Enclosure 2

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REGION I

Report No. 50-443/89-19

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Licensee: Public Service Company of New Hampshire
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Manchester, New Hampshire 03105

Facility Name: Seabrook

Inspection At: Seabrook, New Hampshire

Inspection Conducted: November 28 - December 7, 1989

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Jan 9, 1990 date

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Inspection Summary: Inspection on November 28-30 and December 5-7, 1989 (Report No. 50-443/89-19)

Areas Inspected: Special, announced safety inspection of the licensee's implementation and status of the following task action items identified in NUREG-0737: II.B.3, Post-Accident Sampling Capability; II.F.1-1, Noble Gas Effluents Monitors; II.F.1-2, Sampling and Analyses of Plant Effluents; II.F.1-3, Containment High-Range Radiation Monitor; III.D.3.3, Improved In-plant Iodine Monitoring. The licensee's capabilities in the area of core damage assessment were also reviewed. In addition, the licensee's actions on Safety Evaluation Report Supplement (SSER) Confirmatory Items 56 and 60 were also reviewed.

DETAILS

1.0 Individuals Contacted

The individuals contacted during this inspection are listed in Attachment 1 to this inspection report.

2.0 Purpose

The purpose of this inspection was to verify and validate the adequacy of the licensee's implementation of the following task actions identified in NUREG-0737, Clarification of TMI Action Plan Requirements:

Task No.	Title
II.B.3	Post-Accident Sampling Capability
II.F.1-1	Noble Gas Effluent Monitors
II.F.1-2	Sampling and Analysis of Plant Effluents
II.F.1-3	Containment High-Range Radiation Monitor
III.D.3.3	Improved In-Plant Iodine Instrumentation under Accident Conditions

As part of the inspection, a review was performed to verify and validate the adequacy of the licensee's design and installation of the Post-Accident Sampling System (PASS).

The inspector also reviewed the licensee's core damage assessment procedures and the licensee's implementation of Seabrook Safety Evaluation Report Confirmatory Items 56 and 60.

3.0 TMI Action Plan Generic Criteria and Commitments

The licensee's implementation of the task actions specified in Section 2.0 were reviewed against criteria and commitments contained in the following documents:

- NUREG-0737, Clarification of TMI Action Plan Requirements
- Seabrook Station Final Safety Analysis Report
- Seabrook Station Safety Evaluation Report (NUREG-0896) and Supplements
- Regulatory Guide 1.4, Revision 2, "Assumptions Used for Evaluating Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors"
- Regulatory Guide 1.97, Revision 3, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident"

Results: No violations were identified. Several items requiring resolution prior to the facility exceeding five percent rated power were identified. A number of areas for clarification or improvement were also identified. The licensee was very responsive to the findings and initiated immediate action to resolve them.

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- Regulatory Guide 8.8, Revision 3, "Information Relevant to Ensuring that Occupational Radiation Exposure at Nuclear Power Station will be As Low As Reasonably Achievable"

4.0 Post-Accident Sampling System, Item II.B.3

4.1 Position

NUREG-0737, Item II.B.3, specifies that licensees shall have the capability to promptly collect, handle, and analyze post-accident samples which are representative of conditions existing in the reactor coolant and containment atmosphere. Specific sampling and analysis criteria are denoted in the licensee's commitments to the NRC relative to the specifications contained in NUREG-0737.

4.2 Documents Reviewed and Review Method

The implementation, adequacy, and status of the licensee's post-accident sampling, monitoring, and analysis systems were reviewed against the criteria identified in Section 3.0 and in regard to the documents listed in Attachment 2 of this Inspection Report.

The licensee's performance relative to the above criteria was determined by interviewing cognizant personnel, reviewing applicable documentation and observing sample collection, handling and analysis.

4.3 System Description and Capability

The licensee has installed a Post Accident Sampling System (PASS) which is of a standard design used in Yankee plants. It has the capability to obtain unpressurized undiluted or diluted samples of reactor coolant from reactor coolant loops one and three, residual heat removal (RHR) pumps A and B, RHR vault sumps, and the primary auxiliary building (PAB) sump. Also the licensee's PASS has the capability to sample dissolved gases (hydrogen) in liquid samples. The system can collect samples from a pressurized or unpressurized reactor coolant system.

In addition, the licensee has installed a PASS for sampling containment air. The sample line is heat traced. Redundant containment hydrogen analyzers provide an additional containment hydrogen analysis capability.

Analysis of liquid samples for boron, chloride, radioactivity, and dissolved hydrogen are performed in the laboratory using an automatic potentiometric titration apparatus, ion chromatograph, gamma spectrometer, and gas chromatograph respectively. Analysis of containment air samples for radioactivity and hydrogen are performed using a gamma spectrometer and gas chromatograph, respectively.

4.4 PASS Performance Testing

Grab samples of reactor coolant and the containment atmosphere were collected during operational tests of the liquid and containment air post accident sampling systems on November 29, 1989. All important phases of the operations were observed by the inspectors. During the testing, licensee personnel demonstrated the integrated ability to collect and analyze a liquid sample within the time and accuracy constraints of NUREG-0737, II.B.3. Portions of the test involved the licensee's personnel collecting samples under simulated accident conditions while using full protective clothing, self-contained breathing apparatus, and electronic communications devices. Licensee personnel also demonstrated the ability to collect and analyze a containment air sample within the constraints of NUREG-0737. However, they could not demonstrate that the samples could be collected, transported and analyzed within the personnel radiation dose constraints of NUREG-0737, Item II.B.3. This is further discussed in Section 9.0 of this report.

Overall, the licensee's chemistry personnel demonstrated a good understanding of their procedures indicating chemistry personnel were properly trained in procedures. Detailed documentation for personnel qualification on procedures was available.

4.4.1 Reactor Coolant Sampling

The reactor coolant sampling system is designed to obtain samples of liquids and dissolved gases during all modes of operation. During this operational test, samples were collected from the RHR system because the reactor was shutdown. Although both liquid and dissolved gas samples could be obtained from the prescribed sampling points, the following items were discussed with the licensee for possible clarification or improvement:

- Although the liquid samples are unpressurized samples, the licensee pressurizes the sample system up to approximately 55 psi with argon prior to removing diluted liquid. The sample is drawn from the system through a septum using a syringe with a needle. The syringe in use during the operational test was a plastic syringe. The licensee had no pressure rating data for this syringe. After discussing this matter with the inspector, the licensee produced a glass syringe with suitable pressure rating for sampling at 55 psi and stated that this syringe would be used for future liquid sampling.

-The inspector walked down selected portions of the PASS reactor coolant sampling lines in the containment and the containment enclosure. The installed lines and valves were consistent with drawings. The inspector noted that the electrical junction box (Node U9Z) for PASS liquid sample return valve (SS-FV-2857) exhibited loose cable conduit fittings. The licensee issued a work request and adequately tightened the fittings. No other problems were noted.

-The inspector noted that the fume hood exhaust was not working during the licensee's preparation of liquid PASS samples in the fume hood for counting. Also, an alarm to indicate a malfunction of the fume hood was not working properly.

The licensee revised the checklist for Procedure CS0925.15 to include a check that the fume hood alarm is operable prior to personnel preparing samples in the hood and that the hood was operating properly.

-During performance of the PASS sample analysis in the chemistry laboratory, several individuals were observed leaving the chemistry laboratory without frisking.

The licensee counseled department personnel about not using installed personnel contamination monitors.

-During collection of PASS liquid samples, a communication device worn by a chemistry technician failed and no spares were readily available.

The licensee placed three additional communications devices in the emergency lockers as spares.

-The sample team that was dispatched to the Combustible Gas Analyzer Room to collect a containment atmosphere sample did not have any way of determining if the analyzer room exhibited an explosive atmosphere. Also, the personnel did not have flashlights or other equipment that was certified for use in explosive atmospheres.

The licensee's chemistry personnel borrowed a hand-held explosive gas meter from the instrumentation and control group. The licensee's chemistry personnel initiated action to obtain a hand-held hydrogen monitor and train personnel on its use. The licensee also obtained flashlights certified for use in explosive atmospheres. The licensee also rigged long sampling lines to air sampling pumps to collect samples in explosive atmospheres.

-The licensee did not provide any protection inside the PASS laboratory fume hood to prevent the hood from becoming contaminated during sample handling.

The licensee placed Herculite in the hood to prevent the hood from becoming contaminated.

-During the PASS liquid sample preparation in the PASS laboratory fume hood, a chemistry technician was observed pouring PASS liquids down the wrong cup sink.

The licensee sealed over this cup sink to prevent liquids from being poured down it.

-A chemistry technician, preparing PASS samples in the PASS laboratory fume hood, was observed not using shielding to reduce the accumulated dose to his extremities.

The licensee revised Procedures CSO925.11 and CSO925.02 to include cautions about shielding hot samples when not actually working with them.

-During collection of liquid samples at the PASS panel, there was a potential for liquids to drip on the floor and contaminate the floor of the PASS sample room.

The licensee added a precaution to Procedure CSO925.01 to ensure a method is used to collect drips.

The following item will be reviewed during power operation:

-The samples taken during the operational tests were taken from the RHR system because the reactor was shutdown. The licensee has yet to use the PASS to take and analyze samples from the reactor coolant system at operating pressure and temperature and compare these results to the sample results obtained from the normal reactor coolant system sampling points. The licensee stated that this test of the liquid PASS system would be performed.

Required training on revisions to the procedures as discussed above will be completed by January 19, 1990.

4.4.2 Containment Air Sampling

The containment air PASS provides for sampling the containment atmosphere from either of two sampling points that draw a sample from near the top of containment. These are the same sampling points used for the containment hydrogen analyzers. The containment hydrogen analyzers must be operating in order to take a containment air PASS sample. During this test, containment air samples were taken with the "B" hydrogen analyzer train in service.

Although the containment air sample was taken and analyzed as required, the following items were discussed with the licensee as items requiring attention:

-The licensee's procedures contain no specific guidance on containment gas sample dilution and preparation after the containment gas sample is returned to the laboratory. As witnessed during this operational test, the sample for gamma isotopic analysis was prepared in a manner such that the amount of gas in the counting container was not known.

The licensee stated that this item would be reviewed and the necessary procedure changes would be made. Subsequent to this inspection, the licensee revised Procedure CS0925.02 so that a fixed volume of gas, 0.5 ml, is transferred to the counting container.

-The containment noble gas results from the laboratory sample analysis appear not to be in a form which can be directly applied to the licensee's core damage assessment methodology. The noble gas analysis is performed on a sample at ambient laboratory pressure, whereas the actual conditions in containment may differ from this; the containment atmosphere may be at a higher pressure. The licensee applies no corrections to the laboratory noble gas results to reflect the difference between the sample pressure and the actual containment pressure. The core damage assessment methodology requires that the sample result indicate the noble gas concentration in containment. The licensee stated that this area would be reviewed and appropriate action taken.

Subsequent to this inspection, the licensee modified the following procedures so that the licensee's laboratory results would be in a form suitable for use with the core damage assessment methodology.

- Procedure OS1023.71, was modified to include verification that the combustible gas control (CGC) sample bomb valves are open when checking to ensure that the sample bomb is in place.

- Procedure CS0927.07, has been modified to clearly state the valve manipulation sequence necessary to obtain a containment gas sample. This procedure was also modified to ensure that the temperature and pressure in containment at the time of sampling will be noted.

- Procedure CS0925.11 and CS0925.02, have been modified so that gas sample volumes used in radioactivity analysis calculations are now corrected to sampling containment conditions.

- Procedure CS0925.04, corrects the containment gas sample percent hydrogen results to standard temperature and pressure (STP) conditions. This correction will permit the assessment of core damage conditions in that core damage assessment depends upon the number of moles of hydrogen generated, and the number of moles is proportional to volume after correction to STP conditions.

-The containment atmosphere sample line is heat traced to ensure there is no condensation of moisture during sampling. The inspector was informed by the licensee on December 18, 1989, that the heat trace could not reach a temperature of 300°F. Such a temperature is predicted during a postulated accident situation.

The licensee stated that a design change was immediately initiated to upgrade the heat tracing to ensure collection of a representative sample. This design change will be completed and operational by January 16, 1990.

The licensee indicated all appropriate documents would be updated by January 16, 1990 and that all appropriate personnel would be trained in the change by January 19, 1990.

4.5 Analytical Capability

The licensee's commitments relative to range, uncertainty, and analytical capability are contained in the Final Safety Analysis Report (FSAR) and the Seabrook Safety Evaluation Report (SER), NUREG 0896. The SER specifies that the licensee's methods and procedures are consistent with the requirements of NUREG-0737.

4.5.1 Chloride

The licensee's method of chloride analysis is ion chromatography. The licensee has set up a dedicated ion chromatograph (IC) for the analysis of PASS samples. The separator column for the chromatograph is located behind a lead shield in a fume hood. Chloride standards were submitted to the licensee for analysis. The standards were prepared by Brookhaven National Laboratory (BNL) for the NRC and were submitted to the licensee at three concentrations over the range for which the PASS IC is calibrated. The licensee's analysis results were acceptable.

Although the licensee's analysis results were acceptable, the following matter was discussed with the licensee for clarification or improvement:

-The licensee performs a one point calibration of the IC at 20 ppb and then performs a quality control (QC) check at 10 ppb. However, in order to meet the PASS requirements for range and sensitivity the IC is set up to analyze chloride concentrations up to 100 ppb. The licensee has performed linearity checks of the IC over this range. The inspector discussed this matter with the licensee and suggested that the calibration be performed at the high end of the measurement range and the QC check be performed at the low end. The licensee indicated that the calibration would be performed between 80-100 ppb and a QC check would be performed at 10 ppb. The licensee further indicated that one point calibrations were performed because of the limited capability of the integrator interfaced to the IC, but that additional instrumentation was being procured that would permit multipoint calibrations. The analysis results are listed in Attachment 3. Subsequent to this inspection, the licensee revised Procedure CS0925.06 to require calibration at between 80-100 ppb. Required training on this procedure revision will be completed by January 19, 1990.

4.5.2 Boron

Boron analysis is performed by potentiometric titration after manitol addition to the sample to form a complex acid. The titration is performed in the laboratory using an automatic titration apparatus. The sample analysis takes place in a fume hood behind a lead shield. Boron standards prepared by BNL for the NRC were submitted to the licensee for analysis to cover the range from 1 to 10 ppm. The licensee's results were acceptable and are listed in Attachment 3.

4.5.3 Radioactivity Analysis

Gamma isotopic analysis of both liquid and gaseous PASS samples is performed using the licensee's routine gamma spectrometry system. This gamma spectrometry system is located in the chemistry counting room which is adjacent to the hot chemistry laboratory. A specially configured shield and germanium (Ge) detector, located in the chemistry laboratory, is interfaced to the gamma spectrometry system and is used for the analysis of PASS samples. The shield is designed so that different collimators can be inserted between the sample and the detector. The licensee has performed a separate calibration for each collimator, sample position, and counting geometry. Due to the absence of measurable radioactivity in the reactor coolant system, actual radioactivity measurements were not made by the licensee, but were simulated using the samples obtained from the operational tests.

4.5.4 Hydrogen and Dissolved Gas

Hydrogen analysis of the PASS liquid dissolved gas sample and the PASS containment gas sample are performed using the gas chromatograph located in the hot chemistry laboratory. The gas chromatograph is vented to the laboratory fume hood exhaust system. Due to the absence of hydrogen in the reactor coolant system, actual hydrogen analyses were not performed but were simulated using the samples obtained from the operational tests. This enabled the licensee to demonstrate the adequacy of PASS sample hydrogen analysis procedures.

5.0 Noble Gas Effluent Monitor, Item II.F.1.1

5.1 Position

NUREG-0737, Item II.F.1.1 requires the installation of noble gas monitors with an extended range designed to function during normal and accident conditions. The criteria, including the design range of monitors for individual release pathways, power supply, calibration and other design considerations are set forth in Table II.F.1-1 of NUREG-0737.

5.2 Documents Reviewed and Review Methods

The implementation, adequacy, and status of the licensee's monitoring systems were reviewed against the criteria identified in Section 3.0 and in regard to documents listed in Attachment 4.

The licensee's performance relative to these criteria was determined by interviewing the principal persons associated with the design, testing, installation and surveillance of the high range gas monitoring systems, reviewing associated procedures and documentation, examining personnel qualifications and direct observation of the systems.

5.3 Description and Capability

The Seabrook Station has one release path for gaseous effluents, the Unit 1 vent, which is installed outboard of the Unit 1 containment and which discharges to the atmosphere near its top. To fulfill the NUREG-0737 requirements, it is monitored by a General Atomics (GA) Wide Range Gas Monitor (WRGM) which is located on the 53' elevation in the Primary Auxiliary Building. The WRGM provides for a full range from 10^{-7}-10^{5} $\mu Ci/cm^3$ in three overlapping increments: Low Range 10^{-7}-10^{-1}; Mid Range 10^{-3}-10^{3} and 10^{-1}-10^{5} $\mu Ci/cm^3$. The low range is provided with an RD-52 off-line beta sensitive plastic detector situated in a 350 cm^3 shielded cylinder. The mid and high ranges are provided with identical small (2 mm x 2 mm x 5 mm) Cd-Te detectors which respectively view gas volumes of 30 cm^3 and 3 cm^3 within a thick (~4") Pb shielding.

The WRGM system provides for the local and remote readout in the Control Room of gas concentrations. Input from a stack flow sensor is also utilized to provide for the readout of release rates. The normal routing of the gas sample stream is through the low range path of a sample conditioning skid and thence through the low range detector chamber. At a predetermined set point (~10^{-2} $\mu Ci/cm^3$), the sample stream would be re-routed through the mid-high chambers and the low range path automatically purged.

A tertiary calibration, using solid sources, was made for the installed WRGM detectors by GA and these sources were provided to the licensee. Records of surveillance tests of the WRGM detectors indicate that their responses have remained within an acceptable range.

The licensee was performing surveillance testing of the WRGM consistent with Technical Specification requirements.

The licensee's personnel exhibited an excellent understanding of the system operation and procedural requirements. The licensee's personnel responsible for performing calibration and surveillance of the WRGM were provided training on the operation of the WRGM by the vendor. Also, the individuals performing calibrations and surveillance of the WRGM had written the procedures to perform these functions. The inspector noted the licensee was in the process of developing a procedure sign-off list to document which individuals had been certified to perform calibrations and surveillances.

The noble gas detector response to the radiation will change with time as the energy spectrum changes. The variable response of the detectors with time due to the decreasing energy of the post-accident gas mixture is considered in the licensee's manual dose assessment software which uses an HP-41 and in the software of its computerized dose assessment procedure.

The inspectors questioned control room operation personnel as to their knowledge and understanding of the dose assessment methods. The operation personnel questioned exhibited a good understanding of the use of the dose assessment procedures.

At the onset of this inspection, the WRGM was out-of-service due to a pump failure. The inspectors verified that the licensee had installed appropriate compensatory monitoring required by Technical Specification Table 3.3-13. The licensee was investigating the cause of the pump failure.

The inspector's review indicated the compensatory monitoring provided was for low activity effluent sampling. At the time of this inspection, the licensee did not have in-place methods to implement Technical Specification 6.7.4.f., Accident Monitoring Instrumentation. This section requires the licensee to have in-place backup instrumentation for use in monitoring high activity effluent releases. This section requires the backup instrumentation prior to exceeding five percent rated power. The licensee's facility has not exceeded five percent rated power. The licensee did not have in-place a backup monitor to provide for continuous monitoring of post-accident noble gas releases. The licensee immediately initiated design changes to provide for a backup high-range noble gas effluent monitor to meet Technical Specification 6.7.4.f. requirements. The licensee indicated that the design change will be completed by January 16, 1990. The licensee indicated that appropriate training of operations, chemistry, and radiation protection personnel will be completed by January 19, 1990. The licensee further indicated that appropriate drawings would be updated by January 16, 1990.

The licensee could, however, collect grab samples and analyze these samples. The licensee's equipment could analyze highly radioactive post-accident samples of noble gas.

The licensee has installed General Atomics GA RS-42A GM tubes on the four main steam lines. These detectors met the requirements of NUREG-0737, Attachment II.F.1-1. The licensee has established 'J' factors for use in converting dose rate readings from the detectors to a release rate. Procedures for determining release rates, which incorporate these factors were established. Control room personnel were knowledgeable in the procedures. The inspector noted that the procedures did not incorporate corrections for two-phase flow thru the main steam lines. The licensee indicated that the corrections had been removed from the procedures. The licensee evaluated the inspector's finding and concluded that the correction for two-phase flow would be re-inserted into the procedures. The licensee committed to revise the procedure by January 12, 1990 and to train appropriate personnel by January 19, 1990.

The licensee has established backup monitoring capabilities for the monitors. The backup monitoring consists of portable instrumentation. Procedures defining the backup monitoring are available. The detectors were properly calibrated and tested by knowledgeable personnel.

5.3 Findings

The installed noble gas effluent monitor and main steam line monitor meets the guidance specified in Attachment II.F.1-1 to NUREG-0737.

The following item requires resolution prior to exceeding five percent power:

- Establish backup capabilities for the wide-range noble gas monitor to meet Technical Specification 6.7.4.f.

6.0 Sampling and Analyses of Plant Effluents, Item II.F.1-2

6.1 Position

NUREG-0737, Item II.F.1-2, requires the provision of a capability for the collection, transport, and measurement of representative samples of radioactive iodines and particulates which may accompany gaseous effluents following an accident. It must be performable within specified dose limits to the individuals involved.

The criteria including the design basis shielding envelope, sampling media, sampling considerations, and analysis considerations are set forth in Table II.F.1-2.

6.2 Documents Reviewed and Review Method

The implementation, adequacy and status of the licensee's sampling and analysis system and procedures were reviewed against the criteria identified in Section 3.0 of this report and in regard to the documents listed in Attachment 4.

The licensee's performance relative to these criteria was determined by interviewing the principal persons associated with the design, testing, installation, and surveillance of the systems for sampling and analysis of high activity radioiodine and particulate effluents, by reviewing associated procedures and documentation, by reviewing personnel qualification, and by direct observation of the systems.

6.3 Description and Capabilities

The WRGMs sample conditioning skid contains a module of three unshielded particulate-iodine samplers for the low range pathway, which has a rated flow of 1 cfm and three shielded particulate-iodine samplers for the mid-high range, low-flow 0.06 cfm path, which is selected automatically by the radiogas concentration. Continuous sampling is provided by the selection at one of two samplers in the active flow path. The third is intended for timed grab sampling, which may be performed locally or remotely from the Control Room.

The original installed sampler had a 96' long, ¼" outside diametric (O.D.) diameter sampling line from the plant vent to the WRGM skid. NRC staff review concluded that the ¼" line was unacceptable due to poor iodine sample transmission. Seabrook Safety Evaluation Report

Supplement No. 8 documents the licensee's commitment to replace the line (see Section 10.0 of this report). The licensee installed a 3/4" O.D. sampling line to essentially replace the ¼" line for routine low activity sampling and grab sampling.

The sampling lines are heat traced at 65°F to the inside of the PAB but not completely to the sample conditioning skid. It was not clear that this temperature (65°F) would preclude condensation in the sample line. The licensee could not provide justification to support the 65°F heat trace temperature.

The licensee immediately initiated a review of this matter and elected to install higher temperature heat trace on the sampling line. The licensee indicated heat trace with a temperature of 120°F would be installed and operable by January 16, 1990. Appropriate documents would be updated to reflect this change. The licensee also indicated that appropriate personnel would be trained in this change by January 19, 1990 if determined to be necessary.

To achieve high sampling flow rates during accident conditions (when the lower flow path would be selected on the basis of mid-high range gas concentrations) and yet to minimize collected activity on a sample, the licensee has installed a design modification (688-DCR-605) which includes a flow splitter close to the sample conditioning skid. Manually operated valves and quick-connect ports were installed to facilitate the connection of a portable pump that can maintain a high flow under accident conditions in a path which bypasses the low range samplers and gas detectors. However, the licensee's procedure calls for the use of this arrangement only for grab sampling. At other times, the valving would be realigned to draw a sample from the stack through the ¼" line and to one of the two continuous sampling positions, in order to collect a continuous "archival" sample. This essentially results in grab samples that are representative but continuous "archival" samples that have questionable representativeness.

The licensee concurred in the above observation and revised Procedure CS0925.07 to provide for collection of a representative archival sample by returning the continuous sample collection to the original larger diametric (3/4") sample line. The lower flow rate pump will draw a sample from the larger diameter (3/4") sample line instead of the smaller diameter (¼") sample line. The continuous archival sample will be drawn through a second cartridge thereby allowing for correction of the activity on the cartridge collected via the ¼" O.D. line. Required training on the above procedure revision will be completed by January 19, 1990.

In a walk-through of the licensee's procedures for obtaining and analyzing of simulated highly radioactive sample from the WRGM, it was established the procedures did not provide for the installation of a fresh sample in the grab sample position at the time a sample

was pulled from it. It was also evident that cross-contamination of the components of the sample assembly was possible during its disassembly, due to their random storage behind a small open shield within the hood in which its disassembly was performed.

The samples are taken to the laboratory for analysis. The licensee's sample analysis capabilities meet the guidance contained in NUREG-0737, Item II.F.1-2, Sampling and Analysis of Plant Effluents. The licensee's personnel exhibited a good understanding of the system operation and procedural requirements.

As discussed in Section 5.3 of this report, the WRGM was out-of-service because of a sample pump problem. As a result, the licensee was also collecting a continuous particulate or iodine sample of plant effluents using a backup pump. The licensee's compensatory sampling meet Technical Specification requirements.

The inspector noted that the backup sample method was designed for low activity normal samples. The filter cartridge was not shielded. Consequently, under accident conditions, radiation dose rates on the cartridge could preclude change-out of the cartridge. The inspector noted a backup method to collect and handle particulate and iodine samples of plant effluents under accident conditions is required by Technical Specification 6.7.4.f. A backup method of monitoring to implement Technical Specification 6.7.4.f. was not inplace. A backup method is required by Technical Specifications prior to exceeding five percent of rated power.

The licensee immediately initiated a design change to provide for a backup particulate and iodine sampling system to meet Technical Specification 6.7.4.f. The licensee indicated the change would be installed and operable by January 16, 1990 and appropriate personnel would be trained in the change and associated procedure revisions by January 19, 1990. The licensee also indicated appropriate documents would be updated by January 16, 1990.

6.4 Findings

The system as reviewed meets the guidance specified in Attachment II.F.1-2 of NUREG-0737. However, the following matters requiring licensee attention were identified.

- Provide appropriate documentation to justify the 65°F plant vent sample line or increase the temperature to preclude condensation in the sample lines.

- Establish backup capabilities for the wide-range particulate and iodine sampler to meet Technical Specification 6.7.4.f.

The following items for clarification or improvement were identified:

- Inspector review of the change out of WRGM filter media and cartridges in the PASS laboratory fume hood indicated that the change-out operation did not adequately ensure the new filter media or cartridges would be prevented from becoming contaminated when handled in the chemistry laboratory fume hood. Also, there were no provisions for inspection of the filter cartridge 'O' rings.

  The licensee revised Procedures CS0925.11 and CS0925.02 to improve contamination control and handling and loading of new filter media and cartridges. The procedures also were revised to require inspection of the filter media 'O' rings. In addition, the licensee provided spare backup filter media and catridge holders. The spare cartridge holders would be loaded and ready for use.

- The licensee's procedures contained a statement that plant effluent samples exceeding 300 mR/hr were not to be brought back to the counting lab. It was unclear what the basis for this statement was.

  The licensee revised Procedure CS0925.07 to eliminate this limit. The licensee's procedures and program provide for analysis of post-accident effluent samples consistent with NUREG-0737, Item F.1-2.

Required training on the above procedure revisions will be completed by January 19, 1990.

7.0 Containment High-Range Monitor, Item II.F.1-3

7.1 Position

NUREG-0737, Item II.F.1-3, requires the installation of two in-containment radiation monitors with a maximum range of 1 rad/hr to 10^8 rad/hr (beta and gamma) or alternatively 1 R/hr to 10^7 R/hr (gamma only). The monitors shall be physically separated to view a large portion of containment and developed and qualified to function in an accident environment. The monitors are also required to have an energy response as specified in NUREG-0737, Table II.F.1-3.

7.2 Documents Reviewed and Review Methods

The implementation, adequacy, and status of the installed high-range containment monitors were reviewed against criteria set forth in Section 3.0 of this report and in regard to documents listed in Attachment 5 to this report.

The licensee's performance relative to the above criteria was determined by interviewing the principal persons associated with the design, testing, installation and surveillance of high-range containment monitors, reviewing procedures and documentation, examining personnel qualifications and direct observation of the monitoring system.

7.3 System Description

The licensee has installed two General Atomics high-range containment monitors on the operating floor of containment approximately 180° apart. The detectors, Model RD-23, are Reuter Stokes RS-C3-1006-201 detectors. The detectors are connected to field installed Class 1E ITT Surprenant cables. Cable splices are protected with Raychem 300 WCSF-N heat shrinkable tubing. Detector readout and data recording are provided in the Control Room.

7.4 Findings

Within the scope of the review, the following items were reviewed and verified to conform with NUREG-0737:

- detector location
- electrical separation
- range and energy response
- vendor type calibration
- onsite calibration
- redundancy
- environmental and seismic qualifications

The establishment and implementation of Technical Specification required calibration and surveillance test procedures was also verified.

The detectors were calibration and surveillance tested by knowledgeable personnel.

Within the scope of this review, the following items were identified which the licensee resolved:

- The environmental qualification package for the high-range containment monitor did not specifically demonstrate qualification of the containment high-range detector, cable and cable connector, as a configuration.

  The licensee contacted General Atomics, the system vendor, who subsequently provided documentation to support environmental qualification of the entire configuration for the post-LOCA environmental envelope developed by the licensee.

8.0 Improved In-Plant Iodine Instrumentation Under Accident Conditions, Item III.D.3.3

8.1 Position

NUREG-0737, Item III.D.3.3, requires that each licensee provide equipment and associated training and procedures for accurately determining airborne iodine concentration in areas within the facility where plant personnel may be present during an accident.

8.2 Documents Reviewed and Review Methods

The implementation, adequacy, and status of the licensee's program for in-plant iodine monitoring under accident conditions was reviewed against criteria set forth in Section 3.0 of this report and in regard to documents listed in Attachment 6 to this report.

The licensee's performance relative to the above criteria was determined by interviewing cognizant personnel, reviewing documents, and direct observation by the inspector.

8.3 Description of Methodology and Capabilities

The licensee will use portable grab sampling with subsequent analysis of the filter media as the principle means of determining the airborne radioactive concentrations in areas within the facility where plant personnel may be present during an accident. The licensee had an adequate supply of low flow rate sample pumps for use in collecting samples. The licensee also had an adequate supply of filter media (charcoal cartridges and silver zeolite cartridges). The media were restocked when supplies decreased to a specified minimum value.

The licensee also had a stand-alone continuous air monitor in the Control Room. The monitor (NMC Model AM-221B) had the capabilities to monitor radioactive particulates, iodines and noble gases.

Appropriate personnel were trained on the equipment and procedures for use in determining airborne radioiodine concentrations.

8.4 Findings

The licensee's program for determining the airborne radioiodine condition in areas within the facility meets the guidance issued by the NRC in NUREG-0737, Item III.D.3.3. The following items were identified as areas for clarification or improvement:

- There were no provisions to purge high activity/high dose rate charcoal and silver zeolite samples of noble gases prior to analysis. This would improve the lower limit of detection.

The licensee revised Procedures CSO925.02 and CSO925.11 to provide for the purging of high activity/high dose rate charcoal and silver zeolite samples if needed.

- The licensee did not have data to demonstrate that post-accident in-plant radiation sampling and analyses methods were capable of a lower limit of detection of at least 1 X 10E-7 µCi/ml.

  The licensee subsequently evaluated the capabilities of the sampling and analysis methods and determined that the sampling and analyses methods were capable of a lower limit of detection of at least 1 X 10E-7 µCi/ml for iodine-131.

- Procedures do not account for determining the iodine activity on sample cartridges considering face loaded or uniform loaded cartridges. The procedures also do not address potential iodine breakthrough of cartridges.

  The licensee performed a study of these items and subsequently revised procedures to provide guidance to personnel regarding these items.

- There were no procedures for determining the iodine activity of cartridges from in-plant sampling via use of dose rate conversion factors. Such procedures would be needed if the gamma spectroscopy system was not available.

  Such guidance was contained in the licensee's off-site monitoring procedures. The licensee revised in-plant Procedure ER 4.8 to include guidance for using dose rates to determine iodine deposition on cartridges.

- The licensee's personnel held team briefings prior to dispatching teams to collect post-accident samples. The briefing checklist did not consider or address 1) the need for potential use of KI, 2) inaccessibility to areas due to failures of the security system, 3) the loss of electrical power, and 4) precautions when entering potential explosive atmospheres.

  The licensee revised checklists to ensure the above matters are discussed.

- There were no procedures for control and inventory of in-plant radioiodine samples or criteria to be used or to when such samples may be discarded.

  The licensee revised Procedure ER 4.8 to establish guidance for control, inventory and discard of in-plant radioiodine samples.

- There were no procedures to perform periodic surveillance testing of the continuous air monitor located in the control room.

  The licensee revised Procedure HD0955.33 to include a weekly operations check of the continuous air monitor located in the control room.

Required training on the above procedure revisions will be completed by January 19, 1990.

- The inspector monitored a drill of the licensee's capabilities to collect and analyze in-plant iodine samples. The inspector noted that at least one individual who was required to use a self-contained breathing apparatus had a full beard. There apparently was no policy regarding wearing of beards by personnel who may be required to respond during an accident situation.

  The individual observed with the full beard subsequently shaved off the beard. The licensee initiated a review of the policy on wearing of beards. The licensee subsequently issued to all personnel a draft policy statement requiring personnel who work within the protected area to be clean shaven with no facial hair in the area of the respirator sealing surface.

9.0 General Design Criterion 19 (GDC) Dose Evaluations

NUREG-0737, Item II.B.3, Post-Accident Sampling Capability, and Item II.F.1-2, Sampling and Analysis of Plant Effluents, specifies that the licensee be able to collect, transport, and analyze containment atmospheres, reactor coolant, and plant effluents samples without exceeding the GDC-19 personnel radiation dose limits (5 rem whole-body exposure and 75 rem extremities) during the duration of the accident.

To ensure conformance with the GDC-19 limits, the licensee performed a detailed habitability review in accordance with NUREG-0737, Item II.B.2, Design Review of Plant Shielding and Environmental Qualification of Equipment for Spaces/Systems Which May Be Used in Post-Accident Operations. The licensee used the radiation dose rate profiles from this study to evaluate the capabilities to meet the GDC-19 values.

The inspector evaluated the Habitability Study and compared the results of the study with the radiation dose rate profiles used by the licensee for a detailed time and motion study of each collection, transport, and analysis operation. The inspector performed an independent time and motion of selected sample collection, transport, and analysis operations.

The inspector concluded that the licensee's time and motion study covered the majority of actions which would be performed during collection, transport, and analysis operations. However, some important portions of

the operations were not identified or taken into consideration during analysis of samples in the laboratory. These included preliminary set-up of the laboratory and multiple dilutions of reactor coolant samples for analysis.

Although these operations themselves are not dose intensive, the operations occur in the laboratory whose ambient background radiation level was estimated by the licensee to be 3.8 R/hr using the source term specified in NUREG-0737, Item II.B.2. Using this background and timing personnel, the inspector concluded that it was likely that the GDC-19 whole-body dose limit would be exceeded by certain chemistry technicians.

The licensee's representatives acknowledged the findings and immediately initiated action to evaluate and adjust the sequence of operations and stationing of personnel to ensure that personnel dose limits would be maintained below the GDC-19 limits.

The licensee performed a complete re-analysis of the basis for the expected dose rates and re-performed detailed time and motion studies. The licensee concluded an inappropriate overly conservative factor was used for generating the 3.8 R/hr background. Also, the licensee did not take account for shielding provided by the chemistry counting room. The licensee also revised procedures and protocol to minimize stay times in high dose rate areas.

The inspectors review of the revised time and motion studies and bases subsequent to the inspection indicated all samples could be collected and analyzed within the dose constraints of GDC-19.

10.0 Confirmatory Issues

10.1 Confirmatory Issue No. 60

The NRC's staff review (Reference Seabrook Safety Analysis Report Supplement No. 5) of the licensee's post-accident effluent monitoring system concluded that the system conformed with Attachment 1 and 2 to TMI Action Plan Item II.F.1 (NUREG-0737) except for the capability to obtain representative samples of plant effluents without excessive plateout. The licensee committed to change the sampling system design to improve the sample collection and to provide an analysis of the capabilities of new design (Reference Seabrook Safety Analysis Report Supplement No. 8).

NRC inspector review, during the inspection, found that the licensee installed a complete, new large diameter (3/4") plant vent sampling line. A complete in-place test of the line was performed by the licensee's contractor to evaluate the representativeness of samples collected via the new line. The contractor's review indicated an acceptable transmission factors.

This review closes out Confirmatory Issue No. 60. Additional details regarding the post-accident effluent sampling system are discussed in Sections 5 and 6 of this report.

10.2 Confirmatory Issue No. 56

Seabrook Station Safety Evaluation Report (NUREG-0896) Supplement No. 8 documents the licensee's commitment to install communication isolation devices between the Radiation Data Management System (RDMS) and the Safety Parameter Display System (SPDS). The electrical isolation devices were needed to prevent faults in the non-Class 1E SPDS from propagating to various Class 1E radiation monitors of the RDMS.

Supplement No. 8 described the isolation devices, provided a review and evaluation of the devices, and described the testing of the isolation devices. The devices (optical isolators) were found acceptable for use in interfacing the RDMS and the SPDS. The isolators also isolate the non-Class 1E portion of the RDMS from the Class 1E portion in the event of electrical problems.

The inspector determined that the SPDS was not electrically connected to the RDMS. Rather the SPDS obtained data from a station computer which obtains RDMS information. Consequently, the licensee determined that no isolation devices to electrically isolate the SPDS from the RDMS were needed. The licensee, however, did install optical isolators between the Class 1E and non-Class 1E portion of the RDMS. The licensee also provided isolation between the separate trains of the Class 1E radiation monitors of the RDMS. Upon isolation, each Class 1E radiation monitor in the RDMS becomes a stand-alone radiation monitor with readout in the Control Room at a Class 1E panel.

The inspector reviewed applicable design change packages, discussed the packages with cognizant engineers and visually inspected field installations of the optical isolators. The isolators were installed on the containment purge and post-LOCA monitors, the refueling crane monitors, and the east and west control room air intake monitors. These monitors are Class 1E and provide important information to control room operations personnel.

The design change was reviewed and approved by the Station Operation Review Commmittee. The detectors were declared operable. The licensee's Quality Control group reviewed the installation to ensure seismic and environmental qualifications were maintained. The licensee plans to submit an update to the Final Safety Analysis Report to describe the changes.

The licensee is currently completing the full-service notification (FSN). This notification is a review to ensure that all appropriate documents and drawings were updated to reflect the design change. This FSN is expected to be completed by January 16, 1990. The inspector considered the licensee's commitment to have the isolators installed and operable to be closed.

11.0 Exit Meeting

The inspectors met with licensee personnel (denoted in Attachment 1 of the report) on December 7, 1989. The purpose, scope and findings of this inspection were discussed.

The inspectors also met periodically with licensee representatives to apprise them of inspection findings.

Attachment 1

Individuals Contacted

1.0 New Hampshire Yankee

D. Moody, Station Manager
*W. DiProfio, Assistant Station Manager
*J. Peschel, Regulatory Compliance Manager
*J. Warnock, Nuclear Quality Manager
D. Covill, Nuclear Quality Group Surveillance Supervisor
J. Rafalowski, Health Physics Department Supervisor
R. Cyr, Maintenance Manager
*B. Beuchel, Instrumentation and Control (I&C) Engineering Supervisor
*T. Murphy, I&C Department Supervisor
*J. Linville, Chemistry Department Supervisor
*W. Leland, Health Physics and Chemistry Manager
D. Iseman, I&C Supervisor
*W. Cash, Health Physics Supervisor
*W. Temple, NRC Coordinator
J. Gallagher, Chemistry Supervisor
*T. Harpster, Director, Licensing Services
*J. Vargas, Manager of Engineering

2.0 Nuclear Regulatory Commission

A. Cerne, Senior Resident Inspector, Seabrook
R. Fuhrmeister, Resident Inspector, Seabrook

*Denotes those individuals attending the exit meeting on December 7, 1989

Attachment 2

Documentation for NUREG-0737, II.B.3

Station Operating Procedures

CSO925.01, Post-Accident Liquid Sampling
CSO925.02, Post-Accident Activity Analysis
CSO925.03, Boron by Titration - PASS
CSO925.04, Post-Accident Analysis by Gas Chromatograph
CSO925.06, Post-Accident Chloride by Ion Chromatography
CSO925.07, Post-Accident Gas Sampling
CSO925.08, Undiluted Post Accident Coolant Sampling and Analysis
CSO925.09, Post-Accident Sample Archiving and Waste Handling
CSO925.10, Preparation for Post-Accident Sampling
CSO920, Sample Preparation for Gamma Spectrometry System

Training Documents

CHOJT.18A, Chemistry Technician Training Program PASS Overview Lesson Plan. Both instructor lesson plan and student handouts.
CHOJT.18B-F, Chemistry Technician Training Program Pass Overview Lesson Plan. Both instructor lesson plan and student handouts.

Training Department attendance lists and exam grades for the above lesson plans.

Acceptance Tests

CS86-1-8, Acceptance Test - Post-Accident Sample Panel-Equipment Vault Sump, PAB Sump
CN86-1-10, Acceptance Test - Post-Accident Sample - Volume Calibration
CN86-1-11, Acceptance Test - Post-Accident Sample Panel - RHR

Results of the above acceptance tests.

Repetitive Task Sheets

RTS No. 18-CP-M1,	PASS Panel Operational Check, Valve Lineup
RTS No. 15-CA-M1,	Gamma Spectrometer Operational Check
RTS No. 15-CA-M2,	Post Accident Sampling and Analysis Equipment Inventory
RTS No. 11-2-CL-W2,	ER DIONEX Operational Check
RTS No. 26.5-CL-W1,	Post-Accident pH Meter Operational Check
RTS No. 49-CL-M1,	Gas Chromatograph Operational Checks
RTS No. 28-CL-W1,	Post-Accident Boron Analysis Operational Check

Other Documentation

Safety Evaluation Report NUREG-0896
FSAR Sections 1.9, 7.5, 9.3
Technical Specifications
Mechanical/Electrical/I&C Preventative Maintenance Activity Data Sheets for the PASS Panel

Drawings

PID 1-CGC-B20612, Combustible Gas Control System
PID 1-CGC-D20612, Combustible Gas Control System
PID 1-SS-B20520, Sample System (Nuclear-Post-Accident)
PID 1-SS-D20520, Sample System (Nuclear-Post-Accident)

Attachment 3

Comparison of Chemical Test Results

Parameter	Known Concentration	Licensee's Measured Concentration	Difference	Comparison Requirement
Boron Standards	1.03±0.02 ppm	1.00 ppm	-0.03 ppm	>1000 ppm:±5%
	2.99±0.04 ppm	2.99 ppm	0.00 ppm	<1000 ppm:±50ppm
	5.10±0.10 ppm	5.04 ppm	-0.06 ppm	
Chloride	30±2 ppb	32 ppb	+2 ppb	>500 ppb:±10%
	62±4 ppb	68 ppb	+6 ppb	<500 ppb:±50ppb
	95±5 ppb	96 ppb	+1 ppb	

Note: Normal Boron calibration curve ranges from 1-10 ppm with 481:1 dilution
Normal Chloride calibration curve ranges from 10-100 ppb with 481.1 dilution

Attachment 4

Inspection Report No. 50-443/89-19
Documentation for NUREG-0737
Item II.F.1-1 and Item II.F.1-2

Procedures

CSO925.07, Rev. 3, Post-Accident Gas Sampling, 10/2/89 and 12/5/87, Draft

CSO0925.02, Rev. 2, Post-Accident Activity Analysis, 10/30/89

IX1660.780, Rev. 2, R-6528 Plant Vent Wide-Range Gas Radiation Monitor (WRGM) Operational Test, 7/20/89

CSO925.11, Rev. 0, Post-Accident Activity Analysis with OSC Evacuation, 12/5/89, Draft

IX1660.160, Rev. 1, F-6577 Plant Vent Stack Flow Transmitter Operational Test, 7/11/89

IX1610.801, Rev. 1, R-6481 Main Steam Line Loop (S/GA) and Loop 4 (S/G D) Radiation Monitor Calibration

IX1660730, Rev. 1, R-6528 Plant Vent Wide-Range Gas Monitor (WRGM) Calibration, 9/11/89

R-6528, Plant Vent Stack Wide-Range Gas Radiation Monitor Calibration, 5/16/87

R-6528, Plant Vent Wide-Range Gas Radiation Monitor Operational Test, 7/15/87

051052.01, Rev. 3, Operation of Radiation Monitoring Equipment Console, 1/27/89

Maintenance Work Requests

#89W001701, #89W003338, #89W001781, #89W001014
#89W000260, #89W004973
#89W003330, #89W003153, #89W002964, #89W004438
#89W006180, #89W005900, #89W005343, #89W005450
#89W001016, #89W000803, #89W000601, #88W005761
#88W005761, #88W003920, #88W003871, #88W003331
#88W003331, #88W001416

Licensee Correspondence

R. J. DeLoach, YNSD Program Director to A. M. Ebner, Project Manager, United Engineer and Constructors, Inc., April 24, 1989, "NUREG-0737, Task II.B.3, Post-Accident Shielding Analysis."

Vendor Manuals

GA Technologies

--E-115-865, Rev. 3, Wide-Range Gas Monitor Equipment Manual, 3/86

--E-115-647, Rev. 5, Calibration Reports for Model RD-52 Off-Line Beta Detector, 1984

--E-255-961, Rev. 2, Calibration Report RD-72 Wide-Range Gas Monitor High and Mid-High Detectors, 1/83

--E-115-791, Calibration Report for Model RD-60 Particulate, Iodine and Gas Detector System

SAIC

--SAIC-89/12122, "Radioiodine and Particle Transmission Through Selected Sampling Lines at Seabrook Station," Revised Final Report, May, 1989, Prepared by Utility Services Department, SAIC

Literature

P. J. Unrein et. al., "Transmission of Radioiodine Through Sampling Lines," 18th DOE Nuclear Airborne Waste Management and Air Cleaning Conference, CONF-840806, pps. 116-126, March, 1985

A. L. Wright et. al., "The Chemistry and Behavior of Iodine Vapor Species in Nuclear Plant Air Monitoring Samples Lines," 20th DOE/NRC Nuclear Air Cleaning Conference, NUREG-CR0098, pps. 824-833, May, 1989

Licensee Drawings

--PID 1-RM-B-20509, Radiation Monitoring Skids

--PID 1-MAH-B20494, Miscellaneouse Air Handling PAB EL. 53'-0" + 81' 0" Detail

Attachment 5

Inspection Report No. 50-443/89-19
Documentation for NUREG-0737
Item II.F.1-3

- Final Safety Analysis Report (FSAR) Section 1.9, Compliance with NUREG-0737, Clarification of TMI Action Plan Requirements
- Procedure GT-I-106G-D, Revision 1, Ion Chamber Detector Radiation Monitoring Primary Calibration
- Procedure GT-I-106F-B, Revision 1, Radiation Monitor Transfer Calibration for GM Detector and Ion Chamber
- Procedure GT-I-106E, Revision 0, General Test Procedure - Radiation Monitoring System Functional Test
- Procedure IX1660639, Revision 1, Containment Post-LOCA Train A Area Radiation Monitor Calibration
- Procedure IX166040, Revision 1, Containment Post-LOCA Train B Area Radiation Monitor Calibration
- Procedure IX1660.689, Containment Post-LOCA Train A High-Range Area Radiation Monitor Operational Test
- Procedure IX1660.690, Containment Post-LOCA Train B High-Range Area Radiation Monitor Operational Test
- High-Range Radiation Monitor Information, Model RS-23D, Sorrento Electronics
- Training Documentation for Instrumentation and Controls personnel

Attachment 6

Inspection Report No. 50-443/89-19
Documentation for NUREG-0737
Item III.D.3.3

- Final Safety Analysis Report (FSAR) Section 1.9, Compliance with NUREG-0737, Clarification of TMI Action Plan Requirements
- FSAR Section 12.3.4.2, Airborne Radioactivity Monitoring Instrumentation
- FSAR Section 12.5.2, Equipment, Instrumentation and Facilities
- Procedure HD958.01, Revision 5, Airborne Activity Survey Requirements and Methods
- Procedure HD0963.08, Revision 6, Calibration of Air Sampling Equipment
- Procedure HD0955.33, Revision 1, Operation of NMC Continuous Air Monitor
- Procedure HD0955.24, Revision 2, Canberra Gamma Spectroscopy Performance Evaluation
- Procedure HD0955.25, Revision 2, Gamma Spectroscopy System Calibration
- Procedure HD0955.01, Revision 5, General Count Room Guidelines
- Procedure ER 5.2, Revision 12, Site Perimeter and Offsite Monitoring and Environmental Sampling
- Procedure ER 4.3, Revision 7, Radiation Protection During Emergency Conditions
- Procedure HD0958.01, Revision 5, Airborne Activity Survey Requirements and Methods
- Procedure ER 4.8, Revision 2, Emergency Onsite Radiological Surveys
- Procedure ER 3.2, Revision 2, Operational Support Center Operations
- High Activity Verification Test of Post-Accident Sample Counting System, dated August 9, 1985
- Training Documentation for Radiation Protection Personnel