

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 93-02

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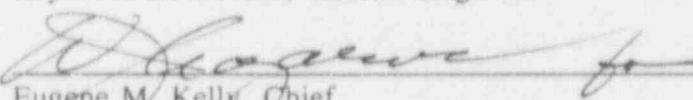
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Brattleboro, VT 05301


Facility: Vermont Yankee Nuclear Power Station
Vernon, Vermont

Inspection Period: January 3 - February 5, 1993

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Approved by:


Eugene M. Kelly, Chief
Reactor Projects Section 3A


2/18/93
Date

Scope: Station activities inspected by the resident staff this period included: plant operations; radiological controls; maintenance and surveillance; emergency preparedness; security; engineering and technical support; and safety assessment and quality verification. Initiatives selected for inspection included maintenance conducted on the Emergency Response Facility Information System and the maintenance history and programs for battery chargers. Periodic inspections amounting to 24 hours of holiday and backshift activities were performed on January 6, 11, 14, 17, 18, 28 and February 3.

Interviews and discussions were conducted with members of Vermont Yankee management and staff as necessary to support this inspection.

Findings: An overall assessment of performance during this period is summarized in the Executive Summary. A violation was identified involving failure to take effective corrective actions to preclude recurrence of inservice testing deficiencies. Unresolved items involving the adequacy of fire detection instrumentation in the emergency diesel generator rooms, 10 CFR Part 50 Appendix J leak rate testing of the hydrogen/oxygen monitoring system, and water hammer susceptibility in the service water system are discussed in Sections 2.2, 4.2.1, and 7.2, respectively.

EXECUTIVE SUMMARY

Vermont Yankee Nuclear Power Station
Report No. 93-02

Plant Operations

Plant operations were conducted safely. Good housekeeping and improved labelling were observed.

Radiological Controls

Efforts to reduce the total square footage of contaminated floor space have decreased personnel contamination events and improved accessibility to reactor building areas.

Maintenance and Surveillance

The station battery charger maintenance program has been effective. The corrective actions associated with the local power range monitor spiking were appropriate, and reduced the potential for unnecessary plant transients. Good maintenance was performed on the batteries for the Emergency Response Facility Information System.

Engineering and Technical Support

Vermont Yankee's response to degraded fire barrier penetrations reflected strong management support, and engineering staff contributed toward the resolution of fire protection deficiencies.

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DETAILS

1.0 SUMMARY OF FACILITY ACTIVITIES

Vermont Yankee Nuclear Power Station (VY) continued normal full power operations this inspection period.

Effective January 29, Mr. Warren P. Murphy, Senior Vice President, Operations resigned his position. With his departure, Mr. James P. Pelletier, Vice President, Engineering was temporarily assigned the responsibilities of Manager of Operations to fulfill Technical Specification (TS) requirements.

2.0 PLANT OPERATIONS (71707, 93702, 90712)

2.1 Operational Safety Verification

This inspection consisted of direct observation of facility activities, plant tours, and operability reviews of systems important to safety. The inspector verified that the facility was operated in accordance with license requirements and confirmed that management actions were consistent with the principles of public health and safety. The inspector observed plant operations during regular and backshift hours in the following areas:

Control Room	Cable Spreading Room
Reactor Building	Emergency Diesel Generator Rooms
Security Facilities	Residual Heat Removal System Corner Rooms

The inspectors independently verified instruments in calibration, correlation between similar instrument channels, and proper operation of control room annunciators and computer parameter displays. The operating logs, tagout log, and the plant information book were reviewed daily; no abnormal trends or conditions were identified. The inspectors performed control panel walkdowns and independently verified that safety systems were properly aligned for automatic initiation, and that conditions adverse to system operation were being properly addressed.

Control room operators were found to be cognizant of alarm conditions, and understood maintenance and surveillance in progress. Operators appropriately entered and exited Technical Specification (TS) limiting conditions for operation based on system conditions. Control room and shift manning satisfied TS. Appropriate use of fire protection permits and compliance with the fire protection program was confirmed.

During plant tours, the inspectors observed improved housekeeping near the emergency core cooling system batteries, on the refueling floor, and at reactor water clean-up pump rooms. Vermont Yankee continues to improve labeling of plant components. This initiative uses large, reflective, permanent labels that discriminate between normally operated valves and those used to implement Emergency Operating Procedures.

2.2 Diesel Generator Room Fire Detection

On January 19, the inspector observed the monthly testing of the "B" emergency diesel generator (EDG). The test was performed to verify diesel operability and to satisfy inservice testing (IST) requirements. The diesel start time was within specification; the governor control system properly controlled diesel speed; and, the kilowatts, kilovolt-amperes reactive were constant and did not indicate any abnormal fluctuations. The inspector observed that the assigned Auxiliary Operator (AO) followed the diesel operation procedure, maintained an accurate operating log, and verified proper operation of diesel support systems.

Approximately five minutes after diesel start, the inspector observed that a bluish-white haze began to accumulate in the ceiling of the diesel room. Both the AO and the firewatch, who were stationed in the diesel room to monitor fire penetrations (Section 7.1), observed the haze and inspected the diesel to determine its source. It appeared that the haze was generated from the heated lube oil from the hot surfaces of the turbocharger and possibly the exhaust manifold. The potential for fire was minimal because good cleanliness was observed both below the diesel and in the general vicinity of the exhaust manifold, and there were no transient combustibles in the area. Approximately 10 minutes into the diesel run, the diesel room exhaust fan automatically started on ambient room temperature, and the haze was evacuated. After approximately 15 minutes, the amount of haze generated was significantly less and did not accumulate to the previous levels even when the room fan was secured. The haze did not actuate any of the three ceiling-mounted, ionization chamber smoke detectors which would alarm in the control room.

The inspector noted that the operation of the EDG was safe and that no conditions affected the operability. However, following a review of plant fire detection equipment surveillance procedures and licensing documentation, the inspector identified the following issues:

- The Safety Evaluation for license Amendment No. 43 issued January 13, 1978, specifies that testing will verify that the smoke detectors have adequate sensitivity to detect the products of combustion. Vermont Yankee procedures OP 4002, Rev. 3, "Integrity Surveillance of Fire Detectors and Fire Suppression Systems" and OP 4339, Rev. 2, "Surveillance of Fire Protection Detectors/Instruments" provide for visual inspection, detector actuation, and circuit continuity checks to verify smoke detector operability.
- No documentation exists to substantiate the proper operation of the smoke detectors when the EDG room fan is in operation. The subject Safety Evaluation requires that an in-situ test be performed to verify that ventilation flow patterns will not significantly reduce or prevent detector response. The effects of the fan on detector operation is not addressed in the VY Fire Hazards Analysis report nor in the Final Safety Analysis Report.

Vermont Yankee's Engineering Department is evaluating the issues and these remain unresolved pending further review by the NRC (URI 93-02-01).

2.3 Power Loss to Motor Operated Suction Valve, RCIC-18

During the installation of scaffolding on January 7, a contractor inadvertently backed into the reactor core isolation cooling (RCIC) motor control center and opened the power supply breaker to motor-operated valve RCIC-18. This event was immediately called to the control room, and an auxiliary operator (AO) was dispatched to close the breaker.

The primary water supply for the RCIC pump is from the condensate storage tank (CST) through the normally opened, deenergized valve, RCIC-18. The alternate RCIC pump suction is from the suppression pool. On actuation of low CST water level (4 percent full), RCIC-39 repositions open to align the RCIC pump suction to the suppression pool. After RCIC-39 fully opens, RCIC-18 then energizes to isolate the CST from RCIC transfer pump suction. Deenergization of RCIC-18 caused the valve to fail in its as-left, open position which assured a continual water supply to the suction of the RCIC pump. Vermont Yankee appropriately concluded that the tripped breaker would not have affected the operability of the RCIC system during reactor level control because operators would have responded to the loss of RCIC flow.

Because the individual immediately notified the control room, operators promptly assessed the condition and implemented corrective actions. The contractor's response was unlike the inappropriate actions taken by contractors during a similar event in November 1991 (Inspection Report 92-22) which indicated that corrective actions taken for the previous event were effective.

3.0 RADIOLOGICAL CONTROLS (71707)

Inspectors routinely observed and reviewed radiological controls and practices during plant tours. The inspectors observed that posting of contaminated, high airborne radiation, and high radiation areas were in accordance with plant instructions. High radiation doors were properly maintained and equipment and personnel were properly surveyed prior to exit from the radiation control area. Plant workers were observed to be cognizant of posting requirements and maintained good radiological housekeeping.

Vermont Yankee continues to make progress in reducing the contaminated floor space within the plant. Currently, approximately seven percent of the radiation control area is contaminated, representing a 50 percent reduction from five months ago. The effort has contributed toward a reduction in personal contamination events and improved the accessibility of equipment areas to plant operators.

4.0 MAINTENANCE AND SURVEILLANCE (62703, 61726, 92700)

4.1 Maintenance

The inspector observed selected maintenance on safety-related equipment to determine whether these activities were effectively conducted in accordance with VY TS (including minimal outage time), using approved procedures, safe tagout practices, and appropriate industry codes and standards.

4.1.1 Station Battery Charger Maintenance

The inspector reviewed VY's maintenance program for the station battery chargers. These chargers are used to provide power to their respective DC buses and to maintain their associated batteries fully charged. A degraded battery charger condition, if not identified and corrected, could result in a loss of charging to the associated DC bus and cause depletion of the respective battery. The inspector examined VY's program by reviewing the procedural requirements, material condition, and maintenance backlog.

Vermont Yankee has three station battery chargers, two of which are normally in-service supplying power to their respective DC buses. The third battery charger is an installed spare, capable of supplying either DC bus. Vermont Yankee recently replaced the normally in-service battery chargers to reduce their corrective maintenance requirements and improve reliability. The inspector noted that a recommendation to replace these chargers had been documented on an inspection work order and considered VY's timeliness in procuring and making the necessary engineering evaluations to install the new charger appropriate.

Vermont Yankee revised procedure OP-5247, Rev. 1, "Maintenance and Testing of Battery Chargers" to improve the capability to identify and correct degraded battery charger components. This procedure is applicable to all battery chargers at VY, however, this inspection effort was directed toward the procedural requirements applicable to the station battery chargers. This procedure is detailed and consistent with available industry guidance, however, the inspector noted that some specific industry guidance (i.e. measuring insulation resistance on transformer windings) was not included; however, this did not detract from the overall effectiveness of the procedure. The inspector discussed this issue with the Electrical Maintenance Production Supervisor who placed this information into the procedure update file for inclusion in the procedure during the next scheduled revision. The inspector also reviewed procedure OP-4210, Rev. 20, "Maintenance and Surveillance of Lead Acid Storage Batteries" which provides an additional surveillance requirement to aid in detecting battery charger degradation. No additional concerns were identified.

The data from the latest performance of OP-5247 were reviewed and no deficiencies were identified. The inspector interviewed the technician who performed this procedure and concluded that this individual was knowledgeable about the procedural requirements. The inspector concluded that VY's implementation of OP-5247 was effective.

The inspector also performed an external inspection of each station battery charger, and noted that all output parameters were as expected. The chargers were in good physical condition, and did not exhibit any visible signs of degradation (i.e. unusual meter deflections or electrical "hum", inadequate cooling or excessive temperatures). Additionally, the inspector examined the condition of the components internal to the standby station battery charger. The internal components inspected were in good condition (i.e. connections appeared tight, capacitors were not bulging or leaking oil, components were clean, and no signs of overheating were observed). The inspector reviewed the station battery charger maintenance requests and noted that the maintenance backlog was low. The inspector was satisfied with the material condition of the station battery chargers.

Based upon the review of the procedural requirements, test data, equipment walkdown, personnel interviews, and maintenance backlog, the inspector concluded that VY has an effective program for maintaining the station battery chargers.

4.1.2 Drywell Hydrogen/Oxygen Monitoring System

During the weeks January 18 and 25, the inspector observed the preventive maintenance performed on the drywell hydrogen/oxygen (H₂/O₂) monitoring system. Excellent material condition and cleanliness were observed during field inspections. A comparison between the applicable drawings and the as-built arrangement of the system identified one minor discrepancy that the foreman stated would be corrected. Good personnel safety perspective was exhibited during the initial entry into the H₂/O₂ monitor cabinet, because of the possible accumulation of oxygen and hydrogen within the cabinet from leaking test-gas isolations and fittings. The inspector verified the proper installation of a motor relay and power supply; and the maintenance performed on the system flow meters. Good control of lifted leads was observed during the replacement of these components. The electrical relays replaced were free of condensation, corrosion, and insulation discoloration. The equipment safety tags properly isolated the H₂/O₂ system and assured worker safety.

The inspector concluded that the maintenance, as required by the VY Environmental Qualification Program, was well planned and implemented. This is noteworthy because portions of this preventive maintenance were unique and were being performed for the first time. The work order provided detailed instructions to the technicians regarding maintenance and post-maintenance testing. Technical manual testing requirements were identified, applicable electrical drawings were referenced, and multiple reviews were performed of the work order to assure its accuracy. The inspector observed good coordination between the engineer, foreman, and technicians which facilitated the development of preplanned work instructions.

4.1.3 Local Power Range Monitor Detector Spiking

Spiking of local power range monitors (LPRM) has occurred at a number of boiling water reactors, including VY. According to General Electric (GE), the spiking is believed to be caused by localized gaseous breakdown occurring at moderate voltages around metallic "whiskers" in the LPRM detector chamber, which are present because of exposure or impurity-related induced growth. General Electric, the supplier of Reuter-Stokes manufactured detectors, provides instruction for the repair of this condition. The GE capacitor discharge procedure for spiking repair is not used by VY because it is potentially damaging to an installed detector. Alternatively, in 1990, VY developed an enhanced LPRM current-voltage (IV) curve plotting procedure. Vermont Yankee has determined that: (1) it does not damage the detectors; (2) is more therapeutic in reducing the frequency of the spiking; and (3) provides improved diagnostic data on detector performance. Following concurrence from Reuter-Stokes on the use of the enhanced procedure, VY implemented this test in procedure OP 5307, Rev. 1, "Electrical Checkout of Neutron Monitoring Detectors." The inspector compared data obtained from both the standard LPRM IV curve plotting method and the enhanced method. The enhanced method provided superior performance data.

The LPRM cards are a subsystem of the neutron monitoring system (NMS). Additionally, the LPRM subsystem inputs into the average power range monitoring (APRM) subsystem of the NMS. Therefore, corrective action to reduce the NMS susceptibility to LPRM spiking is important to preclude unnecessary plant transients. Vermont Yankee has pursued proper long-term corrective actions by obtaining upgraded LPRM cards. These upgraded cards were designed to filter out short-duration, transient spikes which could occur during normal LPRM operation. The inspector reviewed the procurement documentation and VY's One-for-One Evaluation No. 92-067, dated August 14, 1992, which was prepared by the onsite Electrical Engineering and Construction Group.

Between the period of August 26 and September 17, the Instrument & Control (I&C) Department initiated a program of LPRM card replacement. Subsequent to this effort, no spiking has been detected. Vermont Yankee indicated that five of the existing older style LPRM strings still in the core could potentially cause longer-duration spikes that may not be filtered by the upgraded cards. On January 6, the Plant Operations Review Committee (PORC) reviewed procedure OP 2132, Rev. 13, APRM Channels, and determined that operation with the APRMs bypassed (Channels A and F) that utilize shared old style LPRMs would protect against longer-duration LPRM spiking.

The I&C Department pursued long-term corrective actions to minimize the occurrence of LPRM spiking. No safety concerns were identified with VY's actions to ameliorate LPRM spiking.

4.2 Surveillance

The inspector reviewed procedures, witnessed in-progress surveillance testing, and reviewed completed surveillance packages. The surveillances which follow were reviewed and determined to be effective with respect to meeting the safety objectives of the surveillance program. The inspector observed that all tests were performed by qualified and knowledgeable personnel, and in accordance with TS and approved procedures.

- OP 4126, Rev. 28, "Diesel Generator Surveillance"
- OP 4356, Rev. 15, "HPCI Steam Line Flow Functional Calibration"
- OP 4344, Rev. 6, "Dry Well H₂/O₂ Monitor Functional Calibration"

4.2.1 Primary Containment Integrity Concerns

While reviewing the hydrogen/oxygen (H₂/O₂) system maintenance discussed in Section 4.1.2, concerns involving primary containment integrity were identified. The H₂/O₂ system samples the containment atmosphere through four individual containment penetrations and then exhausts back to the suppression chamber. Each 3/4-inch sample line and the common exhaust line are isolable by two solenoid operated primary containment isolation valves actuated remotely from the control room. These solenoid valves do not receive containment isolation signals and, in accordance with TS Table 4.7.2.b, are not required to be leak rate tested.

The H₂/O₂ system is considered a part of the primary containment boundary and, as such, the system is required to meet the primary containment leak rate criteria of 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage testing for Water-Cooled Power Reactors." Vermont Yankee performs a local leak rate test (LLRT) on the H₂/O₂ system, using locally-operated manual globe valves as the test boundary, and factors the LLRT results into the calculation of the integrated containment leak rate. These 3/4-inch equipment isolation globe valves (inlet isolations VG-29A/B and outlet isolations VG-30A/B) are also shut to form the primary containment boundary during the Type A containment leak rate test.

During the maintenance on the H₂/O₂ analyzers, VY tagged shut inlet isolation valves VG-29A/B and outlet valves VG-30A/B for the "A" and "B" H₂/O₂ analyzers, respectively. This allowed the opposite H₂/O₂ analyzer to remain operable, maintained primary containment integrity, and isolated the maintenance. The maintenance was sequentially performed, on the "A" and "B" H₂/O₂ analyzers. The appropriate TS 30-day limiting condition for operation was entered upon isolation of each analyzer.

Two concerns were identified by the inspector: (1) the wording in TS 4.7.A.3 and TS Table 4.7.2 b, regarding primary containment integrity requirements is ambiguous; and, (2) TS 4.7.A.3 and Table 4.7.2 requirements do not have administrative controls to assure that primary containment integrity would be maintained during maintenance.

As a result of VY addressing the above questions, they also determined that portions of the 1/4-inch tubing within the H2/O2 analyzer cabinet and tubing downstream of a check valve isolating the calibration gas bottle were apparently not properly tested. Pending NRC review of VY's evaluation and corrective actions, including reparability determinations, this item is unresolved (URI 92-03-02).

5.0 EMERGENCY PREPAREDNESS (71707, 62703)

5.1 Emergency Response Facility Information System Maintenance

At VY, the Safety Parameter Display System is a subsystem of the Emergency Response Facility Information System (ERFIS). During this inspection period, corrective and preventive maintenance was performed on the ERFIS that consisted of replacement of the battery. The inspector reviewed the work packages, system design documentation, and trending of system parameters associated with the battery replacement and determined that the Maintenance Department adequately trended and evaluated system performance. The inspector also concluded that the quality of maintenance and level of engineering reviews were good.

Vermont Yankee replaced the ERFIS battery, due to performance degradations observed since the first quarter of 1990. Surveillance results documented: decreasing battery specific gravities; the performance of equalizing charges to restore capacity; instances of low cell voltages; and, excessive accumulation of battery residue within the cells. Other surveillances, such as average battery voltage and gravity, electrolyte levels and temperatures, and preventive maintenance of flash arrestors and inter-cell connectors did not indicate abnormal conditions. Both the Maintenance and Reactor/Computer Engineering Departments were cognizant of the maintenance being performed, and control room operators understood the effects of the removal of the ERFIS battery on system operation. The removal and replacement of the battery was properly planned. The new battery installed has an improved plate separator which is intended to reduce plate corrosion and increase battery life. Vermont Yankee received onsite assistance from the vendor during this maintenance. Post-maintenance testing was satisfactorily completed. Reliable operation of ERFIS (99.25 percent availability for 1992) reflected on both the quality of maintenance and proper regard that VY has for availability of equipment important to emergency preparedness.

6.0 SECURITY (71707, 92700, 93702)

The inspector verified that security conditions met regulatory requirements and the physical security plan. The plant physical security was inspected during regular and backshift hours to verify that controls were in accordance with the security plan and approved procedures. Officers properly responded to security perimeter and other equipment deficiencies and complied with procedures. Security force personnel performed their duties in an alert manner.

7.0 ENGINEERING AND TECHNICAL SUPPORT (71707, 62703)

7.1 Degraded Fire Barrier Penetrations

The inspectors reviewed selected VY actions in response to their identification of degraded fire barriers. A number of meetings of the special Task Force were observed. The Task Force's charter is to identify the magnitude of the problem, define and implement necessary fixes, and ensure that adequate compensatory measures are implemented. Yankee Nuclear Services Division and an outside fire protection consultant augmented plant and engineering resources. Properly focused discussions and due regard for plant and personnel safety were exhibited. A high level of management attention was demonstrated by assigning the Vice President, Engineering as Chairman of the Task Force.

Event notifications were appropriately made to the NRC. Besides insulated and uninsulated mechanical penetration deficiencies, some electrical conduit penetration and cable tray fire barriers were identified as also being deficient. Vermont Yankee provided periodic self-initiated briefings to the NRC on the status of their investigation and corrective actions. These included: briefings to the resident inspectors; telephone conference calls with NRC regional and headquarters personnel on January 6, 14, and 21; and, a meeting at the NRC Region I office on January 22 (refer to Section 9.2). Vermont Yankee continues to aggressively pursue the resolution of identified deficiencies.

During this period, identification of the need for additional compensatory measures and the resolution of VY concerns associated with unnecessary radiation exposure to firewatch personnel occurred. Regarding the latter item, a firewatch on the 232 foot level catwalk in the reactor building torus room was replaced with a closed circuit television (CCTV) system on January 21. Proper technical reviews and a justification provided by VY and YNSD engineering personnel facilitated the NRC review of their request to use CCTV in lieu of a conventional firewatch. Vermont Yankee followed NRC guidance regarding the need for the NRC to evaluate the use of CCTV on a case-by-case basis, and plans to submit a letter on a post-implementation basis that would contain their evaluation regarding the use of CCTV. A post-implementation review of the use of CCTV by the inspector included a review of Fire Protection Control Permit No. 93-12, the area in the torus room containing the four cameras surveilling the subject penetrations, the performance of the monitors, and interviews with a number of firewatch personnel. This review confirmed that compensatory measures were effective in meeting the TS requirements, and during plant tours, the inspector found the firewatch personnel knowledgeable of their responsibilities.

Selected design and installation efforts for repairs to both insulated and uninsulated mechanical penetrations were reviewed; specifically, Engineering Design Change Request (EDCR) No. 93-401, "Fire Seal Penetration Modifications," its Engineering Change Notices (ECNs), and Installation and Test (I&T) procedures. The inspector also attended a PORC meeting on February 6, which reviewed ECN No. 1 to EDCR 93-401 and reviewed I&T procedure No. SPN-70940-700. A good technical briefing was provided by the fire

protection coordinator. The inspector reviewed recently installed fire barriers involving silicone foam for uninsulated lines in the EDG rooms and confirmed that the work was in accordance with the established design and installation procedures. Silicone foam installation was of proper depth and of correct composition. Installation and Quality Assurance personnel were knowledgeable of the process and design requirements. Quality Control checks of prepared materials exceeded established VY quality requirements. The installation process of fire seal penetration modifications was well-controlled and continues to receive strong management support.

7.2 Service Water System

The inspector reviewed the maintenance records and inspection history for the service water (SW) system. NRC EDSFI Report 92-81 identified that the reactor building component cooling water (RBCCW) heat exchangers and the high elevation piping were considered vulnerable to a water hammer event due to column separation and void formation. However, minimal void formation would be expected due to the large system volume and short duration that the SW pumps would be deenergized following a loss of offsite power event. Additionally, maintenance records indicated no examples of water hammer damage to SW system safety-related components. Vermont Yankee, in response to the Inspection Report 92-81, assigned an action item to perform an engineering evaluation to determine the potential effects of a water hammer event on the SW system. The inspector considered VY's actions appropriate, and the NRC will further evaluate the susceptibility of the system to water hammer as an unresolved item (URI 93-02-03).

8.0 SAFETY ASSESSMENT AND QUALITY VERIFICATION (40500, 90712, 90713, 92700)

8.1 Periodic and Special Reports

The Failed Fuel Action Plan for the month of January 1992 was reviewed for accuracy and found to be adequate.

8.2 Licensee Event Reports

The inspector reviewed Licensee Event Report 92-21 and concluded that: (1) the report was submitted in a timely manner, (2) the description of the event was accurate, (3) a root cause analysis was performed, (4) safety implications were considered, and (5) corrective actions implemented or planned were sufficient to preclude recurrence of a similar event.

LER 92-21, "Main Steam Relief Valve Actuated Above Technical Specifications Required Setpoint During As Found Testing," describes the identification during the March 1992 refueling outage, that one of two main steam relief valves removed for testing actuated at 1112 psig - 12 psig above the TS setpoint of 1100 psig. The root cause was postulated to be foreign material present between the pilot disk and seat. Internal inspection of the valve revealed no significant seat damage or foreign material.

8.3 Corrective Action for Inservice Test Deficiencies

Vermont Yankee identified that on November 20, 1992, a reactor core isolation cooling (RCIC) pump surveillance was missed due to personnel error in the evaluation of vibration data from a quarterly test performed in July 1992. The vibration magnitudes recorded on the surveillance record sheet were a root-mean-square (RMS) value, and not a "peak" value as required by the procedure. As a result, the recorded values were 70% of those required for comparison to the base-line data which are measured in "peak" values.

The immediate corrective actions were to perform operability testing of the RCIC pump and to initiate a review of the IST vibration database to identify other possible discrepancies. From this review, which included IST data acquired since January 1, 1992, 25 other instances were identified where data discrepancies between RMS and peak values existed. None of these involved missed IST-required surveillance testing. Further review identified a similar event which had occurred in April 1991. This event involved the "B" service water (SW) pump and had resulted in a Potential Reportable Occurrence (PRO) report and corrective actions. Vermont Yankee appropriately concluded that the April 1991 event was not reportable because no TS surveillance requirements were missed.

The April 1991 event initiated actions that included daily checks of the vibration equipment, engineering assessment of the vibration data following the IST surveillance, and actions to assure the proper operation of the vibration monitoring equipment. A formal commitment item was also developed to track and evaluate the effectiveness of the corrective action, and to determine if any procedural or programmatic changes were needed. That item was closed in July 1991 on the basis of training provided to engineers.

Vermont Yankee's investigation for the most recent November 1992 event identified that the root cause evaluation and corrective actions for the April 1991 event were inadequate and resulted in initiation of nonconformance report (NCR) 92-21. The NCR was classified as "significant," because the failure to implement effective corrective action led to a subsequent condition adverse to quality that could have affected plant safety. The formal root cause evaluation determined that: (1) the implementing procedure for the IST program AP-0206, "In-Service Testing Vibration Program" was not followed, in that the field data were not compared to the acceptance criteria provided in the procedure, and (2) AP-0206 did not

provide complete instructions for the proper performance of vibration measurements. Other contributing causes were also identified, such as the lack of effective coordination/management of the IST vibration program and inadequate training of the individuals involved in obtaining and assessing vibration data.

Corrective actions implemented as a result of the most recent event included procedural improvements, training sessions for both mechanics and engineers, and the assignment of a maintenance engineer dedicated to the implementation of the IST vibration monitoring program. The Plant Performance Review Committee, which consists of plant and department managers, will review this event and assess whether the resulting corrective actions affect other maintenance practices and programs. The inspector verified that: appropriate procedure changes were identified for implementation; training had been conducted for individuals responsible for the obtaining and evaluating IST vibration measurements; and that VY had established a dedicated engineer responsible for the implementation of the IST program.

10 CFR Part 50, Appendix B, Criterion XVI requires that in the case of significant conditions adverse to quality, measures shall assure that corrective actions are taken to preclude repetition. Section XVI of the Yankee Operational Quality Assurance Manual establishes measures to assure that significant conditions adverse to quality are promptly identified and corrected to prevent recurrence. Repetitive IST deficiencies that occurred from April 1991 through November 1992 were conditions adverse to quality. These conditions resulted from the failure of VY to implement effective corrective actions to preclude recurrence, and are therefore collectively considered a violation (VIO 92-24-02).

9.0 MANAGEMENT MEETINGS (30702)

9.1 Preliminary Inspection Findings

Meetings were periodically held with plant management during this inspection to discuss inspection findings. A summary of preliminary findings was also discussed at the conclusion of the inspection on February 9. No proprietary information was identified as being included in the report.

9.2 Degraded Fire Barrier Penetration Seals

On January 22, a meeting was held at the NRC:RI office with VY representatives to discuss issues involving degraded fire barrier penetration seals. Discussions included background information, the nature and scope of identified deficiencies for various types of penetrations, corrective actions and safety assessments. A list of meeting attendees and copies of overhead slides used in the VY presentation are contained in Attachments A and B to this inspection report.

9.3 Other Meetings

- On January 8, VY representatives attended a meeting held at NRC:RI office to discuss the scenario for the 1993 Full-Participation Exercise scheduled for the week of April 25 and the status of other Emergency Preparedness issues.
- The NRC:RI Reactor Projects Branch Chief, James C. Linville visited the VY site and corporate offices on January 26 to participate in a plant tour and meetings with VY managers. The principle focus of the tour was a review of on-going activities involving degraded fire barrier penetrations.
- On January 27, a meeting was held in the NRC:RI office with VY representatives to discuss the status of VY training programs and their corrective actions associated with outstanding program issues.

ATTACHMENT A

LIST OF ATTENDEES

Degraded Fire Barrier Meeting, January 22, 1993

NRC Attendees

W. Hodges, Director, Division of Reactor Safety (DRS)
L. Bettenhausen, Chief, Operations Branch (OB), DRS
J. Linville, Chief, Projects Branch 3, Division of Reactor Projects (DRP)
W. Lanning, Deputy Director, DRS
D. Dorman, Projects Manager, Project Directorate 1-3, Office of Nuclear Reactor Regulation
E. Kelly, Chief, Reactor Projects Section 3A, DRP
N. Blumberg, Chief, Performance Programs Section (PPS), OB, DRS
A. Finkel, Senior Reactor Engineer, PPS, OB, DRS
F. Bower, Reactor Engineer, PPS, OB, DRS
H. Eichenholz, Senior Resident Inspection, Vermont Yankee

Licensee Attendees

J. Pelletier, Vice President, Engineering
D. Reid, Plant Manager
B. Buteau, Engineering Director
E. Sawyer, Fire Protection Consultant

ATTACHMENT B

VERMONT YANKEE PRESENTATION SLIDES

January 22, 1993

**VERMONT YANKEE NUCLEAR POWER STATION
FIRE BARRIER PENETRATION SEAL
PRESENTATION TO THE
NUCLEAR REGULATORY COMMISSION**

JANUARY 22, 1993

INTRODUCTION	JPP
BACKGROUND	BRB
INSPECTION SUMMARY	BRB/EAS
CHEMTROL	BRB/EAS
OVERALL ASSESSMENT	DAR
CONCLUSIONS	JPP

**J.P. PELLETIER - VICE PRESIDENT, ENGINEERING
D.A. REID - PLANT MANAGER
B.R. BUTEAU - ENGINEERING DIRECTOR
E.A. SAWYER - CONSULTANT**

BACKGROUND

REFUEL CYCLE SURVEILLANCE SCOPE

MARCH 1992 SURVEILLANCE FINDINGS

CORRECTIVE ACTION REPORT

DECEMBER 1992 WALKDOWN

CLASSIFICATION OF FIRE WALLS

VY REVIEW OF NRC INFO NOTICES

FIRE BARRIER PENETRATIONS

TYPES & QUANTITIES

INSULATED PROCESS LINES	≈ 60
UNINSULATED PROCESS LINES	≈ 300
ELECTRICAL CONDUITS	≈ 750
CABLE TRAYS	≈ 90
TOTAL	≈ 1200

PENETRATION SEALS

1. PENETRATION SEALS REVIEWED

	<u>TECH SPEC</u> Chemtrol/Plant	<u>APP. R</u> Chemtrol/Plant	<u>APP. A</u> Chemtrol/Plant	<u>TOTAL</u> Chemtrol/Plant
INSULATED LINES	9/14 - 23	3/0 - 3	6/2 - 8	18/16 - 34
UNINSULATED LINES (MECH)	6/5 - 11	5/1 - 6	0	11/6 - 17
ELECTRICAL CONDUIT	14/0 - 14	2/0 - 2	0	/ 6/0 - 16
EXTERNAL	14/0 - 14	2/0 - 2	0	
INTERNAL	10/0 - 2 10	0	0	
CABLE TRAYS	6/0 - 6	0	0	6/0 - 6
<u>TOTALS</u>	35/19 - 54	10/1 - 11	6/2 - 8	51/22 - 73

2. UNACCEPTABLE PENETRATION SEALS

	<u>TECH SPEC</u> Chemtrol/Plant	<u>APP. R</u> Chemtrol/Plant	<u>APP. A</u> Chemtrol/Plant	<u>TOTAL</u> Chemtrol/Plant
INSULATED LINES	1/5 - 6	2/0 - 2	1/3 - 4	4/8 - 12
UNINSULATED LINES (MECH)	2/0 - 2	0	0	2/0 - 2
ELECTRICAL CONDUIT	3/0 - 3	0	0	3/0 - 3
EXTERNAL	(1)			
INTERNAL	(1) (2)			
CABLE TRAYS	0	0	0	
<u>TOTALS</u>	6/5 - 16 11	2/0 - 2	1/3 - 4	9/8 - 17

1979 DESIGN CHANGE SCOPE

- **VY IDENTIFIED**
- **SCOPE GIVEN TO CHEMTROL**
- **DEFINED SCOPE**

ACCEPTANCE CRITERIA

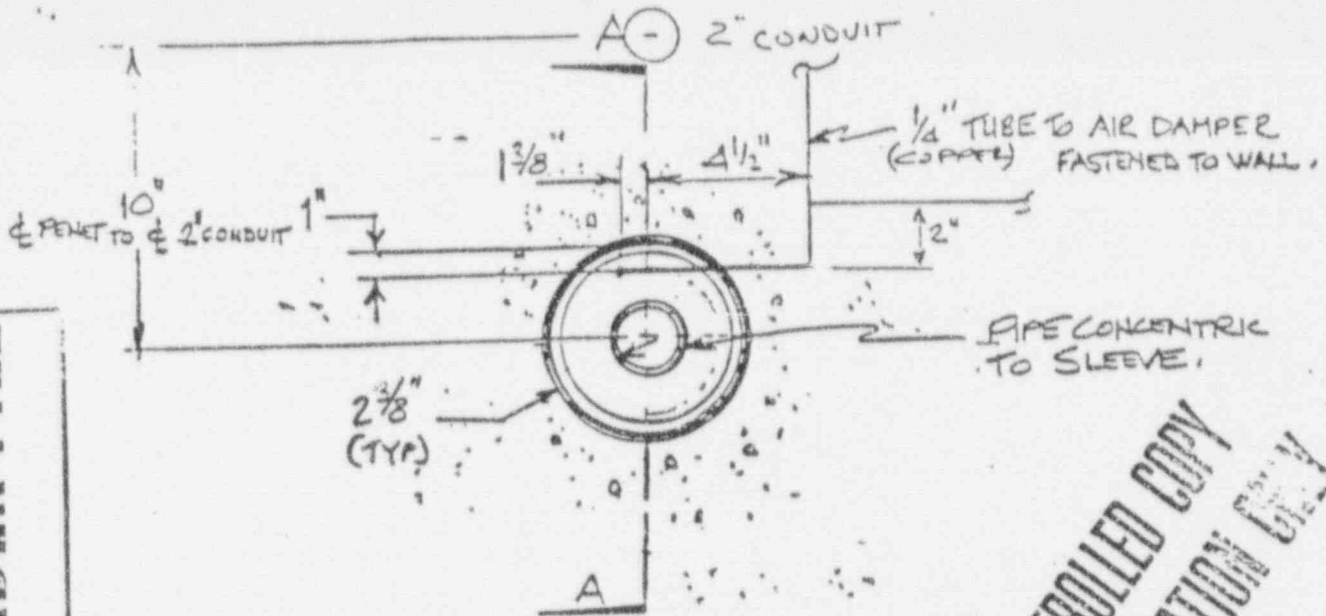
- **DESIGN**

- **TYPICAL DETAILS APPROVED BY ANI**
- **OPTION TO CAULK IF GAP < 1/2"**

- **INSTALLATION**

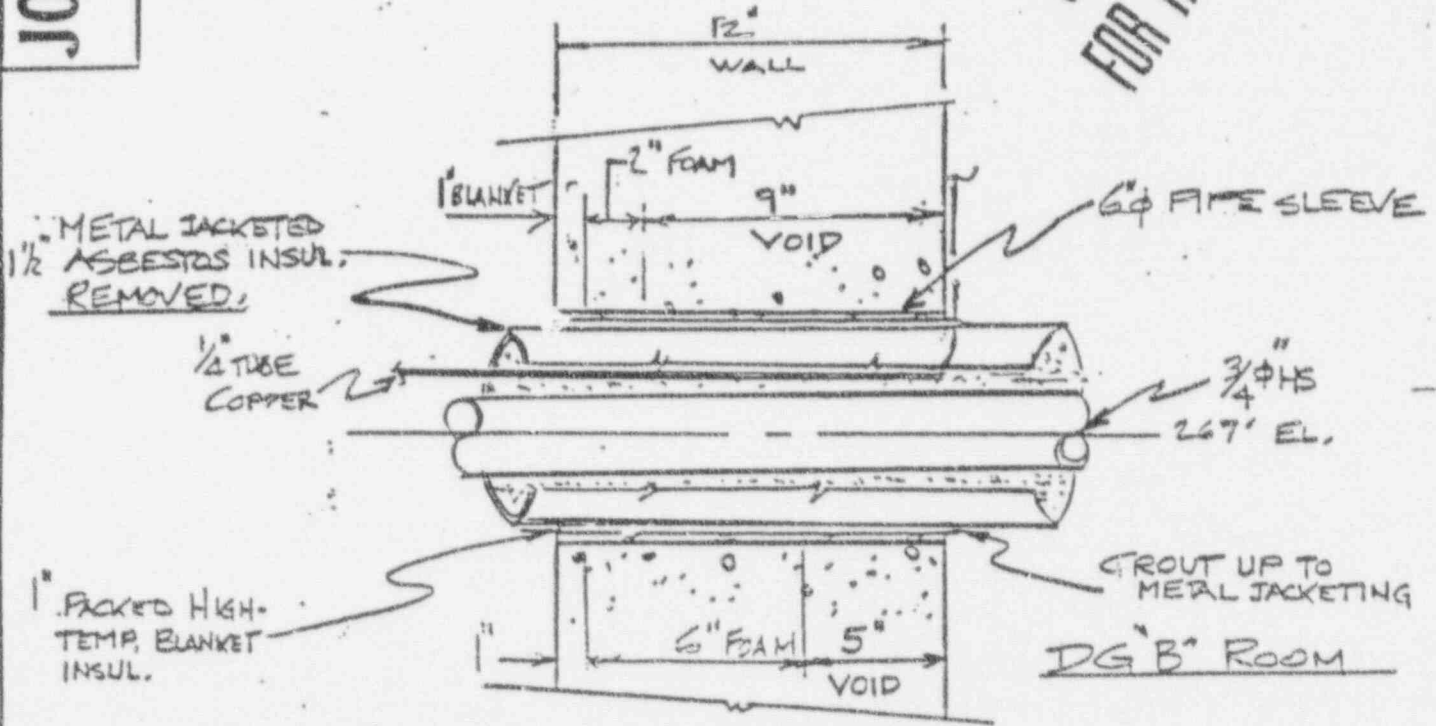
- **TYPICALS**
- **DISCUSS DEVIATIONS WITH ANI**

JOB ORDER FILE



ELEVATION
"B" DG ROOM - LKG. NORTH

UNCONTROLLED COPY
FOR INFORMATION ONLY



SECTION "A-A"
ELEVATION

LINE No. 3/4 HS
DESIGN TEMP 320°
OPERATING TEMP. 292°
PIPE MAT. C.S.

PENETRATION TG-0329 SF

M MERCURY
COMPANY
OF NORWOOD, INC
A FISCHBACH COMPANY

0	1/8/99	AS-BUILT	RHB	MD	MA	A FISCHBACH COMPANY
REV.	DATE	DESCRIPTION	DRWN	CHKD	APP	QA RVWD
						SK-70940-TG-0329 SF

INSULATED PROCESS PIPING PENETRATIONS

≈ 60 TOTAL PENETRATIONS

34 INSPECTED FOR AS-FOUND CONDITION

12 NOT ACCEPTABLE TO '79 STANDARDS

INSULATED PROCESS PIPING PENETRATIONS

VY ASSESSMENT OF FINDINGS:

- **MECHANICAL PENETRATION/NO COMBUSTIBLES OR SOURCES OF IGNITION**
- **MAJORITY WOULD HAVE MET 1979 DESIGN CRITERIA**
- **PENETRATIONS WERE FILLED WITH INSULATION**
- **LARGE GAPS WERE FOAMED OR GROUTED**
- **SMALL GAPS WERE CAULKED OR GROUTED**
- **NO SAFETY SIGNIFICANT DISCREPANCIES**

INSULATED PROCESS PIPING PENETRATIONS

CORRECTIVE ACTIONS

- **INSPECT ALL PENETRATIONS AND REPAIR, IF APPROPRIATE**
- **SOME PENETRATIONS ACCEPTABLE AS-IS**
- **REPAIR OPTIONS:**
 - o **FOAM PER ORIGINAL DESIGN**
 - o **ENHANCED BISCO FOAM DESIGN**
 - o **ENGINEERED 'BOOT' FOR LINES WITH THERMAL GROWTH**
 - o **GROUT PENETRATION**

UNINSULATED PROCESS PIPING

INSPECTION RESULTS:

≈ 300 TOTAL PENETRATIONS

17 INSPECTED FOR AS-FOUND CONDITION

2 NOT ACCEPTABLE TO '79 STANDARDS

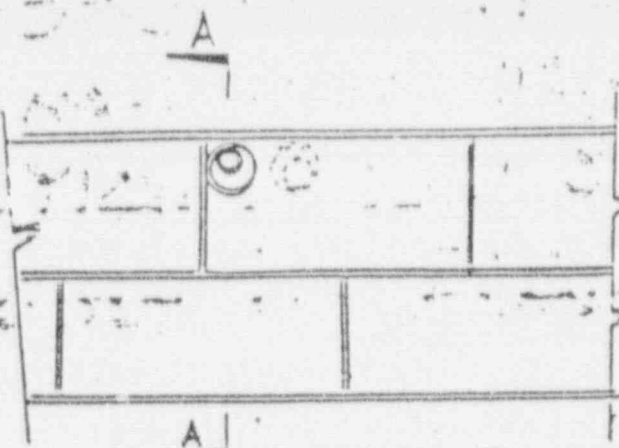
1000 100 100

TG-305-SF

1000 100 100

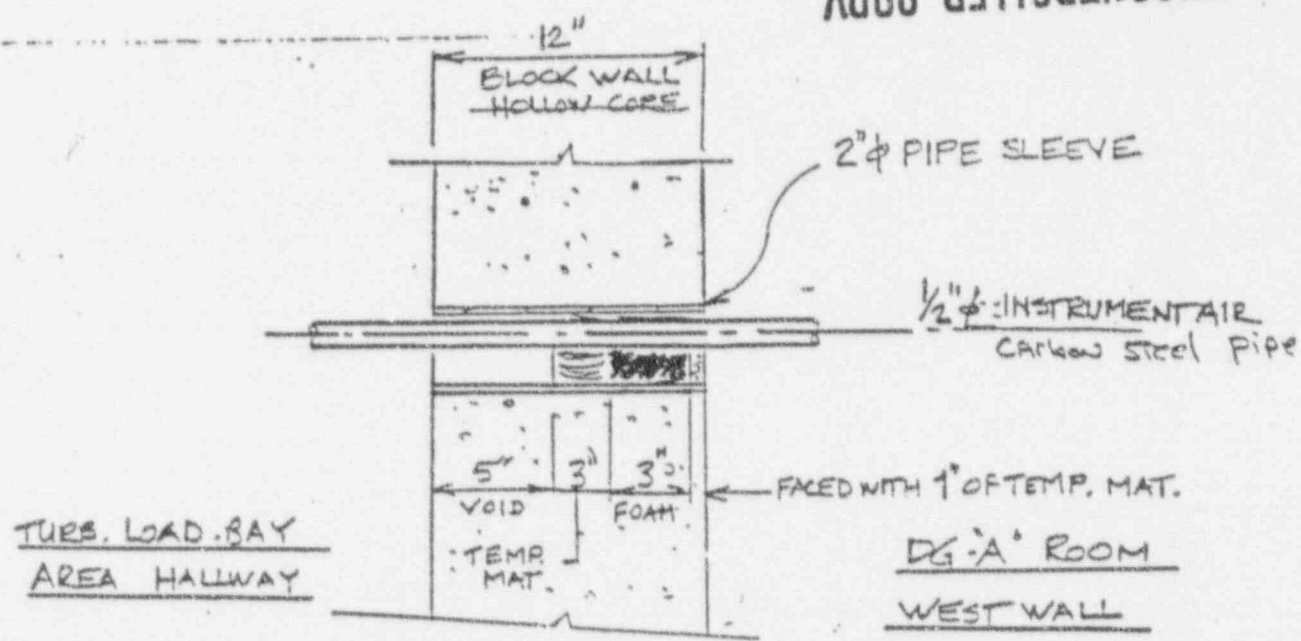
INSPECTION

DATE



ELEVATION

UNCONTROLLED COPY
FOR INFORMATION ONLY



SECTION "A-A"
ELEVATION

PENETRATION TG-0305-SF

M MERCURY
COMPANY
OF NORWOOD, INC.
A FISCHBACH COMPANY

REV.	DATE	DESCRIPTION	DRAWN	CHKD	APP.	C.A. REVNO	SK-70940-TG-0305-SF
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UNINSULATED PROCESS PIPING

VY ASSESSMENT OF FINDINGS:

- **MECHANICAL PENETRATIONS/NO COMBUSTIBLES OR SOURCES OF IGNITION**
- **MAJORITY WOULD HAVE MET 1979 DESIGN CRITERIA**
- **PENETRATIONS GROUTED OR FILLED WITH FOAM**
- **NO SAFETY SIGNIFICANT DISCREPANCIES IDENTIFIED**

UNINSULATED PROCESS PIPING PENETRATIONS

CORRECTIVE ACTIONS:

- **PERFORM ENHANCED REFUEL CYCLE SURVEILLANCE ON AN EXPEDITED SCHEDULE**
- **WILL IMPROVE SEALS IF PROBLEMS IDENTIFIED**

ELECTRICAL PENETRATIONS

INSPECTION RESULTS:

- **≈ 850 TOTAL ELECTRICAL PENETRATIONS**
- **22 INSPECTED FOR AS-FOUND CONDITION**
- **3 NOT ACCEPTABLE TO '79 STANDARDS**

ELECTRICAL PENETRATIONS

VY ASSESSMENT:

- **MAIN FOCUS OF INDUSTRY AND VY DESIGN CHANGE IN 1979**
- **VAST MAJORITY OF VY PENETRATIONS ARE ELECTRICAL**
- **NO SAFETY SIGNIFICANT PROBLEMS IDENTIFIED**
- **MOST VY CONDUITS ARE ACCEPTABLE WITHOUT ANY ADDITIONAL PENETRATION SEALING**
- **CABLE TRAYS**

ELECTRICAL PENETRATIONS

CORRECTIVE ACTIONS

- **WILL PERFORM ENHANCED REFUEL CYCLE SURVEILLANCE**
- **WILL REPAIR ANY NON-CONFORMING BARRIERS**

CHEMTROL QC

- **QC DOCUMENTATION DOES NOT REFLECT AS-BUILT CONDITION**
- **NO EXPLANATION OR DOCUMENTATION**
- **POOR QC DOCUMENTATION PRACTICES**
- **QC INSPECTOR**
 - **WORKED NO OTHER JOBS AT VY**
 - **DILIGENTLY TRIED TO FIND QC INSPECTOR**
 - **TALKED WITH CHEMTROL CORP. QA MANAGER**
 - **SURVEY OF OTHER PLANTS**



Chemtrol Corporation

333 North Bell East
Houston, Texas 77060

PROJECT NAME VERMONT YANKEE
PROJECT LOCATION VERNON, VERMONT
PROJECT NUMBER 0779-256

LOG NUMBER 158

RECORDED BY Randy Battaglia

SEALING MATERIAL TRACEABILITY LOG

CT/QC-3
Revised 6/1/78

PENETRATION NO	DAMAGING			SEALING MATERIAL						ACCEPTANCE				REMARKS/DEVIATIONS
	DAMAGING DATE	DAMAGING DEPTH	INSPECTED BY	SYSTEM NO CT/QC-1	DATE OF APPLICATION	MATERIAL TYPE	VISUAL INSPECTION			CHEMTROL QC	CUSTOMER			
							PASS	HOLD	QC-4	INSPECTOR	DATE	INSPECTOR	DATE	
TG-0304-SF	11-15-79	5"	K.B.	01-023	11-16-79	CT-800	✓			K.B.	11-16			TYPICAL B
TG-0302-SF	11-8-79	9"	"		11-12-79	CT-19				"	11-12			TYPICAL C
TG-0303-CA	—	—	"	—	11-12-79	CT-4G	✓			"	11-12			TYPICAL I
TG-0304-SF	11-8-79	9"	"	02-007	11-12-79	CT-19	✓			"	11-12			TYPICAL E
→TG-0305-SF	11-8-79	9"	"	02-007	11-12-79	CT-19	✓			"	11-12			"
TG-0306-CA	—	—	"	—	11-12-79	CT-4G	✓			"	11-12			TYPICAL I
TG-0307-CA	—	—	"	—	11-12-79	CT-4G	✓			"	11-12			"
TG-0308-SF	11-8-79	9"	"	02-007	11-12-79	CT-19	✓			"	11-12			TYPICAL E
TG-0309-CA	—	—	"	—	11-12-79	CT-4G	✓			"	11-12			TYPICAL I
TG-0310-CA	—	—	—	—	11-12-79	CT-4G	✓			"	11-12			—
TG-0311-CA	—	—	—	—	11-12-79	CT-4G	✓			"	11-12			—
TG-0312-CA	—	—	—	—	11-12-79	CT-4G	✓			"	11-12			—
TG-0313-SF	11-15-79	5"	K.B.	01-023	11-16-79	CT-800	✓			"	11-16			TYPICAL B
TG-0314-SF	11-8-79	9"	"	02-007	11-12-79	CT-19	✓			"	11-12			TYPICAL C
TG-0315	—	—	"	—	11-12-79	CT-4G	✓			"	11-12			TYPICAL I
→TG-0316-SF	11-8-79	9"	"	"	11-12-79	CT-19	✓			"	11-12			TYPICAL E

Chemtrol Corporation
 230 North First East
 Houston, Texas 77002

PROJECT NAME VERMONT YANKEE
 PROJECT LOCATION VERNON, VERMONT
 PROJECT NUMBER 0779-256

LOG NUMBER

RECORDED BY Randy Battaglia

SEALING MATERIAL TRACEABILITY LOG

CT/QC-3
 Revised 6/1/78

PENETRATION NO	DRAINING DATE	DRAINING DEPTH	INSPECTED BY	SEALING MATERIAL		VISUAL INSPECTION		ACCEPTANCE		REMARKS/DEVIATIONS		
				SYSTEM NO CT/QC-1	DATE OF APPLICATION	MATERIAL TYPE	PASS	HOLD	QC-4		CHEMTRON QC INSPECTOR	CUSTOMER INSPECTOR
TG-0317-SF	11-8-79	9"	RB	02-007	11-12-79	CT-19	✓			RB	11-12	TYPICAL E
TG-0318-SF	11-8-79	9"	RB	02-007	11-12-79	CT-19	✓			RB	11-12	TYPICAL E
TG-0319-SF	11-15-79	5"	RB	01-023	11-16-79	CT-800	✓				11-16	TYPICAL B
TG-0320-SF	11-9-79	9"	"	02-007	11-12-79	CT-19	✓			"	11-12	TYPICAL E
→ TG-0321-SF	"	"	"	"	11-12-79	"	✓			"	"	"
TG-0322-SF	"	"	"	"	11-12-79	"	✓			"	"	"
TG-0323-SF	"	"	"	"	11-12-79	"	✓			"	"	"
TG-0324-SF	"	"	"	"	11-12-79	"	✓			"	"	"
TG-0325-SF	"	"	"	"	11-12-79	"	✓			"	"	"
TG-0326-SF	"	"	"	"	11-12-79	"	✓			"	"	TYPICAL C
TG-0327-SF	"	"	"	"	11-12-79	"	✓			"	"	"
TG-0328-SF	"	"	"	"	11-12-79	"	✓			"	"	TYPICAL E
→ TG-0329-SF	"	"	"	"	11-12-79	"	✓			"	"	"
TG-0330-SF	"	"	"	"	11-12-79	"	✓			"	"	TYPICAL C
TG-0331-SF	"	9"	"	"	11-12-79	"	✓			"	"	TYPICAL E
TG-0332-SF	"	9"	"	"	11-12-79	"	✓			"	"	TYPICAL E

OVERALL ASSESSMENT

- SAFETY
- DESIGN
- INSTALLATION
- CYCLE SURVEILLANCE
- ONGOING MAINTENANCE