APPENDIX B

U. S. NUCLEAR REGULATORY COMMISSION
REGION IV

NRC Inspection Report: 50-382/84-26 Construction Permit: CPPR-103

Docket: 50-382

Licensee: Louisiana Power & Light Company
142 Delaronde Street
New Orleans, Louisiana 70174

Facility Name: Waterford Steam Electric Station, Unit 3

Inspection At: Taft, Louisiana

Inspection Conducted: May 29 through June 8, 1984

Inspector: _____ 1/16/85
J. I. Tapia, Reactor Inspector Date

Assisting Personnel:

D. Darley, Energy Technology Engineering Center (ETEC), Rockwell International (RI)
A. Karwoski, ETEC, (RI)
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Approved: _____ 1/17/85
W. A. Crossman, Chief Date
Reactor Project Section B

Inspection Summary

Inspection Conducted May 29 Through June 8, 1984 (Report 50-382/84-26)

Areas Inspected: Routine, announced inspection of test results evaluation, review of IE Bulletin No. 79-14, and a review of the Independent Design Review conducted by Torrey Pines. The inspection involved 544 inspector-hours onsite by one NRC inspector and six consultants.

Results: Within the areas inspected, one violation was identified (Failure to Incorporate Correct Limits in Surveillance Procedure, paragraph 2.g).

DETAILS

1. Persons Contacted

Principal Licensee Personnel:

F. J. Drummond, Nuclear Services Manager
E. J. Senac, Special Project Manager
K. K. Gala, Project Manager, - IDVP
K. W. Cook, Nuclear Support and Licensing Manager
B. Toups, QA Representative
M. S. Green, QA Engineer

Other Personnel:

J. M. Damitz, Ebasco, Stress Analysis Supervisor
J. DeErwin, Ebasco, Project Engineer
R. J. Esnes, Ebasco, Assistant Project Engineer
V. Chandler, Ebasco, Lead Engineer
N. Popevic, Ebasco, Project Engineer

2. Independent Design Review

Torrey Pines Technology (TPT) performed an Independent Design Review (IDR) of the Emergency Feedwater (EFW) system. The purpose of this review was to verify that the design process adequately converted the design basis specified in the Final Safety Analysis Report (FSAR) into design documents. TPT issued 38 Potential Finding Reports (PFRs) documenting the results of their review. The 38 PFRs were evaluated and subsequently defined as 4 findings, 20 observations, and 24 invalid findings. During this inspection the 38 PFRs were reviewed to assess the adequacy of the indpendent design review and associated corrective actions taken. The following lists the 38 PFRs documented by TPT:

LIST OF POTENTIAL FINDING REPORTS

PFR NO.	RESP. ORG.	SUBJECT	CLASSIFICATION
001	EBASCO	Feedwater pumps not capable of 700 gpm flow against steam generator pressure.	Invalid
002	EBASCO	Steam pressure could exceed ASME code allowables.	Observation
003	EBASCO	Inadequate pump NPSH with flow through one suction line and maximum identified pump discharged.	Observation

PFR NO.	RESP. ORG.	SUBJECT	CLASSIFICATION
004	EBASCO	Inadequate specification of humidity requirement.	Observation
005	EBASCO	Valve location questioned-specified to be indoors.	Observation
006	EBASCO	Potential for water hammer exists because of water leakage through valves.	Finding
007	EBASCO	Piping design specification not consistent with FSAR.	Observation
008	EBASCO	Piping support stress resulting from as-built piping loads exceeds FSAR limit.	Observation
009	EBASCO	Potential for pipe freezing exists in outdoor piping.	Finding
010	EBASCO	As built piping loads on steam generator nozzle greater than load analyzed by CE.	Invalid
011	C-E	Unconservative classification of stress category.	Observation
012	C-E	No seismic load in X direction for SG support skirt and sliding base.	Invalid
013	EBASCO	Incorrect bending moment calculations for condensate storage pool wall.	Observation
014	EBASCO	Incorrect calculations for condensate storage pool support beam.	Finding
015	EBASCO	Turbine nozzle load exceeds manufacturers requirements.	Observation
016	EBASCO	Original calculation missing for air handling unit supports.	Observation
017	EBASCO	Potential for water hammer in steam supply line to turbine for pump A/B.	Invalid
018	EBASCO	Equipment specification does not include requirements for radiation dose qualification.	Finding

PFR NO.	RESP. ORG.	SUBJECT	CLASSIFICATION
019	EBASCO	Vent location not per drawing.	Observation
020	EBASCO	Drain line location not per drawing.	Invalid
021	EBASCO	Piping not installed per drawing.	Observation
022	EBASCO	Piping not installed per drawing.	Observation
023	EBASCO	Piping incorrectly identified and not installed per drawing.	Observation
024	EBASCO	Interfacing services to valve not connected.	Invalid
025	EBASCO	Support location not per drawings.	Observation
026	EBASCO	Support location not per drawings.	Invalid
027	EBASCO	Support location not per drawings.	Observation
028	EBASCO	Steam turbine data not available.	Observation
029	C-E	Project Logic Network (PLNs) did not describe EFW design inputs or interfaces.	Invalid
030	C-E	CE's BOP document not reviewed/ approved and marked tentative.	Observation
031	EBASCO	B-P design/analysis document incomplete-no checks or approvals.	Invalid
032	EBASCO	Current issue of specification not available in B-P's home office.	Invalid
033	EBASCO	B-P revision/issue control lacking and requirement missing from Project Instructions.	Invalid
034	EBASCO	Procurement document control requirements not suitable.	Invalid
035	EBASCO	Design document revision/issue not current.	Invalid
036	EBASCO	Drawing update process of approximately 5 FCRs or 1 year violated.	Observation

PFR NO.	RESP. ORG.	SUBJECT	CLASSIFICATION
037	EBASCO	Installed piping and pipe supports not consistent with "as built" stress analysis.	Observation
038	EBASCO	Tornado load not analyzed for EFW piping and supports located outdoors.	Invalid

The following represents the results of the NRC assessment of each PFR:

a. Emergency Feedwater (EFW) Pumps not Capable of 700 gpm Flow Against Steam Generator Pressure

FSAR Section 10.4.9.1(b) stated that the EFW system delivers feedwater against a steam generator pressure corresponding to the main steam safety valve set pressure plus accumulation.

Using the top set relief valve set pressure of 1135 psig with 3 percent accumulation and a 5 percent ambient temperature tolerance, TPT calculated a total pump head requirement of 2,932 feet. The motor driven pump curves indicate that each pump could only supply 270 gpm or with recycle, two pumps could only supply 450 gpm. Similarly, the turbine driven pump could only supply 520 gpm with pump recycle. TPT concluded that neither the two motor driven pumps nor the turbine driven pump were capable of supplying the required 700 gpm flow against the maximum steam generator pressure.

LP&L responded to the potential finding statement by pointing out that in FSAR Section 10.4.9.1, "Design Basis," the 700 gpm flow is an interface requirement for the EFW pump flow to the Combustion Engineering Nuclear Steam Supply System (NSSS) with the steam generator pressure at 1,085 psig. The pumps are capable of meeting this requirement. FSAR Chapter 15, "Safety Analysis," supports the flow requirement of 700 gpm at 1,085 psig. Also, this requirement is independent of safety valve setpoint tolerances. It is LP&L's position that the EFW system is capable of delivering flow to the steam generators at the maximum safety valve set pressure plus accumulation and ambient temperature tolerance and, therefore, the requirements in FSAR Section 10.4.9.1 are satisfied.

Although TPT agrees that the EFW system will meet the design requirements for interfacing with Combustion Engineering's NSSS, they do not agree that the requirements in the FSAR Section 10.4.9.1 are satisfied unless the requirement is interpreted to mean that, at maximum pressure, flow rate is not important.

The issue went for resolution to the Findings Review Committee (FRC). It was concluded in the impact assessment that the requirement of the EFW

system to deliver 700 gpm at the maximum possible steam generator pressure is not a criterion within the design basis of Section 10.4.9.1 of the FSAR. Also, based on the safety analysis of FSAR Chapter 15, the EFW system was determined capable of delivering 700 gpm when required.

This issue has been adequately addressed and the conclusion drawn by the FRC is acceptable to the NRC inspector. Based on the NRC inspector's review of the accident analysis, it was determined that steam generator pressures will never be near the TPT calculated pressure when the EFW flow is actuated at 1,085 psig. Since the peak accident pressure is reached before the EFW is introduced, the EFW pumps will function as required.

b. Steam Generator Pressure Could Exceed ASME Code Allowables

The ASME Code specifies that the total rated relieving capacity shall be sufficient to prevent a rise in pressure of more than 10 percent above the design pressure. Stemming from the response to NRC question 010.36, the relief valve setpoint can be as much as 5 percent above nominal due to code-allowed tolerance of 1 percent and the tolerance from effects of ambient temperature. Based on this response, TPT concluded that, with the relief valve setpoint at 1,135 psig, the maximum steam generator pressure exceeds the ASME Code allowable of 1,210 psig by 17.5 psig.

It is the position of LP&L that the maximum variation from the original setpoint that is realistically possible due to ambient temperature variations is on the order of ±2 percent instead of the originally estimated 5 percent. The basis for the reduced temperature variation is that: (1) the local environment will not vary greatly in the immediate vicinity of the valve due to the heat emanating from the steam piping; (2) the valve topworks, which probably contribute the most to setpoint variations, will experience an even more stable ambient temperature because they are completely shrouded by weatherhoods, which will tend to catch and hold the warm updraft from the piping; and (3) it is extremely unlikely that the valves will be calibrated in ambient conditions of either extreme, i.e., 6°F or 104°F; the normal of 60° to 80°F being the expected ambient.

The total rate relieving capacity of the valves has been analyzed utilizing the above bases. The results of the analysis are that the total capacity of five of the six valves, calculated in accordance with ASME B&PV Code, 1980 Edition through Winter 1983 Addenda, Section III, Subsection NC, paragraphs NC-7734.2 and NC-7736.1, is 8,500,000 lb./hr. of steam as compared with a required capacity per specification of 7,900,000 lb./hr. Overpressure protection of the system is therefore more than adequate.

It was concluded that the overpressure protection of the system is adequate and that the pressures will not exceed the ASME Code allowable as

originally believed. This is based on the analysis performed and on LP&L's verification of all safety relief valve setpoints being at or less than the ASME Section III Code allowable with no cases being found where Section III rules were violated.

TPT also qualified the effect of 17.5 psi overpressure and demonstrated that the ASME B&PV Code allowable stresses would not be exceeded. Thus, there is no safety significance to the potential finding.

c. Inadequate EFW Pump Net Positive Suction Head (NPSH) With Flow Through One Suction Line and Maximum Identified Pump Discharged

FSAR Section 10.4.9.2 states that the suction of the EFW system pumps is from two separate connections to the condensate storage pool (CSP), each sized to provide sufficient suction flow and NPSH to all three EFW system pumps. The EFW system suction piping is provided with manually operated locked open valves for maintenance.

Using a system flow to two steam generators of 1,915 gpm for all three pumps operating with all steam generator valves open, TPT calculated that the total suction flow to the pumps would be 2,085 gpm. The observation by TPT is that inspection of the calculated line pressure drop suggests that, for a single suction line supplying water to all three pumps, pump "A" would have inadequate NPSH and would be expected to cavitate. Therefore, one supply line could not provide sufficient suction flow and NPSH to three operating EFW system pumps.

It was LP&L's response that: (1) it is not reasonable to assume that all three pumps will operate for extended periods of time with delivered flow rates exceeding 700 gpm; (2) it is not reasonable to assume that one suction line will be unavailable; and (3) it has been determined that adequate NPSH does exist for operation at 700 gpm delivered. The basis for position (1) is that when the EFW system is actuated, two of four valves in each discharge line from the pumps will open to a predetermined position equivalent to 200 gpm flow to each steam generator. If the steam generator level continues to fall, the remaining two valves would open to provide a total flow to each generator of 400 gpm. Once level is reestablished, the system will transfer from flow control to level control and the operator will then verify required flow and secure one or two pumps to limit delivered flow to 700 gpm. It is, therefore, not reasonable to assume that all three pumps will operate for an extended period of time. The basis for position (2) is that the CSP discharge valves are manual locked open valves and are monitored so that an inadvertently closed valve will result in an alarm in the control room. It is also unreasonable to assume that a CSP strainer will be blocked since the tank is a closed pool and the strainer open area is over five times greater than the open area of the pipe.

Since the system is provided with controls to monitor flow and steam generator level, the possibility of pump cavitation would only occur through a series of multiple mechanical failures and system misoperation.

TPT disagreed by stating that: (1) whether reasonable or not, the FSAR commitment requires the capability of satisfactorily operating all three pumps with only one suction line in service; (2) with no equipment failures (other than the initiating accident) there are no provisions to limit the total feedwater flow. To the extent that steam generator pressure drops below the 1000 psig assumed in the FSAR, the total feedwater flow will increase beyond 1,915 gpm; and (3) disregarding changes in steam volume in the generators, the total water to be replaced by the EFW system will be 55,560 gallons. At 1,915 gpm, the time to reflood would be 29 minutes during which time the pumps would operate at maximum flow rate. Removal of 55,560 gallons from the CSP would leave an available NPSH from pump "A" of 18.7 ft. compared to a required NPSH of 17 ft. With inaccuracies from estimating pressure drops, a 3 percent error destroys all margin.

The issue went for resolution to the FRC. It was concluded in an impact assessment that it is not clear whether it was intended in the FSAR that all three pumps be required to operate at maximum flow rate from one suction line. In addition, even if pump A cavitated and failed, there would be no safety hazard. However, the committee concluded that the initial observation was valid.

LP&L issued a corrective action plan wherein, based on review of the EFW system design, LP&L determined that: (1) the design flow requirement of the EFW system is only 700 gpm; (2) that multiple failures of CSP suction line and flow controls are unrealistic; (3) that based on realistic operation of the EFW system, there is 39 ft. of NPSH available against 17 ft. required; and (4) that even in the unlikely event that pump A fails due to inadequate NPSH, the EFW system will continue to operate safely.

The Technical Specification surveillance requirements for the EFW system specifies that following any cold shutdown of 30 days or longer, or whenever line cleaning through the EFW line has been performed, the normal flow path from the CSP through each EFW pump to each steam generator is verified by means of a flow test. Also, at least once per 31 days, each valve (manual, power operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is verified for its correct position.

Based on the review of LP&L's corrective action plan and the requirements of the Technical Specification for flow path surveillance, it is concluded that the issue has been adequately addressed and is resolved.

d. Inadequate Specification of Humidity Requirement for Class IE, 4160 V Switchgear Power Distribution Center No. 3A3-5

FSAR Section 3.11, "Environmental Design of Mechanical and Electrical Equipment," and Table 3.11-1, "Environmental Condition Summary," requires that equipment be qualified for a humidity range of 20 to 90 percent relative humidity (RH). EBASCO Specification LOU-1564.259B, Revision 6, did not specify the humidity range, but only identified the humidity as "high."

Power distribution center No. 3A3-5, the source of power for the EFW pump, was procured from GE as Class 1E, IEEE-323, qualified for a humidity range of 10 to 75 percent RH, not the 20 to 90 percent RH specified in the FSAR.

The humidity levels in the switchgear room will never exceed 70 percent RH because the heat given off by the switchgear raises the room's air temperature but does not add moisture to the air. The net effect is a reduction of the relative humidity to approximately 50 percent for summer and winter extremes. This conclusion is supported by EBASCO design calculations 5-D-6-C (summer air conditioning loads) and 5-D-9-A-3 (winter heating loads) which were reviewed by the NRC inspector.

LP&L requested that EBASCO revise Specification LOU-1564.259B to include FSAR humidity parameters. LP&L also revised Table 3.11-1 of the FSAR to reduce the humidity requirements to 70 percent RH for the switchgear area.

TPT agreed with LP&L that the switchgear area will not exceed 70 percent RH. Specification LOU-1564.259B has been revised to include the required humidity parameters. The FSAR has also been revised to reduce the humidity requirement for the switchgear area in the RAB to 70 percent RH. LP&L's response to this finding is considered adequate and the potential finding is considered closed.

e. Valve Location Questioned-Specified to be Indoors

The observation made by TPT was that an EBASCO specification incorrectly identified the location of two valves and accessories to be indoors. The valves and accessories are actually located outdoors. These valves must be qualified to a temperature range of 6° to 104°F per FSAR Table 3.11-1, "Environmental Design Category 'F'," for equipment exposed to outside environment.

In response to the TPT observation, LP&L issued a corrective action plan, which identifies the actions taken to correct the discrepancy and to identify whether other equipment was incorrectly qualified.

The specification has been revised and the valve manufacturer, Masoneilan, has certified that the subject valves and accessories are adequately

designed to operate in the outdoor environment as installed at Waterford 3.

A review was made of safety-related systems to determine whether other valves were located inside or outside and whether the specifications had properly defined the location and environment that the equipment would experience. Nine discrepancies were found and resolved.

Preventive action required that all specifications for future procurement be thoroughly reviewed prior to issuance for consistency with FSAR requirements.

From the review of the corrective action plan, it was found that the issue had been properly resolved by LP&L.

f. Potential EFW Pump Discharge Line Water Hammer

This valid finding identified the potential for water hammer to occur in the EFW pump discharge lines if the water leaked out of the discharge line through the check valves in excess of that which would leak into the lines via the isolation valves. The postulated leakage back to the condensate storage pool through the leaking check valves would result in partial voiding of the 6-inch line which in turn would lead to water hammer when the EFW pumps are started. TPT found that this scenario had not been considered in the design of the EFW system.

In response to this valid finding, the licensee performed a valve leakage analysis intended to quantify the inventory of water present in the EFW discharge line. Although this analysis indicated that the line would remain full of water, the possibility of deterioration in valve seat tightness with life cast doubts on the reliance on the calculation to assure that void creation was not possible. The licensee therefore chose to ensure that the discharge line piping be full of water by installing a 1-inch bypass line with a ¼-inch orifice around the check valves, thus ensuring that the EFW discharge line is maintained full of water.

During this inspection, the 1-inch bypass line modifications were observed by the NRC inspector. The two bypass lines were installed per Design Change Notice No. MP-795R1. The piping stress analysis was modified to include the bypass lines. All other safety-related systems were reviewed to identify any similar instances where stagnant water check valve leakage could lead to a water hammer. No similar instances were identified.

LP&L's response to this finding was conservative considering the low probability of occurrence of the water hammer. This low probability results from the fact that the line is subject to a monthly flow test as required by Technical Specifications. Upon completion of the test, the isolation valves will be closed and the line will be full of water.

Although the shutoff ability of the check valves will be unknown, leakage through series oriented valves would not be expected to be of a sufficient quantity to lead to a water hammer in the 6-inch EFW line.

g. Piping Design Specification not Consistent With FSAR

From the comparison of load combinations in EBASCO Piping Specification No. LOU-1564.100C and the FSAR, it was determined that for the Safety Injection System upset operating condition, the loading combination did not include the load derived from the operating basis earthquake. It was also noted that fast valve closure effects were only considered for the safety injection system per the specification. The FSAR requires that dead weight, operating pressure, fast valve closure, and operating basis earthquake loads be combined for the design loading combination in question. The design specification has this combination listed in two parts. One part lists dead weight, operating pressure, and operating basis earthquake loads while the second part lists dead weight, operating pressure, and fast valve closure with a notation in parenthesis stating "Safety Injection System only."

The two part load combination listed in the specification was combined and made consistent with that in the FSAR via Design Change Notice No. MP-882. An FSAR consistency review was initiated to guarantee that the FSAR was current with all other design documents. In addition, all safety-related design change notices were required to be reviewed by the licensing department for evaluation of the impact on the FSAR.

The licensee's followup audit of this issue noted that the main feedwater isolation valves, specified as fast closing valves (i.e., less than 5 seconds), did not have fast valve closing loads included in the design load combination. It was subsequently determined that these valves were improperly identified as fast closing in that their specified closing time is 5 seconds. It is felt that this time is slow enough so that hydraulic instabilities will not develop. The safety injection system valves were specified to close in under 10 seconds and as such were not classified as fast closing valves.

During this inspection, the NRC inspector attempted to verify closing times for the safety injection and feedwater isolation valves which were subsequently deleted from the specification requirement for inclusion of fast valve closure loads. From closing time tests performed at the NRC inspector's request, it was determined that one safety injection isolation valve closed in 3.82 seconds. The other safety injection isolation valve closed in 5.69 seconds. From the review of valve test data reports, both feedwater isolation valves were found to have closed in 2.8 seconds. The three identified closing times less than 5 seconds invalidate the decision to omit the fast valve closure loads from the design load combination.

The licensee committed to perform a stress analysis to assess the impact of the actual closing time on the design stress values originally utilized for the two feedwater isolation valves. This matter will remain unresolved pending review of the analysis results (8426-02).

The fast closing safety injection valve will be modified to assure closure greater than 5 seconds. The surveillance procedure utilized to perform cold shutdown testing of these safety injection isolation valves was also reviewed during this inspection. This Surveillance Procedure No. OP-903.033, Revision 1, "Cold Shutdown ISI Valve Tests," was found to list the required stroke times as "less than or equal to 90 seconds." This procedure was deemed to be in error in that valve stroke times between 0 and 5 seconds would be accepted during the surveillance but would be in contradiction to design provisions. This is, therefore, a violation of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50, wherein it states that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. The generation of Surveillance Procedure No. OP-903-033 did not assure the acceptance limits on valve stroking times which were utilized in the load combinations for the feedwater system design (8426-01).

h. As-Built Piping Loads on Piping Support Exceeds FSAR Limit

TPT determined that the as-built loads for Pipe Support No. FWRR 313 were greater than those used in the Bergen-Patterson (B-P) analysis for both the basic pipe support design and for the axial restraint lugs which are welded directly to the pipe.

The stresses on a 6 X 1-inch plate that attaches the pipe support to a beam were determined to exceed FSAR limits.

TPT's evaluation came in the middle of the support verification work and did not have the benefit of finalized design calculations. The final design calculations (EBASCO analysis 1072, dated November 23, 1982) took into consideration not only as-built loads but also as-built dimensions of the pipe support installation and demonstrates that the stresses met FSAR limits.

All safety-related supports are reviewed prior to system turnover (via startup system 19-17). This review verifies that the as-built support/restraint configuration is acceptable.

EBASCO Stress Analysis Calculation No. 1072 indicates the critically stressed item in the pipe support to be the 1/4-inch fillet weld that

attaches the plate to the vertical beams. The pipe support computer analysis was modified to account for weld metal stiffness. The as-built changes in support-to-girder eccentricity from 6 to 2 inches reduced the loading on the critical section in the plate to an acceptable level.

LP&L's site review program for safety class pipe supports is sufficiently comprehensive so that all significant as-built variations (loads/dimensions) will be incorporated. The original designs utilized a low stress allowable in anticipation of stress increase due to as-built variations. The final allowable stress value is 66 percent of the material yield strength at temperature. This design approach results in conservative original designs with sufficient margin to accept the variation.

i. Freezing of EFW Piping Located on Reactor Auxiliary Building (RAB) Roof

TPT found that a potential for freezing existed in that portion of the EFW system located outdoors on the RAB roof. The outdoor design temperature is listed as 6°F in the FSAR. Contrary to the engineering judgment used in the original design, TPT performed an analysis and showed that conduction of heat from the 448°F main feedwater line would be insufficient to keep the 6-inch EFW pipe from freezing. The original design performed by EBASCO included the postulations that freezing temperatures would only occur for short durations and that a 6-inch line would not be susceptible to freezing over such periods due to the proximity of the main feedwater lines. This engineering judgment was without adequate basis as shown by TPT.

LP&L decided to add freeze protection in the form of electric heat tracing to protect against design temperature of 0 degrees Fahrenheit. Design Change Notice No. MP-762 was utilized to install the electric heat tracing. The NRC inspector observed the installation of the electric heat tracing during this review. Other actions taken included a review of all piping to show that other safety-related lines were not exposed to the same environment without freeze protection. No such lines were identified. EBASCO's position is that this problem is an isolated case resulting from the subtropical characterization in the facility FSAR.

The completed installation of the heat tracing along with the steps taken to identify similar problems resolves this potential finding.

j. As-Built Piping Loads on Steam Generator Nozzle are Greater Than the Loads Analyzed Originally by Combustion Engineering (CE)

The loads obtained for the as-built loading combinations that includes dead weight, thermal, and operating basis earthquake (EBASCO Calculation No. 1031, dated July 13, 1982) are greater than those used by CE in the steam generator analysis (CENC-1246, September 1975). The as-built nozzle

loads are also greater than those originally transmitted to CE (EBASCO LW-3-714-74), which were within the loads used by CE.

In letters C-CE-208 (June 4, 1971) and C-CE-535 (January 10, 1972), CE provided loads and equations to determine acceptability of calculated nozzle loads. It is LP&L's intention to forward as-built nozzle loads to CE for inclusion in their specifications and reports. This data will be transmitted only after all as-built calculations are complete.

The NRC inspector has determined that the as-built analyses have been completed and that the as-built loads and moments so determined satisfy the control equations specified by CE for the steam generator. LP&L has forwarded this data to CE.

k. Classification of Stress Category

At the steam generator upper support snubber lugs, stresses resulting from a normal operating plus operating basis earthquake loading combination were incorrectly classified as primary plus secondary stresses. These stresses are not self limiting, therefore, the allowable stress intensity should be 1.5 Sm rather than 3 Sm as used by CE in Report No. 1246. The calculated stress intensity exceeds the 1.5 Sm limit.

CE states that the bending stresses calculated on skirt 21 of SS-420-1 are of a local nature and that the interpretation of stress classification concurs with that set forth in a welding research council technical paper.

LP&L cites TPT's calculation using other techniques than used by CE that show emphasis with code limits wherein all stresses are classified as primary and conclude that there is no safety concern for this particular case. TPT reexamined CE's classification of stresses for other structures; e.g., FW nozzle, lower support skirt, and sliding skirt. For these cases the stresses were properly classified.

A review by the NRC inspector of the TPT data package indicated that, by using the steady state full load operating steam pressure of 900 psia or normal operating pressure rather than the design pressure of 1,100 psia in combination with th OBE loading, that code limits could be satisfied (1.5 Sm) treating all stresses as primary. Subparagraph NB-3112.3, relating to the Design Mechanical Loads for the ASME B&PV Code Section III, DIV. 1, states, "The actual mechanical loads at the appropriate time shall be used in the computation made to show compliance with the stress intensity limits of NB-3222.2 and NB-3222.4(b)," where NB-3222 covers normal conditions.

Telecons between NRC, TPT, and LP&L subsequent to the issuances of the findings addressed concerns regarding both CE classification of stresses and TPT's use of operating pressure in place of design pressure.

The entire CE stress report has not been reviewed in its entirety, hence, generic implications as regards the proper classification of stresses have not been completely resolved. This item will remain unresolved until NRC's office of NRR has addressed this issue with CE (8426-03).

l. Steam Generator Support Skirt and Sliding Base Seismic Load

From the TPT design review of the steam generator support structure it was noted that no seismic load oriented along the axis of the steam generator hot leg was included in the calculations for the support skirt and sliding base.

The response to this potential finding consisted of clarifying the methodology utilized in designing the reactor coolant system for seismic loads along the hot leg axis. The computer seismic analysis of the entire reactor coolant system should have been reviewed by TPT in order to note that the design basis earthquake load along the hot leg axis, resulting from the steam generator sliding support, is transmitted through the hot leg to the reactor vessel supports. For this reason, no seismic load along the hot leg axis can be identified in the calculations for the steam generator support structure. For the case of a guillotine break of the hot leg, the loads which are normally transmitted to the reactor vessel supports are added to the loads calculated for the support skirt and sliding base and are oriented along the axis of the hot leg. The reactor vessel support load table and LOCA load condition valves for the sliding base were subsequently provided as evidence of the described design methodology.

The design methodology and load values were reviewed during this inspection. As a result of this review it is evident that the TPT potential finding was a result of a limited review and not due to the omission of any load resulting from a seismic event.

m. Incorrect Bending Moment Calculations for Condensate Storage Pool Wall

The potential finding statement by TPT for this issue was that incorrect bending moment calculations for the condensate storage pool wall were made. The noted discrepancies are as follows:

1. In the calculation for the 3 ft. 0 in. thick wall shown on page 54 of EBASCO calculations for the Condensate Storage Pool the following was observed:

   (a) Moments due to relative and moments should have been calculated based on the full 3 ft. 0 in. wall thickness rather than on a 2 ft. 9 in. thickness.

(b) In the computation for Mu, the moment due to static fluid pressure should have been multiplied by 1.3 rather than 1.2 to reflect the 1.1 dead load factor as well as the 20 percent seismic magnification factor.

(c) The value obtained for steel areas "As" using EBASCO numbers should have been 0.89 sq. in. rather than 0.71 sq. in. (arithmetical error).

2. If the items identified in 1a and 1b were incorporated into the calculation for the required steel area "As", the value obtained would have been 1.08 sq. in., which is greater than the 1.0 sq. in. corresponding to #9 @ 12 in.

LP&L disagreed with the potential finding statement for this issue stating that the design calculations for a 3 ft. 0 in. wall have been revised to incorporate the items identified in descrepancy item 1 above and to eliminate the over-conservativeness for displacement calculations. Design calculation sheets support that the reinforcing steel for the wall is sufficient.

n. Incorrect Calculations for Condensate Storage Pool Support Beam

In the EBASCO calculations for the RAB pool design there are three identically designed beams. The calculations did not consider the weight of the 2 ft. thick wall which is transmitted to the beam at line 7A. Also, the relative stiffness computed for moment distribution factors was not computed based on the dimensions of the detail drawings. Thus, the reinforcing steel requirement for the concrete beam on line 7A beneath the condensate storage pool could exceed that provided in the drawing.

LP&L disagreed with the potential finding statement for this issue stating that the design calculations have been revised to include the weight of the 2 ft. thick wall near line 7A, to reflect the as-built masonry dimensions and to eliminate the over conservativeness in maximum moment and shear computations. It was found from design calculation sheets that the required reinforcing steel for the beams on line 7A has been provided.

o. Turbine Nozzle Loads Exceed Manufacturer's Requirements

The nozzle loads at the turbine inlet based on Calculation 1071-1 dated November 25, 1981, exceeded Terry Turbine requirements. Several interim analyses conducted by EBASCO (July 16, 1982, October 25, 1982) failed to generate loads/load combinations that met the allowable limits. As indicated by EBASCO in telex dated November 9, 1982, nozzle loads based on the as-built configuration of piping and supports satisfied the individual nozzle load requirement but failed to satisfy the requirements for combined nozzle loads. Individually, the actual loads for exhaust and

inlet nozzles must meet the Terry Turbine allowables. The actual nozzle loads when combined must meet allowable loads at the turbine centerline.

EBASCO addressed the issues raised by TPT on a point-by-point basis. The nozzle load information telexed to TPT on November 9, 1982, was based on an interim analysis and did not include all design changes. Subsequent to the telex an additional analysis was performed which incorporated all outstanding design changes (CALC 1070, dated November 24, 1982, and 1070 dated December 4, 1982) meet the individual and combines nozzle allowable requirements.

The NRC inspector has determined that during the as-built verification program, it was noted that the weight of valve 3MS-678A/B used in the piping stress analysis was incorrect. The actual valve weight is approximately 1,000 pounds greater than that used in the original analyses. The heavier valve weight and the proximity of the valve to the turbine inlet nozzle necessitated a design change in the inlet piping loop to relocate the subject valve in order to bring the nozzle load/load combinations to within the Terry Turbine limits. The analysis (Calculation 1072, dated November 24, 1982) of these as-built changes was shown to satisfy the individual and combined nozzle allowable load requirements.

p. Original Calculation Missing for Air Handling Unit Supports

The EBASCO procedure for the preparation of calculations requires that the originals of the calculations are to be kept in the originating discipline or department file. It was TPT's potential finding that EBASCO was unable to locate the original calculations for air handler supports.

LP&L agreed with the potential finding statement. EBASCO performed the required calculations of the existing HVAC air handler supports as a reverification of the design for the TPT evaluation. LP&L concludes that the finding is no longer technical since the calculations, which were redone for the design, demonstrated that the design is adequate.

The issue was reviewed by the FRC. The committee concluded that the calculations which were redone show that the stresses are all within the allowable limit with no safety impact and are satisfactory.

This issue has been adequately addressed and the conclusion drawn by the FRC is acceptable.

q. Potential for Water Hammer in Steam Supply Line to Turbine for Pump A/B

The potential findings statement by TPT for this issue was that there is a possibility of water collecting in the steam supply lines to the turbine driven EFW pump with resulting danger of water hammer on turbine startup.

This statement is based on the following scenario. Leakage of main steam during normal operation would be expected to occur through the two isolation valves to the EFW turbine pump. The steam supply lines are electrically heated to 450°F and if the pressure in the lines exceeds 422 psia, the vapor pressure at 450°F would cause condensate to form throughout the piping resulting in trapped water slugs. Starting the turbine would accelerate the trapped water slugs to high velocities with resultant water hammer problems. Therefore, the FSAR requirement in Section 10.4.9.1(h) requiring that the EFW system is designed to preclude hydraulic instabilities is not met.

LP&L disagreed with the potential statement stating that the drain valve identified by TPT is not the normal drain path. Any condensation that forms in the piping will drain out through the steam trap located off of the drip pot. This trap is continually available draining and has a capacity of 8,000 lbs./hr. at 1,085 psig inlet pressure. If the condensation capacity of the trap is exceeded a valve will open to provide additional drainage capacity. The drip pot is insulated but not temperature maintained. Therefore, the drip pot will be the coldest portion of the system. Based on the collapse in volume due to the condensation process, system pressure will be maintained less than the vapor pressure at 450°F. It is not anticipated that the condensation of steam will occur in areas other than the drip pot and the possibility of water hammer will be precluded.

TPT agreed with LP&L's response to their potential finding statement. TPT obtained additional information and concluded that the steam supply lines maintained at 450°F are vented to atmosphere during normal plant operation, precluding the collection of condensate from valve leakage.

This issue has been adequately addressed and is considered closed.

r. Equipment Specification Does not Include Requirements for Radiation Dose Qualification (Auxiliary Control Panel LCP-43)

FSAR Section 3.11 specifies a radiation dose of 10^4 Rads for equipment located in the general area of the RAB where the auxiliary control panel LCP-43 is located. EBASCO Specification LOU-1564.415E, Revision 3, which was used to purchase LCP-43, did not specify a radiation dose qualification requirement.

The FSAR lists the maximum radiation dose for large general areas or zones within the RAB. Radiation doses, however, vary significantly within these general zones. Subsequent reevaluation by EBASCO of the local area occupied by auxiliary control panel LCP-43 indicates that the radiation dose for this area is only 8.8×10^1 Rads. This is well below the level for which radiation qualification is required. Therefore, radiation dose qualification for LCP-43 is not required.

TPT accepted the dose reduction from 10^4 R to 8.8×10^1 R because it was supported by FSAR Chapter 12.3, "Radiation Protection Design Features," which states that the area in which LCP-43 is located has less than 0.25 mR/hr or a 2 TID of 8.8×10^1R. The radiation dose map for [illegible]AB and the affected FSAR sections have been amended to reflect the correct radiation dose requirement for the LCP-43 area. The NUREG-0588 submittal to the USNRC has also been modified to reflect the radiation dose change for the LCP-43 area.

PFR-018 in itself did not constitute the valid finding classification, but the existence of other similar potential findings 4, 5, 9, and 38, prompted the FRC to rule PPR-018 as a valid finding. PFRs 4, 5, 9, 18, and 38 all relate to equipment not meeting environmental requirements specified in the FSAR. To combat this potential problem, LP&L conducted an audit of environmental conditions specified in equipment specifications and the applicable FSAR environmental design parameters. The review identified some minor inconsistencies which were corrected. The review did not identify any potential safety concerns.

LP&L's response to this finding is considered acceptable. They have initiated review procedures to prevent future reccurences of this type problem. Therefore, this finding is closed.

s. Vent Location not per Drawing EFW System: Components and Piping

EBASCO Specification LOU-1564.100 requires that all pipe and fittings be legibly marked with their identifying line description and piece number. During the TPT walk through, it was observed that the piping from EFW pumps A and A/B discharge nozzles to the wall penetration and check valve 3FW-V601A were not identified.

It was also observed that vent line 3FW1-79 was located downstream of branch line 3FW4-48 instead of upstream of branch line 3FW4-48 as shown in the flow diagram.

The first part of the PFR dealing with markings was invalid since markings were verified by TPT on February 1, 1983.

The location of the vent line was installed correctly according to the orthographic piping drawing (LOU-1564-G-176-sh.1) and the isometric drawing (E-2803-I-87). The vent line location on the flow diagram (LOU-G-153 sh.2) is not correct as noted by TPT. The flow diagram is not the drawing utilized for installation of the system but rather an information drawing of the overall system. Design Change Notice DCN-MP-735 was initiated to revise the flow diagram to conform with the piping drawings.

Verification of subject pipe, fittings, and check valve markings was accomplished during a February 1, 1983 walk through. DCN-MP-135 dated December 20, 1982, provided for the necessary correction to the flow diagram. The correction makes the flow diagram compatible with the isometric drawing.

LP&L's response to this PFR is adequate. The PFR should be considered closed.

t. EFW Piping System: Line 3FW6-19A

Isometric Drawing IC-910, Revision 2, required that drain line 3FW1-104 be located 15 inches from the second 90° elbow upstream of valve No. 3FW-V1541A. The actual installation was 12 inches from the first 90° elbow upstream of valve No. 3FW-V1541A.

This apparent discrepancy was a result of Field Change Request (FCR) MR-2133 October 29, 1982, which relocated the drain line to clear conduit interference.

This FCR was issued prior to the TPT review, but apparently was not received by them.

LP&L's response to PFR-020 is considered adequate. This PFR should be considered closed.

u. Piping not Installed per Drawing

Piping associated with the EFW system was not installed per the dimensions shown on the Isometric Drawing IC-86, Revision 7. The following discrepancies were noted:

1. A horizontal line, which per requirement of the isometric drawing was to be installed at an elevation of 58 ft. 9 in. is installed at an elevation of 61 ft. 11 3/4 in.

2. The length of a vertical line run which per requirement of the isometric drawing was to be 18 ft. 9 in. is installed at 21 ft. 11 5/8 in.

3. The isometric drawing specified a floor penetration at 14 ft. 0 in; whereas, there is no floor penetration at elevation 14 ft. 0 in.

LP&L agreed with the potential finding statement for discrepancy items 1 and 2 above, but disagreed with the statement for discrepancy item 3. For items 1 and 2, a nonconformance report would be issued, the contractor would remeasure and record the as-installed condition, results would be submitted for engineering evaluation, and corrective action would be taken

depending on the results of the engineering evaluation; i.e., whether the orthographic piping drawings and Dravo's isometric drawings must be revised or the piping rerouted.

For item 3, LP&L states that the vertical run of 3FW6-19A from elevation -4 ft. 0 in. (erroneously given as elevation 14 ft. 0 in.) is enclosed in a pipe chase. No floor penetrations are used on the orthographic piping drawing. The symbology used by Dravo for wall or floor penetrations are shown at the +46 ft. 0 in. elevation, which is also supported by the EBASCO drawing although symbology differs.

The dimension discrepancies and hanger support discrepancies noted in PFRs 2448-021, 022, 023, 025, 026, and 027 are all addressed in one conclusion.

v. Piping not Installed per Drawing

Piping associated with the EFW system was not installed per the dimensions shown on the isometric drawing and in accordance with the station piping, hangers, and support specification. The following discrepancies were noted:

	Design Dimension	Installed Dimension
1.	Horizontal run adjacent to Column "L". From Column 3A west to 90° elbow: 12'-3'	12'-4½"
2.	Horizontal run parallel to Column 3A. From 90° elbow to branch line 3FW4-48: 33'-10'	33'-6 3/16'
3.	Center line elevation of 6x6x4 reducing tee at branch line 3FW-48: 65'-3 7/8"	Must be same as center line of main run 3FW6-19A @ 65'-5".
4.	Horizontal run parallel to Column 3A, north of branch 3FW-4-48 to 90° elbow: 10'-8"	10'-10"
5.	Location of 1½" vent. From 90° elbow: 3'-0"	3'-2"
6.	Location of 90° elbow north of Column "N": 6"	4 3/16"

LP&L agreed with the potential finding statement for discrepancy items 1, 2, 4, 5, and 6, but disagreed with the statement for item 3.

For items 1, 2, 4, 5, and 6, the contractor would remeasure and record the as-installed condition, results would be submitted for engineering evaluation, and corrective action would be taken depending on the results of the engineering evaluation; i.e., whether the orthographic piping drawings and Dravo's isometric drawings must be revised or the piping rerouted.

For item 3, a field revision and FCR had already incorporated the discrepancy.

The dimension and hanger support discrepancies noted in PFR 2448-021, 022, 023, 025, 026, and 027 are all addressed in one conclusion.

w. Piping Incorrectly Identified and not Installed per Drawing

Piping associated with the EFW system was not installed per the dimensions shown on the isometric drawing and in accordance with the ASME Section III "N" stamp requirement. The following discrepancies were noted:

	Design Dimension	Installed Dimension
1.	Location of line 3FW6-74A relative to columns "N" and 3A: 6" and 2'0", respectively.	4-3/16" and 2'-1 7/8"
2.	Length of horizontal run, lines 2FW4-58A and 2FW4-59A. From 6"90° elbow to end of 6"x4" reducer (typical): 8'-4 1/8"	7'-11¼"
3.	Length of branch connection to 2FW20-12A: 11 5/16"	9 3/8"
4.	Line 2FW6-20A to be "N" stamped	Identified as 2FW6-72A with no "N" stamp

LP&L agreed with the potential finding statement for discrepancy items 1, 2, and 3, but disagreed with the statement for item 4.

For items 1, 2, and 3, the contractor would remeasure and record the as-installed condition, results would be submitted for engineering evaluation, and corrective action would be taken depending upon the results of the engineering evaluation; i.e., whether the orthographic piping drawings and Dravo's isometric drawings must be revised or the piping rerouted.

For item 4, line 2FW6-20A was fabricated as a sub-assembly of 2FW6-72A, which has the "N" stamp, sufficient documentation, and traceability.

The dimension and hanger support discrepancies noted in PFRs 2448-021, 022, 023, 025, 026, and 027 are all addressed in one conclusion.

x. Support Location not per Drawings

Piping support associated with the EFW system was not installed per the dimensions shown on the isometric drawing. The following discrepancies were noted:

1. Discrepancy in drawings for support FWRR-312.

   Support required to be located 13½" below 90° elbow at elevation 58'-9" (El. 57'-7½") in accordance with ISO.IC-86.

   Support FWRR-312 to be located at elevation 57'-7½" per the support detail drawing FWRR-312.

2. Support FWRR-312 is installed at elevation 58'-3 3/4".

LP&L agreed with the potential finding statement and the resolution will be covered in response with PFR 2448-021.

The dimension and hanger support discrepancies noted in PFRs 2448-021, 022, 023, 025, 026, and 027 are all addressed in one conclusion.

y. Support Location not per Drawings

Piping support associated with the EFW system was not installed per the dimensions shown on the drawings. The following discrepancy was noted:

Design Dimension	Installed Dimension
Support FWRR-317 to be located 9'-1 1/16" from FWRR-316 and 4'-8¼" north of column M	8'-10¼" from FWRR-316 and 4'-4¼" north of column M

LP&L disagreed with the potential finding statement. The discrepancy for the support being located 8'-10¼" from FWRR-316 instead of the 9"-1 1/16" had been identified prior to TPT's finding. However, the design location of FWRR-317 is 4'-8¼" north of column M which is consistent with the Dravo isometric drawing. A discrepancy does exist between the installed dimension and the design dimension. The installed location of FWRR-317 will be provided to the stress analyst and the deviation will be corrected and incorporated. This discrepancy was also identified prior to TPT's finding.

The dimension and hanger support discrepancies noted in PFRs 2448-021, 022, 023, 025, 026, and 027 are all addressed in one conclusion.

z. Support Location not per Drawings

Piping support associated with the EFW system was not installed per the dimension shown on the drawings. The following discrepancies were noted:

1. Discrepancy in drawings for support FWRR-321:

   Support FWRR-321 required to be located 9'-7 1/8" north of Column "N" in accordance with ISO IC-851.

   Support FWRR-321 required to be located 9'-4¼" north of Column "N" per the red lined support detail drawing FWRR-321.

2. Support FWRR-321 is installed 9'-7/16" north of Column "N".

LP&L agreed with the potential finding statement and agrees to provide resolution to the discrepancies consistent with PFR 2448-023.

The dimension and hanger support discrepancies noted in PFRs 2448-021, 022, 023, 025, 026, and 027 are all addressed in one conclusion.

aa. Installed Piping and Pipe Supports not Consistent With As-Built Stress Analysis

The potential finding by TPT is that as-built stress analysis isometric drawings of piping dimensions and support locations were in discrepancy with the as-built piping isometrics and support detail drawings. This does not meet the requirements of the EBASCO Procedure E-65.

LP&L agreed with the potential finding statement. LP&L committed to resolve the noted discrepancy in the nonconformance report for PFR 2448-021.

EBASCO Calculation 1072 Part III, dated November 15, 1983, addressed all dimensional discrepancies associated with piping and pipe support locations documented in FRPs 021, 022, 023, 025, 026, 027 and 037. Stresses resulting from the as-built evaluation where shown to satisfy FSAR limits.

LP&L used the criterion set forth in Procedure ESSE S/A-RR-008, "Evaluation Criteria for Discrepancies Reported During Final Walkdown of Piping Systems," dated November 23, 1983, to disposition the discrepancies documented in the final piping system walkdown. The NRC inspector took exception to paragraphs 1.1a, 1.1b, 2.1.1, 2.1.2, 2.1.3, 3.2.1, and 3.2.2 of this specification that list acceptance criterion for pipe supports/ valve locations.

The statements in the above noted paragraphs that allow the existing hanger/valve span to be 1.5 times the recommended span is too large an as-built tolerance. The subject sections should either be removed entirely and/or suitably revised in the opinion of the NRC inspector. It should be noted that this procedure allows the as-built hanger spacing to approach 150 percent of that used in the design calculations whenever the weight stresses (pressure+weight) at the location evaluated are less than 50 percent of the allowable stress and the span in question is less than that shown in the span table. For example, for 3" pipe the allowable spacing could be as much as 6' and as high as 12' for 30" pipe as long as hanger table span lengths are not exceeded.

LP&L has informed the NRC inspector that it is highly unlikely that any of the hanger spacing discrepancies documented during the final piping system walkdown exceeded 6' for small bore and 12' for large bore piping.

LP&L has agreed to review these data and evaluate those discrepancies which exceeded the 6' and 12' limits and that were not verified by analysis.

This matter will remain unresolved pending review of the data of the final walkdown for compliance with the aforesaid commitment (8426-04).

bb. EFW Piping System: Valve 2FW-V852A

The following condition was observed during a TPT walk-through. The nitrogen supply line to valve (2FW-V852A) diaphragm actuator was disconnected. Also the valve position indicator switch and controls were not installed. Instrumentation cables were also not connected.

This potential finding reflected the condition in which valve 2FW-V852A was during the TPT walkdown. This valve required some rework to correct problems experienced during installation as identified on Condition Identification Work Authorizations (CIWAs) 82-D096, 82-D098, and 82-D099. Since LP&L was not requested to provide CIWAs at the time of walk-through, TPT was unaware of the rework.

The repairs identified on the CIWAs have to be completed as stated on the CIWAs. LP&L's response is considered adequate. This item is considered closed.

cc. Steam Turbine Data not Available (Steam Turbine Driver for Emergency Feedwater Pump A/B)

EBASCO Specification LOU-1564.117, Part 1, Section 9.06 requires that the steam turbine driver be supplied with the necessary performance curves. Also, Part 2 of the Specification, Section 9.4, requires a shop hydrostatic test to be performed on the turbine driver casing. The

required data was not supplied by the vendor. Also, the name plate on the turbine was missing.

The expected performance curve K-13269 furnished in the Terry Turbine Instruction Manual (5817-4544 R2) was accepted in lieu of the specific performance curve called for in the specification. Design Change Notice DCN-ME-34 was initiated to revise the specification to allow the acceptance of the expected performance curve. This DCN was later revised to include EBASCO's justification for waiving the specific turbine performance curve requirement. A second design change notice, DCN-ME-120, was issued to correct paragraph 9.06 to agree with the expected performance curve.

The intent of the specification requirements is to be able to determine the steam consumption requirements for the turbine at all pump operating conditions. Terry's curves shows that the maximum inlet pressure necessary to supply 675 brake horsepower of 4,400 rpm is 150 psig. Therefore, as long as the steam supply is 250 psig or greater, the turbine will operate correctly. Steam is normally supplied at 880 psig with a design pressure of 1,135 psig. The Terry turbine can handle the inlet pressure as stated on their curve. Between Terry's expected performance curve in the instruction manual which gives the steam consumption for various horsepower demands and the Bingham-Williamette pump performance curve which gives the horsepower requirements for the pump's operating range, the requirements of the specification are satisfied.

A shop hydrostatic test of the turbine casing was conducted by Terry Turbine. Test information is available at the site QA documentation records and was reviewed by the NRC inspector.

A new manufacture's nameplate was affixed to the turbine. The old nameplate was inadvertently removed during construction.

A review of the above DCNs and specification verified that the specified changes were made. LP&L's response to PFR-028 is considered adequate. This PFR should be considered closed.

dd. Project Logic Network (PLN) did not Describe EFW Design Inputs or Interfaces

The potential findings statement by TPT for this issue was that the PLN used to track the engineering tasks were prepared late in the program (1976) and did not describe the emergency feedwater design input and interface points.

LP&L disagreed with the potential findings statement citing that the PLN for the EFW was issued with Revision A, October 1, 1971, and was not available during the TPT audit.

TPT agreed with LP&L's response to their potential finding and states that LP&L's PLN meets the requirements and is satisfactory. A review of the PLN, which includes the EFW system, confirms the conclusion drawn and is acceptable. The issue is considered invalid.

ee. CE's BOP Document not Reviewed/Approved and Marked Tentative

The TPT review of CE BOP Criteria Document and related papers revealed no evidence of:

a. Internal review and approval by CE of BOP design criteria document.

b. BOP document was controlled by CE.

c. Compilation of comments on BOP document for design group evaluations.

d. Transmittal of BOP design criteria document by the cognizant CE engineer.

TPT also feels that it is not clear that all the necessary design information that may have been contained in the CE BOP document was transmitted in controlled documents at the proper time.

CE claims that the BOP document is not a formal design document and, therefore, not subject to change control, review, issue date, and document control procedures. CE maintains that the BOP document is issued to assist the engineers involved in the early phases of design work before formal design documentation was issued.

CE provided TPT numerous examples of correspondence betweeen CE and EBASCO documenting the transmittal of formal design requirements.

The NRC reviewers have reviewed the BOP document and conclude that the information provided therein is preliminary in nature and requires finalized information to be formally transmitted to LP&L. This CE has done adequately as indicated by the FRC committee. This PFR is considered closed.

ff. B-P Design/Analysis Document Incomplete-No Checks or Approvals

The calculation sheets prepared by B-P for pipe hangers associated with the EFW system were not completed with the required approval signatures in accordance with B-P's design analysis and calculation procedure. The following discrepancies were noted:

1. Calculation "Approval" block is not filled in on any calculation sheets for hanger numbers 264, 306, 313, and 317.

2. Calculation "Check" block not filled in on all sheets for hanger Nos. 264, 306, 313, and 317.

3. Calculation "Conclusion" block not filed in on hangers Nos. 306 and 313.

LP&L disagreed with the potential finding statement stating that the back-up calculations sent to TPT for FWRR-264, 306, 313, and 317 were in the process of being reviewed with as-built analysis loads; therefore, all approval signatures were not reflected on the calculation sheets.

Review of these supports have since been completed and have the required approval signatures.

gg. Current Issue of Specification not Available in BP's Home Office

EBASCO Procedure E-65, "Control of Project Related Design Documents," requires that project related documents be current and that no earlier issues be used.

It is TPT's potential finding that B-P, Pittsburg office, did not have the required current specification for the EFW system hangers and supports.

LP&L disagreed with the potential finding statement stating that Revision 3 of the specification contained no changes to the design requirements for hangers and supports. The changes reflect general contractural agreements between the piping contractor and the piping fabrication for Waterford 3. At the time Revision 3 was issued plans were being made for pipe support and restraint work to be done at the site. In December the site began support and restraint work thus phasing out the Pittsburg office involvement. The site was in possession and utilized Revision 3 of the specification.

The NRC reviewer reviewed Revision 3 of Specification LOU-1564.100 and concurs with LP&L's statement that the subject revision did not affect B-P design work. Since the B-P Pittsburg office was phased out approximately 3 months after the issue of Revision 3 and since the B-P site support group had Revision 3 from the date of issue, the existence of Revision 2 at B-P Pittsburg did not compromise the total design effort. Therefore, this PFR is considered closed.

h. B-P Revision/Issue Control Lacking and Requirement Missing From Project Instructions

Review of the B-P project instruction by TPT led to the potential finding that there was inadequate control of requirements for the hangers and supports. The discrepancies noted were as follows:

1. The initial issue of the B-P project instructions could not be found. The next issue did not contain the required approval signatures nor a revision/issue designation.

2. The project instructions contained only those requirements which differed from the requirements normally followed by B-P for hangers and supports.

LP&L disagreed with the potential findings statement stating that LP&L agrees with the disposition of TPT's task leader. The TPT task leader stated that there was no evidence that specific B-P requirements had not been met and that TPT's potential finding is invalid. B-P further supports the invalidity of the potential finding as follows:

1. The project instructions were first issued January 20, 1977.

2. Issue No. 2 indicated the revision within a triangle located at the point where revisions occur. This revision method was utilized for all subsequent issues.

3. The intent of the general instructions is to supply to assigned personnel a convenient reference source, covering deviations from normal practice and to delineate certain variables which change from job to job.

The FRC reviewed this PFR and classified the potential finding invalid. They felt there was no evidence that specific requirements have not been met. This PFR is considered closed.

ii. Procurement Document Control Requirements not Suitable (Emergency Feedwater Hanger and Supports Requirements)

10 CFR Part 50, Appendix B, Criterion IV, requires that measures shall be established to assure that applicable regulatory requirements, design bases, and other requirements which are necessary to assure adequate quality are suitably included or referenced in procurement documents and specifications.

TPT stated that EBASCO Specification LOU-1564.100 used to procure piping from Dravo and pipe hangers and supports from B-P is very difficult to interpret for hanger and support requirements. Apparently, it was up to B-P to screen out their particular requirements. Furthermore, TPT felt that Specification LOU-1564.100 contained errors and omissions regarding page numbers, contents, and revision identification.

TPT also felt that engineering requirements and design control processes were contained in meeting notes and memos. These documents were

considered by the TPT reviewed as outside of the procurement documents and thus outside of approved issue/revision controlled engineering procedures.

Purchase Orders E-2804-1 and E-2803-1 only referenced Specification LOU-1564.100 with no revision/issue designation. Also, in EBASCO to B-P transmittal dated May 31, 1973, transmitted 320 drawings to B-P with no revision/issue designation of what was transmitted.

EBASCO Specification LOU-1564.100 was prepared in accordance with their Procedure E-21, "Preparation of Project Equipment Specification." The specification was designed to procure station piping, hangers, and supports; therefore, the requirements for hangers and supports would not be expected to be broken out from the piping.

The meeting notes and memos discusses the agreements made at various meetings which established the administrative arrangements between Dravo, B-P, and EBASCO. There is no requirement that states that these agreements have to be put into a controlled document.

Good practice dictates that when transmitting any controlled document, that the revision/issue designator be referenced on the transmittal document. As stated in PFR, this was a violation of good practice. B-P used good business practice by sending a reply to EBASCO detailing the revisions/issues received.

LP&L felt that the findings cited are not violations of 10 CFR Part 50, Appendix B, Criterion IV.

TPT stated in the IDR Report, Vol. I, that EBASCO does have adequate controlling QA and design implementation procedures and these procedures comply with the NRC 10 CFR Part 50, Appendix B requirements. The FRC committee felt that these procedures were adhered to in the preparation and use of Specification LOU-1564.100. This PFR was ruled invalid.

The NRC reviewer is in agreement that the requirements of 10 CFR Part 50, Appendix B, and EBASCO's QA and implementation procedures were not violated. This PFR is considered closed.

jj. Design Document Revision/Issue not Current

The potential findings statement by TPT for this issue was that design documentation was not being maintained current according to document control procedures. The findings arise from documentation provided to TPT for their review. Correspondence with the onsite design group indicated that the revision date of the documentation being used onsite differed from that provided TPT. In addition, the findings indicate that the specific documentation was revised and not in use at the Waterford 3 plant

site within 7 weeks from the time of issuance. Thus, document control procedures were not being followed.

LP&L disagreed with the potential findings statement citing that the revisions were made and issued in accordance to their control procedures. The discrepancy occurred because the information given in the correspondence with TPT was incorrect. It was provided by a third party rather than by first hand review of the controlled file.

Upon verification of LP&L's response to TPT's potential findings statement, TPT is in agreement with LP&L. TPT states that based on a transmittal form signed by the person representing B-P, PFR-2448-035 is satisfactorily closed as invalid.

Review of the documentation transmittal forms support LP&L's position and the issue is considered invalid.

kk. Drawing Update Process of Five FCRs or 1 Year Violated

The observation made by TPT was that the Procedure E-11 WSES, "As-Built Design Drawings," paragraph 5.4, had been violated for a drawing of the embedded steel details. The procedure for as-built design drawings specifies that revision should occur once a total of five or more FCRs, DCNs, and NCRs are outstanding or when 1 year has elapsed since the last revision. TPT found that there were over 80 FCRs or DCNs listed on a monthly drawing closeout schedule against the drawing in concern and that a later revision of the drawing showed there were approximately 20 FCRs outstanding against the drawing. Therefore, TPT concluded that there is a lack of adherence to the procedure requirements for as-building drawings.

LP&L disagreed with the potential findings statement stating that for the G-896 series drawings, exception must be taken because of the thousands of embedded plates and anchor plates involved. With these type of drawings, 5 DCNs or FCRs could be issued in one day. One reissue of a drawing would be impossible. It was also stated that the over 80 DCNs or FCRs to the drawing in question resulted in only minor revisions to the drawing.

In response to LP&L, TPT disagreed stating that the requirements of the Procedure E-11 WSES were violated and that the potential finding should stand as valid. The issue then went to the FRC. An impact assessment was issued. The impact assessment concludes that the requirements for drawing revisions were violated. However, no safety problem was evident.

LP&L issued a corrective action plan which identifies the actions taken to correct the discrepancy, actions taken to identify whether similar occurrences with other drawings were present, and actions taken to prevent recurrence.

To correct the discrepancy, LP&L incorporated all DCNs for the embedded steel details drawing. LP&L performed an internal review to determine whether other similar occurrences existed. No evidence of multiple similar violations were detected and it was concluded that the observation was an isolated case.

Preventive action identified by LP&L is that the engineering development and standards department is reviewing the nature of the observation for generic impact and any changes that should be made in the corporate procedure. Verification was received that the review had been made to determine if a generic issue existed within the corporate procedure for as-built drawings. The review indicated that the issue raised was not of a generic nature. Therefore, no revisions are warranted to company procedures.

This issue has been adequately addressed and is considered a closed issue.

11. Tornado Load not Analyzed for EFW Piping and Supports Located Outdoors

The potential finding statement by TPT for this issue was that the EFW piping and pipe supports located outdoors above the roof of the reactor auxiliary building were not analyzed for wind or tornado loads. Therefore, the requirements of FSAR Section 3.3.1 and 3.3.2 and the station piping hanger and support specification requirements have not been met. The two requirements of concern are:

1. Plant structures which are seismic Category 1 are designed for a maximum wind of 200 mph and a tornado funnel with rotational velocity of 300 mph and horizontal translational velocity of 60 mph.

2. All piping and hangers located outdoors shall be designed for forces from a tornado funnel with an equivalent velocity of 360 mph.

LP&L disagreed with the potential finding statement for item 1, and agreed with the statement for Item 2. For item 1, LP&L stated that the EFW piping reviewed by TPT is totally enclosed in the RAB with the exception of that portion immediately adjacent to the feedwater line. In that case, all of the piping is in a pit surrounded by concrete walls and covered by missile protection grating. The loads due to wind are negligible on the pipe in this area and the piping meets the design requirements well within code allowables, due to the fact that the total wind loads will not be seen in the pit.

For item 2, LP&L undertook a review of the EFW piping and supports for pump "B" to demonstrate that the wind loading would not cause the stresses in these components to exceed allowables. A new stress analysis was performed to determine the effect of the 200 and 360 mph wind loadings. The results indicate the pipe stresses are insignificant when compared to

code allowables. The highest stressed points have a stress ratio of 0.275 for tornado load combination and 0.244 for the design base earthquake combination. A review of the pipe loading transferred to the supports and the wind loading directly applied to the support structures was made. The results concluded that the support structures and plates were within allowables. The overall result showed that the original design was sufficiently conservative and the components employed have unused capacity such that design modifications were not necessary to accommodate the wind load cases (tornado included). EBASCO also performed a reevaluation of tornado missile loads in combination with wind load for the exposed piping in question and concluded that the missile criteria specified in the FSAR were met.

TPT agreed with the LP&L response to the potential finding statement and concluded the issue is invalid. The issue went to the FRC where the issue was evaluated. An impact assessment was issued stating that there is no safety hazard, the issue adequately handled, and the issue considered invalid.

The issue has been adequately addressed and the conclusion drawn by the FRC is acceptable.

3. NRC Bulletin No. 79-14

LP&L and EBASCO responded to NRC Bulletin No. 79-14, "Seismic Analysis for as-built Piping," by establishing a program of reinspection and verification of pipe geometry, pipe support and restraint installation. Discrepancies were reported on nonconformance report (NCR) No. 4010. All as-built pipe support installation drawings that show any field changes were submitted to EBASCO Site Service Engineering (ESSE) for design review per procedure ASP-IV-82. As-built information for piping, pipe support systems and pipe whip restraints was controlled per procedure ASP-IV-37.

All changes were reviewed by ESSE. The project senior engineer has overall responsibility for implementation of this procedure. All pipe support installations were inspected by the responsible QA inspector and his signature and date along with the contractor engineer's signature was required on all safety-related and seismic Category I piping supports and restraints.

The procedures used to control as-built information were reviewed and were being followed. This was confirmed through verification of pipe support sketches and a review of stress analyses.

Inspection of pipe supports/restraints.

A random sampling of safety-related piping and pipe support installations for the containment spray system, reactor coolant system and safety

injection system were inspected. As-built installation detail drawings were obtained from LP&L QA, and as-built stress isometrics and piping stress calculation from EBASCO. Thirty-six out of sixty-three installation drawings selected were inspected in the field. The others were inaccessible without the aid of ladders and scaffolding.

The pipe supports/restraints that were inspected were verified with the installation detail drawings and stress isometrics for identification, clearances, geographic location and design. Each installation was inspected for deformation or physical damage, deterioration, corrosion, and locking devices. The variable spring supports were inspected for "Cold" and "Hot" position marks. The spring hanger position indication was verified against the spring hanger design data. The mechanical snubbers were inspected and verified for movement at the pivot points and clearances. The hanger support structures were inspected and verified per design detail drawings.

Thirty-six pipe supports and restraints were inspected and physically measured and were verified with the as-built design drawings and the stress analysis isometrics. The following is a list of the variable spring hangers, mechanical snubbers, and rigid restraints that were inspected.

S/SH-187, 231, 338, 401, 255 and 308.

SIRS-870, 496, 1157, 1188, 1193, 1187 and 942.

SIRR-749, 869, 334, 1261, 1343, 1263, 1184, 1262, 1374, 1191, 1192, 1345, 402, 770, 307, 966, 1344, and 1346.

CSRR-381

RCSR-92 and 186

RCRR-90 and 293

Each one was found to be installed per as-built design geometry and within design tolerances. Each mechanical snubber was inspected for freedom of movement at pivot points.

The computer program employed in the piping system analyses is PIPESTRESS 2010. This is a finite element computer program for linear elastic analysis of three-dimensional piping systems including multiple branches and closed loops. The physical parameters of all components of the system, including geometry and layout, design and operating conditions, anchor and restraint characteristics, material specifications and thermal transients are specified by the input parameter cards, which are shown in

the USER MANUAL from Pages III-42 to III-81. These values are used to simulate the piping system under analysis.

The rigid support/restraint loads obtained from the as-built stress analyses are generally somewhat different from the design support loads shown on the pipe support as-built installation drawings. The variable spring hanger support loads from the stress report correspond with the loads shown on the drawings. Most of the loads obtained from the as-built stress analysis for the snubbers and rigid hanger supports are smaller than the design loads. However, some of the rigid hanger supports have loads from the stress analysis that exceed the loads on the drawings. When the as-built stress analysis load exceeds the loads shown on the installation drawing for a particular support, the adequacy of the support is reevaluated by determining that the new loads are within the support allowable loads.

The generic values for stress indices, stress intensification factor (SIF) and material properties defined in ASME Section III, Subsections NB, NC, and ND and ANSI Power Piping Code have been incorporated in the computer program for analyzing piping systems. They are correctly shown in the as-built stress analyses computer printouts. The value for stiffness of supports used in the stress analyses for rigid supports, restraints or hangers is 5.0×10^6 pounds per inch for class 2 and 3 piping systems. For snubbers, this value is 1.5×10^6 pounds per inch. These values are incorporated into the pipe stress program which has been approved by the NRC. The stiffness of the supports for Class I piping used in the analysis is the actual value on a case-by-case basis.

PIPESTRESS 2010 solutions to ASME sample problems have been compared with the solutions to the same sample problems generated by similar, independently written programs in the public domain, namely, ANSYS, PIPES, and ADLPIPE. The comparison shows the PIPESTRESS 2010 results to be substantially identical to results generated by the above programs and by hand calculations. The results were summarized in Washington Public Power Supply System Nuclear Units No. 3 and 5 PSAR (Docket Nos. STN-50-508 and 509).

The programs for inspection of piping and piping supports and restraints was reviewed for the method of verification of hot and cold settings and the method of comparison of calculated displacements with actual displacements. Snubber surveillance procedures were reviewed as part of the inspection program for piping supports and restraints.

Preoperational Test Procedure SPO-99P-002 Thermal Expansion Test increased system temperatures in discrete increments holding at each point while pipe support movements, hanger and snubber positions were recorded. Lines were also visually inspected to assure unrestricted pipe movement. Any discrepancies were reported to the cognizant test engineer and were

resolved before heat-up continued. At the conclusion of the test, all supports and restraints were verified to be back to the base line condition within specified limits. Any deficiencies were listed in the system deficiency records. Lines listed on the deficiency record with inappropriate thermal movement are to be remonitored during post-core hot functional testing.

Snubber visual inspections, sampling and functional testing will be carried out in accordance with Procedure Nos. PE-5-011, Surveillance Procedure for Mechanical Snubber Visual Inspection, PE-5-012 Surveillance Procedure for Hydraulic Snubber visual inspection and PE-5-014 Surveillance Procedure for Snubber Sampling and Functional Testing.

These procedures were reviewed and were found to assure proper performance of the pipe support and restraint systems on a continuing basis.

The overall piping and pipe support design program was found to provide assurance that as-built information is properly documented, reviewed and, where appropriate, referred back to the engineering department when the changes could influence the seismic analysis. The piping runs which were inspected were found to conform to the as-built drawings and stress isometrics. No major discrepancies were identified between stress isometrics and the inspected pipe run geometry, support locations, valve locations and weights.

4. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. Three unresolved items disclosed during the inspection are discussed in paragraphs 2.g, 2.k and 2.aa.

5. Exit Interview

The NRC inspectors met with the licensee representatives (denoted in paragraph 1) and the NRC resident inspectors at the conclusion of the inspection on June 8, 1984. The NRC inspectors summarized the purpose, scope, and findings of the inspection.