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SUBJECT: Responds to GL-94-03,re Intergranular Stress Corrosion Cracking of Core Shrouds.

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August 24, 1994
G02-94-202

Docket No. 50-397

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: **WNP-2, OPERATING LICENSE NPF-21
RESPONSE TO GENERIC LETTER 94-03, "INTERGRANULAR STRESS CORROSION CRACKING OF CORE SHROUDS"**

References: 1. Letter, W. A. Zarbis (GE) to BWR Owners' Group Executives and Primary Representatives, "NRC Generic Communication on Shroud Cracks", OG94-569-01, dated July 25, 1994.

2. Letter, R. A. Pinelli (BWROG) to D. S. Brinkman (NRC), "Response to NRC Request for Shroud Information", BWROG-94089, dated July 13, 1994.

This submittal provides the Supply System's response to the referenced request for information in response to Generic Letter 94-03, "Intergranular Stress Corrosion Cracking of Core Shrouds", Reference 1. The letter provides the information required by the NRC relative to recent core shroud examinations, planned future inspections and safety analyses supporting continued operation of the plant until more inspections are completed.

The following is provided in response to the Reporting Requirements defined in the subject Generic Letter:

1a - A schedule for inspection of the core shroud.

WNP-2 Response

Attachment 1 to this letter describes the decision-making process leading up to the volumetric examinations that WNP-2 completed in late May 1994 on selected core shroud welds. No linear indications or cracking were observed. Inspection reports are provided in Attachment 2. A followup examination of accessible circumferential stainless steel core shroud welds will be performed during the Spring 1996 (R-11) refuel outage, well before the 9.5 full power year threshold for potential crack initiation (as discussed in GENE-523-A107P-0794, attached to Reference 2).

A001

1b - A safety analysis, including a plant-specific safety assessment, as appropriate, supporting continued operation of the facility until inspections are conducted.

WNP-2 Response

WNP-2 is categorized (per Reference 2) among 13 other BWRs which are deemed least likely to develop cracking because of plant water chemistry history and the use of Type 304L material in the shroud. Crack initiation is not anticipated to occur before 9.5 full power years of operation; WNP-2 is over three effective full power years away from that threshold. Under these circumstances, the safety assessment contained in Attachment 1 is considered appropriate at this time.

1c - A drawing or drawings of the core shroud configuration showing details of the core shroud geometry (e.g., support configurations for the lower core support plate and the top guide, weld locations and configurations).

WNP-2 Response

Attachment 3 to this letter contains the requested WNP-2 shroud drawings. Other details regarding fabrication and material are described within Attachment 1. The WNP-2 shroud weld numbers are diagrammed in Attachment 3 and are different than those shown in the Generic Letter. The Generic Letter designations will be used in these discussions to reduce confusion.

1d - A history of shroud inspections for the plant should be provided addressing date, scope, methods and results, if applicable.

WNP-2 Response

WNP-2 completed its first core shroud examinations in late May 1994. The examinations were performed by qualified GE technicians using their "OD tracker" tool. The scope, defined with assistance from GE, included a minimum of four areas on the critical H3 (CF) and H4 (DB) welds. In actuality, 19 feet (about 35% of the circumference) of the H3 and 10 feet (about 18% of the circumference) of the H4 welds were examined. No evidence of surface or volumetric cracking of the welds or adjacent heat-affected-zone/base material was detected. See Attachment 2, examination summary sheets for WNP-2's H3 and H4 core shroud welds.

RESPONSE TO GENERIC LETTER 94-03

2 - No later than three months prior to performing the core shroud inspections, contact WNP-2's NRC project manager.

WNP-2 Response

Response 1a above commits WNP-2 to performance of followup core shroud examinations in Spring 1996 (R-11) refuel outage. At least three months prior to that inspection, WNP-2 will inform NRC of the full scope and detailed plans for the shroud examinations. The submittal will also include plans for evaluation and possible repair options, should cracking be detected. The results of those followup examinations will be provided to the NRC within 30 days of completion of the work, in accordance with provision No. 3 of the Generic Letter.

With the completion of this submittal and its identified commitments, the Supply System considers that programmatic actions required by Generic Letter 94-03 are complete.

Sincerely,

JW Baker for

J. V. Parrish (Mail Drop 1023)
Assistance Managing Director, Operations

/jms
Attachments

cc: LJ Callan - NRC RIV
KE Perkins - NRC RIV, Walnut Creek Field Office
NS Reynolds - Winston & Strawn
JW Clifford - NRC
DL Williams - BPA/399
NRC Site Inspector - 927N

ATTACHMENT 1

CONSIDERATION OF BWR SHROUD CRACKING ISSUES AT WNP-2

Introduction

This report provides a summary of the historical actions taken by the Supply System to address industry concerns with IGSCC of BWR core shrouds. As the summary demonstrates, the Supply System's understanding of this phenomenon has increased over time. In response, the Supply System has taken proactive steps to determine the potential impacts on its WNP-2 facility.

In addition, the report provides the Supply System's safety assessment supporting continued operation.

History

The Supply System has been keenly aware of the latest core shroud issue and has maintained a chronological listing of reports, letters and memos issued by the NRC, the BWR Owner's Group, General Electric, and by the Supply System staff on the subject of BWR core shroud cracking. These reflect the knowledge that the Supply System had of the issue and resulting actions taken by the Supply System for WNP-2 since GE RICSIL No. 054, Revision 1 was issued on July 21, 1993.

The sensitivity toward the issue rose rapidly in the September/October 1993 time frame. At that time, the severity of core shroud cracking at Brunswick became widely recognized. The Supply System convened a meeting on October 11, 1993 to compile information gathered externally and internally. At that time, it was evident that the WNP-2 core shroud was different than the Brunswick shroud in the following ways:

- Material - WNP-2's shroud was fabricated from Type 304L stainless steel with carbon content ranging between 0.010 and 0.024% (see Exhibit 1). Brunswick's shroud was fabricated from Type 304 stainless steel with a carbon content of 0.06% in the plate near the 360 degree crack.

- Fabrication - WNP-2's shroud was shop fabricated by CBIN using a joint design and welding technique that led to much lower residual stresses than those in the Brunswick shroud. The Brunswick shroud was supplied by Sun Shipbuilding and was subjected to heat treating and jacking processes that promoted sensitization and increased localized residual stresses.

- Water Chemistry - WNP-2, being a newer BWR, had benefitted from the lessons learned at older BWRs where significant intergranular stress corrosion cracking (IGSCC) occurred in primary coolant piping. The IGSCC was heavily influenced by relatively poor water chemistry control; WNP-2 recognized this important parameter during its startup in 1983. Since startup, WNP-2 has maintained good water chemistry control. Subsequent large bore piping inspections throughout the first ten-year interval have found no evidence of IGSCC. At numerous other BWRs, significant pipe cracking preceded core internals cracking.

On October 11, 1993, the Supply System determined, as a proactive measure, that some form of shroud examination was necessary during its ninth refueling outage (Spring 1994). At this time, an enhanced visual inspection of a small percentage of the most susceptible welds was considered the appropriate response to the Brunswick findings.

In January 1994, the Supply System selected WNP-2's H3 and H4 as the core shroud welds with the greatest potential for possible end-grain effects and fluence. The H3 weld is associated with the upper ring which is formed from plate segments, thus including an area where end-grain effects might initiate cracking. The second weld, H4, is between two shell sections and located near the peak fluence area.

On February 10, 1994, Supply System NDE personnel visited GE to witness both the video and ultrasonic examination systems being offered for core shroud examinations. The Supply System had been considering ultrasonic rather than visual examination methods since the previous December. During the next few months, less than satisfactory experiences elsewhere with visual methods caused WNP-2 to decide that an ultrasonic examination would be used at WNP-2. This decision was consistent with NRC's position expressed in the May 12, 1994 BWROG letter to BWR Owners' Group Executives. To prepare for this type of examination, a Supply System Senior NDE Specialist visited the Hatch plant to observe the use of GE's automated ultrasonic scanner ("OD tracker"). Subsequently, the Supply System arranged for GE to perform ultrasonic examination of the WNP-2 shroud during R-9. The inspection occurred near the end of May, which allowed the use of GE personnel who had gained experience through examinations performed at the Brunswick, Hatch and Dresden plants.

Prior to the inspection, internal discussions at the Supply System centered around the adequacy of the planned scope, particularly in light of the extent of cracking detected at other plants. The Supply System asked GE for advice on this matter. GE responded by letter dated May 25, 1994, that a reduced scope of inspection was appropriate for WNP-2 because of its age, water chemistry history and shroud material. GE's letter specified four locations on the H3 and H4 welds. The scope of the examination completed consisted of 19 feet (about 35% of the circumference) of the H3 (CF) weld and 10 feet (about 18% of the circumference) of the H4 (DB) weld, exceeding the scope recommended by GE. No indications of cracking were detected in any of the welds and associated base metal.

Factors Specific to WNP-2

This section addresses certain conditions that may influence the probability of cracking and rate of crack growth in WNP-2's core shroud. The most influencing conditions are discussed below:

- Shroud Material - Certified vendor information (CVI) files contained information showing that the WNP-2 core shroud assembly was fabricated from Type 304L stainless steel plate, SA-240 using Type 308L weld metal. Actual carbon contents of the plates ranged from 0.010 to 0.024% - well below the 0.030% maximum permitted. Exhibit 1 lists the carbon content versus piece mark identification. The certified material test reports (CMTRs) also showed (in Exhibit 1) very low sulfur and phosphorous levels, indicative of "clean" steel (maximum sulfur is 0.030% with a 0.045% maximum for phosphorous). This is important from an inclusion standpoint; clean steel means few, if any, inclusions. The presence of inclusions in some of the Brunswick formed and welded plate rings provided initiation sites for their IGSCC. Also of importance are CMTR records showing that all plates were solution annealed and water quenched. Proper solution annealing dissolves all chromium carbides and water quenching ensures that they remain in solid solution.

- Fabrication Details - The WNP-2 core shroud was fabricated by Chicago Bridge and Iron-Nuclear (CBIN) at their Memphis facility. The core shroud was installed in the reactor vessel in the shop, and the entire assembly was then shipped to the site.

  CBIN used welded plate rings in the core shroud assembly. Details of this subassembly fabrication are shown in Exhibit 2 and in Attachment 3. The dotted lines indicate final dimensions after machining. These rings were joined to shell sections using double bevel weld designs (see Exhibit 3). This design (compared to Brunswick's single bevel) reduces the residual stress in the surface of the ring segment. Even though the WNP-2 shell sections are one-half inch thicker than Brunswick's, the resulting joint area is smaller for WNP-2's core shroud welds. Again this is favorable from a residual stress standpoint.

  Fabrication records were searched for non-conformances, weld repairs and base metal repairs and none were found. The inspections performed during fabrication were surface penetrant examinations; no volumetric examinations were performed either then or later for pre-inservice inspection (ISI) baseline purposes. The reactor pressure vessel was designed and fabricated to the Summer 1971 Addenda of the ASME Code, Section III, Class 1. The ASME Code excluded the core shroud and supports at that time and, therefore, there were no provisions for volumetric examinations of these structures.

- Plant Operating Parameters - At the start of WNP-2's ninth refuel outage in April 1994, the plant had accumulated 5.8 effective full power years of operation. Estimated peak fluence for the core shroud over this operating period is 2.38 E20 n/cm^2. This fluence value is based on flux values contained in Nuclear Engineering Calculation NE-02-82-12,

dated August 4, 1982. During the first five years of operation, water chemistry in terms of reactor water conductivity averaged 0.242 microsiemens per centimeter. Yearly averages of reactor water conductivity are:

Cycle	Cond. μS/cm
1	.344
2	.237
3	.241
4	.218
5	.170
6	.196
7	.192
8	.154
9	.162

The Supply System has been committed to the BWR Water Chemistry Guidelines since their inception. These guidelines and other proactive efforts have enabled the Supply System to maintain a high level of water quality.

The BWROG, with assistance from GE, responded to the NRC's request for shroud information via their letter dated July 13, 1994. That correspondence which the Supply System supported (with some corrections provided to the BWROG Chairman on July 25, 1994) places WNP-2 in the most favorable (or least susceptible) of seven possible categories with respect to potential cracking. WNP-2 is listed among 13 other plants with 304L shrouds and low conductivity. This, coupled with the favorable material cleanliness and low stress methods of fabrication used in WNP-2's core shroud, further supports the BWROG conclusion that 360 degree cracking "is therefore very unlikely in other plants on line for less than 9.5 years." Even if cracking was to initiate over the next few months, crack propagation rates with WNP-2's low stresses and water quality would be very low.

The Supply System has inspected portions of its most susceptible welds and found them free of cracking. Because of this examination and the conclusions discussed above, the Supply System believes that it is acceptable to wait until R-11 (Spring 1996) before attempting a complete volumetric examination of accessible stainless steel circumferential welds in its core shroud. Experience gained during R-9 suggests that further inspection equipment developments will be required by GE before some lower welds can be fully examined. Since, R-11 is only two years away, full inspection would still occur well before the 9.5 year limit discussed in GENE-523-A107P-0794 and before the 8 year mark discussed in Generic Letter 94-03. The two year delay presents no significant safety concerns and will likely allow for the development of new equipment which can provide better coverage of WNP-2's shroud welds. In addition, the delay will allow the Supply System to benefit from experiences gained at some of the older lead plants.

<u>Basis for Continued Operation</u>

The BWROG report (Reference 2) in Section 5.1 concludes the following for plants such as WNP-2:

> "The plants in this grouping are newer plants and have had low average conductivity throughout plant operation. All of these plants have eight or less on-line years of operation, which is below the threshold for cracking shown in the inspection results. This is supported by the inspections done to date on plants in this grouping, which have found no circumferential cracking. Therefore, near-term extensive 360 degree cracking is very highly unlikely."

In Appendix A of the same BWROG report, a shroud cracking safety assessment is provided for a situation in which there is 360 degree through wall cracking combined with a number of normal, transient and faulted conditions. The report draws generic conclusions for each normal and accident event pertinent to WNP-2's BWR-5 product vintage. On a plant specific basis, GE's generic safety analyses fully identify and encompass the critical operating and accident scenarios which are deemed relevant to WNP-2. In particular, the full double-ended main steam or recirculation line break, concurrent with complete failure of selected shroud welds, are indeed the limiting accident condition assumptions for WNP-2. The generic safety analyses for these extreme accident cases demonstrate WNP-2's ability to safely achieve reactor shut down and, therefore, resolve the GL request for plant specific safety assessments.

Although the cited BWROG safety analyses are deemed fully encompassing, the impact of WNP-2's currently proposed reactor power uprate on the results of the generic safety assessment requires clarification. Per Reference A[1] the Supply System has submitted to the NRC a proposed operating licensing amendment which would permit operation at 3486 MWt versus the current core thermal power limit of 3323 MWt. If approved by the NRC, the WNP-2 power uprate may be implemented during the R-10 outage with operation at elevated power occurring over the approximate ten month period leading to the R-11 outage. As previously noted, R-11 is the proposed outage at which all shroud weld volumetric inspections will be completed.

Reference A provides to the NRC comprehensive safety analyses which fully detail the operational and safety impacts associated with the proposed WNP-2 power uprate. In general, these operational changes are relatively benign. In particular, reactor dome pressure increases approximately 15 psig, exit saturated steam temperature increases by approximately 2 °F, feedwater temperature increases 1°F, while core maximum rated flow remains unchanged (see Table 1-2, Reference A). Correspondingly, differential pressures acting on the reactor internal structures (under both normal and accident conditions) increase, and flux (or neutron fluence)

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[1]Reference A - Letter from J. V. Parrish to the NRC, "WNP-2 Operating License NPF-21 Request for Amendment to the Facility Operating License and Technical Specifications to Increase Licensed Power Level from 3323 MWt to 3486 MWt With Extended Load Line Limit and a Change in Safety Relief Valve Setpoint Tolerance," G02-93-180, dated July 9, 1993.

increases. These latter operating parameter changes are potentially germane to the phenomena of shroud irradiation assisted stress corrosion cracking (IASCC) or IGSCC and the conclusions of the BWROG report/safety analyses.

The reactor internal component loading is determined by load combinations that include reactor internal pressure difference (RIPD), all containment dynamic SRV and LOCA loads, seismic and fuel lift loads. As stated by Reference A there are no increases in the containment dynamic and seismic loads due to power uprate. The fuel lift loads potentially affected by power uprate are fuel bundle and control rod guide tube lift forces. However, because of improvements in the analytical models, fuel lift loads were demonstrated by GE (Section 3.3.2, Reference A) to be less than those specified in WNP-2's original design basis.

Although containment dynamic, seismic and fuel lift loads are shown by the power uprate analyses to be bounded by the original WNP-2 design basis loads, it cannot be stated that RIPD loads are similarly bounded. Clearly an increase in core average thermal power will result in a higher core exit steam quality, and thus it would be expected that RIPDs, under normal operation, would increase. However, due to advances in the thermal hydraulic characteristics of current fuel designs the RIPDs can, in some cases, be decreased relative to the original analyses, or at least kept to marginal increases.

Table 3-1 of Reference A shows that RIPDs at WNP-2 power uprate conditions are decreased over the core plate and portions of the upper shroud head. However, RIPD load increases are reported over most of the lower shroud extending up to the shroud head area. The maximum differential pressure change (i.e., increased RIPD), as reported by the cited table, is approximately 3.5%. Recall from the BWROG report that shroud design stress levels are generally well below design allowable limits, and consistently, GE reports in Reference A (page 3-5) that the increased RIPDs acting on WNP-2's shroud structure do not result in exceeding the prescribed design allowable limits.

As noted, there is a potential that WNP-2 may operate for an approximate ten month period at uprated conditions prior to inspection of all its core shroud welds during R-11. Since the uprated operating conditions induce slightly increased nominal shroud stress levels, it might be proposed that the IGSCC response would accelerate. However, irrespective of possible uprated core power conditions, IGSCC responses measurably different from those reported by GE in the BWROG report are not expected. This conclusion is based on the fact that a primary mechanism promoting IGSCC is the weld residual stress state. Small changes in the nominal, or design, gross section stresses cannot perturb (ratchet or shakedown) the weld residual stress profile. The weld residual stress levels are large, approaching material yield strength at various points within the weld section. Thus, a superposition of lower nominal section stresses might "shift" the stress profile slightly, but the generally high stress magnitudes will not be changed and consequently observation of IGSCC responses will remain unchanged.

A GE analysis of the recirculation line break (LOCA) for power uprate conditions concurrent with final feedwater temperature reduction determined that acoustic and flow induced loads on reactor internals would increase. However, through analysis refinement, GE was able to demonstrate that the original WNP-2 shroud design basis faulted RIPD loads still bound the increased loads encountered under power uprate conditions. Table 3-3 of Reference A summarizes the new shroud RIPDs (faulted event) and shows that the original design basis loads are bounding over the entire shroud structure. Thus, the cited BWROG safety analyses regarding the double-ended recirculation line break are not affected by possible WNP-2 plant operational modifications for the purpose of power uprate.

Fluence changes resulting from power uprate are approximately linear. Thus, for a core thermal power increase of 5%, a fluence increase of the same relative amount would be expected. However, for purposes of power uprate and conservatism with respect to 10CFR50 Appendix G requirements for RPV fracture toughness evaluation, GE assumes that fluence is increased by 9.2% (page 3-2, Reference A). As stated previously, WNP-2 has accrued 5.8 effective full power years of operation resulting in an estimated total peak fluence of 2.38 E20 n/cm^2. Assuming full power operation to R-10 and full power operation at uprated conditions from R-10 to R-11, WNP-2 will then have achieved a total peak fluence of 3.24 E20 n/cm^2.

Per the BWROG report, GE sets a threshold fluence range for IASCC of 3 to 5 E20 n/cm^2. However, as stated by the BWROG report (bottom of page 6) "...inspection results do not indicate that fluence is a primary contributor to extensive cracking, so it was not selected for susceptibility grouping." Whether WNP-2 implements power uprate post R-10, or defers such action, the fact remains that total peak fluence will reside at the lower threshold for IASCC. However, as deemed by GE, this environmental parameter is only of secondary importance to crack propagation. Clearly, factors of water chemistry, material selection and fabrication technique (or design and induced residual stresses) are the primary contributors to the initiation and propagation of stress corrosion cracks.

A perspective on the margin of safety with respect to IASCC crack propagation may be gained from examination of Figure 3-3 of the BWROG report (see page 21). This figure plots, for weld H3, crack propagation depth versus operating time. Observe that the SCC responses are plotted for various levels of conductivity. Now, for purposes of hypothetical evaluation, assume that WNP-2's historically good water chemistry is maintained, and further presume that crack propagation initiates at weld H4 post R-9. Under these assumptions crack propagation, by R-11, per Figure 3-3, would have progressed 0.4 inches (maximum) into WNP-2's two-inch thick shroud. Since irradiation effects are deemed by GE as "secondary", it is judged grossly conservative to assume that the crack depth is increased by 100% beyond the Figure 3-3 results which portray only IGSCC responses. In sum, the hypothetical crack is seen to have progressed to about 40% of the nominal WNP-2 shroud thickness. This value is still only one half of the 80% (full 360°) flaw depth that GE states (see BWROG report) as the maximum tolerable depth prior to loss of the shroud's full accident condition structural load capability.

Finally recall that WNP-2 has already completed volumetric inspection of the peak fluence weld (i.e., H4 near core mid-plane, during R-9), with no indications of cracking. It, therefore, follows, from the BWROG recommendations of an alternate outage inspection program, that the next WNP-2 scheduled inspection should occur at R-11.

In sum, WNP-2 power uprate may induce, by R-11, small changes in accumulated fluence, but these increased exposures induce threshold (lower bound) IASCC integrated fluences at only one shroud weld. The effect is of secondary importance to crack propagation and, therefore, does not obviate, from a plant specific view, the results and conclusions of the generic GE safety analyses. Furthermore, the limiting accident condition assumed by GE postulates, on an essentially non-mechanistic basis, that shroud cracking is 100% through wall over the full shroud circumference. Clearly, this conservative safety analysis space bounds WNP-2 on a plant specific basis.

WNP-2 CORE SHROUD BASE MATERIAL SUMMARY

SECTION	MARK NO.	HEAT NO.	THICKNESS	CARBON (%)	PHOSPHORUS (%)	SULFUR (%)
A-A	10-1-1	636162-2	4.75"	0.019	0.020	0.014
A-A	10-1-2	636162-2	4.75"	0.019	0.020	0.014
A-A	10-1-3	636162-2	4.75"	0.019	0.020	0.014
A-A	8-2	7135-1B	0.25"	0.010	0.023	0.014
B-B	10-2-1	636174-1	2.00"	0.024	0.020	0.010
B-B	10-2-2	636174-1	2.00"	0.024	0.020	0.010
B-B(1)	10-3-1	636162-1A	3.00"	0.019	0.020	0.014
C-C	10-4-1	636166-1	2.00"	0.018	0.018	0.018
C-C	10-4-2	636166-1	2.00"	0.018	0.018	0.010
D-D	11-6-1	636170-1	2.00"	0.020	0.019	0.019
D-D	11-6-2	636174-1A	2.00"	0.024	0.020	0.010
E-E	11-2-1/6	636162-1	4.75"	0.019	0.020	0.014
E-E	11-3-1	636166-1A	2.00"	0.018	0.018	0.010
E-E	11-3-2	636166-1A	2.00"	0.018	0.018	0.010
F-F	11-1-1	636174-2A	2.00"	0.024	0.020	0.010
F-F	11-1-2	636178-2A	2.00"	0.023	0.018	0.024
LUGS	10-5-1 to -32	636162-1B	2.50"	0.019	0.020	0.014
LUGS	10-6-1 to -4	636162-1B	2.50"	0.019	0.020	0.014
LUGS	10-7-1 to -8	636162-1B	2.50"	0.019	0.020	0.014
				AV=0.020	AV=0.020	AV=0.014

NOTE 1: Section B-B Mark 10-3-1 is the core support ring.

NOTE 2: All heats were solution annealed and water quenched.

FABRICATION OF WNP-2 CORE SHROUD TOP GUIDE SUPPORT RING

BASE MATERIAL SA 240 304 L   2.5 INCHES THICK

1. CUT (6) SECTIONS TO MAKE ARCS
2. BEVEL ENDS OF ARC SECTIONS
3. MAKE (6) SAW SEAM WELDS
4. MACHINE RING TO DESIRED I.D./O.D. AND THICKNESS

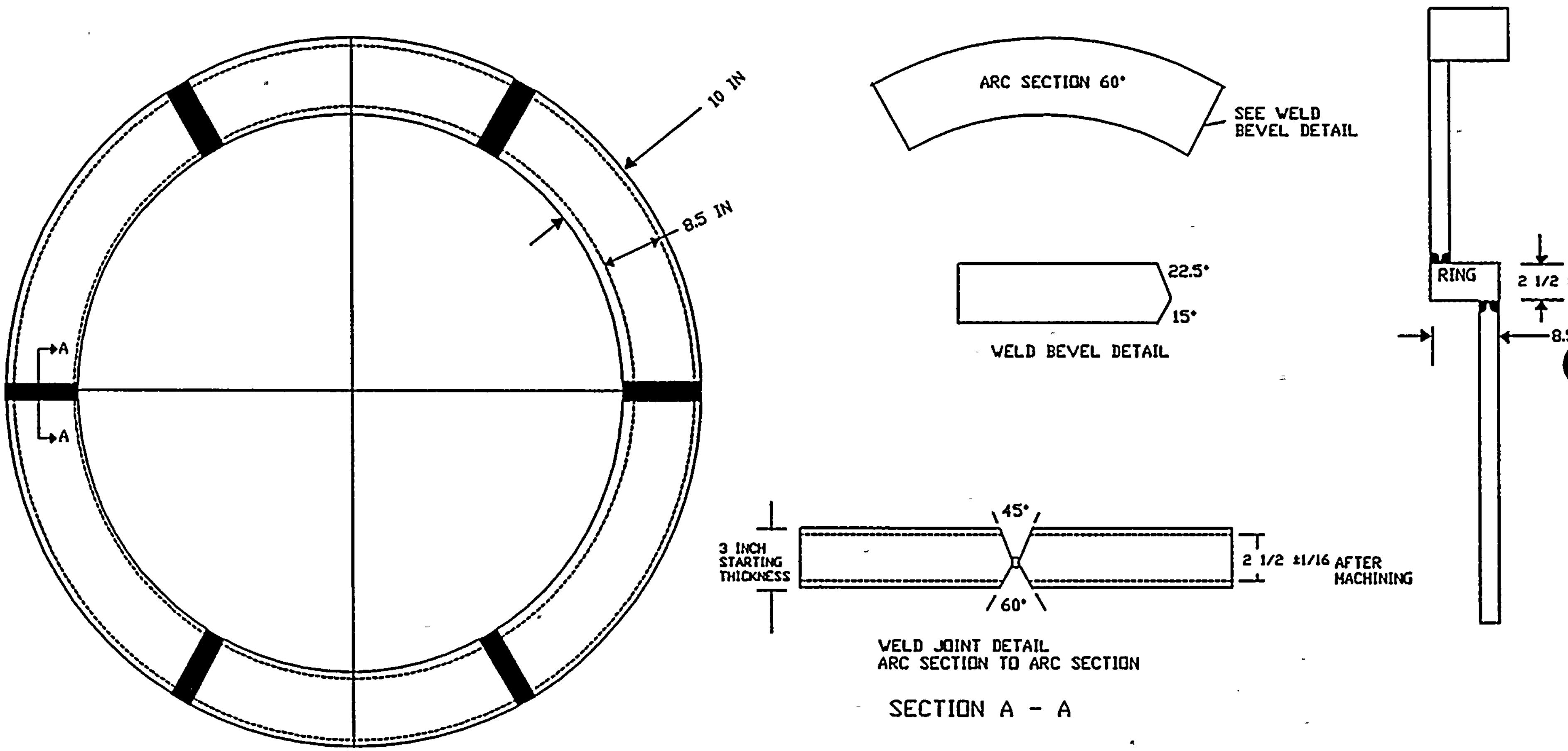
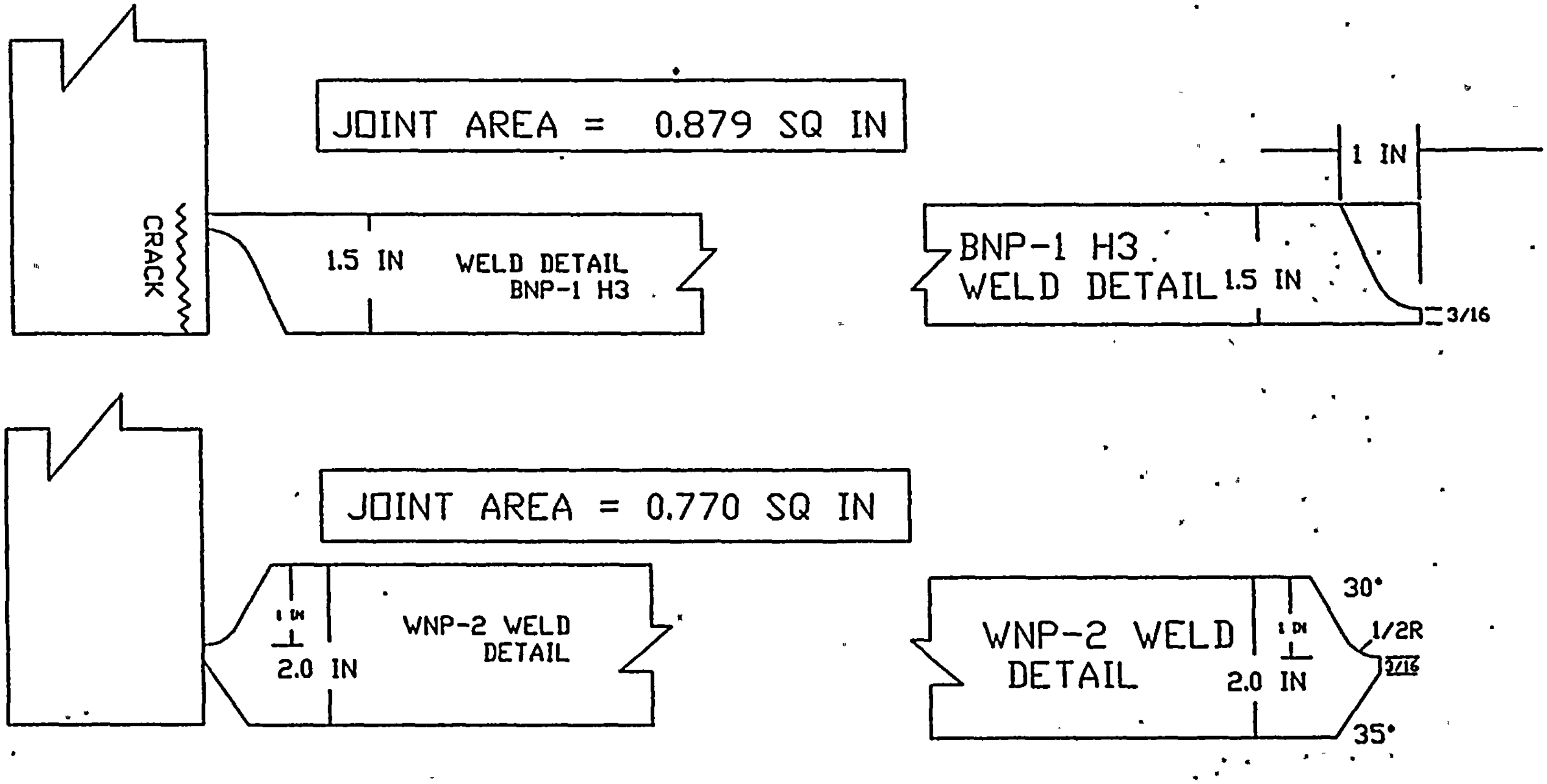


EXHIBIT 2

WELD BEVEL DETAIL COMPARISON
BRUNSWICK UNIT 1 VS WNP-2



1. WNP-2 SHELL SECTION THICKER (2 IN vs 1.5 IN)
2. WNP-2 WELD GROOVE AREA SMALLER
3. WNP-2 JOINT BALANCED (DUAL BEVEL vs SINGLE BEVEL)

EXHIBIT 3

ATTACHMENT 2

EXAMINATION SUMMARY SHEETS

FOR

WNP-2'S H3 AND H4

CORE SHROUD WELDS

GE Nuclear Energy

EXAMINATION SUMMARY SHEET

REPORT NO.: R-R9-053

PROJECT: WNP2 RFO9 1D7KJ

PROCEDURE: UT-WNP2-503V1 REV: 0 FRR: N/A, N/A, N/A

N/A REV: N/A FRR: N/A, N/A, N/A

N/A REV: N/A FRR: N/A, N/A, N/A

SYSTEM: SHROUD

WELD NO.: H-3 (GIRTH WELD)

CONFIGURATION: CIRCUMFERENTIAL WELD SCAN

EXAMINER: PAUL ANDERSON LEVEL: II

EXAMINER: ED SWITZER LEVEL: II

EXAMINER: JOE LOYD LEVEL: II

☐ MT ☐ PT ■ UT ☐ VT

WELD TYPE: ■ CIRCUMFERENTIAL ☐ LONGITUDINAL ■ OTHER SHROUD

DATA SHEET NO.(S): DS-R9-001 & 002

CAL SHEET NO.(S): CS-R9-001 & 002

During the ultrasonic examination of the above referenced weld, no indications associated with IGSCC or IASCC were recorded by the "Smart 2000" utilizing 45° shear wave and 60° refracted longitudinal wave search units.

The 45° shear wave did record non-relevant indications, inside surface geometry, inside surface weld crown geometry, and welding discontinuities from the lower side of the weld.

The 60° RL recorded non-relevant indications, shear component, and welding discontinuities from the lower side of the weld.

No examination was performed from the upper side of the weld due to the component configuration.

This examination encompassed a segment of the weld between the azimuths of 189° to 312° clockwise from vessel "0".

Circumferential "L" dimensions for all examination scans were recorded in angular units in lieu of linear units. The conversion factor for circumferential measurements is 1.81" per degree.

☐ EXAM COMPLETE ■ PARTIALLY EXAMINED (EXPLAIN IN COMMENTS) ☐ EXAM COMPLETE IN COMBINATION WITH DATA SHEETS BELOW

ADDITIONAL DATA SHEETS: N/A

COMPARED TO: ☐ PSI ☐ ISI REPORT NO.(S): N/A ☐ NO CHANGE

EXAMINATION RESULTS: ☐ ACCEPTABLE ☐ UNACCEPTABLE

NO. OF RECORDABLE INDICATIONS: 0

NO. OF REPORTABLE INDICATIONS: 0

RWP NO.: 135

TOTAL DOSE: .040 MAN REM

Paul Anderson	II	5-29-94	[signature]	5-31-94
SUMMARY BY	LEVEL	DATE	UTILITY REVIEW	DATE
Wes Money	III	5-31-94	N/A	N/A
GE REVIEWED BY	LEVEL	DATE	ANII REVIEW	DATE

FORM UT-08 REV. 5

GE Nuclear Energy

EXAMINATION SUMMARY SHEET

REPORT NO.: R-R9-059

PROJECT: WNP2 RFO9 1D7KJ

PROCEDURE: UT-WNP2-503V1 REV: 0 FRR: N/A N/A N/A

N/A REV: N/A FRR: N/A N/A N/A

N/A REV: N/A FRR: N/A N/A N/A

SYSTEM: SHROUD

WELD NO.: H-4 (GIRTH WELD)

CONFIGURATION: CIRCUMFERENTIAL WELD SCAN

EXAMINER: PAUL ANDERSON LEVEL: II

EXAMINER: JOE LOYD LEVEL: II

EXAMINER: N/A LEVEL: N/A

☐ MT ☐ PT ■ UT ☐ VT

WELD TYPE: ■ CIRCUMFERENTIAL ☐ LONGITUDINAL ■ OTHER SHROUD

DATA SHEET NO.(S): DS-R9-003

CAL SHEET NO.(S): CS-R9-003, 004, 005, & 006

During the ultrasonic examination of the above referenced weld, no indications associated with IGSCC or IASCC were recorded by the "Smart 2000" utilizing 45° shear wave and 60° refracted longitudinal wave search units.

The 45° shear wave did record non-relevant indications, inside and outside surface weld crown geometry from both sides of the weld, along with inside surface geometry from the upper side of the weld.

The 60° RL recorded non-relevant indications and weld discontinuities from both sides of the weld, along with shear component from the upper side of the weld.

This examination encompassed a segment of the weld between the azimuths of 185° to 292° clockwise from vessel "0". Within this segment, the examination was limited to "L" dimensions of 201° to 218°, 232° to 247°, and 263° to 278° due to the proximity of the jet pump riser braces.

Circumferential "L" dimensions for all examination scans were recorded in angular units in lieu of linear units. The conversion factor for circumferential measurements is 1.81" per degree.

☐ EXAM COMPLETE ■ PARTIALLY EXAMINED (EXPLAIN IN COMMENTS) ☐ EXAM COMPLETE IN COMBINATION WITH DATA SHEETS BELOW

ADDITIONAL DATA SHEETS: N/A

COMPARED TO: ☐ PSI ☐ ISI REPORT NO.(S): N/A ☐ NO CHANGE

EXAMINATION RESULTS: ■ ACCEPTABLE ☐ UNACCEPTABLE

NO. OF RECORDABLE INDICATIONS: 0

NO. OF REPORTABLE INDICATIONS: 0

RWP NO.: 135

TOTAL DOSE .020 MAN REM

Paul Anderson (signature)	II	5-30-94	(signature)	6-1-94
SUMMARY BY	LEVEL	DATE	UTILITY REVIEW	DATE
(signature)	II	5-31-94	N/A	N/A
GE REVIEWED BY	LEVEL	DATE	ANII REVIEW	DATE

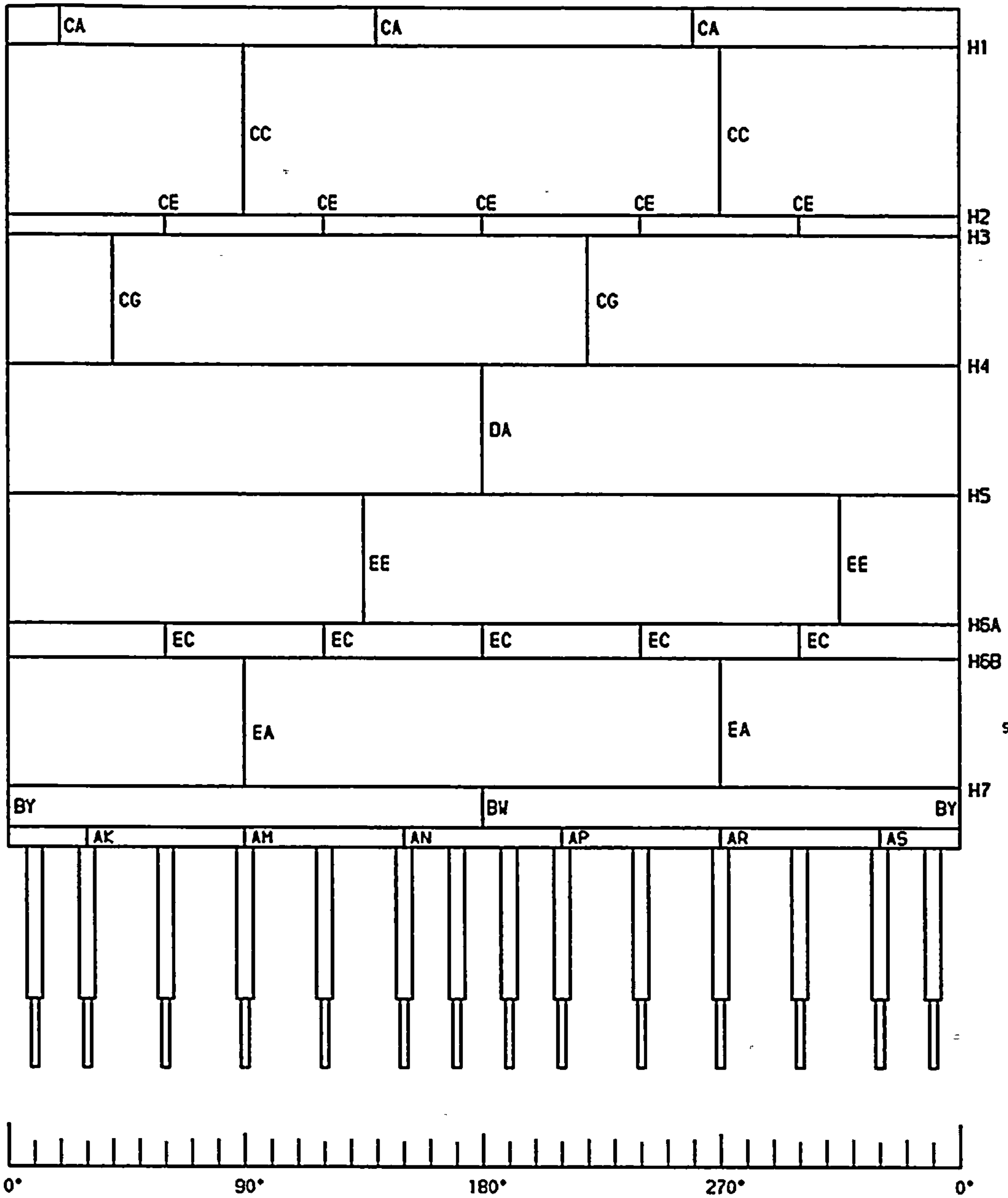
FORM UT-03 REV. 5

ATTACHMENT 3

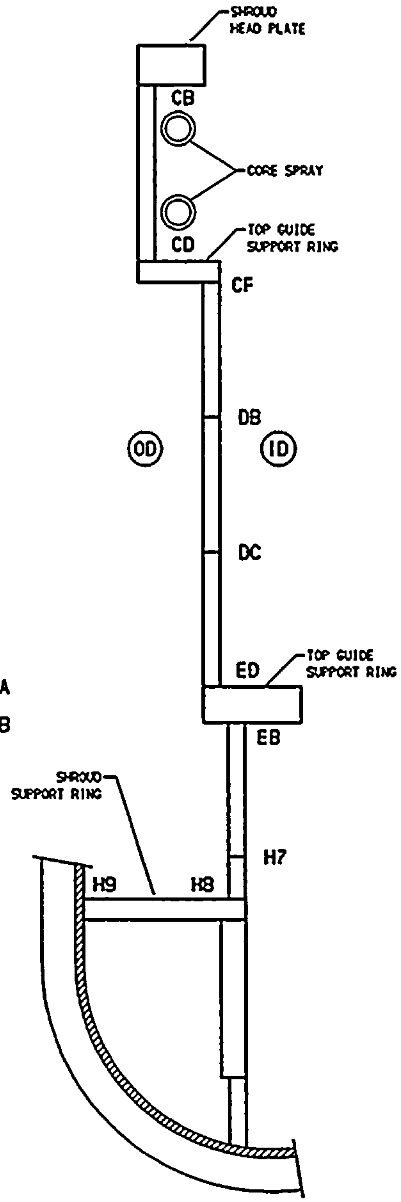
DRAWINGS OF WNP-2

CORE SHROUD WELD DETAILS

- For Information Only -



CORE SHROUD



WELD ID NUMBERS		DETAIL
CBI	NRC/BWR	SEE DWG RPV-402
CA		E
CB	H1	A
CC		H
CD	H2	B
CE		G
CF	H3	B
CG		H
DA		H
DB	H4	D
DC	H5	D
EA		H
EB	H6B	C
EC		F
ED	H6A	C
	H7	J
	H8	K
	H9	K

REFERENCES:

CBI NUCLEAR COMPANY
CVI 023-02813-10,10
CVI 023-02813-10,17
CVI 023-02813-10,18
CVI 023-02813-10,23
CVI 023-02813-06,104
CVI 023-02813-06,148

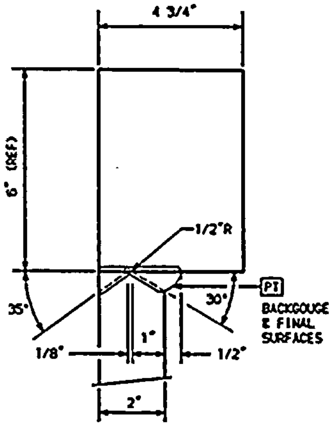
GENERAL ELECTRIC
CVI 023-02813-04,119
VPF-3527-33-8
VPF-3527-32-10

ENGR: DICK MOEN	DRAWN: K-McA	DATE: 8-11-94

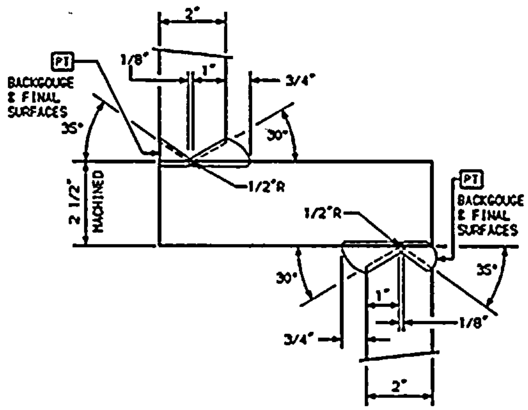
WASHINGTON PUBLIC POWER
SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

TITLE: WNP-2
RPV CORE SHROUD & ASSOCIATED WELD TABLE

DWG NO: RPV-401



DETAIL A



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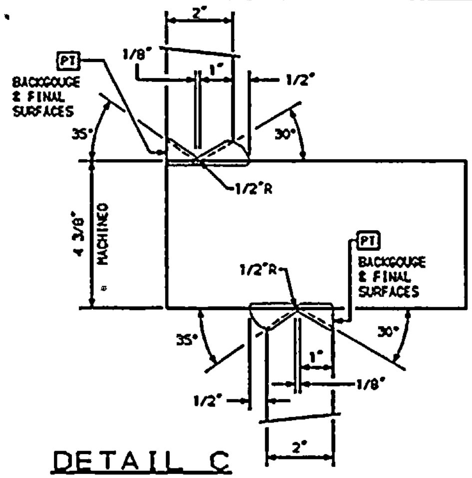
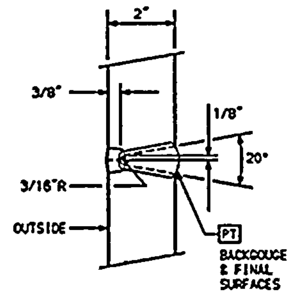
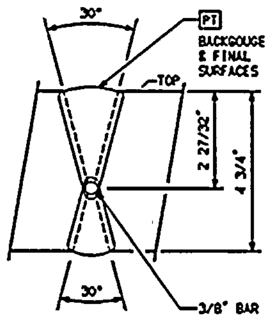


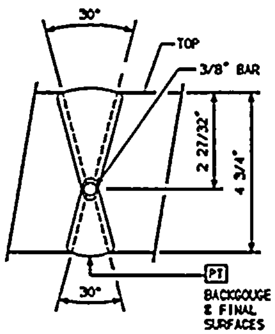
DETAIL C



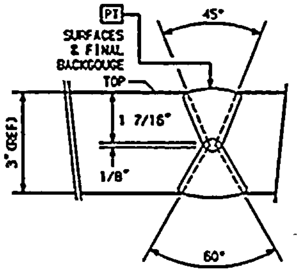
DETAIL D



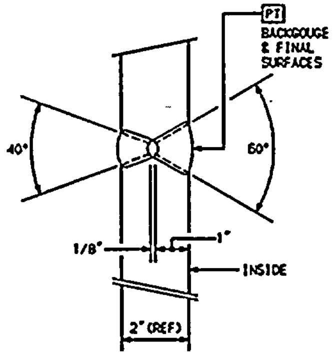
DETAIL E



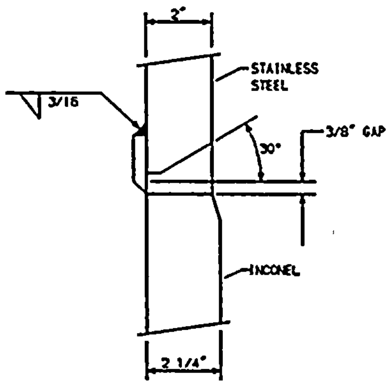
DETAIL F



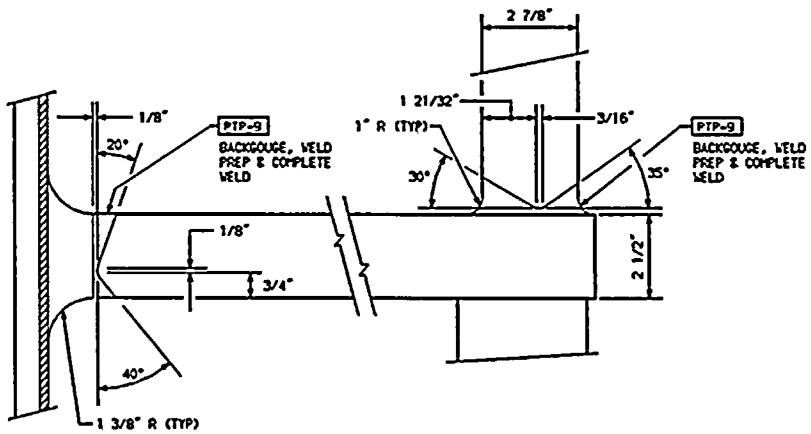
DETAIL G



DETAIL H



DETAIL J



DETAIL K

ENGR: DICK MOEN	DRAWN: K-McA	DATE: 8-11-94
WASHINGTON PUBLIC POWER SUPPLY SYSTEM RICHLAND, WASHINGTON 99352		
TITLE: WNP-2 RPV CORE SHROUD WELD DETAILS		
DWG NO: RPV-402		