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APR 19 1984

Dr. Thomas E. Murley
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

SUSQUEHANNA STEAM ELECTRIC STATION
FINAL REPORT ON A DEFICIENCY INVOLVING
IMPROPER RELIEF VALVE SETTINGS, DESIGN PRESSURES,
AND DESIGN TEMPERATURES FOR UNIT 2
ER 100508 FILE 821-10
PLA-2180

Docket No. 50-388

References:
(1) PLA-1972 dated Nov. 30, 1983
(2) PLA-1976 dated Dec. 5, 1983
(3) NRC Meeting Report No. 50-387/83-26; 50-388/83-27 dated Dec. 9, 1983
(4) PLA-2006 dated Dec. 20, 1983 (First Interim Report)
(5) PLA-2075 dated Mar. 02, 1984 (Second Interim Report)

Dear Dr. Murley:

This letter serves to provide the Commission with a final report on a deficiency involving improper relief valve settings, design pressures, and design temperatures within several Unit 2 systems. This deficiency was reported under 10CFR50.55(e) as potentially reportable by telephone to Mr. E. C. McCabe of NRC Region I by Mr. J. Saranga and Mr. A. Sabol of PP&L on November 18, 1983.

Attachment 1 to this letter contains a description of the problem, the safety implications, the cause, and the corrective actions. Attachment 2 is a list of discrepancies identified during the review to address the concerns raised by the subject deficiency. Attachment 3 discusses the cause of process condition deficiencies not associated with relief valve setpoints.

Since the details of this report provide information relevant to the reporting requirements of 10CFR21 for Unit 2, this correspondence is considered to also

discharge any formal responsibility PP&L may have for reporting in compliance thereto.

We trust the Commission will find this report to be satisfactory.

Very truly yours,

for N. W. Curtis
Vice President-Engineering & Construction-Nuclear

Attachments

Copy to:
Mr. Richard C. DeYoung (15)
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Washington, D.C. 20555

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ATTACHMENT 1

FINAL REPORT

SUBJECT

Improper relief valve settings, design pressures, and design temperatures used for piping systems at Susquehanna.

DESCRIPTION

On October 9, 1983 as a result of the evaluation of an operational problem with a leaking check valve, it was discovered that over pressure protection devices had been installed within the high pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) systems with set points higher than the system design pressures. Further investigation revealed additional discrepancies. Twelve (12) deficiencies were discussed in the first interim Report (Reference (4)).

The design temperatures and pressures for Susquehanna Units 1 & 2 are listed in project specification M-199. The values for the design temperatures and pressures listed in M-199 are determined through standard engineering practices for system design. These practices include determining the most limiting operational conditions within a particular system. Once the most limiting operational conditions are determined, the pressure and temperature values corresponding to this condition are calculated. The process is an iterative one and the values are subject to change due to system alterations or enhancements.

To confirm the adequacy of safety related piping at Susquehanna, PP&L directed Bechtel to perform a complete review of all Q-listed piping in specification M-199. Lines which are not significantly different between Units 1 & 2 were reviewed only for one Unit. In addition, Teledyne Engineering Services was retained for an independent design review. Teledyne's investigation covers a review of the design temperatures, pressures, and relief valve settings for the following systems:

1. high pressure coolant injection (HPCI)
2. reactor core isolation cooling (RCIC)
3. residual heat removal (RHR)
4. core spray (CS)
5. emergency service water (ESW)
6. reactor building closed cooling water (RBCCW)
7. containment instrument gas

As a result of the Bechtel Review, 245 discrepancies in design pressure/temperature and relief valve settings were discovered as listed on Attachment 2, pages 1 to 23.

Teledyne documented 58 discrepancies based on the following classification scheme:

(1) Eleven findings were classified as Category 1 (Observations). These findings required no response or action.

(2) Four items were identified under Requests for Additional Information and were closed upon transmittal of the required information.

(3) Sixteen items were found to coincide with Bechtel findings, so no additional action was required, although Teledyne subsequently reviewed the process used by Bechtel in resolution.

(4) Twenty-seven items were classified as Category 2 or 3 findings requiring action to be corrected. (Copies of these findings are available for NRC inspection.) These findings were dispositioned and no additional action (documentation, field work) was required.

CAUSE

In assessing the cause of these items, it is useful to divide the items listed in Attachment 2 into two main categories: environmental and process conditions. These are discussed below:

A. Environmental Conditions

This category includes those cases wherein the maximum ambient temperature exceeds the design temperatures. The design temperatures are based on the maximum process fluid temperatures. These were originally identified as items requiring further assessment. This assessment included a review of the background and technical rationale for not analyzing environmental conditions in the same manner as process design temperatures. This review concluded that environmental conditions had been appropriately considered in the piping design. The rationale for this conclusion is as follows:

(1) Paragraph 4.1 of the piping design specifications indicate that the piping internal (i.e., process) pressures and temperatures are to be reflected in M-199, and that these are the design values (Para. 4.2). The external temperatures are specified in Para. 1.3 of the design specifications. The designation of the internal or process temperature as the design temperature is consistent with Article 3112 in Subsection NB (NC) (ND) of the Code and Appendix B of Subsection NA. Therefore, M-199 is not discrepant for listing the lower process temperature as the design temperature.

(2) The specified environmental temperatures were considered in the design as required by the piping design specifications and the ASME code. As provided in Bechtel letter BLP-25976 dated 1/23/84, specific calculations or evaluations for post LOCA environmental conditions are not necessary. This letter is available for NRC review. An analysis was performed for each line identified to conservatively assess the effect of these environmental temperatures. The analyses confirmed the validity of the position stated above as no cases were identified where the safety function of the piping was affected.

B. Process Conditions

These are cases in which the internal pressure or temperature was underspecified. These fall into two main categories: relief valve setpoint inconsistencies and other problems, which are described below, followed by observations and conclusions.

(1) Relief Valve Setpoint

There are several relief valve related problems identified wherein the setpoint was higher than the design pressure of the associated pipe. In most of these cases, the relief valve setpoint was specified by GE as part of the NSSS design. The causes are further assessed below in paragraph (4) Conclusions.

(2) Other Causes

A review was conducted to ascertain whether there was some predominant cause for the remaining discrepancies. Attachment 3 lists each of these lines along with a brief discussion of what appears to be the reason for the problem. As can be seen, most of the causes involve not accounting for static head in conjunction with certain operating modes, misunderstanding or discounting system operating procedures or characteristics, or not identifying the most limiting operating cases.

(3) Observations

In assessing the cause and significance of these process condition anomalies, the following observations pertain:

(a) There is a basic hierarchy in specifying the pressure retaining requirements of piping. The first step is ascertaining the appropriate piping design rating (i.e. 150#, 300#, etc., which is a function of pipe wall thickness) by conservatively estimating the bounding process pressures in that portion of the system. These design ratings (or piping classes) are indicated on the P&ID. Establishing the design pressure for a given line is then a refinement of the earlier step.

Inasmuch as the piping design rating is above the design pressure, the possibility of a pipe being inadequate for its intended service due to an understated design pressure is remote. In fact, no instance was found among the various nonconservatisms where the pipe was unsuitable for the higher pressure.

In the same regard, relief valve setpoint design pressure inconsistencies do not constitute inadequate overpressure protection. In all cases, the pipe was adequately protected against excessive pressures, there is only an inconsistency in the design documents.

(b) In reviewing the process problems, it can be seen that in almost all cases the originally specified design value has some plausible basis and that in several instances the reason for a higher value is relatively subtle (see Attachment 3).

In other words, there are no non-conservatisms that would be immediately apparent to a designer/reviewer. This includes relief valve setpoint inconsistencies since the design pressures are otherwise reasonable, and nowhere in the design documents are the two values juxtaposed.

(c) The ASME Code is the basic criteria document for the piping design, yet it does not provide clear-cut guidance in establishing design values, nor is it explicit regarding relief valve setpoints.

For example, Article NC-3112.1 Design Pressure, states: "Components shall be designed for at least the most severe condition of coincident pressure and temperature expected in normal operation". Article NC-3112.2 Design Temperature, states: "(a) The temperature used in the design shall not be less than..... expected under normal operating conditions." However, Article NC-3612.4(c) refers to the "maximum pressure and temperature that may be accidentally or otherwise subjected" for exhaust and pump suction piping. Article NC-3612.4(g) refers to "maximum pressure exerted by the pump at any load and for the highest corresponding temperature actually existing" for pump discharge piping.

From the above, it can be seen that a considerable range of interpretation could be possible in determining what need be considered in establishing design conditions including what failures or off-normal modes, if any, should be assumed.

With respect to relief valve setpoints, the code is also somewhat ambiguous. Footnote 1 to Article 3112.1 seems to imply that making the design pressure equal to or greater than the setpoint is only a recommendation. Article NC-7500 makes references to "maximum allowable working pressure of the system" (an undefined term), not "design pressure" when establishing relief valve setpoints. Again, there is room for interpretation or at least understandable misreading of the Code requirements.

In assessing the M-199 design pressure and temperature conformance with the ASME Code, the more conservative interpretations have been made. For example, single failures are assumed and "normal operation" is taken to mean any mode of operation or transient portions thereof.

(d) As M-199 is controlled and issued by the Bechtel Plant Design discipline, but includes input from the Bechtel Mechanical discipline, a review was conducted to determine if there was an

interface problem. It appears that the Mechanical discipline input to Plant Design was properly handled by Plant Design.

(4) Conclusions

Based on the above, the following conclusions are made:

(a) The cause for most of the deviations is believed to be that certain Bechtel engineers did not completely implement the various criteria in use for establishing the most limiting design pressures and temperatures. In many of these cases, this may have been engendered by the fact that the ASME Code is somewhat ambiguous and subject to interpretation.

In the case of the relief valve setpoints specified by GE, there additionally appears to have been a lack of coordination between the Bechtel engineer who established the design pressure and the Bechtel engineer responsible for procurement of relief valves. The relief valves were purchased and installed without considering refinements of system design pressures.

(b) The fundamental design process is such that the system design pressures and temperatures are established with significant safety margins. As a result, an increase in a previously defined design value does not automatically invalidate the acceptability of the piping itself. In fact, sufficient margin often exists to allow relatively coarse adjustments to design values.

(c) Because of the unique nature of the ASME Code, the piping design process, and other aspects of this problem, there is no indication that the programmatic concerns extend to other areas of design.

SAFETY IMPLICATIONS

With the exception of the RHR pump seal coolers (which were discussed in Reference (5)), no discrepancy has been identified that would have affected the safe operation of the plant had it gone undetected.

CORRECTIVE ACTION

PP&L and Bechtel have completed a final review of all Q-listed piping in specification M-199 for relief valve settings, system design pressures and design temperatures. Additionally, Teledyne's independent review is complete and all audit findings have been closed.

Bechtel has reviewed the original stress calculations for all lines with inadequate design pressures/temperatures. Based on this review, study calculations were performed to assure that all lines were adequate for their intended service. The calculations confirmed that the existing piping and pipe supports are acceptable. These study calculations are expected to be incorporated into the as-built reconciliation (ABR) packages at a later date.

Additionally, all attached instrumentation, hangers and mechanical equipment have been reviewed and, with the exception of the RHR pump seal coolers, been found adequate for their new design pressures/temperatures. The inadequate RHR pump seal coolers have been replaced with new coolers designed to withstand the higher design pressures. The containment instrument gas relief valve springs discussed in Reference (5) have been replaced.

Hydrotesting has been completed as required for all piping with the exception of seventeen instrument lines and two lines (HCB-108, HCB-123) in the containment atmosphere control system all on Unit 1. For the seventeen instrument lines, testing is tentatively set for the Unit 1 first refueling outage. The testing for HCB-108 and HCB-123 is tentatively scheduled for May 1984. Initial service leak tests on B31.1 piping are expected to be complete by the end of May 1984.

Specification M-199 has been revised to reflect all new design conditions and all code data reports are currently being amended. The code data report amendments for Unit 2 are complete. The code data report amendments for Unit 1 are scheduled for completion by June 15, 1984.

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-111 (8)	HRC-3	ESW Cooler Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-4	ESW Cooler Return Line	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-5	ESW Cooler Return Line	D.P. = 136 psig, should be 171 psig	P	Evaluate line to 171 psig	Documentation, rehydro
	HRC-7	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-9	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-10	ESW Supply	D.P. = 136 psig, should be 171 psig	P	Evaluate line to 171 psig	Documentation, rehydro
	HRC-13	ESW Supply	D.P. = 136 psig, should be 161 psig	P	Evaluate line to 161 psig	Documentation, rehydro
	HRC-14	ESW Return	D.P. = 136 psig, should be 161 psig	P	Evaluate line to 161 psig	Documentation, rehydro
	HRC-101 201	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-102 202	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-103 203	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-104 204	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation,rehydro
	HRC-105 205	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-111 (Cont'd) (8)	HRC-106 206	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-107 207	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-108 208	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-109 209	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-110 210	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-116 216	EWS Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-117 217	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-118 218	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-119 219	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-120 220	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-121 221	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-111 (Cont'd) (8)	HRC-122 222	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-123 223	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-124 224	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-125 225	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-126 226	ESW Supply to RHR Unit Coolers and ESW Return from CS Unit Coolers	D.P. = 136 psig, should be 177 psig (Both supply and return lines)	P	Evaluate line to 177 psig	Documentation, rehydro
			D.T. = 95°F, may see 125°F (Return line only)		Evaluate for 125°F	Documentation
	HRC-127 227	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate for 177 psig	Documentation, rehydro
	HRC-128 228	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate for 177 psig	Documentation, rehydro
	HRC-129 229	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate for 177 psig	Documentation, rehydro
	HRC-130 230	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate for 177 psig	Documentation, rehydro
	HRC-131 231	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate for 177 psig	Documentation, rehydro

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-111 (Cont'd) (8)	HRC-132 232	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate for 177 psig	Documentation, rehydro
	HRC-133 233	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-134 234	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HBC-139 239	ESW Supply	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HBC-140 240	ESW Return	D.P. = 136 psig, should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-112 RHRSW (8)	HRC-1 -2	ESW Loop A Return and Spray Pond Network (7)	D.T. = 125°F, may see 150°F D.P. = 136 psig, should be 171 psig	P P	Evaluate for 150°F Evaluate line to 171 psig	Documentation, rehydro
	HRC-16	RHRSW Supply to RHR Heat Exchanger	D.P. = 136 psig, it should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-112 212	RHRSW Supply to RHR Heat Exchanger	D.P. = 136 psig, it should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-113 213	RHRSW Supply to RHR Heat Exchanger	D.P. = 136 psig, it should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro
	HRC-114 214	RHRSW Return from Heat Exchanger	D.P. = 136 psig, it should be 177 psig	P	Evaluate line to 177 psig	Documentation, rehydro

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-133/2113 RBCCW (8)	HBB-157 257	RBCCW Piping between Containment Isolation Valve for Recirculation Pump Seal and Motor Bearing Coolers	D.T. = 105°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None
	HBB-158 258	RBCCW Piping between Containment Isolation Valve for Recirculation Pump Seal and Motor Bearing Coolers	D.T. = 105°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-126/2126 Containment Instrument Gas	HCC-132 232	Instrument Air to MSRV Accumulators (8)	D.T. = 150°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None
	HCC-138 238	Instrument Air to MSRV Accumulators (8)	D.T. = 150°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None
	HCB-110 210	Instrument Air for MSRV with Auto Depressurization (8)	D.T. = 120°F, may see 340°F (Environmental) (inside containment portion only)	E	Analyze line to 340°F	None
	HCB-111 211	Instrument Air for MSRV with Auto Depressurization (8)	D.T. = 120°F, may see 340°F (Environmental) (inside containment portion only)	E	Analyze line to 340°F	None
	HCB-144 244	Instrument Air to Tip Indexing Mechanism (8)	D.T. = 150°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None
	HCB-143 243	Test Connection on Instrument Gas Header to Various Nuclear Valves (8)	D.T. = 150°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None
	HCB-130 230	Instrument Gas to Vacuum Relief Valves (8)	D.T. = 120°F, may see 210°F (Environmental)	E	Analyze line to 210°F	None
	CCC-101 201	Instrument Gas Bottle Header	D.P. = 2200 psig, relief valves (PSV-22644 and PSV-22646) set at 2500 psig	R	Document lower operating pressure of bottles	Documentation, Reset relief valves to 2200 psig
	CCC-102 202	Instrument Gas Bottle Header	D.P. = 2200 psig, relief valves (PSV-22644 and PSV-22646) set at 2500 psig	R	Document lower operating pressure of bottles	Documentation, Reset relief valves to 2200 psig

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-134 Diesel Auxiliary	GBC-2	Starting Air Skid Interconnecting from Moisture Separator	D.P. = 260 psig, relief valves (PSV-0342A1, A2, etc., and PSV-03434A1, A2, etc.) are set at 265 psig and D.T. = ambient, it should be 130°F; 150°F is temp. for faulted conditions.	R P	Evaluate for 265 psig Evaluate, for 130°F for normal/upset and 150°F for faulted	Documentation, Due to the small change in pressure, the original hydro is still considered valid.
	GBC-3	"	"	R,P	"	"
	GBC-4	"	"	R,P	"	"
	GBC-5	"	"	R,P	"	"
	GBC-6	"	"	R,P	"	"
	GBC-7	"	"	R,P	"	"
	GBC-8	"	"	R,P	"	"
	GBC-9 (8)	"	"	R,P	"	"
	GBC-22	Starting Air Supply	D.T. = ambient, however, it should be 130°F; 150°F is temp. for faulted conditions	P	Evaluate for 130°F for normal/upset and 150°F for faulted	Documentation
	GBC-23	Starting Air Supply	D.T. = ambient, however, it should be 130°F; 150°F is temp. for faulted conditions	P	Evaluate for 130°F for normal/upset and 150°F for faulted	Documentation
	GBC-24	Starting Air Supply	D.T. = ambient, however, it should be 130°F; 150°F is temp. for faulted conditions	P	Evaluate for 130°F for normal/upset and 150°F for faulted	Documentation

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-134 (Cont'd)	GBC-25	Starting Air Supply	D.T. = ambient, however, it should be 130°F; 150°F is temp. for faulted conditions.	P	Evaluate for 130°F for normal/ upset and 150°F for faulted	Documentation
	GBC-26	Starting Air Supply	D.T. = ambient, however, it should be 130°F; 150°F is temp. for faulted conditions	P	Evaluate for 130°F for normal/ upset and 150°F for faulted	Documentation
	GBC-27	Starting Air Supply	D.T. = ambient, however, it should be 130°F; 150°F is temp. for faulted conditions	P	Evaluate for 130°F for normal/ upset and 150°F for faulted	Documentation
	GBC-28	Starting Air Supply	D.T. = ambient, however, it should be 130°F; 150°F is temp. for faulted conditions	P	Evaluate for 130°F for normal/ upset and 150°F for faulted	Documentation
	GBC-29	Starting Air Supply	D.T. = ambient, however, it should be 130°F; 150°F is temp. for faulted conditions	P	Evaluate for 130°F for normal/ upset and 150°F for faulted	Documentation

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-141/2141 Nuclear Boiler (8)	HCB-145 245	Demineralized Water Service Connection	D.T. = 100°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None
	HCC-137 237	Instr. Gas to MSIV Accum.	D.T. = 150°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None
	HCC-131 231	Instr. Air to MSRV Accum.	D.T. = 150°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None
	HCC-132 232 (see under P&ID M-2126)	Instr. Air to MSRV Accum.	D.T. = 150°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None
	HCC-138 238 (see under P&ID M-2126)	Instr. Air to MSRV Accum.	D.T. = 150°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None
	HCC-133 233	Instr. Air to MSRV Accum.	D.T. = 150°F, may see 340°F (Environmental)	E	Analyze line to 340°F	None

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-149/2149	HBB-103/203	RCIC Pump Suction	D.P. = 50 psig, relief valve PSV-F097 which protects HBB-113/213 and this line is set at 150 psig	R	Evaluate this line to 150 psig	Documentation, Previous hydro sufficient to cover new D.P.

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-150/ 2150 RCIC (14)	HBB-101 201	RCIC Turbine Exhaust Line	D.T. = 240°F, should be 297°F (sat at 50 psi trip) (9)	P	Reanalyze to 297°F (6)	Documentation
			D.P. = 30 psig, rupture disc PSV-1D002, 1D001 are set at 150 psig	R	Evaluate this line to 150 psig	Documentation, rehydro
	HBB-137 237	RCIC Turbine Exhaust Drain Lines (8)	D.P. = 100 psig, these lines are connected to HBB-101/201 without isolation valves. Will see the same pressure of 150 psig which is the set point for the rupture discs	R	Evaluate this line to 150 psig	Documentation, rehydro
	HBB-138 238	RCIC Turbine Drain Lines (8)	"		Evaluate this line to 150 psig	Documentation, rehydro
	HBD-1136 2136	RCIC Turbine Drain Lines (8)	"		Evaluate this line to 150 psig	Initial service leak test
	HBD-1137 2137	RCIC Turbine Drain lines (8)	"		Evaluate this line to 150 psig	Initial service leak test
	HBB-115 215	RCIC Pump Discharge to Bar. Condenser	D.P. = 75 psig, relief valve PSV-F018 which protects this line (in the event of a failure of PCV-F015) is set at 150 psig	R	Evaluate this line to 150 psig	Documentation, rehydro
	HBB-139 239	RCIC Vacuum Tank Condensate Pump Discharge to RCIC Pump Suction	D.P. = 100 psig, relief valve PSV-F097 which protects HBB-103/203 and this line is set at 150 psig	R	Evaluate this line to 150 psig	Documentation, hydro test exempt.
	HBD-1138 2138	RCIC Bar. Condenser to HBB-215	D.P. = 75 psig. This line is connected to HBB-215 which should have a design pressure of 150 psig	R	Evaluate for 150 psig	Initial service leak test

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-151/ 2151 RHR	HBB-120 220	RHR Steam Relief Valve Discharge	D.P. = 60 psig. Per calc. No. 200-0628, the maximum transient pressure for this line is 140 psig	P	Evaluate this line to 140 psig	Documentation, HBB-220 rehydroed, EBB-120 exempt.
	GBB-118 218	RHR Drywell Spray Header	D.T. = 180°F, may see 340°F (Environmental) (inside containment portion)	E	Analyze line to 340°F	None
	DCB-123 223	Analyzer Piping	D.T. = 240°F, may see 340°F	P	Analyze line to 340°F	Documentation
	DCB-102A 202A	RHR Head Spray Line Outside Containment Portion	D.T. = 240°F, may see 340°F	P	Analyze line to 340°F	Documentation
	GBB-116 216	RHR Heat Exchanger Outlet	D.T. = 240°F, may see 340°F	P	Analyze line to 340°F	Documentation
	GBB-117 217	RHR Head Spray Line	D.T. = 240°F, may see 340°F	P	Analyze line to 340°F	Documentation
	GBB-106 206	RHR Shutdown Cooling Line	D.T. = 300°F, may see 340°F	P	No action required. This line was originally analyzed for 455°F	Documentation

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-152/ 2152 Core Spray	HBB-104 204	Core Spray Pump Suction	D.P. = 40 psig, thermal relief valve PSV-F032 setpoint which protects this line is 100 psig	R	Evaluate line to 100 psig	Documentation, rehydro
			D.T. = 200°F, should be 210°F	P	No action required. By inspection, this temperature increase is insignificant	Documentation

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other A (5)
M-153/ 2153 Fuel Pool Cooling and Clean-up	HBC-117 217	Fuel Pool Skimmer Surge Tank Drain to RHR Line	D.P. = 30 psig, static head not adequately considered. D.P. should be 55 psig.	P	Evaluate line to 55 psig	Documentation, rehydro

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-155/ 2155 HPCI	HBB-107 207	HPCI Pump Suction	D.P. = 50 psig, thermal relief valve located in this line (PSV-F020) is set at 100 psig	R	Evaluate line to 125 psig. 125 psig is the GE process diagram design pressure for this line.	Documentation, rehydro

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-156/ 2156 HPCI Turbine Pump	HBB-135 235	HPCI Turbine Drain	D.P. = 100 psig. This line is connected to HBB-108/208 with no isolation, therefore, should have the same design pressure of 175 psig which is the setpoint of rupture disc PSE-D003	R	Evaluate this line to 175 psig	Documentation, rehydro
	HBD-1135 2135	HP Turbine Casing Drain	D.P. = 50 psig. Line is connected to HBB-135/235 and 108/208 which have D.P. = 175 psig	R	Evaluate line to 175 psig	Initial service leak test
	HBB-134 234	HPCI Pump Discharge to Bar. Condenser	D.T. = 140°F, process temperature may be 170°F	P	Evaluate for 170°F	Documentation
	HBD-1133 2133	From HPCI Booster Pump to Bar. Condenser	D.T. = 140°F, process temperature may be 170°F		Evaluate for 170°F	Documentatior
	EBB-102 202 (10)	HPCI Pump Discharge	D.T. = 170°F. Portion inside wetwell may see maximum post-LOCA temperature of 210°F (Environmental)	E	Reanalyze portion inside wetwell to 210°F	Documentation
			D.P. = 1140 psig, should be 1276 psig	P	Evaluate for 1276 psig	Documentation, rehydro

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-157/ 2157 Containment Atmosphere Control	HCB-108(11) 208	Wetwell atmos. return line to analyzer	D.T. = 200°F, line is heat traced to 285°F	P	Reanalyze line to 285°F	Documentation
			D.P. = 30 psig, diaphragm pump pressure is 85 psig (13)	P	Evaluate line to 85 psig	Documentation, rehydro (12)
	HCB-109 209	Wetwell atmos. supply line to analyzer	D.T. = 200°F, lines are heat traced to 285°F	P	Reanalyze line to 285°F	Documentation
	HCB-127 227	Suppression chamber atmos. to H_2/O_2 analyzer	D.T. = 200°F, lines are heat traced to 285°F	P	Reanalyze line to 285°F	Documentation
	HCB-126 226	H_2/O_2 Analyzer Return Line	D.T. = 200°F, lines are heat traced to 285°F	P	Reanalyze line to 285°F	Documentation
			D.P. = 44 psig, N_2 supply line design pressure is 150 psig	P	Evaluate line to 150 psig	Documentation, rehydro (12)
	HCB-152 252	To H_2/O_2 analyzer(8)	D.T. = 294°F, maximum drywell post-LOCA temperature is 340°F	P	Reanalyze line to 340°F	Documentation
	HCB-153 253	To H_2/O_2 analyzer(8)	D.T. = 294°F, maximum drywell post-LOCA temperature is 340°F	P	Reanalyze line to 340°F	Documentation
	HCB-154 254	From H_2/O_2 analyzer	D.T. = 294°F, maximum drywell post-LOCA temperature is 340°F (15)	P	Reanalyze line to 340°F	Documentation
			D.P. = 44 psig, diaphragm pump pressure is 85 psig	P	Evaluate this line to 85 psig	Documentation, rehydro

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-157/ 2157 (Cont'd)	HCB-155 255	From H_2/O_2 Analyzer	D.T. = 294°F, maximum drywell post-LOCA temperature is 340°F (15)	P	Reanalyze line to 340°F	Documentation
			D.P. = 44 psig, diaphragm pump pressure is 85 psig	P	Evaluate this line to 85 psig	Documentation, rehydro (12)
	HCB-123(11) 223	From H_2/O_2 Analyzer	D.P. = 44 psig, diaphragm pump pressure is 85 psig(13)	P	Evaluate line to 85 psig	Documentation, rehydro (12)
	HCB-125 225	H_2/O_2 Analyzer Return Lines	D.P. = 44 psig, N_2 supply line design pressure is 150 psig	P	Evaluate this line to 150 psig	Documentation, rehydro (12)
	HBB-118 218	Nitrogen Purge Line	D.P. = 44 psig, N_2 supply has 150 psig design pressure	P	Evaluate this line to 150 psig	Documentation, rehydro (12)
	HCB-115 215	Suppression pool water level instrument line	D.P. = 30 psig, maximum pressure is 39 psig	P	Evaluate this line for 39 psig	Documentation, rehydro
	HCB-119 219	Suppression pool water level instrument line	D.P. = 30 psig, maximum pressure is 39 psig	P	Evaluate this line for 39 psig	Documentation, rehydro
	HCB-107 207	-	Line does not exist. (8)	-	Delete from M-199	None

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-186 Control Structure Chilled Water	HBD-58/98	Service Water to Air Separator	D.P. = 50 psig. Relief valves PSV-08633A&B are set at 60 psig. System may see pressure as high as 130 psig due to elevation head and pump head with over pressure of expansion tank	P	Evaluate for 130 psig	Documentation. Current hydro is adequate for B31.1 initial service leak test
	HBD-59/99	Chilled water to air separator	"	P	Evaluate for 130 psig	"
	HBD-61/ 3002	Chilled water pump suction from air separator	"	P	Evaluate for 130 psig	"
	HBD-67/ 3004	Expansion tank drain	"	P	Evaluate for 130 psig	"
	HBD-68/ 3011	Air Separator Drain	D.P. = 50 psig. This line is protected by PSV-08633A & B set at 60 psig system may see 60 psig	P	Evaluate for 60 psig	"
	HBD-69/ 3005	From Expansion Tank to Air Separator	"	P	Evaluate for 60 psig	"
	HBD-60/ 3001	From Chilled to Unit Cooling Coil	D.P. = 65 psig. System may see pressure as high as 130 psig due to elevation head, and pump head with overpressure of expansion tank	P	Evaluate for 130 psig	"

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-186 (Cont'd)	HBD-62/ 3003	Chilled Water Pump Discharge	D.P. = 75 psig. System may see pressure as high as 130 psig due to elevation head, and pump head with overpressure of expansion tank	P	Evaluate for 130 psig	Documentation. Current hydro is adequate for B31.1 initial service leak test
	HBD-1147 2147	Chilled Water Supply	D.P. = 65 psig. System may see pressure as high as 130 psig due to elevation head, and pump head with overpressure of expansion tank	P	Evaluate for 130 psig	"
	HBD-1148 2148	Chilled Water Supply	"	P	Evaluate for 130 psig	"
	HBD-1149 2149	Chilled Water Supply	"	P	Evaluate for 130 psig	"
	HBD-1150 2150	Chilled Water Supply	"	P	Evaluate for 130 psig	"

M-199 REVIEW RESULTS

P&ID System	Line No. (1)	Function	Problem (2)	Type (3)	Bechtel Action (4)	Other Action (5)
M-187/ 2187 RB Chilled Water (8)	HBB-125 225	Chilled water for recirculation pump motor cooler	D.T. = 125°F, may see 340°F (Environmental)	E	Reanalyze for 340°F	None
	HBB-126 226	"	D.T. = 105°F, may see 340°F (Environmental)	E	Reanalyze for 340°F	None
	HBB-127 227	"	D.T. = 125°F, may see 340°F (Environmental)	E	Reanalyze for 340°F	None
	HBB-128 228	"	D.T. = 105°F, may see 340°F (Environmental)	E	Reanalyze for 340°F	None
	HBB-129 229	Chilled water to drywell unit coolers	D.T. = 125°F, may see 340°F (Environmental)	E	Reanalyze for 340°F	None
	HBB-130 230	Chilled water to drywell unit coolers	D.T. = 105°F, may see 340°F (Environmental)	E	Reanalyze for 340°F	None
	HBB-131 231	Chilled water to drywell unit coolers	D.T. = 125°F, may see 340°F (Environmental)	E	Reanalyze for 340°F	None
	HBB-132 232	Chilled water to drywell unit coolers	D.T. = 105°F, may see 340°F (Environmental)	E	Reanalyze for 340°F	None

NOTES:

(1) In some cases only a portion of the line is affected

(2) D.P. = design pressure
D.T. = design temperature

(3) P = process condition deviation
R = relief valve setpoint/design pressure inconsistency
E = environmental condition

(4) Bechtel action is limited to those immediate actions to document the continued acceptability of the piping and Unit 2 ABR annotations.

(5) This column denotes field work and documentation changes where such actions were needed.

Documentation includes, as appropriate, the following: M-199 revision, N-5 data report revision, Unit 1 ABR annotations, code data plate changeouts.

(6) Per BLP-26015, the design temperature is 297°F and the design pressure can be established by PP&L as either 150 psig or 50 psig.

(7) For 2" and 3" HRC-1 and HRC-2, the design temperature is 70°F.

(8) This line/system was not included in Attachment 2 or 3 of Reference (5).

(9) Original D.T. specified in Reference (5) was incorrect. The original D.T. = 240°F

(10) EBB-102/202 were inadvertently omitted from Attachment 3 of Reference (5).

(11) Rehydro for HCB-108 & HCB-123 will be performed in May.

(12) Pneumatic testing is an acceptable alternative for hydrotesting under the ASME code.

(13) D.P. discrepancy not included in Attachment 2 of Reference (5).

(14) P&ID specified in Attachment 2 to Reference (5) was incorrect.

(15) D.P. discrepancy not included in Attachment 2 to Reference (5).

ANALYSIS OF PIPING DESIGN PRESSURE AND TEMPERATURE DISCREPANCIES

The discussion below provides an analysis of the apparent cause of the discrepancies listed as type "P" (process) on Attachment 2.

1. HRC-3, -4, etc. - The design pressure of these ESW lines was based on pump shutoff head and did not adequately account for additional static head for portions of piping below the pump nozzle centerline.

2. HRC-1,2- Design temperature based on ESW operation, did not consider combined ESW/RHRSW operation, or failure of ESW while RHRSW is cooling RHR heat exchangers at maximum service water and heat load conditions. For design pressure see 1. above.

3. HRC-126/226 - Design temperature based on maximum cooler inlet temperature rather than max outlet temperature due to simple error. For design pressure, see 1. above.

4. HRC-16, -112/212, etc., see 1. above. Pump shutoff head considerations in certain system lineups contributed to additional design pressure requirements in some locations.

9,10. GBC-2,3, etc. - Design temperature did not account for higher transient temperatures that would be seen after compressor operation due to compressive heating effects.

13. HBB-101/201- Design temperature corresponds to GE process diagram maximum operating pressure (25 psia) and not to trip setpoint/design pressure of 25 psig. May have been confusion between psia & psig.

18. HBB-120/220- Design pressure evidently based on choking pressure at relief valve discharge. In as-built configuration, choking occurs at end of discharge pipe, with a steady state backpressure maximum of 79 psig. Also, due to the fact that relief valve cycles and discharge is submerged, a transient backpressure due to reflood will occur resulting in maximum transient pressure of 140 psig.

20. DCB-223,202A, etc. - Design temperature based on maximum normal RHR Hx outlet temperature. Did not assume a failure of RHRSW in which case outlet temperature would equal inlet temperature.

21. GBB 106/206 - Current operating procedures indicate RHR Hx is initially bypassed during startup of shutdown cooling mode, resulting in higher transient temperature in this line.

22. HBB-104/204, etc. - Design temperature (200°) did not account for maximum suppression pool temperature post-LOCA (210°).

23. HBC-117/217 - Design pressure based on static head at upper elevation of pipe rather than lower elevation where it ties into RHR system.

26. HBB-134/234- Design temperature based on maximum value on process diagram (140°) rather than maximum pool temperature (170°) during HPCI operation.

27. EBB-102/202- Design pressure did not account for fact that pump discharge valve is initially closed when pump starts up, or assume a single failure of discharge valve to open.

28. HCB-108/208, etc. - Heat tracing evidently added subsequent to specification of design temperature. For design pressure, see 31 below.

29. HCB-126/226- Design pressure based on maximum containment pressure post-LOCA, did not assume a single failure resulting in maximum N_2 supply pressure in this line. For design temperature, see 28 above.

30. HCB-152/252, etc.- Lines are used for drywell atmosphere sampling. Maximum post-LOCA drywell temperature not considered.

31. HCB-154/254, etc. - Design pressure based on maximum containment pressure post-LOCA, did not assume a single failure resulting in maximum diaphragm pump discharge pressure in this line. For design temperature, see 30 above.

32. HCB-125/225, etc - See 29, above (design pressure only).

33. HCB-115/215, etc. - Design pressure based on maximum wetwell pressure post-LOCA, did not consider static head of suppression pool in conjunction with maximum post-LOCA conditions.

35. HBD-58/59, etc. - Expansion tank overpressurization during normal operation in conjunction with static head not considered.

ewh/d69i/1f