Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37384-2000

June 16, 2006 10 CFR 50.55a

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

Gentlemen:

In the Matter of) Docket Nos. 50-327
Tennessee Valley Authority) 50-328
50-390

SEQUOYAH NUCLEAR PLANT (SQN) UNITS 1 AND 2 AND WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) BOILER AND PRESSURE VESSEL CODE, SECTION XI - PREEMPTIVE WELD OVERLAYS ON ALLOY 600 PRESSURIZER NOZZLE-TO-PIPE WELDS AND ASSOCIATED ALTERNATIVE REPAIR TECHNIQUES - GENERIC REQUEST FOR RELIEF G-RR-1

Pursuant to 10 CFR 50.55a(a)(3)(i), TVA requests approval for use of alternatives to the requirements of the ASME Code, Section XI, for the specified Edition and Addenda, Article IWA-4000, for repair and replacement activities related to the performance of preemptive weld overlays (PWOL), and/or needed weld overlay repairs at SQN and WBN. TVA plans to perform surface examinations and where practical, volumetric examinations of pressurizer surge line, spray line, and safety and relief valve header nozzle-to-pipe dissimilar metal (DM) weld areas to address potential primary water stress corrosion cracking (PWSCC) associated with Alloy 600 and Alloy 182/82 welds. Where the full examination of nozzle-to-pipe weld areas cannot be practically obtained, or evidence of indications is discovered that precipitate repairs in the existing welds, TVA plans to use weld overlays as a repair technique. In addition, TVA plans to use PWOLs as a mitigation technique for potential PWSCC degradation and as a practical means to improve nondestructive examination results and to obtain full coverage during future inservice inspections (ISI).

The status of the SQN and WBN ISI Program intervals are as follows:

SQN Units 1 and 2
Units 1 and 2 are in the third 10-year ISI Program intervals. Since June 1, 2006, SQN performs repairs and replacements utilizing the ASME Boiler and Pressure Vessel Code, Section XI, 2001 Edition through the 2003 Addenda.

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Watts Bar Unit 1
Unit 1 is in the third period of the first 10-year ISI Program interval. WBN utilizes the 1989 Edition of Section XI, but intends to transition to the ASME Boiler and Pressure Vessel Code Section XI, 2001 Edition through the 2003 Addenda on December 27, 2006 at the start of the second 10-year interval.

TVA requests approval for G-RR-1 prior to TVA's fall 2006 refueling outages. TVA intends to install PWOLs during the SQN Unit 2 fall 2006 refueling outage and then install PWOLs on SQN Unit 1 during the fall 2007 refueling outage. TVA plans to conduct examinations at WBN during the Unit 1, Cycle 7, fall 2006 refueling outage. Based upon potential ISI findings at WBN, use of PWOLs for repairs would be on a contingency basis.

Enclosure 1 provides Generic Request for Relief No. G-RR-1. Section VIII of G-RR-1 lists nine similar industry examples that have either been approved by NRC or are pending NRC approval as indicated therein. Enclosure 2 lists the TVA commitments.

TVA's schedule has been discussed with Mr. Doug Pickett, NRC Senior Project Manager. If you have any questions, please contact Rob Brown at (423) 751-7228.

Sincerely,

R M Brown for

G. W. Morris
Manager
Corporate Nuclear Licensing & Industry Affairs

Enclosures:
cc : See page 3

Enclsoures
cc (Enclsoures):

U.S. Nuclear Regulatory Commission
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, Georgia 30303-8931

NRC Senior Resident Inspector
Sequoyah Nuclear Plant
U.S. Nuclear Regulatory Commission
2600 Igou Ferry Road
Soddy Daisy, TN 37379

NRC Senior Resident Inspector
U.S. Nuclear Regulatory Commission
Watts Bar Nuclear Plant
1260 Nuclear Plant Road
Spring City, TN 37381

Douglas V. Pickett, Senior Project Manager
U.S. Nuclear Regulatory Commission
Mail Stop 08G9A
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852-2739

ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY (TVA)

SEQUOYAH NUCLEAR PLANT (SQN) UNITS 1 AND 2
THIRD 10-YEAR INTERVAL

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
FIRST AND SECOND 10-YEAR INTERVAL

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
SECTION XI REPAIRS AND REPLACEMENTS (R&R) PROGRAM
GENERIC REQUEST FOR RELIEF NO. G-RR-1

EXECUTIVE SUMMARY

Pursuant to 10 CFR 50.55a(a)(3)(i), TVA requests approval for use of alternatives to the requirements of the ASME Code, Section XI, for the specified Edition and Addenda, Article IWA-4000, for repair and replacement activities related to the performance of preemptive weld overlays (PWOL), and/or needed weld overlay repairs. TVA plans to perform surface examinations and where practical, volumetric examinations of pressurizer surge line, spray line, and safety and relief valve header nozzle-to-pipe dissimilar metal (DM) weld areas to address potential primary water stress corrosion cracking (PWSCC) associated with Alloy 600 and Alloy 82/182 welds. Where the full examination of nozzle-to-pipe weld areas cannot be practically obtained, or evidence of indications is discovered that precipitate repairs in the existing welds, TVA plans to use structural weld overlays (SWOLs) as a repair technique. In addition, TVA plans to use PWOLs as mitigation for potential PWSCC degradation and as a practical means to improve nondestructive examination results and coverage during future inservice inspections.

TVA intends to install PWOLs during the planned SQN Unit 2 fall 2006 refueling outage and then install PWOLs on SQN Unit 1 during the planned fall 2007 refueling outage. TVA plans to conduct examinations at WBN during the Unit 1, Cycle 7, fall 2006 refueling outage. Based upon examination findings and potential for repairs, the WBN utilization of PWOLs for repairs will be on a contingency basis.

G-RR-1 is similar to several prior NRC approvals. Section VIII of this enclosure lists nine industry examples. These examples are either approved or pending NRC review/approval. TVA proposes the use of PWOLs where it is known that full Code examination coverage of the nozzle-to-pipe DM weld areas is impractical, as well as, the use of weld overlays as a repair technique where full coverage can be obtained, but unacceptable indications are discovered. In addition, TVA requests the option to install SWOLs/PWOLs to mitigate potential PWSCC areas where full coverage can be obtained, but no indications are detected. The PWOLs and repair overlays performed at SQN and WBN will use the provisions of ASME Code Cases N-504-2, "Alternative Rules for Repair of Classes 1, 2, and 3 Austenitic Stainless Steel Piping, Section XI, Division 1," and N-638-1, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique, Section XI, Division 1," with modifications as

shown in this request. In addition, TVA will follow the requirements of 10 CFR 50.55a(g)(6)(ii)(c) and comply, to the extent practical, with the provisions of ASME Section XI, Appendix VIII, Supplement 11, of the 2001 Edition of ASME Section XI for the performance of volumetric examinations of the welded areas following the application of the completed full structural weld overlays. TVA meets these requirements utilizing the approved Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) techniques and the procedures as outlined in the attachments.

The successful use of these techniques and approved alternatives at other utilities have demonstrated that the weld overlay processes provide an acceptable level of quality and safety in accordance with the requirements of 10 CFR 50.55a(a)(3)(i).

I. SYSTEM/COMPONENT(S) FOR WHICH RELIEF IS REQUESTED:

Tables 1-3 provide the lists of nozzle-to-pipe DM weld areas (six welds for each unit) to be considered for the application of SWOLs/PWOLs. These tables list the specific weld designations, description, the associated weld and component configuration detail drawings, the corresponding weld overlay design drawings, and the associated base materials and the existing weld materials associated with the potential weld overlay areas. Attachment 1 provides Inservice Inspection (ISI) Program drawings. Attachment 2 provides a typical drawing of a weld overlay design.

The deposited material for the weld overlays will extend to cover the regions from the low-alloy steel nozzle, nozzle end weld buttering, DM weld, existing stainless-steel nozzle safe-end (SE) transition piece, the transition piece-to-pipe stainless steel weld area, and a portion of the stainless steel process piping. The tables are collated using the number designations for the SE DM welds, as the primary area of focus. For each SE DM weld, there is a corresponding stainless steel SE to stainless steel process pipe field weld with a unique weld number that is listed in Table 4. As stated above, these stainless steel welds will also be covered by the overlay process.

Because these SE welds are Alloy 600 DM welds, examinations of the welds are on an accelerated augmented schedule in accordance with the guidelines of the EPRI Material Reliability Program Primary System Piping Butt Weld Inspection and Evaluation Guideline (MRP-139).

For all three units, each of the six pressurizer nozzle-to-safe end DM welds are ASME Code Class 1 (or equivalent) welds within the Reactor Coolant System (RCS) which are all analyzed under the Risk-Informed Inservice Inspection Program (RI-ISI) processes and assigned the Code Category R-A, as appropriate. The examination volume coverage and the acceptance standards are defined by the RI-ISI Program as that analysis is applied to the standard ASME, Section XI, ISI Program requirements. For the SQN units, the six DM welds were all recently reevaluated as part of the ISI Program's third interval update to meet the 2001 Edition through the 2003 Addenda (2001A03) Code requirements and as part of the revision to the existing RI-ISI Program that is also reevaluated to accompany the ISI Program update. In the case of the SQN units, five of the six welds remain classified as low safety significant piping components. The SQN surge lines were reclassified as High Safety Significant (HSS) piping segments and the surge line nozzle safe end-to-process piping weld selected to be examined as

part of the RI-ISI program weld population. In the case of the initial WBN RI-ISI Program, the six pressurizer DM welds were categorized as low safety-significant (LSS) welds and were to be examined as part of the augmented ISI program in accordance with the agreed upon industry Alloy 600 program mitigation responses in MRP-139. In all three units, the augmented accelerated examinations will continue to be performed, as stated above, until weld overlays are in place and the examination schedule can be relaxed, if appropriate.

Table 1

Sequoyah Unit 1									
Weld No.	Description	TVA Drawing [Ref. ISI-0394-C-01, for location]	Overlay Design Drawing No.	Nozzle Material	Nozzle End Buttering Material	Nozzle to Safe-End Weld Material	Safe-End Material	Safe-End to Pipe Weld Filler Material	Process Pipe Material
RCW-29-SE	14" Surge Line	ISI-0394-C-05	10056C56	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308	A-376, TP 316 SCH. 160
RCW-24-SE	4" Spray Line	ISI-0394-C-02, Detail D	10056C57	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308	SA-376, TP 316 SCH. 120
RCW-26-SE	6" Relief Valve Line	ISI-0394-C-02, Detail C	10056C58	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376 TP 316, SCH. 160
RCW-27-SE	6" Safety Valve Line	ISI-0394-C-02, Detail C	10056C59	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376 TP 316, SCH. 160
RCW-28-SE	6" Safety Valve Line	ISI-0394-C-02, Detail C	10056C60	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376, TP 316 SCH. 160
RCW-25-SE	6" Safety Valve Line	ISI-0394-C-02, Detail C	10056C61	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376, TP 316, SCH. 160

Table 2

Sequoyah Unit 2									
Weld No.	Description	TVA Drawing [Ref. ISI-0396-C-01, for location]	Overlay Design Drawing No.	Nozzle Material	Nozzle End Buttering Material	Nozzle to Safe-End Weld Material	Safe-End Material	Safe-End to Pipe Weld Filler Material	Process Pipe Material
RCW-29-SE	14" Surge Line	ISI-0396-C-03	10056C67	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	A-376, TP316 SCH. 160
RCW-24-SE	4" Spray Line	ISI-0396-C-02, Detail D	10056C66	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308	SA-376, TP 316 SCH. 120
RCW-27-SE	6" Relief Valve Line	ISI-0396-C-02, Detail C	10056C62	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376 TP 316, SCH. 160
RCW-28-SE	6" Safety Valve Line	ISI-0396-C-02, Detail C	10056C64	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376 TP 316, SCH. 160
RCW-25-SE	6" Safety Valve Line	ISI-0396-C-02, Detail C	10056C65	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376, TP 316 SCH. 160
RCW-26-SE	6" Safety Valve Line	ISI-0396-C-02, Detail C	10056C63	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376, TP 316, SCH. 160

Table 3

Watts Bar Unit 1									
Weld No.	Description	TVA Drawing [Ref. CHM-2570-C-01, for location]	Overlay Design Drawing No.	Nozzle Material	Nozzle End Buttering Material	Nozzle to Safe-End Weld Material	Safe-End Material	Safe-End to Pipe Weld Filler Material	Process Pipe Material
WP-10-SE	14" Surge Line	CHM-2570-C-05, Detail E	10056C74	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376, TP 316, SCH. 160
WP-11-SE	4" Spray Line	CHM-2570-C-06, Detail D	10056C75	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308	SA-376, TP 304 SCH. 160
WP-12-SE	6" Relief Valve Line	CHM-2570-C-06, Detail C	10056C76	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376 TP 304, SCH. 160
WP-15-SE	6" Safety Valve Line	CHM-2570-C-06, Detail C	10056C77	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376 TP 304, SCH. 160
WP-13-SE	6" Safety Valve Line	CHM-2570-C-06, Detail C	10056C78	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376, TP 304 SCH. 160
WP-14-SE	6" Safety Valve Line	CHM-2570-C-06, Detail C	10056C79	SA-508, Class 2	Alloy 600 82/182	Alloy 600 82/182	SA-182, Grade F316L	Stainless Steel, ER308/E308	SA-376, TP 304, SCH. 160

Table 4

Sequoyah Unit 1					**Sequoyah Unit 2**				
Weld No.	Description	TVA Drawing [Ref. ISI-0394-C-01, for location]	Process Pipe Weld No.	TVA Weld Map Drawing No.	Weld No.	Description	TVA Drawing [Ref. ISI-0396-C-01, for location]	Process Pipe Weld No.	TVA Weld Map Drawing No.
RCW-29-SE	14" Surge Line	ISI-0394-C-05	RC-35	ISI-0482-C-01	RCW-29-SE	14" Surge Line	ISI-0396-C-03	RC-35	ISI-0008-C-01
RCW-24-SE	4" Spray Line	ISI-0394-C-02, Detail D	RCF-23	ISI-0369-C-02	RCW-24-SE	4" Spray Line	ISI-0396-C-02, Detail D	RCF-23	ISI-0013-C-01
RCW-26-SE	6" Relief Valve Line	ISI-0394-C-02, Detail C	RCF-24	ISI-0369-C-03	RCW-27-SE	6" Relief Valve Line	ISI-0396-C-02, Detail C	RCF-24	ISI-0013-C-03
RCW-27-SE	6" Safety Valve Line	ISI-0394-C-02, Detail C	RCF-36	ISI-0369-C-03	RCW-28-SE	6" Safety Valve Line	ISI-0396-C-02, Detail C	RCF-45	ISI-0013-C-03
RCW-28-SE	6" Safety Valve Line	ISI-0394-C-02, Detail C	RCF-42	ISI-0369-C-03	RCW-25-SE	6" Safety Valve Line	ISI-0396-C-02, Detail C	RCF-42	ISI-0013-C-03
RCW-25-SE	6" Safety Valve Line	ISI-0394-C-02, Detail C	RCF-45	ISI-0369-C-03	RCW-26-SE	6" Safety Valve Line	ISI-0396-C-02, Detail C	RCF-36	ISI-0013-C-03

Table 4 (Continued)

Watts Bar Unit 1				
Weld No.	Description	TVA Drawing [Ref. CHM-2570-C-01, for location]	Process Pipe Weld No.	TVA Weld Map Drawing No.
WP-10-SE	14" Surge Line	CHM-2570-C-05, Detail E	RCF-H3-5	CHM-2547-C-01
WP-11-SE	4" Spray Line	CHM-2570-C-06, Detail D	RCF-D233-07	ISI-0365-C-02
WP-12-SE	6" Relief Valve Line	CHM-2570-C-06, Detail C	RCF-D232-01	ISI-0365-C-01
WP-15-SE	6" Safety Valve Line	CHM-2570-C-06, Detail C	RCF-D232-12	ISI-0365-C-01
WP-13-SE	6" Safety Valve Line	CHM-2570-C-06, Detail C	RCF-D232-10	ISI-0365-C-01
WP-14-SE	6" Safety Valve Line	CHM-2570-C-06, Detail C	RCF-D232-11	ISI-0365-C-01

II. CODE REQUIREMENTS:

The following table lists the applicable ISI Program 10-year interval, the period of ASME Section XI ISI Code of Record (Code Edition, or Edition with Addenda) for the given plant and unit, the ISI/Nondestructive examination (NDE) program Code of Record for the overlay examinations, and the ASME Section XI Repairs and Replacements Code of Record, and the ASME Section III Code of Record to be used for the design of the weld overlay.

Plant/Unit	ISI Program Interval / Period	ISI Program Code	Overlay NDE Code* (i.e., PDI)	R&R Code	Overlay Design Code
SQN / 1	3rd / 1st	2001A03	2001A03; 2001, no addenda, for use of PDI	2001A03	2001A03
SQN / 2	3rd / 1st	2001A03	2001A03; 2001, no addenda, for use of PDI	2001A03	2001A03
WBN / 1	1st / 3rd [2nd / 1st, as of 12/27/06]	1989, No Addenda [2001A03 as of 12/27/06]	2001A03; 2001, no addenda, for use of PDI	1989, No Addenda [2001A03 as of 12/27/06]	2001A03

* Note that TVA recently received permission to update its ISI/NDE procedures to meet the 2001A03 Code as part of an effort to standardize NDE procedures across all of TVA's units [reference NRC letter dated May 5, 2006 (ML060880207)]. Note also that the third 10-year ISI program interval for SQN Units 1 and 2 started on June 1, 2006. Watts Bar Unit 1 is in the third period of its first 10-year interval and currently plans to transition to its second 10-year interval on December 27, 2006, with the ASME Section XI Programs written to meet the 2001A03 Code.

In accordance with the ASME Section XI Program requirements, repairs and replacements activities must meet the Owner's requirements in that a repaired or replaced/modified item must meet the Construction Code to which the original item was constructed. Accordingly, consideration was given to the respective units' original codes of record in the weld overlay designs and the development of the individual repairs and replacements plans and associated installation of the weld overlay activities. The original plant component and piping design, and fabrication and installation, Codes-of-Record are:

Plant / Unit - Original Design Codes of Record

	SQN Unit 1	SQN Unit 2	WBN Unit 1
Pressurizer (Nozzle) Design & Fabrication Code:	ASME Section III, 1968 Edition with Code Case 1401	ASME Section III, 1968 Edition with Code Cases 1401 & 1459	ASME Section III, 1971S71 with Code Case 1493-1
Piping Primary Design Code:	USAS B31.1.0, 1967	USAS B31.1.0, 1967	ASME Section III, 1971S73
Fabrication and Installation Code:	USAS B31.7, 1969 with Addenda a, b, & c	USAS B31.7, 1969 with Addenda a, b , & c	ASME Section III, 1971S73

Alternatively, the given unit-specific repairs and replacements plan may meet all or portions of the requirements of different Editions and Addenda of the Construction Code, or Section III when the Construction Code was not Section III, provided the Code to be used for the activities is reconciled with the Owner's requirements, in accordance with the reconciliation requirements of IWA-4000 (or IWA-7000) of the applicable ASME Section XI Repairs and Replacements Program Code of Record.

In a standard ASME Section XI ISI program, TVA would classify the safe-end welds as Class 1, Subsection IWB, Table IWB-2500-1, Category B-F pressure retaining DM welds in vessel nozzles, with item number B5.40, as Pressurizer nominal pipe size 4 inch (NPS 4) or larger Nozzle-to-Safe End Butt Welds. Table IWB-2500-1, of the units' respective ASME Section XI Codes-of-Record, would require that these welds receive volumetric and surface examinations using Figure IWB-2500-8 with acceptance standards as shown in IWB-3514, for the given Edition/addenda of the Code. The nozzle safe-end to process pipe stainless steel welds, which will also be covered by a portion of the overlay, would be classified as Category B-J welds with item numbers of B9.11, and would have to meet the same examination volume and acceptance standards as the Category B-F welds. Examinations performed prior to the application of the weld overlays will meet these requirements.

In accordance with the requirements of 10 CFR 50.55a(g)(6)(ii)(c), the provisions of ASME Section XI, Appendix VIII, and its applicable supplements, must be used for the performance of volumetric examinations of the welded areas following the application of the completed full structural weld overlays over the DM welds. TVA plans to meet those requirements by using the EPRI PDI techniques and procedures. TVA understands that in the case where licensee's NDE programs are generally written to meet the 2001 Edition and later addenda of ASME Section XI (e.g., the 2001A03 Code), 10 CFR 50.55a(b)(2)(xxiv) restricts the incorporation of the PDI processes to the use of certain ultrasonic examination criteria that is shown in the 2001 Edition.

In addition to the examination requirements discussed above, application of the repair welding requirements, or the performance of weld overlays in areas where it is not practical to preheat and post-weld heat treat a component, the applicable ASME Section XI Codes, Articles IWA-4000, allow the use of temper bead (or half-bead) weld techniques to accomplish proper repairs and replacements.

Along with the IWA-4000 repairs and replacements requirements, the ASME Code allows the use of approved alternatives in ASME Section XI Code Cases N-504-2, "Alternatives Rules for Repair of Classes 1, 2, and 3 Austenitic Stainless Steel Piping, Section XI, Division 1," and N-638-1, "Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temper Bead Technique, Section XI, Division 1." However, Regulatory Guide (RG) 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Revision 14, also imposes additional limitations of the use of these Code Cases. TVA has incorporated consideration of these limitations into the proposed weld overlay processes and plans shown in this enclosure.

III. CODE REQUIREMENTS FROM WHICH RELIEF IS REQUESTED:

Relief is requested from meeting the following Code of Record requirements during the performance of these weld overlays.

1) For SQN Units 1 and 2, relief is requested for welding performed in accordance with the requirements of IWA-4610(a) of the 2001 Edition, with the 2003 (2001A03) Addenda, of ASME Section XI.
2) For WBN Unit 1, relief is requested for welding performed in accordance with the requirements of IWA-4500 of the 1989 Edition, with no Addenda, of ASME Section XI.
3) For SQN Units 1 and 2 and WBN Unit 1, relief is requested for examination of the completed weld overlay(s) in accordance with the requirements of 2001 Edition of ASME Section XI, Appendix VIII, Supplement 11.
4) For SQN Units 1 and 2 and WBN Unit 1, relief is requested from meeting the full provisions of the alternative ASME Code Case N-504-2 with the use of ASME Section XI 2005 Addenda Non-mandatory Appendix Q, as required in NRC RG-1.147.
5) For SQN Units 1 and 2 and WBN Unit 1, relief is requested from meeting the full provisions of the alternative ASME Code Case N-638-1 including examination of the weld overlay area and the associated maximum limit for the surface area for the given overlay to 100 square-inch.

IV. BASIS FOR RELIEF:

During future refueling outages scheduled to start fall 2006 for WBN Unit 1, fall 2006 for SQN Unit 2, and the fall 2007 for SQN Unit 1, TVA plans to perform surface examinations of the subject pressurizer nozzle-to-safe end DM welds; and, where practical, volumetric examinations, as part of the industry initiatives on the investigation and mitigation of Alloy 600 and Alloy 82/182 PWSCC issues. Where unacceptable indications of weld flaws are found, TVA plans to use weld overlay techniques as a repair process and to mitigate the impact of any such indications on the unit's future operation. The application of weld overlays will also facilitate the performance of future examinations of these nozzle areas by providing a more consistent outer surface configuration from which volumetric examination scanning can be performed. In addition, TVA proposes to take a proactive approach on these DM weld areas and apply PWOLs, as necessary and as schedules permit, on the pressurizer nozzle-to-safe end DM weld areas on all three units, and/or use the SWOL/PWOL process outlined in this request where DM weld repairs, are needed in the pressurizer nozzles.

Currently, there is no comprehensive ASME Code or industry standard criteria for a licensee to apply a structural weld overlay repair to a DM weld that is constructed of Alloy 82/182 weld material susceptible to PWSCC. The ASME Section XI Code Committee recently approved Code Case N-740. However, this code case is not published and has not been reviewed and approved for general industry use by the NRC Staff, nor incorporated into RG 1.147. In addition, the current effective Code edition and addenda requirements for the ASME Section XI Repairs and Replacements Programs in place at SQN and WBN [i.e., the 2001A03 Code for SQN (the latest 10 CFR 50.55a approved Code), and the 1989 Edition for WBN] do not have the needed process requirements. The repairs and replacements activities associated with a structural weld overlay DM weld repair (or use of a PWOL) are required to address the materials involved, the welding parameters, ALARA concerns, operational constraints,

examination techniques, and procedure requirements. The need for a viable mitigation process with the Alloy 600 DM welds and a ready approved methodology to repair any potentially unacceptable indications found in these types of welds, during the near-term TVA outages, has prompted this relief request.

V. PROPOSED ALTERNATIVES:

TVA proposes to use a full structural weld overlay as a repair process for any unacceptable examination indications found in these welds and as a PWOL process to mitigate the impact of potential future degradation of the SQN Units 1 and 2 and the WBN Unit 1 pressurizer nozzle-to-safe end Alloy 82/182 DM welds (six welds each unit).

As part of the preparation for these weld overlays, prior to the start of the weld overlay process, TVA plans to perform, as a minimum, surface examinations of the planned overlay weld areas. In addition, ultrasonic (UT) volumetric examinations of some of the DM weld areas for all three units (e.g., in the surge line nozzles) will be performed for those components where a full code coverage (i.e., greater than 90 percent) can be obtained. Where it has been determined that full code coverage cannot be obtained, by physical measurements of the areas and access investigations, TVA will evaluate the need for the performance of a weld overlay, as a means to mitigate the potential weld degradation and any need for more frequent successive examinations.

The materials associated with each of the SQN and WBN weld areas are as shown in Tables 1, 2 and 3 above. The nozzle material is a ferritic, low alloy steel (P3 Group 3). The process piping material is an austenitic stainless steel (P8). The existing DM weld filler materials are Alloy 82/182 (F43, considered equivalent to P43). The overlays will be designed as full structural overlays in accordance with the requirements of ASME Section XI Code Case N-504-2, with certain modifications, and Nonmandatory Appendix Q of the 2005 Addenda to ASME Section XI, as required by Table 2 of NRC RG-1.147, Revision 14. The proposed modifications to the processes in N-504-2 are discussed in Attachment 3.

For application of the weld overlays, an automatic or machine gas tungsten-arc welding (GTAW) ambient temperature temper bead welding technique will be implemented in accordance with ASME Section XI Code Case N-638-1, also with certain modifications. Use of Code Case N-638-1 is required for support of the PWOL process at WBN as that unit's Repairs and Replacements Program must meet the requirements of the 1989 Edition of ASME Section XI. As currently planned, beginning December 27, 2006, the WBN Repairs and Replacements Program will be updated to meet the 2001A03 Code, unless the current 1st 10-year ISI Program interval is extended in accordance with the provisions of the Code. If the current interval is extended for WBN as allowed by the Code, TVA plans to apply the provisions of this request to the ASME Code programs that are currently in effect. When the WBN ISI and Repair and Replacements Program is updated, TVA plans to apply the provisions of this request as appropriate to the WBN programs that are updated to meet the new 10-year interval requirements. For the SQN Units 1 and 2, automatic or machine GTAW is allowed in accordance with the provisions of the 2001A03 Code, Articles IWA-4633.2(a) through (e), which is the SQN Repairs and Replacements Program code-of-record for this request. However, Code Case N-638-1 is also appropriate to be used with the 2001A03 Code in order to allow the qualification and use of the ambient temper bead weld techniques. Use of N-638-1 for the SQN

pressurizer overlays, as it is proposed in this request, is compatible with the ASME Section XI 2001A03 Code provisions in Article IWA-4623.2. In addition, manual GTAW may be used if local repairs of base metal defects and/or weld defects are necessary, or additional weld metal is required to be deposited locally (in non-temper bead areas only) to form the final PWOL contour. However, manual GTAW will only be permitted in areas that do not affect the tempering region adjacent to the low alloy steel nozzle. The proposed modifications to Code Case N-638-1 are discussed in Attachment 4 of this enclosure. Depending upon the diameter of the nozzle(s) and process pipe to be overlaid and the axial extent of the overlay, the 100 square inch limit of surface covered by the overlay imposed by Code Case N-638-1 may be exceeded. Additional weld material may need to be deposited, in the axial directions, onto the ferritic nozzle in order to facilitate the required post-overlay ultrasonic examination and/or to ensure that a final smooth nozzle area is obtained. As part of this request, TVA proposes to keep the maximum weld overlay surface areas to less than, or equal to, 300 square inch on the ferritic nozzle surface area.

In accordance with the provisions of ASME Section IX Code Case 2142-2, the welding metal to be used as the overlay filler wire will be either ERNiCrFe-7A (Alloy 52M, UNS06054), or ERNiCrFe-7 (Alloy 52, UNS06052). Use of these weld filler materials is supported by ASME Code Case 2142-2, "F-Number Grouping for Ni-Cr-Fe Filler Metals Section IX (Applicable to all Sections, including Section III, Division 1, and Section XI)," which was approved for use with Section IX on August 7, 2003. Use of this filler metal is also discussed in Attachment 4. These temper bead weld techniques in accordance with the requirements of N-638-1 will be applied to the ferritic nozzle base material using the modifications shown in Attachment 4 also. During the performance of the overlay in accordance with N-638-1 monitoring of the weld preheat and interpass temperatures is required to meet the requirements of Article IWA-4000 of the applicable unit's Repairs and Replacements Program [e.g., IWA-4533(b) for the 1989 Code, IWA-4610(a) for the 2001A03 Code]. The IWA-4000 requirements stipulate that the temperatures are to be monitored with the use of thermocouples. In lieu of the thermocouples, contact pyrometers and manual records of the temperatures will be used to document the monitoring of these temperatures in order to preclude the need of attaching the thermocouples, thereby reducing the amount of personnel radiation exposure. The pyrometers will be calibrated in accordance with TVA's, or the contractor's, measuring and test equipment programs and will be capable of monitoring at least the required process temperature range from the minimum preheat temperatures of 50 degrees Fahrenheit (F) to the maximum interpass temperatures of 350 degrees F. In addition to the requirements of N-638-1 (with its modifications), the weld overlay methodology for the use of Code Case N-504-2 (with its modifications) will be used to install the overlays. These aspects are also discussed in the attachments.

Following the completion of the overlay process, volumetric examinations of the completed overlay weld areas will be performed. In accordance with the requirements of 10 CFR 50.55a(g)(6)(ii)(c) and the restrictions of 10 CFR 50.55a(b)(2)(xxiv), the ultrasonic (UT) examination of these weld areas will be accomplished in accordance with the requirements of the 2001 Edition of ASME Section XI , Appendix VIII, Supplement 11. TVA will meet these requirements using the approved EPRI PDI techniques and procedures also outlined in Attachment 5. It is TVA's expectation that full ASME code coverage (i.e., greater than 90 percent) of the weld overlay areas will be obtained in the UT examinations of the overlaid areas. However, in some cases for a specific pressurizer nozzle, there is the potential of encountering practical examination limitations

as the result of the physical component contours in the transition areas from the surface of the overlay material onto the existing nozzle, or piping material, at the ends of the overlay areas. If any such practical limitation is encountered during the performance of the post-overlay examinations such that the full (greater than 90 percent) coverage of the overlay area cannot be obtained, TVA understands that a separate request for relief to address these issues may be required.

Any applicable requirements not addressed in Attachments 3, 4 and 5, will be met as described in the provisions/requirements of the applicable Edition and Addenda of ASME Section XI, Article IWA-4000; Appendix VIII, Supplement 11; Code Case N-504-2; and Code Case N-638-1.

TVA proposes to apply the provisions of this request, when approved, during the current 10-year ISI Program intervals as indicated above. In the case of WBN, TVA requests that this relief also be granted for use during the 2nd 10-year ISI Program interval that is scheduled to start December 27, 2006.

VI. JUSTIFICATION FOR GRANTING RELIEF:

Attachments 3, 4, and 5 of this enclosure, when used with the applicable ASME Section XI Edition and Addenda Article IWA-4000 requirements, provide a comprehensive package of proposed detailed criteria with requirements, proposed alternatives, methodologies, modifications, and the basis for these differences, to support the use of G-RR-1.

Application of the weld overlays provides a residual axial and hoop stress field (in compression) which is favorable to the mitigation of potential PWSCC degradation in the original Alloy 82/182 DM weld and buttering areas. The overlay weld filler material (52/52M) is resistant to PWSCC in the pressurized water reactor (PWR) environment and provides a suitable replacement for the Alloy 82/182 properties. The proposed overlay design provides for the minimum dimensions to meet ASME Code Case N-504-2, the Appendix Q of the 2005 Addenda to Section XI, and the associated Section XI, Article IWB-3640, and Section III requirements. The overlay will be designed for access to meet the ASME Section XI inspection requirements, including coverage for the stainless steel nozzle safe end-to-process pipe weld, for each specific nozzle area. The weld overlay thickness and length of the overlay has been determined in accordance with the requirements of Code Case N-504-2 and included the assumption of a 100 percent through-wall circumferential flaw. The design thickness also meets the flaw stability criteria of ASME Section XI Article IWB-3640. The overlay length was also designed such that the length is sufficient to transmit loads onto the adjoining pipe material. However, consideration for the inspection requirements of the completed weld overlay generally controlled the design lengths. A rigorous finite element analysis (FEA) evaluation was performed in developing the overlay design and to determine the post-overlay residual weld stresses. This analysis included consideration of the system conditions (i.e., piping/nozzles wet or dry) under which the overlay is to be applied. Thermal stratification and its effects were taken into account, where applicable. Industry standards on crack growth principles with the currently accepted data for PWR environments and the Alloy 600, or stainless steel, materials were used in the FEA evaluation. The design report for these PWOLs will be provided to the NRC Staff as part of the supporting information for this request. A final structural integrity evaluations

(including analysis of any indications found during the pre-overlay examinations) which support this relief request will be provided to the NRC Staff, prior to the restart of the unit (prior to entry into Mode 4) during the outage in which the overlays are performed.

Over the SQN and WBN units' operating life, various NDE methods (visual, surface, and volumetric) have been performed on the DM welds and associated nozzle-to-safe end process piping welds as part of the Section XI ISI Program requirements, augmented examinations, or as information examinations. The ISI program examinations have been performed during the current, or previous, ISI program intervals. Some of these volumetric examinations have been performed in accordance with the PDI processes. To date, no reportable indications have been found with volumetric examinations that have been performed on the welds that may be subjected to overlays in the SQN and WBN units. For SQN Unit 1, no reportable indications have been found in DM weld RCW-26-SE and in DM weld RCW-28-SE. In two instances, minor indications were found during the performance of routine dye penetrant (PT) examinations performed as part of the Unit 1 ISI Programs. In both cases, the indications were satisfactorily dispositioned. In the September 1985 case with the RCW-26-SE weld examination, the indication was removed by minor surface polishing of the area and a follow-up examination found to be satisfactory. In the case of the RCW-28-SE weld, the minor surface indication in the weld was evaluated as acceptable to leave as-is. For the RCW-28-SE weld, the preliminary surface examination and preparation of the weld surface prior to the application of PWOLs will effectively remove these indications. For SQN Unit 2, there were also no reportable surface or visual indications in the examinations that have been performed. For WBN Unit 1, the surface or visual examinations of the subject welds have resulted in no reportable indications. Consequently, the application of the PWOLs to these nozzle areas will be performed under optimum conditions of integrity for the subject DM and their associated stainless steel welds. TVA considers the process described herein to result in high-quality weld areas that can be readily examined and expects that the post-overlay examinations of the welds will show that there are no recordable indications in the deposited metal. For the completed overlays that meet these expectations, TVA may choose to revert to the examinations and schedules required by the integration of the applicable unit's standard ASME Section XI ISI Program, any associated RI-ISI Program, and any added requirements of Nonmandatory Appendix Q , Article Q-4000, of the 2005 Addenda to ASME Section XI, imposed in RG-1.147, Table 2. The resulting frequency of required examinations may not necessarily be on a frequency that is equivalent to those imposed with the current version of the EPRI MRP-139 guidelines. However, as industry experience evolves, TVA intends to adjust monitoring of weld overlays as appropriate.

This request follows the provisions of ASME Code Cases N-504-2 and N-638-1, with the modifications shown in the attachments. Both of these Code Cases are approved for generic use by licensees through the guidelines in RG-1.147, Revision 14, as approved September 29, 2005. Both Code Cases have stipulations on their generic use, shown in Table 2 of RG-1.147.

In developing the weld overlay designs, the potential for exceeding the maximum allowed limit of 100 square inches for the surface areas, in accordance with the unmodified requirements of Code Case N-638-1, was encountered, especially in the design of the 14 inch NPS surge line nozzle overlay areas. TVA proposes to maintain the completed weld overlay area over the ferritic nozzle material to less than the 100 square inches wherever practical and still meet the optimum reliability of the completed

overlay. Where the completed overlay exceeds 100 square inches over the ferritic material, TVA will maintain the completed area to less than or equal to 300 square inches. Weld overlays in excess of 100 square inches have been supported by numerous precedents in other utility relief requests that are similar to this request. Relaxation of the 100 square inches surface area in overlays is also the subject of an ASME Code Committee white paper which supported the revision of Code Case N-638-1 to revision N-638-2. A copy of this white paper has been submitted to the Staff as information in an attachment to Enclosure 1 of the Calvert Cliffs Nuclear Power Plant relief request submitted January 18, 2006. See the cited precedent, item 6, below.

In addition to the above attributes, TVA's ASME Section XI repairs and replacements Program procedures will precipitate a rigorous review, by TVA, of the welding procedures used to perform the overlays to ensure that the procedures are compatible with the plant/unit base design requirements and safety margins. With this review, the suitability of these overlays will also be ascertained through the TVA design change process. Both the scheduled PWOLs and any applied SWOL repairs will require post PWOL or SWOL repair UT examination that will serve as the Code required preservice examinations, as appropriate. These preservice examinations will be performed in accordance with the alternative PDI requirements that are shown in Attachment 5. TVA personnel, or supplemental contract personnel will also perform the post-overlay NDE under TVA's NDE programs and procedures to ensure that the examinations are high quality, complete, and thorough with coverage obtained to the maximum practical extent. Along with the performance of the required post-overlay NDE, the associated components and weld areas will receive a visual VT-2 examination conducted as part of the routine post-refueling outage RCS nominal temperature and pressure system leakage test performed in accordance with the requirements of IWB-2500 and Table IWB-2500-1, Category B-P. A system leakage test is also routinely performed, following repairs and replacements that require the performance of a hydrostatic pressure test, in accordance with the requirements of ASME Code Case N-416-3, "Alternative Pressure Test Requirement for Welded or Brazed Repairs, Fabrication Welds or Brazed Joints for Replacement Parts and Piping Subassemblies, or Installation of Replacement Items by Welding or Brazing, Classes 1, 2 and 3, Section XI, Division 1." Code Case N-416-3 is approved in RG-1.147, Revision 14, unconditionally, for generic use. Code Case N-416-3 will be used here to support other ASME Code Class 1 pressure boundary repairs and replacements activities within the RCS, if so required. Note that the application of the weld overlays is performed in a manner such that the pressure boundary wall materials inside the outer 10 percent of the pressure vessel nozzle and associated piping wall thicknesses are not penetrated beyond the 10 percent thickness. Since this welding is applied to the outer surfaces of the existing components, the overlay activities are exempt from the hydrostatic pressure test requirements of IWA-4700 of the 1989 Edition of the Code, or the hydrostatic pressure test requirements of IWA-4540 of the 2001A03 Code.

In summary, the combined effects of deposition of PWSCC resistant weld reinforcement on the outside surface of the DM weld; the resulting favorable axial and hoop residual compressive stresses produced on the inside diameter of the primary areas of interest due to the overlay weld shrinkage, and the facilitation of high quality NDE of the overlays, will result in a plant/unit condition that is safe and will improve protection of the general public from the consequences of design basis accidents. In accordance with the requirements of 10 CFR 50.55a(a)(3)(i), the proposed alternatives provide an acceptable level of quality and safety for use at SQN and WBN.

VII. IMPLEMENTATION SCHEDULE:

TVA will apply the provisions G-RR-1 following approval, for the remainder of the current 10-year ISI Program intervals as indicated in the table above. In the case of WBN, TVA also plans to apply the provisions of this request during the 2nd 10-year ISI Program interval which is scheduled to start December 27, 2006. Once the structural weld overlays are installed, the overlays will remain in place for the design life of the repair that is defined in accordance with the evaluation requirements in paragraph (g) of Code Case N-504-2 and the corresponding requirements of Appendix Q of the 2005 Addenda to ASME Section XI. Appropriate inservice examinations will continue to be performed in accordance with TVA's integrated ISI and RI-ISI Program, and if required by Appendix Q, paragraph Q-4300.

VIII. PRECEDENTS:

Numerous precedents regarding the use of full structural weld overlays on DM welds, including those where weld flaws or indications have been found in the DM weld material and in cases where preemptive weld overlays are used to mitigate the potential degradation of the DM welds. A partial list of these precedent submittals or associated safety evaluation reports (SER) is as follows:

1) Three Mile Island, Unit 1, Docket No. 50-289, SER dated July 21, 2004 [ML041670510]

2) Cooper Nuclear Station, Docket No. 50-298, SER dated March 4, 2005 [ML050670165]

3) Susquehanna Steam Electric Station, Unit 1, Docket No. 50-387, SER dated June 22, 2005 [ML051220568]

4) D. C. Cook Nuclear Plant, Unit 1, Docket No. 50-315, SER dated June 27, 2005 [ML051720006]

5) Calvert Cliffs Nuclear Power Plant, Unit 2, Docket No. 50-318, SER dated July 20, 2005 [ML051930316]

6) Calvert Cliffs Nuclear Power Plant, Units 1 and 2, Docket Nos. 50-318 & 50-318, Submittal dated January 18, 2006 [ML060240110], with enclosed copy of ASME Code Committee white paper on 100 square inch limitation, (reference Committee Tracking #BC04-1000); written approval pending

7) Millstone Power Station, Unit 3, Docket No. 50-423, SER dated January 20, 2006 [ML053260012]

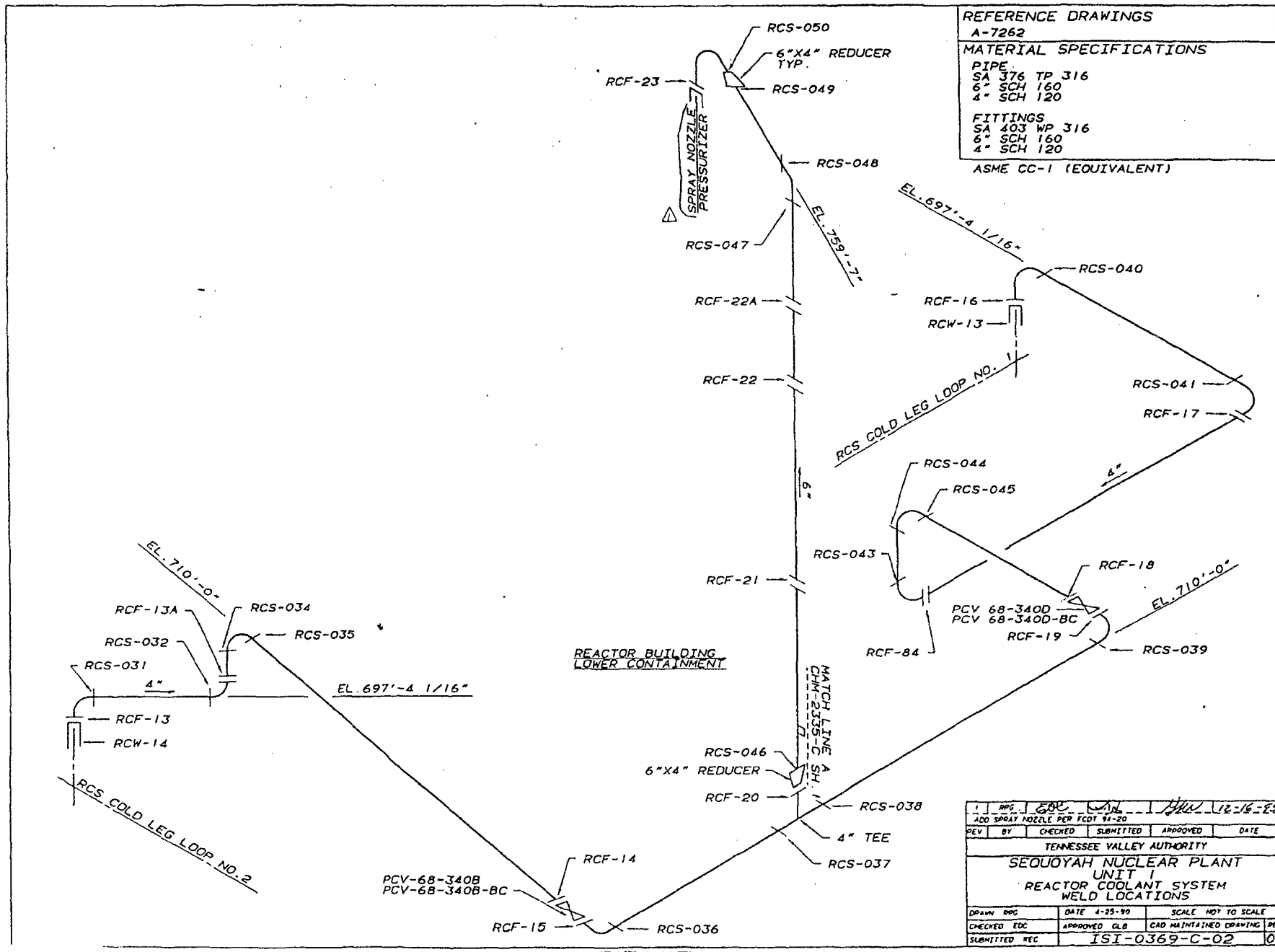
8) San Onofre Nuclear Generating Station, Unit 2, Docket No, 50-361, Submittal dated February 22, 2006 [ML060550423]; written approval pending

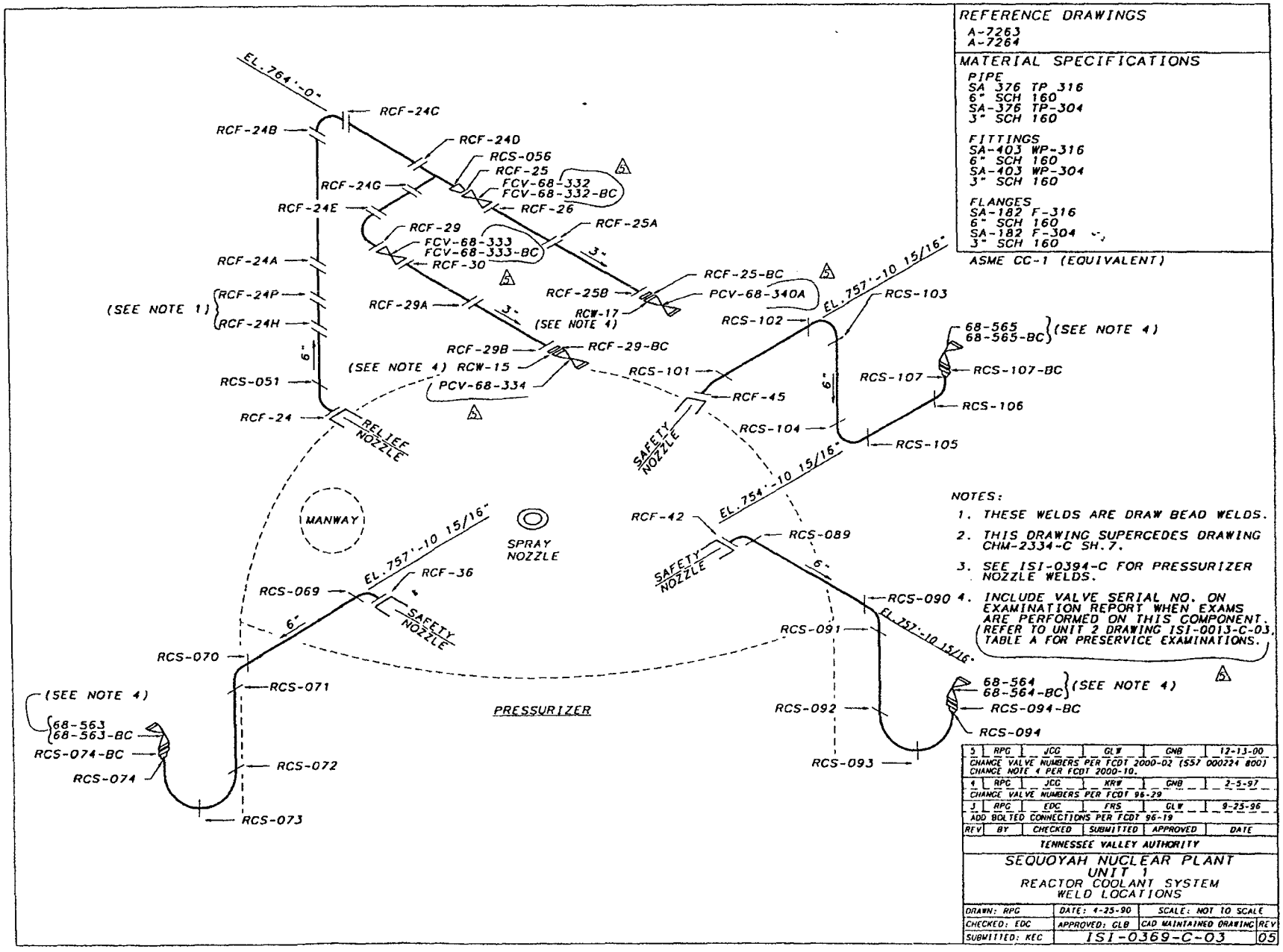
9) Davis Besse Nuclear Power Station, Docket No. 50-346, Submittals dated March 29 and March 31, 2006 [ML060900374 and ML060940424, respectively]; written approval pending

ATTACHMENT 1

TVA ISI PROGRAM DRAWINGS
OF
PRESSURIZER DM WELD AREAS

SQN Unit 1	SQN Unit 2	WBN Unit 1
ISI-0369-C-02	ISI-0008-C-01	CHM-2570-C-01
ISI-0369-C-03	ISI-0013-C-01	CHM-2570-C-05
ISI-0394-C-01	ISI-0013-C-03	CHM-2570-C-06
ISI-0394-C-02	ISI-0396-C-01	CHM-2547-C-01
ISI-0394-C-05	ISI-0396-C-02	ISI-0365-C-01
ISI-0482-C-01	ISI-0396-C-03	ISI-0365-C-02


REFERENCE DRAWINGS
A-7262
MATERIAL SPECIFICATIONS
PIPE
SA 376 TP 316
6" SCH 160
4" SCH 120
FITTINGS
SA 403 WP 316
6" SCH 160
4" SCH 120
ASME CC-1 (EQUIVALENT)
RCS-050
6"X4" REDUCER TYP.
RCS-049
RCF-23
SPRAY NOZZLE PRESSURIZER
RCS-048
RCS-047
EL. 759'-7"
EL. 697'-4 1/16"
RCS-040
RCF-16
RCW-13
RCF-22A
RCF-22
RCS COLD LEG LOOP NO. 1
RCS-041
RCF-17
RCS-044
RCS-045
RCS-043
RCF-18
PCV 68-340D
PCV 68-340D-BC
RCF-84
RCF-19
EL. 710'-0"
RCS-039
RCF-21
REACTOR BUILDING LOWER CONTAINMENT
MATCH LINE A CHM-2335-C SH. 1
RCS-046
6"X4" REDUCER
RCF-20
RCS-038
4" TEE
RCS-037
RCF-14
PCV-68-340B
PCV-68-340B-BC
RCF-15
RCS-036
EL. 710'-0"
RCF-13A
RCS-034
RCS-035
RCS-032
RCS-031
4"
EL. 697'-4 1/16"
RCF-13
RCW-14
RCS COLD LEG LOOP NO. 2
1 PPG EDC 12-16-95
ADD SPRAY NOZZLE PER FCDT 94-20
REV BY CHECKED SUBMITTED APPROVED DATE
TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT
UNIT 1
REACTOR COOLANT SYSTEM
WELD LOCATIONS
DRAWN PPG DATE 4-25-90 SCALE NOT TO SCALE
CHECKED EDC APPROVED GLB CAD MAINTAINED DRAWING REV
SUBMITTED REC ISI-0369-C-02 01



REFERENCE DRAWINGS

A-7263
A-7264

MATERIAL SPECIFICATIONS

PIPE
SA 376 TP 316
6" SCH 160
SA-376 TP-304
3" SCH 160

FITTINGS
SA-403 WP-316
6" SCH 160
SA-403 WP-304
3" SCH 160

FLANGES
SA-182 F-316
6" SCH 160
SA-182 F-304
3" SCH 160

ASME CC-1 (EQUIVALENT)

NOTES:

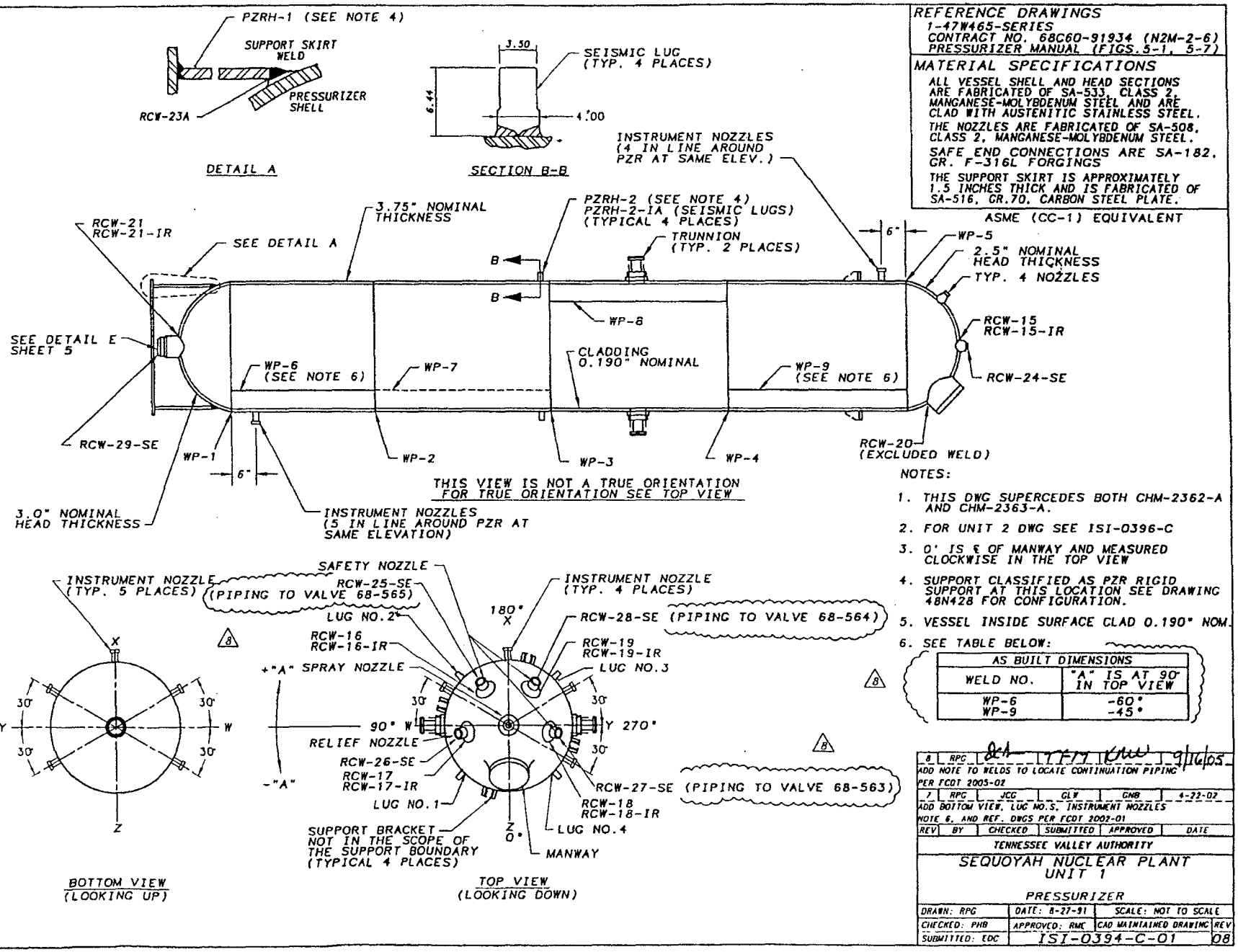
1. THESE WELDS ARE DRAW BEAD WELDS.
2. THIS DRAWING SUPERCEDES DRAWING CHM-2334-C SH. 7.
3. SEE ISI-0394-C FOR PRESSURIZER NOZZLE WELDS.
4. INCLUDE VALVE SERIAL NO. ON EXAMINATION REPORT WHEN EXAMS ARE PERFORMED ON THIS COMPONENT. REFER TO UNIT 2 DRAWING ISI-0013-C-03, TABLE A FOR PRESERVICE EXAMINATIONS.

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
5	RPG	JCG	GLW	GNB	12-13-00
	CHANGE VALVE NUMBERS PER FCDT 2000-02 (SS7 000224 800) CHANGE NOTE 4 PER FCDT 2000-10.				
4	RPG	JCG	KRW	GNB	2-5-97
	CHANGE VALVE NUMBERS PER FCDT 96-29				
3	RPG	EDC	FRS	GLW	9-25-96
	ADD BOLTED CONNECTIONS PER FCDT 96-19				

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT
UNIT 1
REACTOR COOLANT SYSTEM
WELD LOCATIONS

DRAWN: RPG	DATE: 4-25-90	SCALE: NOT TO SCALE	
CHECKED: EDC	APPROVED: GLB	CAD MAINTAINED DRAWING	REV
SUBMITTED: KEC	ISI-0369-C-03		05



REFERENCE DRAWINGS

1-47W465-SERIES
CONTRACT NO. 68C60-91934 (N2M-2-6)
PRESSURIZER MANUAL (FIGS.5-1, 5-7)

MATERIAL SPECIFICATIONS

ALL VESSEL SHELL AND HEAD SECTIONS ARE FABRICATED OF SA-533, CLASS 2, MANGANESE-MOLYBDENUM STEEL AND ARE CLAD WITH AUSTENITIC STAINLESS STEEL.

THE NOZZLES ARE FABRICATED OF SA-508, CLASS 2, MANGANESE-MOLYBDENUM STEEL.

SAFE END CONNECTIONS ARE SA-182, GR. F-316L FORGINGS

THE SUPPORT SKIRT IS APPROXIMATELY 1.5 INCHES THICK AND IS FABRICATED OF SA-516, GR.70, CARBON STEEL PLATE.

ASME (CC-1) EQUIVALENT

NOTES:

1. THIS DWG SUPERCEDES BOTH CHM-2362-A AND CHM-2363-A.
2. FOR UNIT 2 DWG SEE ISI-0396-C
3. 0° IS ℄ OF MANWAY AND MEASURED CLOCKWISE IN THE TOP VIEW
4. SUPPORT CLASSIFIED AS PZR RIGID SUPPORT AT THIS LOCATION SEE DRAWING 48N428 FOR CONFIGURATION.
5. VESSEL INSIDE SURFACE CLAD 0.190" NOM.
6. SEE TABLE BELOW:

AS BUILT DIMENSIONS	
WELD NO.	"A" IS AT 90° IN TOP VIEW
WP-6	-60°
WP-9	-45°

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
8	RPG				9/16/05

ADD NOTE TO WELDS TO LOCATE CONTINUATION PIPING PER FCDT 2005-02

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
7	RPG	JCG	GLW	GNB	4-22-02

ADD BOTTOM VIEW, LUG NO.3, INSTRUMENT NOZZLES NOTE 6, AND REF. DWGS PER FCDT 2002-01

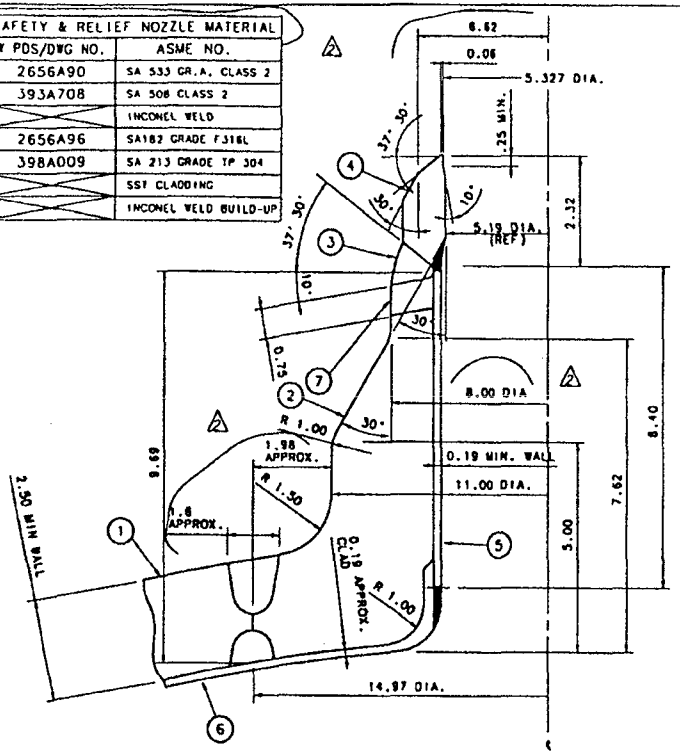
TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT
UNIT 1

PRESSURIZER

DRAWN: RPG	DATE: 8-27-91	SCALE: NOT TO SCALE
CHECKED: PHB	APPROVED: RMC	CAD MAINTAINED DRAWING
SUBMITTED: EDC	ISI-0394-C-01	REV 08

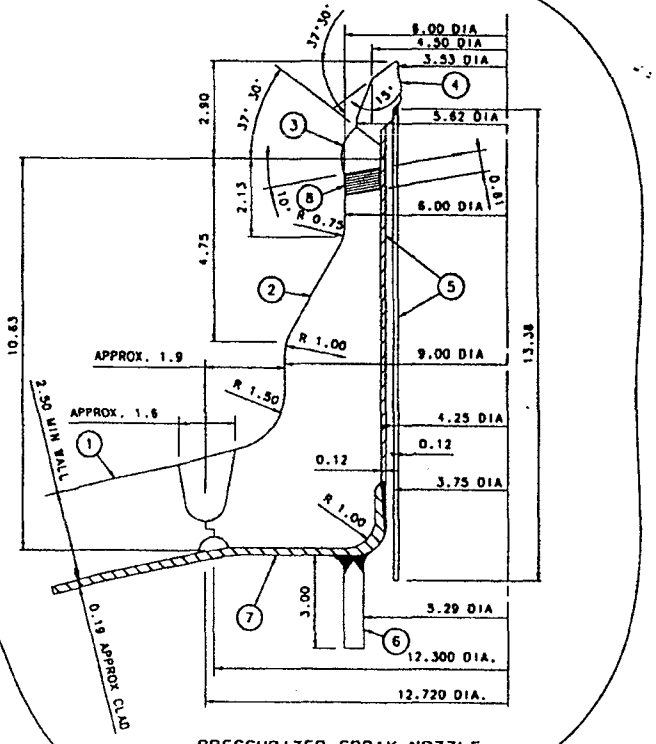
	SAFETY & RELIEF NOZZLE MATERIAL	
ITEM	W PDS/DWG NO.	ASME NO.
1	2656A90	SA 533 GR.A, CLASS 2
2	393A708	SA 508 CLASS 2
3		INCONEL WELD
4	2656A96	SA182 GRADE F316L
5	398A009	SA 213 GRADE TP 304
6		SST CLADDING
7		INCONEL WELD BUILD-UP



PRESSURIZER SAFETY & RELIEF NOZZLE

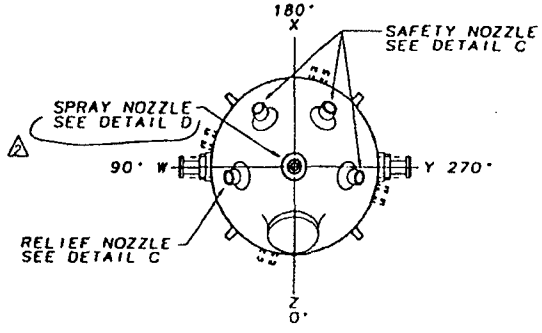
DETAIL C

	SPRAY NOZZLE MATERIAL	
ITEM	W PDS/DWG NO.	ASME NO.
1	2656A90	SA 533 GR.A, CLASS 2
2	393A708	SA 508 CLASS 2
3		INCONEL WELD
4	2656A96	SA 182 GRADE F316L
5	398A009	SA 213 GRADE TP 304
6	398A009	SA 312 GRADE TP 304
7		SST CLADDING
8		INCONEL WELD BUILD-UP



PRESSURIZER SPRAY NOZZLE

DETAIL D



REFERENCE DRAWINGS
WESTINHOUSE DWG NO. EDSK-379348B
MEMO RIMS NO. B38 960527 802
1097J91
1099J91
EDSK-379346B
1098J04

ASME (CC-1) EQUIVALENT

NOTE: THE DIMENSIONS ON THIS DRAWING ARE FOR INFORMATION ONLY.

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
2	RPG				12/5/91
ADD SPRAY NOZZLE DETAIL & ADD DIMENSIONS					
1	PHB	RPG	JCC	GLB	12-12-91
REVISE SAFETY & RELIEF NOZZLE NOTES CORRECT VENDOR DWG. NO.					

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT
UNIT 1
PRESSURIZER
SPRAY, SAFETY & RELIEF NOZZLE DETAILS

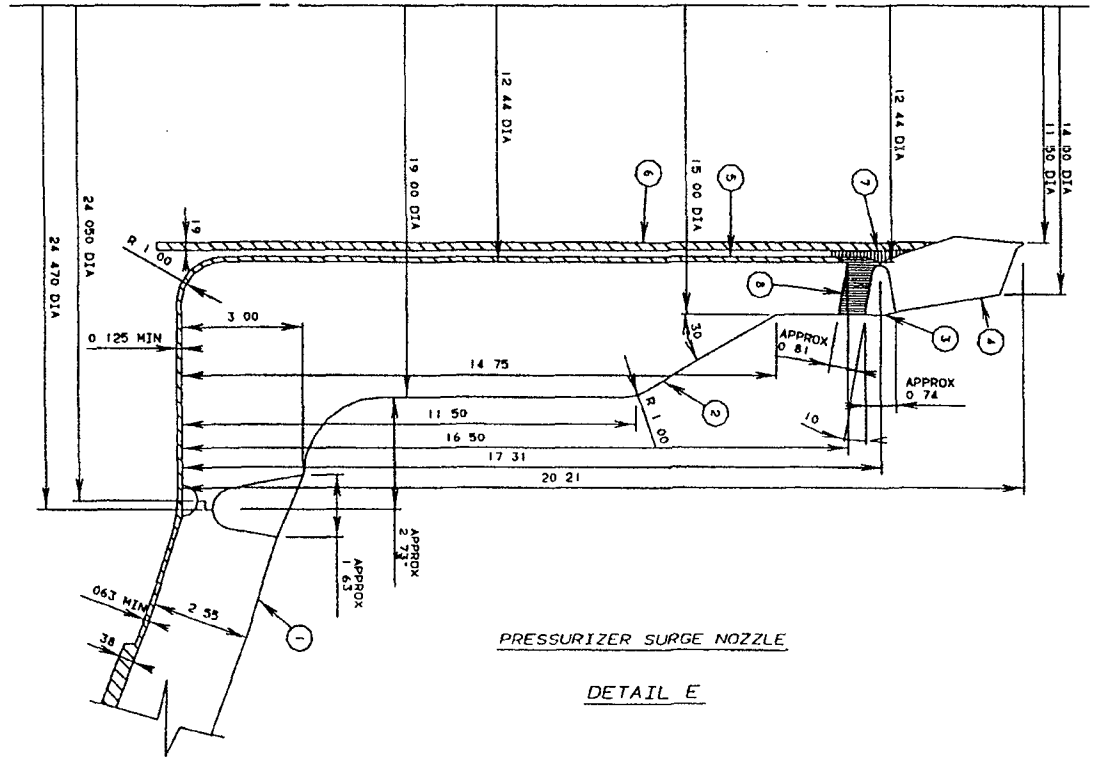
DRAWN: RPG	DATE: 8-27-91	SCALE: NOT TO SCALE	
CHECKED: PHB	APPROVED: RWE	CAD MAINTAINED DRAWING	REV
SUBMITTED: EDC	ISI-0394-C-02		02

REFERENCE DRAWINGS
MEMO RIMS BJ8 960527 802
1097J91
1099J91
350894-A
1098J04

ASME (CC-1) EQUIVALENT

NOTE THE DIMENSIONS ON THIS DRAWING ARE FOR INFORMATION ONLY

	SURGE NOZZLE MATERIAL
ITEM	ASME NO
1	SA 533 GR A, CLASS 2
2	SA 508 CLASS 2
3	INCONEL WELD
4	SA 182 GRADE F316L
5	SST CLADDING
6	SA 240
7	INCONEL WELD
8	INCONEL WELD BUILD-UP



PRESSURIZER SURGE NOZZLE

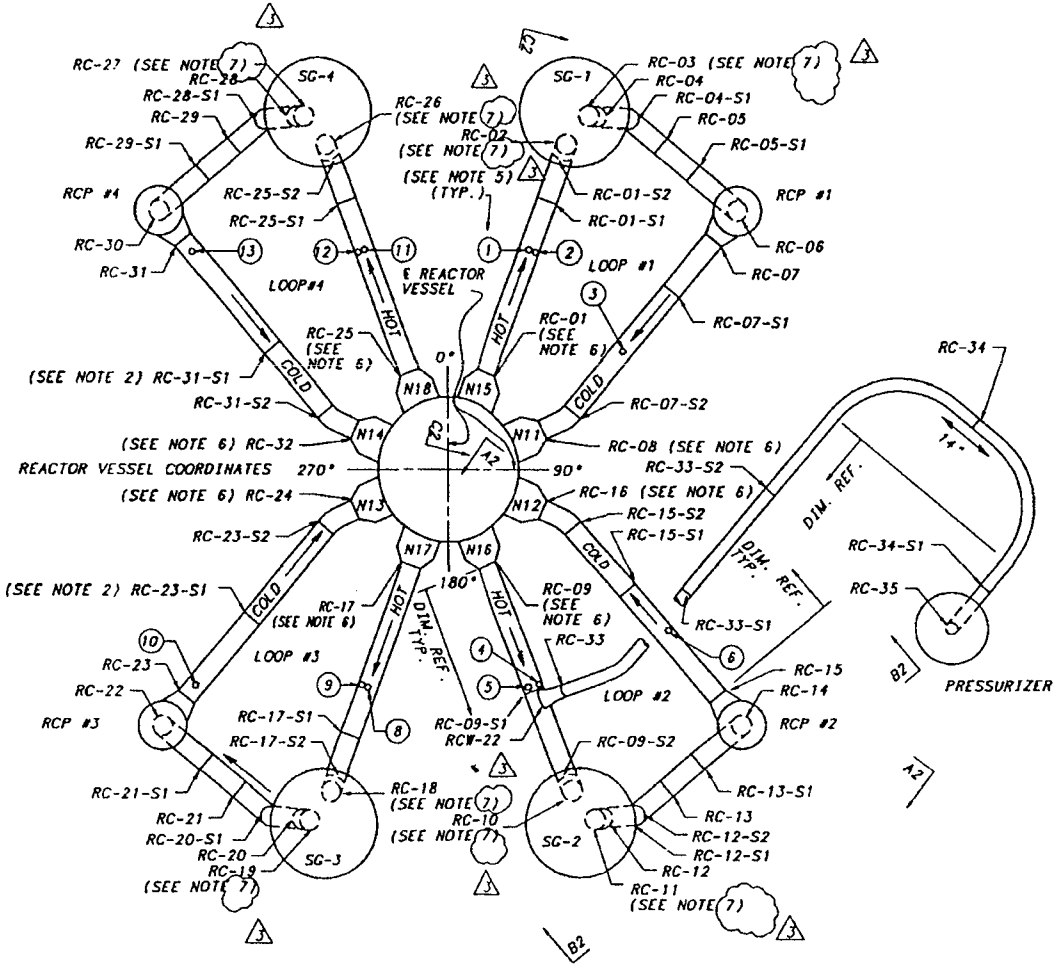
DETAIL E

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE

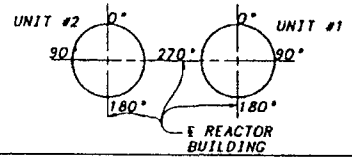
TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT
UNIT 1
PRESSURIZER
SURGE NOZZLE DETAILS

DRAWN RPG	DATE 2/5/94	SCALE NOT TO SCALE	
CHECKED	APPROVED	CAD MAINTAINED DRAWING	REV
SUBMITTED	ISI 0394-C-05		00



REACTOR BUILDING LOWER CONTAINMENT



REFERENCE DRAWINGS

47W304-1
47W465-1
1-RC-001, 1-RC-002
1-RC-003, 1-RC-004

MATERIAL SPECIFICATIONS

PRESSURIZER SURGE LINE
14" SCH 160 A-376

HOT LEG
29"ID, A-351 CF8M, N.W. 2.84"

CROSSOVER LEG
31"ID, A-351 CF8M, N.W. 2.99"

COLD LEG
27.5"ID, A-351 CF8M, N.W. 2.69"

ASME CC-1 (EQUIVALENT)

NOTES:

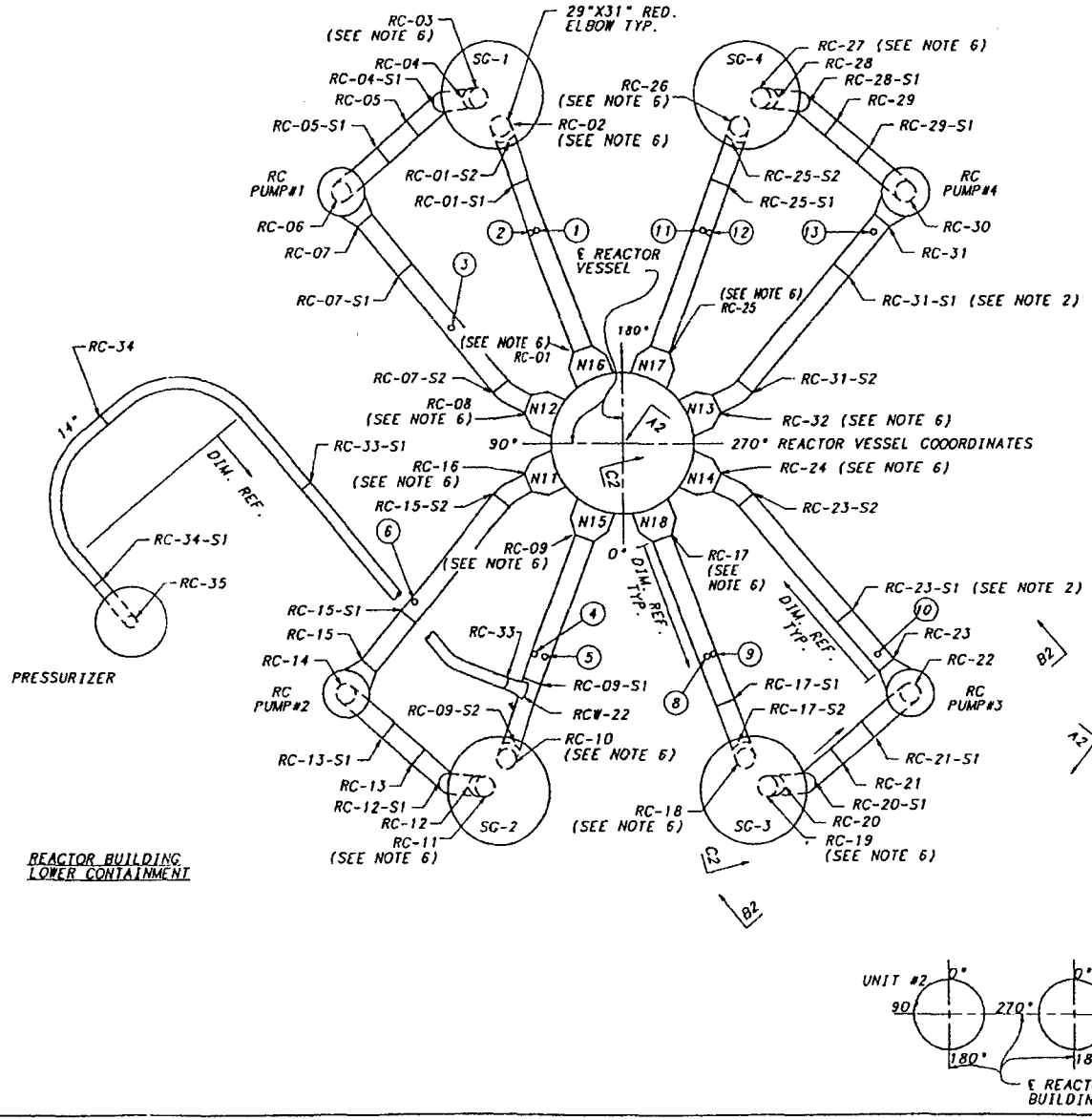
1. THIS DWG REPLACED CHM-2333-C.
2. INACCESSIBLE
3. REACTOR VESSEL NOZZLE TO SAFE END WELD ID'S ARE SHOWN ON RV DWG CHM-2343-C. THESE ARE ASME SECTION XI EXAM CATEGORY B-F, DISSIMILAR METAL WELDS.
4. STEAM GENERATOR NOZZLE TO SAFE END WELD ID'S ARE SHOWN ON S/G DWG ISI-0399-C. THESE ARE ASME SECTION XI EXAM CATEGORY B-F, DISSIMILAR METAL WELDS.
5. FOR TEMPERATURE ELEMENTS SEE SHEET 2, TAG 1 THRU 13.
6. THE EXAMINATIONS OF THESE WELDS ARE INCLUDED IN THE EXAMINATION OF THE NOZZLE TO SAFE END WELDS. THE IDENTIFIER FOR THE NOZZLE TO SAFE END WELD IS USED FOR THE EXAMINATION. THESE WELDS ARE NOT INCLUDED IN THE B-J OR B-F POPULATION BECAUSE THEY ARE INCLUDED IN THE NOZZLE TO SAFE END EXAMINATION. DURING U1C12 THIS NOTE WAS REMOVED FROM WELDS RC-02, 03, 10, 11, 18, 19, 26, AND 27 DUE TO REPLACEMENT STEAM GENERATOR SAFE ENDS.
7. THESE WELDS WERE CUT OUT AND REMADE DURING THE STEAM GENERATOR REPLACEMENT IN U1C12.

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
3	RPC	JCC	GLV	KRW	9-15-03
CHANGE NOTE 6, ADD NOTE 7 PER FCDT 2003-04					
2	RPC	JCC	GLV	SCC	7-20-01
CHANGE NOTE 6 PER FCDT 2001-03					
1	RPC	JCC	KRW	GNB	10-31-97
PLACED NOTE 6 REFERENCE ON WELDS PER FCDT 97-02					

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT
UNIT 1
REACTOR COOLANT PIPING
WELD LOCATIONS

DRAWN: RPC	DATE: 12-16-95	SCALE: NOT TO SCALE
CHECKED: LDC	APPROVED: GLV	CAD MAINTAINED DRAWING
SUBMITTED: JCC	ISI-0482-C-01	REV 03



REFERENCE DRAWINGS
47W304-1
2-RC-005W (LOOP 1)
2-RC-006W (LOOP 2)
2-RC-007W (LOOP 3)
2-RC-008W (LOOP 4)
47W465-1
CONTRACT: 91934
DRAWING: 9392-TEN
SHOP SHTS: TEN-1 THRU TEN-18E

MATERIAL SPECIFICATIONS
PRESSURIZER SURGE LINE
14" SCH 160 A-376

HOT LEG
29"ID, A-351 CF8M, N.W. 2.84"

CROSSOVER LEG
31"ID, A-351 CF8M, N.W. 2.99"

COLD LEG
27.5"ID, A-351 CF8M, N.W. 2.69"

ASME CC-1 (EQUIVALENT)

NOTES:

2. INACCESSIBLE
3. REACTOR VESSEL NOZZLE TO SAFE END WELD ID'S ARE SHOWN ON RV DWG ISI-0298-C. THESE ARE ASME SECTION XI EXAM CATEGORY B-F, DISSIMILAR METAL WELDS.
4. STEAM GENERATOR NOZZLE TO SAFE END WELD ID'S ARE SHOWN ON S/G DWG ISI-0401-C. THESE ARE ASME SECTION XI EXAM CATEGORY B-F, DISSIMILAR METAL WELDS.
5. FOR TEMPERATURE ELEMENTS SEE SHEET 2 TAGS 1-13.
6. THE EXAMINATIONS OF THESE WELDS ARE INCLUDED IN THE EXAMINATION OF THE NOZZLE TO SAFE END WELDS. THE IDENTIFIER FOR THE NOZZLE TO SAFE END WELD IS USED FOR THE EXAMINATION.

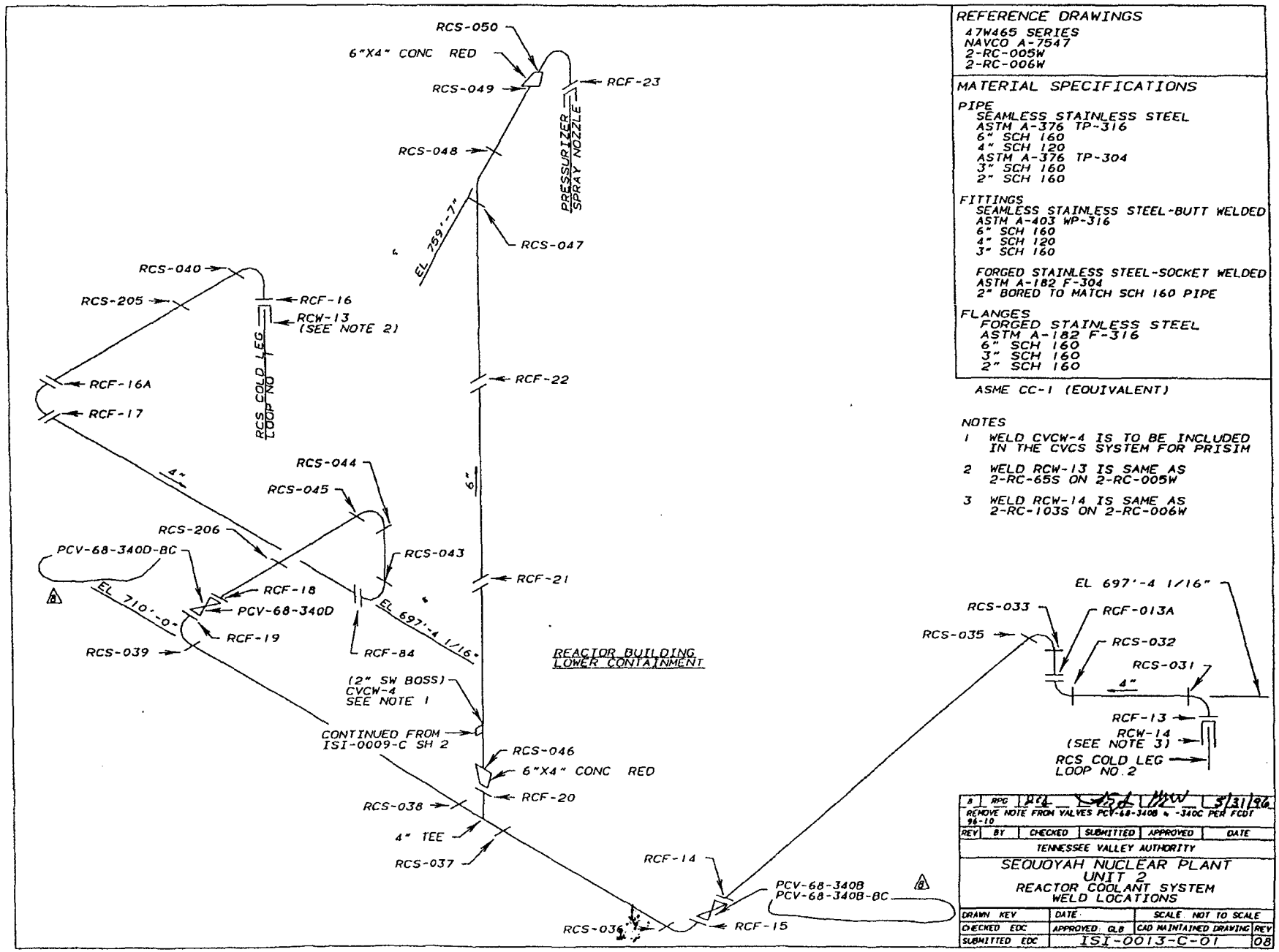
THESE WELDS ARE NOT INCLUDED IN THE B-J OR B-F POPULATION BECAUSE THEY ARE INCLUDED IN THE NOZZLE TO SAFE END EXAMINATION.

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
7	RPC	JCG	CLW	SCC	7-20-01
CHANGE NOTE 6 PER TCDT 2001-03					
6	RPC	JCG	FRS	CLW	12-16-95
CHANGE NOTES 2. & 3. ADD NOTE 6. ADD "REACTOR VESSEL COORDINATES" CHANGE DWG NO. & SHEET SIZE FROM B TO C.					
5	RPC	EDC	JCG	GLB	7-9-92
CHANGED PER SQN WELD REVIEW; REMOVE WELD RC-33-S2 AND IE-68-S1 AT BRANCH CONN. LOCATION 7 (NPS 1"), CORRECT REF DWGS, ADD SHOP SHTS. 4 ADD SH. 4					

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT
UNIT 2
REACTOR COOLANT PIPING
WELD LOCATIONS

DRAWN:	DATE:	SCALE: NOT TO SCALE	
CHECKED: EDC	APPROVED: GLB	CAD MAINTAINED DRAWING	REV
SUBMITTED: EDC	ISI-0008-C-01		07



REFERENCE DRAWINGS

47W465 SERIES
NAVCO A-7547
2-RC-005W
2-RC-006W

MATERIAL SPECIFICATIONS

PIPE
SEAMLESS STAINLESS STEEL
ASTM A-376 TP-316
6" SCH 160
4" SCH 120
ASTM A-376 TP-304
3" SCH 160
2" SCH 160

FITTINGS
SEAMLESS STAINLESS STEEL-BUTT WELDED
ASTM A-403 WP-316
6" SCH 160
4" SCH 120
3" SCH 160

FORGED STAINLESS STEEL-SOCKET WELDED
ASTM A-182 F-304
2" BORED TO MATCH SCH 160 PIPE

FLANGES
FORGED STAINLESS STEEL
ASTM A-182 F-316
6" SCH 160
3" SCH 160
2" SCH 160

ASME CC-1 (EQUIVALENT)

NOTES

1 WELD CVCW-4 IS TO BE INCLUDED IN THE CVCS SYSTEM FOR PRISIM

2 WELD RCW-13 IS SAME AS 2-RC-65S ON 2-RC-005W

3 WELD RCW-14 IS SAME AS 2-RC-103S ON 2-RC-006W

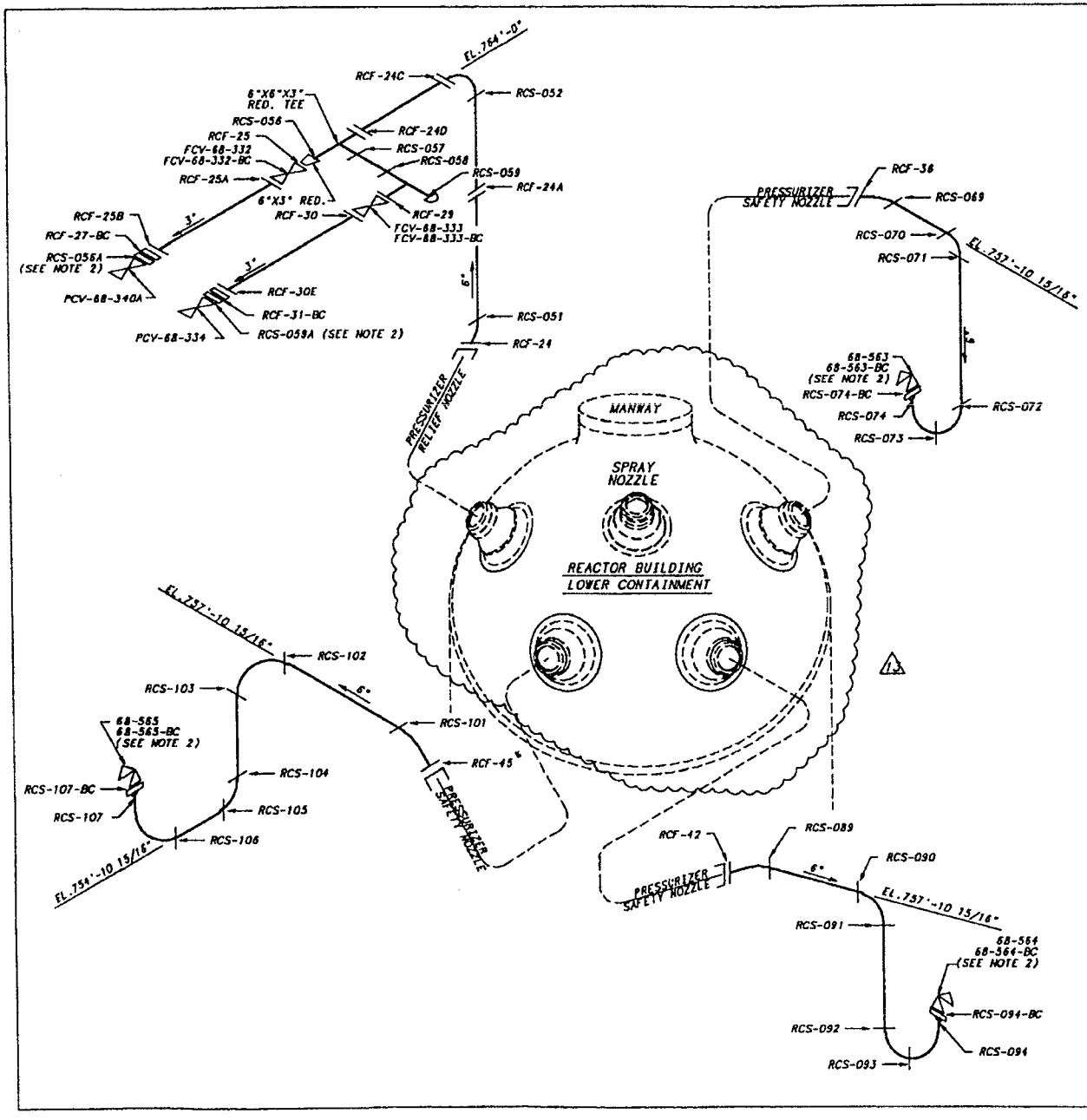
REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
A	RPG	[illegible]	[illegible]	[illegible]	5/31/96

REMOVE NOTE FROM VALVES PCV-68-340B & -340C PER FCDI 96-10

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT
UNIT 2
REACTOR COOLANT SYSTEM
WELD LOCATIONS

DRAWN KEV	DATE	SCALE NOT TO SCALE
CHECKED EDC	APPROVED GLB	CAD MAINTAINED DRAWING REV
SUBMITTED EDC	ISI-0013-C-01	08



REFERENCE DRAWINGS
47W465 SERIES
NAVCO A-7548
NAVCO A-7549

MATERIAL SPECS.
SEE SHEET 1

ASME CC-1 (EQUIVALENT)

NOTE:
1. FOR NOZZLE LOCATIONS SEE ISI-0396-C.
2. INCLUDE VALVE SERIAL NUMBER ON EXAMINATION REPORTS WHEN EXAMINATIONS ARE PERFORMED ON THIS COMPONENT. REFER TO TABLE A FOR PRESERVICE EXAMINATIONS.

TABLE A

PSI EXAMINATIONS ON WELDS IN THE VALVE ASSEMBLIES FOR VALVES PCV-68-334 AND PCV-68-340A BY VALVE SERIAL NUMBER

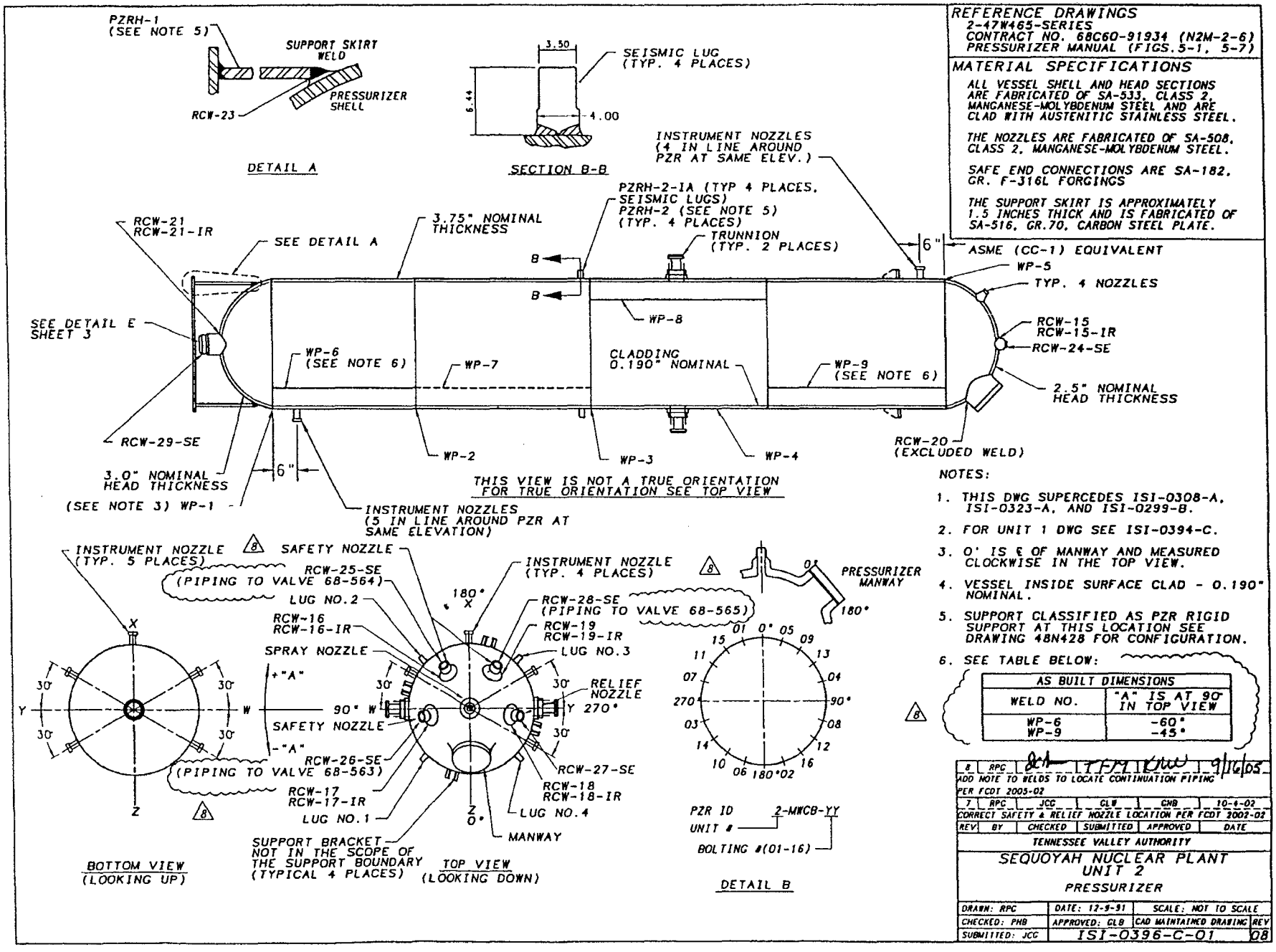
SERIAL NO.	REPORT NO.
2	R5879 (U2C8) (PT)
3	R7638 (U1C10) (PT)
7	IR92-02314 (U2C5A) (PT)
8	R7644 (U1C10) (PT)
9	IR95-04021 (U1C7) (PT)
10	R5875 (U2C8) (PT)
1	R6607 (U2C12) (UT)

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
13	RPG				10/7/05
ADD PRESSURIZER FOR ORIENTATION PER FCDT 2005-02					
12	RPG	JCG	GLW	KR9	3-19-04
CHANGE TABLE A PER FCDT 2004-01					
11	RPG	JCG	GLW	GMB	12-13-00
CHANGE VALVE NO.S PER FCDT 2000-02 REF: SS7 000234 800 ADD TABLE A, CHANGE NOTE 2 PER FCDT 2000-10					
10	RPG	JCG	FRS	GLW	5-31-96
REMOVE NOTE FROM VALVES FCV-68-332 & -333 PER FCDT 96-10					
9	RPG	JCG	FRS	GLW	12-16-95
ADD "SAFETY NOZZLE"					
8	RPG	EDC	JCG	GLW	11-15-94
ADD NOTE 2 AND CORRECT IDENTIFIER RCF-31-BC PER FCDT 94-03 ADD RELIEF NOZZLE LABEL					
7	RPG	EDC	JCG	RWE	7/27/92
CORRECT LOCATION OF VALVE NO.S					
6	RPG	PHB	JCG	GLB	11-16-91
ADD EXEMPTION FOR BC, ADD NOTE 1					
5	RPG	MRA	REC	GLB	7-9-87
REDRAWN ON CAD & CORRECTED WELD NOS. & ELEV. ADD BLOC. & REMOVE REV NOS.					

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT
UNIT 2
REACTOR COOLANT SYSTEM
WELD LOCATIONS

DRAWN: KEV	DATE:	SCALE: NOT TO SCALE
CHECKED: EDC	APPROVED: GLB	CAD MAINTAINED DRAWING REV
SUBMITTED: EDC	ISI-0013-C-03	13



REFERENCE DRAWINGS
2-47W465-SERIES
CONTRACT NO. 68C60-91934 (N2M-2-6)
PRESSURIZER MANUAL (FIGS. 5-1, 5-7)

MATERIAL SPECIFICATIONS

ALL VESSEL SHELL AND HEAD SECTIONS ARE FABRICATED OF SA-533, CLASS 2, MANGANESE-MOLYBDENUM STEEL AND ARE CLAD WITH AUSTENITIC STAINLESS STEEL.

THE NOZZLES ARE FABRICATED OF SA-508, CLASS 2, MANGANESE-MOLYBDENUM STEEL.

SAFE END CONNECTIONS ARE SA-182, GR. F-316L FORGINGS

THE SUPPORT SKIRT IS APPROXIMATELY 1.5 INCHES THICK AND IS FABRICATED OF SA-516, GR.70, CARBON STEEL PLATE.

NOTES:

1. THIS DWG SUPERCEDES ISI-0308-A, ISI-0323-A, AND ISI-0299-B.
2. FOR UNIT 1 DWG SEE ISI-0394-C.
3. 0° IS ℄ OF MANWAY AND MEASURED CLOCKWISE IN THE TOP VIEW.
4. VESSEL INSIDE SURFACE CLAD - 0.190" NOMINAL.
5. SUPPORT CLASSIFIED AS PZR RIGID SUPPORT AT THIS LOCATION SEE DRAWING 48N428 FOR CONFIGURATION.
6. SEE TABLE BELOW:

AS BUILT DIMENSIONS	
WELD NO.	"A" IS AT 90° IN TOP VIEW
WP-6	-60°
WP-9	-45°

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
8	RPC		TFM	DW	9/16/05
ADD NOTE TO WELDS TO LOCATE CONTINUATION PIPING PER FCDT 2005-02					
7	RPC	JCC	GLB	CNB	10-4-02
CORRECT SAFETY & RELIEF NOZZLE LOCATION PER FCDT 2002-02					

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT
UNIT 2
PRESSURIZER

DRAWN: RPC	DATE: 12-9-91	SCALE: NOT TO SCALE
CHECKED: PHB	APPROVED: GLB	CAD MAINTAINED DRAWING
SUBMITTED: JCC	ISI-0396-C-01	REV 08

ITEM	SAFETY & RELIEF NOZZLE MATERIAL	
	W PDS/DWG NO.	ASME NO.
1	2656A90	SA 533 GR.A, CLASS 2
2	393A708	SA 508 CLASS 2
3		INCONEL WELD
4	2656A96	SA182 GRADE F316L
5	398A009	SA 213 GRADE TP 304
6		SST CLADDING
7		INCONEL WELD BUILD-UP

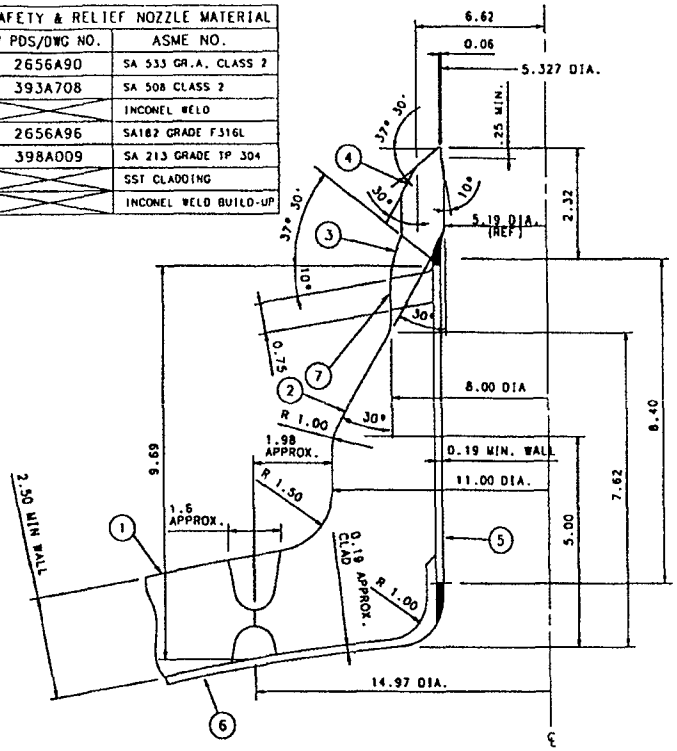
ITEM	SPRAY NOZZLE MATERIAL	
	W PDS/DWG NO.	ASME NO.
1	2656A90	SA 533 GR.A, CLASS 2
2	393A708	SA 508 CLASS 2
3		INCONEL WELD
4	2656A96	SA 182 GRADE F316L
5	398A009	SA 213 GRADE TP 304
6	398A009	SA 312 GRADE TP 304
7		SST CLADDING
8		INCONEL WELD BUILD-UP

REFERENCE DRAWINGS
WESTINHOUSE DWG NO. EDSK-379348B

MEMO RIMS NO. B38 960527 802
1097J91
1099J91
EDSK-379346B
1098J04

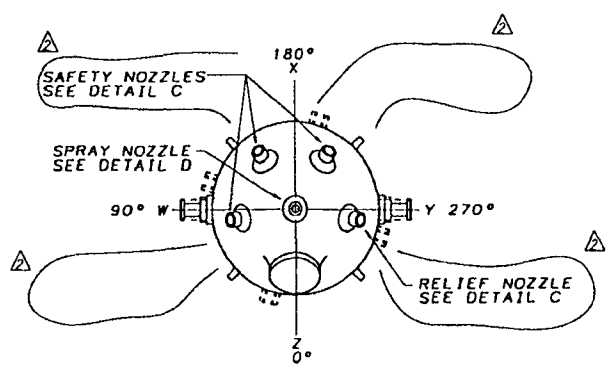
ASME (CC-1) EQUIVALENT

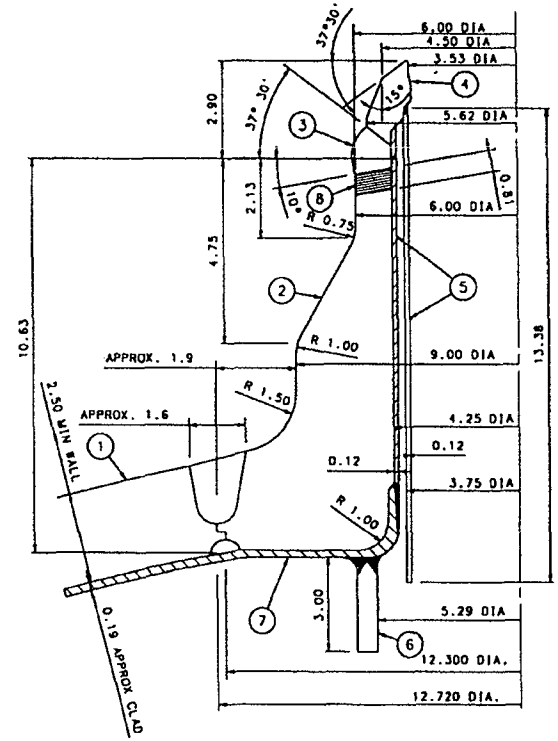
NOTE: THE DIMENSIONS ON THIS DRAWING ARE FOR INFORMATION ONLY.



PRESSURIZER SAFETY & RELIEF NOZZLE

DETAIL C





PRESSURIZER SPRAY NOZZLE

DETAIL D

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE
2	RPG	JCG	GLW	GNB	12-13-00
	CORRECT NOZZLE LOCATIONS PER FCDI 2000-11				
1	RPG	JCG	KRW	GNB	6-11-97
	ADD SPRAY NOZZLE DETAIL & ADD DIMENSIONS PER FCDI 96-14				

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT
UNIT 2
PRESSURIZER
SPRAY, SAFETY & RELIEF NOZZLE DETAILS

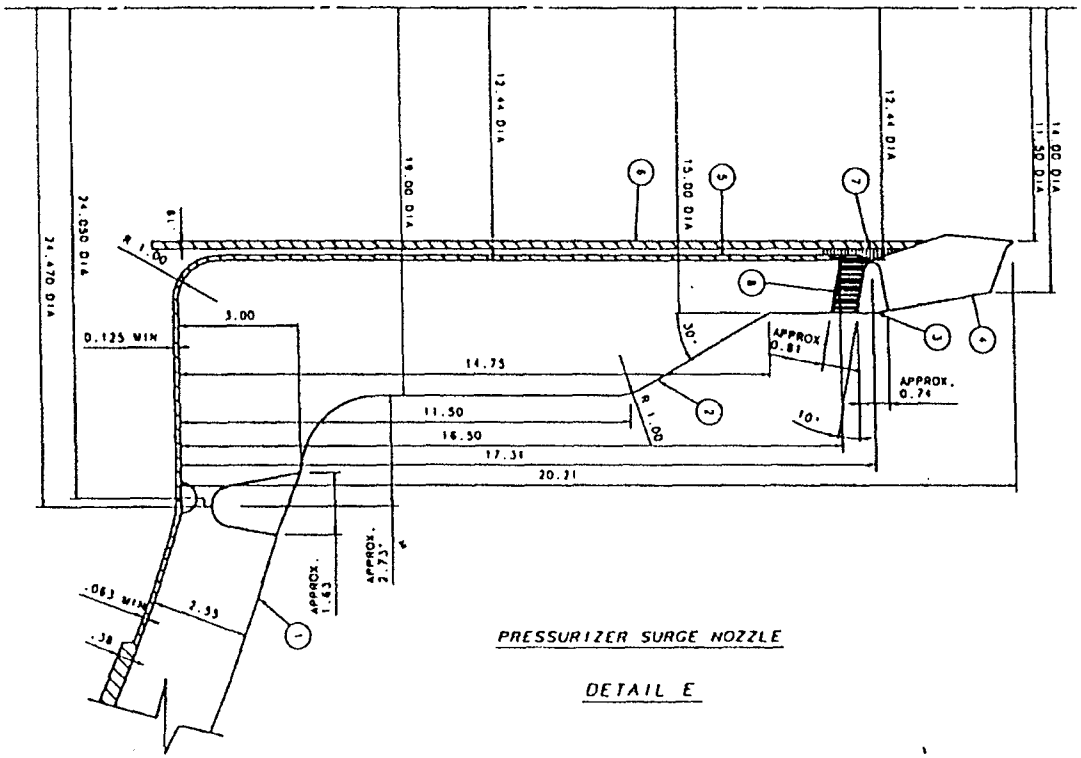
DRAWN: RPG	DATE: 12-9-91	SCALE: NOT TO SCALE	
CHECKED: PHB	APPROVED: GLB	CAD MAINTAINED DRAWING	REV
SUBMITTED: JCG	ISI-0396-C-02		02

REFERENCE DRAWINGS
MEMO RIMS B38 960527 802
1097J91
1099J91
350894-A
1098J04

ASME (CC-1) EQUIVALENT

NOTE: THE DIMENSIONS ON THIS DRAWING ARE FOR INFORMATION ONLY.

ITEM	SURGE NOZZLE MATERIAL ASME NO.
1	SA 533 GR.A, CLASS 2
2	SA 508 CLASS 2
3	INCONEL WELD
4	SA 182 GRADE F316L
5	SST CLADDING
6	SA 240
7	INCONEL WELD
8	INCONEL WELD BUILD-UP



PRESSURIZER SURGE NOZZLE

DETAIL E

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT
UNIT 2
PRESSURIZER
SURGE NOZZLE DETAILS

DRAWN: RPG	DATE: 6/11/92	SCALE: NOT TO SCALE
CHECKED: DCA	APPROVED: [illegible]	CAD MAINTAINED DRAWING
SUBMITTED: [illegible]	1S1-0396-C-03	REV 00

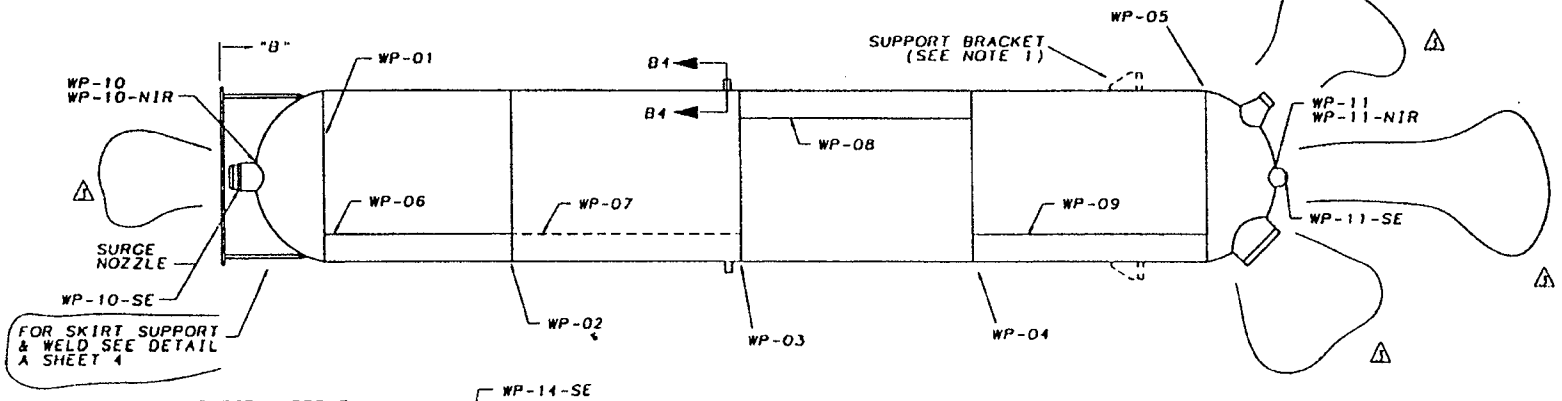
REFERENCE DIMENSIONS			
TITLE	SEAM NO.	"A"	"B"
GIRTH WELDS	1		56.44"
	2		193.25"
	3		322.12"
	4		450.87"
	5		588.12"
LONGITUDINAL WELDS	6	+30°	
	7	-29°	
	8	+135°	
	9	+47°	
SURGE NOZ.	10	0°	
SPRAY NOZ.	11	0°	
RELIEF NOZ.	12	+81°	
SAFETY NOZ.	13	+146° 59'	
SAFETY NOZ.	14	-147° 7'	
SAFETY NOZ.	15	-82°	

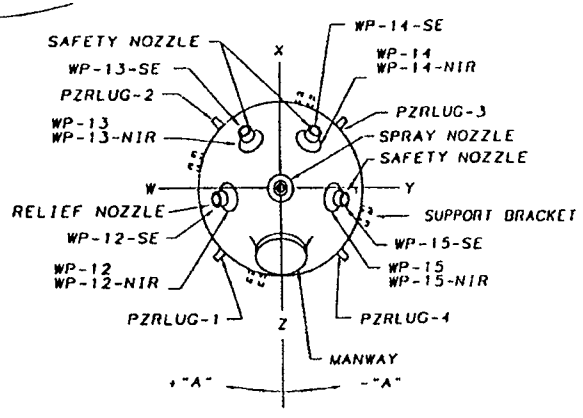
REFERENCE DRAWINGS
47W465-2
VENDOR MANUAL WBN-VTM-W120-0550
FIGURES 5-1, 5-3, 5-6, 5-7S, 5-1, 5-7)

MATERIAL SPECIFICATIONS
NOZZLE SAFE ENDS
SURGE 14" SCH. 160 SA-182 OR F-316L
SPRAY 4" SCH. 160 SA-182 OR F-316L
SAFETY 6" SCH. 160 SA-182 OR F-316L
RELIEF 6" SCH. 160 SA-182 OR F-316L
NOZZLE & MANWAY FORGINGS
SA-508 CLASS 2
SHELL BARRELS
SA 533 GR. A CL. 2
UPPER & LOWER HEAD
SA-533 GR. A CL. 2

ASME CC-1 (EQUIVALENT)

NOTE:
1. SUPPORT BRACKETS NOT USED





TOP VIEW

REV.	BY	CHECKED	SUBMITTED	APPROVED	DATE
3	PHB	CLB	KEC	TLH	2-7-96
CHANGE DRAWING FROM A SIZE TO C SIZE, DELETE DIMENSION "C" & MANWAY, ADD MATERIAL SPECIFICATIONS, REV. SKIRT NOTE					
2	PHB	PHB	CLB	FAX	4-26-95
REVISE REFERENCE DRAWINGS & TITLE BLOCK					

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT
UNIT 1

PRESSURIZER

DRAWN: KEV	DATE: 12-9-80	SCALE: NOT TO SCALE
CHECKED: JCG	APPROVED: CLB	CAD MAINTAINED DRAWING
SUBMITTED:	CHM-2570-C-01	REV 03

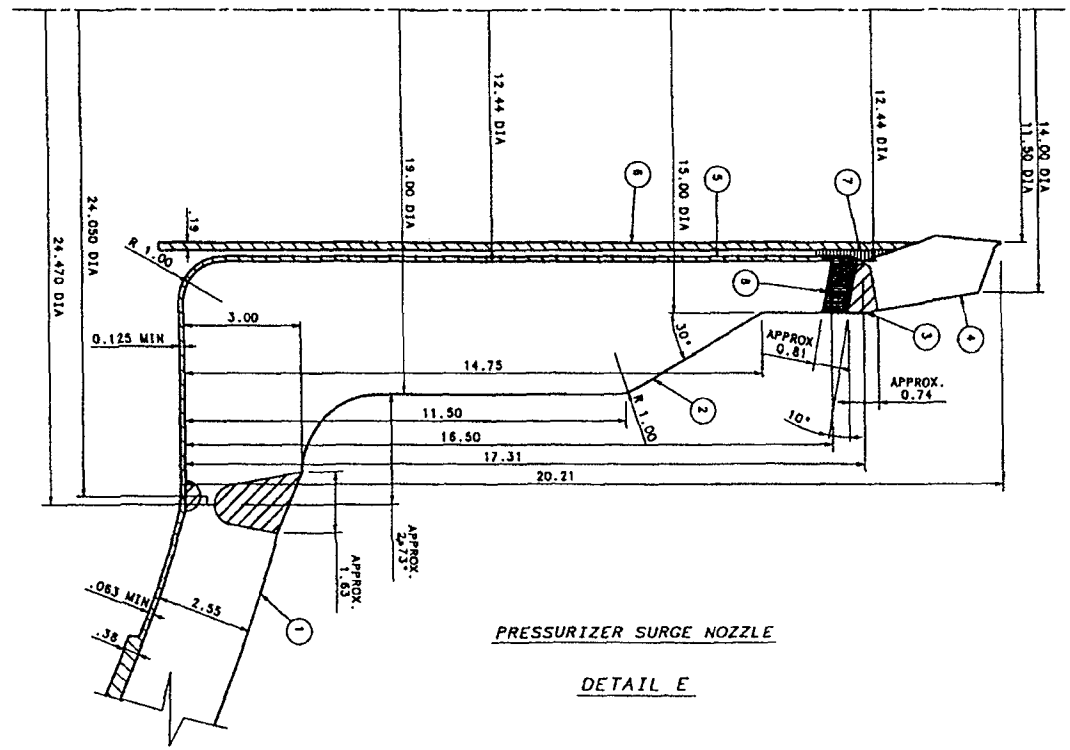
REFERENCE DRAWINGS

MEMO RIMS (WBN) WAT-D-10911
MEMO RIMS (SQN) B38 960527 802
1097J91
1099J91
350894-A
1098J04

ASME (CC-1) EQUIVALENT

NOTE: THE DIMENSIONS ON THIS DRAWING ARE FOR INFORMATION ONLY.

	SURGE NOZZLE MATERIAL
ITEM	ASME NO.
1	SA 533 GR.A, CLASS 2
2	SA 508 CLASS 2
3	INCONEL WELD
4	SA 182 GRADE F316L
5	SST CLADDING
6	SA 240
7	INCONEL WELD
8	INCONEL WELD BUILD-UP



PRESSURIZER SURGE NOZZLE

DETAIL E

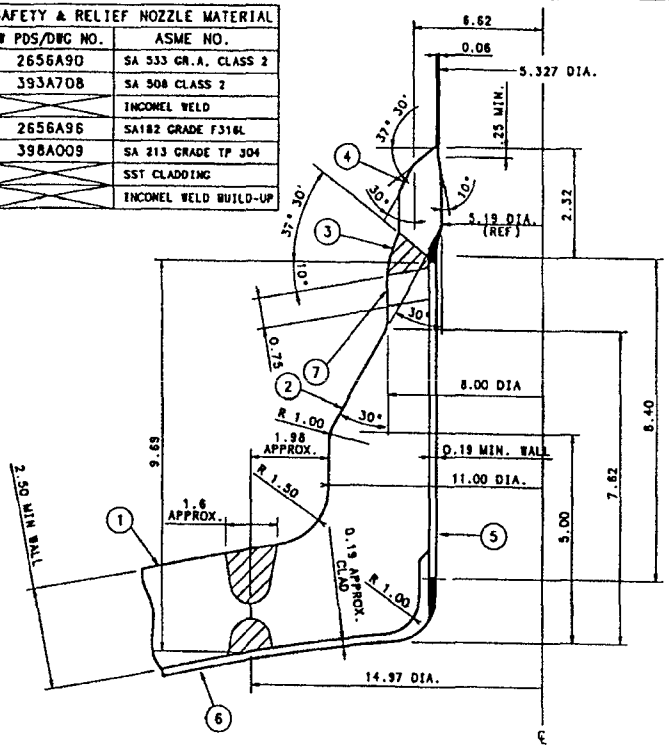
REV	BY	CHECKED	SUBMITTED	APPROVED	DATE

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT
UNIT 1
PRESSURIZER
SURGE NOZZLE DETAILS

DRAWN: PHB	DATE: 8-13-03	SCALE: NOT TO SCALE	
CHECKED: KEC	APPROVED: MDD	CAD MAINTAINED DRAWING	REV
SUBMITTED: ILH	CHM-2570-C-05		00

	SAFETY & RELIEF NOZZLE MATERIAL	
ITEM	W PDS/DWG NO.	ASME NO.
1	2656A90	SA 533 GR.A, CLASS 2
2	393A708	SA 508 CLASS 2
3		INCONEL WELD
4	2656A96	SA182 GRADE F316L
5	398A009	SA 213 GRADE TP 304
6		SST CLADDING
7		INCONEL WELD BUILD-UP



PRESSURIZER SAFETY & RELIEF NOZZLE

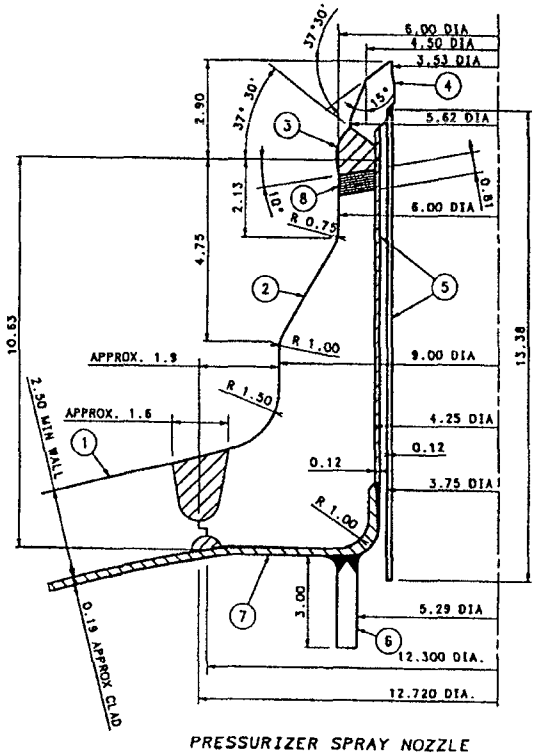
DETAIL C

	SPRAY NOZZLE MATERIAL	
ITEM	W PDS/DWG NO.	ASME NO.
1	2656A90	SA 533 GR.A, CLASS 2
2	393A708	SA 508 CLASS 2
3		INCONEL WELD
4	2656A96	SA 182 GRADE F316L
5	398A009	SA 213 GRADE TP 304
6	398A009	SA 312 GRADE TP 304
7		SST CLADDING
8		INCONEL WELD BUILD-UP

REFERENCE DRAWINGS
WESTINHOUSE DWG NO. EDSK-379348B
MEMO RIMS NO. WAT-D-10911 (WBN)
MEMO RIMS NO. B38 960527 802 (SON)
1097J91
1099J91
EDSK-379346B
1098J04

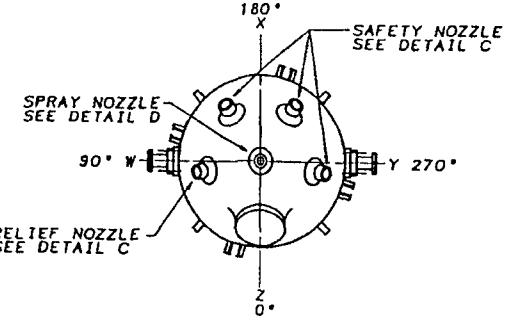
ASME (CC-1) EQUIVALENT

NOTE: THE DIMENSIONS ON THIS DRAWING ARE FOR INFORMATION ONLY.



PRESSURIZER SPRAY NOZZLE

DETAIL D

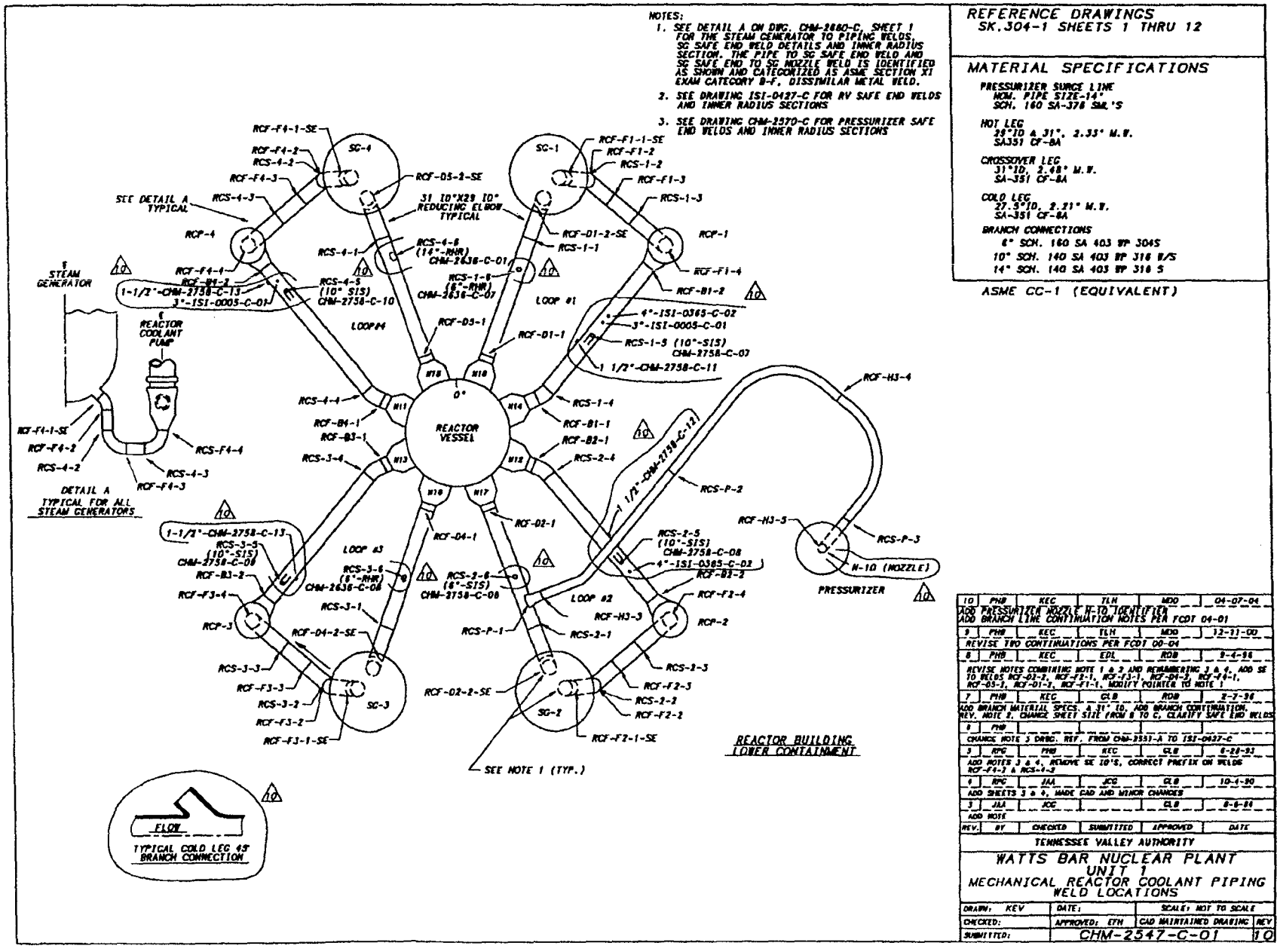


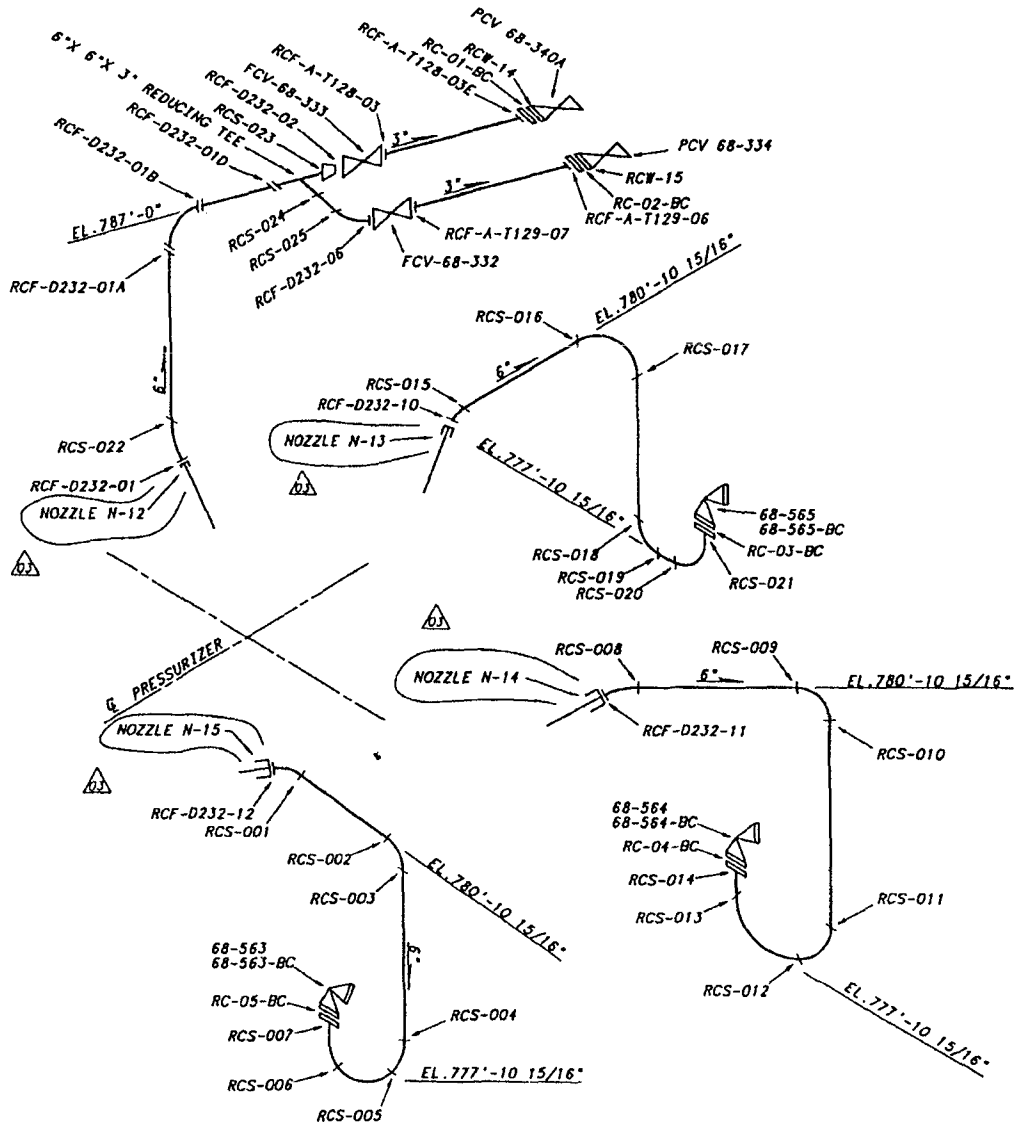
REV	BY	CHECKED	SUBMITTED	APPROVED	DATE

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT
UNIT 1
PRESSURIZER
SPRAY, SAFETY & RELIEF NOZZLE DETAILS

DRAWN: PHB	DATE: 8-13-03	SCALE: NOT TO SCALE	
CHECKED: KEC	APPROVED: MDD	CAD MAINTAINED DRAWING	REV
SUBMITTED: TLH	CHM-2570-C-06		00


NOTES:
1. SEE DETAIL A ON DWG. CHM-2680-C, SHEET 1 FOR THE STEAM GENERATOR TO PIPING WELDS, SG SAFE END WELD DETAILS AND INNER RADIUS SECTION. THE PIPE TO SG SAFE END WELD AND SG SAFE END TO SG NOZZLE WELD IS IDENTIFIED AS SHOWN AND CATEGORIZED AS ASME SECTION XI EXAM CATEGORY B-F, DISSIMILAR METAL WELD.
2. SEE DRAWING ISI-0427-C FOR RV SAFE END WELDS AND INNER RADIUS SECTIONS
3. SEE DRAWING CHM-2570-C FOR PRESSURIZER SAFE END WELDS AND INNER RADIUS SECTIONS
REFERENCE DRAWINGS
SK.304-1 SHEETS 1 THRU 12
MATERIAL SPECIFICATIONS
PRESSURIZER SURGE LINE
NOM. PIPE SIZE-14"
SCH. 160 SA-376 SML'S
HOT LEG
29"ID & 31", 2.33" M.W.
SA351 CF-8A
CROSSOVER LEG
31"ID, 2.48" M.W.
SA-351 CF-8A
COLD LEG
27.5"ID, 2.21" M.W.
SA-351 CF-8A
BRANCH CONNECTIONS
6" SCH. 160 SA 403 WP 304S
10" SCH. 140 SA 403 WP 316 W/S
14" SCH. 140 SA 403 WP 316 S
ASME CC-1 (EQUIVALENT)
SC-4
SC-1
SC-3
SC-2
RCP-4
RCP-1
RCP-3
RCP-2
REACTOR VESSEL
PRESSURIZER
N-10 (NOZZLE)
STEAM GENERATOR
REACTOR COOLANT PUMP
DETAIL A
TYPICAL FOR ALL STEAM GENERATORS
SEE DETAIL A TYPICAL
31 ID*X29 ID* REDUCING ELBOW TYPICAL
LOOP #1
LOOP #2
LOOP #3
LOOP #4
SEE NOTE 1 (TYP.)
REACTOR BUILDING LOWER CONTAINMENT
FLOW
TYPICAL COLD LEG 45° BRANCH CONNECTION
10 PHB KEC TLH MDD 04-07-04
ADD PRESSURIZER NOZZLE N-10 IDENTIFIER
ADD BRANCH LINE CONTINUATION NOTES PER FCDT 04-01
9 PHB KEC TLH MDD 12-11-00
REVISE TWO CONTINUATIONS PER FCDT 00-04
8 PHB KEC EDL RDB 9-4-96
REVISE NOTES COMBINING NOTE 1 & 2 AND RENUMBERING 3 & 4, ADD SE TO WELDS RCF-02-2, RCF-F3-1, RCF-F3-1, RCF-04-2, RCF-F4-1, RCF-05-2, RCF-01-2, RCF-F1-1, MODIFY POINTER TO NOTE 1
7 PHB KEC CLB RDB 2-7-96
ADD BRANCH MATERIAL SPECS. & 31" ID, ADD BRANCH CONTINUATION, REV. NOTE 2, CHANGE SHEET SIZE FROM B TO C, CLARIFY SAFE END WELDS
6 PHB
CHANGE NOTE 3 DRWG. REF. FROM CHM-2551-A TO ISI-0427-C
3 RPG PHB KEC CLB 8-26-93
ADD NOTES 3 & 4, REMOVE SE 10'S, CORRECT PREFIX ON WELDS RCF-F4-2 & RCS-4-2
4 RPG JAA JCC CLB 10-4-90
ADD SHEETS 3 & 4, MADE CAD AND MINOR CHANGES
3 JAA JCC CLB 8-6-84
ADD NOTE
REV. BY CHECKED SUBMITTED APPROVED DATE
TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT
UNIT 1
MECHANICAL REACTOR COOLANT PIPING
WELD LOCATIONS
DRAWN: KEV DATE: SCALE: NOT TO SCALE
CHECKED: APPROVED: ETH CAD MAINTAINED DRAWING REV
SUBMITTED: CHM-2547-C-01 10



REFERENCE DRAWINGS
82UU-001
WBN-E-2879 1C-232
SK-465-2 SH.1
SK-465-2 SH.2

MATERIAL SPECIFICATIONS
CLASS 1
PIPE
SEAMLESS STAINLESS STEEL
SA 376 TP 304
6"SCH.160
3"SCH.160

FITTINGS
SEAMLESS STAINLESS STEEL
SA 403 WP 304
6"SCH.160
3"SCH.160

FLANGES
SA 182 F316
6"SCH.160

SA 182 F304
3"SCH.160

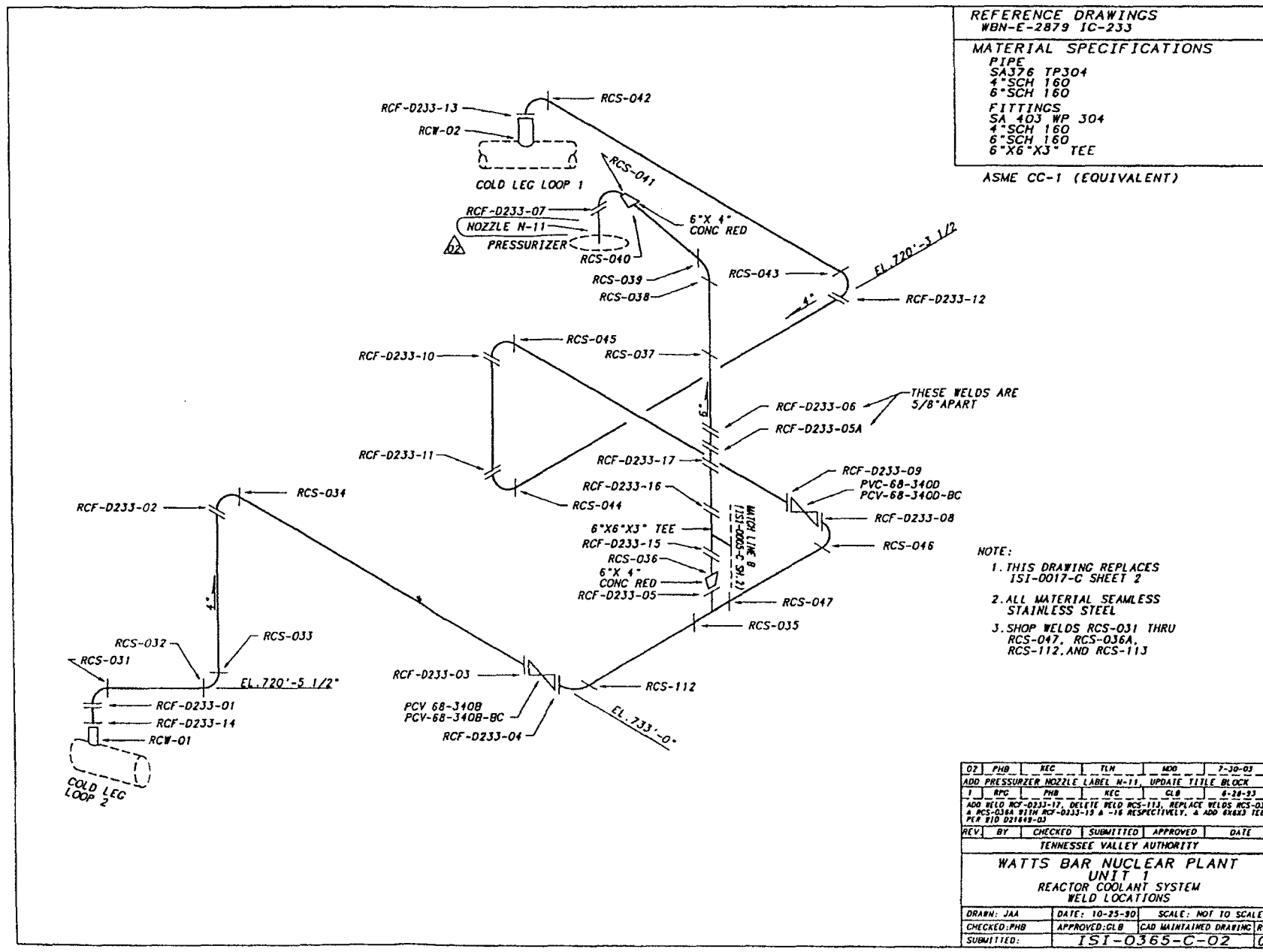
NOTES:
1. SHOP WELD NUMBERS RCS-01 THRU RCS-025
2. THIS DRAWING REPLACES ISI-0017-C SHEET 1

REV.	BY	CHECKED	SUBMITTED	APPROVED	DATE
3	PHB	KEC	TLH	MDD	7-30-03
	ADD PRESSURIZER NOZZLE ID'S				
2	PHB	CLB	KEC	HDB	3-7-96
	REMOVE BOLTED CONNECTIONS FROM VALVES				
1	PHB	CLB	KEC	RDB	9-27-95
	REVISE VALVE NOTATION PER TCDT 94-02, REVISE TITLE BLOCK				

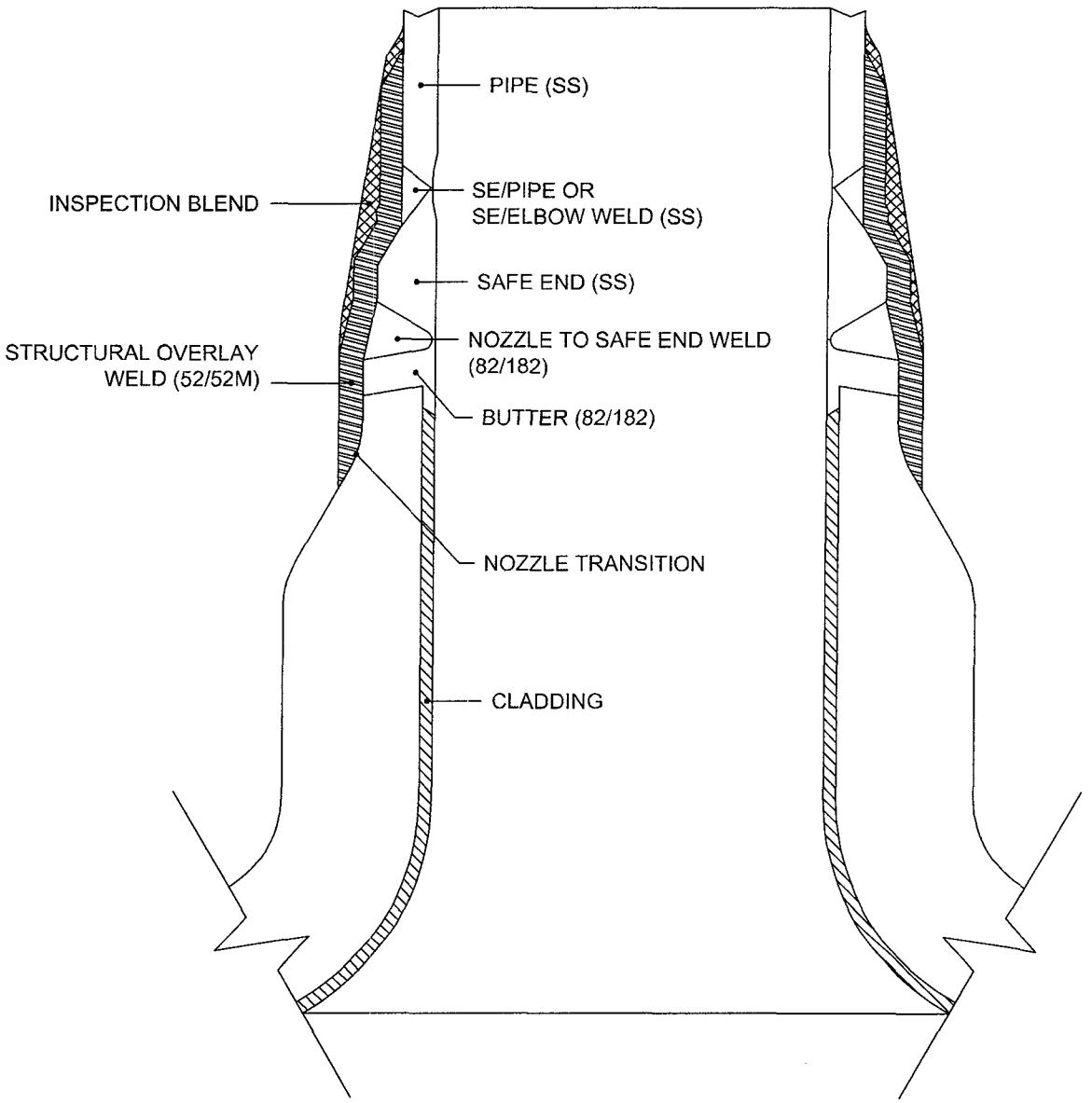
TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT
UNIT 1
REACTOR COOLANT SYSTEM
WELD LOCATIONS

DRAWN: JAA	DATE: 1-24-90	SCALE: NOT TO SCALE
CHECKED: PHB	APPROVED: CLB	CAD MAINTAINED DRAWING
SUBMITTED: JCC	ISI-0365-C-01	03


REFERENCE DRAWINGS
WBN-E-2879 IC-233
MATERIAL SPECIFICATIONS
PIPE
SA376 TP304
4"SCH 160
6"SCH 160
FITTINGS
SA 403 WP 304
4"SCH 160
6"SCH 160
6"X6"X3" TEE
ASME CC-1 (EQUIVALENT)
RCF-D233-13
RCW-02
COLD LEG LOOP 1
RCS-042
RCS-041
6"X 4" CONC RED
RCF-D233-07
NOZZLE N-11
PRESSURIZER
02
RCS-040
RCS-039
RCS-038
RCS-043
EL. 720'-3 1/2"
4"
RCF-D233-12
RCS-045
RCF-D233-10
RCS-037
6"
RCF-D233-06
RCF-D233-05A
THESE WELDS ARE 5/8"APART
RCF-D233-11
RCF-D233-17
RCF-D233-16
RCS-044
RCF-D233-09
PVC-68-340D
PCV-68-340D-BC
RCF-D233-08
RCS-046
6"X6"X3" TEE
RCF-D233-15
RCS-036
6"X 4" CONC RED
RCF-D233-05
MATCH LINE @ ISI-0005-C SH.2
RCS-047
RCS-035
RCF-D233-02
RCS-034
4"
RCS-032
RCS-033
RCS-031
EL. 720'-5 1/2"
RCF-D233-01
RCF-D233-14
RCW-01
COLD LEG LOOP 2
RCF-D233-03
RCS-112
PCV 68-340B
PCV-68-340B-BC
RCF-D233-04
EL. 733'-0"
NOTE:
1. THIS DRAWING REPLACES ISI-0017-C SHEET 2
2. ALL MATERIAL SEAMLESS STAINLESS STEEL
3. SHOP WELDS RCS-031 THRU RCS-047, RCS-036A, RCS-112, AND RCS-113
02 PHB REC TLN MDO 7-30-03
ADD PRESSURIZER NOZZLE LABEL N-11, UPDATE TITLE BLOCK
1 RFG PHB REC CLB 6-26-93
ADD WELD RCF-D233-17, DELETE WELD RCS-113, REPLACE WELDS RCS-036 & RCS-036A WITH RCF-D233-15 & -16 RESPECTIVELY, & ADD 6X6X3 TEE PER WID D216693-03
REV BY CHECKED SUBMITTED APPROVED DATE
TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT
UNIT 1
REACTOR COOLANT SYSTEM
WELD LOCATIONS
DRAWN: JAA
DATE: 10-25-90
SCALE: NOT TO SCALE
CHECKED:PHB
APPROVED:CLB
CAD MAINTAINED DRAWING
REV
SUBMITTED:
ISI-0365-C-02
02

ATTACHMENT 2



Typical Weld Overlay Configuration

ATTACHMENT 3
Modifications To Code Case N-504-2 and Corresponding Non-Mandatory Appendix Q Requirements

Code Case N-504-2	Modification/Basis
Reply: It is the opinion of the Committee that, in lieu of the requirements of IWA-4120 in Editions and Addenda up to and including the 1989 Edition with the 1991 Addenda, up to and including, the 1995 Edition, and in IWA-4410 in the 1995 Edition with the 1995 Addenda and later Editions and Addenda, defect in austenitic stainless steel piping may be reduced to a flaw of acceptable size in accordance with IWB-3640 form the 1983 Edition with the Winter 1985 Addenda, or later Editions and Addenda, by deposition of weld reinforcement (weld overlay) on the outside surface of the pipe, provided the following requirements are met. [Essentially same as Scope of Appendix Q]:	**Modification.** Code Case N-504-2 will be used for weld overlay repairs to the ferritic (P3) and nickel alloy (F43/P43) base material as well as the austenitic stainless steel (P8) base material. **Basis**: Code Case N-504-2 is accepted for use along with Nonmandatory Appendix Q in the current NRC Regulatory Guide 1.147 Rev. 14. For the weld overlay of the identified welds at TVA, the base material will be ferritic material (P3) with existing nickel alloy weld metal (F43/P43) to which an austenitic stainless steel (P8) safe-end is welded. Industry operational experience has shown that PWSCC in Alloy 82/182 will blunt at the interface with stainless steel base metal, ferritic base metal, or Alloy 52/52M weld metal, TVA plans to apply a 360 degree structural weld overlay to control growth in any PWSCC crack and maintain weld integrity. The weld overlay will induce compressive stress in the weld, thus impeding growth of any reasonably shallow cracks. Furthermore, the overlay will be sized to meet structural requirements independent of the existing weld.
(b) Reinforcement weld metal shall be low carbon (0.035 percent max.) austenitic stainless steel applied 360 degrees around the circumference of the pipe, and shall be deposited in accordance with a qualified welding procedure specification identified in the Repair Program. [Same as Q-2000(a)]	**Modification.** In lieu of austenitic stainless steel filler material, the reinforcement weld metal will be a nickel alloy. Basis: The weld metal used may be ERNiCrFe-7A (alloy 52M, UNS N06054) or ERNiCrFe-7 (alloy 52 UNS N06052). This weld metal is assigned F43 by ASME per Code Case 2142-2. The requirements of ASME Section III, NB-2400 will be applied to all filler material. The chromium content of Alloy 52M is 28 - 31.5 percent identical to that of Alloy 52. The main difference in Alloy 52 vs. Alloy 52M is a higher Niobium content (0.5 - 1 percent).

ATTACHMENT 3 (continued)
Modifications To Code Case N-504-2 and Corresponding Non-Mandatory Appendix Q Requirements

	The difference in chemical composition between Alloy 52 and Alloy 52M improves the weldability of the material and pins the grain boundaries thus reducing the likelihood of separation between the grains and hot tearing during weld puddle solidification. These filler materials were selected for their improved resistance to PWSCC. Alloys 52 and 52M contain about 30 percent chromium that imparts excellent corrosion resistance. The existing alloy 82/182 weld and the Alloy 52/52M overlay are nickel base and have ductile properties and toughness similar to austenitic stainless steel piping welds at pressurized water reactor operating temperature. These filler materials are suitable for welding over the ferritic nozzle or pipe Alloy 82/182 weld and the austenitic stainless steel pipe or safe-ends.
(e) The weld reinforcement shall consist of a minimum of two weld layers having as-deposited delta ferrite content of at least 7.5 FN. The first layer of weld metal with delta ferrite content of least 7.5 FN shall constitute the first layer of the weld reinforcement design thickness. Alternatively, first layers of at least 5 FN may be acceptable based on evaluation. [Same as Q-2000(d)]	**Modification:** Delta ferrite (FN) measurements will not be performed for weld overlay repairs made of Alloy 52/52M weld metal. **Basis:** Welds of alloy 52/52M are 100 percent austenitic and contain no delta ferrite due to the high nickel composition (approximately 60 percent nickel).

ATTACHMENT 4
Modification To Code Case N-638-1

Code Case N-638-1	Modification/Basis
1.0(a) The maximum area of an individual weld based on the finished surface shall be 100 square inches, and the depth of the weld shall not be greater than one-half of the ferritic base metal thickness.	**Modification:** In certain cases (e.g. with surge line nozzles) it will be necessary for the weld overlays to exceed the 100 square inches limitation. **Basis:** Use of Code Case N-638-1 is primarily focused on application of the weld filler material on ferritic portion of the pressurizer nozzle base metal extending onto the existing Alloy 82/182 nonferritic buttering (in accordance with N-638-1 1.0(b). Depending upon the diameter of the nozzle(s) and process pipe to be overlaid and the axial extent of the overlay, the 100 square inches limit of surface covered by the overlay imposed by Code Case N-638-1 may be exceeded. Additional weld material may need to be deposited, in the axial directions, onto the ferritic nozzle and onto the stainless steel process pipe in order to facilitate the required post-overlay ultrasonic examination and/or to ensure that a final smooth nozzle area contour is obtained. As part of this request, TVA proposes to keep the maximum weld overlay surface areas on the ferritic nozzle base materials to less than, or equal to, 300 square-inches. In support of this modification to the N-638-1 limitation is an ASME Code Committee white paper which supported the revision of the Code Case to revision N-638-2. This Code Committee white paper is under NRC review as part of the Calvert Cliffs Nuclear Power Plant, Units 1 and 2, Docket Nos. 50-317 & 50-318, Submittal dated January 18, 2006 [ML060240110]. The use N-638-2 has not been approved, by the regulator, for generic application and published in RG-1.147. However, the ASME Code Committee white paper indicates that the 100 square inch limitation was arbitrarily established and repair areas of up to 500 square inches would have no adverse effects. (Reference ASME Code Committee action item # RRA 00-04, tracking #BC04-1000)

ATTACHMENT 4 (continued)
Modification To Code Case N-638-1

(Referenced below in 4.0(b) para. 1.0(d) Prior to welding the area to be welded and a band around the area of at least 1-1/2 times the component thickness or 5 in., whichever is less shall be at least 50°F.) 4.0(b) The final weld surface and a band around the area defined in para. 1.0(d) shall be examined using a surface and ultrasonic methods when the completed weld has been at ambient temperature for at least 48 hours. The ultrasonic examination shall be in accordance with Appendix I.[3] ——— [3] Refer to the 1989 Edition with the 1989 Addenda and later Editions and Addenda	**Modification:** In lieu of the required ultrasonic examination of 4.0(b) only the required liquid penetrant examination will be performed. The ultrasonic examination will be in accordance with N-504-2 and Appendix Q. **Basis:** For the application of the weld overlays or repairs, for some of the DM welds addressed in this request, it is not possible to perform a meaningful ultrasonic (UT) examination of the required band of base material because of the existing nozzle configurations shown in the TVA drawings contained in Attachment 1. This occurs with the SQN safety and relief valve nozzle and the spray line nozzle areas. This Code Case applies to any type of welding where a temper bead technique is to be employed and is not specifically written for a weld overlay repair. However, it is believed that for this type of repair any major base material cracking would take place in the heat affected zone (HAZ) directly below the weld overlay or in the underlying 82/182 weld deposit and not in the required band of material out beyond the overlay. Therefore, it is assumed that if this cracking were to occur it would be identified by the ultrasonic examination of the weld overlay and not performing the required base material ultrasonic examination should be considered acceptable.

ATTACHMENT 4 (continued)
Modification To Code Case N-638-1

4.0(c)requires temperature monitoring by welded thermocouples per IWA-4610(a)	**Modification:** Preheat and interpass temperatures for the weld pad will be measured using a contact pyrometer. Interpass temperature will be monitored for the first three layers at each repair location. On the first repair location, the interpass temperature measurements will be taken every three to five passes. After the first three layers, interpass temperature measurements will be taken every six to ten passes for the subsequent layers. The heat input for layers beyond the third layer will not have a metallurgical affect on the low alloy steel HAZ. **Basis:** Due to the location of the repair and area radiation dose rate, the placement of welded thermocouples for monitoring weld interpass temperatures determined to be not beneficial based on dose costs. Therefore, welded thermocouples are not planned for use to monitor interpass temperature during welding.

(1) Regulatory Guide 1.147, Rev. 14, Page 14, Table 2, "Conditionally Acceptable Section XI Code Cases," special condition for Code Case N-638-1: "UT examinations shall be demonstrated for the repaired volume using representative samples which contain construction type flaws. The acceptance criteria of NB-5330 of Section III edition and addenda approved in 10 CFR 50.55a apply to all flaws identified within the repaired volume."	**Modification:** In lieu of the ultrasonic examination acceptance criteria of the Construction Code in the condition for the use of Code Case N-638-1, the acceptance criteria of ASME Section XI Nonmandatory Appendix Q, as stipulated in the Conditions of RG-1.147, Rev. 14, for the use of Code Case N-504-2 will be applied for the entire structural weld overlay. **Basis:** As an approved alternative to the requirements of ASME Section XI, the use of the approved RG-1.147 stipulations with use of Code Case N-504-2 is appropriate in order to reduce the possibility of conflicting acceptance criteria and provides an acceptable level of quality and safety.

ATTACHMENT 5
Alternatives to Appendix VIII, Supplement 11

Appendix VIII of Section XI cannot be used for NDE of a structural weld overlay repair. Relief is requested to use the PDI program implementation of Appendix VIII. A detailed comparison of Appendix VIII and PDI requirements is summarized below.

Relief is requested to allow closer spacing of flaws provided they don't interfere with detection or discrimination. The specimens used to date for qualification to the Tri-party (NRC/BWROG/EPRI) agreement have a flaw population density greater than allowed by current Code requirements. These samples have been used successfully for all previous qualifications under the Tri-party agreement program. To facilitate their use and provide continuity from the Tri-party agreement program to Supplement 11, the PDI program has merged the Tri-party test specimens into their weld overlay program.

Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
1.0 SPECIMEN REQUIREMENTS	
1.1 General. The specimen set shall conform to the following requirements.	
*(b)*The specimen set shall consist of at least three specimens having different nominal pipe diameters and overlay thicknesses. They shall include the minimum and maximum nominal pipe diameters for which the examination procedure is applicable. Pipe diameters within a range of 0.9 to 1.5 times a nominal diameter shall be considered equivalent. If the procedure is applicable to pipe diameters of 24 in. or larger, the specimen set must include at least one specimen 24 in. or larger but need not include the maximum diameter. The specimen set must include at least one specimen with overlay thickness within -0.1 in. to +0.25 in. of the maximum nominal overlay thickness for which the procedure is applicable.	**Alternative**: *(b)* The specimen set shall include specimens with overlays not thicker than 0.1 in. more than the minimum thickness, nor thinner than 0.25 in. of the maximum nominal overlay thickness for which the examination procedure is applicable. **Basis**: To avoid confusion, the overlay thickness tolerance contained in the last sentence was reworded and the phrase "and the remainder shall be alternative flaws" was added to the next to last sentence in paragraph 1.1(d)(1).

ATTACHMENT 5 (continued)
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(d) Flaw Conditions	
(1) Base metal flaws. All flaws must be cracks in or near the butt weld heat-affected zone, open to the inside surface, and extending at least 75 percent through the base metal wall. Flaws may extend 100 percent through the base metal and into the overlay materials; in this case, intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the cracking. Specimens containing IGSCC shall be used when available.	**Alternative:** (1) ...must be in or... intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws. Specimens containing intergranular stress corrosion cracking shall be used when available. At least 70 percent of the flaws in the detection and sizing tests shall be cracks and the remainder shall be alternative flaws. Alternative flaw mechanisms, if used, shall provide crack-like reflective characteristics and shall be limited by the following: (a)The use of alternative flaws shall be limited to when the implantation of cracks produces spurious reflectors that are uncharacteristic of actual flaws. (b)Flaws shall be semi elliptical with a tip width of less than or equal to 0.002 inches. **Basis**: This paragraph requires that all base metal flaws be cracks. Implanting a crack requires excavation of the base material on at least one side of the flaw. While this may be satisfactory for ferritic materials, it does not produce a useable axial flaw in austenitic materials because the sound beam, which normally passes only through base material, must now travel through weld material on at least one side, producing an unrealistic flaw response. To resolve this issue, the PDI program revised this paragraph to allow use of alternative flaw mechanisms under controlled conditions. For example, alternative flaws shall be limited to when implantation of cracks precludes obtaining an effective ultrasonic response, flaws shall be semi elliptical with a tip width of less than, or equal,

ATTACHMENT 5 (continued)
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(d) *Flaw Conditions*	
	to 0.002 inches, and at least 70 percent of the flaws in the detection and sizing test shall be cracks and the remainder shall be alternative flaws. To avoid confusion, the overlay thickness tolerance contained in paragraph 1.1(b) last sentence, was reworded and the phrase "and the remainder shall be alternative flaws" was added to the next to last sentence. Paragraph 1.1(d)(1) includes the statement that intentional overlay fabrication flaws shall not interfere with ultrasonic detection or characterization of the base metal flaws.

ATTACHMENT 5 (continued)
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(e) Detection Specimens	
(1) At least 20 percent but less than 40 percent of the flaws shall be oriented with ±20 degrees of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access. The rules of IWA-3300 shall be used to determine whether closely spaced flaws should be treated as single or multiple flaws.	**Alternative:** (1) At least 20 percent but less than 40 percent of the base metal flaws shall be oriented within ± 20 degrees of the pipe axial direction. The remainder shall be oriented circumferentially. Flaws shall not be open to any surface to which the candidate has physical or visual access. **Basis**: The requirement for axially oriented overlay fabrication flaws was excluded from the PDI Program as an improbable scenario. Weld overlays are typically applied using automated GTAW techniques with the filler metal applied in a circumferential direction. Because resultant fabrication induced discontinuities would also be expected to have major dimensions oriented in the circumferential direction axial overlay fabrication flaws are unrealistic. The requirement for using IWA-3300 for proximity flaw evaluation was excluded. Instead indications will be sized based on their individual merits.
(2) Specimens shall be divided into base and overlay grading units. Each specimen shall contain one or both types of grading units.	**Alternative:** (2) Specimens shall be divided into base metal and overlay fabrication grading units. Each specimen shall contain one or both types of grading units. Flaws shall not interfere with ultrasonic detection or characterization of other flaws.

ATTACHMENT 5 (continued)
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(a)(1) A base grading unit shall include at least 3 in. of the length of the overlaid weld. The base grading unit includes the outer 25 percent of the overlaid weld and base metal on both sides. The base grading unit shall not include the inner 75 percent of the overlaid weld and base metal overlay material, or base metal-to-overlay interface.	**Alternative:** (a)(1) A base metal grading unit includes the overlay material and the outer 25 percent of the original overlaid weld. The base metal grading unit shall extend circumferentially for at least 1 in. and shall start at the weld centerline and be wide enough in the axial direction to encompass one half of the original weld crown and a minimum of 0.50" of the adjacent base material. **Basis**: The phrase "and base metal on both sides," was inadvertently included in the description of a base metal grading unit. The PDI program intentionally excludes this requirement because some of the qualification samples include flaws on both sides of the weld. To avoid confusion several instances of the term "cracks" or "cracking" were changed to the term "flaws" because of the use of alternative Flaw mechanisms. Modified to require that a base metal grading unit include at least 1 in. of the length of the overlaid weld, rather than 3 inches.

ATTACHMENT 5 (continued)
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(a)(2) When base metal cracking penetrates into the overlay material, the base grading unit shall include the overlay metal within 1 in. of the crack location. This portion of the overlay material shall not be used as part of any overlay grading unit.	**Alternative:** (a)(2) When base metal flaws penetrate into the overlay material, the base metal grading unit shall not be used as part of any overlay fabrication grading unit.
(a)(3) When a base grading unit is to be unflawed, at least 1 in. of unflawed overlaid weld and base metal shall exist on either side of the base grading unit. The segment of weld length used in one base grading unit shall not be used in another base grading unit. Base grading units need not be uniformly spaced around the specimen.	**Alternative:** (a)(3) Sufficient unflawed overlaid weld and base metal shall exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws. Modified to require sufficient unflawed overlaid weld and base metal to exist on all sides of the grading unit to preclude interfering reflections from adjacent flaws, rather than the 1 inch requirement.
(b)(1)An overlay grading unit shall include the overlay material and base metal-to-overlay interface of at least 6 in^2. The dimensions of 2 in.	**Alternative:** *(b)*(I) An overlay fabrication grading unit shall include the overlay material and the base metal-to-overlay interface for a length of at least 1 inch. Modified to define an overlay fabrication grading unit as including the overlay material and the base metal-to-overlay interface for a length of at least 1 in, rather than the 6 in^2 Requirement.

ATTACHMENT 5 (continued)
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(b)(2) An overlay grading unit designed to be unflawed shall be surrounded by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 in. around its entire perimeter. The specific area used in one overlay grading unit shall not be used in another overlay grading unit. Overlay grading units need not be spaced uniformly about the specimen.	**Alternative:** (b)(2) Overlay fabrication grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 in. at both ends. Sufficient unflawed overlaid weld and base metal shall exist on both sides of the overlay fabrication grading unit to preclude interfering reflections from adjacent flaws. The specific area used in one overlay fabrication grading unit shall not be used in another overlay fabrication grading unit. Overlay fabrication grading units need not be spaced uniformly about the specimen. **Basis**: Paragraph 1.1(e)(2)(b)(2) states that overlay fabrication grading units designed to be unflawed shall be separated by unflawed overlay material and unflawed base metal-to-overlay interface for at least 1 in. at both ends, rather than around its entire perimeter.

ATTACHMENT 5 (continued)
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
(b)(3) Detection sets shall be selected from Table VIII-S2-1. The minimum detection sample set is five flawed base grading units, ten unflawed base grading units, five flawed overlay grading units, and ten unflawed overlay grading units. For each type of grading unit, the set shall contain at least twice as many unflawed as flawed grading units.	**Alternative:** ...base metal grading units, ten unflawed base metal grading units, five flawed overlay fabrication grading units, and ten unflawed overlay fabrication grading units. For initial procedure qualification, detection sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.
(*f*) Sizing Specimen	
(1)The minimum number of flaws shall be ten. At least 30 percent of the flaws shall be overlay fabrication flaws. At least 40 percent of the flaws shall be cracks open to the inside surface.	**Alternative:** (1) The .... Least 40 percent of the flaws shall be open to the inside surface. Sizing sets shall contain a distribution of flaw dimensions to assess sizing capabilities. For initial procedure qualification, sizing sets shall include the equivalent of three personnel qualification sets. To qualify new values of essential variables, at least one personnel qualification set is required.
(3) Base metal cracking used for length sizing demonstrations shall be oriented circumferentially.	**Alternative:** (3) Base metal flaws used ... circumferentially.
(4) Depth sizing specimen sets shall include at least two district locations where cracking in the base metal extends into the overlay material by at least 0.1 in. in the through-wall direction.	**Alternative:** (4) Depth sizing specimen sets shall include at least two distinct locations where a base metal flaw extends into the overlay material by at least 0.1 in. in the through-wall direction.

ATTACHMENT 5 (continued)
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
2.0 CONDUCT OF PERFORMANCE DEMONSTRATION	
The specimen inside surface and identification shall be concealed from the candidate. All examinations shall be completed prior to grading the results and presenting the results to the candidate. Divulgence of particular specimen results or candidate viewing of unmasked specimens after the performance demonstration is prohibited.	**Alternative**: The specimen.....prohibited. The overlay fabrication flaw test and the base metal flaw test may be performed separately.
2.1 Detection Test	
Flawed and unflawed grading units shall be randomly mixed. Although the boundaries of specific grading units shall not be revealed to the candidate, the candidate shall be made aware of the type or types of grading units (base or overlay) that are present for each specimen.	**Alternative:** Flawed.... (base metal or overlay fabrication) ...each specimen.
2.2 Length Sizing Test	
	Alternative: *(d)* For ...base metal grading ... base metal wall thickness.

ATTACHMENT 5 (continued)
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
2.3 Depth Sizing Test	
For the depth sizing test, 80 percent of the flaws shall be sized at a specific location on the surface of the specimen identified to the candidate. For the remaining flaws, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.	**Alternative:** (a) The depth sizing test may be conducted separately or in conjunction with the detection test. (b) When the depth sizing test is conducted in conjunction with the detection test and the detected flaws do not satisfy the requirements of 1.1(f), additional specimens shall be provided to the candidate. The regions containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region. (c) For a separate depth sizing test, the regions of each specimen containing a flaw to be sized shall be identified to the candidate. The candidate shall determine the maximum depth of the flaw in each region.

ATTACHMENT 5 (continued)
Alternatives to Appendix VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
3.0 ACCEPTANCE CRITERIA	
3.1 Detection Acceptance Criteria	
Examination procedures, equipment, and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls. The criteria shall be satisfied separately by the demonstration results for base grading units and for overlay grading units.	**Alternative:** Examination procedures are qualified for detection when: a. All flaws within the scope of the procedure are detected and the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for false calls. b. At least one successful personnel demonstration has been performed meeting the acceptance criteria defined in (c). c. Examination equipment and personnel are qualified for detection when the results of the performance demonstration satisfy the acceptance criteria of Table VIII-S2-1 for both detection and false calls. d. The criteria in (b) and (c) shall be satisfied separately by the demonstration results for base metal grading units and for overlay fabrication grading units.

ATTACHMENT 5 (continued)
Alternatives to Appendix 'VIII, Supplement 11

SUPPLEMENT 11 – QUALIFICATION REQUIREMENTS FOR FULL STRUCTURAL OVERLAID WROUGHT AUSTENITIC PIPING WELDS	PDI PROGRAM: The Proposed Alternative to Supplement 11 Requirements
3.2 Sizing Acceptance Criteria	
(a) The RMS error of the flaw length measurements, as compared to the true flaw lengths, is less than or equal to 0.75 inch. The length of base metal cracking is measured at the 75 percent through-base-metal position.	**Alternative:** *(a)* The ... base metal flaws is ... position.
(b) All extensions of base metal cracking into the overlay material by at least 0.1 in. are reported as being intrusions into the overlay material.	**Alternative:** This requirement is omitted. Basis: The requirement for reporting all extensions of cracking into the overlay is omitted from the PDI Program because it is redundant to the RMS calculations performed in paragraph 3.2(c) and its presence adds confusion and ambiguity to depth sizing as required by paragraph 3.2(c). This also makes the weld overlay program consistent with the Supplement 2 depth sizing criteria.

Enclosure 2

TVA Commitments

1. The design report for these preemptive weld overlays will be provided to the NRC Staff as part of the supporting information for this request.

2. A final structural integrity evaluation (including analysis of any indications found during the pre-overlay examinations) which support this relief request will be provided to the NRC Staff prior to the restart of the unit (prior to entry into Mode 4) during the outage in which the overlays are performed.