UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W.
ATLANTA, GEORGIA 30323

Report No.: 50-261/88-14

Licensee: Carolina Power and Light Company
P. O. Box 1551
Raleigh, NC 27602

Docket No.: 50-261 License No.: DPR-23

Facility Name: H. B. Robinson

Inspection Conducted: November 28 - December 2, 1988

Inspector: Nick Economos 12/20/88
Nick Economos Date Signed

Approved by: 12/21/88
J. J. Blake, Chief Date Signed
Materials and Processes Section
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope: This routine unannounced inspection was conducted in the areas of resistance temperature detector (RTD) bypass elimination and service water system piping replacement modifications.

Results: In the areas inspected, no violations or deviations were identified.

Both modifications are being implemented by vendor, e.g. Westinghouse and PCI, respectively. The licensee has dedicated adequate resources/manpower for engineering work monitoring and liaison between the licensee and the vendors. Work quality, material control, training and qualification were found to be consistent with Code and regulatory requirements.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

S. B. Clark, Project Engineer Configuration Control
R. Cox, Modification Project Liaison Engineer
*J. M. Curley, Director, Regulatory Compliance
*R. H. Dufresne, Project Engineering Supervisor, Civil Engineering
W. Farmer, System Supervisor Technical Support
B. Harward, Principal Engineer Modification Projects
J. Latimer, Welding Engineer
*R. E. Morgan, General Manager
R. Munday, Engineering Technician I, Modifications Projects
*S. M. Pruitt, Inservice Inspection (ISI) Coordinator
*D. Sayer, Senior Specialist Regulatory Compliance
*H. J. Young, Director, Quality Assurance (QA)

Other licensee employees contacted during this inspection included craftsmen, engineers, operators, mechanics, security force members, technicians, and administrative personnel.

Westinghouse Energy Systems Services Division
R. Bialecki, Project Manager, Mechanical
J. Marburger, QA Lead Engineer
W. Rice, Manager, Fluid Systems

*Attended exit interview.

2. Design, Design Changes and Modifications (37700)

a. RTD Bypass Piping Elimination

Westinghouse (W) has been contracted by the licensee to remove the existing RDT bypass piping system and replace this hot leg and cold led temperature measurement method with fast response thermowell-mounted RTDs installed in the reactor coolant loop piping. The licensee stated that the reasons for this modification was to eliminate the outage maintenance and the corresponding radiation exposure associated with periodic replacement and response time testing of the RTDs installed in the bypass manifolds and connecting piping to the reactor coolant system. By review of non-proprietary WCA-11890, the inspector ascertained the following information:

(1) The hot leg temperature measurement on each loop will be accomplished with three fast response, narrow range, dual element RTDs mounted in thermowells. One element of the RTD

will be considered active and the other element will be held in reserve as a spare. To accomplish the sampling function of the RTD bypass manifold system and minimize the need for additional hot leg piping penetrations, the thermowells will be located within the three existing RTD bypass manifold scoops wherever possible. A hole will be drilled through the end of each scoop so that water will flow in through the existing holes in the leading edge of the scoop, past the RTD, and out through the new hole. Because of structural interferences on Loops A and B, one thermowell on each loop cannot be installed in the existing scoop location. These thermowells will, instead, be mounted in independent bosses and relocated downstream from the existing scoop. The resulting unused hot leg scoops will be capped. These three RTDs will measure the hot leg temperature which is used to calculate the reactor coolant loop differential temperature (WT) and average temperature (T_{avg}).

(2) On the cold leg side of the coolant loop, One fast response, narrow range, dual-element RTD will be located in each cold leg at the discharge of the Reactor Coolant Pump (RCP) (as replacement for the cold leg RTDs located in the bypass manifold). Temperature streaming in the cold leg is not a concern due to the mixing action of the RCP. For this reason, only one RTD is required. This RTD will measure the cold leg temperature which is used to calculate reactor coolant loop WT and T_{avg}. The existing cold leg RTD bypass penetration nozzle will be modified to accept the RTD thermowell. One element of the RTD will be considered active and the other element will be held in reserve as a spare.

This modification will not affect the single wide range RTD currently installed near the entrance of each steam generator and in each cold leg at the discharge of the RCP. Changes required by this modification will involve the hot leg scoops, the hot leg piping, the cross-over leg bypass return nozzle, and the cold leg bypass manifold connections. All welding will be Gas Tungsten Arc Weld (GTAW) or Shielded Metal Arc Weld (SMAW) per ASME Code, Section IX. This welding will be examined using nondestructive methods (liquid penetrant or radiography where applicable) per ASME Code, Section XI, 1977 Edition through Summer 1978 Addendum. As required by Article IWA-4000 of Section XI, a hydrostatic test will be performed following completion of the modification. Other codes, standards, and regulatory requirements applicable to this modification were as follows:

ASME Boiler and Pressure Vessel, Section III, 1983 Edition

ANSI B31.1-1967, "Code for Power Piping"

ANSI N45.2.2-1972, "Packages, Shipping, Storage, and Handling of Items for Nuclear Power Plants"

RG 1.33	-	"Quality Assurance Program Requirements (Operation)," November 1972 [references ANSI Standard N18.7-1976, "Administrative Controls and Quality Assurance Requirements for the Operating Phase of Nuclear Power Plants"]
RG 1.37	-	"Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants," March 1973
RG 1.38	-	"Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Water-Cooled Nuclear Plants," March 1973
RG 1.39	-	"Housekeeping Requirements for Water-Cooled Nuclear Power Plants," March 1973
RG 1.58	-	"Qualification of Nuclear Power Plant Inspection, Examination, and Testing Personnel," September 1980

The scope of work either planned or in progress on the hot legs, cold leg and crossover legs were as follows:

Hot Legs

The existing hot leg bosses were being cut to allow for the removal of the Schedule 160 bypass piping. The severance cut on the existing bosses was being made just below the socket at predetermined dimensions to allow for removal of the piping.

The existing hot leg scoops were being modified to allow the addition of a flow hole in the bottom of the scoop. This flow hole was formed by utilizing the Metal Disintegration Machining (MDM) Process. The debris produced was an insignificant benign talc-like powdery material which was determined to be harmless to the RCS. Due to interferences, Loop A hot legs scoops cannot be utilized. These scoops were to be capped and new penetrations and bosses would be installed approximately 24 inches from the existing scoops towards the steam generator. These scoops will be located in approximately the same plane at 0, 120 and 240 degrees.

A hydraulic boring machine, mounted on the hot leg piping will perform the machining on the scoops to allow for thermowell installation. Prior to installing the thermowells, the machined surfaces will be deburred and the weld preps and surface conditions will be verified. Dimensional checks will be performed on the the hot leg scoops to verify proper thermowell fit-up. The thermowells will be screwed into place with a seal ring and then seal welded to the hot leg bosses. A dam will be used during the external machining process to control debris.

This pressure boundary code weld will be radiographed.

Cold Legs

The existing cold leg nozzles will be cut the same as the hot leg bosses. A cut will be made in the 2" Schedule 160 bypass piping with a port-a-band saw at a location to allow for removal of the piping. Upon completion of the cut, a hydraulic boring machine will be mounted on the cold leg to machine the nozzle.

Crossover Legs

The existing crossover leg bosses will be cut using a split OD machining tool. The cutting tool bit used for this operation is designed to machine a specific weld prep while the severance cut is being made. A cut will made in the 3" Schedule 160 bypass piping with a port-a-band saw at a location to allow for removal of the piping. A pipe cap will be welded to the crossover leg boss to complete the modification.

This pressure boundary code weld will be radiographed.

Replacement materials specified for this modification were as follows:

(a) Thermowells and crossover line caps are made from Class 1 SA-182 F316 or equivalent stainless steel material.

Valves installed as Reactor Vessel Level Indication System (RVLIS), root valves shall be "zero-leak" type metal diaphragm packless globe valves. The valve body shall be austenitic stainless steel (ASTM SA182, Alloy Types 316 or F316, or equivalent).

Thermowell Bosses, RTD Thermowells, and other weld fittings are made of austenitic stainless steel material per ASTM A182, Alloy Types 316, 316L, 316N, F316, or F316L or equivalent.

Welding rods used on stainless steel piping or fittings were made from material compatible with the respective base metal.

Engineering and/or design documents applicable to this modification that were provided by the licensee for review were as follows:

M-959:	Design Change Notice Plant Modification Safety Evaluation, Attachment 2, M-959-2, Rev. 0, Design Basis, Attachment 4, M-959-4, Rev. 0 Implementing Procedure, Attachment 8, Rev. 0
WCAP-11889	Response to NRC Question on RTD Bypass Elimination Licensing Report for H. B. Robinson - 2, June, 1988
WCAP-11889	Response to NRC Questions on RTD Bypass Elimination Licensing Report, October, 1988
Westinghouse Field Change Notice (WFCN)	RTD Bypass Elimination CPLO 40519A
R87-048/00-01 Rev. 2	Design Basis Document, RCS Bypass RTDs
Plant Modification M-959, 9/25/88	Manual

MPII 2.7.2 CPL-1 Rev. 1, RTD Bypass Elimination for H. B. Robinson

Replacement materials required for this modification were procured by W under requirements of their QA program. Those materials included couplings, nozzle caps, fast response dual elements, thermowells and bosses and filler metal. For these items, the inspector reviewed quality records including certified material test reports, W quality release reports, certificates of compliance, Nondestructive Examination (NDE) reports, and receipt inspection reports as applicable.

Replacement material of particular interest selected for a review of quality records were as follows:

- Fast Reponse Dual Elements, Model N9004E-2B PO #85140-D, Quality Release (QR)#N-101981, Rev. 0 (W) SPIN QAELRT

- Thermowells and Bosses
  (W) SPIN # RCPCTW
  QR #N-101982, Rev. 0

- Couplings (RVLIS Welded Fittings)
  PO# MA 00973D

- 3" Schedule 160 Nozzle Caps
  (W) SPIN # RCPCFB
  QR #N-102613, Rev. 0

- 1" Schedule 160 Nozzle Caps
  QR N-102612, Rev. 0
  (W) SPIN #RCPCFB

- Weld Filler Metal
  PO #PCP-88-150

In addition to the quality records, the inspector reviewed the following special process procedures:

Nondestructive Examinations

NDE-240, Rev. 0	(W) Liquid Penetrant Procedure
NDEP-101, Rev. 11	CP&L Radiographic Examination

Weld Procedures (W)

WPS 50800, Rev. 3	Manual Gas Tungsten Arc
WPS 10800, Rev. 1	Manual Shielded Metal Arc

Completed welds examined for workmanship and appearance were as follows

W-1-2A	1"d x.250	Hot Leg Loop A Cap to Pipe nipple @120°	Acceptable
W-1-1A	1"d x.250	Hot Leg Loop A Cap to Pipe nipple @ 0°	Acceptable
W-1-3A	1"d x.250	Hot Leg Loop A Cap to Pipe nipple @240°	Acceptable

These welds were radiographed with the aforementioned procedure to verify weld integrity. The inspector reviewed the films to verify that the welds and technique used met applicable code requirements and determined them satisfactory. Difficulties draining the primarly loops to satisfactory levels caused a delay in the start-up of the modification. That and the need to wear respirator protection precluded the inspector from observing cutting and MDM activities which commenced on December 1, 1988.

Within the areas inspected, no deviations or violations were identified.

(b) Service Water System Piping Replacement Modification.

This inspection effort was performed as a followup to that documented in Inspection Report No. 50-261/88-12. This plant modification serves to replace a portion of service water supply and return piping inside the Reactor Building including the supply and return lines to the Containment Fan Coolers HVH-1, -2, -3, and -4 . The remaining piping, including that in the Auxiliary Building, will be replaced by a later Plant Modification. The replacement material is a stainless steel alloy which contains 6% molybdenum and additional amounts of nitrogen and nickel to achieve maximum corrosion resistance. The new piping was fabricated from Allegheny Ludlum AL6XN material, Alloy No. UNS N08367 manufactured/supplied in accordance with ASME Code Case N-438. The replacement pipe, which has the same diameter and schedule as the original was procured under purchase order number 545681M-AR-02 from Connex Pipe Systems Inc., The chemical analysis and mechanical properties of one of the heat numbers supplied, HT# 838907, was as follows:

Element	%Content	Mechanical Properties	
Carbon	.018	Tensile	113,700 psi
Manganese	0.36	Yield	58,000
Nickel	23.82	%Elongation	44%
Chromium	20.28	Hardness	RB83
Molybdenum	6.28		
Copper	.30		
Nitrogen	.230		

Corrosion tests were performed on the material per ASTM A-262 Practice E, to determine its resistance to crevice pitting and intergranular corrosion attack. Results showed no evidence of pitting, intergranular corrosion and the degree of crevice corrosion attack experienced measured _

1.5 mills in depth. The licensee found these results to meet the acceptance criteria of Specification HBR2-M-027, Rev. 1. The licensee stated that this type material was used by other licensees including Public Service Electric and Gas Company, Salem Plant, for a similar service water pipe problem.

The licensee indicated that all existing pipe supports are to be revised as well as any new ones which may be required will be designed in accordance with applicable sections of ANSI B31.1 and AISC Codes. ASME, Section IX (86S88), was the governing code for qualification of weld procedures and welders, inspection and testing of welds was being performed in accordance with ASME Section XI, 1977 Edition and Addenda through Summer 1978. A review of the Safety Evaluation Report M-858-2, Rev. 1, revealed that the subject modification generated no unreviewed safety questions. Following is a list of procedures relative to this modification that were reviewed for content and compliance to code and regulatory requirements:

WP-502, Rev. 15 Weld Rod Control
WP-503, Rev. 11 Qualification of Welders and Welding Operators
WP-500, Rev. 11 General Welding Procedures
WP-504 Processing of Weld Documentation
WP-506, Rev. 2 Welding Procedure Specification

Welding Specifications (WPS)

WPS	Process	Procedure Qualification Records	Thickness Range	Filler Metal Type/ Size
45-4-01	GT (machine)	181	1/16 - 17/64	ERN1CrMo-3 0.035"
45-4-30	GT (machine)	182	1/16 - 17/64	ERN1CrMo-3 0.035"
45-2-04	GT (manual)	181	1/16 - 17/64	ERN1Cr Mo-3 3/32, 1/8, 0.035
45-2-31	GT (manual)	182	1/16 - 17/64	ERN1Cr Mo-3 3/32, 1/8, 0.035

*GT - Gas tungsten arc welding

The above WPSs and their supporting Procedure Qualification Records (PQRs) were reviewed to ascertain whether essential, supplementary and/or nonessential variables, were consistent with Code requirements; whether the WPSs were properly qualified and their supporting PQRs were accurate and retrievable; whether all mechanical tests had been performed and the results met the minimum requirements; whether the PQRs had been reviewed and certified by appropriate personnel; and whether any revisions and/or changes to nonessential variables were noted.

Completed welds and others being fabricated were observed to ascertain whether appearance and workmanship requirements imposed by the aforementioned code and procedures were being followed. For the most part, pipe welds were being fabricated with a combination manual/machine GT procedure. The welding was being performed by CPI, Inc. under contract with the licensee. Following is a list of welds examined as part of this work effort:

Weld	Size	Description	Comments
HBR2-CW-276	6"d x.134"	Pipe to Pipe	Complete/ Accept
HBR2-CW-273	6"d x.134"	Pipe to Reducer	"/"
HBR2-CW-272	3"d x.134"	Reducer to Pipe	"/"
HBR2-CW-271	3"d x.134"	Pipe to Ell	"/"
HBR2-CW-519	6"d x.134"	Pipe to Tee	"/"
HBR2-CW-521	6"d x.134"	Pipe to Pipe	"/"
HBR2-CW-527	6"d x.134"	Pipe to Pipe	"/"
HBR2-CW-656	6"d x.134"	Pipe to Pipe	"/"
HBR2-CW-212	6"d x.134"	Pipe to Pipe	"/"
HBR2-CW-203	6"d x.134"	Pipe to Pipe	"/"
HBR2-CW-285	6"d x.134"	Pipe to Tee	Tacking/ Accept

By walk-through inspections, drawing and other related document reviews, the inspector ascertained that the majority of the piping was being routed in the same location as the existing pipe, using the existing pipe supports. Design variances from the existing configuration

were: 1) Tie-in of motor cooler outlet piping in HVH unit outlet piping inside containment, thereby relocating the motor cooler isolation valve to inside containment and eliminating the motor cooler containment penetrations; 2) Reduction in diameter of the motor cooler outlet piping from 2" to 1-1/2" between the motor cooler discharge and the new tie-in with the HVH discharge valves; and 3) Addition of flanges on the inlets and outlets of the HVH units and their motor coolers.

As required by the applicable code, pipe welds are liquid penetrant examined and upon completion of the modification will be hydrostatically tested prior to plant start-up. Also as a control tool used to monitor microbiological corrosion (MIC) attack on the new material, the licensee is radiographing selected welds. The procedure used to radiograph these welds does not meet code requirements in that no penetrameter is used to monitor quality. Instead the licensee uses lead shot at predetermined locations/ intervals along the weld whose image will be used as the standard to check against possible MIC attack in the future. The inspector selected at random the following radiographs to ascertain the type of film and weld image that was produced by this procedure.

The welds selected were as follows:

Weld	Size	Loop
W-034	6 "x 0.134"	HVH-1
W-044	6 "x 0.134"	HVH-1
W-203	6 "x 0.134"	HVH-2
W-212	6 "x 0.134"	HVH-2
W-441	6 "x 0.134"	HVH-3
W-442	6 "x 0.134"	HVH-3
W-521	6 "x 0.134"	HVH-3
W-527	6 "x 0.134"	HVH-3
W-656	6 "x 0.134	HVH-4
W-665	6 "x 0.134"	HVH-4
W-751	6 "x 0.134	HVH-4

Welders whose stencils appeared next to completed pipe welds were noted and their qualification records were reviewed to verify that they had been and are currently qualified to weld under the respective procedures above. Welders selected for this evaluation were identified by the following stencils; TC, through TI and TQ.

Filler Metal Control

Filler metal used on this modification is purchased and controlled/issued to the field by the licensee. Accordingly, the inspector reviewed the licensee's applicable procedure, documented earlier in this report, inspected warehouse storage, issuing stations and field locations where the material was being used/consumed. The material checked had been purchased from Techalloy under purchase order PO #472598AV. It was produced under SFA 5.14 requirements, type ERNiCrMo-3. For Heat Nos. VX0582AK and VX0389AK; purchase, receiving and rod issue records, were reviewed to verify that these activities were consistent with approved procedures and that the material met specification requirements. In the field the inspector verified that cleanliness and identification was being maintained up to consumption, and that unused material was being controlled and/or returned as appropriate.

Within the areas inspected, no deviations or violations were identified.

3. Exit Interview

The inspection scope and results were summarized on December 2, 1988, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed below. Although reviewed during this inspection, proprietary information is not contained in this report. Dissenting comments were not received from the licensee