]	b. Instruct Department to develop a Work Request per RSAP-0803. (Name of person contacted _____)	[ ] [ ]		
		c. Test results received from a & b	[ ] [ ] WR #		
		d. Other			

26 QC Inspector / Date

RECEIVING INSPECTION DATA REPORT

17 RIDR# QA- 9970

REQUIRED YES 11	REQUIRED NO	INSPECTION CRITERIA	RECEIVED YES 24	RECEIVED NO	APPLICABLE LINE ITEM	PDQ NO. 25
		V. Documentation				
[X]	[ ]	a. Certificate of ~~Conformance~~ Calibration to: see attached	[ ]	[ ]		
[ ]	[X]	b. Certified Material Test reports				
		[ ] 1. Chemical	[ ]	[ ]		
		[ ] 2. Physical	[ ]	[ ]		
		[ ] 3. Charpy	[ ]	[ ]		
		[ ] 4. Other _____	[ ]	[ ]		
[ ]	[ ]	c. ASME Code Data Reports _____	[ ]	[ ]		
[ ]	[ ]	d. Weld Records	[ ]	[ ]		
[ ]	[ ]	e. ASME Supplementary Tests Reports	[ ]	[ ]		
[ ]	[ ]	f. Vendor Nonconformance Reports	[ ]	[ ]		
[ ]	[ ]	g. Flame Test (IEEE 383 1974)	[ ]	[ ]		
[ ]	[ ]	h. Environment Qualification Certification (IEEE 323 1974) Test #(s)_____	[ ]	[ ]		
[ ]	[ ]	i. Seismic Certification (IEEE 344 1975) Test #(s)_____	[ ]	[ ]		
[ ]	[ ]	j. Calibration Records	[ ]	[ ]		
[ ]	[ ]	k. Special Performance Test Results Specify:_____	[ ]	[ ]		
[ ]	[ ]	l. NDE Reports				
		[ ] 1. Ultrasonic	[ ]	[ ]		
		[ ] 2. Magnetic Particle	[ ]	[ ]		
		[ ] 3. Liquid Penetrant	[ ]	[ ]		
		[ ] 4. Radiographic	[ ]	[ ]		
		[ ] 5. Other:_____	[ ]	[ ]		

26 _____
QC Inspector / Date

ADM-100 Rev. 4

EXHIBIT 9

17 RIDR# QA- 9970

11 REQUIRED YES	NO		
[ ]	[X]	o.	SMUD Technical Services Engineer shall verify that Vendor Technical submittals are in the "APPROVED" status and the Technical documentation attached to the RIDR is acceptable. Contact_____/_____ Ext. Signature/Date _____

REQUIRED YES	NO	INSPECTION CRITERIA	ACCEPTABLE 24	APPLICABLE LINE ITEM	PDQ NO. 25
		VI. Storage Requirement for Tagging			
		[ ] a. ANSI N45.2.2 (1972) Level A			
		[ ] b. ANSI N45.2.2 (1972) Level B			
		[ ] c. ANSI N45.2.2 (1972) Level C			
		[ ] d. ANSI N45.2.2 (1972) Level D			
[ ]	[X]	e. Verify cure date and shelf date - rubber products/ elastomers - OR - expiration date indicated on package.	[ ]	_____	_____
[ ]	[X]	f. Shelf Life Certification (Per PO)	[ ]	_____	_____
[ ]	[X]	g. Request for "In-Storage Maintenance Evaluation" form MTL-014 attached to equipment being placed in storage.	[ ]	_____	_____
[ ]	[X]	VII. Other Requirements Specify:_____	[ ]	_____	_____

INSPECTORS COMMENTS

_____

_____

_____

_____

26 QC Inspector / Date

ATTACHMENT TO RIDR # QA-9970

A Certificate of Calibration shall accompany the standards. This certification shall include the following data:

* Source ID Number

* Reference time

* Radionuclide

* Total Activity

* Overall or Total Uncertainty of measurement associated with each radionuclide of +/- 5% with a 99.7% confidence.

* A statement of NIST traceabily

* Dimensions

* Beta Surface Emission Rate

* Date of Leak Test

ITEM NO.	QUANTITY	UNIT OF MEAS	Q CLASS	MATERIAL CODE	FOR STOCK Y-N	MIN STK	DESCRIPTION Name, Type, Size, Composition, Rating, Codes, Etc.	ACCOUNTING INFORMATION AREA	DISTRIBUTION	COST ELEM	PROP UNIT	ESTIMATED UNIT PRICE
1	2	EA	2		N		Radioactive Source Set with the following	604	465030	333		$1600
							specifications:					
							Four Cs 137 Beta Standard Sources, NIST traceable,					
							<45 mm diameter active area disks, 0.9 mg/cm^2					
							mylar cover, with the following approximate					
							activities:					
							one source @ 2,500 dpm					
							one source @ 25,000 dpm					
							one source @ 250,000 dpm					
							one source @ 2,500,000 dpm					
							Cs 137 activity shall be evenly distributed					
							over active area of disks.					
							Sources certification must be provided.					
							Available from:					
							(See attached list)					

EXHIBIT 9
PAGE 488 OF 506 PAGE(S)

MATERIAL SAFETY DATA SHEET REQUIRED: ☐ YES ☒ NO (SEE SDP 705-1)
MATERIAL SAFETY DATA SHEET ON FILE: ☐ YES ☐ NO, IF "YES" DATE:

IS REQUEST FOR M&TE ☐ YES ☒ NO
IF "YES" FORWARD TO CAL LAB M.S. 242

TOTAL ESTIMATED PRICE $ 3200

CONTRACT NO.

REASON FOR PURCHASE

RECOMMENDED SUPPLIER:
LOCATION: See attached

WRN:
ECN:

SYSTEM I.D.:

ITEMS REQUIRED FOR OUTAGE ☐ YES ☐ NO

☐ RIDR ATTACHED
INITIALS:

QUALITY CL ☐ I ☒ II ☐ III ☐ FP ☐ RW

PROCUREMENT LEVEL ☐ I ☐ II ☐ III ☐ IV

DATE NEEDED: 6/2/97

DELIVER TO: Rancho Seco Nuclear Plant
NOTIFY: Bruce Rogers

MAIL STOP: N403 EXT: 4853

CME NO.

SPECIFICATION NO.

DRAWING NO.

PLANT EQUIP. I.D.

EQ ITEM ☐ YES ☒ NO

PROC. ENGR. DATE

PREPARED BY: Bruce Rogers

RESP CENTER

DATE 4/14/97

SUPV. APPROVAL

DATE 4/15/97

QA DATE

DEPARTMENT Nuclear RP/Chemistry

EXT. 4853

ADMINISTRATIVE

DATE 4/15/97

EQ USE DATE

SMUD-1611 1/87

Log 21010

Printed:
06/28/95
13:45:44

Rancho Seco Nuclear Generating Station
Commitment Tracking System
General CTS Report
STDRPT1

Page:
Report: C
Version: 0803
Table: C

CTS #: 51832 Rev:

System: CDS

XREF: PDQ #: DQ #: 95-0039 CCTS #: LRSL #:

Title: FR-95108 FAILED SP.482. THE FLOW TOTALIZER WAS OUT OF TOLERANCE >7% (8.4%)

Agency: SMUD

Resp Dept: Tech Svcs
Manager: Field, J.
Phone: 4038
Mail Stop: 231
Assigned:
Area:

Origin Dt: 06/01/95
Originatr: Curry, G.
Orig Dept: Maint
Storage Box:

Status : Open
Priority : 3
Mig Pri :
NRC Report:
CTS STage : Accepted Dispo
Stage Date: 06/28/95
Stage Dept: Tech Svcs
Stage Due Date: 07/30/
Final Due Date: 04/01/
Due Date Rev:
Sched Start:
Sched Finish:
Actual Start:
Actual Finish:

QA Req'd? :
Licensing Req'd? :
Reportable? : N
CCTS Closure? :
Hardware/Software: H

COPY

Description: During performance of SP.482, the flow totalizer portion of FR-95108 was found out of tolerance. The maximum deviation allowed is 7% and the calculated deviation was 8.38%.

Requirements: TECH SERVICES is to: (1) Revise SP.482 and SP.524 to increase the totalizer tolerances to account for a 20% totalizer estimated accuracy; (2) Reperform the totalizer calibration per revised SP.482. The actual flow data from the previously performed SP.482 may be transferred to the revised procedure; and (3) Reset the surveillance clock after the revised SPs (482 and 524) are first run. RP/CHEM is to report/explain the 20% estimated accuracy for the total volume of dilution water in the next Radioactive Effluent Report.

Response:

Comments: The CMRG reviewed this item on 06/05/95, determined it is a DQ, and assigned an action to Tech Services to perform a DQ Disposition, due 07/05/95. The CMRG reviewed and accepted the DQ Disposition on 06/07/95, and assigned actions to Tech Services and RP/Chem, due 07/30/95. The CMRG reviewed Revision 1 to the Disposition on 06/27/95, modified the Disposition in committee, and approved the modified Disposition. The CMRG assigned 3 actions to Tech Services, due 07/30/95, and one action to RP/Chem, due 04/01/96.

Related Documents: Document:	Rev:	CTS Code:	CCTS Type:
WR 8003447		O : Originating Document	
SP.482 PRO		O : Originating Document	

EXHIBIT 9
PAGE 489 OF 506 PAGE(S)

COMMITMENT COVER SHEET

☐ New
☐ Change CTS # _____

IDENTIFICATION - Originator #4-8 CTS/CCTS Only

1. Originator
Name: Richard Mannheimer Ext: 4916 Mail Stop: 250
Signature: Richard Mannheimer Dept: Licensing Date: 6/1/95

CTS #: 51832
REV. #: 0
DATE: 6/1/95

2. Source Documents (Attachments):
☐ PDQ # ☒ DQ # 95-0039, Rev. 1 ☐ CCTS # _____ ☐ LRSL # _____
☐ CAR (*) _____ ☐ OTHERS (SPECIFY) _____

3. Brief Title: FR 95109 Failed SP 482 out of tolerance > 7% (9.4%)

4. Description: _____

5. Related Documents: (O = Originating, X = Cross Ref, C = Closure)

Document	Type	Document	Type

N/A

6. Agency: _____
7. Priority: _____ 8. Reportable: Y N

DISPOSITION AND APPROVAL Commitment Mgmt. Review Group

9. ☒ Hardware ☐ Software 10. Regulatory Due Date: Y ☒ N Date: Original _____ Revised _____
11. Priority 3 12. Applicable Systems CDS

13. APPROVED:

	DEPARTMENT	DUE DATE
☐ Potential 10 CFR 21 / Reportability Review	LIC	
☐ PDQ Initiate W/R		
☐ PDQ Action		
☒ DQ Disposition	TS	~~6/12/95~~ SIR
☐ Accepted DQ Disposition/Close		
☒ Accepted DQ Dispo/Action Perform Remedial Preventive Actions	TS, RP	7/30/95
☐ Study		
☐ Design		
☐ Implement		
☐ Disapproved/Canceled		
☐ N/A in POL Phase		
☐ Superseded by CTS #		

Y N Will Control Room change occur as a result of the design change?

Chairman, Commitment Management Review Group — Date 6/5/95

CMRG Comments: Rev 1, same assignments — due date for item 1 remain ~~changed~~ 7/30/95. Item 2 - changed to 4/1/96 and new Item 4 - 7/30/95 Tech Services

CTS

ECN # _____ DCP # _____

ENTERED	DATE	VALIDATE	DATE	ENTERED	DATE	VALIDATE	DATE
RM	6/5/95	N/A RM	6/5/95	RM	6/7/95	N/A RM	6/7/95

NOTE: (*) CMRG approval not required.
ADM-256 Rev. 7

ENTERED BY RM 6/28/95
VALIDATED BY N/A RM 6/28/95

EXHIBIT 9
PAGE 490 OF 506 PA

POTENTIAL DEVIATION FROM QUALITY FORM

PDQ# 95-0039
REV# 1
6/1/95

PROBLEM IDENTIFICATION
ORIGINATOR

1. DATE OF OCCURRENCE: 6/1/95 TIME OF OCCURRENCE: 0730 AM PM
2. DATE OF IDENTIFICATION: 6/1/95 TIME OF IDENTIFICATION: 0730 AM PM
3. TIME SS NOTIFIED: 0730 AM PM 4. DEADLINE ASSIGNED BY SS: 1600 AM PM
5. SS NAME: Tom Barela
6. SYSTEM: CDS 7. EQUIPMENT ID: FR-95108
8. EQUIPMENT NAME: Outlet Flow Recorder 9. QUALITY CLASS: 2
10. PROBLEM DESCRIPTION: SP 482R8 Step 6.9.12.6 Flow totalizer was found out of spec. Max allowed deviation is 7% Calculated deviation was 8.38%

11. ASSOCIATED DCP, WR OR OTHER DOCUMENTS: WR# 80034470
12. AFFECTED DRAWINGS: N/A 13. P.O./CONTRACT: N/A
14. ORIGINATOR NAME: Gene Curry EXT: 4293 MAILSTOP: 253
ORIGINATOR SIGNATURE: Gene Curry DEPT: I&C DATE: 6/1/95
15. EQUIPMENT OPERATES IN PRESENT CONFIGURATION (FOR CONFIGURATION DISCREPANCIES): ☐Y ☐N
SUPERVISOR NAME: Don Wiles EXT: 4293 MAILSTOP: 253
SUPERVISOR SIGNATURE: Don Wiles DATE: 6-1-95

OPERATIONS REVIEW

16. POTENTIALLY REPORTABLE CONDITION: ☐Y ☒N PURSUANT TO:
17. TECH SPEC VIOLATION: ☐Y ☒N OPERABLE: ☐Y ☒N ☐NA CLEARANCE TAG REQ'D ☐Y ☒N
JUSTIFY IF NO LER REQUIRED:
This condition is not reportable per OAP.004A.

18. SS NAME: T. Barela
SS SIGNATURE: [signature] DATE: 6/1/95 TIME: 0904 AM PM

ACM-129 REV. 10 (RSAP-1308)

EXHIBIT 9

DEVIATION FROM QUALITY FORM

DQ # 95-CC39
REV # 1

PROBLEM DISPOSITION
ASSIGNED DEPARTMENT

19. DISPOSITION:

☐ ACCEPT-AS-IS ☐ REPAIR ☐ REWORK ☐ REPLACE
☐ INTERIM ACCEPT-AS-IS ☐ NOT A NONCONFORMANCE ☐ NON-HARDWARE
☒ DOCUMENT CHANGE

20. PROBLEM ANALYSIS AND RESOLUTION: (PROVIDE CAUSE, EXTENT, REMEDIAL AND PREVENTIVE ACTIONS UNDER SEPARATE HEADINGS)

See Continuation Sheet

21. DISPOSITION BY:

NAME: Jim Sawin EXT: 4987 DEPT: TS

SIGNATURE: [signature] DATE: 6/26/95

FOR ACCEPT-AS-IS OR REPAIR ONLY (NOT REQUIRED FOR NON-HARDWARE)

22. DESIGN OR DRAWING: ☐ Y ☐ N 23. RELATED DCPs OR TRANS. NO. _____

24. CALC No.: _____ 25. TEST No.: _____

26. ASME CODE: ☐ Y ☐ N

ANII

27. ANI/ANI REVIEW: _____ DATE: _____

ASSIGNED DEPARTMENT

28. COMMENTS:

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CMRG

29. TREND CODE: E-3

ADM-261 REV. 1 (RSAP-1310)

25. PROBLEM ANALYSIS AND RESOLUTION:

CAUSE:

The acceptance criteria of SP.482 Rev. 8 for the totalizer is a tolerance of 7% at the 9,000 gpm calibration point . This tolerance was based on ensuring a totalizer accuracy of 10%. The totalizer accuracy of 10% was determined by taking the square root of the sum of the squares of the errors involved including a calibration tolerance of 7%. This basis is stated in a memo from Dennis Gardiner to the CMRG (RPM 95-35) as follows: " The error reported for the total volume of dilution water listed in the Semi-annual Radiological Effluent Report is +/- 10%. This error was determined from the criteria of SP.482 Refueling Interval Plant Waste Water Flow Loop 95108 Calibration, Step 6.9.11 which states "verify actual flows are +/- 10% of indicated flows." Note, however, that the statement is incorrect by assuming that the calibration tolerance of 10% would yield an accuracy of 10%. This is not true since there are other errors in the system other than the 10% tolerance. Moreover, the referenced tolerance of 10% applied to the Flow Recorder not the Totalizer. However, the idea is correct in that the calibration tolerance is a primary factor in determining the estimated system accuracy.

The cause of the totalizer being out of spec. (o.o.s.) was due to trying to achieve the desired 10% totalizer accuracy which was previously reported to the NRC in the Semi-annual Report without the use of a correction factor as suggested in DQ 95-0012 Rev 1. The desired totalizer accuracy will therefore be increased to +/- 20% to avoid the use of a correction factor.

Historically, there has been a reluctance at this plant to use correction factors when recording instrument readings. Therefore, the device should have been originally specified and procured to have a means of adjusting and calibrating the totalizer without the use of a correction factor.

EXTENT:

The extent of this problem is limited to this particular instrument. The totalizer's indicated flow was found to be 8.38% less than actual flow thereby underestimating the amount of dilution water used.(i.e., in the conservative direction).

The combined effluent 30 day average flows reported monthly to the California Regional Water Quality Control Board were also underestimated. However, no limits have been placed on the amount or rate of the combined effluent waste water released or the accuracy of this flow measurement by the Board in the NPDES permit.

REMEDIAL ACTION:

1) Revise the surveillance procedures associated with the totalizer, SP 482 and SP 524, to increase the totalizer tolerances for a 20% totalizer estimated accuracy.

2) Report a 20% estimated accuracy for the total volume of dilution water parameter in the next Semi-annual Report.

3) Reperform the totalizer calibration (Step 6.12) per the revised SP. 482. The actual flow data from the previously performed SP 482 may be transferred to the revised procedure for this purpose.

PREVENTATIVE ACTION:

The revised SPs as described above should minimize future totalizer o.o.s. conditions.

Note: Per the long term repair disposition of DQ 95-0017, the totalizer will be replaced with a new instrument.

4) When revised SPs 482 & 524 are First run, Tech Services is to reset the surveillance clock based on the run date For the two revised SPs.

This Fourth item was added by the CMRG at the 6/27/95 CMRG Mtng.

RM 6/28/95

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PAGE 1 OF 2
ATTACHMENT A

DQ 95-0039

SACRAMENTO MUNICIPAL UTILITY DISTRICT

OFFICE MEMORANDUM

TO: Jim Field

DATE: June 21, 1995
RPM 95-067

FROM: Dennis Gardiner

SUBJECT: **SP 482 REFUELING INTERVAL PLANT WASTE WATER FLOW LOOP 95108 CALIBRATION AND SP 524 QUARTERLY CHANNEL TEST OF WASTE WATER FLOW RATE TOTALIZER**

The effort that went into the proposed revisions to SP 482 and SP 524 is greatly appreciated, but the revisions may not be necessary. There is no requirement for a specific accuracy for the waste water flow device other than that we impose on ourselves. The NRC only requires us to report the estimated accuracy of the measurement. The accuracy of the Totalizer as recently measured is acceptable to the Radiation Protection/Chemistry Group.

It is acknowledged that the total error for the reported volume of waste water leaving the site could be a number greater than 10% if a correction factor is not applied or other action is not taken. Rather than calculate a correction factor, I would propose that RP/Chem establish an accuracy requirement of 20% for the total effluent waste water flow measurement and that SP 482 and SP 524 need only verify that the instrument error portion of the total error will not result in exceeding a total error of 20%.

RP/Chem has reviewed previous effluent reports and finds that the total error recently calculated for the total waste water volumes reported has no impact on any previously reported off-site dose projections.

The review also revealed that several different error numbers for the total effluent volumes have been reported over the years.

Although not required by Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs - Effluent Streams and the Environment", in consideration of the extraordinary effort Technical Services and Instrument and Control has put into determining the accuracy of the waste water flow device, RP/Chem will use a 20% accuracy value in future reports and acknowledge that a more rigorous method

of error determination has been used to determine this value than the methods used to determine the error reported in previous reports.

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PAGE 2 OF 2
ATTACHMENT A

cc:
Steve Nicolls
Einar Ronningen
RIC 2A.750

1 of 11

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V
1990 N. CALIFORNIA BOULEVARD
SUITE 202, WALNUT CREEK PLAZA
WALNUT CREEK, CALIFORNIA 94596

May 14, 1981

IE Circular "81-07"
AF 8803220162
N-81-112

Docket No. 50-312

Sacramento Municipal Utility District
P. O. Box 15830
Sacramento, California 95813

Attention: Mr. John J. Mattimoe
Assistant General Manager

Gentlemen:

The enclosed circular is forwarded for your information. No written response to this circular is required. If you have any questions related to this matter, please contact this office.

Sincerely,

R. H. Engelken
Director

Enclosure:
IE Circular No. 81-07

cc w/enclosure:
R. J. Rodriguez, SMUD
L. G. Schwieger, SMUD

RECEIVED
MAY 15 1981
Construction Engineering

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PAGE 497 OF 506 PAGE(S)

Ltr to Rancho (4)

RECEIVED
MAY 15 1981
OFFICE OF GENERAL MANAGER

2

SSINS: 6830
Accession No.:
8103300375
IEC 81-07

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

May 14, 1981

IE Circular No. 81-07: CONTROL OF RADIOACTIVELY CONTAMINATED MATERIAL

Description of Circumstances:

Information Notice No. 80-22 described events at nuclear power reactor facilities regarding the release of radioactive contamination to unrestricted areas by trash disposal and sale of scrap material. These releases to unrestricted areas were caused in each case by a breakdown of the contamination control program including inadequate survey techniques, untrained personnel performing surveys, and inappropriate material release limits.

The problems that were described in IE Information Notice No. 80-22 can be corrected by implementing an effective contamination control program through appropriate administrative controls and survey techniques. However, the recurring problems associated with minute levels of contamination have indicated that specific guidance is needed by NRC nuclear power reactor licensees for evaluating potential radioactive contamination and determining appropriate methods of control. This circular provides guidance on the control of radioactive contamination. Because of the limitations of the technical analysis supporting this guidance, this circular is applicable only to nuclear power reactor facilities.

Discussion:

During routine operations, items (e.g., tools and equipment) and materials (e.g., scrap material, paper products, and trash) have the potential of becoming slightly contaminated. Analytical capabilities are available to distinguish very low levels of radioactive contamination from the natural background levels of radioactivity. However, these capabilities are often very elaborate, costly, and time consuming making their use impractical (and unnecessary) for routine operations. Therefore, guidance is needed to establish operational detection levels below which the probability of any remaining, undetected contamination is negligible and can be disregarded when considering the practicality of detecting and controlling such potential contamination and the associated negligible radiation doses to the public. In other words, guidance is needed which will provide reasonable assurance that contaminated materials are properly controlled and disposed of while at the same time providing a practical method for the uncontrolled release of materials from the restricted area. These levels and detection capabilities must be set considering these factors: 1) the practicality of conducting a contamination survey, 2) the potential of leaving minute levels of contamination undetected; and, 3) the potential radiation doses to individuals of the public resulting from potential release of any undetected, uncontrolled contamination.

Studies performed by Sommers[1] have concluded that for discrete particle low-level contamination, about 5000 dpm of beta activity is the minimum level of activity that can be routinely detected under a surface contamination control program using direct survey methods. The indirect method of contamination monitoring (smear survey) provides a method of evaluating removable (loose, surface) contamination at levels below which can be detected by the direct survey method. For smears of a 100cm^2 area (a de facto industry standard), the corresponding detection capability with a thin window detector and a fixed sample geometry is on the order of 1000 dpm (i.e., 1000 dpm/100 cm^2). Therefore, taking into consideration the practicality of conducting surface contamination surveys; contamination control limits should not be set below 5000 dpm/100 cm^2 total and 1000 dpm/ 100 cm^2 removable. The ability to detect minute, discrete particle contamination depends on the activity level, background, instrument time constant, and survey scan speed. A copy of Sommers studies is attached which provides useful guidance on establishing a contamination survey program.

Based on the studies of residual radioactivity limits for decommissioning (NUREG-0613[2] and NUREG-0707[3]), it can be concluded that surfaces uniformly contaminated at levels of 5000 dpm/ 100cm^2 (beta-gamma activity from nuclear power reactors) would result in potential doses that total less than 5 mrem/yr. Therefore, it can be concluded that for the potentially undetected contamination of discrete items and materials at levels below 5000 dpm/100cm^2, the potential dose to any individual will be significantly less than 5mrem/yr even if the accumulation of numerous items contaminated at this level is considered.

Guidance:

Items and material should not be removed from the restricted area until they have been surveyed or evaluated for potential radioactive contamination by a qualified* individual. Personal effects (e.g., notebooks and flash lights) which are hand carried need not be subjected to the qualified individual survey or evaluation, but these items should be subjected to the same survey requirements as the individual possessing the items. Contaminated or radioactive items and materials must be controlled, contained, handled, used, and transferred in accordance with applicable regulations.

The contamination monitoring using portable survey instruments or laboratory measurements should be performed with instrumentation and techniques (survey scanning speed, counting times, background radiation levels) necessary to detect 5000 dpm/100 cm^2 total and 1000 dpm/100 cm^2 removable beta/gamma contamination. Instruments should be calibrated with radiation sources having consistent energy spectrum and instrument response with the radionuclides being measured. If alpha contamination is suspected appropriate surveys and/or laboratory measurements capable of detecting 100 dpm/100 cm^2 fixed and 20 dpm/100 cm^2 removable alpha activity should be performed.

*A qualified individual is defined as a person meeting the radiation protection technician qualifications of Regulatory Guide 1.8, Rev. 1, which endorses ANSI N18.1, 1971.

In evaluating the radioactivity on inaccessible surfaces (e.g., pipes, drain lines, and duct work), measurements at other appropriate access points may be used for evaluating contamination provided the contamination levels at the accessible locations can be demonstrated to be representative of the potential contamination at the inaccessible surfaces. Otherwise, the material should not be released for unrestricted use.

Draft ANSI Standard 13.12[4] provides useful guidance for evaluating radioactive contamination and should be considered when establishing a contamination control and radiation survey program.

No written response to this circular is required. If you have any questions regarding this matter, please contact this office.

REFERENCES

[1]Sommers, J. F., "Sensitivity of Portable Beta-Gamma Survey Instruments," Nuclear Safety, Volume 16, No. 4, July-August 1975.

[2]U.S. Nuclear Regulatory Commission, "Residual Radioactivity Limits for Decommissioning, Draft Report," Office of Standards Development, USNRC NUREG-0613, October 1979.

[3]U.S. Nuclear Regulatory Commission, "A Methodology for Calculating Residual Radioactivity Levels Following Decommissioning," USNRC NUREG-0707, October 1980.

[4]Draft ANSI Standard 13.12, "Control of Radioactive Surface Contamination on Materials, Equipment, and Facilities to be Released for Uncontrolled Use," American National Standards Institute, Inc., New York, NY, August 1978.

Attachments:
1. Reference 1 (Sommers Study)
2. Recently issued IE Circulars

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MAY 6 1981

Control and Instrumentation

Edited by E. W. Hagen

Sensitivity of Portable Beta–Gamma Survey Instruments

By J. F. Sommers*

Abstract: Development of a new generation of portable radiation survey instruments and application of the "as low as practicable" (ALAP) philosophy have presented a problem of compliance with guides for radioactive contamination control. Isolated, low-level, discrete-particle beta-gamma contamination is being detected with the new instruments. To determine the limits of practicability requires, in turn, the determination of the limits of detection of these surface contaminants. The data and calculations included in this article indicate the source detection frequencies that can be expected using the new generation of survey instruments. The author concludes that, in low population groups of discrete particles, about 5000 dis/min of beta activity per particle is the minimum level of activity per particle which is applicable for confident compliance with surface contamination-control guides. Lower control levels are possible with additional development of instruments or through high-cost changes in radiation survey and contamination-control methods. Additional analyses are required for assessment of the hazard caused by widely dispersed discrete-particle contaminants.

The common, historical way to classify surface radioactive contamination has developed into standard definitions, limits, and control guides which, in some instances, are difficult, if not impossible, to apply.

In general, the definition of "removable" radioactive contamination must be inferred from guides[1] and regulations[2] on the significance of the quantity of radioactive materials removed. "Fixed" contamination, although not as uniquely defined, is, by inference, the radioactive contaminants that remain on a surface after the surface has been checked and found to have less than some defined removable contamination level. There are many minor variations of these definitions, but these will suffice to outline a major problem that applied health physicists have to verify compliance with radioactive surface contamination limits and guides.

In recent years the lowering of limits and the emphasis on as low as practicable[3] (ALAP) hazard control has encouraged commercial development of more sensitive survey instruments, the big improvement being detectors with thin windows. Peripheral features, such as audible alarms with adjustable set points, external speakers (instead of earphones), and selectable meter time constants, are common. However, the strong commercial competition to supply this type of instrumentation, the extreme competition for funds that could be used to improve radiation protection equipment, and the health physicists' reluctance or inability to provide adequate specifica-

*John F. Sommers received degrees in mathematics (B.A., 1948) and physics (B.S., 1950) from the University of Wyoming and was elected to the National Honorary Physics Society, Sigma Pi Sigma, in 1949. Under an AEC fellowship grant, he earned a certificate in radiological physics from the Oak Ridge Institute of Nuclear Studies for work at Vanderbilt University and Oak Ridge National Laboratory during 1950 and 1951. Since 1951, he has been associated with the Idaho National Engineering Laboratory (INEL) (formerly the National Reactor Testing Station) as technical assistant and as manager of Applied Health Physics in the safety groups of the prime contractors for AEC. At present, he is supervisor of the Radiological Engineering Section in the Safety Division of Aerojet Nuclear Company, the prime operating contractor for the Energy Research and Development Administration (ERDA) at INEL, where he is directly involved in development and application of a positive-action ALAP (as low as practicable) program for control of radiation hazards in INEL nuclear facilities.

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tions have left something to be desired in quality and overall performance of many of the instruments.

Although present beta–gamma contamination-control practices are more rigorous than in the past, there is still less than complete control of low-activity low-density particulate sources within the operating areas. In a typical situation the highest density of these particles, outside of contamination-control zones, may be on the order of one detectable particle per 10^2 to 10^3 ft^2. The particles are removable beta–gamma activity, but because of the large areas involved, the multiple types of surfaces on which they are deposited, and the low area density of the particles, they are not subject to detection with any sensible frequency using the smear or wipe technique. Thus survey instruments must be used to detect and measure the activity of the removable particles.

The particles tend to be trapped and concentrated on certain types of surfaces, such as mopheads and acrylic fiber rugs. From these deposits it has been determined that the specific activities of most of the particles range from about 2×10^3 to 2×10^6 dis/min. In order to determine why the particles escape detection and control within the operating areas, experimenters devised a rigorous test to determine the expected frequency of detection of the particles using standard survey methods. The results of these experiments have shown that the main hope for improvement lies in the development of more sensitive survey instruments and portal monitors and the development and application of contamination-control methods similar to those used in facilities where the much more hazardous alpha-emitting materials are handled.

THEORY

The ability of a count-rate meter to provide reliable information for detection of small-diameter sources during surveys for radioactive contaminants depends upon a number of factors. These factors, for any given type and energy of radiation sources, are the specific activity of the sources, the influence of background radiation, the instrument time constant, the source–detector geometry, and the relative source–detector velocities. When an alarm set point is used to indicate the presence of radioactive sources, investigation shows that the sensitivity of the instrument is increased by setting the alarm set point as low as possible without causing alarms due to the fluctuations of background; the response of the count-rate meter is modified from the equilibrium count rate when source residence time under the detector is on the same order of magnitude of or less than the time constant of the meter; the count rate of the instrument increases as the source–window distance decreases; and the response of the count-rate meter increases as the source residence time under the detector window increases.

On the basis of the approximate Gaussian distribution of a count rate around the true average count rate, an alarm set point A has a probability p of being reached and causing an alarm due to an average background count rate B during a counting interval T that can be expressed as

$$A = (1 - e^{-T/\tau})(B + kT^{-1/2}B^{1/2}) \qquad (1)$$

where τ is the time constant of the count-rate meter and k is a constant that uniquely defines the probability of alarm.[4] The term $1 - e^{-T/\tau}$ (the fraction of equilibrium count rate obtained during T) is limited by design considerations of count-rate meters to the accuracy of the meter output. Most instruments have 1% (of full-scale reading) or larger accuracy limits. For this reason the value of $0.99 = 1 - e^{-T/\tau}$ has been assigned for this study. Knowing the value of τ allows solution for T, and the solution is used in the second term of Eq. 1. This solution can be thought of as the practical, constant, integrating interval observed by the count-rate meter.

The approximate response of an instrument to small-diameter sources can be calculated by defining standard survey conditions and relating them to the response characteristics of the instrument. For these calculations the velocity vector v of a flat circular window of the detector is assumed to be parallel to the surface being surveyed, and the velocity is held constant. The sources passing under the window of the detector bisect the circular projection of the window on the surface. The beta-counting efficiency of the instrument is assumed to be positive and constant when a source resides in the circular projection of the window on the surface; otherwise, the efficiency for counting the source is zero. This latter assumption may cause significant perturbations of experimental data from calculated data when source–window distances are larger than 2.5 cm. Gamma-counting efficiencies, the same order of magnitude as the beta-counting efficiencies, may also cause significant perturbation of experimental results, depending on the detector shielding configuration and effectiveness. The ideal source residence time t is assumed to be equal to the window diameter d divided by the velocity vector v. Under field conditions, t will usually be less than the ideal value

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because the source velocity vector will hardly ever exactly bisect the circular window projection on the surface being surveyed.

Using the ideal survey conditions and an average background count rate B, a source with a net equilibrium count rate S will cause a count rate as large as, or larger than, A, with a probability P_i that is uniquely defined by the constant K_i when the source residence time under the window is t and the time-dependent meter response term is $1 - e^{-t/\tau}$. The count rate A can then be expressed as

$$A \leq (1 - e^{-t/\tau})(B + S + K_i t^{-1/2}(B + S)^{1/2}) \quad (2)$$

By substitution of the alarm set-point count rate A from Eq. 1 into Eq. 2 and rearrangement, the source strength is found to be

$$S \geq \left(\frac{1 - e^{-T/\tau}}{1 - e^{-t/\tau}}\right)(B + kIT^{-1/2}B^{1/2}) - (B + K_i t^{-1/2}(B + S)^{1/2}) \quad (3)$$

Analysis of Eq. 3 shows that P_i is the probability, or time-dependent frequency, that S will cause an alarm when K_i is positive, and $(1 - P_i)$ is the probability that the alarm will be actuated when K_i is negative. Solutions for S can be obtained using selected values of K_i, B, τ, t, and T.

METHODS

In order to determine expected alarm-actuation frequencies during standard contamination surveys, experimenters established the following conditions. These conditions would also allow an experimental check of the calculated alarm-actuation probabilities that occur when the source strength, background, instrument time constants, and source residence time are changed.

Commercially available (two manufacturers) portable survey instruments were used as models for the calculations and experiments. Selectable time constants of 0.0159 and 0.159 min were calculated from the manufacturers' quoted time-response characteristics. "90% of the equilibrium count rates in 2.2 or 22 seconds." Survey velocities between 2.4 and 15 cm/sec were selected for analysis, velocities that cause the source residence times under the 5-cm-diameter detector windows to range from 0.33 to 2.1 sec. Cesium-137 sources having small diameter and low backscatter were used experimentally for verification of calculated data; these sources are counted with an efficiency of 0.1 count per beta at ½ in. from the center of 1.7 mg/cm², 5-cm diameter windows of "pancake"-type semishielded Geiger-Mueller tubes. Extrapolation of the data to other beta emitters is a practical exercise; i.e., from Evans,[5] beta transmission factors through 3.0 mg/cm² (air plus window) were calculated and shown to be greater than 72% for betas with energy spectra having maximum-energy betas (E_{max}) greater than 0.2 MeV. Thus ^{137}Cs betas, with a mean $E_{max} \cong 0.58$ MeV, provide a beta-counting efficiency from the thin-window detectors which is typical of beta emitters with E_{max} greater than 0.2 MeV. Also, background and source size data are presented in counts per minute, so that changes in beta energies of sources and/or source–window distances can be normalized, using observed counting efficiencies, to the calculated data presented in this article.

With some manipulation of Eq. 3, a computer program was used to obtain an iterative set of solutions for S that are accurate to within 1% of the true values. The alarm set points were determined using Eq. 1. Selections of background count rates, relative detector–source velocities, and the instrument time constant were arbitrary but within the ranges chosen for investigation. Values of K_i were chosen to provide known probabilities of alarm actuation.

An extensive set of experimental data was obtained by moving calibrated sources past the detector windows at measured velocities and source–window distances to check the validity of the calculations. The same experimental setup to determine source detection frequencies was used with the audio (speaker) output of the survey meters. The use of audio output during contamination surveys is a well-known practice and will not be described further.

When the experimental and calculated source detection frequencies were compared, it became apparent that the time constants of the commercial survey instruments were not equal to specified values. Variations were noted between instruments of one model and between the different alarm set points on the other model. By measuring the buildup of the indicated count rates to 90% of equilibrium, we were able to determine the actual time constant on the instruments for any particular alarm set point.

The experimental data were obtained on an instrument that exhibited the advertised time constants. However, the poor (time-dependent response) performance of these instruments as a group has caused us to abandon the alarm set-point method for source detection under field conditions.

RESULTS

Alarm set points vs. background count rate were calculated from Eq. 1. These are illustrated in Fig. 1 for time constants of 0.0159 and 0.159 min. The λ value selected, 4.09, uniquely defines the probability of an alarm being caused by a constant average background as 5×10^{-7} min^{-1}.

Figure 2 shows that the short-time-constant set point is more sensitive for source detection, even though the long-time-constant set point is the lowest. The relative difference between the two becomes less as the source residence time increases.

Figure 3 illustrates the improved sensitivity to be expected as the source residence time increases (detector velocity decreases). The set point is obtained from Eq. 1 or Fig. 1. Note that with a source residence time of 1 sec (5 cm/sec), it takes 5000 betas/min (500 counts/min) at a background of 60 counts/min to cause an alarm 90% of the time. As a practical illustration, if an individual surveys himself at 10 cm/sec, it will take about 3 min for him to survey half the surface area of his body, and the particles he discovers with a 90% confidence level will have a beta-emission rate of about 9000 per minute (900 counts/min).

Figure 4 illustrates the benefit of selecting low-background areas to perform contamination surveys. As indicated by Eq. 1, the alarm set point has to be changed each time the background changes, and, if the time constant is not dependable (known), the set point may not be correct. Changing background count rates are a common occurrence in our operations, and our inability to make time-constant determinations in the field has caused us to abandon the alarm-set-point method for contamination surveys.

Figure 5 shows that the calculational method of determining source detection frequencies using the alarm set point is valid in comparison with experimental data. Both the time constant and the alarm set point were verified on the instrument used. In practice, there would be some ambiguity in the setting of the alarm owing to the crude alarm set point dial furnished on this model instrument.

Figure 6 compares calculated alarm-actuation frequencies with experimental data on audio-output source detection frequencies at an average background of 170 counts/min and a relative surface–window velocity of 15 cm/sec. Using the speaker output method, smaller sources are detected with the same frequency that is obtained using the alarm set point method. The improvement is about a factor of 3.

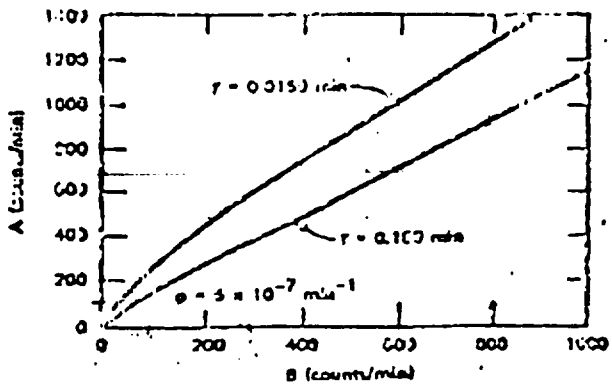

Fig. 1 Effect of background on the optimum alarm set point.

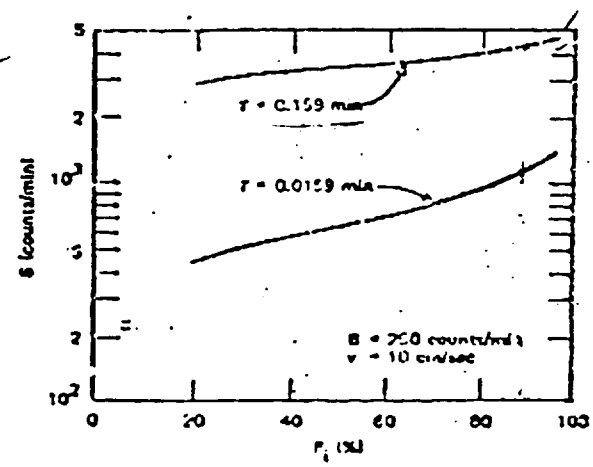

Fig. 2 Effect of instrument time constant on source detection frequency.

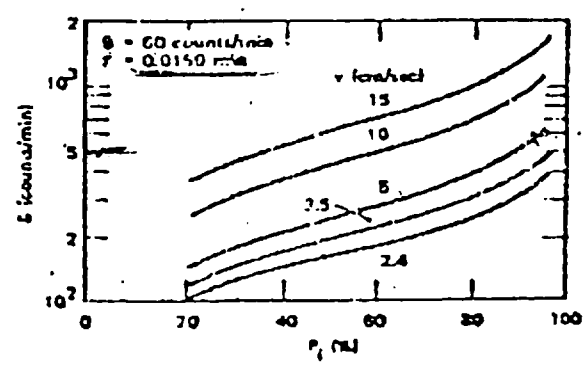

Fig. 3 Effect of probe velocity on source detection frequency.

Figure 7 shows a similar comparison using a detector velocity of 3.5 cm/sec. Here, the difference in detection frequencies narrows, and the alarm set-point method becomes better than the audio detection method for the larger sources at this low survey velocity.

Figure 8 compares experimental audio-output data for three different survey velocities at 120 counts/min background. The difference in source detection frequencies is surprisingly small when compared with the alarm-actuation method. This is explained by the adaptability of the human audio response; i.e., the effective time constant (human) adapts, within bounds, to the source size that can be detected with a given survey velocity and background count rate. Note that at 500 counts/min (5000 betas/min), the source detection frequencies appear to converge at about 60%. The results shown are averages of over 100 observations per datum point from two or more experienced surveyors. The largest variations in the data occurred between individuals; i.e., the largest variables were caused by the physical and psychological conditioning

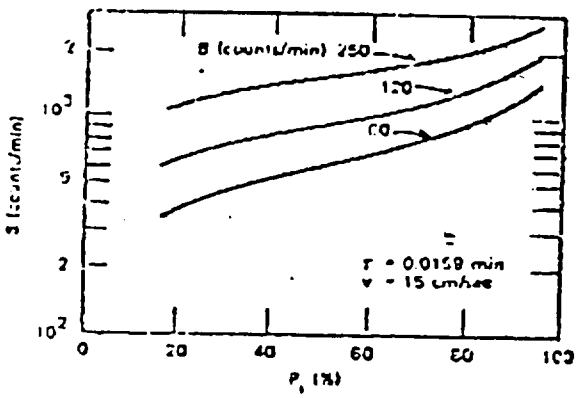

Fig. 4 Effect of background on source alarm-actuation frequency.

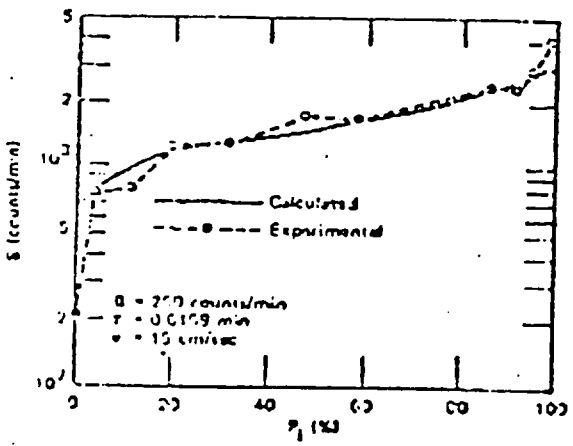

Fig. 5 Comparison of experimental and calculated data on source detection frequencies.

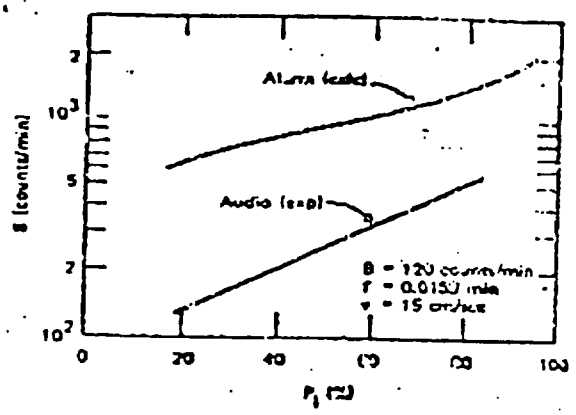

Fig. 6 Comparison of source detection frequencies using alarm set-point and audio detection methods.

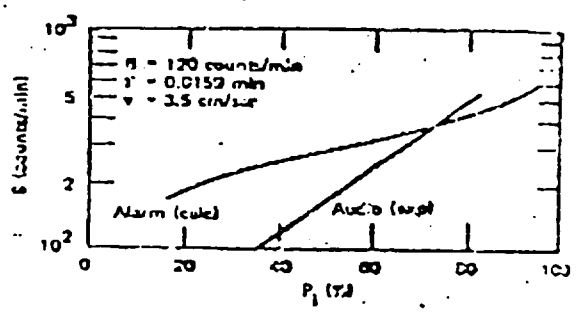

Fig. 7 Comparison of source detection frequencies using alarm and audio detection methods.

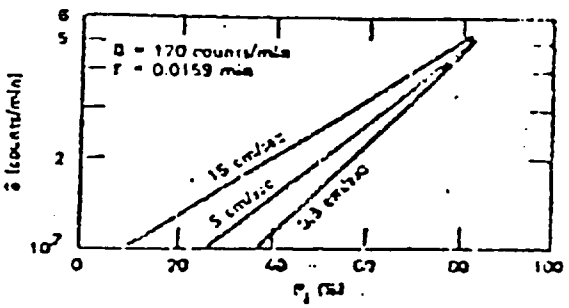

Fig. 8 Comparison of audio source detection frequencies and velocities.

Attachment 2
IEC 81-07
May 14, 1981

RECENTLY ISSUED
IE CIRCULARS

Circular No.	Subject	Date of Issue	Issued to
81-06	Potential Deficiency Affecting Certain Foxboro 20 to 50 Milliampere Transmitters	4/14/81	All power reactor facilities with an OL or CP
81-05	Self-Aligning Rod End Bushings for Pipe Supports	3/31/81	All power reactor facilities with an OL or CP
81-04	The Role of Shift Technical Advisors and Importance of Reporting Operational Events	4/30/81	All power reactor facilities with an OL or CP
81-03	Inoperable Seismic Monitoring Instrumentation	3/2/81	All power reactor facilities with an OL or CP
81-02	Performance of NRC-Licensed Individuals While on Duty	2/9/81	All power reactor facilities (research & test) with an OL or CP
81-01	Design Problems Involving Indicating Pushbutton Switches Manufactured by Honeywell Incorporated	1/23/81	All power reactor facilities with an OL or CP
80-25	Case Histories of Radiography Events	12/5/80	All radiography licensees
80-24	AECL Teletherapy Unit Malfunction	12/2/80	All teletherapy licensees
80-23	Potential Defects in Beloit Power Systems Emergency Generators	10/31/80	All power reactor facilities with OL or a CP
80-22	Confirmation of Employee Qualifications	10/2/80	All holders of a power reactor OL or CP architect-engineering companies and nuclear steam system suppliers

OL = Operating Licenses
CP = Construction Permit