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10CFR50

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

South Texas Project Electric Generating Station
Unit 1 and 2
Docket No. STN 50-498, STN 50-499
Response to NRC Compliance Bulletin 87-001:
Thinning of Pipe Walls in
Nuclear Power Plants

Houston Lighting & Power Company (HL&P) has completed its evaluation of the subject bulletin received on July 15, 1987. Per a conversation with L. G. Constable of Region IV, an extension until March 18, 1988, was granted for submittal of this evaluation. The HL&P program for detection of pipe wall thinning at the South Texas Project Electric Generating Station and the responses to the questions of the bulletin are attached.

If you should have any questions on this matter, please contact Mr. S.M. Head at (512) 972-8392.

J. H. Goldberg
Group Vice President, Nuclear

JHG/WPE/eg

Attachments: Responses to NRC Compliance Bulletin 87-001 questions and details of the HL&P program for detecting pipe wall thinning.

JE11

cc:

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter	)	
	)	
Houston Lighting & Power Company, et al.,	)	Docket Nos. 50-498
	)	
South Texas Project Units 1 and 2	)	

AFFIDAVIT

J. H. Goldberg being duly sworn, hereby deposes and says that he is Group Vice President, Nuclear of Houston Lighting & Power Company; that he is duly authorized to sign and file with the Nuclear Regulatory Commission the attached response to NRC Bulletin 87-001; is familiar with the content thereof; and that the matters set forth therein are true and correct to the best of his knowledge and belief.

J. H. Goldberg

J. H. Goldberg
Group Vice President, Nuclear

STATE OF TEXAS)
)
COUNTY OF MATAGORDA)

Subscribed and sworn to before me, a Notary Public in and for Matagorda County, Texas this 1st day of March, 1988.

Mazie D. Hill

Notary Public in and for the
State of Texas

My commission expires:
2-2-89

MAZIE D. HILL
Notary Public, State of Texas
My Commission Expires 02/02/89

NL.88.074.03

Response to NRC Bulletin 87-001:
Thinning of Pipe Walls in Nuclear Power Plants

The following are responses to the questions in NRC Bulletin 87-001. The numbers refer to the questions in the bulletin.

1. Identify the codes or standards to which the piping was designed and fabricated.

   Response: The piping systems which are considered susceptible to erosion/corrosion (E/C) were designed and fabricated to either ASME Section III (Class 2 or Class 3), 1974 Edition through Winter 1975 Addenda, or to ANSI B31.1, 1973 Edition through Winter 1975 Addenda.

2. Describe the scope and extent of your programs for ensuring that pipe wall thicknesses are not reduced below the minimum allowable thickness. Include in the description the criteria that you have established for:

   a) Selecting points at which to make thickness measurements:

      Response: Houston Lighting & Power (HL&P) has developed a surveillance program for ensuring the integrity of the piping systems which may be subject to single phase or two phase flow E/C. HL&P has performed an analysis of STP piping systems to determine the systems and components within those systems most susceptible to either single or two phase flow E/C. HL&P has completed its analysis, using EPRI's "CHEC" program for single phase flow systems and Technicon Enterprises Inc. (TEI) "ERODE CALC" for two phase flow systems. HL&P plans to refine its analysis and may update the initial set of points to be monitored for E/C when EPRI's verified production copy of the "CHEC" and "CHECMATE" programs for single phase and two phase analysis, respectively, are made available for HL&P use.

      In order to determine the STP systems to be analyzed for E/C susceptibility, an initial screening was performed on all systems as described and tabulated in Appendix A. Systems were excluded from further analysis using the screening criteria specified in Appendix A. Based on this screening process, the following systems were subjected to detailed evaluation for E/C susceptibility:

      - Condensate System (CD)
      - Extraction Steam System (ES)
      - Feed Water System (FW)
      - Main Steam System (MS)
      - Heater Vents System (HV)
      - Heater Drip System (HD)
      - Steam Generator Blowdown System (SB)
      - Turbine Gland Seal System (GS)
      - Auxiliary Feedwater (AF)
      - Turbine Vents and Drain System (MD)
      - Liquid Waste processing System (WL)

Next a detailed evaluation was made on each of these eleven systems to determine which line segments (subsystems) would be modeled with either the "CHEC" or "ERODECALC" computer program. This evaluation is described in Appendix B. The Turbine Vents and Drain System (MD) is discussed in Note 6 to Table C-3 of Appendix C. Each subsystem is assigned an inspection category (A-D) in the tables of Appendix B. These inspection categories are defined in Appendix C.

Components and pipe fittings within each subsystem determined to be potentially susceptible to E/C were modeled with either "CHEC" or "ERODECALC" as applicable. These programs provided an estimated wear rate and wear period for each component or fitting. Based on these calculations, HL&P selected inspection points in accordance with NUMARC criteria as well as additional points based on engineering judgment. A total of thirty-eight points have been selected for the initial inspection program. These inspection points are listed in Appendix D, Table D-2.

b) Determining how frequently to make thickness measurements:

Response: HL&P will perform initial (baseline) Nondestructive Examination (NDE) thickness measurements on selected piping, pipe fittings, and components not later than the first refueling outage of each unit. The frequency of subsequent inspections will be determined based on engineering analysis. The inspections will be performed frequently enough to assure integrity of the piping and components.

The initial frequency of inspection is based upon an empirical model used in "CHEC" for single phase and "ERODECALC" for two phase analytical programs. Baseline readings will be used to calculate Estimated Remaining Life (ERL) as follows:

The initial wall thickness for straight sections of pipe is considered as 1.1 ($T_{nominal}$) since no records of actual thickness nor the baseline wall thickness measurements are available.

For components, ERL will be computed based on an assumed initial thickness ($T_{initial}$). The Remaining Wear Allowance (RWA) will be determined by subtracting the code minimum wall thickness (T_m) from the initial thickness (i.e., 1.1 $T_{nominal}$ or assumed initial thickness of components) or actual measured wall thickness (T_a) if available. The wear rate is computed by dividing ($T_{initial}$ - T_a) by y, where y is the actual operating time in years. The inspection frequency is established based on the equation

$$\text{ERL (Periods)} = \frac{\text{Remaining Wear Allowance}}{\text{Wear Rate}}$$

and either subtracting two (2) years from the ERL (ERL-2) or dividing the ERL by 2 (ERL÷2) and selecting whichever value provides the shorter inspection interval. In either case, any

value for frequency of inspection of between zero (0) and one (1), inclusive, will require the component to be inspected at the next outage with the possibility of replacement. When two actual inspections of a point have been performed, the Actual Remaining Life (ARL) of the component will be calculated based on actual measured material loss. The RWA will be determined by subtracting the code minimum wall thickness (T_m) from the actual measured wall thickness (T_a). The Wear Rate is computed by dividing the actual thickness ($T_{a1} - T_{a2}$) measured at time 1 and 2 by the actual operating time in years between the two inspection periods. The subsequent frequency of inspection will be established based on the equation

$$\text{ARL (Periods)} = \frac{\text{Remaining Wear Allowance}}{\text{Actual Wear Rate}}$$

and either subtracting two (2) years from the ARL (ARL-2) or dividing the ARL by 2 (ARL ÷ 2) and selecting whichever value provides the shorter inspection interval. In either case, any value for frequency of inspection between zero (0) and one (1), inclusive, will require the component to be inspected during the next outage with the possibility of replacement.

The frequency of subsequent inspection is dependent on the RWA and the AWR and will be recalculated with the two most recent consecutive inspection results.

c) Selecting the methods used to make thickness measurements:

Response: HL&P will utilize the ultrasonic (UT) examination method to measure the thickness of components selected for inspection. The UT examination method is the most accurate of the NDE methods currently available and readily useable in the field (see EPRI Report NP-5410, Sept. 1987). Although HL&P has not finalized its NDE program and procedures, HL&P intends to apply a manual UT technique to obtain thickness measurement data from the outside surface of components after insulation removal. Thickness readings will be obtained at grid intersections permanently marked on the component surface to assure high repeatability of measurement locations.

In addition to the UT thickness measurements conducted to detect degradation of components due to either single phase or two phase E/C, internal visual examinations will be performed on the internal surface of the crossunder piping between the High Pressure (HP) Turbine and the Moisture Separator Reheater (MSR) to detect two phase E/C. These visual examinations will be performed in accordance with the recommendations of Westinghouse Operations and Maintenance Memo No. 034 (April 27, 1983).

d) Making replacement/repair decisions:

Response: HL&P has developed preliminary criteria for repair or replacement of piping components which may suffer wall thinning due to E/C. HL&P's preliminary criteria for evaluation, acceptance standards, and repair or replacement are provided in Appendix E. Figure E-1 is a logic diagram for E/C evaluation criteria.

3. For liquid-phase systems, state specifically whether the following factors have been considered in establishing your criteria for selecting points at which to monitor piping thickness (Item 2a):

a) Piping material (e.g., chromium content):

Response: For the E/C monitoring, HL&P exempted piping systems fabricated from corrosion-resistant materials, such as stainless steel. HL&P has included piping systems fabricated of Chrome-moly steel in its E/C susceptibility analysis and has considered all carbon steel piping to be equally susceptible to E/C.

b) Piping configuration (e.g., fittings less than 10 pipe diameters apart):

Response: HL&P recognizes that piping configuration is a significant parameter in the analysis for E/C susceptibility. Piping configuration was a significant factor in the HL&P analysis and will continue to be a factor in future analyses. HL&P has used CHEC Version 1.1 for analysis which recognizes straight pipe configuration for fittings less than 15 diameters apart.

c) pH of water in the system (e.g., pH less than 10):

Response: The STP systems considered susceptible to E/C operate in the pH range of 9.0 to 10.0. This pH range is considered conducive to E/C degradation. No distinction was made in the analysis for pH level differences between the systems.

d) System temperature (e.g., between 190°F and 500°F):

Response: In the analysis, system operating temperature was a significant parameter in selecting surveillance points. Systems operating in the 265°F - 320°F range were considered most susceptible to E/C with decreasing susceptibility on either side of this range. HL&P has analyzed the systems susceptible to E/C above 180°F.

e) Fluid bulk velocity (e.g., greater than 10 ft/s):

Response: Fluid velocity was also a significant parameter in the analysis. Susceptibility to E/C was considered to increase with fluid velocity. Components having fluid velocities less than 5 ft/s are considered to have a low degree of susceptibility. HL&P

has considered the effect of fluid bulk velocity greater than 10ft/s in its analysis.

f) Oxygen content in the system (e.g., oxygen content less than 50 ppb):

Response: The STP systems considered susceptible to E/C are deoxygenated (i.e., oxygen content of approximately 5 ppb) for steam generator secondary chemical control. Since very low oxygen levels are considered an important contributor to E/C degradation, HL&P has considered the effect of the increased susceptibility of STP secondary systems to E/C due to oxygen levels.

4. Chronologically list and summarize the results of all inspections that have been performed, which were specifically conducted for the purpose of identifying pipe wall thinning, whether or not pipe wall thinning was discovered, and any other inspections where pipe wall thinning was discovered even though that was not the purpose of that inspection.

a) Briefly describe the inspection program and indicate whether it was specifically intended to measure wall thickness or whether wall thickness measurements were an incidental determination.

b) Describe what piping was examined and how (e.g., describe the inspection instrument(s), test method, reference thickness, locations examined, means for locating measurement point(s) in subsequent inspection).

c) Report thickness measurement results and note those that were identified as unacceptable and why.

d) Describe actions already taken or planned for piping that has been found to have a nonconforming wall thickness. If you have performed a failure analysis, include the results of that analysis. Indicate whether the actions involve repair or replacement, including any change of materials.

Response: Since neither South Texas Project Electric Generating Station (STPEGS) Unit has begun operation, the STPEGS piping systems have not experienced the operating conditions which may contribute to E/C degradation. HL&P's inspection program to monitor for E/C degradation has not been implemented and no inspections have been performed (including baseline inspections) for E/C.

5. Describe any plans either for revising the present or for developing new or additional programs for monitoring pipe wall thickness.

Response: As described above, HL&P's surveillance program to monitor piping components for E/C has been developed. However, HL&P will continue to evaluate available information, refine the susceptibility analysis, finalize the NDE inspection program, and perform baseline inspections on STP piping components not later than the first refueling outage for each unit.

APPENDIX A

APPENDIX A

E/C SCREENING CRITERIA FOR STPEGS SYSTEMS

South Texas Project Electric Generating (STPEGS) plant systems have been screened to select the systems most susceptible to erosion/corrosion.

The general screening criteria used to exclude the systems from the erosion/corrosion program were:

- Systems carrying other than water or wet steam.
- Piping materials other than Carbon Steel or Chrom-Moly steel
- Systems operating less than 180°F.

The results are summarized in Table A-1.

TABLE A-1

PIPING SYSTEM EVALUATION FOR EXCLUSION FROM THE

E/C INSPECTION PROGRAM

SOUTH TEXAS PROJECT ELECTRIC GENERATING STATION

SYSTEM		Included (Y or N)	Reason for Elimination: Not H_2O	Not CS	Low Temp	Notes
AC	Closed Loop Auxiliary Cooling Water System	N			X	
AD	Acid Storage and Transfer System	N	X		X	
AF	Auxiliary Feedwater	Y				
AP	Post Accident Sampling System	N		X	X	
AS	Auxiliary Steam System and Boilers	N				(1)
BA	Breathing Air System	N	X	X	X	
BR	Boron Recycle System	N		X	X	
CA	Caustic Storage and Transfer System	N			X	
CC	Component Cooling Water System	N				(2)
CD	Condensate System	Y				
CF	BOP Chemical Feed System	N		X	X	
CH	Chilled Water HVAC	N				(3)
CM	Containment Hydrogen Monitoring	N		X	X	
CO	Gas Carbon Dioxide Storage System	N	X	X	X	
CP	Condensate Polisher System	N			X	
CR	Condensate Air Removal System	N	X			
CS	Containment Spray System	N		X	X	
CT	Condensate Storage System	N			X	

SYSTEM	Included (Y or N)	Reason for Elimination Not H_2O	Not CS	LOW Temp	Notes
CV Chemical and Volume Control System	N		X	X	
CW Circulating Water System	N		X	X	
DA Standby Diesel Generator Miscellaneous Drains	N	X		X	
DB Diesel Generator (BOP)	N	X			
DG Standby Diesel Generator	N	X			
DS Standby Diesel Generator Combustion Air Intake	N	X		X	
DL Diesel Generator Lighting	N	X			
DO Standby Diesel Generator Fuel Oil	N	X		X	
DR Nonradioactive Plumbing Drains and Sumps System	N				(4)
DW Demineralized Water System (Makeup)	N		X	X	
DX Standby Diesel Generator Combustion Gas Exhaust	N	X	X		
ED Radioactive Vents and Drain System	N		X	X	
EP Essential Cooling Pond Makeup System	N			X	
ES Extraction Steam System	Y				
EW Essential Cooling Water System and ECW Screen Wash System	N		X	X	
FC Spent Fuel Pool Cooling and Cleanup System	N		X	X	
FO Fuel Oil Storage and Transfer System	N	X		X	

SYSTEM	Included (Y or N)	Reason for Elimination: Not H_2O	Not CS	LOW Temp	Notes
FP Fire Protection System	N			X	
FW Feedwater System	Y				
GC Stator Cooling Water System	N			X	
GS Turbine Gland Seal System	Y				
HC Containment Building HVAC	N	X		X	
HD Heater Drip System	Y				
HV Heater Vent System	Y				
HY Gas Hydrogen Storage System	N	X		X	
IA Instrument Air System	N	X		X	
IL Containment Leak Rate Test System	N	X		X	
JW Standby Diesel Jacket Water	N		X		(3)
LM Reservoir Makeup Pumping System	N		X	X	
LO Lube Oil Purification Storage and Transfer System	N	X		X	
LP Feed Pump Turbine Lube Oil System	N	X		X	
LU Standby Diesel Generator Lube Oil System	N	X		X	
LW Circ. Water Pump Seal Water and Priming System	N		X	X	
MC Cooling Water Reservoir Spillway Gates and Blowdown Facilities	N			X	
MD Turbine Vents and Drain System	Y				
MS Main Steam System	Y				
NC Nonradioactive Chemical Waste System	N	X		X	

	SYSTEM	Included (Y or N)	Reason for Elimination Not H_2O	Not CS	LOW Temp	Notes
NH	Gas, Nitrogen High Pressure Supply System	N	X		X	
NL	Gas, Nitrogen Storage System	N	X		X	
OC	Open Loop Auxiliary Cooling System	N			X	
OM	Lube Oil System	N	X			
OS	Chemical Feed System	N	X			
OW	Oily Waste System	N	X		X	
PO	Reactor Coolant Pump Oil Change-Out System	N	X		X	
PS	Primary Sampling System	N		X		
PW	Potable Waste System	N			X	
RA	Radiation Monitoring System	N	X		X	
RC	Reactor Coolant System	N		X		
RD	Reactor Coolant System Degassing System	N	X	X	X	
RH	Residual Heat Removal System	N		X		
RK	RMPF Seal Water System	N		X	X	
RL	RMPF Screen Wash System	N		X	X	
RM	Reactor Makeup Water System	N		X	X	
SA	Station Air System	N	X			
SB	Steam Generator Blowdown System	Y				
SC	Circulating Water Screen Wash System	N		X	X	
SD	Diesel Starting Air	N	X	X	X	
SH	Sodium Hypochlorite System	N	X		X	
SI	Safety Injection System	N		X		

TABLE A-1 (CONTINUED)

	SYSTEM	Included (Y or N)	Reason for Elimination Not H_2O	Not CS	LOW Temp	Notes
SL	Steam Generator Sludge Lancing and Chemical Cleaning System	N		X		
SS	Secondary Process Sampling System	N		X	X	
SW	Fresh Water Supply System	N			X	
TW	Service Water System	N			X	
VE	Radioactive Vent Header System	N	X		X	
WG	Gaseous Waste Processing System	N	X	X	X	
WL	Liquid Waste Processing System	Y				
WS	Solid Waste Processing System	N			X	
WW	Well Water Supply System	N			X	
XC	Containment Building/ Containment Air Lock	N	X		X	

NOTES FOR THE SYSTEM EVALUATION TABLE A-1

(1) AS (Auxiliary Steam System and Boilers)

The Auxiliary Steam system is only used during plant startup and shut-down. The discharge of the auxiliary boiler is superheated steam which does not cause E/C degradation. When Main Steam is used in the AS piping it also is superheated. Therefore this system is excluded from the E/C Inspection Program.

(2) CC (Component Cooling Water System)

This System is treated with the corrosion inhibitor "Nulcool". Therefore, this system is excluded from the E/C Inspection Program.

(3) CH (Chilled Water System) & JW (Standby Diesel Jacket Water)

These systems are treated with a corrosion inhibitor and therefore may be excluded from the E/C Inspection Program.

(4) DR (Nonradioactive Plumbing Drains and Sump System)

The majority of this system is non-safety related, stainless steel and <180°F which excludes it from the E/C Inspection Program. However there are six (6) lines segments which are safety related carbon steel. The line list indicates that they all operate at a pressure of 5 psig and 150°F (<180°F). The P&ID 6Q069F20005 Rev. 10 indicates that these drain lines are normally closed. Therefore, based on the operating conditions and low intermittent use, these lines are excluded from the E/C Inspection Program.

APPENDIX B

APPENDIX B

DETAILED EVALUATIONS OF SUSCEPTIBLE SYSTEMS

Susceptible systems were evaluated for system specific parameters such as systems description various operating modes, bulk velocities, (flow rates, specific volume, number of operating branches, etc.) line sizes, thermodynamic conditions (heat balance, steam temperature, pressure, etc.) down stream and upstream conditions of control valves, etc. as applicable.

This detailed evaluation was used to identify exactly which line segments (subsystems) will be modeled with Technicon's two phase ERODECALC and EPRI's single phase CHEC program. Also subsystems were classified to Category A through D as described in Appendix C relative to the South Texas Project Electric Generating Station (STPEGS) Unit 1 & 2 erosion/corrosion program. For details of subsystem categories for various systems see Tables B-1 through B-10.

Class terminology for Table B-1 thru B-10.

NSR - NUCLEAR SAFETY RELATED
NNSR - NON-NUCLEAR SAFETY RELATED

TABLE NO. B-1

CD (CONDENSATE SYSTEM) SUBSYSTEM IDENTIFIED AND CATEGORIZED

SUBSYSTEM DESCRIPTION	CATEGORY	PARAMETERS		
		Material	Temp. °F	Class
Condenser to Condensate Pump	B (1)	A106GRB	120.6	NNSR
Condensate Pump to Polishing Demineralizer	A (16" Pip) B (Remain)	(Vendor CS) A106GRB	121.1	NNSR
To Gland Steam Condenser	B (1)	A106GRB	121.4	NNSR
To F.W. Htr. No. 16	B (1)		122.5	NNSR
To Htr. Drain Pump Connection	A (4)		167.4	NNSR
To F. W. Htr. No. 15	A (4)		168.7	NNSR
To Blowdown Heat Exchanger Connection	A		216.7	NNSR
To F. W. Heater No. 14	A		217.3	NNSR
To F. W. Htr. No. 13	A		264.3	NNSR
To Deaerator	A		314.6	NNSR
Header Downstream of F.W. Booster Pumps to Steam Generator Feed Pumps	A	A106GRB	374.8	NNSR
Condensate Pump Minflow Recirc.	NOTE (2)	A106GRB	(720 psig) 125°F	NNSR
Condensate Piping to the Vent Condenser	B (3)	(JC) A106GRB	(428 psig) 121.4°F	NNSR
Condensate Piping to the Blowdown Heat Exchanger	B (3)	(JC3) A106GRB	121.4	NNSR
Condensate Pump Vents to the Condenser	NOTE (5)	(XC8) A106GRB	(0 psig) 121°F	NNSR
Condensate Valve Bypasses, Diverts, and any other Normally Cloud Valve CD Piping	C			NNSR
Small Bore Vents and Drains	D			NNSR
Condensate Piping From Vent Condenser to the Deaerator	A	CS	314.9	NNSR

Notes contd. Table B-1

Notes for the CD (Condensate System)

(1) The velocities for the main runs from the condensers to the No. 6 FW Heaters are calculated and compared to those of the remaining included CD subsystems.

SUBSYSTEM DESCRIPTION	Nom. Dia. (In.)	No. Lines Oper.	Area Per Line (Ft^2)	Specific Volume (Ft^3/lbm)	Gross Mass Flow (lbm/hr)	Bulk Fluid Vel. (Ft/Sec)
Condenser to the Cond. Pump	24.00 42.00 30.00	6 1 2	2.948 9.280 4.666	(121°F) 0.016196	9,221,000	2.35 4.47 4.45
Condensate Pump to the Polishing Demineralizer	16.00 24.00	2 1	1.177 2.655	(121°F) 0.016213	9,221,000	17.64 (a) 15.64
Polishing Demineralizers to the Gland Steam Condenser	24.00 16.00	1 1	2.655 1.177	(121°F) 0.016213	9,221,000 5600 GPM	15.64 10.72
Gland Steam Condenser to the No. 16 FW Htr.	28.00 16.00	1 3	3.758 1.177	(121°F) 0.016213	8,777,000	10.52 11.19
FW Htr. No. 16 to FW Htr. No. 15	16.00	3	1.177	(168°F) 0.016622	11,056,000	14.46
FW Htr. No. 15 to FW Htr. No. 14	16.00 28.00 20.00	3 1 2	1.177 3.758 1.842	(217°F) 0.016749	11,131,000	14.67 13.78 14.06
FW Htr. No. 14 to FW Htr. No. 13	20.00	2	1.842	(264°F) 0.017124	11,131,000	14.37
FW Htr. No. 13 to the Deaerator	20.00 30.00	2 1	1.842 4.352	(314°F) 0.017600	11,131,00	14.77 12.50
Header D/S of the FW Booster Pumps to the Stm. Gen. Feed Pumps	36.00 22.00	1 3	6.633 2.237	0.01830	17,026,000	13.05 12.90

(a) The 16"Ø piping from the discharge of the condensate pumps to the header has the highest velocity within the subsystems considered above. This section of pipe should be placed in Category A to ensure plant reliability.

NOTES TO TABLES B-1 CONTINUED:

(4) While these two subsystems operate at lower than 180°F, they are being placed in Category A to ensure plant reliability for critical components (from an economical standpoint).

(5) The CD Pump vents to the Condenser are for air removal from the feedwater as it goes through the pump, however, it is felt that this line will have waterflow for the most part. This water flow will be single phase based on the water temp. and condenser pressure, therefore place this subsystem in Category "B".

TABLE NO. B-2

ES (EXTRACTION STEAM) SUBSYSTEMS IDENTIFIED AND CATEGORIZED

SUBSYSTEM DESCRIPTION	CATEGORY	PARAMETERS		
		Material	Temp. °F	Class
H.P. Turbine to FW Htr #1	A	CS	453	NNSR
Crossunder Pipe to the Deaerator	A	CS	377	NNSR
L.P. Turbine to FW Htr. #3	D Superheated Stm.	CS	395	NNSR
L.P. Turbine to FW Htr. #4	A	CS (1)	274	NNSR
L.P. Turbine to FW Htr. #5 (Internal to the Condenser)	A	CS (1)	223	NNSR
Moisture Separator Reheater to SGFP Turbines	D Superheated Stm.	CS	537	NNSR
SGFP Turbine Exhaust Duct to the Condensers	A	CS	(2-phase flow) 126	NNSR
All Lines within Ref. 3.3 Labeled "Drip Leg"	D	CS	All >180°	NNSR
All Valve Bypasses & Normally Closed Lines	C	CS	Any Temp	NNSR
Westinghouse Crossunder Pipe (H.P. Turbine to MSR)	..	CS	382	NNSR
Westinghouse Crossover Pipe (MSR to L.P. Turbines)	D Superheated Stm.	CS	523	NNSR

NOTES:

(1) System Information Extraction piping low pressure turbine to Hea[illegible]s # 14, 15, & 16.

[illegible]ystem Description document Rev.3 TPNS # 6S159HD1047.

Heat Balance Dwg. No. 9S019F22512 Rev. 0 100% NSSS output Heat Balance (3817 MWT).

S3/E029/j

TABLE NO. B-3

FW (FEEDWATER SYSTEM) SUBSYSTEM IDENTIFIED AND CATEGORIES

SUBSYSTEM DESCRIPTION	CATEGORY	PARAMETERS MATERIAL	TEMP °F	CLASS
Deaerator Storage Tank #2 to FW Booster Pumps	A	(RC8) A106 GR B	374.2	NNSR
To CD Header	A	(JC7) A106 GR B	374.2	NNSR
Stm Generator Feed Pumps to FW Htr #1	A	(EC7) Varies w/size	376.7	NNSR
To I.V.C. Wall (Class Break)	A	(EC7) Varies w/size	440.2	NNSR
To Valve FV-7141A, 7142A, 7143A & 7144A at Mtl Change	A	(AA2)	440.2	NSR
To RCB Wall	A	(GA2) SA-333 GR B	440.2	NSR
To Steam Generators	A	(GA 2) SA-333 GR B	440.2	NSR
FW Booster Pump Minflow Recirc. To Control Valve	B(1)	(JC8) A106 GR B	380	NNSR
To Deaerator Storage Tank #1	A(1)	(JC8) A106 GR B	380	NNSR
Stm. Generator Feed Pump Recirc. To Control Valve	B(2)	(EC7) A106 GR B	380	NNSR
To Deaerator Storage Tank #1	[illegible](2)	(EC7) A106 GR B	380	NNSR
Start-Up Stm. Generator Feed Pump Section	C(3)	(JC8) A106 GR B	380	NNSR
Discharge to Feedwater Header	C(3)	(EC7) A106 GR B	380	NNSR
Start-Up Stm. Generator Feed Pump Recirc. to the C.V.	B(4)	(EC7) A106 GR B	380	NNSR
To Deaerator Storage Tank #1	A(4)	(EC7) A106 GR B	380	NNSR
(FW Booster Pumps) Stuffing Box Leakoff to Condensate Return Units	C(5)	(XC7) A106 GR B	165	NNSR
To Seal Leakoff Tank	C(5)	(XC7) A106 GR B	165	NNSR
To Main Condenser	C(5)	(XC7) A106 GR B	160	NNSR

TABLE NO. B-3 CONTINUED

FW (FEEDWATER SYSTEM) SUBSYSTEM CATEGORIES

SUBSYSTEM DESCRIPTION	CATEGORY	PARAMETERS		
		MATERIAL	TEMP °F	CLASS
FW Valve Bypass, Divert, and any other normally closed valve FW Piping	C	Carbon Stl's.		NNSR NSR
Small Bore Vents and Drains	D	Any	Any	NNSR
Deaerator Exhaust Line to the Deaerator External Vent Condenser (DEVC)	D	CS	373	NNSR
DEVC Condensed Exhaust Return to the Deaerator	D	SS	>180°F	NNSR
FW Cleanup Lines, FW Warm-up Lines, Htr. Bypass Lines, Start-Up Control Valves, DA Dump to the Condenser, & Stm. Generator Warm-up Lines	C	CS	Varies >180°F	NNSR

NOTES TO TABLES B-3:

(1) FW Booster Pump Minflow Recirc. to Control Valve to Deaerator Storage Tank =1

The Velocities are calculated for up and down stream of the control valves to determine which category these subsystems should be placed.

Upstream of the Control Valve:

Size: 12.0" ℄ Nominal Sch. 60 Area A=0.7372Ft^2/Line
Flow Rate: 6000gpm * 8.337lb/gal * 60min/Hr = 3,001,320#/Hr
Velocity: V=Mv/[3600A]=20.6Ft/Sec Single Phase Flow

Downstream of the Control Valve:

Size: 12.0" ℄ Nominal Sch 60 Area A=0.7372Ft^2/Line
Flow Rate: 6000gpm or 3001320#/hr=M (Per Ref. 3.4)
Specific Volume: ~=0.02062 Ft^3/lbm @ 182 PSIA & h=348.0
Velocity: V=M~/[3600A]=23.3Ft/Sec 2-Phase Flow

Since D/S of the Control Valve is 2-Phase Flow it will be placed in Category A. The U/S portion will be placed in Category B with future inspections to be based on the D/S portion.

The Piping immediately D/S of the Control Valve should be considered first. These Categories are chosen based on past history of Minflow Recirc Lines.

NOTES TO TABLE B-3 CONTINUED:

(2) FW Steam Generator Feed Pump Recirc. to Control Valve to Deaerator Storage Tank #1

The velocities are calculated for up and downstream of the control valves to determine which Category these subsystems should be placed.

Upstream of the Control Valve (Carbon Steel):

Size: 10.0" ⌀ Nominal Sch 120 Area A=0.4481Ft^3
Flow Rate: 4500gpm (Per Ref 3,4)(4500gpm*8.337lb/gal*60min/Hr=2,250990lb/Hr
Specific Volume: ~=0.01826 Ft^3/lbm @ 1200 PSIA h=351.5 BTU/lb
Velocity: V=M~/3600A=25.5Ft/Sec (Single Phase Flow)

Downstream of the Control Valve (Carbon Stl)

Size: 10.0" ⌀ Nominal Sch 120 Area A=0.4481Ft^2
Flow Rate: M = 2,250990 lb/Hr
Specific Volume: ~=0.03086 Ft^3/lbm @ 182 PSIA & h=354.92BTU/lb
Velocity: V=M~/3600A=43.1Ft/Sec (2-Phase Flow)

Since D/S of the Control Valve is 2-Phase Flow it will be placed in Category A with the most critical being immediately D/S of the Control Valve. The U/S portion will be placed in Category B with future inspection being based on the D/S portion.

(3) Start-Up Steam Generator Feed Pump Suction & Discharge Piping Velocity Call

S/U SGFP Suction:

Size: 14.0" ⌀ Nominal Sch 60 Area A=0.8956Ft^2
Flow Rate: M=8,700gpm * 8.337lb/gal * 60min/Hr = 4,352,000lb/Hr
Specific Volume: ~=0.01836Ft^3/lbm @ 380°F (OPer. Temp)
Velocity: V=M~/3600A=24.8Ft/Sec Single Phase Flow

S/U SGFP Discharge:

Size: 14.0: ⌀ Nominal Sch 120 Area A=0.7612Ft^2
Flow Rate: M=4,352,000lbm/Hr
Specific Volume: ~=0.01826Ft^3/lbm @ 1200 PSIA & 380°F
Velocity: V=M~/3600A = 29.0Ft/Sec Single Phase Flow

This piping is Category C by definition. The High temperature and velocities require that when it operates outside its normal conditions (Start-Up Feed Pump) it should be considered for inspection point selection.

NOTES TO TABLE B-3 CONTINUED:

(4) S/U SGFP Recirc. to the Control Valve to the Deaerator Storage Tank #1
The Categories will be assigned based on the bulk fluid velocities calculated:

Upstream of the Control Valve:

Size: 8" ϕ Nominal Sch 120 Area A=0.2819Ft^2
Flow Rate: M=3500gpm * 8.337lb/gal * 60 min/Hr = 1,731,000lb/Hr
Specific Volume: ~=0.01826Ft^3/lbm @ 1200 PSIA & 300°F h=351.5BTU/lbm
Velocity: V=M~/3600A=31.5Ft/Sec (Single Phase Flow)

Downstream of the Control Valve:

Size: 8" ϕ Nominal Sch 120 Area A=0.2819Ft^2
Flow Rate: M=1751000lb/Hr
Specific Volume: ~=0.03086Ft^3/lbm @ 182 PSIA
Velocity: V=M~/3600A=53.2Ft/Sec (2-Phase Flow)

The D/S portion is placed in Category A (immediately D/S of the Control Valves most critical) and the U/S portion is placed in Category B with future inspections being based on the D/S portion.

(5) FWBP Stuffing Box Leadoff to Main Condenser No. 12
These Subsystems are being placed in Category C for the following reasons:

a) Temp. <180°F
b) Pressure 20 PSIG & ATM D/S of C.V. (D/S of Control Valve is the most likely area for a failure if one would occur and this failure would result in the sucking of air into the Condenser rather than a spraying of water or steam.)

This subsystem should be considered for inspection if any significant deviation from normal operation is noted during the yearly reviews.

TABLE NO. B-4

MS (MAIN STEAM) SUBSYSTEM IDENTIFIED AND CATEGORIZED

SUBSYSTEM DESCRIPTION	CATEGORY	PARAMETERS		
		Material	Temp. °F	Class
Steam Generators to the I.V.C. Wall	A	(CAZ) SA155GRKCF70	567	NSR
To High Pressure Turbine	A	(HC7) A155GRKCF70G1	567	NNSR
Main Steam Supply Header (MSSH)	A	(HC7) (CS) A-106 GRB	567	NNSR
MSSH to Moisture Separator Reheaters	A	(HC7) (CS) A-106GRB	567	NNSR
MSSH to Gland Seal System	A	(HC7) (CS) A-106GRB	567	NNSR
MSSH to Aux. Steam	$C^{(1)}$	(HC7) (CS) A106GRB	567	NNSR
MSSH to Steam Generator Feed Pump Turbines	$C^{(1)}$	(HC7) (CS) A106GRB	567	NNSR
MSSH to Deaerator	$A^{(2)}$	(HC7&RC7)(CS) A155GRKC-60 A106GRB	567	NNSR
MSSH to Condensers (Bypass Lines)	$C^{(1)}$	(HC7)(CS) A106GRB	567	NNSR
6" Takeoff of the MSSH to the MD Drain System Tie In.	$B^{(3)}$	(HC7) (CS) A106GRB	567	NNSR
Nuclear Safety Related Main Steam Lines which Tie into the MD System	$B^{(4)}$	(GAZ) (CS) VARIES W/SIZE	567	NSR
Non Nuclear Safety Related Main Steam Lines which Tie into the MD System	$B^{(4)}$	(CS) VARIES	567	NNSR
Main Steam Safety Relief Piping (NSR) to Atmos.	$C^{(5)}$	(GAZ) SA106GRB	567	NSR
Main Steam Safety Relief Piping (NNSR) to Atmos.	$C^{(5)}$	(XC7)A-155GR (VARIES)	567	NNSR
Valve Bypasses (NSR)	$C^{(6)}$	VARIES(CS)	567	NSR

TABLE NO. B-4 CONTINUED

MS (MAIN STEAM) SUBSYSTEM IDENTIFIED AND CATEGORIZED

SUBSYSTEM DESCRIPTION	CATEGORY	PARAMETERS		
		Material	Temp. °F	Class
Valve Bypass (NNSR)	C(6)	VARIES(CS)	567	NNSR
Small Bore Vents and Drains	D	ANY	Any	NSR NNSR
Main Steam to AF Pump Turbine (Supply)	C(7)	CS	567	NSR

Notes TO TABLE B-4:

(1) These subsystems have low operating time and the main steam flow has a vary low moisture content. Therefore, a reevaluation on every 5 years of the operating time history and flow rates with possible inspections will be sufficient (Category C).

(2) The MS to the Deaerator is used during startup and intermittently during normal operation. It's takeoff from the Main Steam Supply Header is located at one end of the header with no moisture removal device. Considering that the deaerator is the last to receive steam and that the percent moisture contain in the steam will continue to increase as it passes each takeoff (since the direction of the droplets wants to continue in a straight line). Therefore the percent moisture at the deaerator takeoff could reach detrimental levels. The inspection point (if any) should be at or close to the takeoff.

(3) The 6" MS 1250, 1264, 1246, 1244, 1242, 1240-HC7 lines act as moisture removal or drain lines. The steam is also rerouted back to the bypass lines therefore some flow rate is always observed. It is therefore recommended that this piping be placed in Category "B" and future inspections be based on the Main Steam Supply Header.

(4) The NSR and NNSR subsystems which tie into the MD (Turbine Vents and Drain System) can be placed in category B since the MD piping considered operates intermittently. Any future inspections should be based on the corresponding MD lines inspection data.

(5) The NSR and NNSR subsystems of the Main Steam Safety Relief Valve piping to atmosphere can be placed in Category C for the following reasons:

a) Infrequent use (only used if over pressurization of the Main Steam Lines occur.

b) Percent moisture in the MS is very low

Future inspection should be based on the surrounding MS piping.

(6) The NSR and NNSR valve bypass piping can be placed in Category C based on the following reasons:

a) The bypass lines are used infrequently
b) The percent moisture is very low

(7) The MS to the AF Pump Turbine Subsystem can be placed in Category C based on intermittent usage.

TABLE NO. B-5

HV (HEATER VENTS) SUBSYSTEM CATEGORIES

SUBSYSTEM DESCRIPTION	CATEGORY	PARAMETERS		
		MATERIAL	TEMP °F	CLASS
Htr.s 16A, B, C Vents to Condenser	D	CS	175	NNSR
Htr.s 15A, B, C Vents to Condenser	D	CS	225	NNSR
Htr.s 14A, B Vents to Condenser	D	CS	273	NNSR
Htr.s 13A, B Vents to Condenser	D	CS	322	NNSR
Htr.s 11A, B Vents to Condenser	D	CS	448	NNSR
Htr.s Maintenance Vents & Drains	D	CS	--	NNSR
Htr. Relief Valves Discharge Piping	C	CS	--	NNSR

TABLE NO. B-6

HD (HEATER DRIPS) SUBSYSTEM CATEGORIES

SUBSYSTEM DESCRIPTION	CATEGORY	PARAMETERS MATERIAL	TEMP °F	CLASS
MSR's to MS Drip Tanks	A	C	380	NNSR
MS Drip Tanks to MS Drip Tank Pumps	A	CS	380	NNSR
MS Drip Tank Pumps to DA	A	CS	380	NNSR
MSR Tube Drains to MSR Drip Tank	A	CS	562	NNSR
MSR Drip Tanks to Control Valves (LV 7208, 7211, 7220, 7223)	A	CS	562	NNSR
Control Valves to Htr.s 11A & B	A	AS	448	NNSR
MSR Tube Vent Condenser Drains to Htr.s 11A & B	A	AS	562	NNSR
MS Drip Tanks Dumps to Condenser	C	CS	380	NNSR
MSR Drip Tanks Dumps to Condenser	C	CS	562	NNSR
MSR Drip Tanks Vents to MSRs	C(1)	CS	562	NNSR
MS Drip Tanks Vents to MSRs	C(1)	CS	380	NNSR
MSR Tube Vent Condenser Drains to Condenser	C	AS	448	NNSR
Htr.s 11A & B Drips to DA	A	CS	390	NNSR
Htr.s 11A & B Dumps to Condenser	C	CS	390	NNSR
Htr.s 13A & B to Control Valves (LV 7282 & 7285)	A	CS	276	NNSR
Control Valves to Htr.s 14A & B	A	AS	276	NNSR
Htr.s 14A & B to Control Valves (LV 7802A & B 7805A & B	A	CS	228	NNSR
Control Valves to Htr.s 15A, B, C	A	AS	230	NNSR

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TABLE NO. B-6 CONTINUED

HD (HEATER DRIPS) SUBSYSTEM CATEGORIES

SUBSYSTEM DESCRIPTION	CATEGORY	PARAMETERS		
		MATERIAL	TEMP °F	CLASS
Htr.s 13A & B Dumps to Condenser	C	CS	322	NNSR
Htr.s 14A & B Dumps to Condenser	C	CS	228	NNSR
Htr.s 15A, B, C to Control Valves LV 7322, 7325, 7328	A	CS	180	NNSR
Control Valves to LPHD Flash Tanks	A	CS	180	NNSR
Htr.s 16A, B, C to LPHD Flash Tanks	B	CS	175	NNSR
LPHD Flash Tanks Steam Lines to Htr.s 16A, B, C	B	CS	175	NNSR
LPHD Flash Tanks to LPHD Pumps	B	CS	175	NNSR
LPHD Pumps to Control Valves LV 7353, 7357, 7361	B	CS	175	NNSR
Control Valves to Condensate System	A(2)	CS	175	NNSR
Htr.s 15A, B, C Dumps to Condenser	C	CS & AS	225	NNSR
LPHD Flash Tank Dumps to Condenser	C	CS & AS	175	NNSR
LPHD Dumps Min. Flow to LPHD Flash Tanks	C	CS	175	NNSR
LPHD Pump Vents to LPHD Flash Tanks	B	CS	175	NNSR

NOTES:

(1) Vent line is for pressure balancing between MSR & drain tank; flow is not a continuous full flow rate.

(2) Piping to be included in the Baseline Insp. Program is limited to the area immediately downstream of the control valve.

TABLE NO. B-7

SB (STEAM GEN. BLOWDOWN) SUBSYSTEM CATEGORIZED

SUBSYSTEM DESCRIPTION	(4) CATEGORY	PARAMETERS (3)		
		Material	Temp. °F	Class
Stm. Gen. to Iso. Valve #'s FV-4150 (4151, 4152, 4153)	A	Chrm-Moly	567	NSR
Iso. Valve #'s FV-4150 (4151, 4152, 4153) to Flash Tank	A	Chrm-Moly	567 & 358	NNSR
Flash Tank Steam to Htr's. 13A & 13B	D(1)	Carbon Stl.	358	NNSR
Flash Tank Steam to Htr's. 13A & 13B valve bypass	D(1)	Carbon Stl.	358	NNSR
Flash Tank Liquid to SGBD Ht Exchanger	C(2)	Carbon Stl.	358	NNSR
Flash Tank Liquid to Condenser	A	Carbon Stl.	358	NNSR
SGBD Ht. Exchanger to M.B. Demineralizer	C(2)	Carbon Stl.	140	NNSR
M.B. Demineralizer to Valve LV 4160	C(2)	Carbon Stl.	140	NNSR
Valve LV4160 to Condenser	C(2)	Carbon Stl.	140	NNSR
1" SG Water Sampling Line to Valve #'s FV-4186, 4187, 4188, 4159	C	Chrm-Moly	567	NSR
SG Water Sampling from FV-4186, 4187, 4183, 4189 to Sample System	C	Chrm-Moly	567	NNSR
SG Recirc. Pump 11A, B, C, D Disch & Suction Pipe	D	Stn. Stl.	250	NNSR
Flash Tank Steam to Htr. 13A & 13B and to Condenser Lines Drain & Trap Piping	D	Carbon Stl.	358	NNSR
Flash Tank Steam to Condenser	C	Carbon Stl.	358	NNSR
Condensate Sys. Return Piping from SGBD Ht. Exchanger to Condensate Sys. Piping	C	Carbon Stl.	224	NNSR
M.B. Demineralizer Resin Sluice and Fill Lines	D	Line C.S. & Stn. Stl.	140	NNSR
Demin. Water to M.B. Demineralizers	D	Stn. Stl.	140	NNSR

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TABLE NO. B-7 CONTINUED

SB (STEAM GEN. BLOWDOWN) SUBSYSTEM CATERGORIZED

SUBSYSTEM DESCRIPTION	(4) CATEGORY	PARAMETERS (3) Material	Temp. °F	Class
Stm. Gen. to Iso. Valve #'s FV-4150 (4151, 4152, 4153)	A	Chrm-Moly	567	NSR
Iso. Valve #'s FV-4150 (4151, 4152, 4153) to Flash Tank	A	Chrm-Moly	567 & 358	NNSR
Flash Tank Steam to Htr's. 13A & 13B	D(1)	Carbon Stl.	358	NNSR
Flash Tank Steam to Htr's. 13A & 13B valve bypass	D(1)	Carbon Stl.	358	NNSR
Flash Tank Liquid to SGBD Ht Exchanger	C(2)	Carbon Stl.	358	NNSR
Flash Tank Liquid to Condenser	A	Carbon Stl.	358	NNSR
SGBD Ht. Exchanger to M.B. Demineralizer	C(2)	Carbon Stl.	140	NNSR
M.B. Demineralizer to Valve LV 4160	C(2)	Carbon Stl.	140	NNSR
Valve LV4160 to Condenser	C(2)	Carbon Stl.	140	NNSR
1" SG Water Sampling Line to Valve #'s FV-4186, 4187, 4188, 4159	C	Chrm-Moly	567	NSR
SG Water Sampling from FV-4186, 4187, 4183, 4189 to Sample System	C	Chrm-Moly	567	NNSR
SG Recirc. Pump 11A, B, C, D Disch & Suction Pipe	D	Stn. Stl.	250	NNSR
Flash Tank Steam to Htr. 13A & 13B and to Condenser Lines Drain & Trap Piping	D	Carbon Stl.	358	NNSR
Flash Tank Steam to Condenser	C	Carbon Stl.	358	NNSR
Condensate Sys. Return Piping from SGBD Ht. Exchanger to Condensate Sys. Piping	C	Carbon Stl.	224	NNSR
M.B. Demineralizer Resin Sluice and Fill Lines	D	Line C.S. & Stn. Stl.	140	NNSR
Demin. Water to M.B. Demineralizers	D	Stn. Stl.	140	NNSR

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Notes TO TABLE B-7:

1. Steam is not wet but saturated, i.e., H-1194.1 btu/lb - hg per Heat Balance Dwg. No. 9S019F22512 Rev. 0.

2. The normal continuous operation mode selected for the initial years of the plants operation was by-passing the SGBD heat exchanges, filters, and demineralizers and discharging the flash tank liquid directly to the condenser per page 6 of system discription document rev. 1 TPNS #5S209MD1013.

3. Parameters are taken from PS Master file piping line list #5L229p60001, page 555 to 563.

4. Operating mode descriptions are taken from system description document rev. 1, TPNS No. 5S209MD1013.

TABLE NO. B-8

GS (TURBINE GLAND SEAL) SUBSYSTEM IDENTIFIED AND CATAGORIZED

SUBSYSTEM DESCRIPTION	CATEGORY	PARAMETERS		
		Material	Temp. °F	Class
Downstream of Gland Steam Regulator (PV 6150) to Pressure Regulators for LP Turbine Glands (PV 6170, 6168, 6166, 6164, 6162) and to Pressure Regulator for Feed Pump Turbine Gland (PV 6180)	A(1)	CS	552	NNSR
Downstream of Pressure Regulators to Turbine Gland Seals	D(2)	CS	300	NNSR
Valve By-pass Lines (All lines)	C	CS	---	NNSR
Leak-offs from Turbine Gland Seals to the Gland Seal Condenser	D(2)	CS	300	NNSR
Steam Chest Leak-offs to Gland Seal Condenser	D(2)	CS	300	NNSR
Steam Chest Leak-offs to Downstream of Gland Seal Regulator	A(1)	CS	552	NNSR
HP Turbine Glands Leak-off Spillover to Main Condenser	D(2)	CS	300	NNSR

4. Notes

(a) The operating conditions provided the pressure downstream of the steam seal regulator (PV 6150) as 140 psia. Based on the outlet enthalpy of the steam from the heat balance, for the portion of the system downstream of the steam seal regulator, the fluid is wet steam. Since this system is in continuous operation (flow is 14970 lb/hr from heat balance) and the material is carbon steel (A106 GrB, schedule 80) the appropriate category for this subsystem is A. These conditions also apply to the leak-offs from the steam chest to downstream of the steam seal regulator; the total flow from these leakoffs is 1326 lb/hr. from the heat balance.

(b) The operating conditions provided the pressure downstream of the Press Regulators to Turbine Gland Seals as approximately 18 psia for all turbines. Therefore based on the steam inlet conditions to the Press Regulators, the steam in these subsystems is dry and superheated downstream of the control valves. The appropriate category for these subsystems is D. This superheated steam condition also applies to the leak-offs from the turbine glands to the gland steam condenser since the lines are maintained at sub atmospheric pressure and to the spill over line to the main condenser from the HP Turbine Gland leak-offs.

TABLE NO. B-9

AF (AUXILIARY FEEDWATER) SUBSYSTEMS IDENTIFIED AND CATEGORIZED

SUBSYSTEM DESCRIPTION	CATEGORY	PARAMETERS		
		MATERIAL	TEMP °F	QUALITY CLASS
Auxiliary Feedwater Storage Tank to Aux. Feedwater Pumps	D	(WB3) SS	120	NSR
To the Check Valves & Class Break Outside R.C.B.	C(1)	(GA3) CS SA-106-GR B	120	NSR
To the Steam Generators	C(2)	(GA2) CS SA-106-GR B	600	NSR
Aux. Feedwater Recirc. Inside I.V.C. Building	C(1)	(GA3) CS SA-106-GR B	120	NSR NNSR
Outside I.V.C. Building to the AFST	D	(W09) SS	120	NNSR
Aux. Feed Pump Turbine Exhaust to Atmos.	C(3)	(WA3) CS	240	NSR
Cross Connect to FW System (Normally Closed)	C	(GA2) CS	275	NSR
Valve By-Pass Lines (NSR)	C	(GA2) CS	240	NSR
Vents & Drains (Small Bore)	D	CS or CrMoStl	ANY	NSR NNSR
AF Testing Recirc Line to the AF Pump Minflow Recirc.	C(1)	CS	120	NSR

NOTES:

1) Aux. Feedwater from the AF Pumps to the Check Valves & Class Break outside the R.C B. This piping is NSR and operates at 120°F for 2 basic functions; Start-Up and Back-Up plus once per month it is tested. During its normal operation the flow rate is 540 gpm, during testing it is up to 675 gpm. The corresponding velocities are calculated below.

The Recirc. piping for Pump Recirc. is routed through valves AF0011, AF0036, AF0058, and AF0091 into a 1-1/2" line to a 3" line and back to the AFST. The Recirc. routing for the test mode does not use the 1-1/2" lines - only the 3" is used. This is accomplished by a 3" takeoff downstream of the REF'S. valves. The corresponding velocities are calculated below. (Test Mode Flow Rate = 675GPM Recirc. FR-120GPM)

NOTES CONTINUED:

SUBSYSTEM DESCRIPTION	NOM. DIA. (IN)	AREA PER LINE (Ft^2)	SPECIFIC VOLUME (Ft^3/lmb)	BULK FLUID VEL (FT/SEC.) 540GPM	675GPM (Testing)
Aux. Feedwater Pumps to Check Valves & A.Bk.	4"	SCH 80 0.0799	@ 120°F 0.016204	15.22	19.0
AF Pump Recirc. & Testing Recirc.	1-1/2"	SCH 100 0.00976	@ 120°F 0.016204	120-150gpm 27.7-34.6	
	3"	SCH 80 0.0459	@ 120°F 0.016204	5.9	33.1

NOTES CONTINUED:

While all of the velocities are high the amount of time the subsystems are operated at these velocities and the actual time the subsystems are operated is very low. Therefore, based on the low operating time these subsystems can be placed in Category C.

(2) The subsystem from the check valves outside of the R.C.B. @ Class Break to the Steam Generators has a 600°F operating temperature. This high temp. is due to heat transfer from the SG during its normal operation (No flow in the AF Lines). When the AF system is in operation the fluid temperature would be 120°F with similar bulk fluid velocities to those shown above for 540GPM. Again this subsystem has little operating time and can therefore, be placed in Category C.

(3) The Aux. Feed Pump Turbine Exhaust is not in operation under normal plant operation at full load levels therefore, it can be placed in Category C.

TABLE NO. B-10

WL (LIQUID WASTE) SUBSYSTEMS IDENTIFIED AND CATEGORIZED

LINE NUMBER	CATEGORY	PRESSURE PSIG	TEMP. F	REASON
2.0WL1037WR7	D	60	220	Carpenter Stainless Steel ASTM B-464
1.50WL1038WR7	D	60	220	Carpenter Stainless Steel ASTM B-464
2.00	D			Carpenter Stainless Steel ASTM B-464
2.00WL1211XC7	C	60	286	Intermittent Operations
2.00WL1212WN7	C	75	267	Intermittent Operations
2.0WL1213WN7	D	60	286	To Drain (Normally Closed)
2.0WL1215WN7	C	60	286	Intermittent Operation
3.0	C			Closed Valve/Intermittent Operation
2.0WL1216WN7	C	60	286	Intermittent Operation
2.0WL1217WN7	D	60	286	To Drain (Normally Closed)
6.0WL1241XC7	D	65	419	Superheated Main Stm. or Aux. Stm. Supply
8.0	D	50	419	Line Not Continuous Use
.50WL1242XC7	D	50	300	Drip Leg to Stm. Trap & Drain
1.0	D			Drip Leg to Stm. Trap & Drain
.50WL1243XC7	D	50	330	Dripleg to Stm. Trap & Drain
1.0	D	50	330	Dripleg to Stm. Trap & Drain
6.0	C	50	330	
8.0	C	50	330	To LWPs Waste Evap. (Htg. Elem. 1A)
1.0WL1244RC7	D	110	419	Superheated Main Stm. or Aux. Stm. Supply
1.5	D	110	419	Lines Not Continuous Use.
6.0	D	235	419	
.75WL1245XC7	C	50	300	Intermittent Operation
2.0		50	300	
4.0		50	300	
6.0	D	50	300	
1.0WL1247XC7	C	165	270	
3.0WL1248XC7	C	65	270	Intermittent Operation
1.0WL1249XC7	C	50	270	Intermittent Operation
.75WL1250XC7	C	65	330	Intermittent Operation
2.0	C			Intermittent Operation

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TABLE NO. B-10 CONTINUED

LINE NUMBER	CATEGORY	PRESSURE PSIG	TEMP. F	REASON
1.0WL1254WR7(CSS)	D	20	220	Stainless Steel (Carpenter)
2.0WL1255WR(CSS)	D	65	220	Stainless Steel (Carpenter)
1.5WL1256WR7(CSS)	D	95	220	Stainless Steel (Carpenter)
1.5WL1260WR7(CSS)	D	20	220	Stainless Steel (Carpenter)
2.0	D	50	220	Stainless Steel (Carpenter)
0.5WL1270XC7	D	50	300	Drip Leg to Stm. Trap & Drain
1.0	D			Drip Leg to Stm. Trap & Drain
3.0	C			Stm. Supply to Gas Stripper 1A (Normally Closed)
1.0WL1272XC7	C	50	300	Normally Closed Valve
1.0WL1275WN7	C	5	270	Intermittent Operation
1.5	C			
4.0WL1284XC7	D	65	300	Vent Piping
6.0	D			Vent Piping
8.0	D			Vent Piping
1.0WL1305RC7	D	235	419	Superheated Steam from Aux. or Main Stm. Etm. Supply to Boric Acid Batching Tank (Normally Closed Valve)
2.0WL1313XC7	C	50	300	
0.5WL1318XC7	D	50	300	Drip Leg to Stm. Trap & Drain
1.0	D			Drip Leg to Stm. Trap & Drain
6.0	C			Supply Stm. to Htg. Elem. 1A Intermittent Operation
8.0	C			Supply Stm. to Htg. Elem. 1A Intermittent Operation
2.0WL1319XC7	D	50	300	Stm Trap Line Into
1.0WL1324WR7(CSS)	D	20	220	Carpenter Stainless Steel
1.0WL1586XC7	D	110	360	Vent

The lines listed in the chart are all over 180°F operating temp.

The remaining lines in the Liquid Waste Processing System are Category D by definition.

APPENDIX C

APPENDIX C

DEFINITION OF CATEGORY A THROUGH D

DEFINITION OF CATEGORY A THROUGH D

Category "A": Systems to be included in the Baseline Inspection Program.

a) Nuclear Safety Related (NSR) subsystems with carbon or Chrom-Moly steel pipe with water or wet steam flow, operating at or above 180°F regardless of flow velocity or below 180°F with bulk fluid velocities equal to or greater than 10 ft/sec. and which are in continuous operation at normal full power levels.

b) Non-Nuclear Safety Related (NNSR) subsystems with carbon or Chrom-Moly steel pipe with water or wet steam flow, operating at or above 180°F and which are in continuous operation at normal full power levels.

c) Any subsystem with pressure breakdown orifices and flow or pressures control valves which experience a phase change across the component regardless of material or safety class and which are continuously operated at normal full power levels.

Category "B": Subsystems with fluid conditions outside the velocity and temperature criteria of Category "A" will be excluded from the Baseline Inspection Program. These systems will only be incorporated into the inspection program should significant E/C degradation appear in related Category "A" subsystems.

Criteria for Inclusion:

a) Nuclear Safety Related subsystems with carbon or Chrom-Moly steel pipe with water or wet steam flow operating below 180°F with bulk fluid velocities less than 10 ft/sec. and which are continuously operated at normal full power levels.

b) NNSR subsystems with carbon or Chrom-Moly steel pipe with water or wet steam flow operating below 180°F and which are in continuous operation at normal full power levels.

Category "C": Subsystems meeting the requirements of Category A or Category B except for operating time. These subsystems will be reviewed periodically for changes to operating time history.

Criteria for Inclusion:

a) Subsystems which meet all the requirements of Category A or B except they are not in continuous operation at normal full power levels.

Category "D": Subsystems which are to be permanently excluded form the Erosion/Corrosion Inspection Program.

Criteria for Inclusion:

a) Flow is not water or wet steam.
b) Pipe materials other than carbon or Chrom-Moly steel.
c) Small bore subsystems leaks (e.g., vent lines, steam trays, drain lines, heating steam lines, etc.) would normally be detected by plant operating personnel conducting walkdowns during plant operation. Such leaking components will be identified to the Maintenance Department for corrective action.

SUMMARY TABLE NO. C - 1

CATEGORIES OF SUBSYSTEMS/CRITERION FOR INCLUSION E/C PROGRAM

SAFETY FUNCTIONS Criterion for Inclusion / Category Description	NUCLEAR SAFETY RELATED (NSR) Materials of Pipe	Content of Pipe	Operating Temp. of Content/ Fluid	Bulk Velocity of Fluid	Operating Conditions	Notes
Category A Subsystems to be included in the baseline inspection program.	Carbon or Chrome Moly Steel	Water or Wet Steam	Operating at or above 180 degrees Fahrenheit Operating at less than 180°F	N/A Greater than 10 ft/sec.	Continuous Operations at Normal Full Power Operation	Any subsystem with pressure breakdown orifices and flow or pressure control valves which experience a phase change across the component regardless of material or safety class and which are continuously operated at normal power levels.
Category B Systems to be excluded from baseline inspection program, however only to be included if significant E/C degradation appear in category "A" subsystems	Carbon or Chrome Moly Steel	Water or Wet Steam	Operating below 180°F	Less than 10 ft/sec	Continuous Operations at Normal Full Power Operation	
Category C Excluded from Baseline, however periodically to be reviewed for operating time history.	Carbon or Chrome Moly Steel	Water or Wet Steam	Operating at or above ambient Temperature	N/A	Continuously Not Operated Normal Full Power Operations	
Category D Permanently excluded from the E/C Inspection Program	Pipe Matl's Other than Carbon or Chrome Moly Steel	Flow is not Water or Wet Steam	N/A	N/A	N/A	

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SUMMARY TABLE C-2

CATEGORIES OF SUBSYSTEMS/CRITERION FOR INCLUSION E/C PROGRAM

SAFETY FUNCTIONS	NON-NUCLEAR SAFETY RELATED (NNSR)					
Criterion for Inclusion / Category Description	Materials of Pipe	Content of Pipe	Operating Temp. of Content/ Fluid	Bulk Velocity of Fluid	Operating Conditions	Notes
Category A Subsystems to be included in the baseline inspection program.	Carbon or Chrome Moly Steel	Water or Wet Steam	Operating at or above 180 degrees Fahrenheit	N/A	Continuous Operations at Normal Full Power Operation	Any subsystem with pressure breakdown orifices and flow or pressure control valves which experience a phase change across the component regardless of material or safety class and which are continuously operated at normal power levels.
Category B Systems to be excluded from baseline inspection program, however only to be included if significant E/C degradation appear in category "A" subsystems	Carbon or Chrome Moly Steel	Water or Wet Steam	Operating below 180°F	N/A	Continuous Operations at Normal Full Power Operation	
Category C Excluded from Baseline, however periodically to be reviewed for operating time history,	Carbon or Chrome Moly Steel	Water or Wet Steam	Operating at or above ambient Temperature	N/A	Continuously Not Operated Normal Full Power Operations	
Category D Permanently excluded from the E/C Inspection Program	Pipe Matl's Other than Carbon or Chrome Moly Steel	Flow is not Water or Wet Steam	N/A	N/A	N/A	

SUMMARY TABLE NO. C-3

ID	SYSTEM DESCRIPTION	PARAMETERS				INCLUSION EXCLUSION
		FLOW	MAT'L	TEMP.	CLASS	
AC	Closed Loop Auxiliary Cooling Water System	H_2O	CS	120°F	NNSR	EXCL.
AD	Acid Storage and Transfer System	ACID	CS	105°F	NNSR	EXCL.
AF	Auxiliary Feedwater	H_2O	CS CS	120°F 600°F	NSR NSR	Inclusion
AP	Post Accident Sampling System	H_2O	CS SS	130°F 626°F	NNSR NNSR	EXCL.
AS	Auxiliary Steam System and Boilers	H_2O	CS	419°F	NNSR	EXCL. SEE NOTE (1)
BA	Breathing Air System	H_2O AIR	(DRAIN)CS SS	80°F 80°F	NNSR	EXC.
BR	Boron Recycle System	H_2O	CS SS	130°F 200°F	NNSR	EXCL.
CA	Caustic Storage and Transfer System	SOLUTION	CS	120°F	NNSR	EXCL.
CC	Component cooling Water System	H_2O	CS	150°F	WA, CA, NSR	EXCL. SEE NOTE (2)
CD	Condensate System	H_2O	CS	378°F	NNSR	INCL.
CF	BOP Chemical Feed System	SOLUTION	SS	120°F	WD, GD, NNSR	EXCL.
CH	Chilled Water HVAC	H_2O	CS CS	110°F	WA, NSR NNSR	SEE NOTE (5) EXCL.
CM	Containment Hydrogen Monitoring	AIR	SS	120°F	UB NSR	EXCL.
CO	Gas Carbon Dioxide Storage Systems	CO_2	CS	110°F	WN, XX NNSR	EXCL.
CP	Condensate Polisher System	H_2O		180°F 120°F	XX XX, WY, WD, GDNNSR	EXCL.
CR	Condensate Spray System	NON H_2O	CS	310°F	NNSR	EXCL.
CS	Containment Spray System	H_2O	CS SS	262°F	PB, UB, UC, UD, NSR NSR	EXCL.
CT	Condensate Storage System	H_2O	CS	121°F	NNSR	EXCL.
CV	Chemical and volume Control System	H_2O	CS SS	100°F 570°F	NNSR NSR	EXCL.

SUMMARY TABLE NO. C-3 CONTINUED

ID	SYSTEM DESCRIPTION	PARAMETERS FLOW	MAT'L	TEMP.	CLASS	INCLUSION EXCLUSION
CW	Circulating Water System	H_2O	CU CSL	260°F 114°F	WY NNSR WL, WH (PCP)	EXCL.
DA	Standby Diesel Generator Miscellaneous Drains	OILY WASTE	CS	120°F	NNSR	EXCL.
DB	Diesel Generator (BOP)	AIR EXHAUST SEE REF. 3.4	CS CS	125°F 850°F	NNSR NNSR	EXCL.
DG	Standby Diesel Generator	OIL	CS	200°F	NNSR	EXCL.
DI DI	Combustion Air Intake Combustion Air Intake	AIR AIR	CS CS	70°F	NSR	EXCL.
DL	Diesel Generator Lighting	EXHAUST	CS	900°F	NNSR	EXCL.
DO	Standby Diesel Generator Fuel Oil	OIL	CS	100°F	NSR	EXCL.
DR	Nonradioactive Plumbing Drains and Sumps System	H_2O	CS	150°F	NSR	See Note (3) EXCL.
DW	Demineralized Water System (Makeup)	H_2O	CSL SS	70°F 110°F	NNSR NNSR	EXCL.
DX	Standby Diesel Generator Combustion Gas Exhaust	COMBUSTION EXHAUST	AS	850°F	NSR	EXCL.
ED	Radioactive Vents and Drain System	H_2O	SS SS	104°F 150°F	NSR NNSR	EXCL.
EP	Essential cooling Pond Makeup System	H_2O	CSL DI	115°F	NNSR	EXCL.
ES	Extraction Steam System	H_2O	CS	537°F	NNSR	Inclusion
EW	Essential Cooling Water System and ECW Screen Wash System	H_2O	SS ALB	123°F	NSR	See Note (4) EXCL.
FC	Spent Fuel Pool Cooling and Cleanup System	H_2O	SS	147°F	NSR	EXCL.

SUMMARY TABLE NO. C-3 CONTINUED

ID	SYSTEM DESCRIPTION	PARAMETERS				INCLUSION EXCLUSION
		FLOW	MAT'L	TEMP.	CLASS	
FO	Fuel Oil Storage and Transfer System	OIL	CS	$105^{\circ}F$	NNSR	EXCL.
FP	Fire Protection System	H_2O	GCS	$85^{\circ}F$	NNSR	EXCL.
FW	Feedwater System	H_2O	CS	$560^{\circ}F$	NSR	INCL.
GC	Stator Cooling Water System	H_2O	CS	$180^{\circ}F$	NNSR	EXCL.
GS	Turbine Gland Seal System	H_2O	CS	$469^{\circ}F$	NNSR	INCL.
HC	Containment Building HVAC	Air	CS	$120^{\circ}F$	NSR	EXCL.
HD	Heater Drip System	H_2O	CS	$562^{\circ}F$	NNSR	INCL.
HV	Heater Vent System	H_2O	CS	$448^{\circ}F$	NNSR	INCL.
HY	Gas, Hydrogen Storage System	H	CS	$110^{\circ}F$	NNSR	EXCL.
IA	Instrument Air System	Air	CS	$275^{\circ}F$	NNSR	EXCL.
IL	Containment Leak Rate Test System	Air	CS	$110^{\circ}F$	NSR	EXCL.
JW	Standby Diesel Jacket Water	H_2O	CS	$125^{\circ}F$	NSR	EXCL.
LM	Reservoir Makeup Pumping System	H_2O	FVC	$95^{\circ}F$	NNSR	EXCL.
LO	Lube Oil Purification Storage and Transfer System	Oil	CS	$160^{\circ}F$	NNSR	EXCL.
LP	Feed Pump Turbine Lube Oil System	Oil		$120^{\circ}F$	NNSR	EXCL.
LU	Standby Diesel Generator Lube Oil System	Oil	CS	$165^{\circ}F$	NSR	EXCL.
LW	Circ Water Pump Seal Water and Priming System	H_2O	CS CSL	$110^{\circ}F$ $95^{\circ}F$	NNSR NNSR	EXCL.

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SUMMARY TABLE NO. C-3 CONTINUED

ID	SYSTEM DESCRIPTION	PARAMETERS FLOW	MAT'L	TEMP.	CLASS	INCLUSION EXCLUSION
MC	Cooling Water Reservoir Spillway Gates and Blowdown Facilities	H_2O	PCP	95°F	NNSR	EXCL.
MD	Turbine Vents and Drain System	H_2O	CS	567°F	NNSR	INCL. (6)
MS	Main Steam System	H_2O	CS	567°F	NSR	INCL.
NC	Nonradioactive Chemical Waste System	Non H_2O	PVC/CS	105°F	NNSR	EXCL.
NH	Gas, Nitrogen High Pressure Supply System	Gas	XA	110°F	NNSR	EXCL.
NL	Gas, Nitrogen Storage System	Gas	CS	Des 150°F Oper AMB	NNSR	EXCL.
OC	Open Loop Auxiliary Cooling System	H_2O	CS	105°F	NNSR	EXCL.
OM	Lube Oil System	Oil	-	165°F	NNSR	EXCL.
OS	Chemical Feed System	Non H_2O	-	-	NNSR	EXCL.
OW	Oily Waste System	Oily	CS	110°F	NNSR	EXCL.
PO	Reactor Coolant Pump Oil Change-Out System	Oil	CS	140°F	NNSR	EXCL.
PS	Primary Sampling System	H_2O	SS	624°F	NSR	EXCL.
PW	Potable Water System	H_2O	Various	85°F	NNSR	EXCL.
RA	Radiation Monitoring System	Air	CS	140°F	NSR	EXCL.
RC	Reactor Coolant System	H_2O	SS	653°F	NSR	EXCL.
RD	Reactor Coolant System Degassing System	Gas	SS	150°F	NSR	EXCL.
RH	Residual Heat Removal System System	H_2O	SS	350°F	NSR	EXCL.
RK	RMPF Seal Water System	H_2O	CU	80°F	NNSR	EXCL.
RL	RMPF Screen Wash System	H_2O	CSL CU	95°F	NNSR	EXCL.

SUMMARY TABLE NO. C-3 CONTINUED

ID	SYSTEM DESCRIPTION	PARAMETERS FLOW	MAT'L	TEMP.	CLASS	INCLUSION EXCLUSION
RM	Reactor Makeup Water System	H_2O	SS	104°F	NSR	EXCL.
SA	Station Air System	Air	CS	275°F	NNSR	EXCL.
SB	Steam Generator Blowdown System	H_2O	CS	567°F	NSR	INCL.
SC	Circulating Water Screen Wash System	H_2O	CU CSL	95°F	NNSR	EXCL.
SD	Diesel Starting Air	Air	CS SS	120°F 120°F	NNSR NSR	EXCL.
SH	Sodium Hypochlorite System	Solution	ABS	110°F	NNSR	EXCL
SI	Safety Injection System	H_2O	SS	265°F	NSR	EXCL.
SL	Steam Generator Sludge Lancing and Chemical Cleaning System	H_2O	SS	250°F	NNSR	EXCL.
SS	Secondary Process Sampling System	H_2O	SS	120°F	NNSR	EXCL.
SW	Fresh Water Supply System	H_2O	PVC/CS	85°F	NNSR	EXCL.
TW	Service Water System	H_2O	Various	85°F	NNSR	EXCL.
VE	Radioactive Vent Header System	Gas	CS	130°F	NNSR	EXCL.
WG	Gaseous Waste Processing System	Gas	SS	130°F	NNSR	EXCL.
WL	Liquid Waste Processing System	H_2O	SS CS	200°F 419°F	NNSR NNSR	INCL.
WS	Solid Waste Processing System	Non H_2O	CSS CS	Design 120°F	NNSR	EXCL.
WW	Well Water Supply System	H_2O	CS	85°F	NNSR	EXCL.
XC	Containment Building/ Containment Air Lock	Air	CS	Design 120°F	NSR	EXCL.

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Notes To Table C-3

(1) AS (Auxiliary Steam System and Boilers)
This System has little operating time as it is used during Startup (when neither unit is operating) and for shut-down of one unit when main steam is not available from the other unit or during the shut down of both units. From the auxiliary deaerator to the auxiliary boiler the feedwater is at about 230°F (in the moderate range as temp. relates to wear rates). The discharge of the boiler is superheated steam which does not cause E/C degradation. Also, for the equipment which switches from AS to Main Steam or other sources during normal operation the piping downstream of the AS cut-in is covered under Main Steam or the Line Specification for the Normal Operating Source.

- o Based on the above considerations of operating time, moderate temperatures, superheated steam, and line spec. changes at downstream of AS cut-in. This system can be excluded from the E/C Inspection Program.

  Also note Main Steam Line 6" MS 1053 HC7 supplying 14" AS1002RC7 during normal operation receives main steam from the MS header. This steam passes through a pressure control valve making the steam superheated before entering the Auxiliary Steam System Piping.

(2) CC (Component Cooling Water System)

This system is treated with the corrosion inhibitor "Nulcool". Therefore this system maybe excluded from the E/C Inspection Program.

(3) DR (Nonradioactive Plumbing Drains and Sump System)

The majority of this system is non-safety related, stainless steel and <180°F which excludes it from the E/C Inspection program. However, there are six (6) line segments which are safety related carbon steel. The line list indicates that they all operate at a pressure of 5 psig. and 150°F (<180°F). The P&ID 6Q069F20005 Rev. 10 indicates that these drain lines are normally closed. Therefore based on the operating conditions and low intermittent use these lines can be excluded from the E/C Inspection Program.

(4) EW (Essential Cooling Water System and ECW Screen Wash System)

The material used in the nuclear safety related portions of this system are stainless steel and aluminum/bronze which are not effected by erosion/corrosion and can be excluded from the E/C Inspection Program.

(5) CH (Chilled Water System)

The water in this System is treated with a corrosion inhibitor as per the CH System Description.

(6) Turbine Vents and Drains Subsystem Categories (MD)

Most of the piping shown on P&ID's listed below (MD System) are small bore (<4"Ø) lines involved with draining condensate from steam lines to steam traps and discharging the condensate to the condenser. Also included in this piping are steam line drains without steam traps and the LWPS condensate return tank collection and discharge piping. All of these lines were put into Category D because the problems associated with the operation of the steam traps or associated condensate return scheme have a more significant impact on the degradation of the associated piping than the normal erosion/corrosion factors evaluated in the Baseline Inspection Program.

P&ID's for turbine vent and drains systems

a) 6T169 F00056 #1 Rev. 8 Extraction Steam Drains

b) 6T169 F00055 #2 Rev. 8 Main Steam Vents and Drains

c) 9T169 F00057 #2 Rev. 9 Turbine Drains

d) 6T169 F00072 #2 Rev. 8 Main Steam Vents and Drains

APPENDIX D

APPENDIX D

INSPECTION CRITERIA

INSPECTION POINT SELECTION

Single Phase Flow Piping

The primary factors of velocity, temperature, and geometry are used to assess the potential erosion/corrosion (E/C) problem areas in single phase flow piping systems. Other parameters which have an affect on E/C are the water chemistry and piping material composition. Water chemistry and pipe material composition have a significant affect on material loss, but the effect is uniform relative to other parameters throughout a system. However, for inspection point selection, water chemistry and pipe material composition are fixed and not controlled or varied by the plant thermal operating cycle and are not part of an individual point evaluation.

Inspection points are selected that represent the components with the highest potential for erosion/corrosion pipe wall thinning in each subsystem. Multiple inspection points are identified in systems or subsystems with higher potential for E/C and larger numbers of components, while systems with fewer numbers of components and lower potential for E/C are represented by a single inspection point. In lower E/C potential systems, components are also selected for inspection to provide data for each system or subsystem which is potentially susceptible to E/C. The results of these inspections will be reviewed for piping system condition and the overall plant reliability with respect to erosion/corrosion. The initial inspection program for single phase liquid systems at STPEGS has selected twenty-three (23) points to establish reasonable reliability and adequate representation of plant systems.

TWO PHASE FLOW PIPING

Two phase flow piping system inspection points are selected based on applying the empirical equation developed by Keller which related temperature velocity, moisture, system component geometries, and material to a wear rate. Water chemistry effects are not a direct factor in point selection for the same reasons discussed in the single phase write-up. The wear rate which results from applying Keller's equation is then used to determine a wear period for each component type. The Keller equation does not directly relate the effect of compound or multiple component configurations to erosion/corrosion wear rates. Factors for various component geometries and their effects of being close-coupled were developed by Technicon Enterprises Incorporated (TEI) and described in Table D-1. These factors are applied in a similar manner to that for single phase flow piping to establish a wear rate. The resulting wear rates are then applied to the material wear allowance to determine a wear period. Individual components within a system or subsystem are then rated based on this assessment. By placing the components in order from smaller to

larger values of wear period for each system, an inspection priority is established. Inspection points are selected that represent components with the shortest wear period within a system and consequently that represent components with highest potential for E/C degradation. Systems which have shorter wear periods and large numbers of components has received more inspection points while systems with fewer number of components and longer wear periods need only received a single point. The initial program for two phase flow systems STPEGS has selected fifteen (15) points for reasonable reliability and plant system representation. The results of the inspections will be reviewed for piping system condition and the overall plant reliability with respect to erosion/corrosion.

TABLE D-1

GEOMETRICAL EROSION/CORROSION FACTORS

TWO-PHASE FLOW

Component	Weighting Factors
Control Valve, Pressure Breakdown Orifice, Tee (Splitting)	1.0
Check Valve, Reducer, Tee (,)	0.8
Reducing and Short Radius Elbows, Expander	0.6
Long Radius Elbow, Butterfly Valve, Flow Element, Instrument Taps (3 Close Coupled)	0.4
90° Bends	0.3
Tee (, ,), Gate Valve, Welds in Straight Pipe, Reservoir Upstream	0.2
Nozzle	0.1

Notes:

(1) When the distance to upstream component is less than three diameters, add the upstream components' geometry factor to component being rated. Second upstream component is not considered.

(2) When the distance to upstream component is greater than three diameter but less than 10 diameter, add 1/2 of the upstream components' geometry factor to component being rated. Second upstream component is not considered.

(3) 45° lateral is rated at 1/2 90° tee, same for elbows.

(4) Any component with thermowells in it receives an additional 0.2 for the first thermowell and 0.1 for each additional thermowell.

TABLE D - 2

EROSION/CORROSION POINT SELECTION

COMPONENT DESCRIPTION AND TYPE	LINE NUMBER	ISOMETRIC DRAWING NUMBER	PIPE SIZE (IN)	WALL THICK-NESS (IN)	TEMP-ERAT-URE (F)	MATERIAL	TWO PHASE FLOW	SIN-GLE PHASE FLOW	COMPO-NENT DESCRIP-TION	WEAR PERIOD (HOURS)	REMARKS
ES-1009-05T	ES-1009-RC7	7G369PES828-02	10.750	0.365	378	A-106 GR.B	YES	---	TEE JOINT	4597	
ES-1010-02T	ES-1010-RC7	7G369PES828-02	10.750	0.365	378	A-106 GR.B	YES	---	TEE JOINT	6061	
ES-1010-03V	ES-1010-RC7	7G369PES828-02	20.000	0.593	378	A-106 GR.B	YES	---	VALVE	7207	
ES-1006-01T	ES-1006-RC7	7G369PES828-02	42.000	0.375	378	A-106G.WPB	YES	---	WELDOLET	7961	
ES-1008-02T	ES-1008-RC7	7G369PES828-02	28.000	0.750	378	A-234G.WPB	YES	---	WELDOLET	7961	
ES-1010-18E	ES-1010-RC7	7G369PES828-02	20.000	0.593	378	A-234G.WPB	YES	---	ELBOEW	8890	
ES-1009-01E	ES-1009-RC7	7G369PES828-02	20.000	0.593	378	A-234G.WPB	YES	---	ELBOW	11597	
ES-1009-15R	ES-1009-RC7	7G369PES828-02	20.000	0.593	378	A-234G.WPB	YES	---	REDUCER	11597	
ES-1006-03E	ES-1006-RC7	7G369PES828-02	20.000	0.593	378	A-234G.WPB	YES	---	ELBOW	13679	
ES-1010-19N	ES-1010-RC7	7G369PES828-02	24.000	0.687	378	A-234G.WPB	YES	---	NOZZLE	13679	
SB-1204-01V	SB-1204-SH7	5G369PSB668-05	3.500	0.438	358	B,C,M,C900	YES	---	FC-VALVE	11755	
SB-1404-01V	SB-1404-SH7	5G369PSB668-01	3.500	0.438	358	B,C,M,C900	YES	---	FC VALVE	11755	
SB-1104-02R	SB-1104-SH7	5G369PSB668-03	3.500	0.438	358	A234G.WP22	YES	---	REDUCER	13282	
SB-1304-02R	SB-1304-SH7	5G369 SB668-07	3.500	0.438	358	A234G.WP22	YES	---	REDUCER	13282	
SB-1117-05T	SB-1117-MC7	7G369PSB868-19	4.500	0.237	358	A-234G.WPB	---	YES	TEE	12900	
SB-1117-10T	SB-1117-MC7	7G369PSB868-19	6.625	0.280	358	A-234G.WPB	---	YES	TEE	35640	
SB-1117-04E	SB-1117-MC7	7G369PSB868-19	6.625	0.280	358	A-234G.WPB	---	YES	ELBOW	42770	
SB-111[illegible]-10R	SB-1118-MC7	7G369PSB868-14	[illegible].500	0.216	358	A-234G.WPB	---	YES	REDUCER	10000	
SB-111[illegible]-02E	SB-1118-MC7	7G369PSB868-14	6.625	0.280	358	A-234G.WPB	---	YES	ELBOW	42770	
HD-1175-02R	HD-1175-JC8	8G361PHD836-38	4.500	0.237	174	A-234G.WPB	---	YES	REDUCER	10000	
HD-1176-01N	HD-1176-JC8	8G361PHD836-38	4.500	0.237	174	A-234G.WPB	---	YES	NOZZLE	12500	
HD-1179-10T	HD-1179-JC8	8G361PHD836-38	8.625	0.406	174	A-234G.WPB	---	YES	TEE	15540	
HD-1178-01N	HD-1178-JC8	8G361PHD836-38	4.500	0.237	174	A-234G.WPB	---	YES	NOZZLE	12500	
CD-1020-05E	CD-1020-JC8	8G368PCD808-13	16.000	0.656	169	A-234G.WPB	---	YES	ELBOW	22640	
CD-1021-04T	CD-1021-JC8	8G369PCD808-13	8.625	0.406	169	A-234G.WPB	---	YES	TEE	11450	
CD-1026-04T	CD-1026-JC8	8G369PCD808-12	16.000	0.656	217	A-234G.WPB	---	YES	TEE	18750	
CD-1026-07T	CD-1026-JC8	8G369PCD808-12	16.000	0.656	217	A-234G.WPB	---	YES	TEE	18750	
CD-1153-02T	CD-1153-JC8	8G369PCD808-20	14.000	0.875	315	A-234G.WPB	---	YES	TEE	12830	
CD-1183-10V	CD-1183-JC8	8G369PCD808-20	2.375	0.154	315	A-234G.WPB	---	YES	VALVE	11900	
CD-1183-11R	CD-1183-JC8	8G369PCD808-26	2.375	0.154	315	A-234G.WPB	---	YES	REDUCER	10000	
FW-1001-05E	FW-1001-EC7	7G369PFW833-05	22.000	1.625	377	A-234G.WPB	---	YES	45-ELBOW	31040	
FW-1001-08R	FW-1001-EC7	7G369PFW833-05	20.000	1.500	377	A-234G.WPB	---	YES	REDUCER	10000	
FW-1001-09V	FW-1001-EC7	7G369PFW833-05	20.000	1.500	377	A-234G.WPB	---	YES	VALVE	28480	
FW-1004-16T	FW-1004-EC7	7G369PFW833-09	28.000	1.750	377	A-234G.WPB	---	YES	TEE	10000	
CD-1035-03T	CD-1035-JC8	8G369PCD808-21	14.000	0.594	375	A-234G.WPB	---	YES	TEE	11210	
CD-1036-04E	CD-1036-JC8	8G369PCD808-21	20.000	0.812	375	A-234G.WPB	---	YES	ELBOW	33333	
CD-1153-05S	CD-1153-JC8	8G369PCD808-20	30.000	0.875	315	A-234G.WPB	---	YES	OREFICE	20240	
GS-PV6168	GSPV6168TEE	WESTG.-4664D24	4.500	0.237	353	A-106GR.B	YES	---	TEE CONN.	30950	

APPENDIX E

APPENDIX E

I. EVALUATION CRITERIA

Ultrasonic Testing (UT) examination data should be evaluated in two parts. The first is a screening of the preliminary data by the Nondestructive Examination (NDE) engineering group and supplemented by an immediate engineering evaluation when required. The second part consists of engineering evaluation of the final data.

A. The Evaluation Criteria are presented as a logic diagram in Figure E-1.

The following is a list of Key Terms:

T_a = as measured component wall thickness, maximum and minimum inches

T_m = calculated code minimum required wall thickness, inches

$T_{acc\ n=t1}$ = the minimum required wall thickness for the component to remain in service for 1 fuel cycle or 2 years whichever is greater, inches.

$1.1\ T_N$ = 110% of the published nominal pipe wall thickness. Considered to be the maximum pipe wall thickness by tolerances imposed on the pipe diameter and weight.

EWR = Estimated Wear Rate, inches/year

ERL = Estimated Remaining Life, years

AWR = Actual Wear Rate, inches/year

ARL = Actual Remaining Life, years

Note: The methods used to calculate T_m and $T_{acc\ n=t1}$ are discussed in the section titled: Acceptance Value for Piping Component Wall Thickness.

II. SCREENING OF PRELIMINARY DATA BY NDE ENGINEERING GROUP

The purpose of preliminary screening is to identify components which have remaining wall thickness adequate for safe operation.

The following two criterion will be used as part of preliminary screening and will be performed by UT technicians.

A. Minimum T_a less than or equal to the minimum required wall thickness for component to remain in service for one fuel cycle <u>or</u> two years whichever is greater, inches.

Where minimum T_a is as measured (minimum) component wall thickness

Components that can not pass above screening criteria will be classified as Category 1 and will be turned over to responsible engineer for an immediate engineering evaluation.

B. Possible recommended corrective actions (Category 1). There will be two recommended actions available to engineers.

1. When Min. T_a less than or equal to T_m (Category 1a) immediate replacement of the component followed by a baseline inspection of the new installed component.

   a. Repair the component followed by:

      - o Reinspection next outage to schedule its replacement on future inspections

      - o Replacement next outage and a baseline inspection on newly installed component.

2. Greater of $T_{acc}^{n=t1}$ or 0.100 inches is greater than or equal to MIN T_a and MIN T_a greater than T_m (Category 1b)

   Calculate the remaining life for the component with following recommended actions.

   a. Immediate repair or replacement. Treat same as Category (1a).

   b. Schedule the component for replacement or reinspection based on the calculated remaining life.

All components in Category (1) must have secondary inspection points identified and inspected during current outage. The secondary inspection will be continued until no Category (1) components are found, or all components are inspected within the subsystem and related subsystems.

C. Criteria 2

Max $T_a \geq 1.1\ T_N$ (This category is applicable for the component's baseline inspection only)

Components that cannot pass above screening criteria will be classified as Category (2) and are turned over to the responsible engineer for Immediate Engineering Evaluation. In this evaluation the EWR and ERL are calculated based on the UT inspection data with consideration given to location of Max T_a and Min T_a within the component. The component must be placed into one of the following categories:

1. ERL $\leq$ Fuel Cycle or 2 years whichever is greater (Category 2a)

   This components will be treated same as those in Category (1b).

2. ERL > Fuel Cycle or 2 years whichever is greater (Category 2b).

   Components in this category need no further evaluation of the preliminary data.

   All components in category (2a) must have secondary inspection points identified and inspected current outage. The secondary inspections shall continue until no category (2a) components are found or all components are inspected within the subsystem or related subsystems.

III. ENGINEERING EVALUATION OF THE FINAL DATA

The purpose of this evaluation is to schedule each component, not dispositioned under categories (1a), (1b), or (2a), for future inspection or replacement based on the ERL or ARL calculated herein. Also, verification of the preliminary data used in the Immediate Engineering Evaluations will be performed subsequent to plant startup.

A. Following criteria will be used for scheduling component inspections based on the ERL or ARL:

1. ERL $\leq$ 3 Fuel Cycles or ARL $\leq$ 2 Fuel Cycles (Category 3a)

   Components in Category (3a) have the following two options at the next outage:

   a. Replace the component and baseline inspect the newly installed component

   b. Reinspect and schedule the component for replacement or future inspection based on the ARL.

2. ERL > 3 Fuel Cycles or ARL > 2 Fuel Cycles (Category 3b)

   Components in Category (3b) are scheduled for reinspection based on the criteria presented in the paragraph 5.3 titled: Inspection Frequency. This criteria is summarized below:

   YNI = Years to Next Inspection
   YNI = (ERL or ARL)-2 or (ERL or ARL)/2, whichever is smaller

All components in Category (3a) shall have secondary inspection points identified and inspected during the outage in which the replacement takes place.

IV. ACCEPTANCE VALUES FOR PIPING COMPONENT WALL THICKNESS

The pipe wall thickness acceptance values are determined by calculating the wall thickness required at the current inspection outage to allow the component to remain in operation for a given period of time before min. code wall thickness is jeopardized. The purpose for establishing a unique numerical acceptance value for piping component wall thickness is to allow the timely screening of preliminary inspection data. The screening process is outlined in the section (6.0) titled Evaluation Criteria.

A. BASELINE AND FIRST SUBSEQUENT INSPECITON

The general formula for the acceptable pipe wall thickness is as follows:

$T_a - nEWR \geq T_m$, where:

T_a = as found UT wall thickness measurement, in.
n = projected time to next outage in years
EWR = calculated yearly estimated wear rate
T_m = calculated code minimum required wall thickness, in.

EWR is calculated as follows:

$EWR = (1.1T_N - T_a)/y$
$1.1T_N$ = maximum nominal wall thickness (nominal wall + manufacturing tolerance)
y = actual operating time in years for each component

T_m is calculated as follows:

$T_m = P*D_o/(2*(SE + P*Y))$, where
P = internal design pressure, PSI gage
D_o = outside diameter of pipe, in.
SE = maximum allowable stress in material due to internal pressure and joint efficiency, at the design temperature, PSI
Y = a constant based on internal flow temperature for ferritic and authentic steels, unitless

Thus if the lowest actual measured component wall thickness minus the maximum wear expected in a remaining period of time of operation is greater than or equal to the code minimum required wall thickness, then the component meets the acceptance requirement.

LOGIC DIAGRAM FOR EROSION/CORROSION EVALUATION CRITERIA

FIGURE E - 1

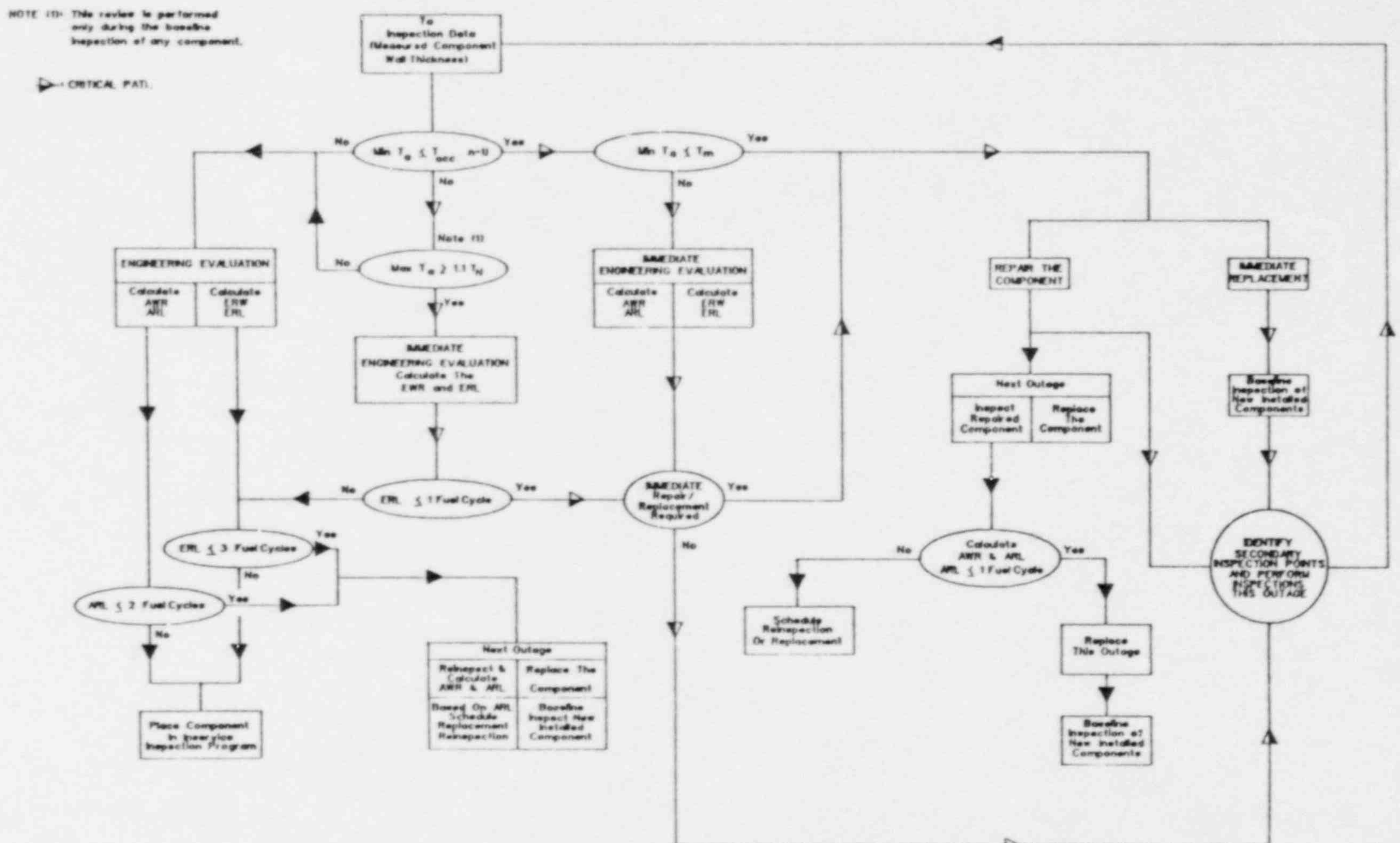

TABLE E - 1
EROSION/CORROSION EVALUATION CRITERIA
AND
RECOMMENDED ACTIONS (PRELIMINARY DATA)

SCREENING CRITERIA	COMPONENT CATEGORY	APPLICABLE NOTES	RECOMMENDED CORRECTIVE ACTION
MIN $T_a \leq T_m$	1a	1 & 3	a) Immediate Replacement of components followed by baseline inspection of newly installed component. b) Repair component followed by 1. Reinspection next outage to schedule its replacement as future inspections. 2. Replacement next outage and baseline inspection on newly installed component.
Greater of $T_{acc\ n-t1}$, or 0-100 inches $\geq$ MIN $T_a \geq T_m$	1b	1 & 3	Calculate the remaining life for components. 1) If remaining life less than greater of the 2 years estimated next fuel cycle life, treat same as Category 1a. 2) Schedule the component for replacement or reinspection based on the calculated remaining life.
MAX $T_a \geq 1.1\ T_N$ ERL $\leq$ 1 fuel cycle or 2 years whichever is greater.	2a	1,2 & 3	Treat components same as Category 1b.
MAX $T_a \geq 1.1\ T_N$ ERL $\geq$ 1 fuel cycle or 2 years whichever is greater.	2b	2 & 3	Need no further evaluations of preliminary data.

Notes:

1) All components in Category under review must have secondary inspection points identified and inspected during ongoing outage. The secondary inspection shall continue until no further components are found which can be classified as Category under review or all components are inspected within the system or related subsystems.

2) Category 2a and 2b are only applicable to components baseline inspections only.

3) All components which are not dispositioned under Categories 1a, 1b, or 2a for future inspection or replacement shall receive further engineering evaluation of the final data subsequent to plant startup.

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TABLE E-2

EROSION/CORROSION EVALUATION CRITERIA

AND

RECOMMENDED ACTIONS (FINAL DATA)

SCREENING CRITERIA	COMPONENT CATEGORY	APPLICABLE NOTES	RECOMMENDED CORRECTIVE ACTION AT NEXT OUTAGE
ERL ≤ 3 Fuel Cycles or ARL ≤ 2 Fuel Cycles	3a	1	Option 1: Replace the component and baseline inspect the newly installed component. Option 2: Reinspect and reschedule the component for replacements or future inspection based on the ARL.
ERL > 3 Fuel Cycles ARL > 2 Fuel Cycles	3b		Schedule for reinspection based on the calculated inspection frequency. YNI = (ERL or ARL) -2 or (ERL or ARL)/2 whichever is smaller. YNI - Years of next Inspection For Details see Section 9.3

Notes:

1) All components in Catagory 3a, option 1 shall have secondary inspection points identified and inspected during the outage in which the replacement takes place.