North Atlantic

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The Northeast Utilities System

August 31, 2001

NYN-01076
CR#01-07785

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Seabrook Station
Response to NRC Bulletin 2001-01
"Circumferential Cracking of Reactor Vessel Head Penetration Nozzles"

NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Vessel Head Penetration Nozzles" dated August 3, 2001, requests that licensees provide information to permit the assessment of plant specific compliance with Nuclear Regulatory Commission (NRC) regulations concerning through-wall cracking of vessel head penetration nozzles. The NRC required that all addressees provide written responses to the requested information in accordance with the provisions of 10 CFR 50.54(f) within 30 days of the date of the bulletin.

The North Atlantic Energy Service Corporation (North Atlantic) responses to items 1 through 4 of NRC Bulletin 2001-01 are herein provided in Enclosure 1. The response to item 5 shall be provided to the Nuclear Regulatory Commission within 30 days after plant restart following the next refueling outage as identified in the bulletin. Enclosures 2 and 3 contain copies of the drawings referenced in Enclosure 1. Commitments made by North Atlantic in response to this bulletin are contained in Enclosure 4.

Should you have any questions concerning this response, please contact Mr. James M. Peschel, Manager - Regulatory Programs, at (603) 773-7194.

Very truly yours,

NORTH ATLANTIC ENERGY SERVICE CORP.

Gene F. St. Pierre
Station Director

A166

cc: H. J. Miller, NRC Region I Administrator
G.F. Wunder, NRC Project Manager, Project Directorate I-2
G.T. Dentel, NRC Senior Resident Inspector

STATE OF NEW HAMPSHIRE

Rockingham, ss. DATE 8/31/01

Then personally appeared before me, the above-named Gene F. St. Pierre, being duly sworn, did state that he is the Station Director of the North Atlantic Energy Service Corporation that he is duly authorized to execute and file the foregoing information in the name and on the behalf of North Atlantic Energy Service Corporation and that the statements therein are true to the best of his knowledge and belief.

Marilyn R. Sullivan

Marilyn R. Sullivan, Notary Public
My Commission Expires: March 19, 2002

ENCLOSURE 1 TO NYN-01076

North Atlantic Response to
NRC Bulletin 2001-01
"Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles"

BACKGROUND INFORMATION

On August 3, 2001, NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles" was issued due to recent discoveries of cracked and leaking Alloy 600 vessel head penetration (VHP) nozzles, at four pressurized water reactors (PWRs). These discoveries have raised concerns about the structural integrity of VHP nozzles throughout the PWR industry.

Several provisions of the NRC regulations and plant operating licenses (Technical Specifications) pertain to the issue of VHP nozzle cracking. This bulletin requests that addressees (holders of operating licenses for PWR nuclear power reactors) provide information to permit the assessment of plant-specific compliance with NRC regulations. Addressees who choose to utilize the analysis provided in Materials Reliability Program (MRP) document MRP-44, Part 2 or similar analyses need to consider the NRC staff questions relative to this report (letter dated June 22, 2001) when preparing the plant specific responses to the requested information. These questions addressed aspects of the proposed industry treatment that the NRC staff did not agree with. Two specific areas of concern are (1) the finding that nozzle leaks are detectable on all vessel heads, and (2) the lack of consideration of an applicable crack growth rate for the VHP nozzle cracking situation (including a conclusion in the MRP responses that the appropriate crack growth for OD cracking of VHP nozzles is represented from data from a primary water environment).

North Atlantic has reviewed the letters addressed by the NRC in NRC Bulletin 2001-01 (June 22, 2001, NRC questions to MRP and June 29, 2001, MRP responses to NRC questions) from which the NRC concerns were generated. It is the North Atlantic position that the concerns raised by the NRC merit further work by the MRP and WOG. Resolution of these concerns involves significant research and data. North Atlantic is relying upon MRP to resolve the relevant issues and present the findings to the NRC.

As part of the MRP response to NRC Bulletin 2001-01, the Nuclear Energy Institute (NEI) in a letter dated August 21, 2001 from Alexander Marion to Dr. Brian Sheron (NRC), submitted EPRI report TP-1006284, "PWR Materials Reliability Program Response to NRC Bulletin 2001-01 (MRP-48)." This report was produced by the MRP to support individual utility responses to NRC Bulletin 2001-01. North Atlantic references the applicable sections of MRP-48 in responding to NRC Bulletin 2001-01 in addition to information provided to the NRC in Part 2 of MRP-44, "PWR Materials Reliability Program Interim Alloy 600 Safety Assessments for US PWR Plants."

REQUESTED INFORMATION

As a result of NRC Bulletin 2001-01, North Atlantic was requested to provide responses to items 1 through 4 within 30 days of the date of the bulletin. The following information is provided in response to those requests:

ITEM 1.a:

1.a. the plant-specific susceptibility ranking for your plant(s) (including all data used to determine each ranking) using the PWSCC susceptibility model described in Appendix B to the MRP-44, Part 2, report;

RESPONSE TO ITEM 1.a:

Seabrook Station has been ranked for the potential for primary water stress corrosion cracking (PWSCC) of the reactor pressure vessel (RPV) to head nozzles using the time-at-temperature model and plant-specific input data reported in MRP-48. MRP-48 was utilized in lieu of MRP-44 to supply certain data since it represents the most recent data available. As identified in Table 2-1 of MRP-48, this evaluation indicates that it will take Seabrook Station 109.9 effective full power years (EFPYs) of equivalent normalized operating time from March 1, 2001, to reach the same point of susceptibility as Oconee Nuclear Station Unit 3 (ONS3) had at the time that its leaking nozzles were discovered in February 2001.

Using the criteria stated in NRC Bulletin 2001-01, Seabrook Station falls into the NRC category of plants considered to have a low susceptibility to PWSCC of the RPV top head nozzles.

ITEM 1.b:

1.b. a description of the VHP nozzles in your plant(s), including the number, type, inside and outside diameter, materials of construction, and the minimum distance between VHP nozzles;

RESPONSE TO ITEM 1.b:

Seabrook Station has seventy-eight (78) Control Rod Drive Mechanism (CRDM) VHP nozzles and one (1) Head Vent Nozzle as depicted in Figure A-3 (Figure a) of Part 2 of MRP-44 and identified in Table 2-3 of MRP-48. The VHP and head vent nozzles are Alloy 600 J-Groove Type that were supplied by Huntington as identified in Table 2-1 "Key Parameters and Ranking (Revised August 21, 2001)" and Table 2-3 of MRP-48 "Supplemental Data - Head Arrangement and Nozzle Information (Revised August 21, 2001)." Information pertaining to the inside and outside diameter of the nozzles and the minimum distance between VHP nozzles is also provided in Table 2-3 of MRP-48.

ITEM 1.c:

1.c. a description of the RPV head insulation type and configuration;

RESPONSE TO ITEM 1.c:

As identified in Table 2-1 of MRP-48, Seabrook Station has reflective stepped RPV head insulation. The RPV head insulation at Seabrook Station exists on the outside of the head from the mating flange up to the RPV head shroud. Inside the shroud, the insulation forms two steps up along the peripheral CRDMs, then goes horizontal along a plane approximately 1.5-inches above the center of the head. The

insulation consists of reflective panels made of stainless steel. A copy of the details of construction and layout of the insulation is provided on the drawings contained in Enclosure 2.

ITEM 1.d:

1.d. a description of the VHP nozzle and RPV head inspections (type, scope, qualification requirements, and acceptance criteria) that have been performed at your plant(s) in the past 4 years, and the findings. Include a description of any limitations (insulation or other impediments) to accessibility of the bare metal of the RPV head for visual examinations;

RESPONSE TO ITEM 1.d:

There have been no specific VHP nozzle or RPV head inspections performed at Seabrook Station. Documented inspections of the RPV head have been limited to those performed in accordance Section XI of the American Society of Mechanical Engineer's (ASME) Boiler and Pressure Vessel Code.

Seabrook Station has completed two refueling outages (OR06 and OR07) within the past four years. Upon completion of the last two outages and prior to reactor startup, the RPV head was examined along with other pressure boundary components during the performance of the Class 1 system leakage test required by Category B-P of ASME Section XI. No unacceptable conditions were identified. Also, during OR07, a liquid penetrant examination was performed on one peripheral CRDM weld that exists just above the head in accordance with Category B-O of the ASME Section XI Code. No unacceptable indications were identified.

RPV head insulation poses a limitation to accessibility. The degree of limitation is unknown at this time and is dependent upon movement of insulation panels within each of the four duct openings in the lower shroud. This evolution has not been previously attempted. The four duct openings may also pose a limitation with respect to their location in the lower shroud. A complete 360° view of each CRDM penetration may be difficult on some penetrations due to the four openings in the shroud not being spaced at equal distances.

ITEM 1.e:

1.e. a description of the configuration of the missile shield, the CRDM housings and their support/restraint system, and all components, structures, and cabling from the top of the RPV head up to the missile shield. Include the elevations of these items relative to the bottom of the missile shield.

RESPONSE TO ITEM 1.e:

Integral Missile Shield

The design of the head assembly integral missile shield consists of a 2-inch thick steel plate supported by a network of 4-inch and 6-inch structural steel I-beams located above the CRDM housings. S4X9.5 I-beams are welded to the top side of the 2-inch thick carbon steel plate. There is a ring girder composed of W6X16 sections. The S4X9.5 radial beams are connected to the W6X16 ring girder with four high

strength 3/8-inch diameter bolts. The ring girder is connected to 5X5X1/2 structural steel tubes, which are then attached to the lift leg extensions of the RVH lift rig.

Forty 8.5-inch diameter holes and four 5.5-inch diameter holes are drilled in the 2-inch steel plate to allow the ventilating air to be drawn through by the CRDM cooling fans. The location of each ventilation hole is chosen to clear the supporting grid so that air flow is not affected and to eliminate the possibility of a missile passing through the opening. The overall weight of the assembly is estimated to be between 7,500 and 8,000 lbs.

The RV missile shield protects vital components and structures, including the containment structure, from damage from missiles which could result from a mechanistic failure causing portions of a CRDM and/or CRDM drive rod to be rapidly ejected from the reactor. The missile shield is safety-related.

The CRDM seismic spacer plates prevent excessive movement of the CRDM housing during a seismic event to prevent a failure of the RC system pressure boundary. The CRDM seismic spacer plates are safety-related.

Cables

The CRDM and Digital Rod Position Indication (DRPI) power and instrumentation cable assemblies run from the connector plates which are mounted on the steam generator enclosure walls on the east (DRPI) and west (CRDM) sides of the reactor cavity. These cables are run in cable trays, which are mounted on the underside of the missile shield to the individual terminations of each CRDM column. Internal routing of the CRDM/DRPI cables is achieved by strapping the cable to wire support ropes that are part of the ring girder. There are a total of 171 CRDM and DRPI cables.

Loose Parts Monitoring System (LPM)

Two LPM probes are attached to the RV Head lift rig at the vessel. Both of these devices are external to the RV Head package. However, one electrical junction box for these instruments is located within the ventilation shroud beneath the missile shield.

Equipment Elevations:

Reactor Vessel Head Flange	(-1) foot 10 ½ inch elevation
CRDM Platform	24 foot 8 inch elevation
Missile Shield Plate	26 foot 5 ½ inch elevation

Simplified drawings of the plan view of the CRDM and lateral restraint arrangement (Figure 1) and the relative position of components by elevation (Figure 2) are provided in Enclosure 3.

ITEM 2:

2. *If your plant has previously experienced either leakage from or cracking in VHP nozzles, addressees are requested to provide the following information:*

a. *a description of the extent of VHP nozzle leakage and cracking detected at your plant, including the number, location, size, and nature of each crack detected;*

b. *a description of the additional or supplemental inspections (type, scope, qualification requirements, and acceptance criteria), repairs, and other corrective actions you have taken in response to identified cracking to satisfy applicable regulatory requirements;*

c. *your plans for future inspections (type, scope, qualification requirements, and acceptance criteria) and the schedule;*

d. *your basis for concluding that the inspections identified in 2.c will assure that regulatory requirements are met (see Applicable Regulatory Requirements section). Include the following specific information in this discussion:*

(1) *If your future inspection plans do not include performing inspections before December 31, 2001, provide your basis for concluding that the regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.*

(2) *If your future inspection plans do not include volumetric examination of all VHP nozzles, provide your basis for concluding that the regulatory requirements discussed in the Applicable Regulatory Requirements section will be satisfied.*

RESPONSE TO ITEM 2:

Seabrook Station has not previously experienced leakage from or cracking in VHP nozzles.

ITEM 3:

3. *If the susceptibility ranking for your plant is within 5 EFPY of ONS3, addressees are requested to provide the following information:*

a. *your plans for future inspections (type, scope, qualification requirements, and acceptance criteria) and the schedule;*

b. *your basis for concluding that the inspections identified in 3.a. will assure that regulatory requirements are met (see Applicable Regulatory Requirements section). Include the following specific information in this discussion:*

(1) *If your future inspection plans do not include performing inspections before December 31, 2001, provide your basis for concluding that the regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.*

(2) *If your future inspection plans include only visual inspections, discuss the corrective actions that will be taken, including alternative inspection methods (for example, volumetric examination), if leakage is detected.*

RESPONSE TO ITEM 3:

The susceptibility ranking for Seabrook Station is not within 5 EFPY of ONS3. Refer to the response to item 1a.

ITEM 4:

4. *If the susceptibility ranking for your plant is greater than 5 EFPY and less than 30 EFPY of ONS3, addressees are requested to provide the following information:*

   a. *your plans for future inspections (type, scope, qualification requirements, and acceptance criteria) and the schedule;*

   b. *your basis for concluding that the inspections identified in 4.a will assure that regulatory requirements are met (see Applicable Regulatory Requirements section). Include the following specific information in this discussion:*

      (1) If your future inspection plans do not include a qualified visual examination at the next scheduled refueling outage, provide your basis for concluding that the regulatory requirements discussed in the Applicable Regulatory Requirements section will continue to be met until the inspections are performed.

      (2) The corrective actions that will be taken, including alternative inspection methods (for example, volumetric examination), if leakage is detected.

RESPONSE TO ITEM 4:

Seabrook's susceptibility ranking is greater than 30 EFPY of ONS3. Refer to the response to item 1a.

ENCLOSURE 2 TO NYN-01076

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THAT CAN BE VIEWED AT THE RECORD TITLED: REACTOR VESSEL INSULATION TOP HEAD INSUL. LAYOUT C2 & DET. WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT DWG. NO.JM-4421-C2

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ENCLOSURE 3 TO NYN-01076

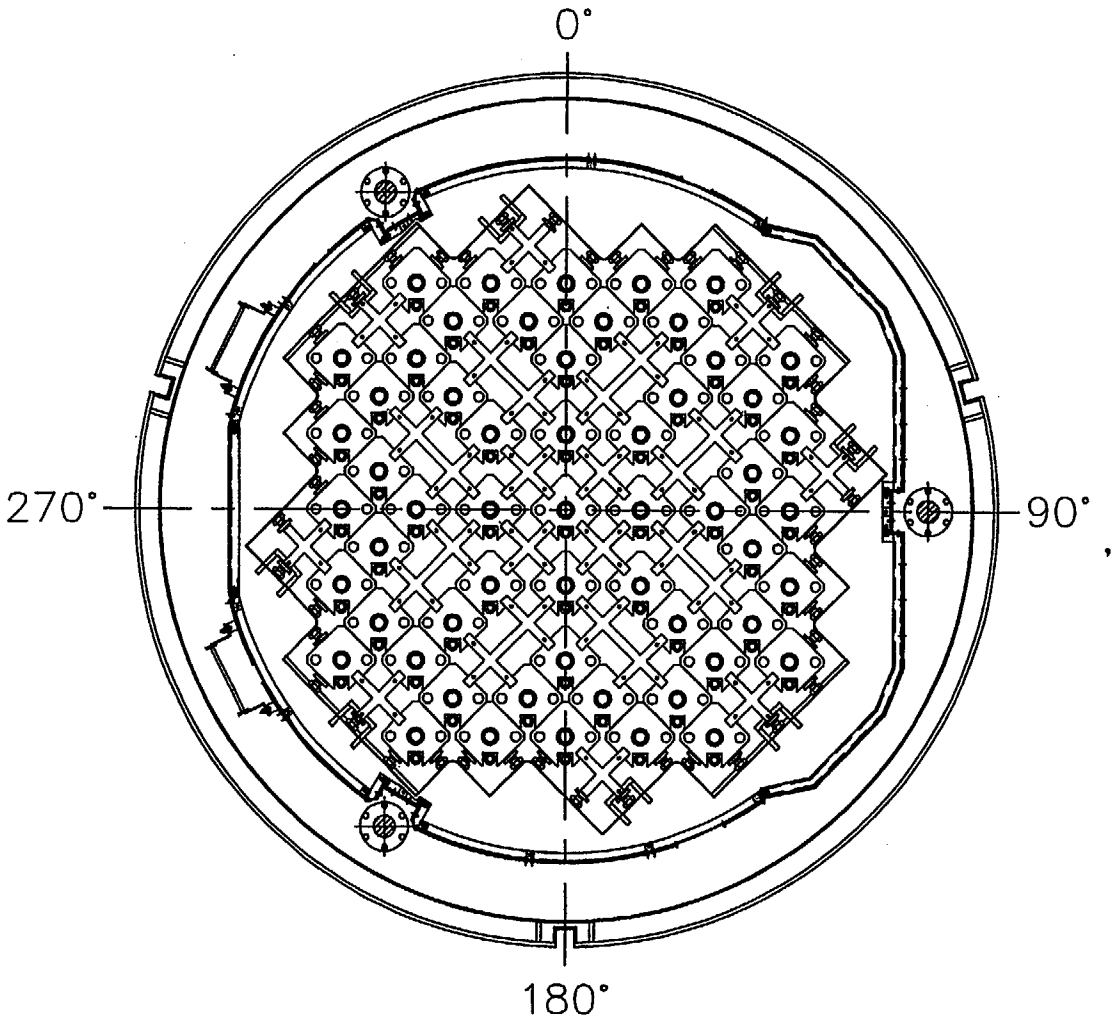

FIGURE 1
PLAN VIEW OF CRDM AND LATERAL RESTRAINT ARRANGEMENT

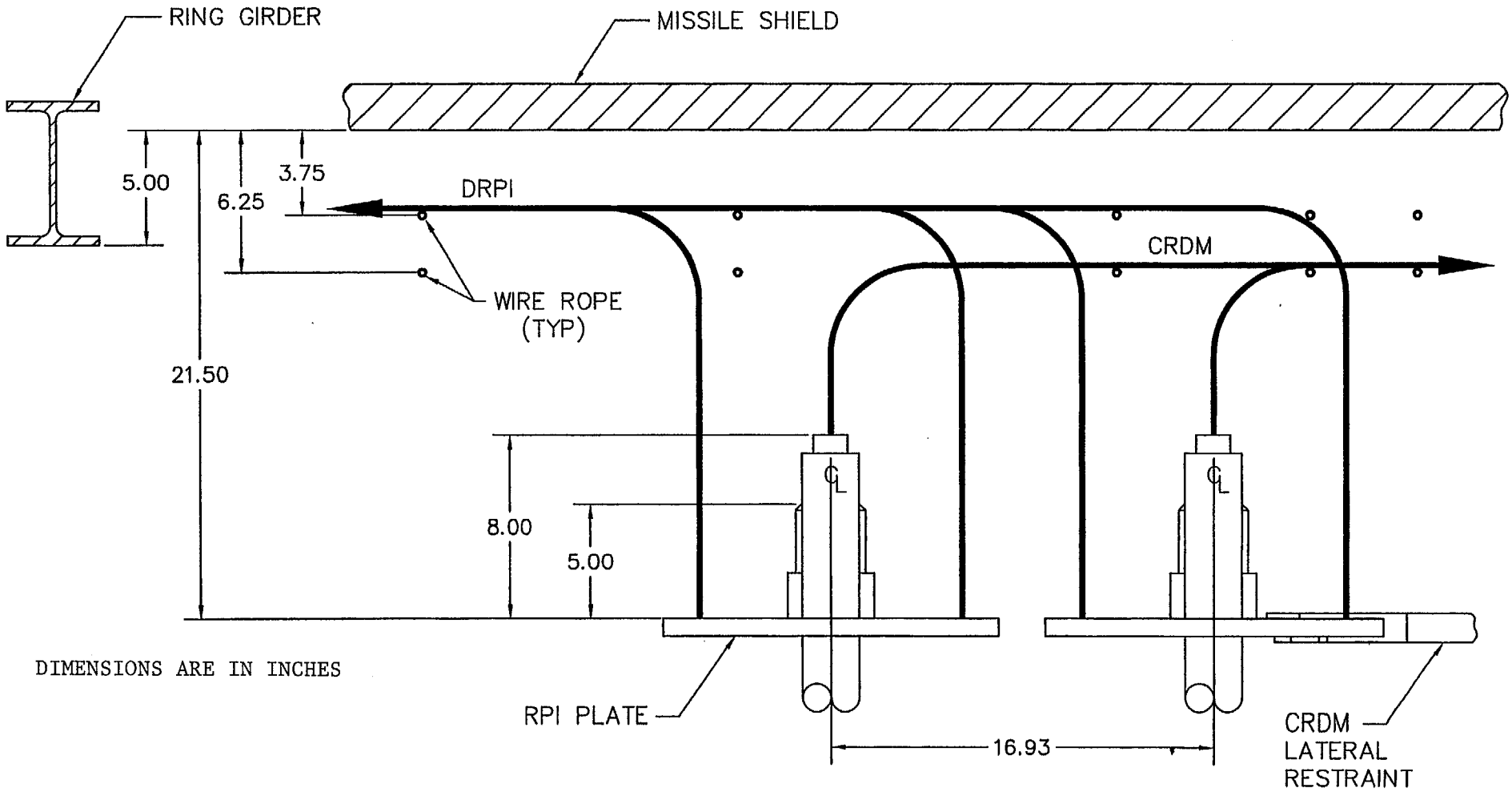

FIGURE 2

RELATIVE POSITION OF COMPONENT IN ELEVATION VIEW

ENCLOSURE 4 TO NYN-01076

North Atlantic Commitments to NRC Bulletin 2001-01
"Circumferential Cracking of Reactor Vessel Head Penetration Nozzles"

CR 01-07785-10	Within 30 days of plant restart from OR08, forward a response to requested information item 5 identified in NRC Bulletin 2001-01.