VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

July 14, 2005

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

Serial No. 05-277
NLOS/GDM R0
Docket No. 50-280
License No. DPR-32

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNIT 1
ASME SECTION XI INSERVICE INSPECTION PROGRAM
PARTIAL EXAMINATION RELIEF REQUESTS
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

In a letter dated October 11, 2004 (Serial No. 04-614), Virginia Electric and Power Company (Dominion) submitted relief requests PRT-02 through PRT-06 for certain examinations conducted for Surry Unit 1 during the third inservice inspection interval. These inspections could only be partially performed due to interferences that prohibited full weld coverage being attained during the examinations.

During the course of their review, the NRC staff determined that they required additional information to complete their review. Consequently, in a letter dated April 5, 2005, the NRC requested additional information to facilitate their review of the relief requests. A conference call was held on May 26, 2005, to discuss the NRC's questions, and Dominion agreed to provide a response to the NRC's questions on the docket. Dominion's response is provided in the enclosure.

If you have any questions or require additional information, please contact Mr. Gary D. Miller at (804) 273-2771.

Very truly yours,

Leslie N. Hartz
Vice President – Nuclear Engineering

Enclosure

Commitments made by this letter: None

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Serial No. 05-277
Docket No. 50-280

Enclosure

Response to NRC Request for Additional Information

Virginia Electric and Power Company
(Dominion)
Surry Power Station Unit 1

Virginia Electric & Power Company
Surry Power Station Unit 1

Response to NRC Request for Additional Information

1. Request for Relief PRT-02, Examination Category C-C, Integral Attachments for Vessels, Piping, Pumps, and Valves

   The licensee stated, "This component support has multiple integrally attached welds as shown in the sketches on pages 3 and 4. One portion consists of two clevis type attachments that were welded to the pipe prior to the installation of two clam shell type pieces that were assembled over the attachments. The two clam shell pieces were welded together with two longitudinal welds and then attached to the pressure boundary with two circumferential welds. One hundred percent (100%) coverage of the two circumferential welds was obtained."

   a. Please confirm whether the subject component support is fabricated of carbon or austenitic steel and what surface nondestructive examination (NDE) method was applied (liquid penetrant or magnetic particle testing).

   b. Please state the plant piping system for the subject request for relief.

Dominion Response

   a. The component support is fabricated of carbon steel. The outer clam shell has two welds to the pressure-retaining boundary - one on the top circumference and one on the bottom circumference. These circumferential welds received 100% coverage using the magnetic particle testing (MT) method.

      The clevis portion has multiple areas, some accessible and some inaccessible, as shown in the "Exploded Side View". The accessible areas were examined by the liquid penetrant testing (PT) method. It was not possible to perform either PT or MT on the inaccessible areas.

   b. This component support is located on line 30"-SHP-2-601 in the Main Steam system.

2. Request for Relief PRT-03, Examination Category C-C, Integral Attachments for Vessels, Piping, Pumps, and Valves

   The licensee stated, "This component support has multiple integrally attached welds as shown in the sketches on page 3. One portion consists of two clevis type

attachments that were welded to the pipe prior to the installation of two clam shell type pieces that were assembled over the attachments. The two clam shell pieces were welded together with two longitudinal welds and then attached to the pressure boundary with two circumferential welds, thus rendering the clevis welds totally inaccessible. One hundred percent (100%) of the examination surface for the circumferential welds was obtained utilizing magnetic particle and liquid penetrant examination methods."

a. Please state the base material (carbon or austenitic steel). Describe which NDE surface technique was used for each portion of the component support and list any restrictions or limitations for that method.

b. Please state the plant piping system for the subject request for relief.

Dominion Response

a. The component support is fabricated from carbon steel. The outer clam shell has two welds to the pressure-retaining boundary - one on the top circumference and one on the bottom circumference. Unlike PRT-02, some areas of this support are obstructed by an adjacent support that limits the use of MT for the total length of the top circumferential weld. The areas on the top weld that were unobtainable by MT were evaluated using PT resulting in 100% coverage for surface examination in that area.

b. The component support is located on line 30"-SHP-3-601 in the Main Steam system.

3. Request for Relief PRT-04, Examination Category R-A, Full Penetration Piping Welds Governed by the Risk-Informed Program

The licensee stated, "Weld 1-05 is a circumferential weld joining a valve and a pipe tee. The material type and outside profile do not allow for ultrasonic examination from the outside, resulting in no coverage of the examination volume in the 2 direction. Only 14% of the examination volume could be attained in the 2 and 5 direction. For flaws oriented transverse to the welds, in the 7 and 8 scan direction, full coverage was attained. The total average percent coverage obtained was 57%." The following table was provided by the licensee.

Table 3.3 - %UT Scan Coverage at 45 degree Angle Beam

Weld	Scan Direction and Coverage				Total Average
	2	5	7	8	
1-05	14%	14%	100%	100%	57%
1-11	0%	44%	100%	100%	61%

a. Please clarify the discrepancies stated in the paragraph above with the information shown on the table for scans 2 and 5 on both Welds 1-05 and 1-11. State whether scan 2 or scan 5 is performed from the cast valve side of Weld 1-05.

b. The licensee stated for Weld 1-05, "Ultrasonic shear wave examination was attempted on the tee and valve sides of the weld, and it was apparent that the material for these components is cast stainless steel. At elevated sensitivity levels, an inner diameter roll was not visible on the valve side, and excessive noise resulted on the tee side. The weld material was examined to the maximum extent practical in the 2, 5, 7, and 8 directions. Alternative ultrasonic techniques would not produce additional meaningful data."

   The licensee also stated for Weld 1-11, "Due to material type limitations of the tee (cast stainless) and the component outer diameter contour of the reducer, the examination volume was examined to the maximum extent practicable. Alternative ultrasonic techniques would not produce additional meaningful data."

   Explain why other standard ultrasonic methods such as refracted longitudinal waves, lower frequencies, or phased array technology could not be used on the subject weld(s) to increase coverage. Many licensees have applied these techniques to austenitic welds to ensure coverage and penetration in coarse-grained materials, and procedures employing these techniques have successfully qualified under the industry's Performance Demonstration Initiative (PDI). Discuss these issues in regard to application on Welds 1-05 and 1-11, and clarify why these types of ultrasonic techniques would not substantially increase examination coverage for the subject welds.

c. Finally, discuss why the partial examinations performed on Welds 1-05 and 1-11 provide an adequate basis to conclude that the targeted degradation mechanism (thermal fatigue) would have been detected, if present, in these welds. Include a description of the coverage(s) obtained during scans 2 and 5, and why these were adequate to detect any circumferentially oriented flaws that may be present.

Dominion Response

a. The original relief request submitted contained an editorial error in the second sentence under section III of the relief, "Basis for Relief." The phrase "...resulting in no coverage of the examination volume in the 2 direction..." should be deleted. The follow-on statement, "Only 14 % of the examination volume could be attained in the 2 and 5 direction..." is correct. The corrected paragraph is as follows:

"Weld 1-05 is a circumferential weld joining a valve and a pipe tee. The material type and outside profile do not allow for ultrasonic examination of flaws oriented in the circumferential direction. Only 14% of the examination volume could be attained in the 2 and 5 direction. For flaws oriented transverse to the welds, in the 7 and 8 scan direction, full coverage was attained. The total average percent coverage obtained is 57%. (See Table 1.)"

The information in Table 1 remains correct.

For weld 1-05 the 2 direction is from the valve side towards the tee.
For weld 1-11 the 2 direction is from the tee side.

b. Other ultrasonic testing (UT) examination techniques, e.g., refracted longitudinal wave, would not make up for the loss of contact on the surface due to the outer diameter (OD) geometry from the tee side, weld material or the valve side. At the time of this examination (April 2000), Phased Array technology had not been developed to the point of being qualified for this examination. Even with current technology, Phased Array would not provide coverage of the lower 1/3 of the weld in question because of the weld profile and valve cast material. Furthermore, ASME Section XI, Appendix VIII qualification programs were not implemented until November of 2000. Even if Appendix VIII qualified personnel, procedures and equipment had been available, this weld configuration can not be examined from the tee side or on the weld itself. For examinations from the cast valve side, there are no qualified Appendix VIII, Supplement 9 personnel or procedures.

c. Since the examination coverage that was attained on welds 1-05 and 1-11 would not necessarily, by itself, detect the postulated mechanism if present, alternative means were used to determine whether the damage mechanism was present.

The postulated damage mechanism for segment ECC-002 was thermal fatigue caused by thermal cycling. The mechanism is caused by leakage past the charging system isolation valve sending colder water into the reactor coolant system. The postulated damage mechanism is potentially more prevalent in the reactor coolant system at segment RC-042 downstream of segment ECC-002. The Surry Risk-Informed Inservice Inspection (RI-ISI) Expert Panel was concerned that the check valve (1-SI-82) separating the two segments might not seat correctly causing segment ECC-002 to be subject to the postulated damage mechanism also. Quantitatively segment ECC-002 was low safety significant (LSS); however, the Expert Panel made the segment high safety significant (HSS) due to the check valve concern.

WCAP-14572 recommends the selection of an additional weld if a partial examination is obtained. In the case of weld 1-05 on segment ECC-002, the weld was classified "1(a)" or mandatory. Weld 1-08 was also selected on

segment ECC-002 as a "1(b)" or sample selection. Full volumetric coverage was attained on weld 1-08. Since only partial coverage was attained on weld 1-05, weld 1-11 was selected to supplement the 1-05 examination. Weld 1-11 is just upstream of weld 1-05 on segment ECC-002. Only slightly better coverage was attained on weld 1-11 as compared to weld 1-05.

A review of examinations for the third interval indicated that weld 1-07, which is also on segment ECC-002, had been volumetrically examined with full coverage prior to implementation of the RI-ISI program. Neither of the full volumetric coverage welds 1-07 or 1-08 indicated any problems within the segment. Additionally, surface exams were performed on the locations with no problems noted.

Segment RC-042 (downstream from ECC-002) was also examined for the postulated damage mechanism at two locations volumetrically in the third interval. As explained above, this segment is the location for which the postulated damage mechanism is potentially more prevalent. Volumetric coverage requirements were met at each location with no problems identified.

It was concluded from all the examinations performed that the postulated damage mechanism was not present. As such, no further examinations were deemed required, and a partial relief request was submitted for welds 1-05 and 1-11.

Subsequently, the RI-ISI Expert Panel determined that the check valve concern for segment ECC-002 no longer existed due to actions that were taken to ensure positive valve (1-SI-82) closure. As part of the periodic update, segment ECC-002 was returned to a LSS classification and no longer requires examination, thus confirming our initial quantitative assessment that the damage mechanism was not present.

4. Request for Relief PRT-05, Examination Category B-B, Pressure-Retaining Welds in Vessels Other Than Reactor Vessels

   a. The licensee provided, as Figure 1, a sketch showing how the pressurizer insulation support ring and the power-operated relief valve (PORV) welded support restrict access to make scans on Welds 1-07 and 1-15. This sketch adequately explains the limited access to examine the shell-to-head and intersecting longitudinal weld from the shell side. Also, the licensee provided the tables to indicate completed volumetric percentages for each of the scans on each weld. For example:

Table 1 Weld 1-07, % Volume by Scan Direction			
SCAN ANGLE, degrees	**SCAN DIRECTION**	**SCAN AREA**	**% EXAMINED**
0	0	Weld and Base Metal	68
45	2	Weld and Base Metal	82
60	2	Weld and Base Metal	20
45	5	Weld and Base Metal	15
60	5	Weld and Base Metal	20
45	7	Weld and Base Metal	35
60	7	Weld and Base Metal	35
45	8	Weld and Base Metal	35
60	8	Weld and Base Metal	35
Average Percent Examined for Weld 1-07: 38.3%			

Based on the information in the table and figure, it is assumed that scan 2 was made from the head side of Weld 1-07, given that the 45-degree shear wave was able to achieve 82-percent coverage. However, it is unclear why the 60-degree shear wave scan 2, which places the transducer slightly farther from the weld, could only obtain 20-percent volumetric coverage. Please clarify this result with further information or provide a cross-sectional sketch to indicate coverages for all scans.

b. In addition, no explanation to describe the information in Figures 2 or 3 is given in the licensee's request. These appear to be cross-sectional drawings that depict volumetric coverage of Welds 1-07 and 1-15, respectively. The interferences shown in Figure 2 are labeled 2 x 2-inch welded pad, 1-inch instrumentation nozzle, and 6-inch safety valve support ring. Please explain whether these interferences impact the full length of Weld 1-07 or only near the PORV. Also, indicate which scans are directly affected by these interferences, and what portion of the entire length of the scan is impacted.

Finally, clarify whether the 45-degree circumferential scan 2 (82%) covered the full ASME Code-required examination volume except for a small length of weld, or covered 82 percent of the examination volume for the full length of the weld.

Dominion Response

a. There was an error with the information provided in the table. The scan coverage percentages were recalculated and the information is being resubmitted. The 45-degree scan from the 2 side is 82% and for the 60-degree scan the coverage is 92%. This resulted in an overall average increase in the percentage covered to a total of 46.3% versus the previously stated 38.3%. Revised Relief Request PRT-05, Revision 1, is provided in the attachment for NRC approval and supercedes the previously submitted Relief Request PRT-05 in its entirety.

b. The attached revised Relief Request PRT-05, Revision 1, contains a more detailed explanation of the obstructions encountered and the percent coverage obtained for each scan.

Attachment

Revised Relief Request PRT-05, Revision 1

Virginia Electric and Power Company
(Dominion)
Surry Power Station Unit 1

Virginia Electric & Power Company
Surry Power Station Unit 1
Third Ten Year Interval

Relief Request No. PRT-05 Revision 1

I. Identification of Components

Weld No.	1-07
Drawing	11448-WMKS-RC-E-2
ASME Class	1
ASME Category	B-B
ASME Item	B2.11
Description	Pressurizer Shell to Head Circumferential Weld

Weld No.	1-15
Drawing	11448-WMKS-RC-E-2
ASME Class	1
ASME Category	B-B
ASME Item	B2.12
Description	Pressurizer Shell to Head Longitudinal Weld

II. Code Requirement

The 1989 Edition of ASME Section XI Table IWB-2500-1, examination category B-B, item B2.11 requires volumetric examination of essentially 100% of the circumferential shell to head welds.

Table IWB-2500-1 category B-B, item B2.12 of the 1989 Edition requires volumetric examination of one foot on the longitudinal weld that intersects the selected circumferential shell to head weld.

III. Basis for Relief

The pressurizer is covered with an insulation support ring (Figure 1). The insulation support ring is 6 inches wide at the location where examination interference is encountered for weld 1-07. As seen in Figure 1, this insulation support ring and a power operated relief valve support prevent the required volumetric coverage of both the upper circumferential head weld 1-07 and the intersecting longitudinal weld 1-15. Total removal of the insulation support ring at the mechanical connection is considered impractical due to high anticipated exposure levels, estimated at 18 man-rem. Partial removal of the support ring could allow some increased

coverage; however, the actual increase would be very small in relation to the entire weld length. This partial removal is not a viable alternative when considering consequential disturbance of interconnected cross supports and the welded connections to safety and power operated relief valve supports. Any removal of the mechanical connections or forced spreading apart of components would create a risk of misalignment and possible warping of the structure.

Weld 1-07

Weld 1-07, the circumferential head weld, was examined for 100% of the weld length. Examination coverage of the required volume was limited due to the position of hardware that supports the safety valves. Table 1 shows the percent volume that was examined by each scan direction. All areas were examined to the maximum extent practical for flaws oriented in the circumferential as well as the axial directions. The average total examination of all scan directions is 46%. These percentages are based on total volume of the weld per scan.

Figure 2 shows obstructions for weld 1-07 in the 2 and 5 directions using both 45 and 60 degree angle beams. The 2 direction was limited as shown by the safety valve support ring for the entire length of the weld. The 2" X 2" welded pad (typical of three) reduced the weld inspection as shown for 2% of the total weld length in the 2 direction. Also the instrument nozzles (typical of four) limited the 2 direction for 0.7% of the total weld length as shown for 45 and 60 degree angle beams. The 5 direction scan was limited by the safety valve support ring for the entire length of the weld. Total percentage covered is determined by calculating the cross sectional area not examined, multiplying by the percent limitation for the entire weld length attributed to that obstruction and subtracting from 100% coverage.

Figure 3 shows all obstructions laid out for the entire length of the weld with designated reference points. Reference for the 2 and 5 side orientation is shown.

Weld 1-15

Weld 1-15 was examined to the maximum extent possible but was limited by the power operated valve support. Table 2 shows the percent volume achieved for each scan direction. All areas were examined to the maximum extent practical for flaws oriented in the circumferential and axial directions. The average total coverage of all scan directions is 30.5%, based on total volume of weld per scan.

Figure 4 shows the general configuration of obstruction for weld 1-15. Figure 5 gives greater detail for the particular scans for the 2 and 5 directions using 45 and 60 degree angle beams. The hatched areas indicate zero coverage due to the safety valve support. The percentage covered for the entire weld length is given for each scan direction on Figure 5 and was calculated by determining the cross sectional area not examined, multiplying by the percent limitation for the required weld length and subtracting from 100% coverage.

IV. Alternative Examination

No additional ultrasonic examination techniques, such as extended beam, or alternative nondestructive examination methods would provide meaningful additional data on this cladded material for the examination volume not attained. It is proposed that the percentage coverage obtained be considered as meeting the Code requirements in accordance with 10 CFR 50.55a(a)(3)(ii) since any effort to achieve greater coverage is considered a hardship due to the risk of component damage and excessive personnel dose exposure without a compensating level of quality and safety.

In an NRC letter dated August 30, 1995, similar relief was granted for the Surry Unit 2 Third Interval (Relief Request SR-011) under the same ASME Section XI 1989 Edition.

Relief Request No. PRT-05, Revision 1

Table 1 Weld 1-07, % Volume by Scan Direction

SCAN ANGLE, degrees	SCAN DIRECTION	SCAN AREA	% EXAMINED
0	0	Weld and Base Metal	68
45	2	Weld and Base Metal	82
60	2	Weld and Base Metal	92
45	5	Weld and Base Metal	15
60	5	Weld and Base Metal	20
45	7	Weld and Base Metal	35
60	7	Weld and Base Metal	35
45	8	Weld and Base Metal	35
60	8	Weld and Base Metal	35

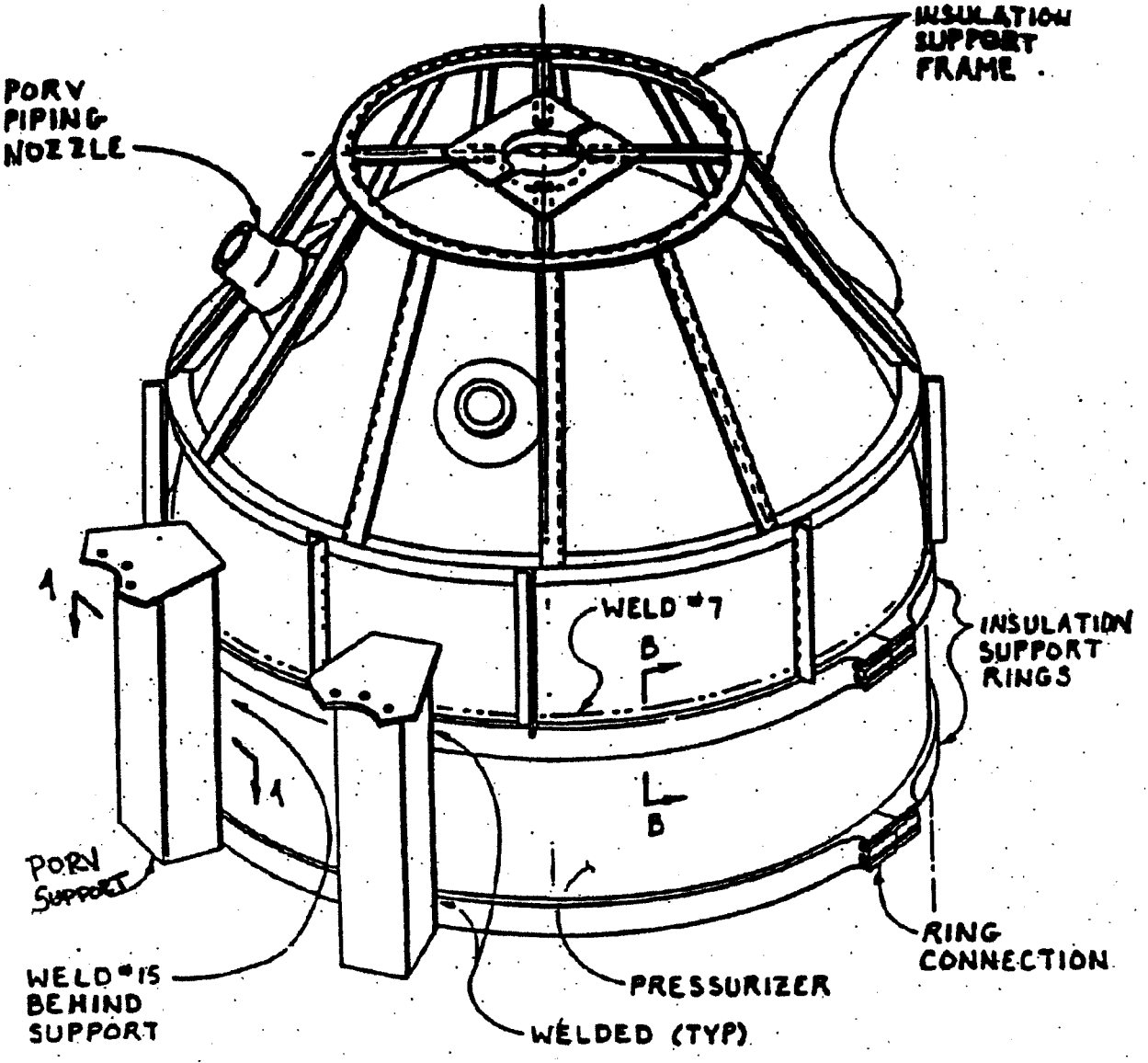
Average Percent Examined for Weld 1-07 46.3%

Table 2 Weld 1-15, % Volume by Scan Direction

SCAN ANGLE, degrees	SCAN DIRECTION	SCAN AREA	% EXAMINED
0	0	Weld and Base Metal	10
45	2	Weld and Base Metal	57
60	2	Weld and Base Metal	75
45	5	Weld and Base Metal	36
60	5	Weld and Base Metal	57
45	7	Weld and Base Metal	10
60	7	Weld and Base Metal	10
45	8	Weld and Base Metal	10
60	8	Weld and Base Metal	10

Average Percent Examined for Weld 1-15 30.5%

UT Scan Direction Definitions
2 - axial scan, 180 degrees from isometric flow direction.
5 - axial scan, the same direction as the isometric flow.
7 - circumferential scan, clockwise rotation when viewing in the direction of isometric flow.
8 - circumferential scan, counter-clockwise rotation when viewing in the direction of isometric flow.



INSULATION SUPPORT ISO

(FOR STUDY OF INTERFERENCES WITH ISI NDE OF PRESSURIZER WELDS #7 & 15)

Figure 1 PRESSURIZER INSULATION SUPPORT

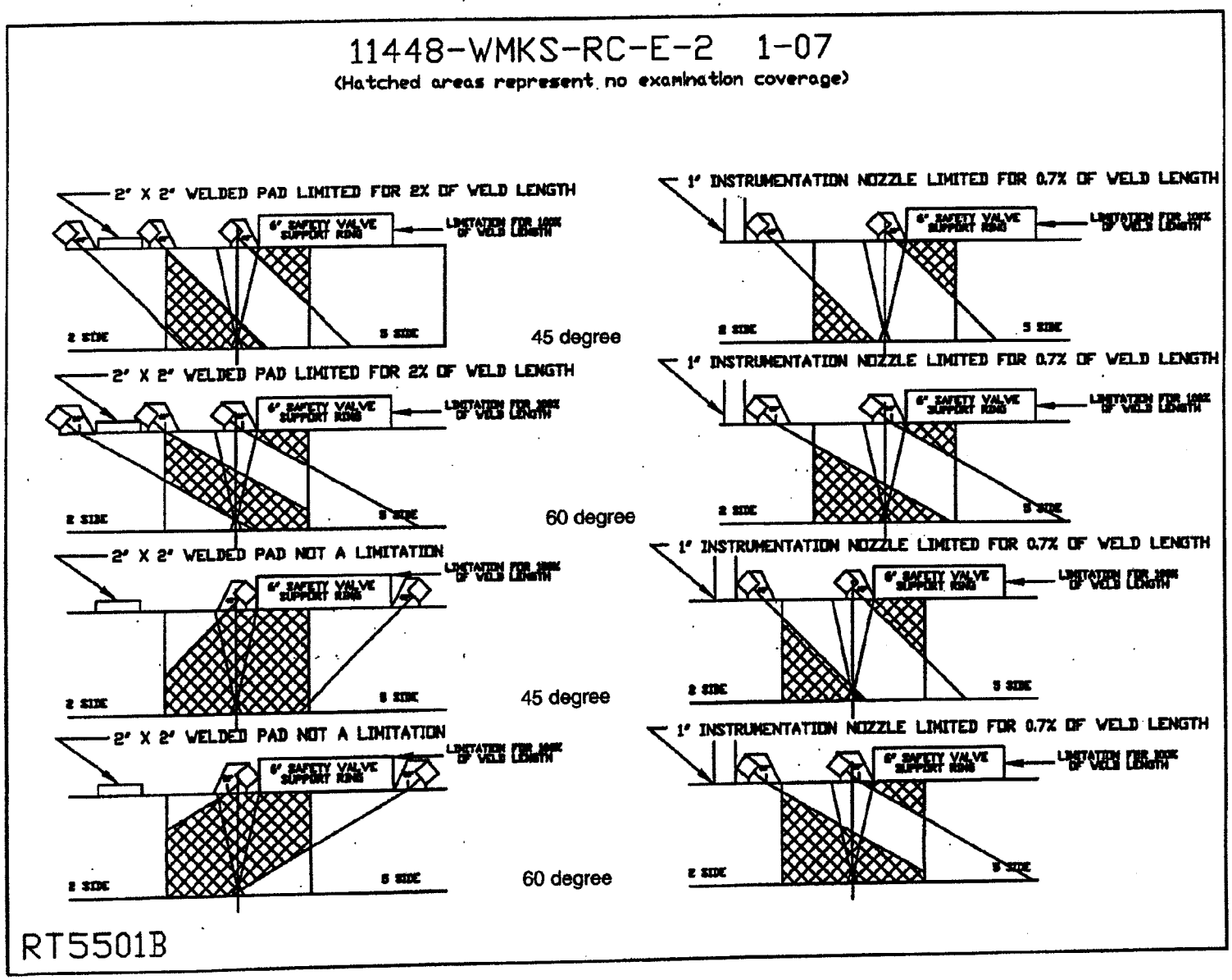

11448-WMKS-RC-E-2 1-07
(Hatched areas represent no examination coverage)
2" X 2" WELDED PAD LIMITED FOR 2% OF WELD LENGTH
6" SAFETY VALVE SUPPORT RING
LIMITATION FOR 100% OF WELD LENGTH
2 SIDE
5 SIDE
45 degree
2" X 2" WELDED PAD LIMITED FOR 2% OF WELD LENGTH
60 degree
2" X 2" WELDED PAD NOT A LIMITATION
45 degree
2" X 2" WELDED PAD NOT A LIMITATION
60 degree
1" INSTRUMENTATION NOZZLE LIMITED FOR 0.7% OF WELD LENGTH
1" INSTRUMENTATION NOZZLE LIMITED FOR 0.7% OF WELD LENGTH
1" INSTRUMENTATION NOZZLE LIMITED FOR 0.7% OF WELD LENGTH
1" INSTRUMENTATION NOZZLE LIMITED FOR 0.7% OF WELD LENGTH
RT5501B

Figure 2

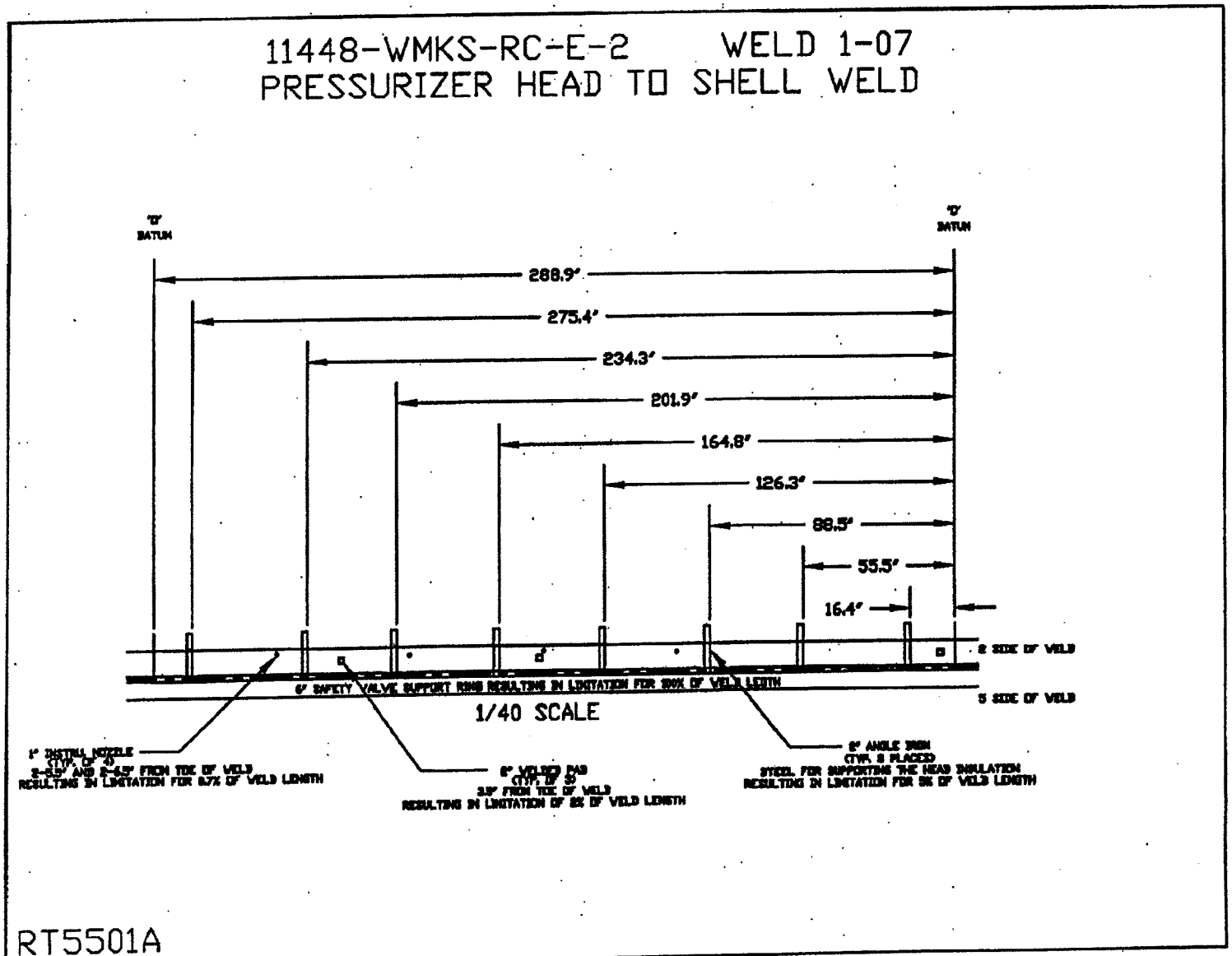
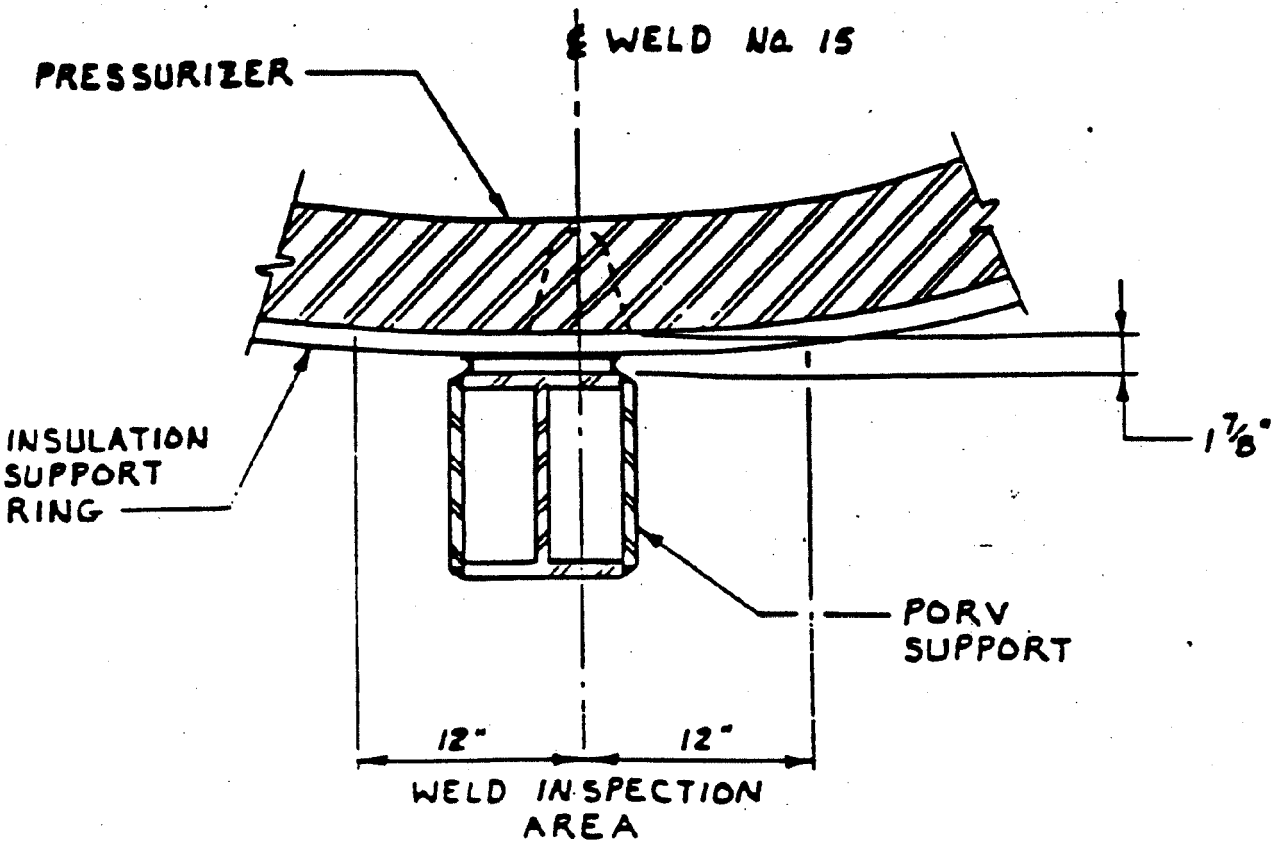

11448-WMKS-RC-E-2 WELD 1-07
PRESSURIZER HEAD TO SHELL WELD
"D" DATUM
"D" DATUM
288.9"
275.4"
234.3"
201.9"
164.8"
126.3"
88.5"
55.5"
16.4"
2 SIDE OF WELD
5 SIDE OF WELD
1/40 SCALE
RT5501A

Figure 3



SECTION A-A

N. T. S.

PRESSURIZER INSULATION SUPPORT

Figure 4

11448-WMKS-RC-E-2 1-15

Pressurizer, Long Seam Weld

(Hatched areas represent no examination coverage)

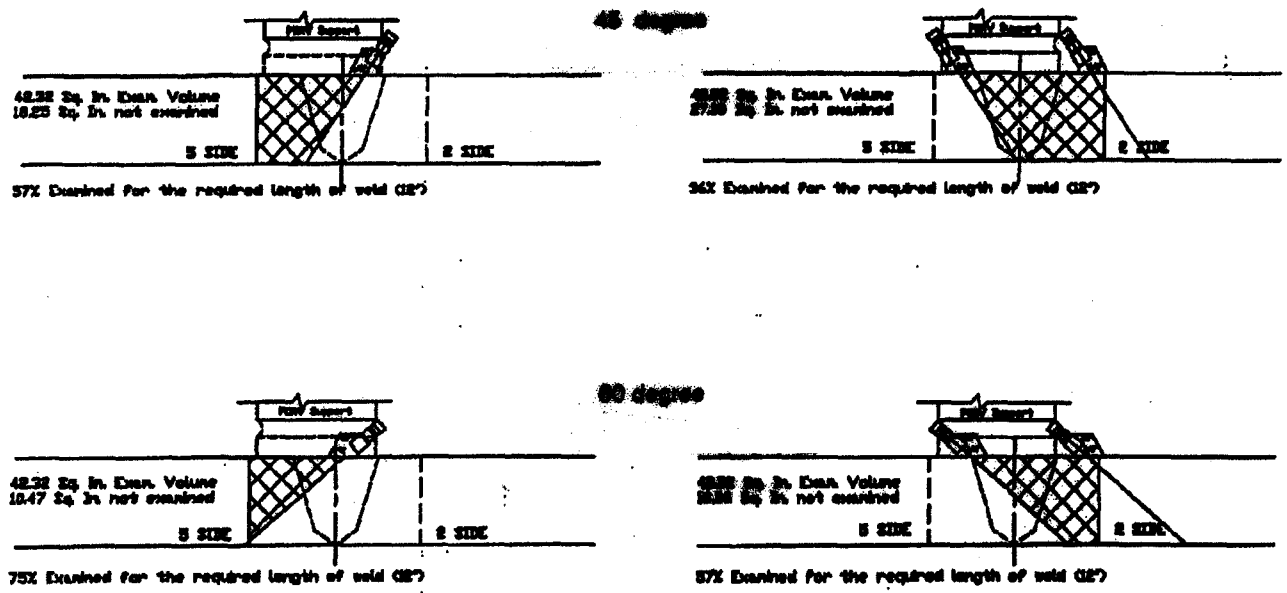


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Figure 5