Attachment 2

Framatome ANP Non-Proprietary Documents for Relief Requests 30 and 31

Framatome ANP Non-Proprietary Document List for Relief Requests 30 and 31

1. Framatome Document 33-5016874, Rev. 0, Dated 2/19/02, ASME Stress Report, CRDM ID Temperbead Repair Stress Report, Turkey Point Unit 3

2. Framatome Document 51-5014575, Rev. 1 Dated 1/30/02, Turkey Point CRDM Nozzle ID Temper Bead Weld Repair Requirements

3. Framatome Document 32-5016950, Rev. 3, Dated 6/3/02, TP4 CRDM Temperbead Weld Repair Analysis

FRAMATOME ANP

TECHNICAL DOCUMENT

ASME Stress Report

FRA-ANP Contract 4160057

5016874 ~~ASS~~ per HTH 2/19/02

33-~~5015074~~-00

Doc. ID - Serial No., Revision No.
For

CRDM ID Temperbead Repair Stress Report

Turkey Point Unit 3

FRAMATOME ANP

NUMBER: 33-5016874-00

RECORD OF REVISION

REV. NO.	CHANGE SECT/PARA.	DESCRIPTION/CHANGE AUTHORIZATION
0	All Sections	Original Issue

Prepared By: [signature] Date: 2-18-2002

Reviewed By: J F Shepard Date: 2/18/02

Approved By: [signature] Date: 2/19/02

TABLE OF CONTENTS

STRESS REPORT CERTIFICATION DOCUMENT

FRAMATOME ANP

FRA-ANP Contract No. 4160057

CRDM ID Temperbead Weld Repair -- Turkey Point Unit 3

I certify that the calculation in Reference [1.1] on sheet A-2 demonstrates that the CRDM ID Temperbead Weld Repair defined in Reference [2.1] on sheet A-2 meets the Class 1 stress and fatigue criteria of the ASME Boiler and Pressure Vessel Code, Section III, 1989 Edition with no Addenda, for the loading conditions defined in Reference [3.1] on sheet A-2.

This certification consist of two (2) sheets, sheets A-1 and A-2, which together form part and parcel of the whole as if written on this sheet.

Attested to this date: 2-18-2002

COMMONWEALTH OF VIRGINIA
HARRY T. HARRISON, III
No. 12551
PROFESSIONAL ENGINEER

By Harry T. Harrison III
Harry T. Harrison III
Framatome ANP
Lynchburg, Virginia

License No. 12551
Virginia State Board of Professional Engineers

Sheet A-1 of A-2

CERTIFICATION DOCUMENT

FRAMATOME ANP

FRA-ANP Contract No. 4160057

REFERENCES

1.0 DESIGN ANALYSIS

1.1 FRA-ANP Document No. 32-5014640-02, "Turkey Point 3 – CRDM Temperbead Bore Weld Analysis"

2.0 DESIGN DRAWINGS

2.1 FRA-ANP Drawing No. 02-5014781E-00, "CRDM Nozzle ID Temperbead Weld Repair"

3.0 SPECIFICATIONS

3.1 FRA-ANP Document No. 51-5014575-01, "Turkey Point CRDM Nozzle ID Temperbead Weld Repair Requirements"

Sheet A-2 of A-2

CERTIFICATION DOCUMENT

FRAMATOME ANP

FRA-ANP Contract No. 4160057

ASME Code Reconciliation

The Construction Code for the Turkey Point 3 reactor closure head is ASME Section III, 1965 Edition with Summer 1966 Addenda.

The analysis of the repair was performed to the 1989 Edition of ASME Section III, no addenda.

The stress criteria and allowable stresses are the same in both Code editions with the following exception:

> In Table N-413 of the original Construction Code, the bending stress due to a through-wall thermal gradient is classified as a peak stress.
>
> In Table NB-3217-1 of the 1989 Edition of ASME Section III, this stress, the equivalent linear stress, is classified as a secondary stress and, therefore, its effect must be included in the calculation of the range of primary-plus-secondary stress intensity (NB-3222.2).
>
> The criterion of the 1989 Edition is more restrictive. Since the analysis was performed to the 1989 Code, the requirements of the original Construction Code are satisfied as well.

FRAMATOME ANP

ENGINEERING INFORMATION RECORD

Document Identifier 51 - 5014575-01

Title TURKEY POINT CRDM NOZZLE ID TEMPER BEAD WELD REPAIR REQUIREMENTS

PREPARED BY:

Name William S. Morgan

Signature [signature] Date 1/30/02

REVIEWED BY:

Name Dale Matthews

Signature [signature] Date 1/30/02

Technical Manager Statement: Initials DEW

Reviewer is Independent.

Remarks:

This document contains the requirements for implementation of a Control Rod Drive Assembly (CRDM) nozzle ID temper bead weld repair to be performed at FP&L's Turkey Point Unit Numbers-3 & 4.

Record of Revisions:

Rev 01: Revised paragraphs 3.5 and 6.5.3.1; Deleted paragraph 6.5.3.2; Added References 2.11 and 2.12; Added second paragraph to Appendix B.

1.0 Introduction and Background

In December 2000, inspection of the Alloy 600 control rod drive mechanism (CRDM) nozzle penetrations in the RV closure head (RVH) at Oconee Unit 1 identified leakage in the region of the partial penetration attachment weld between the RVH and the CRDM nozzle. This leakage, identified as the result of Primary Water Stress Corrosion Cracking (PWSCC), was repaired using manual grinding and welding. In February 2001, the manual repair of several CRDM nozzles at Oconee Unit 3 with similar defects resulted in extensive radiation dose to the personnel due to the location and access limitations.

Consequently, the B&W Owner's Group (BWOG) commissioned Framatome ANP (FRA-ANP) to design and demonstrate an automated repair that was ultimately implemented at Oconee Unit 2. The requirements for development and qualification of the repair are contained in Reference 2.4.

Due to concerns that similar CRDM nozzle degradation may have occurred at other Pressurized Water Reactors (PWRs), Florida Power & Light (FP&L) has contracted FRA-ANP to adapt this repair for its Turkey Point Units 3 & 4(TP-3 & 4) with modifications as required to meet Reference 2.1.5. This document contains the technical requirements for implementation of this repair at TP-3 & 4.

2.0 References

All references are the latest published edition unless otherwise noted.

2.1 ASME Boiler and Pressure Vessel Code

2.1.1 Section II, Material Specifications, 1989 Edition, with no Addenda.

2.1.2 Section III, Nuclear Power Plant Components, Subsection NB, 1989 Edition, with no Addenda

2.1.3 Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components, 1989 Edition, with no Addenda.

2.1.4 Code Case 2142-1

2.1.5 Code Case N-638

2.2 FRA-ANP Document 56-1151178, ASME Sections III & XI QA Program

2.3 FRA-ANP Document 56-1201212, Safety Related QA Program

2.4 FRA-ANP Document 51-5011892, Technical Requirements Document (TRD) - Design and Qualification of ID Temper Bead Weld Repair for a B&W CRDM Nozzle.

2.5 FRA-ANP Document 55-PQ7031;Thermal Sleeve Weld Procedure Qualification

2.6 FRA-ANP Drawing 02-117875E; Arrgt- RV Long. Sect.

2.7 FRA-ANP Drawing 02-117878E; Closure Head Ass'y (Unit 3)

2.8 FRA-ANP Drawing 02-117881E; Closure Head Sub- Ass'y (Unit 3)

2.9 FRA-ANP Drawing 02-117880E; Det & Sub Ass'y CR Mech Housing

2.10 FRA-ANP Document 54-1221817; Visual Examination of Thermal Sleeve Reattachment Weld.

2.11 FRA-ANP Drawing 02-153810E; Closure Head Ass'y (Unit 4)

2.12 FRA-ANP Drawing 02-153811E; Closure Head Sub- Ass'y (Unit 4)

3.0 General Requirements

3.1 The repair weld shall meet the applicable configuration requirements of Reference 2.1.2, Subsection NB, for a Category D partial penetration weld.

3.2 The repair weld shall be deposited using the machine GTAW process, with cold wire feed, in accordance with Reference 2.1.5, except as allowed in Paragraph 3.5.

3.3 Riser blocks shall be provided if required to elevate the head to a height that permits use of repair equipment designated by FRA-ANP and agreed upon by FP&L & FRA-ANP.

3.4 The specific nozzle(s) to be repaired shall be identified based on a visual, surface, and/or volumetric examinations for CRDM nozzle leakage. FP&L shall specify, in writing, the CRDM nozzles to be repaired.

3.5 The work shall be performed in accordance with the requirements of References 2.1.1, 2.1.2 and 2.1.5 as applicable. The portions of these references, and the extent to which each portion of each reference applies to the work, shall be established by the utility. Once established, if specific requirements will not be met, relief requests against the applicable requirements shall be submitted for regulatory approval. This shall be the responsibility of the utility. Note: Reference 2.1.5 has been tentatively approved in Proposed Regulatory Guide 1.147, Rev 13 (Draft Regulatory Guide DG-1091 dated Dec. 2001).

3.6 Weld filler material used for the repair shall be in accordance with the applicable requirements of References 2.1.2 and 2.1.4.

3.7 Repair Description

3.7.1 Baseline volumetric and surface examination of repair region.

3.7.2 Remove the thermal sleeve from the nozzle as follows:
<u>Note: Not applicable for part length drive nozzles and all other RV Head Penetration (RVHP) Nozzles that do not contain thermal sleeves.</u>

3.7.2.1 Clean the thermal sleeve bore.

3.7.2.2 Install the thermal sleeve cut-off tool.

3.7.2.3 Cut and remove the lower portion of the thermal sleeve.

3.7.3 Roll expand the CRDM nozzle into the Reactor Vessel Head (RVH) penetration.

3.7.4 Clean the nozzle bore.

3.7.5 Machine away the lower end of the nozzle and form the weld preparation.

3.7.6 Grind chamfer at the bottom end of the RVH penetration in the remnant of the original CRDM nozzle/RVH attachment weld (this step may be performed at any time after paragraph 3.7.5 and prior to paragraph 3.7.14).

3.7.7 PT bored region of RVH and weld prep on the bottom of the remaining portion of the CRDM nozzle.

3.7.8 Clean repair area suitable for welding.

3.7.9 Deposit repair weld.

3.7.10 Machine the weld to re-establish nozzle free path and to provide a surface suitable for PT and UT.

3.7.11 PT the repair.

3.7.12 UT the repair.

3.7.13 Remediate the repair using abrasive waterjet (AWJ).

3.7.14 No-go gage the repair area (to confirm that free path and wall thickness requirements, respectively, have been maintained).

3.7.15 Replace the thermal sleeve as follows: **<u>Note: This requirement is not applicable for RVHP nozzles that do not contain thermal sleeves.</u>**

3.7.15.1 Install the thermal sleeve deburring tool.

3.7.15.2 Deburr/hone the upper portion of the thermal sleeve, as required.

3.7.15.3 Visually inspect the upper portion of the thermal sleeve.

3.7.15.4 Fit and weld the new lower portion of the thermal sleeve to its upper portion.

3.7.15.5 Visually inspect the thermal sleeve weld.

3.7.15.6 Free-path gage the thermal sleeve.

3.7.16 Perform final cleaning and visual inspection of each CRDM nozzle.

3.8 A repair program shall be prepared in accordance with IWA-4130, Reference 2.1.3.

3.9 A plant-specific stress analysis shall be performed demonstrating that the requirements of NB-3000, Reference 2.1.2, are met for the modification with exception as follows: A fracture mechanics analysis shall be performed in accordance with IWB-3132.4 and IWB-3600, Reference 2.1.3. This analysis shall assume and justify a .100 inch weld anomaly assumed as a linear defect and extending into the weld in any direction from the triple point. The triple point is defined as the intersection of the RVH base material, the CRDM nozzle, and the repair weld.

3.10 A corrosion evaluation shall be performed, considering all potentially applicable corrosion mechanisms that may affect the design life of the modification (see paragraph 3.11). The results of the corrosion evaluation shall be considered in the stress analysis required by paragraph 3.9.

3.11 The repair shall have a minimum design life of 14 years.

3.12 An engineering evaluation shall be performed to justify any remaining flaws in the original CRDM nozzle to RVH attachment weld and include in the documentation the flaw characteristics assumed since NDE methods are not available to accurately characterize flaws in this region.

3.13 A Code reconciliation shall be performed that reconciles Reference 2.1 to the original Construction Code for TP-3 & 4 as required by IWA-7210(c), Reference 2.1.3.

3.14 Design transients for operating temperatures and pressures are included in Appendix A. Appendix B contains detailed design information relative to the TP RV design transients and transient operating cycles.

3.15 Design pressure is 2500 psia.

3.16 Operating Pressure is 2250 psia.

3.17 Design Temperature is 650 degrees F.

3.18 For the thermal analysis of the Turkey Point RV head a film coefficient of 300 BTU per hr per sq. ft per F should be used.

3.19 Part length CRDM nozzle repairs, when required, will be implemented by first lowering the CRDM lead screw. The lower section of the lead screw shall then be removed and the lead screw retracted. Justification or hardware modifications must then be provided for alterations of the upper internals hydraulic coolant flow patterns.

4.0 Materials

4.1 The portion of the RVH containing CRDM nozzles at TP-3 & 4 is fabricated from SA-302 Grade B.

4.2 The portion of the CRDM nozzle that penetrates the RVH is SB-167 Alloy 600.

4.3 Weld filler material for this repair shall be ERNiCrFe-7, UNS N06052 in accordance with Reference 2.1.4, NB-2000 of Reference 2.1.2, and the additional requirements specified herein.

4.4 The cobalt content of weld filler materials used for this repair shall not exceed 0.20%.

4.5 See paragraph 5.11 for thermal sleeve base material and weld filler requirements.

5.0 Process and Equipment Requirements

5.1 Methods for debris collection shall be employed during machining, grinding, and abrasive water-jet operations.

5.2 Local repair weld defects shall be removed by machining through the repair weld thickness to a diameter sufficient to remove the defect. The maximum diameter for this operation shall be ∅3.670 inches to assure that a minimum of 3/16 inches of repair weld thickness remains after machining. This value assumes the bore can be held to a true position of ∅.031 inches to the original nozzle removal bore. A corresponding reduction in allowable diameter shall be applied if the foregoing tolerance cannot be met. Equipment shall also be provided for removal of shallow defects that provides a nominal bore diameter of ∅3.31 inches.

5.3 Contingency tooling shall be available to oversize the bore in the event that the repair weld requires complete removal and re-welding. The bore minimum oversize diameter shall be ∅4.120 inches to assure complete removal of the weld, but shall not exceed ∅4.250 inches.

5.4 All process changes from those qualified per Reference 2.4 for the nozzle repair, and Reference 2.5 for the replacement thermal sleeve welding, shall be qualified in accordance with the requirements of Reference 2.4, or Reference 2.5, as applicable (prior to use in the repair process).

5.5 Post-weld machining of the repair weld shall provide a surface suitable for UT and PT over the full thickness portion of the weld and at least one-half inch above the highest point of the weld.

5.6 The full range of the abrasive water-jet remediation of the repair area shall extend a minimum of two (2) inches above the highest point of the repair weld and at least .25 inches below the toe of the weld at the RVH/repair weld fusion line.

5.7 After machining the weld prep in the CRDM nozzle, the inside edge of the CRDM nozzle penetration in the RVH shall be chamfered. The size of this chamfer shall be sufficient to reduce the distance from the weld surface to the original Ni-Cr-Fe/low alloy steel fusion line in the original weld preparation to less than the largest remaining flaw size justified in paragraph 3.12. This chamfer need not be uniform in size around the circumference of the penetration.

5.8 Elimination or change of any welding or temperature monitoring requirement of Reference 2.1.3 or Reference 2.1.5 shall be documented in a Relief Request (see paragraph 3.5).

5.9 Tooling and welding equipment shall accommodate a maximum nozzle ovality of 0.080 inches and nozzle bends due to weld distortion of up to 2 degrees in the area of the nozzle/closure head attachment weld. (See Figure 1)

5.10 <u>Thermal Sleeves</u>

5.10.1 The replacement thermal sleeves shall be designed and fabricated as safety related hardware in accordance with Reference 2.3.

5.10.2 Thermal sleeve free-path requirements are given in paragraph 6.5.3.

5.10.3 In situations where it is required that FRA-ANP remove and install a previously replaced lower thermal sleeve, the new cut line shall be moved upwards by 0.25 inches (nominal) from the original, and a new lower thermal sleeve shall be installed.

5.10.4 The overall length of the restored thermal sleeve shall be the same as the original length, +0" / - 0.5".

5.10.5 The thermal sleeve cutting technique and cut location shall be such that the lower thermal sleeve can be removed when the nozzle distortion conditions specified in paragraph 5.9 exist.

5.10.6 The thermal sleeve remnant shall be deburred as required to provide a suitable surface for welding after cutting.

5.10.7 Thermal sleeve tooling centering devices should avoid engaging the thermal sleeve ID in the regions where spacer pads are welded to the OD of the thermal sleeve.

5.10.8 Cutting tools shall not violate the ID of the nozzle from which the thermals sleeve is being removed.

5.11 Thermal Sleeve Welding

5.11.1 The replacement thermal sleeve shall be welded to the upper sleeve using a weld metal insert in accordance with SFA 5.9 ER309L (UNS 30983) or ER316L (UNS 31683) of Reference 2.1.1. The weld configuration is shown on Reference 2.5.

5.11.2 Each weld metal insert shall have a calculated minimum delta ferrite content of 12% based on the actual Material Test Report for the insert. The resultant thermal sleeve weld shall have a delta ferrite content of greater than 3% based on direct measurement or greater than 5% as calculated based on dilution assumption.

5.11.3 The replacement thermal sleeve attachment weld shall provide 360 degree continuous weld deposit and shall achieve a minimum penetration of 50% wall thickness (.094 inches). The width of the weld face that corresponds to this depth of penetration shall be established as specified in paragraph 5.11.6.2.

5.11.4 The maximum allowable diametrical shrinkage due to welding is .020 inches, not including weld crown. (See paragraph 6.5.3 for minimum free path requirements).

5.11.5 Base material shall be considered as type 304 stainless steel (P-8) for thermal sleeves.

5.11.6 A minimum of two (2) weldability samples, approximately 6" long, shall be taken from the removed portion of the existing thermal sleeve(s) at site. Furthermore, at least one sample shall be taken from each additional unique heat of thermal sleeve material removed. All samples shall be welded to a sample thermal sleeve fabricated from the actual heat of material used to fabricate the replacement thermal sleeve(s). These test samples shall be sectioned and examined as follows:

5.11.6.1 Verify that there is no wall burn-through.

5.11.6.2 Verify that the minimum weld thickness has been achieved (see 5.11.3). The width of the face of the weld shall be recorded for use during actual replacement thermal sleeve welding.

6.0 Testing and Examination

6.1 Nondestructive examinations performed on the nozzle repair weld shall be in accordance with NB-5000, Reference 2.1.2. Elimination or change of any examination required by Reference 2.1.5, paragraph 4.0, shall be documented in a Relief Request (see paragraph 3.5).

6.2 Visual examination (VT-2) and pressure testing required by IWA-2212 and IWA-5000, respectively, of Reference 2.1.3 shall be the responsibility of FP&L.

6.3 Liquid penetrant examination of the entire nozzle weld prep and the entire base metal bore (original weld bore) shall be performed to detect the presence of laminations. Any laminations detected shall be evaluated by FRA-ANP engineering prior to continuing with repair activities under the acceptance requirements for weld preparations of Reference 2.1.2.

6.4 Indications identified in the remaining portion of the original CRDM nozzle to RVH weld and buttering during the examination specified in paragraph 6.3 shall be disregarded.

6.5 Thermal Sleeves

6.5.1 In addition to the requirements of 5.11.6, the weldability samples required by 5.11.6 shall be measured for actual OD and wall thickness. These measurements shall be taken at two (2) locations, approximately 90 degrees apart, and at least 1.5 inches from the cut line and spacer pad locations.

6.5.2 The thermal sleeve attachment weld shall be visually examined in accordance with Reference 2.10.

6.5.3 Each welded thermal sleeve shall be free path gauged after welding in accordance with the following:

6.5.3.1 The minimum diameter in the welded region shall be verified with a rod gage Ø2.050"+.002/-.000 x 61.00" long.

6.5.3.2 Deleted.

6.5.3.3 Free path gaging procedures shall include measures to minimize the possibility of a free path gage becoming stuck in the thermal sleeve.

7.0 Quality Assurance

7.1 The repair activities shall be performed in accordance with the ASME Section XI requirements of Reference 2.2.

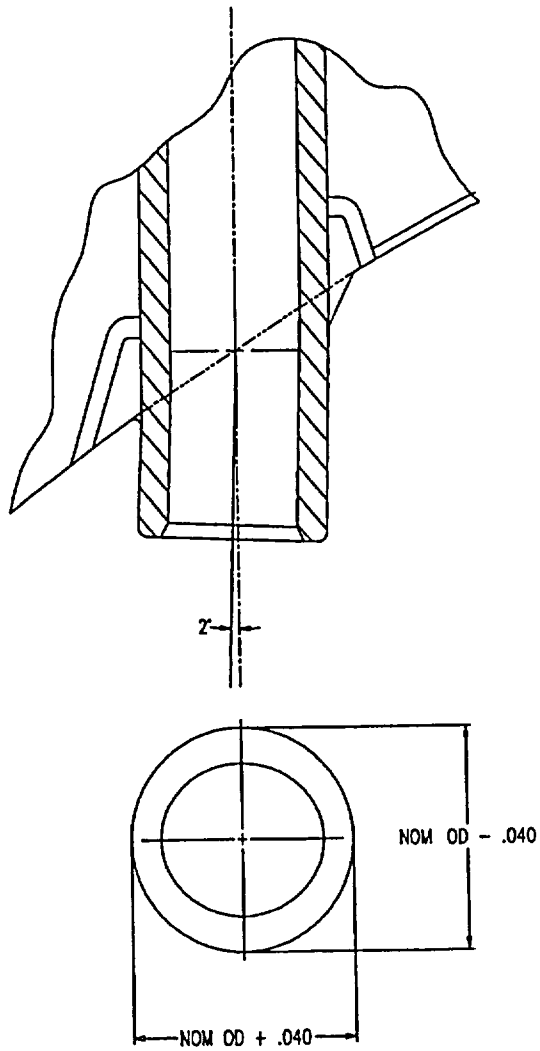
7.2 Repair and process equipment is considered non-safety related, except for qualification thereof, and shall be in accordance with the Addendum A of Reference 2.3.

7.3 A Form NR-1 is not required.

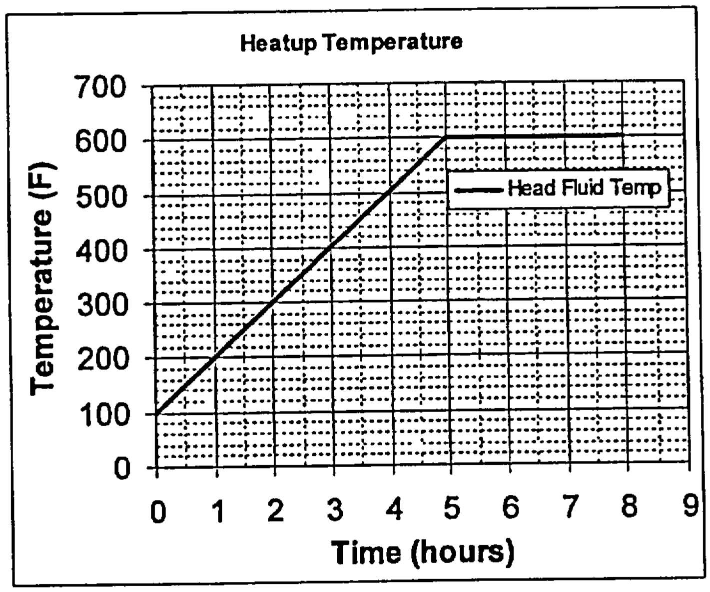
7.4 Use of Reference 2.1.5 shall be documented on form NIS-2 by FP&L.

7.5 NR stamping after completion of the repair activities is not required per paragraph 7.3.

Figure 1



Appendix A


Heatup Temperature
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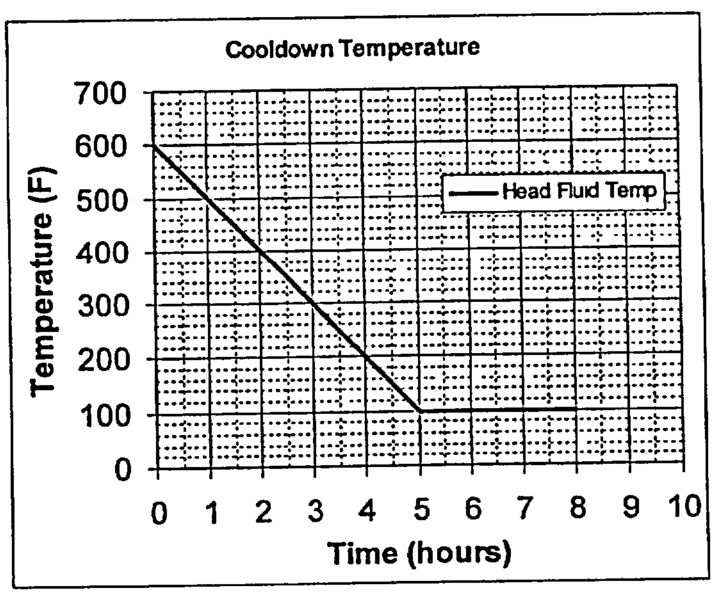
500
400
300
200
100
0
Temperature (F)
Head Fluid Temp
0 1 2 3 4 5 6 7 8 9
Time (hours)


Cooldown Temperature
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600
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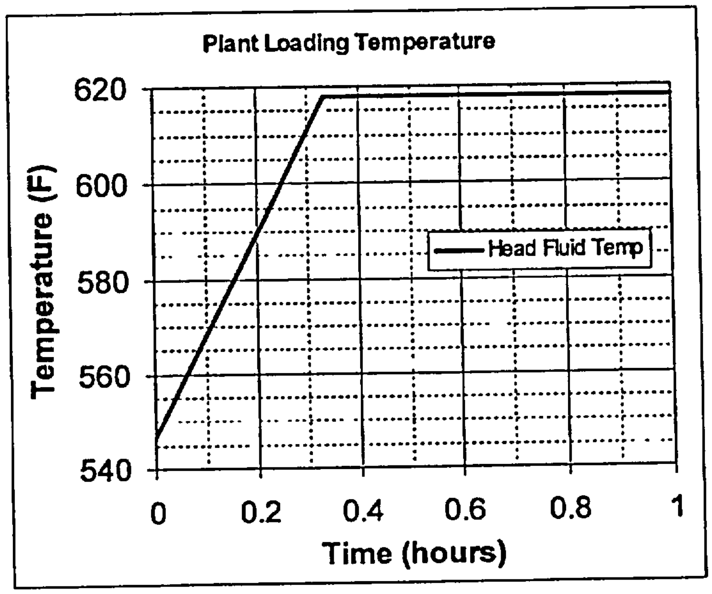
300
200
100
0
Temperature (F)
Head Fluid Temp
0 1 2 3 4 5 6 7 8 9 10
Time (hours)

Appendix A


Plant Loading Temperature
Temperature (F)
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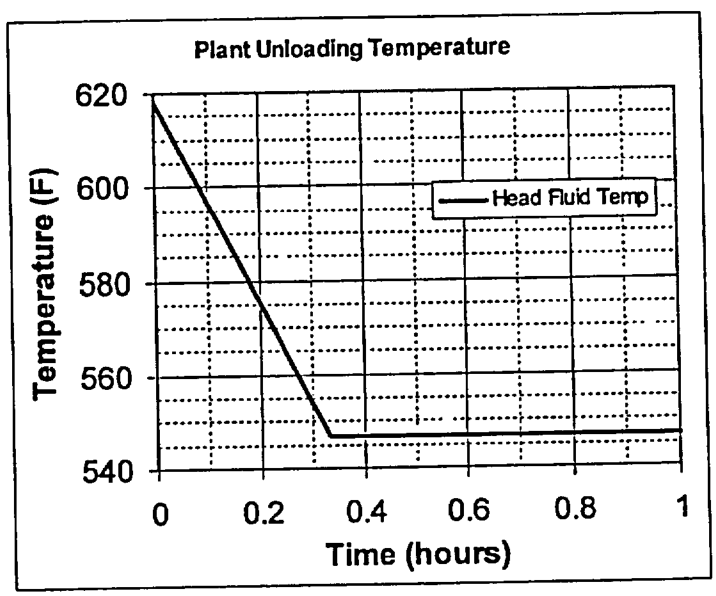
600
580
560
540
Head Fluid Temp
0
0.2
0.4
0.6
0.8
1
Time (hours)


Plant Unloading Temperature
Temperature (F)
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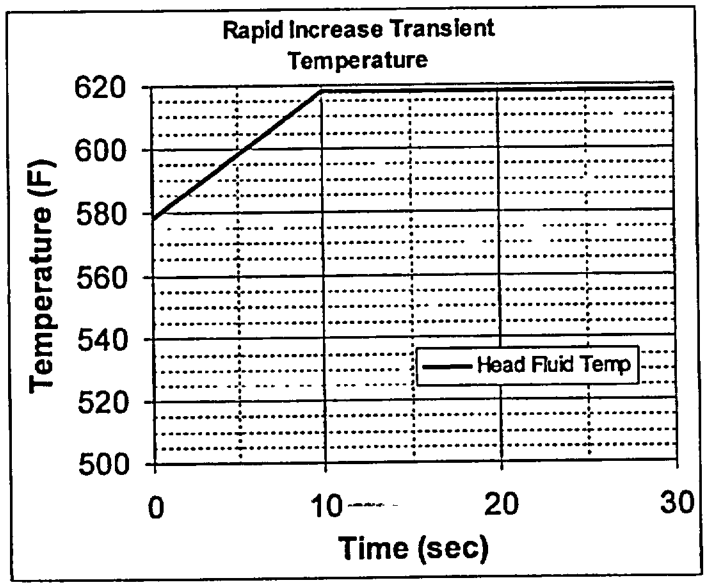
600
580
560
540
Head Fluid Temp
0
0.2
0.4
0.6
0.8
1
Time (hours)

Appendix A


Rapid Increase Transient
Temperature
620
600
580
560
540
520
500
Temperature (F)
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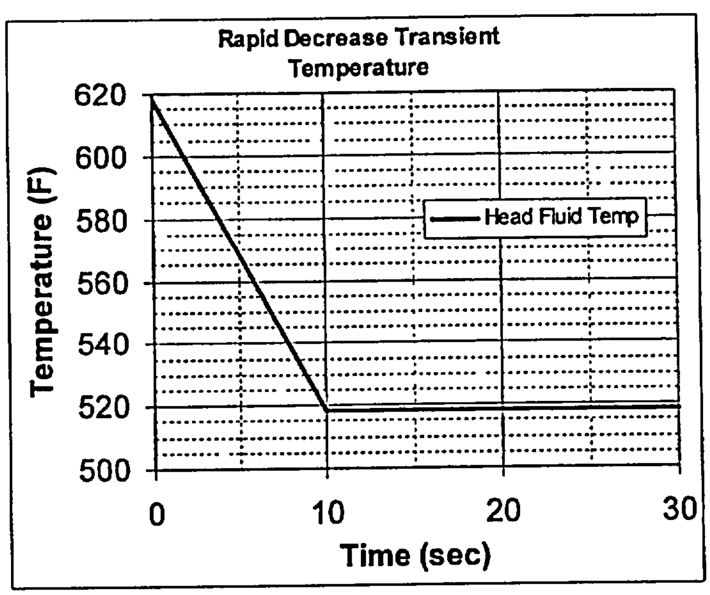
10
20
30
Time (sec)
Head Fluid Temp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Temperature
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Temperature (F)
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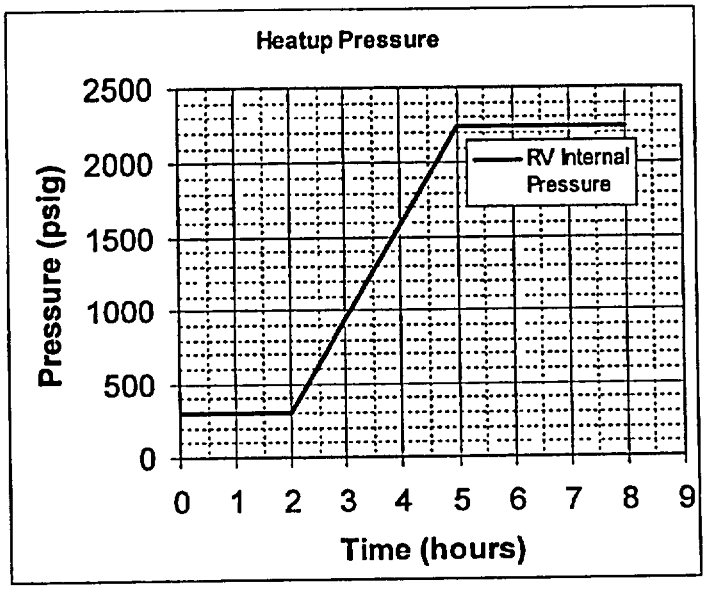
Time (sec)
Head Fluid Temp

Appendix A


Heatup Pressure
Pressure (psig)
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2000
1500
1000
500
0
RV Internal Pressure
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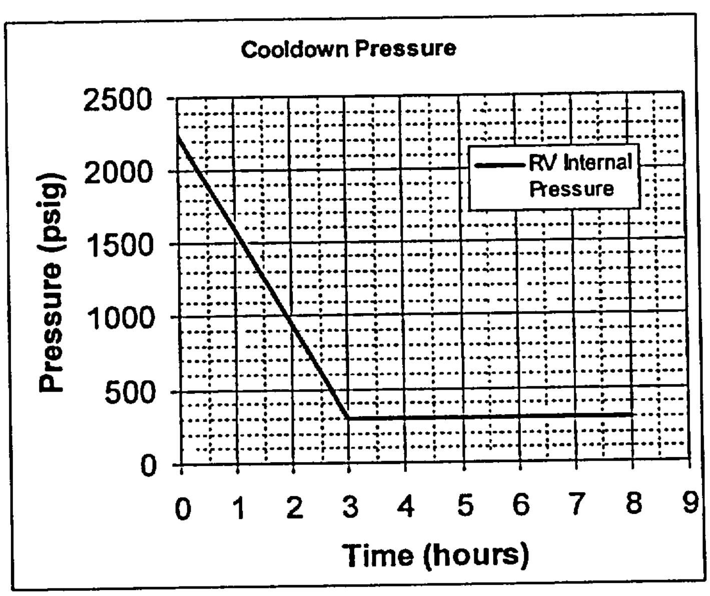
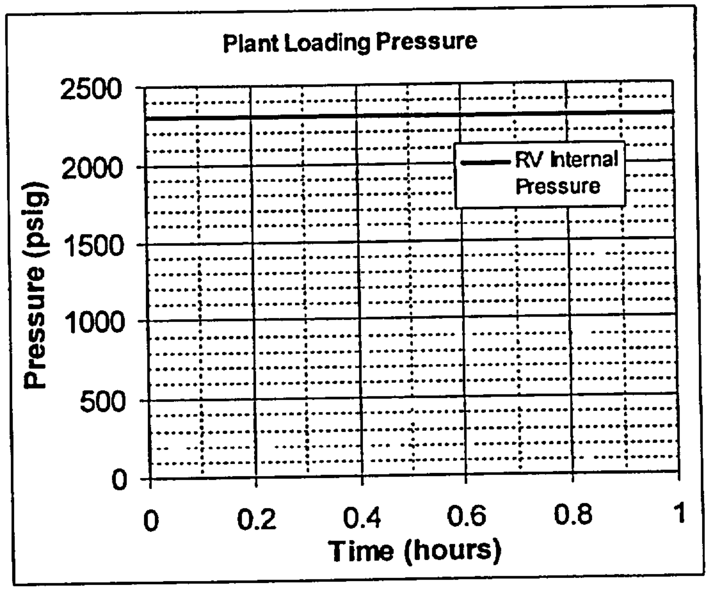
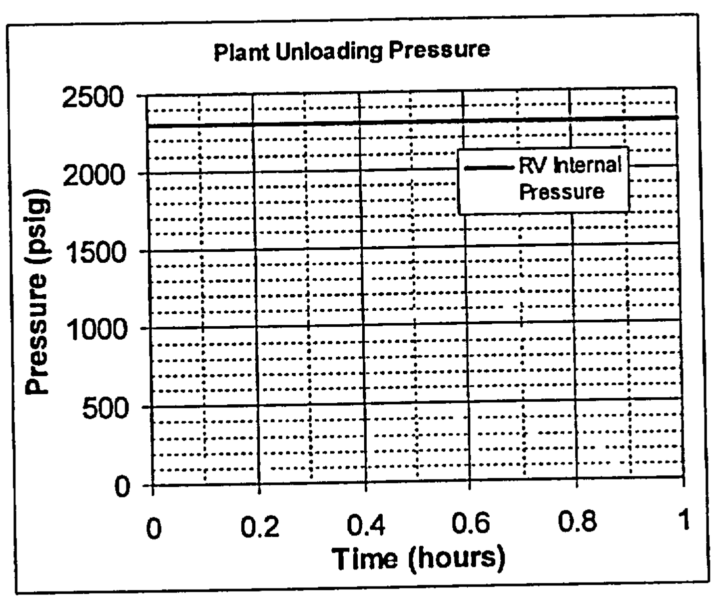
Time (hours)


Cooldown Pressure
Pressure (psig)
2500
2000
1500
1000
500
0
RV Internal Pressure
0 1 2 3 4 5 6 7 8 9
Time (hours)

Appendix A



Plant Loading Pressure
2500
2000
1500
1000
500
0
Pressure (psig)
0
0.2
0.4
0.6
0.8
1
Time (hours)
RV Internal Pressure



Plant Unloading Pressure
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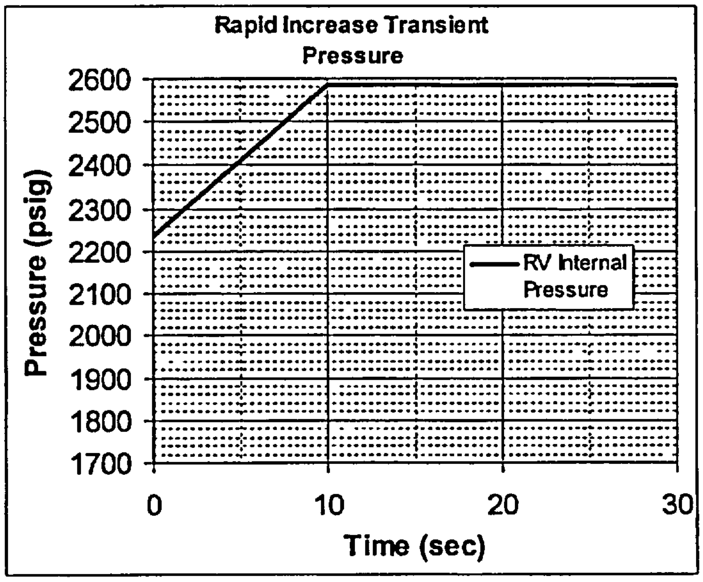
2000
1500
1000
500
0
Pressure (psig)
0
0.2
0.4
0.6
0.8
1
Time (hours)
RV Internal Pressure

Appendix A


Rapid Increase Transient
Pressure
Pressure (psig)
2600
2500
2400
2300
2200
2100
2000
1900
1800
1700
RV Internal Pressure
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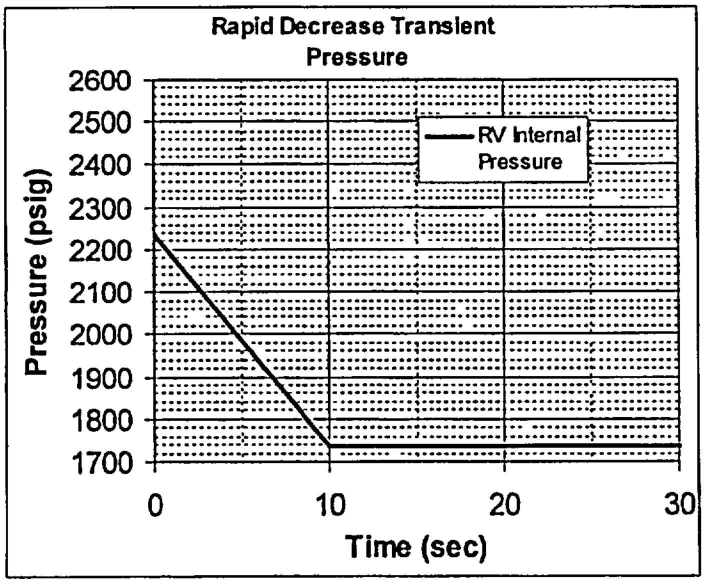
10
20
30
Time (sec)


Rapid Decrease Transient
Pressure
Pressure (psig)
2600
2500
2400
2300
2200
2100
2000
1900
1800
1700
RV Internal Pressure
0
10
20
30
Time (sec)

Appendix B

Reference: Framatome Draft Analysis Transients e-Mailed 9/10/01

FPL has completed preliminary review of the draft analysis transient set sent by E-Mail on 9/10/01 and provides the following comments. This still needs to be checked tomorrow 9/12/00 and will be ready for final approval of the Framatome input data document at the meeting on Thursday 9/13/01.

FRA-ANP note: The specific transients and cycles contained in this appendix are not a change to the plant licensing design basis but are intended for use as input to the RV Head repair analyses only. The transient curves and cycles are based on plant "transient logging" data.

Heatup – Cooldown Transient:

1. From the Turkey Point design transient basis documents the PTN is licensed to 200 heatup and cooldown cycles not the 240 cycles assumed by Framatome. The primary side hydrostatic test at 2500 psia and an elevated temperature is only 5 cycles with one cycle at 3125 psia hydro. And ambient temperature.
2. From the work establishing ranking of the PTN plant relative to the Oconee and effective full power years, the upper reactor head bulk temperature during steady state operation was determined to be 594 °F. Therefore it is reasonable to use a heatup and cooldown temperature range of 100 to 594 °F not the 600 °F assumed. The operating pressure at PTN is 2250 psia (2235 psig) not the 2300 psig assumed.

Plant Loading and Unloading:

1. The Turkey Point design basis for this transient is 14,500 cycles not the 18,000 cycles assumed. However, in performing the analysis is it necessary to assume the full number of design cycles. If the plant has been operating for 29 years on a 40 year license or on the pending 60 year license is it reasonable to assume a lesser number of cycles for any new flaw analysis. For any existing assumed flaw in the as left J-weld the use of 14,500 would be appropriate.
2. For the transient temperature range the only information from our design transient basis would be valves for T_{HOT} which is considerably higher than the assumed range of 550 to 575 °F. The design specifications list this transient as a ramp change from 547 °F to 618 °F in 20 minutes. The pressure is steady state at 2250 psia ± 50 psi. Therefore the assumed value of 2300 psi is acceptable.

Remaining Transients:

3. Review of the following transients from the design transient basis was used to establish a representative yet bounding transient.

- 10% Step Increase – 2000 cycles
- 10% Step Decrease – 2000 cycles
- Large Step Degrease – 200 cycles
- Loss of Load – 80 cycles
- Loss of Flow – 80 cycles
- Reactor Trip – 400 cycles
- Loss of AC Power – 40 cycles

The resulting transient is as follows for a total of 2800 cycles:

Increasing transient	577 °F to 617 °F or $\Delta T = +40$ °F in 10 sec.
	2235 psia to 2585 psia or $\Delta P = +350$ psi in 10 sec.
Decreasing transient	617 °F to 537 °F or $\Delta T = -80$ °F in 10 sec.
	2235 psia to 1735 psia or $\Delta P = +500$ psi in 10 sec.

If you have any questions or require further clarification of the above comments, please contact R.M. Rose at (305) 246-6544 or John A. Manso at (305) 246-6622.