Northeast Nuclear Energy

Rope Ferry Rd. (Route 156), Waterford, CT 06385

Millstone Nuclear Power Station
Northeast Nuclear Energy Company
P.O. Box 128
Waterford, CT 06385-0128
(860) 447-1791
Fax (860) 444-4277

The Northeast Utilities System

JAN 12 1999

Docket No. 50-336
B17610

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Millstone Nuclear Power Station, Unit No. 2
Response to The Request For Additional Information Regarding Resolution of Issues
Related to Generic Letter 96-06 (TAC No. M96833)

This letter provides Northeast Nuclear Energy Company's (NNECO) response to the request for additional information regarding resolution of issues related to Generic Letter (GL) 96-06.

GL 96-06[(1)] included a request for licensees to evaluate cooling water systems that serve containment air coolers to assure that they are not vulnerable to waterhammer and two-phase flow conditions. By a letter dated January 28, 1997,[(2)] NNECO provided its assessment of the waterhammer and two-phase flow issues for Millstone Unit No. 2. In a letter dated May 5, 1998,[(3)] the Nuclear Regulatory Commission (NRC) informed NNECO that a preliminary review of NNECO's response was completed and that several issues, which require additional information, have been identified. The purpose of this letter is to transmit the requested additional information, which is contained in attachment 1.

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(1) Thomas T. Martin to Licensees, Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," dated September 30, 1996.

(2) M. L. Bowling to U. S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No.2, Response to Requested Actions of Generic Letter 96-06, Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," dated January 28, 1997.

(3) D. G. McDonald Jr. to M. L. Bowling, "Request For Additional Information Regarding Resolution of Generic Letter (GL) 96-06, 'Assurance of Equipment Operability And Containment Integrity During Design-Basis Accident Conditions,' dated September 30, 1998, Millstone Unit No. 2 (TAC No. M96833)," dated May 5, 1998.

NNECO's commitments associated with this letter are provided in Attachment 2. Should you have any questions regarding this submittal, please contact Mr. Ravi G. Joshi at (860) 440-2080.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

M L Bowling

Martin L. Bowling, Jr.
Recovery Officer - Technical Services

Attachments (2)

cc: H. J. Miller, Region I Administrator
S. Dembek, NRC Project Manager, Millstone Unit No. 2
D. P. Beaulieu, Senior Resident Inspector, Millstone Unit No. 2
E. V. Imbro, Director, Millstone ICAVP Inspections

Docket No. 50-336
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Attachment 1

Millstone Nuclear Power Station, Unit No. 2
Response to The Request for Additional Information Regarding Resolution of Issues Related to Generic Letter 96-06 (TAC No. M96833)

January 1999

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION ON GL 96-06
Millstone Nuclear Power Station Unit No. 2

Since the submission of the January 28, 1997,[(1)] response to Generic Letter (GL) 96-06, Northeast Nuclear Energy Company (NNECO) has completed several tasks to adequately address the waterhammer and two-phase flow issues. These tasks include an evaluation of the potential for two-phase flow conditions in the Reactor Building Closed Cooling Water (RBCCW) system during normal and post-accident operation, a transient thermal-hydraulic analysis for the determination of waterhammer pressure responses and transient piping loads following an accident, and an evaluation of the piping integrity subject to waterhammer loads. An evaluation has also been conducted to assess the integrity of the essential equipment.

The above mentioned evaluation demonstrates that there is adequate design margin in the RBCCW system during normal and post-accident operation. The system experiences voids following a Loss of Coolant Accident (LOCA) scenario concurrent with a loss of normal power (LNP). The system also experiences pressure surges and loads due to waterhammer during the RBCCW pump restart. However, it has been demonstrated that the piping and the component integrity are maintained.

The effects associated with a delayed restart of the RBCCW pump has also been investigated. It was determined that the resulting piping loads were increased due to the larger void formation. However, by taking appropriate operator action, such as further delaying the time at which the RBCCW pump will be restarted through procedural changes, these more severe waterhammer effects can be effectively mitigated.

The following is the response for the questions addressed in the request for additional information:

1. **If a methodology other than that discussed in NUREG/CR-5220, "Diagnosis of Condensation-induced Waterhammer," was used in evaluating the effects of waterhammer, describe this alternate methodology in detail. Also, explain why this methodology is applicable and gives conservative results (typically accomplished through rigorous plant-specific modeling, testing, and analysis).**

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(1) M. L. Bowling to U. S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No.2, Response to Requested Actions of Generic Letter 96-06, Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," dated January 28, 1997.

Response to question 1:

The principles outlined in NUREG/CR-5220[2] were used to predict the waterhammer phenomenon with the help of computer modeling of the RELAP5/MOD3.2[3] computer program. The computer model is capable of simulating the void formation, slug acceleration, and void collapse phenomena.

The void formation is calculated by conservatively accounting for heat transferred into the system from the containment atmosphere by assuming zero fouling of the cooler units, maximum airside environmental conditions, and airside heat transfer coefficients based on the design airflow. This heat transfer results in the system void formation. The computer modeling calculates the fluid conditions throughout the system, including the steam/water quality, and determines the extent of voiding that develops.

The water column acceleration is also calculated by the computer model. The pump startup rate is conservatively defined (i.e., fast ramp up to full speed) which will result in the maximum acceleration of the upstream water slug. The computer modeling tracks the system fluid transient response as the water slug accelerates in the system.

The computer modeling calculates the thermodynamics and fluid dynamics as the water slug compresses the formed void. The eventual void collapse phenomena and resulting pressures are calculated based on the water column velocity and deceleration. The water column impact overpressurization calculated is consistent with the slug velocity prior to impact.

The waterhammer loads have been calculated without taking credit for the cushioning effects from non-condensable gas that remains in the void. Energy dissipation due to friction has been considered, although the effect is minimal.

Each RBCCW system header, Header A and Header B, was rigorously modeled based on its physical arrangement for use with RELAP5/MOD3.2. The system was modeled such that the expected velocities into the voided piping during pump restart would be maximized.

Sensitivity studies were completed to verify that the modeling approach provided reasonable and conservative results.

Based on the above, it is concluded that the results of the analysis are conservative.

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(2) NUREG/CR-5220, "Diagnosis of Condensation-Induced Waterhammer," Creare, Inc., October 1988.

(3) NUREG/CR-5535, "RELAP5/MOD3 Code Manual, Idaho National Engineering Laboratory," August 1995.

2. For both the waterhammer and two-phase flow analyses, provide the following information:

   a) Identify any computer codes that were used in the waterhammer and two-phase flow analyses and describe the methods used to benchmark the codes for the specific loading conditions involved (see Standard Review Plan Section 3.9.1).

   b) Describe and justify all assumptions and input parameters (including those used in any computer codes) such as amplifications due to fluid structure interaction, cushioning, speed of sound, force reductions, and mesh sizes, and explain why the values selected give conservative results. Also, provide justification for omitting any effects that may be relevant to the analysis (e.g., fluid structure interaction, flow induced-vibration, erosion).

   c) Provide a detailed description of the "worst case" scenarios for waterhammer and two-phase flow, taking into consideration the complete range of event possibilities, system configurations, and parameters. For example, all waterhammer types and water slug scenarios should be considered, as well as temperatures, pressures, flow rates, load combinations, and potential component failures. Additional examples include:

      - the effect of void fraction on flow balance and heat transfer;
      - the consequences of steam formation, transport, and accumulation;
      - cavitation, resonance, and fatigue effects; and
      - Erosion consideration

   d) Licensees may find NUREG/CR-6031, "Cavitation Guide for Control Valves" helpful in addressing some aspects of the two-phase flow analyses. (Note: it is important for licensees to realize that in addition to heat transfer considerations, two-phase flow also involves structural and system integrity concerns that must be addressed).

   e) Confirm that the analyses included a complete failure modes and effects analysis (FMEA) for all components (including electrical and pneumatic failures) that could impact performance of the cooling water system and confirm that the FMEA is documented and available for review, or explain why a complete and fully documented FMEA was not performed.

   f) Explain and justify all uses of "engineering judgment."

Response to question 2a:

Computer codes that were used in evaluating the system operating conditions and in performing the waterhammer analyses are discussed below:

RELAP5/MOD3.2: The RELAP5[3] computer program was developed (with US NRC sponsorship) as a light water reactor transient analysis code with intended applications which include simulation of a wide variety of hydraulic and thermal transients involving mixtures of steam, water, noncondensables, and solute. The code has been widely used in the nuclear industry and has undergone extensive benchmarking against experimental data and empirical correlations.

RFPP: The RFPP computer program is a post processor which uses the RELAP5/MOD3.2 calculated fluid conditions to calculate the unbalanced forces acting on piping segments. The program uses the theoretical approach of determining the net unbalanced force on a segment by calculating the time derivative of the fluid momentum, both liquid and vapor phases, for each control volume within the segment and summing over the piping segment length. The program has been verified and maintained in accordance with the Holtec International software quality control program which meets the requirements of ASME NQA1.

PIPESTRESS2010 Release 3.18.4: This computer program was used for dynamic time history analysis of LOCA induced forcing functions. The program was used for un-coupled models in which supports were incorporated as restraints based on the functional characteristics. The program has been controlled in accordance with the Raytheon Nuclear Incorporated (RNI) Software Quality Control Program which meets the requirements of ASME NQA1 and NRC benchmark problems (NUREG/CR-1677).

E/PD STRUDL Version 0894 or 1197: E/PD STRUDL was used for dynamic time history pipe and pipe support analysis of LOCA induced forcing functions. The program was used for coupled models in which supports were modeled as structural elements coupled with the piping elements. This program was also used for analysis and code checking of discrete support analysis. The program has been controlled in accordance with the Raytheon Nuclear Incorporated (RNI) Software Quality Control Program which meets the requirements of ASME NQA1 and NRC benchmark problems (NUREG/CR-1677).

ANSYS Version 5.2: This computer program was used to generate finite element analyses for welded pipe attachments. The software is qualified for nuclear safety related applications and has been controlled in accordance with the Raytheon Nuclear Incorporated (RNI) Software Quality Control Program which meets the requirements of ASME NQA1 and NRC benchmark problems (NUREG/CR-1677).

Proto-Flo and Proto-Hx: The Proto-Flo computer program was used to calculate the flow and pressure distribution in the RBCCW system for normal and post-accident operating alignments. The system computer model was developed based on the as-built plant arrangement and was benchmarked against field testing of the RBCCW system to improve the reliability of the predicted fluid conditions. Thermal performance of the system heat exchangers and cooler units were calculated using the Proto-Hx computer program. This program has been verified against vendor heat exchanger and cooler unit performance data. Heat exchanger performance was calculated based on the most conservative conditions, e.g. either design fouling or zero fouling, etc., depending on the intent of the analysis performed.

Response to question 2b:

Assumptions and input parameters utilized in the individual evaluations are addressed in the subject analyses and calculations. Assumptions and input parameters are defined based on verified conditions and in such a way as to conservatively evaluate the system response.

In calculating the pressure and equipment loads that occur due to waterhammer, no fluid structure interaction and force reductions were taken into account. RELAP5/MOD3.2 calculates the speed of sound on a volume-by-volume basis using the fluid conditions within each volume. The program accounts for two-phase conditions in the system in determining the local sonic velocity. Dissolved non-condensables have not been included in the modeling liquid definition and therefore, no cushioning occurs due to non-condensables released into the void. This liquid modeling results in a conservative (high) calculation of the speed of sound within the system. This conservative sound speed will maximize the waterhammer pressures and resulting wave forces when the void collapses and the water columns rejoin.

Sensitivity studies were completed to determine the appropriate modeling scheme with respect to volume/mesh sizes and time step specification.

The calculated piping waterhammer transient loads are applied directly to the piping system with no force reductions taken due to fluid structure interaction.

Response to questions 2c and 2d:

Waterhammer

The waterhammer evaluation was completed by analyzing the RBCCW system response to a LOCA concurrent with a LNP event. Each RBCCW system header was modeled for use with the RELAP5/MOD3.2[(3)] computer program. Through this modeling and conservative definition of the system parameters, the computer code calculates the fluid movement and heat transfer in the system. Based on these calculations the program determines the pressure, temperature, and flowrates. In addition, the code calculates the steam/water quality and identifies the corresponding and flow patterns to be considered in each portion of the system. In this way, the waterhammer types and water slug scenarios are properly defined.

At the initiation of the event, the RBCCW pumps, CAR fans, and CEDM fans trip and coastdown. Coastdown of the RBCCW pumps is calculated based on the system pressure and flow conditions throughout the transient. No credit is taken for fan coastdown since uncertainties exist with respect to the fan coastdown rates and the impact of decreasing airflows and changing containment conditions on the airside heat transfer coefficients. The RBCCW pumps are restarted at the design basis time of 26 seconds which includes time for accident identification, diesel generator startup, emergency bus re-energization, and signal processing. This system modeling represents a worst case scenario since the void formation is maximized. The pump is conservatively assumed to reach full speed within 1 second following a startup signal.

In addition, several conservative assumptions designed to maximize the void formation within the system were made. These included:

- Cooler performance defined based on zero fouling.
- Outside heat transfer coefficients on cooler fins were assumed at their design airflow value during the coastdown transient.
- Cooler performance was determined to be higher for the LOCA conditions, vs. the MSLB conditions, that exist in the initial post-accident time frame. Therefore, the LOCA accident case was analyzed for this evaluation.
- Minimum water level in the system surge tank.
- Containment temperature during the event is defined based on the worst case LOCA conditions.

During the period when the pump is tripped, heat transfer at the cooler units results in void formation within the cooler unit tubes. As the voids expand they push water out of the units and into the adjacent piping. Eventually, the cooler unit and portions of the surrounding piping contain significant levels of voiding. As the RBCCW pumps restart the voids are compressed, pushed forward, and eventually condense and collapse in the piping just downstream of the cooler unit. The voids are not predicted to be transported into other portions of the RBCCW system based on the system configuration and piping arrangement.

The system alignment during pump restart was determined based on the potential LOCA injection phase configuration that would result in the highest velocities into the voided portion of the system. These conservative velocities are expected to produce the largest waterhammer loadings.

During normal operation the temperature of the RBCCW water is maintained within a small range (approximately 75°F to 85°F). As the LOCA/LNP event progresses the void and surrounding water heatup. The small initial temperature variation that could exist does not significantly influence the calculated waterhammer. Analyses were completed which demonstrated that this parameter had insignificant impact on the resulting waterhammer pressure and effects. Additionally, due to the length of piping between the RBCCW heat exchanger and the system voiding, the voids have condensed and collapsed well before the colder water that would exit the heat exchanger during the pump restart phase of the transient reaches the void location.

Two Phase Flow

The RBCCW system is a closed loop system and equipped with an elevated surge tank to maintain system pressure. Based on the pressure, temperature, and flow conditions calculated, it was concluded that no flashing will develop in the system and no two-phase flow occurs when the RBCCW pumps are in operation.

The potential for cavitation has been examined at flow restrictions within the RBCCW system, such as at orifices and throttled valves, using the methodology outlined in NUREG/CR-6031, "Cavitation Guide for Control Valves."

The CAR throttle valves may experience cavitation in the incipient damage range during the injection phase operation. The cavitation remains above the incipient choking cavitation level and therefore no degradation of the cooling water flowrate is expected. Since the post-accident injection phase is relatively short, this cavitation level would not persist for a significant length of time. Excessive pitting, erosion, and resonance/fatigue failures are not anticipated during this short time period. In the recirculation phase, the cavitation improves to the critical cavitation range and remains well above the incipient damage level. The energy level and excitation potential for this expected cavitation level is low and no potential for damaging resonance, fatigue, or component erosion is predicted.

Cavitation at the CEDM throttle valves (2-RB-35A,B,C) remains well above the incipient damage level during the injection phase and above the critical cavitation level during the recirculation phase.

Cavitation remains above the critical cavitation level for other system throttle valves and orifices.

The two-phase flow evaluation was completed for each potential post-accident operating alignment. In addition to design alignments, the impact of postulated component failures such as loss of instrument air were also included in the flow distribution calculations. Physical modifications of system components were also completed to ensure that components come to the fail safe position upon loss of instrument air. The system modeling also included consideration of RBCCW pump degradation.

System temperatures were maximized by calculating the heat exchanger and cooler unit performances based on the most enveloping conditions for the specific case analyzed, e.g. design fouling in the RBCCW heat exchanger, minimum service water flow at maximum temperature to the RBCCW heat exchanger, zero fouling in the CAR and CEDM units, and maximum post-accident containment temperature.

Response to question 2e:

The GL 96-06 related analyses were performed using conservative post-accident operating conditions and system parameters to maximize the consequences of the event with respect to the potential for waterhammer and two-phase flow conditions, e.g.,

- Worst case post-accident containment scenarios, with the consideration of single active failures
- Design basis restart time for the RBCCW pumps for the waterhammer analysis
- Degraded RBCCW pump performance for the two-phase flow evaluation
- CAR performance based on zero fouling and no fan coastdown
- RBCCW operating alignments to maximize the potential for waterhammer and two-phase flow, including consideration of loss of instrument air, instrument uncertainties, etc.

The worst case design basis scenario envelopes other conditions resulting from any other component failures, and therefore, an additional FMEA analysis was not necessary.

Response to question 2f

In the initial response to GL 96-06,[4] some postulation of scenarios and potential conclusions were derived based to some extent on engineering judgment. Following this initial submission, several detailed and rigorous analyses were conducted. In these analyses no unsupported assumptions have been allowed based on engineering judgment. All assumptions have been clearly defined and justified as conservative, and sometimes, supported by additional sensitivity studies.

3. **Determine the uncertainty in the waterhammer and two-phase flow analyses, explain how the uncertainty was determined, and how it was accounted for in the analyses to assure conservative results.**

Response to question 3:

The waterhammer and two-phase flow analyses have inherent uncertainties. A quantitative assessment of these uncertainties is difficult, if not impossible. In a

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(4) M. L. Bowling to U. S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No.2, Response to Requested Actions of Generic Letter 96-06, Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," dated January 28, 1997.

computer program the physics of the phenomenon is idealized in mathematical form and a solution is obtained. The process of idealization involves uncertainties, while the numerical solution may incur inaccuracies. The uncertainties are minimized by modeling the phenomenon as closely as possible, by choosing the right options, and by incorporating the penalty of conservatism. In the current analysis conservative assumptions have been used in modeling the phenomenon, and also in the determination of certain physical parameters. Some examples are discussed below to illustrate how conservatism is assured.

The fan cooler thermal performance has been defined based on a zero fouling condition. The airside heat transfer coefficient is defined based on the design airflow and maximum containment conditions to envelope uncertainties in the fan coastdown rate and in the heat transfer coefficient due to the changing containment conditions.

The RBCCW pump is assumed to restart at the design basis maximum value of 26 seconds. The pump is also assumed to accelerate to full speed within 1 second after it has been energized.

These assumptions maximize the size of the predicted void and the velocity of its collapse. The margin added by these assumptions cannot be precisely estimated.

4. Confirm that the waterhammer and two-phase flow loading conditions do not exceed any design specifications or recommended service conditions for the piping system and components, including those stated by equipment vendors; and confirm that the system will continue to perform its design-basis functions as assumed in the safety analysis report for the facility.

Response to question 4:

The impact on the RBCCW system components and piping was analyzed based on the loads and conditions calculated to occur due to waterhammer during the LOCA/LNP event. Detailed time-history piping computer analyses were completed to analyze the loading and stress conditions that result in the RBCCW system piping and pipe supports. The piping and support stresses were analyzed using both coupled and uncoupled models of the piping and pipe supports.

These analyses predicted that several modifications were required in order to maintain the design basis criteria. These modifications included the modification of four (4) pipe supports in Header A and the addition of one (1) pipe support in Header B.

Analyses were also completed for the individual components. The CAR and CEDM cooler units, and each specific sub-component, were evaluated for the expected fluid transient and waterhammer loading conditions and pressures to ensure that the component stresses remain within the acceptable code stress limits for the materials of construction.

With implementation of the required modifications, the system remains within its design basis criteria and will continue to perform its design basis functions as assumed in the safety analysis report.

5. Provide a simplified diagram of the system, showing major components, active components, relative elevations, lengths of piping runs, and the location of any orifices and flow restrictions.

Response to question 5

At Millstone Unit No. 2, the RBCCW system supplies cooling water to the CAR cooler units as well as the following essential and non-essential equipment:

Essential Components:

⇒ High Pressure Safety Injection Pump Seal Coolers
⇒ Low Pressure Safety Injection Pump Seal Coolers
⇒ Containment Spray Pump Seal Coolers
⇒ Engineered Safety Features (ESF) Room Coolers
⇒ Shutdown Cooling Heat Exchanger (LOCA recirculation phase)

Non-Essential Components

⇒ Reactor Vessel Support and Cooling Coils
⇒ Reactor Coolant Pump (RCP) Thermal Barrier, Lube Oil, and Motor Coolers
⇒ Control Element Drive Motor (CEDM) Coolers
⇒ Primary Drain and Quench Tank Heat Exchanger
⇒ Letdown Heat Exchanger
⇒ Degasifier Vent Cooler
⇒ Quench Tank Heat Exchanger
⇒ Spent Fuel Pool Heat Exchangers

Each header serves two (2) CAR cooler units (one at the 43' Elevation and the other at either the 4' or 5' Elevation). Some non-essential components are aligned to receive cooling water from one header. Only Header A is aligned to supply flow to the CEDM coolers, which are not required to perform any post-accident safety function.

Figures 1 and 2 provide simplified diagrams of the RBCCW system Header A and Header B, respectively. These figures show the major components and their relative elevations. Each of the CAR and CEDM unit loops are equipped with a flow orifice and a valve which is throttled for flow balancing purposes. The piping lengths for various portions of the system and the relative locations of these flow orifices and throttled valves are summarized below.

Header A

Description	Pipe Length (ft)	General Information
Surge Line	210	-
Surge Line to Pump	60	-
Pump to RBCCW Hx	70	-
RBCCW Hx to CAR Supply	80	Flow divides to CARs & CEDMs
To CAR X-35A/X-35C Tee	150	Flow divides to X-35A & X-35C
Supply to CAR Inlet	200	-
CAR Outlet to Flow Orifice	250	Flow Orifices at 6.5' & 3.5' Elevations
Flow Orifice to Throttle Valves	18	Throttle Valves at 0.0' Elevations
Throttle Valves to Return Line	80	Flow from CARs Combine
To CEDM X-34A,B,C Tees	200	Flow divides to X-34A,B,C
Supply to CEDM Inlet	100	-
CEDM Outlet to Flow Orifice	25	Flow Orifices at 47',49' & 48' Elevations
Flow Orifice to Throttle Valves	105	Throttle Valves at 1' Elevations
Valves to CEDM Return Lines	10	-
To CAR Return Line	145	-
From CAR Return to Surge Line	80	-

Header B

Description	Pipe Length (ft)	General Information
Surge Line	210	-
Surge Line to Pump	25	-
Pump to RBCCW Hx	40	-
RBCCW Hx to CAR Supply	80	Flow divides to CARs
To CAR X-35B/X-35D Tee	65	Flow divides to X-35B & X-35D
Supply to CAR X-35B Inlet	280	-
CAR Outlet to Flow Orifice	260	Flow Orifice at 3' Elevations
Flow Orifice to Throttle Valve	10	Throttle Valve at 1' Elevation
Throttle Valve to CAR Return Line	20	Flow from CARs Combine
Supply to CAR X-35D Inlet	200	-
CAR Outlet to Flow Orifice	180	Flow Orifice at (-)2.5' Elevation
Flow Orifice to Throttle Valve	10	Throttle Valve at (-)4' Elevation
Throttle Valve to CAR Return Line	12	Flow from CARs Combine
From CAR Return to Surge Line	150	-

6. **Since reliance is being placed on RBCCW surge tank level in addressing the waterhammer and two-phase flow concerns, describe how the minimum surge tank level requirements will be assured, including justification for reliance on any non-safety grade instrumentation and annunciation in this regard, and explain why it would not be appropriate to establish Technical Specification requirements for maintaining surge tank level.**

Response to question 6

The potential for and expected effects of waterhammer and two-phase flow in the RBCCW system have been evaluated assuming the RBCCW surge tank, at the time of the event, is at its minimum water level. During normal operation, this water level is maintained by non-safety grade instrumentation and annunciation. Makeup water is supplied from the Primary Water system based on the operation of level controller LC-6000 which controls the position of the makeup valve 2-RB-215. Low level alarms (LS-6001 and LS-6730) are provided on the surge tank to provide remote annunciation of a low water level in either side of the dividing weir of the surge tank. The presence of two (2) instruments designed to ensure that the water level is not below an acceptable value provides a reasonable level of assurance during normal operation that a decrease in the surge tank water level will be detected and brought to the attention of operating personnel.

Design provisions have been made, in the form of two (2) Category I check valves at the RBCCW system interface with the Primary Water system, to prevent flow out of the RBCCW system in the event of a loss of pressure in the Primary Water system resulting from a pipe rupture in non-safety piping or other causes.

Changes in the system performance and conditions that result from water leaks or decreased surge tank water level would be expected to provide an additional indication of low water level and additional assurance that the adverse condition would be detected.

In light of this highly reliable layout, Technical Specification requirements would not improve assurance of public safety. Furthermore, Technical Specification requirements for maintaining RBCCW surge tank level does not meet any one of the criteria of 10CFR 50.36c(2)(ii). As such, additional Technical Specifications are not warranted.

7. **Describe in detail any plant modifications or procedural changes that have been made or are planned to be made to resolve the waterhammer and two-phase flow issues.**

Response to question 7

Several plant modifications have been implemented in response to the waterhammer and two-phase flow issues.

Based on the piping loading conditions that have been calculated to result from the waterhammer event, the following pipe support modifications have been implemented:

- RBBCW System Header A: Four (4) pipe supports have been modified
- RBBCW System Header B: One (1) new pipe support has been added

A procedural change will be implemented to address the scenario where an RBCCW pump does not automatically restart within the required design basis time and could be restarted manually later. This procedural change will instruct operators to delay restarting the idle RBCCW pump (restarting of the pump will be based on the existing post-accident containment conditions).

FIGURE 1: RBCCW SYSTEM HEADER A SCHEMATIC

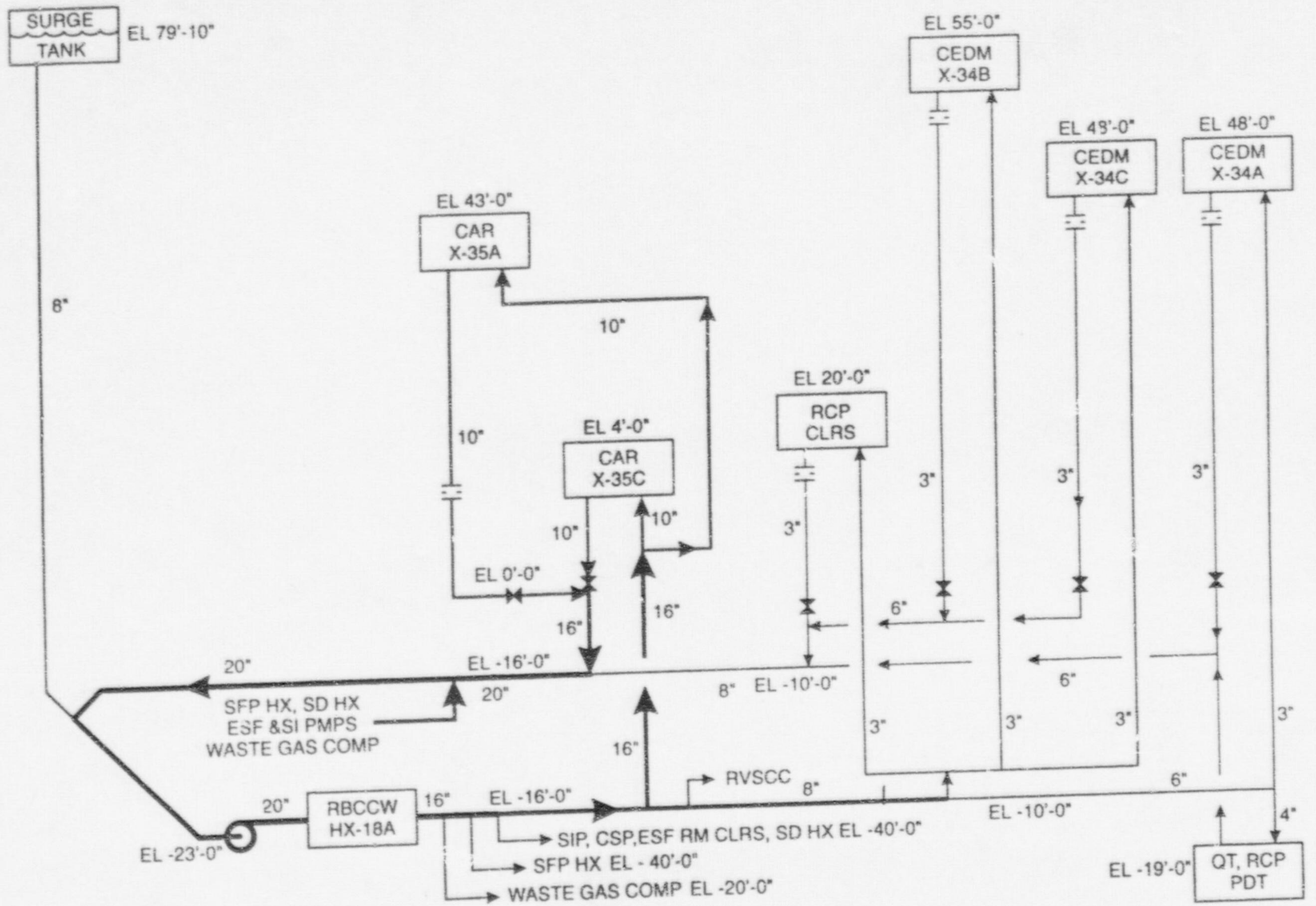
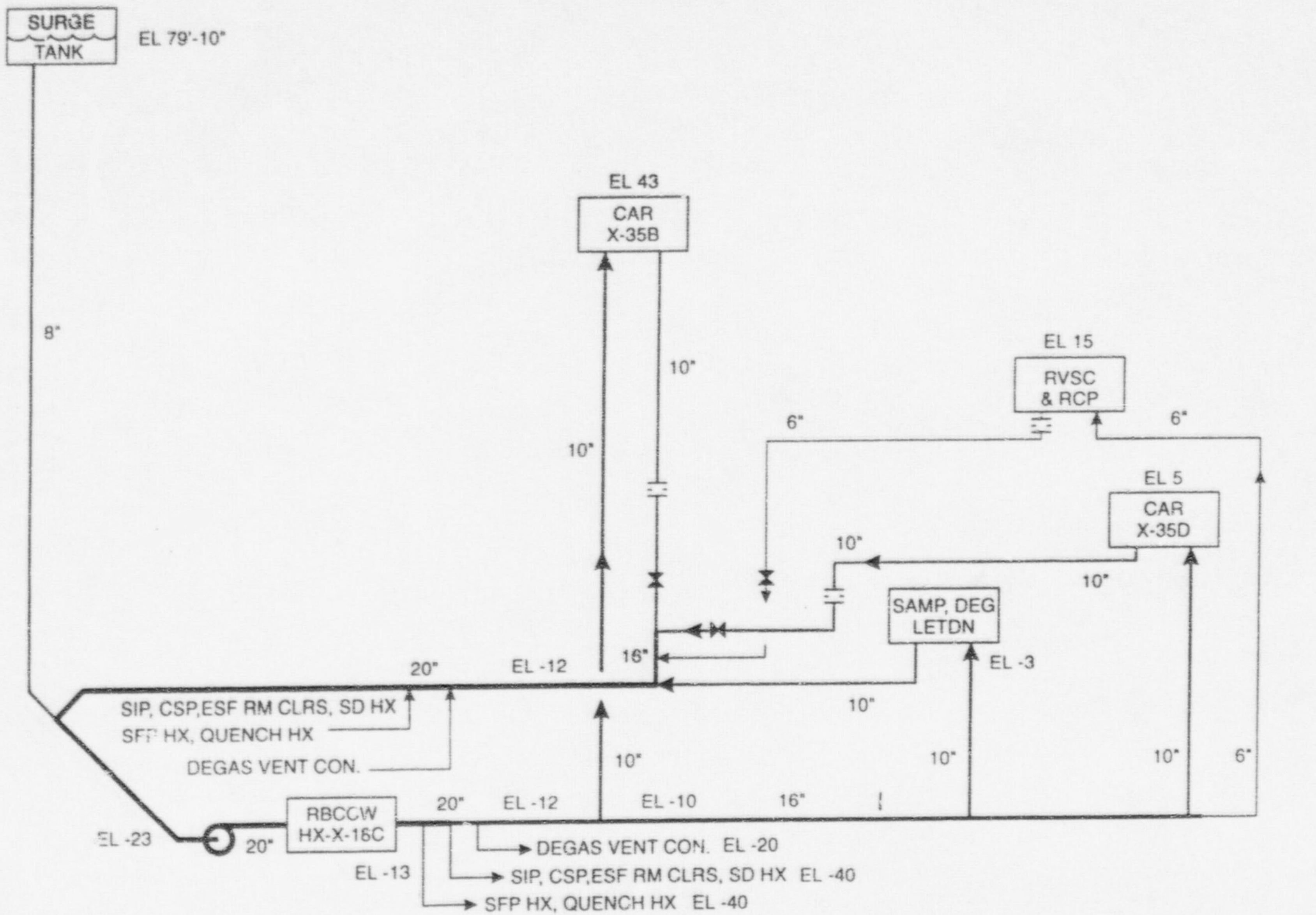


FIGURE 2: RBCCW SYSTEM HEADER B SCHEMATIC



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Attachment 2

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Response to The Request for Additional Information Regarding Resolution of Issues
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January 1999

Millstone Nuclear Power Station, Unit No. 2
Response to The Request for Additional Information Regarding Resolution of Issues Related to Generic Letter 96-06 (TAC No. M96833)
List of Regulatory Commitments

The following table identifies those actions committed to by NNECO in this document. Please notify the Manager - Regulatory Compliance at Millstone Unit No. 2 of any questions regarding this document, or any associated regulatory commitments.

Commitment	Committed Date or Outage
A procedural change will be implemented to address the scenario where an RBCCW pump does not automatically restart within the required design basis time and could be restarted manually later.	Prior to entering MODE 4