Omaha Public Power District

444 South 16th Street Mall
Omaha NE 68102-2247

April 7, 2005
LIC-05-0040

U.S. Nuclear Regulatory Commission
ATTN.: Document Control Desk
Washington, D.C. 20555-0001

References:
1. Docket No. 50-285
2. Letter from Samuel J. Collins (NRC) to Ross Ridenoure (OPPD) dated February 11, 2003, Issuance of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (EA-03-009) (NRC-03-025) (ML030380470)
3. Letter from R. William Borchardt (NRC) to Ross Ridenoure (OPPD) dated February 20, 2004, Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (NRC-04-0022) (ML040220181)
4. Letter from Ross Ridenoure (OPPD) to Document Control Desk (NRC) dated March 3, 2003, Response to Commission Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (LIC-03-0018) (ML030640399)
5. Letter from Ross Ridenoure (OPPD) to Document Control Desk (NRC) dated March 3, 2003, Answer to Commission Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (LIC-03-0019) (ML030640403)
6. Letter from D. J. Bannister (OPPD) to Document Control Desk (NRC) dated March 11, 2004, Answer and Response to First Revised Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (LIC-04-0033) (ML040750510)
7. Letter from Ross Ridenoure (OPPD) to Document Control Desk (NRC dated December 22, 2003, Fort Calhoun Station Unit No. 1, Reactor Pressure Vessel Head Examination Report (LIC-03-0163) (ML040020322)

SUBJECT: Fort Calhoun Station Unit No. 1, Relaxation Request for First Revised Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors

On February 11, 2003, the NRC issued Reference 2 for interim inspection requirements for reactor pressure vessel (RPV) heads at pressurized water reactor (PWR) facilities. On

February 20, 2004, the NRC issued the Reference 3, which superseded Reference 2. Reference 3 modified the requirements regarding nondestructive examination of the penetration nozzles.

The Omaha Public Power District (OPPD) consented to Reference 2 in References 4 and 5, and provided a response consenting to Reference 3 in Reference 6. OPPD provided inspection results to the NRC for Reference 2 in Reference 7.

As discussed with Nuclear Reactor Regulation (NRR) personnel of the NRC staff (Terence Chan and William Koo) in a phone conversation on April 4, 2005, OPPD is requesting relaxation from the requirements for certain Reference 3 inspection requirements. The requested relaxation is for nondestructive examination of a portion of the J-groove weld wetted surface for Incore Instrumentation (ICI) nozzles and a portion of the wetted surface of the nozzle base material above the highest point of the root of the J-groove weld for certain Control Element Drive Mechanism (CEDM) nozzles. Pursuant to the procedure specified in Section IV, paragraph F, of Reference 3, OPPD requests relaxation from the requirements specified in Section IV, Paragraph C.(5)(b)(ii) for Fort Calhoun Station Unit No. 1 (FCS) for the RPV head penetration nozzles for which Eddy current testing requirements cannot be completed as required. Attachment 1 of this letter provides the relaxation request.

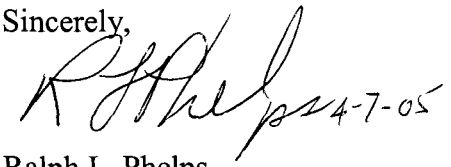
The Spring 2005 Refueling Outage for FCS began on February 26, 2005. The current schedule for plant criticality is April 29, 2005. Therefore, OPPD requests that the NRC complete its review and approval of this relaxation request by April 29, 2005. OPPD plans to submit additional analysis information from Westinghouse and Dominion Engineering, as well as a status report of nozzle examinations completed to date, on or about April 13, 2005 (as discussed in Attachment 1, Section 5) as a supplement to support review and approval of this request. NRR personnel in the April 4, 2005 phone conversation asked that the information in this letter be provided in advance of forthcoming analysis information to facilitate their review.

This letter contains the following commitment:

1. OPPD will complete the inspections required by Reference 3 as modified by this relaxation request and will provide the results of these inspections to the NRC within 60 days of returning the plant to operation.

If you have any questions or require additional information, please contact Thomas R. Byrne at (402) 533-7368.

Sincerely,



Ralph L. Phelps
Division Manager
Nuclear Engineering

RLP/TRB/trb

Attachment 1 - Relaxation Request for First Revised Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors

Attachment 1

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Relaxation Request for First Revised Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors

1. ASME Code Component(s) Affected

The scope of this relaxation includes the Fort Calhoun Station Unit No. 1 (FCS) ASME Class 1 reactor pressure vessel (RPV) head penetrations as delineated in Table 1 and Figures 1 through 5. The Omaha Public Power District (OPPD) has determined its primary water stress corrosion cracking (PWSCC) susceptibility category for the 2005 Spring Refueling Outage (RFO) to be "High" per the guidance in Reference 1, Sections 1V.A and 1V.B.

2. Applicable Examination Requirements

The NRC issued Reference 1 establishing interim inspection requirements for RPV heads of pressurized water reactors. Section IV, Paragraph C (Parts 1, 2, 3, and 4), require nonvisual nondestructive examination (NDE) in accordance with Section IV, Paragraph C.(5)(b). Section IV.C.(5)(b) of Reference 1 states the following:

"(b) For each penetration, perform a nonvisual NDE in accordance with either (i), (ii), or (iii):

(i) Ultrasonic testing of the RPV head penetration nozzle volume (i.e., Nozzle base material from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches [see Figure IV-1]); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0-inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater (see Figure IV-2). In addition, an assessment shall be made to determine if leakage has occurred into the annulus between the RPV head penetration nozzle and the RPV head low-alloy steel.

(ii) Eddy current testing or dye penetrant testing of the entire wetted surface of the J-groove weld and the wetted surface of the RPV head penetration nozzle base material from at least 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches [see Figure IV-3]); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0-inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater (see Figure IV-4).

(iii) A combination of (i) and (ii) to cover equivalent volumes, surfaces and leak paths of the RPV head penetration nozzle base material and J-groove weld as described in (i) and (ii). Substitution of a portion of a volumetric exam on a nozzle with a surface examination may be performed with the following requirements:

1. On nozzle material below the J-groove weld, both the outside diameter and inside diameter surfaces of the nozzle must be examined.

2. On nozzle material above the J-groove weld, surface examination of the inside diameter surface of the nozzle is permitted provided a surface examination of the J-groove weld is also performed."

3. Requirement from Which Relaxation is Requested

OPPD currently is examining RPV head penetrations in accordance with Reference 1, Section IV.C(5)(b)(ii), which states:

> "Eddy current testing or dye penetrant testing of the entire wetted surface of the J-groove weld and the wetted surface of the RPV head penetration nozzle base material from at least 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches [see Figure IV-3]); OR from 2 inches above the highest point of the root of the J-

groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0 inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater (see Figure IV-4)."

Specifically, the planned inspection for FCS includes the following:

Eddy current testing (ECT) of the entire wetted surface of the J-groove weld and the wetted surface of the RPV head penetration nozzle base material from at least 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis or the bottom of the nozzle if less than 2 inches (see Reference 1, Figure IV-3).

OPPD is employing a wetted surface ECT examination methodology demonstrated at the EPRI NDE Center for inspections of RPV head penetration nozzles. The wetted surface will be examined by using three different probe holders for examination of different surfaces: a J-groove holder, a blade holder, and a fingertip holder. The probe holders incorporate an eddy current sensor which applies an alternating current magnetic field to interrogate for material surface discontinuities. Auto-biasing controls maintain sensor sensitivity in varying residual magnetic fields resulting from delta-ferrites in the RPV head cladding heat-affected zone. Examination results will be evaluated in accordance with guidance in ASME Section V, Article 8.

Examination results that exceed flaw criteria specified by Reference 1 will be remediated or repaired in accordance with ASME Section XI, 1998 edition, 2000 addendum. Flaws in penetration nozzles or J-groove weld surface areas will be removed and repaired as necessary to maintain primary boundary integrity.

OPPD has performed upper surface bare metal visual examinations of the RPV head during the three most recent refueling outages (2002, 2003, and 2005). No reportable indications were found during any of these inspections.

4. Reason for Relaxation Request

OPPD anticipates difficulties with two portions of the planned inspection, as follows:

1. Incore instrumentation (ICI) nozzles

A portion of the J-groove weld wetted surface at the toe of the weld may not be accessible by the ECT device. Nominal weld surface bend radius between the tube and wetted reactor head surface is 1/4 inch, but industry experience shows that fabricated weld dimensions may differ from nominal dimensions. A smaller radius is possible due to the difficulty of maintaining a 1/4 inch radius when welding in the acute angle at the toe of the J-groove weld. The articulated ECT weld probe is designed to travel across the surface of the weld. Continuous ECT weld probe contact may not be achievable at the toe of the J-groove weld if weld radius is less than 1/4 inch. The anticipated area of difficulty is expected to be approximately 10 out of 360 radial degrees for each of the six ICI nozzles (approximately 0.2 square inches per nozzle) (see Figure 3). Relaxation is therefore requested for the ICI nozzles in this area. The remainder of the weld surface, as well as required wetted portions of the RPV ICI head penetration nozzle base material, will be examined in accordance with Reference 1.

2. Control Element Drive Mechanism (CEDM) nozzles

A portion of the wetted surface of the RPV head penetration nozzle base material above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) may not be accessible by the ECT device in some CEDM penetrations. The blade-type ECT nozzle probe is designed to be inserted between the nozzle and thermal sleeve for inner diameter (ID) examination of the nozzle base material. Each thermal sleeve has four, 1/8 inch wide by 1/4 inch high centering tabs on its outer surface, spaced 90 degrees apart. Probe insertion will be limited whenever the end of the blade contacts a tab. This will prevent scanning above that height for the combined width of the blade and tab (approximately 9/16 inches), at four locations 90 degrees apart in affected penetrations (see Figures 4 and 5). Full-height scanning can still be accomplished between the centering tabs where there is no interference between tabs and the probe. Circumferential orientation of the tabs relative to weld high and low points is indeterminate because the thermal sleeves are not keyed in the nozzles. The distance from the lower end of each thermal sleeve to its centering tabs is fixed. As hillside angle increases, the vertical distance will decrease between centering tabs and the J-groove weld root. Manufacturing tolerance stack-up combines with

lack of as-built nozzle assembly measurements to make actual distances uncertain. Centering tabs in the outermost CEDM nozzles (Penetrations 22 through 41) are expected to intrude into the required inspection zone (less than 2 inches above the plane perpendicular to the nozzle axis at the highest point of the root of the J-groove weld). Centering tabs are not expected to interfere with nozzle inspections nearer to the center of the reactor head, but it is uncertain at what hillside angle the centering tabs will begin to interfere. Relaxation is therefore requested for 20 CEDM nozzles (Penetrations 22 through 41) in this area, although the actual number requiring relaxation may be less. Except as stated herein, all required wetted portions of the CEDM head penetration nozzle base material and J-groove weld surfaces will be examined as originally planned.

Examination difficulties are not expected in required inspection areas below the CEDM and ICI welds. There also is no anticipated difficulty in examining the reactor head vent. This relaxation will only be utilized where inaccessible areas are found and is not anticipated to be required for all areas where relaxation is requested. A status report of nozzle examinations completed to date is planned to be submitted to the NRC on or about April 13, 2005.

5. Proposed Alternative and Basis for Use

OPPD requests relaxation, as described in Table 1, from portions of the examination described in Section 3 above. Westinghouse will perform deterministic fracture mechanics analysis, based upon the Dominion Engineering elastic plastic analysis, to evaluate stresses in the portions for which relaxation is requested. A reactor head temperature of 588°F will be used for the calculations (Reference 2). This analysis will be used to establish that the scope of relaxation requested will not significantly affect the continued safe operation of the RPV head for one additional fuel cycle, after which it will be replaced. Upon completion, this analysis will be provided to the NRC. This analysis, as well as a status report of nozzle examinations completed to date, is planned to be submitted to the NRC on or about April 13, 2005.

OPPD has considered alternative means of examining the areas for which relaxation is requested. OPPD considers that performance of these alternatives would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety for the following reasons:

1. **ICI weld areas inaccessible by ECT**: Dye penetrant examination (PT) would be very difficult and would incur substantial dose. ICI nozzles are physically located above the reactor head stand inner shield wall. An examiner would have to crawl under the reactor head, navigate around

CEDM nozzles and grippers, and examine the toe of each weld from the opposite side of the nozzle. The difficulties of preparation, application, inspection by mirror, and cleanup would all extend examination time and contribute to significant worker exposure. It is estimated that the task would consume 15 person-rem and extend the outage duration by one to two days (see Figures 2 and 3).

2. **CEDM nozzle ID areas inaccessible by ECT**: Full probe access would require removal of thermal sleeve centering lugs, which could only be practically accomplished by removal of part or all of the thermal sleeves. Due to the uncertainty regarding which or how many nozzles will have interferences, the work would need to be done on an emergent basis. FCS CEDM internals would have to be removed from the reactor head before thermal sleeves could be shortened. Foreign material generated by the disassembly and removal processes could potentially cause CEDM mechanical seals to leak and fail after the plant is returned to power, potentially challenging reactor coolant system (RCS) Technical Specifications leakage limits. The FCS examination was designed to perform ECT without removal of internals. It is estimated that shortening of thermal sleeves would consume 2 person-rem and extend the outage duration by 20 hours per affected CEDM penetration. This could result in additional radiation exposure of up to 82 person-rems and extension of the outage duration by up to 820 hours if all 41 CEDM penetrations require shortening of the thermal sleeves.

   In order to rotate the thermal sleeves to allow for ID inspection of CEDM Nozzles 22 through 41, OPPD would have to build equipment to clamp onto the nozzle and thermal sleeve to enable rotation to occur. Building such a piece of equipment would extend the outage duration by seven days. Rotating the thermal sleeve could have the potential for deforming the thermal sleeve and create operational problems with control rod movement. Additionally, rotating the thermal sleeves could cause the centering tabs to scratch the ID of the CEDM housings and introduce artifacts which would have to be dispositioned. The additional radiation exposure and outage delays would be significant.

6. Duration of Proposed Alternative

This relaxation is applicable only to the Spring 2005 RFO for FCS. The FCS Reactor Vessel Head is scheduled for replacement in the Fall 2006 RFO.

7. Precedents

1. Letter from Herbert N. Berkow (NRC) to Joseph E. Venable (Waterford 3) dated March 22, 2005, Relaxation Request from US Nuclear Regulatory Commission (NRC) First Revised Order EA-03-009 for Control Element Drive Mechanism (CEDM) Nozzles (TAC No. MC2643), Docket No. 50-382 (ML050820683).

2. Letter from Herbert N. Berkow (NRC) to Gregory M. Rueger (Diablo Canyon Unit 2) dated November 23, 2004, Relaxation of Requirements Associated with First Revised Order (EA-03-009) Regarding Alternate Examination Coverage for Reactor Pressure Vessel Head Penetration Nozzles (TAC No. MC4932) Docket No. 50-323 (ML043290092).

3. Letter from Stuart A. Richards (NRC) to P. E. Katz (Calvert Cliffs) dated April 18, 2003, Relaxation of the Requirements of Order (EA-03-009), Regarding Reactor Pressure Vessel Head Inspections (TAC Nos. MB7752 and MB7753), Docket Nos. 50-317 and 50-318 (ML031070434).

4. Letter from Scott W. Moore (NRC) to J. A. Stall (St. Lucie Unit 2) dated May 29, 2003, Order EA-03-009 Relaxation Requests Nos. 1 and 2 Regarding Examination Coverage of Reactor Pressure Vessel Head Penetration Nozzles (TAC Nos. MB8165 and MB8166), Docket No. 50-389 (ML031500489).

8. References

1. Letter from R. William Borchardt (NRC) to Ross Ridenoure (OPPD) dated February 20, 2004, Issuance of First Revised NRC Order (EA-03-009) Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors (NRC-04-0022) (ML040220181).

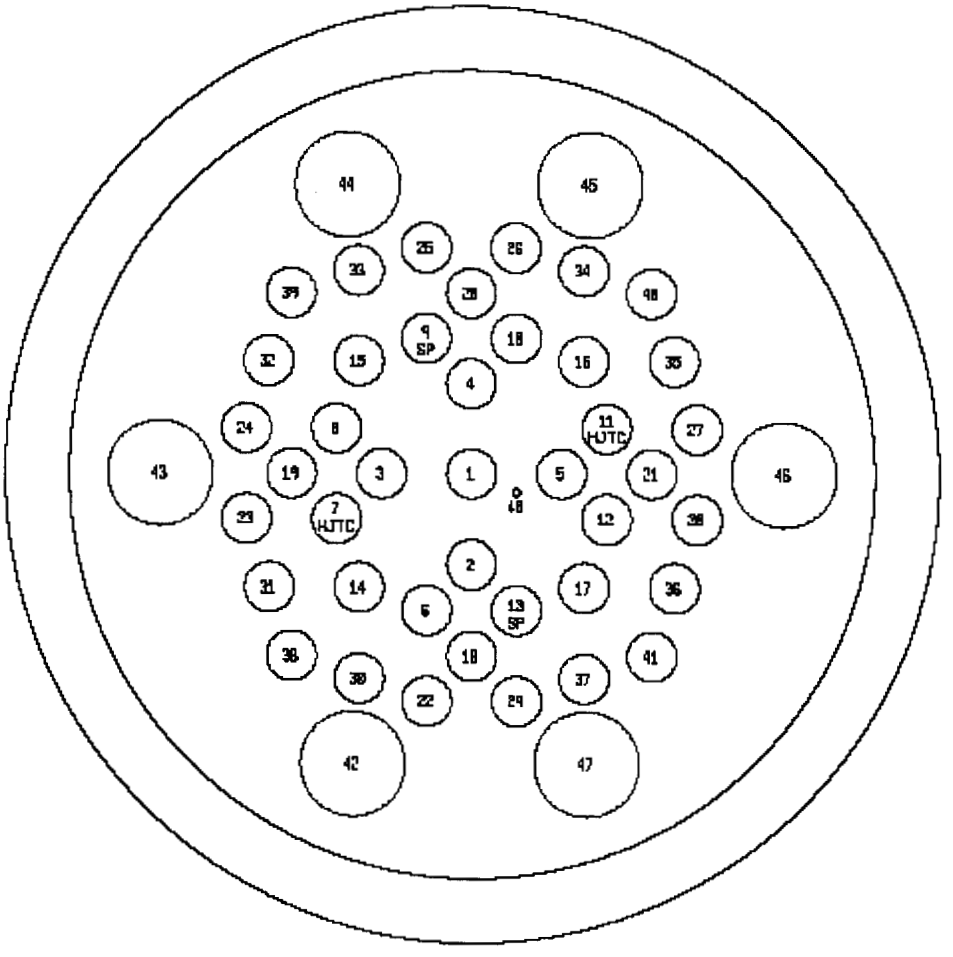
2. EPRI MRP-48, PWR Materials Reliability Program Response to NRC Bulletin 2001-01, August 2001.

Attachment 1, Table 1: Description of Fort Calhoun RPV Head Penetrations and Scope of Relaxation Requested

Penetrations		Tube Diameter, Inches		Hillside Angle, Degrees at Nozzle Centerline	Alloy 600 Tube Material		Examinations and Relaxation Requested		
Type	Numbers	OD	ID		Manufacturer, Heat No.	Yield, ksi	OD ECT	ID ECT	J-Groove Weld ECT
CEDM	1	3.50	2.73	0.0	Huntington NX4908	37.0	Examination As Planned	Examination As Planned	Examination As Planned
CEDM	2 through 5	3.50	2.73	13.6	Huntington NX4908	37.0			
CEDM	6 through 10	3.50	2.73	21.8	Huntington NX4908	37.0			
CEDM	11 through 13	3.50	2.73	21.8	Huntington NX5836	56.0			
CEDM	14	3.50	2.73	24.6	Huntington NX5836	56.0			
CEDM	15 through 17	3.50	2.73	24.6	Huntington NX4908	37.0			
CEDM	18 through 21	3.50	2.73	28.1	Huntington NX4908	37.0			
CEDM	22 through 29	3.50	2.73	36.8	Huntington NX4908	37.0		**Relief Requested for top 3/4 inch of inspection area, above the tabs.** **1 1/4 inches above the root of the J-groove weld will be fully inspected.**	
CEDM	30 through 37	3.50	2.73	37.3	Huntington NX4908	37.0			
CEDM	38 through 41	3.50	2.73	41.7	Huntington NX4908	37.0			
ICI	42 through 46	6.63	5.19	54.4	Huntington NX7054	32.0	Examination As Planned	Examination As Planned	**Relief Requested for 10° Circumferential at Toe of Weld: Examination of All Accessible Portions** **350° Circumferential: Examination As Planned.**
ICI	47	6.63	5.19	54.4	Huntington NX7901	52.5			
Vent	48	1.05	0.74	7.5	Huntington NX3575	41.0	Not Applicable	Examination As Planned	Examination As Planned

ATTACHMENT 1, FIGURE 1
FCS REACTOR HEAD NOZZLE

PLAN VIEW



KEY

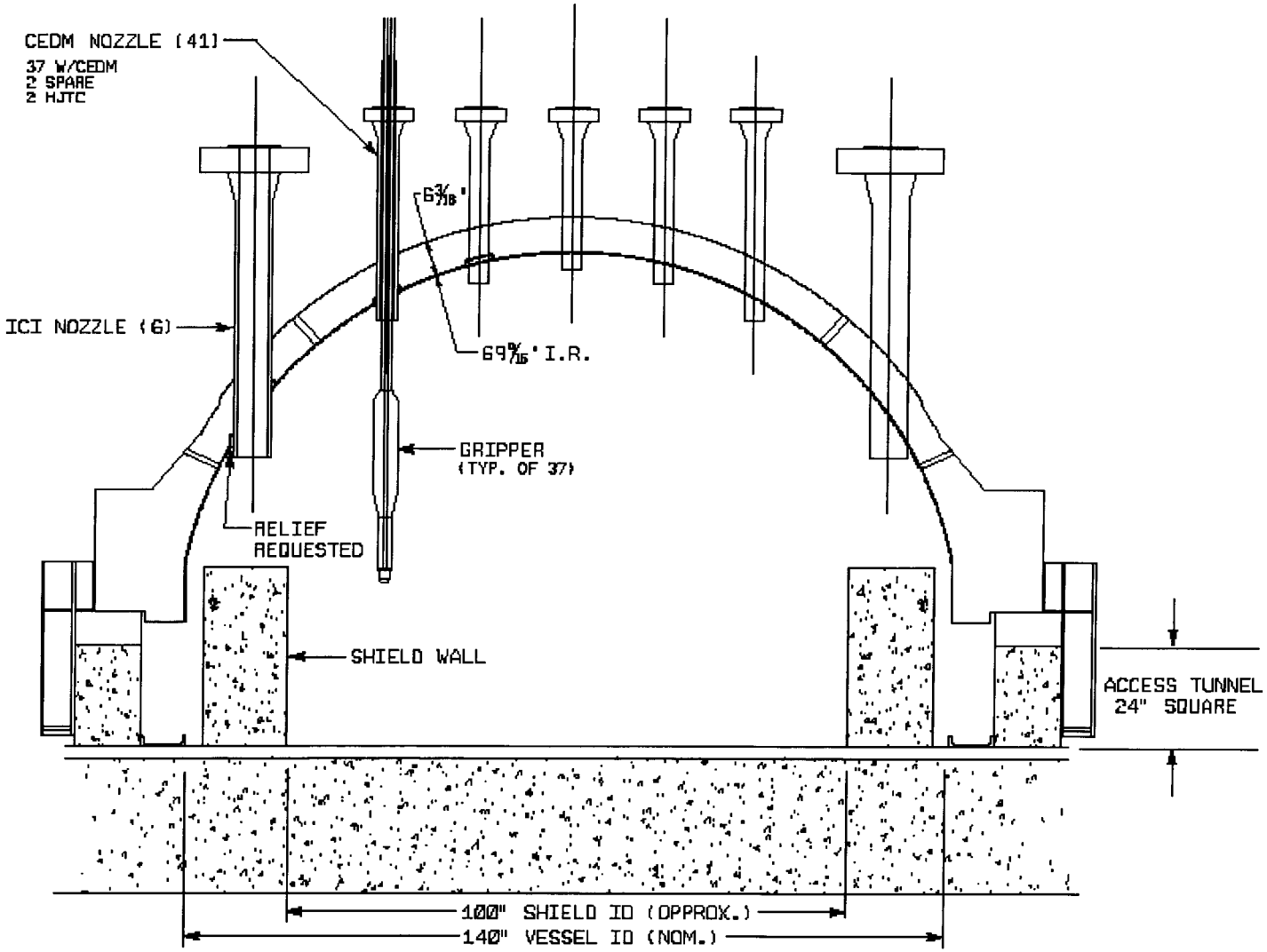
SP = SPARE
HJTC = HEATED JUNCTION THERMO-COUPLE

NOZZLES

1-41 CEDM
42-47 ICI

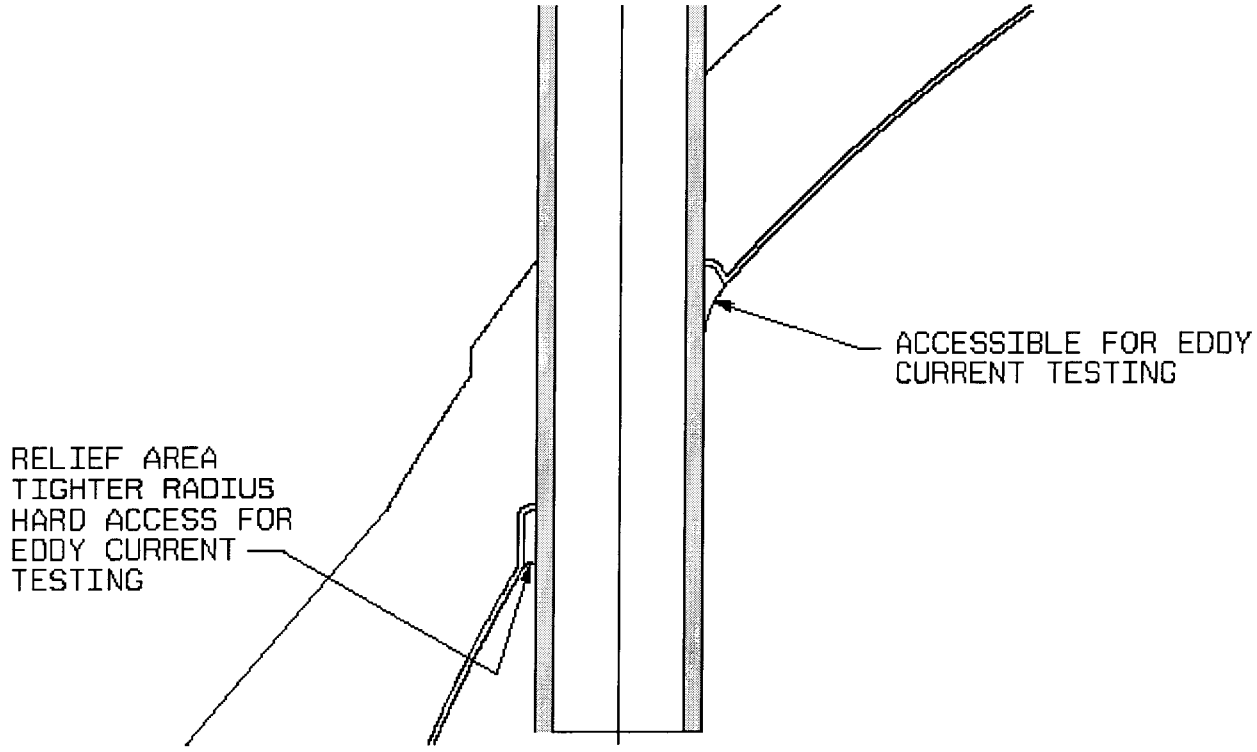
ATTACHMENT 1, FIGURE 2

FCS REACTOR HEAD RVH SECTIONAL VIEW

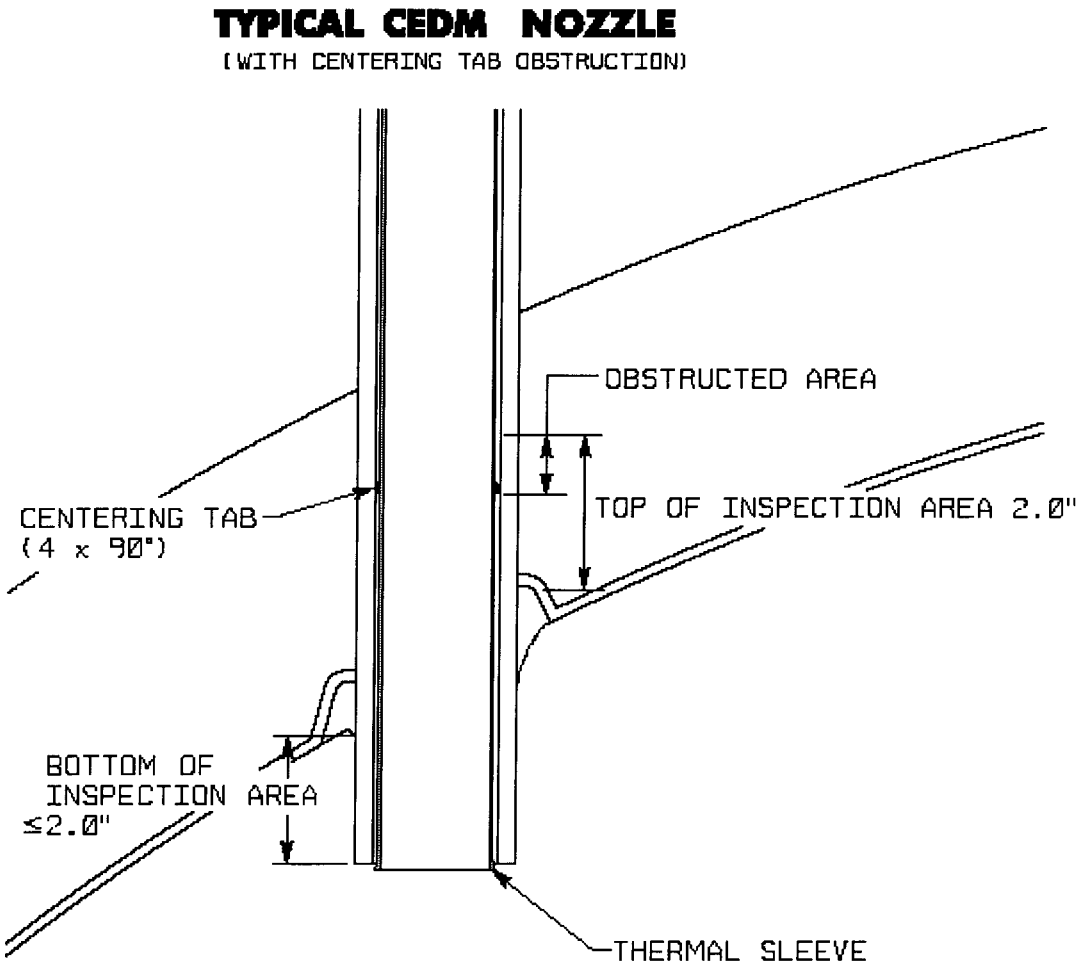


ATTACHMENT 1, FIGURE 3
FCS REACTOR HEAD NOZZLE

TYPICAL ICI NOZZLE



ATTACHMENT 1, FIGURE 4
FCS REACTOR HEAD NOZZLE



ATTACHMENT 1, FIGURE 5
FCS REACTOR HEAD NOZZLE

THERMAL SLEEVE ASSEMBLY