U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-220/87-12
50-410/87-22

Docket Nos. 50-220
50-410

License Nos. DRP-63 Priority - Category C
CPPR-12 -

Licensee: Niagara Mohawk Power Company
301 Plainfield Road
Syracuse, New York 13212

Facility Name: Nine Mile Point Units 1 and 2

Inspection At: Scriba, New York

Inspection Conducted: June 22-26, 1987 and June 30 - July 1, 1987

Inspectors: H. J. Bicehouse for 8/6/87
R. L. Nimitz, Senior Radiation Specialist date

H. J. Bicehouse 8/6/87
H. J. Bicehouse, Radiation Specialist date

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Approved by: [signature] for 8/6/87
M. Shanbaky, Chief date
Facilities Radiation Protection Section

Inspection Summary: Inspection on June 22-26, 1987, and June 30 thru July 1, 1987 (Combined Inspection Report No. 50-220/87-12; 50-410/87-22

Areas Inspected:

Unit 1: Review of licensee actions on items identified in Inspection Report 50-220/84-14. Also reviewed was a worker concern regarding Emergency Kits.

Unit 2: Special, announced safety inspection of the licensee's implementation and status of the following task actions identified in NUREG-0737: Post-accident sampling of reactor coolant and containment atmosphere; increased range of radiation monitors; post-accident effluent monitoring; containment radiation monitoring; and in-plant radioiodine measurements.

The inspection involved onsite review by three NRC Region I based inspectors.

Results: No violations were identified. Several areas needing improvement were identified in the area of post-accident sampling and accident monitoring.

DETAILS

1.0 Individuals Contacted

The individuals contacted during the inspection are identified in Attachment 1 to the report.

2.0 Purpose and Scope of Inspection

Unit 1

The inspection activities at Unit 1 focused on licensee review, evaluation and initiation of corrective actions (as necessary) for the post accident sampling, analysis and effluent monitoring improvement items identified during Inspection 50-220/84-14 (See Section 3 of this report).

Also reviewed was a concern brought to the attention of NRC Region I by a worker. The concern involved improper filter papers in Emergency Kits (See Section 10 of this report).

Unit 2

The purpose of the inspection at Unit 2 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
• III.F.1-3	Containment High-Range Radiation Monitor
• III.D.3.3	Improved Inplant 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 quality assurance (QA) program for the design and installation of the Post-Accident Sampling Systems (PASS).

3.0 TMI Action Plan Generic Criteria and Commitments

The licensee's implementation of the task actions specified in Section 2.0 was reviewed against criteria contained in the following documents.

- NUREG-0737, "Clarification of TMI Action Plan Requirements."
- "Generic Letter 82-05," Letter from Darrell G. Eisenhut, Director, Division of Licensing (DOL), to all Licensees of Operating Power Reactors, dated March 14, 1982.

- NUREG-0578, "TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations," dated July 1979.

- "Letter from Darrel G. Eisenhut, Acting Director, Division of Operating Reactors, NRC," to all Operating Power Plants, dated October 30, 1979.

- Letter from Darrel G. Eisenhut, Director, Division of Licensing, NRR to Regional Administrators, "Proposed Guidelines for Calibration and Surveillance Requirements for Equipment Provided to Meet Item II.F.1, Attachments 1, 2 and 3, NUREG-0737," dated August 16, 1982.

- Regulatory Guide 1.2 "Assumptions Used for Evaluating Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors".

- Regulatory Guide 1.97, Rev. 3, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident."

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

- Unit 2 Final Safety Analysis Report

- Unit 2 Technical Specifications

- NRC Safety Evaluation Report for the Nine Mile Point 2 Nuclear Power Station.

4.0 <u>License Action on Previous Items</u>

<u>Unit 1</u>

4.1 (Closed) Inspector Follow Item (50-220/84-14-01)

This item consisted of two subparts

<u>Item 1: (Closed)</u>

Modify the dissolved gas collection portion of the PASS system to improve its collection ability. Problems involved were leakage and water introduction into the sample.

The licensee completed the modifications via Mod. No. 80-40-1. A preoperation test of the system was completed. Test results were reviewed and approved on June 13, 1986. A review was performed of the preoperation PASS dissolved gas test results and compared with normal sample station results. Results were considered acceptable for the dissolved gas concentration found.

Item 2 (Closed)

Determine the purge time required to obtain a representative liquid sample.

The licensee measured line lengths and estimated line volumes to determine needed sample purge time. Purge time requirements were incorporated into appropriate procedures.

4.2 (Open) Inspector Follow Item (50-220/84-14-02)

This item consisted of two subparts:

Item 1 (Closed)

Document the performance characteristic of the criteria flow orifice above and below atmosphere pressure.

The licensee determined the flow at pressure differentials which the orifice would encounter. Appropriate flow correction charts were incorporated into applicable procedures.

Item 2 (Open)

Increase the heat trace temperature on the containment sample line to at least 100°C.

This has not yet been performed, because of on-going discussions between the corporate and site staff.

4.3 (Closed) Inspector Follow Item (50-220/84-14-03)

Licensee to complete and document all training in core damage assessment and the hands-on operation of the PASS.

The inspector reviewed training documentation for chemistry technician and reactor analysts. The training has been completed and documented. Personnel receive periodic requalification training.

4.4 (Closed) Inspector Follow Item (50-220/84-14-04)

Complete preoperational testing of the RAGEMS effluent monitoring system.

The preoperational testing was completed. The Station Operation Review Committee and Nuclear Review and Audit Board reviewed and approved the test results.

4.5 (Closed) Inspector Follow Item (50-220/84-14-05)

This item included five subparts:

Item 1 (Closed)

An additional read-out of the information available from RAGEMS should be established in the Control Room.

A modem and computer terminal, which can access RAGEMS, are in the Control Room. These can be used to obtain RAGEMS information and status.

Item 2 (Closed)

Provide a duplicate readout and recording of RAGEMS monitor functions in the Control Room.

The computer terminal discussed in Item 1 provides monitor status. A second back-up High Range Effluent Monitoring System (OGESMS) provides for tracking of effluent releases.

Item 3 (Closed)

Provide pilot lights to verify immediate operation of the RAGEMS sample dilution process.

The computer terminal discussed in Item 1 provides readout in the Control Room of both sample count rates and RAGEMS flow control (i.e. dilution).

Item 4 (Closed)

Establish records for the availability of RAGEMS. Develop backup procedures in the event RAGEMS is not functional.

Licensee records indicate RAGEMS was available 100% of the time in 1987 and about 97% of the time in 1986. The licensee's old High Range Effluent Monitor (OGESMS) can provide back-up sampling capability (See Section 4.8 regarding status of procedures).

Item 5 (Closed)

Establish controls to better control modifications to RAGEMS software.

The licensee established procedure control for modification and review of RAGEMS software.

4.6 (Closed) Inspector Follow Item (50-220/84-14-06)

Provide procedures and training in the capabilities and utilization of RAGEMS. At the time of Inspection 84-14 only about 2 individuals had an indepth understanding of its capabilities and utilization.

The licensee has developed and completed procedures which describe the capabilities and utilization of RAGEMS. Additional chemistry personnel, emergency planning personnel, and reactor operation personnel have received appropriate training on RAGEMS.

4.7 (Closed) Inspector Follow Item (50-220/84-14-07)

Provide additional illumination and legible flow diagrams at the base of the stack.

The licensee has provided for controlled flashlights in Emergency Stack Sampling Kits. Also controlled flow diagrams have been provided at the base of the stack.

4.8 (Open) Inspector Follow Item (50-220/84-14-08)

This item included two subparts:

Item 1 (Open)

An analysis should be provided of the licensee's ability to obtain, to handle and to analyze the levels of particulate and iodine activity anticipated during accident conditions and in the event that RAGEMS were partially or fully disabled by hardware and/or software malfunction.

The licensee provided procedure guidance for collection of a particulate and iodine effluent sample if the RAGEMS was partially or fully disabled. Although this method is a back-up to the licensee's principal means of monitoring high effluent activities, the procedure guidance was considered in need of improvement in that the procedure did not specify methods to limit activity collected on sample cartridges to ensure capability for analysis and minimize unnecessary personnel exposure.

Licensee representatives concurred with the inspector's observations and indicated procedure quality would be upgraded to address this matter.

Item 2 (Closed)

The licensee should demonstrate that RAGEMS and its associated sampling lines meets the stipulation of Footnote 14 of Regulatory Guide 1.97, namely that it provides "the best sample practicable."

The licensee should make an empirical determination of line losses or deposition, so as to establish appropriate correction factors to be applied.

The licensee performed a detailed evaluation of effluent sample line losses. Appropriate correction factors for correcting sample results were incorporated into station procedures.

4.9 (Open) Unresolved Item (50-220/84-14-09)

The licensee was not able to provide sufficient information to demonstrate that the High Range Containment Monitor and associated equipment were qualified for the harsh accident environment they might be subjected to.

The detectors and associated equipment are not subjected to drywell atmosphere. The detectors do protrude into the drywell via penetration but are located in the Reactor Building. The licensee considers the monitor to be subject to a mild environment as discussed in Regulatory Guide 1.89. The licensee demonstrated that the detectors are qualified for anticipated radiation dose rates and integrated doses to be encountered. The licensee provided memoranda which provided a general discussion of temperature and humidity acceptability of the detectors and equipment. However, specific maximum values of temperature and humidity to be encountered were not readily available.

The acceptability of the detectors qualifications relative to temperature and humidity remains unresolved.

The licensee will supply the data to support qualifications for these items.

4.10 (Closed) Inspector Follow Item (50-22/84-14-10)

Remove or reduce the length of the tygon sample tubing for the Technical Support Center Particulate, Iodine and Noble Gas (PING) monitor.

The licensee removed the tygon tubing.

UNIT 2

4.11 (Closed) Inspector Follow Item (50-410/86-09-34)

Complete NRC review of licensee action on NUREG-0737 Item II.B.3. This matter is discussed in section 5 of this report.

4.12 (Closed) Inspector Follow Item (50-410/86-09-35)

Complete NRC Review of licensee action on NUREG-0737 Item II.F.1-1. This matter is discussed in section 6 of this report.

4.13 (Closed) Inspector Follow Item (50-410/86-09-30)

Complete NRC Review of licensee action on NUREG-0737 Item II.F.1-2. This matter is discussed in section 7 of this report.

4.14 (Closed) Inspector Follow Item (50-410/86-04-37)

Complete NRC review of licensee action on NUREG-0737 Item II.F.1-3. This matter is discussed in section 8 of this report.

4.15 (Closed) Inspector Follow Item (50/410/86-09-42)

Complete NRC review of licensee action on NUREG-0737 Item III.D.3.3. This matter is discussed in section 9 of this report.

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

5.1 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 criteria are denoted in commitments to the NRC relative to the specifications contained in NUREG-0737.

5.2 Scope of Review

The implementation, adequacy and status of the licensee's post-accident sampling, monitoring and analysis systems were reviewed relative to the criteria identified in Section 3 and in regard to licensee letters, memoranda, drawings and station procedures as listed in Attachment 2 of this inspection report.

The licensee's performance relative to these criteria was determined by interviews and discussions with cognizant licensee personnel, review of procedures and documentation and conduct of performance tests to verify hardware, procedures and personnel capabilities.

5.3 System Description and Capability

The licensee has installed a Post-Accident Sampling System which is a standard General Electric design. The system has the ability to obtain unpressurized undiluted and diluted samples of reactor coolant from the jet pump and the Residual Heat Removal (RHR) system.

Atmospheric samples can also be obtained from the drywell, suppression pool and reactor building atmospheres. Redundant containment hydrogen analyzers provide hydrogen analysis back-up capability.

Analyses for chloride, boron, pH and hydrogen are conducted in the laboratory using an ion specific electrode, carminic acid (Hach Method), pH electrode and a gas chromatograph, respectively. Radioactivity analyses are performed using a computer-based gamma spectrometer in the licensee's counting room. Chloride analysis can also be performed by an offsite laboratory.

5.4 PASS Performance Testing

Grab samples of reactor coolant and the drywell (primary containment) atmosphere were collected during an operations test of the PASS on June 24-25, 1987. During this test licensee personnel demonstrated the integrated ability to collect and analyze samples within the constraints of NUREG-0737, II.B.3.

5.5 Reactor Coolant Sampling

The reactor coolant sampling subsystem is designed to obtain samples of liquids and dissolved gases during all modes of operation. During this operational test, diluted and undiluted samples were collected from the jet pump loop during low-power reactor operation. Although both liquid and dissolved gas samples could be obtained from the sampling points, the following improvement items were discussed with the licensee.

The licensee indicated that these matters will be reviewed and clarification or improvements will be considered, as appropriate (50-410/87-22-01):

- Although licensee personnel had received training and procedures covering hydrogen determination by Henry's Law in undiluted samples. The licensee hadn't practiced the procedure during Unit-2 drills. Reactor conditions did not allow the collection of a sample for this purpose.

- No intercomparison of results with normal and other PASS samples had been made to ensure that hydrogen gas determinations could be made by Henry's Law method.

- A ball valve is used to provide a 0.1 ml reactor coolant samples for dilution with 9.9 ml of demineralized water (i.e., 100:1 dilution) for the PASS diluted sampling capability. No records

were available of calibrations of the ball valve to show that it reproducibly and reliably provided 0.1 ml samples for subsequent dilution.

5.6 Containment Air Sampling

Atmosphere samples can be obtained from the drywell, reactor building and suppression pool. During the operational test, samples were collected from the drywell. The following item needing improvement was identified. The licensee indicated this item would be reviewed and clarification or improvements will be considered as appropriate. (50-410/87-22-02):

- Procedural guidance for gathering containment particulate and iodine samples was not provided to restrict total radioactivity to ensure that the samples could be safely handled and counted.

5.7 Analytical Capability

The licensee's commitments relative to range, uncertainty and analytical capability were provided in the licensee's Final Safety Analysis Report (FSAR).

The Safety Evaluation Report specifies that the accuracy, range and sensitivity of the PASS analytical procedures are consistent with NRC Regulatory Guide 1.97, Revision 3, and NUREG-0737.

5.7.1 Chloride

The licensee's primary method for chloride analysis is the use of a specific ion electrode. Back-up capability is provided offsite through the Pooled Inventory Management System (PIMS) which includes resources for analysis of samples. NRC's chloride standards were submitted to the licensee for analysis in-house. The results are listed in Attachment 3. The licensee's analysis results were acceptable.

The following improvement item related to the offsite transport of samples was noted. The licensee indicated that this item would be reviewed and clarification or improvements will be considered as appropriate: (50-410/87-22-03)

- The licensee planned to use a NUPAC Model PAS-1 (Certificate of Compliance No. 9184) for offsite shipments of undiluted reactor coolant. However, the licensee was not a registered user of the shipping cask and procedures for sample loading and handling the cask had not been established.

The licensee indicated that registration as a user of the NUPAC Model PAS-1 would be completed and procedures for its use would be established and maintained.

5.7.2 Boron

Boron analysis is performed by the carminic acid method in the licensee's laboratory on a diluted reactor coolant sample (200:1). NRC's boron standards were submitted to the licensee for analysis. The results are listed in Attachment 3. The licensee's analytical results were acceptable. However, the following item needing clarification was noted. The licensee indicated that this item would be reviewed and clarification would be made if appropriate (50-410/87-22-04):

- The licensee's FSAR commitments for boron analysis specified a range of 50 to 2,000 parts per million (ppm) ± 50 ppm. The GE standard methods call for a range of 0 to 1,000 ppm in order to show boron injection had reached a total reactor coolant concentration of 660 ppm or more. The licensee stated that a request to alter the FSAR range to 0 to 1,000 ppm with an accuracy of ± 50 ppm would be made. Licensee's laboratory practice would remain unchanged. This clarification was considered acceptable.

5.7.3 pH

Analysis for pH is performed using a pH meter in the licensee's laboratory on an undiluted sample. Comparison of the pH measurements on the undiluted PASS sample and a routine sample from the licensee's normal reactor sampling are contained in Attachment 3. The licensee's analytical results were acceptable.

5.7.4 Radioactivity Analysis

Gamma isotopic analysis of PASS liquid and gaseous samples is performed using the licensee's normal counting room gamma spectroscopy system. The use of dilution and increased sample to detector (i.e., up to 100 cm) distances allow the licensee to analyze the full range of anticipated concentrations in liquid samples. However, as noted above, limitations on airborne particulate and iodine radioactivities were needed to ensure counting capability. (See section 5.6)

Results of actual reactor water samples are contained in Attachment 3 for a PASS sample (undiluted) and normal operational sample. The licensee's analytical results were acceptable. However, the licensee's library of computer gamma spectral peaks did not contain Ruthenium-103 which could

be used in assessing core damage (i.e. melting). The use of Ruthenium (and Tellurium) as fuel melting indicators is well established.

The licensee indicated that Ruthenium-103 would be included in the new gamma spectroscopy system computer library.

5.7.5 Hydrogen and Dissolved Gas

Dissolved gas is determined by the GE PASS expansion method and by gas chromatography for hydrogen and oxygen. As noted earlier, the licensee had not practiced the GE PASS expansion method (see section 5.5). However, the licensee demonstrated operation of the gas chromatograph for oxygen and hydrogen determinations. The analysis of hydrogen in the containment atmosphere is also provided by an in-line hydrogen analyzer as required by NUREG-0737, Item II.F.1-6.

5.8 Core Damage Assessment

The licensee uses a computer-based ratio method for core damage assessment with a back-up capability for hand calculational methods. Results from the computations and other plant parameters (e.g. core water level and hydrogen measurements) are assessed by senior technical staff for determining core damages. On June 25, 1987, the licensee's staff successfully determined the apparent core damage from a postulated PASS reactor coolant sample gamma spectroscopic analysis.

5.9 Additional Findings

The licensee indicated that the following additional items would be reviewed for clarification or improvement: (50-410/87-22-05):

- During the PASS drill on June 24, 1987, the PASS sampling team removed supplied air respirators from the PASS sampling area to use other face masks for airline respirators. In a potentially contaminated area (such as the sampling room), high unnecessary airborne exposures to sampling team members could result from the need to change masks. A respiratory protection apparatus allowing both self-contained and airline use would eliminate this concern.

- The PASS Sample Room is also the Radwaste Sampling Room. The introduction of radwaste liquid samples to the lines supplying the radwaste sampling panel following an accident could result in unacceptably high dose rates in the area of the PASS panel. The licensee indicated Post-accident controls for the use of the Radwaste Sampling Panel will be provided to minimize this concern.

- Under Technical Specification 6.8.4.c, the licensee is required to provide a maintenance program for the PASS. Approximately quarterly, the licensee tests technician proficiency in using the PASS. Problems with the PASS may be uncovered during those tests. If problems are noted, a work request is generated to correct the problem. However, a program for routine inspection and surveillance testing of the PASS was not provided. The test program conducted by the licensee is considered a repair program in practice. This program would not generally provide complete assurance that the PASS could perform its intended function since routine testing and surveillance as recommended by GE are not performed.

6.0 Noble Gas Effluent Monitor, Item 11.F.1.1

6.1 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 basis 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.

6.2 Documents Reviewed

The implementation, adequacy, and status of the licensees monitoring systems were reviewed against the criteria identified in Section 3.0 and in regard to licensee correspondence, memoranda, drawings and station procedures as 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.

6.3 System Description

The licensee has installed a Science Applications International Corporation Gaseous Effluent Monitoring System (GEMS) to sample the main stack and combined reactor building vent/radwaste building exhaust effluent.

The systems are designed to provide for the on-line analysis of noble gases over the range of concentrations from normal low-level emissions up to the highest levels stipulated in NUREG-0737, II.F.1-1. (i.e., the system is used for normal effluent monitoring purposes also).

A germanium (GE) detector coupled to a Multi-Channel Analyzer (MCA) is used to acquire data. A DEC PDP 11/44 computer is used to analyze and interpret data.

In order to provide for a wide dynamic range, the gaseous detection channel utilizes the following: automatic control of analysis times; routing of the gas stream alternatively through either a 6 liter or a 30 cm^3 shielded detection chamber; and the dilution of high concentrations of radiogases in the inlet sampling stream by successive factors of approximately 1/200.

Detector readouts are available in the Control Room, Technical Support Center and Emergency Operation Facility.

6.4 Findings

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

- range
- calibration
- sample points

The establishment and implementation of Technical Specification required surveillance procedure was also verified. A procedurally described maintenance program was in place. (See section 10.3.1)

Within the scope of this review the following item for clarification or improvement was identified: (50-410/87-22-06)

- The licensee has made back-up provisions to collect a grab noble gas sample using a marinelli and sample pump. However:
  - a large volume marinelli is used. A small volume (approximately 25 cc) marinelli is needed for higher concentrations of noble gases to ensure samples can be analyzed and personnel exposure is minimized when handling.
  - the marinelli is purged to the general area of the sample station. This may cause a personnel exposure problem.

7.0 Sampling and Analysis of Plant Effluents, Item II.F.1-2

7.1 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.

7.2 Documents Reviewed

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 licensee correspondence, memoranda, drawings and station procedures as 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 qualifications, and by direct observation of the system.

In addition, performance evaluation was made during a drill in which particulate and iodine sample cartridges were collected and analyzed.

7.3 Description and Capabilities

The licensee has in place a Science Applications International Corporation Gaseous Effluent Monitoring System (GEMS).

As with the noble gas portion of the system (described in Section 6.0), the particulate and iodine portion of the system is designed to provide for the analyses of these effluents from normal low-level emissions up to the highest levels specified in NUREG-0737, II.F.1-2.

This system provides for the automatic insertion of individual standard sized particulate and iodine sampling cartridges into the sample line in series ahead of the gas module. They are then allowed to collect activity for a specified but variable amount of time (through computer control) depending on the level of activity sensed by the gas sample ratemeter. They are then automatically removed from the sample line and directed into shielded counting chambers for measurement of the collected particulate iodine radioactivity by their detectors. The counting time is also computer controlled on the basis of the amount of activity contained in the immediately preceding sample.

7.4 Findings

Within the scope of the review, the GEMS was found to meet the NUREG-0737 Item II.F.1-2 specifications. The following elements were reviewed:

- range
- calibration
- sample points
- analysis capability

The establishment and implementation of appropriate Technical Specification required surveillance procedures was also verified. A procedurally described maintenance problem was also in place. (See Section 10.3.1)

Within the scope of this review, the following matters were identified which the licensee indicated would be reviewed for clarification or improvement (50-410/87-22-07):

- Guidance is not contained in procedures to aide in selection of the optimum nuclide library for use in analysis of particulate and charcoal cartridges at the 100 cm shelf-height of the gamma spectroscopy system.

- A temporary sample arrangement is used to provide backup capability for collecting a particulate and iodine effluent sample from the main stack and reactor building vent. The following deficiencies associated with the backup samples were identified:

  - The sampler collects a sample from the normal effluent sampler return line. It is not apparent that the samples collected are representative.

  - The sampler exhausts its effluent to the general area of the sample station creating a possible personnel exposure concern during sampling.

  - No provisions to limit the amount of activity collected on the cartridges is in place.

  - Technicians, although trained in procedure requirements, do not perform walk-throughs of backup sampling.

  - Procedures do not describe use of the backup pump to collect a particulate and iodine sample in the event GEMS is not operable.

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

8.1 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.

8.2 Documents Reviewed

The implementation, adequacy, and status of the installed in-containment high range monitors were reviewed against the criteria set forth in Section 3.0 of this report and in regard to interviews with cognizant licensee personnel, licensee letters, station procedures, as-built prints and drawings as listed in Attachment 5 to this inspection report, and by direct observation.

8.3 System Description

The licensee has installed four Kaman Model 50314 pressurized ion chambers at the 265' elevation of the drywell (90° apart from each other). The detectors, part of the Kaman KMA-I1000 Instrument System, are powered by vital instrument power supplies. The detectors readout in the Control Room at Panel 880B and at the five strategically located Digital Radiation Monitoring System consoles.

The detector readouts are not used for core damage assessments but may be used to provide source term information.

8.4 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
- personnel training

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

Within the scope of this review the following items were identified which the licensee indicated would be reviewed for possible clarification or improvement (50-410/87-22-08):

- The in-situ calibration of detectors A and B were in error due to a shield analysis error. The error, however, was minor and limited to 4%.

- Detector C and D are out of service due to cable problems. However, the channels A and B satisfy the Technical Specification requirement for two operable channels.

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

9.1 Position

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

9.2 Review Criteria

The implementation, adequacy and status of the licensee's in-plant iodine monitoring under accident conditions were reviewed against the criteria listed in Section 3.0 and in regard to the documents identified in Attachment 6 to this inspection report. The licensee's performance relative to these criteria was determined by:

- Interviews with cognizant licensee personnel;
- Review of applicable operational and emergency plan procedures;
- Review of applicable lesson plans and training records;
- Discussions of methodology and implementation with radiation protection technicians;
- Verification of equipment availability and storage; and
- Observations during a sample collection and analysis drill.

9.3 Description of Methodology and Capabilities

The licensee has in place three methods which can be used to determine the airborne concentration of radioiodine within the facility. The three methods are: collection of an air sample with a high volume sampler and subsequent analysis of the sample with a thin window GM tube; collection of an air sample with a high volume sampler and subsequent analysis of the sample with a Ge-Li system; and lastly real time monitoring of airborne iodine concentrations with an Eberline PING. The method selected is based on dose rates emanating from the sample and location being sampled. The Technical Support Center and Emergency Operations Facility each have a PING monitor.

Samples can be collected using charcoal or silver zeolite cartridges. Appropriate precautions for purging samples are in place.

9.4 Findings

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

- equipment
- associated training
- procedures
- sample analysis, methodology and accuracy

Within the scope of the review, the following items for improvement or clarification were identified (50-410/87-22-09):

- The flow rate measuring devices on the PINGs has not been calibrated for about 4 years. It was not apparent that the flow rate measuring device was in calibration. The licensee indicated that the calibration of the device will be reviewed and proper calibration frequency will be established.

- The background effects due to noble gases collected on cartridges and limiting dose rates for acceptable operation of the PINGs has not been fully evaluated. Procedures do not provide minimum dose rates the system is considered acceptable to operate in and provide valid data.

- Practical factors training is not provided for inplant sampling teams.

- Procedure EPP-6 specifies incorrect location of battery carts for air samples.

- Guidance as to where to store inplant air samples after analysis is not provided in appropriate procedures.

10.0 Quality Assurance and Design Review

10.1 Post Accident Sampling System (PASS)

10.1.1 Environmental Qualification of Electrical Components

Inspection was made to determine licensee conformance with the requirements of Criterion 1 of NUREG-0737, Appendix B, for the environmental qualification of the PASS electrically-operated components or devices which are either exposed to containment harsh environment or which could be inaccessible for maintenance during an accident condition. The inspector selected and examined the licensee qualification documentation for the Containment Monitoring System (CMS) Loop A sample line components which include the solenoid-operated sampling valves, electrical cables, cable penetrations, and heat tracing.

The environmental qualification of the components in the PASS system was made in accordance with 10 CFR 50.49 Paragraph (f)(2) which permits qualification by testing a similar item with supporting analysis to show that the equipment to be qualified is acceptable.

In order to verify the qualification of the actual items installed by the licensee, the inspector reviewed the analyses made by the vendors and the licensee to demonstrate similarities/differences between the test items and the installed items and the justification for the qualifications.

The inspector confirmed that incoming electrical conduit and cable to the electrical solenoids are environmentally terminated/installed in accordance with licensee specification E061A by a review of the appropriate installation and inspection reports listed in Attachment 7. Cable and solenoid wires are connected together by splicing and insulated by utilizing a Raychem nuclear-qualified in-line splice sleeve type WCSF-N. The Target Rock solenoid-operated valve qualification in the licensee's EQ Manual requires maintenance to replace the elastomeric components every five years and to replace the entire electrical assembly every ten years. The inspector confirmed that the licensee's maintenance program for these valves in the Electrical Maintenance Procedure N2-EPM-GEN-5Y524, Rev. 0, 1/87, contains these requirements.

Within the scope of this review no unacceptable conditions were identified.

10.1.2 Electrical Power Supplies to The PASS

Criterion 3 of Appendix B to NUREG-0737 states that "The instrumentation should be energized from station class 1E power sources."

A review by the inspector disclosed that the PASS instrumentation and Control Panels 2SSP-IPNL101 and 2SSP-IPNL102 including their input and output devices are powered from non Class 1E power sources. Therefore the inspector reviewed the pertinent electrical power documentation listed in Attachment 7 to ascertain whether PASS equipment and instrumentation can be considered reliably-powered.

The review disclosed that panels 2SSP-IPNL101 and 2SSP-IPNL102 are supplied power from distribution panels 2VBS-PNLA102 and 2BVBS-PNLB107, respectively. These power distribution panels are each separately powered from Uninterruptable Power Supply (UPS) panels which are separately supplied A-C power through Automatic Bus Transfer (ABT) from either offsite power source and each UPS panel is separately supplied D-C power from its own 125 volt D-C battery. It appears that this independence and multiplicity of power sources should provide reliable power to the PASS.

Further review of the electrical power distribution within the PASS disclosed that the solenoid-operated isolation/sampling valves in each of the two PASS sampling lines from inside containment to the outside sampling stations are powered from the two class IE Division I and II, 120 volt A-C power sources. The containment samples for each sampling level must pass through a total of five solenoid-operated valves. In each line there are four valves powered from one supply and one from the other supply. It is understood that this design is necessary to assure containment isolation. However, failure of either power supply disables the sampling system.

According to the NUREG-0737 acceptance criteria, this single failure which causes the loss of sampling capability within the PASS is satisfactory provided that it can be restored to take samples within 3 hours. The licensee will provide instructions for accomplishing the restoration of power such that sampling can be accomplished.

PASS samples taken at the sampling station normally require the use of the store room elevator to transport them for analysis due to the heavy weight of the sample containment and transport cart. This elevator is powered from non-safety related 600 volt load center 2NJS-US2 in the reactor building. This load center could be fed from either offsite source by a manual circuit breaker selection to feed the load center. Powering this load center from either of its feeders is covered in the normal station operating procedures. Therefore the elevator could be powered at all times when offsite power is available unless there is a fault in the power feeders in or to the load center. In this case or if the elevator is otherwise disabled, other provisions must be made by the licensee to transport the samples from the station to the laboratory for analysis.

The containment sampling lines are electrically heat-traced to prevent condensation in the lines. Heat tracing of the lines from within the containment to the last solenoid-operated valve ahead of the sampling station is from a Class 1E power supply. Beyond this valve to the sampling station, power is Class non 1E. It appears that loss of power to either section of the lines could cause problems with water within the lines. However, it is reasonable to assume that power could be restored to these heaters within the NUREG-0737 criterion 3-hour time period.

The temperature of each heat traced line is controlled by an individual electrical thermostat.

Within the scope of this review, the following items for improvement or clarification were identified (50-410/87-22-10):

- Provide some guidance for identification of loss of power and restoration of power to the PASS isolation valves to ensure the capability to collect and analyze a sample within 3 hours.

- Provide guidance for restoration of power to the store room elevator to ensure its availability for sample transport.
- Provide an appropriate periodic maintenance of heat tracing for the containment sample line.

10.2 Containment High Range Radiation Monitor (CHRRM)

NUREG-0737 requires that there be two radiation monitors within containment. By a review of the pertinent electrical instrumentation and electrical power drawings and documents listed in Attachment 7 and by a physical walkdown of the system, the inspector confirmed that there are two independent CHRRM systems.

10.2.1 CHRRM Environmental Qualification

The inspector reviewed the EQ files for portions of the system located within the containment harsh environment and also for portions of the system located outside the containment as follows:

- Kaman Instrumentation Company Qualification Report for Model KDI-1000 High Range Containment Area Radiation Detector and Mineral-Insulated Cable System - Report 4600365-002, Rev. A including Addendum No. 1 dated 12/5/85.
- Comex Corporation Design Qualification Report for Instrumentation Service Classification Electric Penetration Coaxial and Triaxial Feedthrough Module Assemblies - Report No. IPS-1054, Rev. D dated 6/15/84.
- Niagara Mohawk and Stone and Webster Specifications, Procedures and Inspection Reports listed in Attachment 7 which verify the maintenance of environmental qualification from the initial procurement through the final installation/acceptance tests.

Within the scope of this inspection, the inspector confirmed that the licensee has been able to qualify CHRRM channels A and B for operation. Channels C and D will require replacement of in-containment mineral-insulated cables which do not meet the EQ qualified insulation resistance test acceptance criteria (see Section 8.4).

10.2.2 CHRRM Electrical Power Supplies

The CHRRM system has been classified by the licensee as Nuclear Safety Related and as such it is required to be powered from Class 1E safety-related power sources.

Pertinent electrical instrumentation power supplies documentation were reviewed to ascertain the sources of power used throughout this system as follows:

- NMPC Unit 2 Electrical Plant Master One Line Diagram Drawing 12177-EE-MOIE-3.

- NMPC Unit 2 Radiation Monitoring System Area Monitors and Detectors Electrical Wiring Diagram Drawing 12177-EE-36G-2.

- NMPC Unit 2 Reactor Building Ventilation, Radiation Monitoring Systems Electrical Wiring Diagrams Drawing 12177-EE-3TN-3.

These drawings show that CHRRM system channels A and C are powered form Division I Safety Related Uninterruptable Power Supply (UPS) 120 volt AC Instrumentation Power Panel 102A and channels B and D are similarly powered from Division II UPS Power Panel 302B.

The Class 1E CHRRM system provides output information/signal data to non Class 1E data acquisition devices. The inspector confirmed that these output circuits include the appropriate qualified Class 1E/non Class 1E electrical isolation devices required to protect the CHRRM system from non Class 1E circuit degradation.

Outside containment system connecting electrical cables were verified as Class 1E qualified by a review of licensee Cable Qualification E024PAB, Rev. 2 dated 2/18/86.

The inspector found no deficiencies in the licensee's design, environmental qualification, or the electrical power systems for the CHRRM system. The walkdown inspection of channel A (outside containment) did not disclose installation or construction problems in the areas of cable installation (pulling, routing, separation, identification) nor wiring or identification problems within both the local and remote instrumentation panels.

10.3 Gaseous Effluent Monitoring System (GEMS)

10.3.1 GEMS Environmental Qualification

The inspector made a review of the following GEMS equipment and system environmental qualification documentation.

- Science Applications International Corporation - Environmental Certificate of Compliance for the items of equipment which make up the GEMS system.

- Science Applications International Corporation - Gaseous Effluent Monitoring System - NM Unit 2 Electrical Equipment Qualification Report.

Satisfactory operation and continuing qualification of this system and its equipment is contingent upon an ongoing preventive maintenance program. The inspector reviewed the recommended program by Science International to maintain the environmental qualification and operability of the system. It included inspection, replacements, etc. ranging from monthly to six year intervals. Accordingly, the licensee had prepared Equipment Qualifications/Maintenance Program Data Sheets covering these system. The licensee indicated he would include these requirements in the maintenance program.

Within the scope of this review, the following item for improvement or clarification was identified (50-410/87-22-11):

- Include the Maintenance Program data sheets for GEMS into the formally established maintenance program.

10.3.2 GEMS Electrical Power Supplies

NUREG-0737, Appendix B, Criterion 3, states that "The instrumentation should be energized from station Class 1E power sources." A review was made by the inspector to determine the power sources to the GEMS systems in order to ascertain their reliability and availability to power this system.

The inspector found that the GEMS system mainframe cabinets 2RMS-CAB170 and 2RMS-CAB180 are powered from non Class 1E power sources. However, each of the cabinets is powered from a separate electrical distribution panel which derives its power from an uninterruptable power supply (fed by both 125 volt D-C battery and 120 volt A-C supply). The A-C power supply to each of the UPS systems is derived from A-C load centers which can be fed from either of the A-C offsite sources. Therefore, the power supply to these systems was considered to be reliable.

10.4 Quality Assurance Review

The inspector reviewed pertinent work and quality assurance records for the design, construction and installation of both the High Range Radiation Monitoring and Post Accident Sampling Systems to ascertain whether the work completed and the records reflect accomplishments consistent with NRC requirements, the TMI Action Plan Generic Criteria of NUREG-0737, and licensee commitments.

Particular emphasis of this inspection in the area of Quality Assurance was placed on the High Range Radiation Monitoring System mineral-insulated cabling. The stringent requirements placed upon it at every step including its procurement, shipping, receipt, storage, handling, coiling, uncoiling, recoiling, installation, checkout, treating and acceptance were critical to the successful operation of this system. Documents reviewed included those listed in Attachment 7. A thorough review of the licensee's QA program in regards to this portion of the system with favorable findings was believed to be indicative of a good overall program.

During this inspection in this area, there were not adverse findings in the licensee's QA program and its implementation.

11.0 Worker Concerns (RI-87-A-0015)

11.1 General

On March 3, 1987 an individual contacted the NRC Region I to express concern about the adequacy of particulate air sample filters provided in Emergency Survey Kits. The individual also indicated that a deficiency report (i.e., Nonconformance Event Transmittal [NET]) concerning the adequacy of the filters had been rewritten to minimize the significance of the finding.

An onsite review of this matter was performed during this inspection.

The evaluation of the circumstances surrounding this matter and licensee action thereon was based on review of the NET, observation of filters in filter kits and discussion with cognizant personnel.

11.2 Findings

On February 4, 1987, a NET was issued involving apparent use of improper air sample particulate filter papers in Emergency Kits. The NET was reviewed by the Unit 1 Radiation Protection Supervisor on or about February 4, 1987. Based on this review, the NET was considered inappropriate for issuance because of a lack of specificity. In addition, the supervisor believed the matter should be addressed through the Emergency Kit Inventory Process. This was concurred in by the Radiation Protection Manager. However, as a result of discussions between the Radiation Protection Manger, and the individual, a second NET was issued on February 6, 1987, by the Emergency Response Coordinator. The second NET was issued for the purpose of placing the observation in the NET tacking process.

On February 6, 1987, the Emergency Response Coordinator issued a memorandum identifying short and long term corrective actions for the concerns. The corrective actions were independently verified by the inspector. The actions were:

- The ion exchange papers and chemistry filter papers contained in the kits were replaced.

- Storeroom stocks were verified correct. (Note: The licensee believes incorrect stock number filter papers were inadvertently used.)

- Procedures have been revised to clearly specify filters to be placed in kits.

- Procedures were revised to require periodic Emergency Planning Management inspection of kits and initiation of corrective action for identified deficiencies.

On March 6, 1987, a memorandum was issued to the concerned individual by the Radiation Protection Manager outlining the reasons the original NET was not issued.

11.3 Conclusions

The following conclusions were obtained:

- Incorrect filter papers were in the kits but subsequently replaced with the correct papers.

- Corrective actions were taken to identify similar potential concerns with Emergency Sample Kit inventories in the future.

- Emergency Procedures (EPMP-2) provide a mechanism for correcting inventory discrepancies. Discrepancies are to be corrected within 96 hours. Consequently, it was not apparent that a NET need be written to ensure corrective actions were taken.

- The individual was satisfied with the corrective actions taken.

No violations were identified.

The licensee's Superintendent, Chemistry and Radiation Protection Management indicated that consideration would be given to requiring Radiation Protection Manager sign-off of NETs that are believed not needed to be issued. Currently, first line Radiation Protection Supervision are permitted to solely make the decision as to the need for a NET.

12.0 Exit Meeting

The inspectors met with licensee representatives denoted in Attachment 1 on June 26, 1987 and July 1, 1987. The inspectors summarized the purpose, scope and findings of the inspection.

No written material was provided to the licensee.

Attachment 1

Individuals Contacted

1. Niagara Mohawk Power Company

T. J. Perkins, General Superintendent
2) T. W. Roman, Unit 1 Station Superintendent
1) R. Abbott, Unit 2 Station Superintendent
2) W. Connolly, QA Program Manager
2) T. Newman, Supervisor, Nuclear Quality Assurance
C. Beckman, Manager, Operations Quality Assurance
M. Jones, Unit 2 Operations Superintendent
1) A. Sassani, Supervisor, Instrumentation and Control
2) J. Blasiak, Supervisor, Unit 1 Chemistry
1) A. Ross, Supervisor, Unit 2 Chemistry
1)&2)P. Volza, Supervisor Radiological Support
1) D. Barcomb, Supervisor, Unit 2 Radiation Protection
1)&2)L. Wolf, Site Licensing Engineer
1) A. Athelli, Senior EQ Engineer
1) M. Grammes, EQ Engineer
1)&2)T. Chwalek, Emergency Planning Coordinator
1)&2)J. Duell, Supervisor, Chemistry and Radiochemistry
2) E. Leach, Radiation Protection Manager
1)&2)T. Egan, Compliance and Verification Engineer
D. Coleman, Assistant Reactor Analyst
A. Pinter, Site Licensing Coordinator
1) C. Stuart, Superintendent Chemistry and Radiation Management
1) W. Thompson, Supervisor, Training
1) T. Kurtz, Supervisor, Radiation Protection Instrumentation

2. NRC

W. Cook, Senior Resident Inspector
1) W. Schmidt, Resident Inspector
C. Marschall, Resident Inspector

The inspectors also contacted other individuals.

1) Denotes those individuals present at the June 26, 1987 Exit Meeting.

2) Denotes those individuals present at the July 1, 1987 Exit Meeting.

<u>Attachment 2</u>

Documentation for NUREG 0737, II.B.3

Procedures

- N2-POT-17-4, "Preoperation Test-Post Accident Sampling System," Revision 1, (7/3/86);
- N2-CSP-13, "Chemical Post Accident Assessment at Unit 2," Revision 1, (4/24/87);
- EPP-9, "Determination of Core Damage Under Accident Conditions," Revision 3, (3/30/87);
- S-CAP-60, "Dilution of Liquid and Gas Samples of High Activity," Revision 2, (7/25/84);
- S-LIP-22, "Operation and Calibration of the Carle Instrument Analytical Gas Chromatograph," Revision 1, (6/11/87)

Drawings

- 12177-FSK-21.8.0, "Flow Diagram Post Accident Sampling"
- 12177-FSK-22-5L, "Flow Diagram Radwaste Building Ventilation"
- GE 796E723, "Post Accident Sampling System P&ID"
- GE 796E762, "Post Accident Sampling System P&ID"
- GE 795E822, "Post Accident Sampling System P&ID"

General Electric Co.

- GE PASS Manual, GEK-83344
- GE NEDC-24889

Calculations (Stone & Webster)

- "Pressure Drop Calc for Post Accident Sampling Sys.-RHR Sample Lines" (6/20/85);
- "Pressure Drop, Flow & Transport Time for Post Accident Sampling System - Jet Pump Sample," (6/25/87);
- "Pressure Drop Calculation for Post Accident Sampling Sys-Gas Sample Lines," (2/20/86)

Attachment 3

Comparison of Chemical and Radiochemical Test Results*

Parameter	Concentration	Measured Concentration	Difference	Licensee Commitment in FSAR
Boron (standard)	985±10ppm	1000ppm	+15ppm	±50ppm
	2980±50ppm	3080ppm	+100ppm	over the range
	4870±60ppm	5100ppm	+130ppm	50-2000ppm
chloride (standard)	24.1±3.1	19.5	-4.6ppm	1-10ppm±1ppm
	37.4±1.2	40.0	-2.6ppm	>10ppm±10%
	80.5±2.2	76.5	-4.5ppm	
pH(actual samples)	6.4	5.9	-0.5	±0.2
Isotopic (total activity) (Actual Samples)	2.47E-3* ±1.22E-4 μCi/ml	2.29E-3** ±1.14E-4 μCi/ml	-0.19E-3 μCi/ml	***

*Standard Reactor coolant sample taken June 25, 1987 (Normal Station)
**PASS Sample taken June 25, 1987
*** 1uCi/g to 10 Ci/g ± 200%

Attachment 4

Documentation for NUREG-0737, Item II F.1-1 and II F.1-2

Procedures

- Procedure S-CRIP-1, "Operation, Calibration and Maintenance of Canberras Jupiter Spectroscopy Systems," Revision 0
- Procedure N2-CSP-7V, "Gaseous Rad Waste Chemistry Surveillance at Unit 2," Revision 3
- Procedure S-CRIP-7, "Operation and Calibration of the GELI-1 and GELI-2 Gamma Spectroscopy System," Revision 1
- Procedure N2-OP-79, "Radiation Monitoring System," Revision 2
- Procedure No. N2-CSP-13, "Chemical Post Accident Assessment at Unit 2," Revision 2, (Appendix Q)

Attachment 5

Documentation for NUREG-0737 Item II.F.1-3

Kaman

- Kaman Report K83-62 u (R), Kaman Instrument, KMA-I 1000
- Kaman Instrument Corporation Report of Calibration - Model KDA-HR High Range Area Monitor Ion Chamber Detector

Procedures

- Procedure N2-RSP-RMS-R106, "Channel Calibration Test of the Drywell High Range Area Monitor," Revision 1, 4/21/87

Attachment 6

To Inspection Report 50-410/87-22

Documentation for NUREG-0737 Item III D.3.3

Niagara Mohawk

- Procedure S-RTP-76, "Operation and Calibration of the Eberline Model Ping-1A, Particulate Iodine and Noble Gas Monitor," Revision 1
- Procedure S-RTP-75, "Operation and Calibration of Radeco High Volume and Battery Operate Air Samplers Model H809V1 and H809C, Revision 1
- Procedure EPP-6, "Inplant Emergency Surveys," Revision 9
- Procedure S-CRP-1, Au Sample Analysis, Revision 0
- Procedure EPMP-3, "Review and Revision of Site Emergency Plan and Procedures," Revision 2.
- Procedure EPMP-2, "Emergency Equipment Inventories and Checklist," Revision 3.

Attachment 7

Documentation for QA and design review

Niagara Mohawk

12177-EE-BTA-4 Wiring Diagram, Control Panel, 2SSP-IPNL101 and 2SSP-IPNL102

12177-EE-M01E-3 Plant Master One Line Diagram Emergency 600v and 120 VAC

12177-EE-M01G-4 Plant Master One Line Diagram Normal 125 VDC

12177-EE-M01F-4 Plant Master One Line Diagram Emergency and Normal 125 VDC

12177-EE-M01A-3 Plant Master One Line Diagram Normal Power Distribution

12177-EE-M01C-3 Plant Master One Line Diagram Normal 600v and 120 VAC Rev 3

12177-EE-M01D-5 Plant Master One Line Diagram Normal 600v and 120 VAC Rev 4

12177-EE-M01A-4 Plant Master Diagram Normal Power Distribution

12177-EE-M01C-4 Plant Master Diagram Normal 600v and 120 VAC

12177-EE-11GM-2 Wiring Diagram Heat Tracing System

12177-EE-11GN-3 Wiring Diagram Heat Tracing System 2 HTS*PNL001

2-87-0210, -0343, -0344, -0367, -1126 and -1048 Quality Assurance Inspection Reports for Containment High Range Radiation Monitoring System

Stone and Webster Quality Assurance Inspection Reports

E6A 44615 - Witness Cable Removal from Packing Boxes and Storage

E6A 44626 - Insulation Resistance Tests

E5A 83455 - Unsatisfactory Attributes for Cables

E6A 44669 - Coiling and Uncoiling Cables

E6A 44682 - Cable Installation

E6A 44790 - Cable Termination, Continuity Testing, Torquing of Connectors

E6A 44632 - Handling of Cable

E6A 44725 - Cleaning of Cable

E6A 44743 - Termination and Torquing of Connectors

<u>Niagara Mohawk Quality Assurance Inspection Reports</u>

2-87-0367 CHRRM System

2-87-0344 CHRRM System

2-87-0210 CHRRM System

2-87-0343 CHRRM System

2-87-1126 CHRRM System

2-87-1048 CHRRM System