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I.3 MAIN STEAM LINE ROUTING AND RUPTURE EVALUATION

I.3.1 ROUTING DESCRIPTION

The Main Steam piping from Steam Generator No. 11 exits from the southwest quadrant of containment on the Mezzanine Floor whereupon it enters the stopcheck and check (isolation) valves and anchor block assembly. The pipe then rises to the Operating Floor where it turns northward and runs horizontally through the Auxiliary Building and into the Turbine Building. The Main Steam pipe from Steam Generator No. 12 exits from the northwest quadrant of containment on the Mezzanine Floor and rises vertically to the Operating Floor where the stop-check and check (isolation) valves and anchor block are located. Steam Line No. 12 then rises to elevation 747' where it turns northward and runs horizontally parallel to pipe No. 11, through the Auxiliary Building and into the Turbine Building.

The above routing is shown isometrically on Fig. I.3-1. This isometric also shows all branch connections to the 30" Main Steam headers as well as the entire run of the 20" equalizing line near the turbine.

I.3.2 DESIGN BASES BREAKS

Description of Break Locations

Potential design basis pipe break locations are as shown on the Main Steam Isometric, Fig. I.3-1, and as described below. The stresses for the main steam piping system, were calculated with the aid of a computer program using general flexibility and response spectra model analysis techniques. The combined stress values due to thermal expansion, pressure, weight, and seismic loading conditions have been computed.

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Description of Break Locations (Continued)

Postulated design basis break locations outside containment have been determined on the basis of calculated stress values and the criteria given in Section I.2.1 for Code Class 2 and 3 piping breaks. These consist of:

A. The terminal points of the main steam lines at the turbine stop valves in the Turbine Building and the anchor elbow inside containment.
B. Branch point connections in the main steam line for the atmospheric steam dump lines, the moisture separator and condenser steam dump lines, the auxiliary feedwater steam turbine lines, the equalizing line, and risers to safety valve and relief valve headers.
C. Two additional points having the highest calculated stress values in each main steam line, and the 20" equalizing line.

At no points do the calculated stress values exceed $0.8S_A$ or $0.8(S_h + S_A)$. The two intermediate large break locations have been selected on the basis of their having the highest calculated stress values.

Required Equipment

The equipment required for a design basis break in the main steam line is given in Table I.3-1. Operability of this equipment provides for reactor trip and the capability to maintain the reactor at hot shutdown after the break as well as ultimately achieving cold shutdown. Required equipment includes associated piping, cables and structures required for the equipment to perform its function.

The system of a steam line has been analyzed in Section 14.2.5 and provides the basis for generating Table I.3-1. The capability of the auxiliary feedwater system to provide adequate decay heat removal is discussed in Sections 6.6.3 and 14.1.10 and shown in Figures 14.1-46(a) and 14.1-46(c).

Protection from Potential Pipe-Whip Damage

Pipe rupture restraints will be provided, if required, in order to protect required equipment listed in Table I.3-1.

I.4 FEEDWATER ROUTING AND RUPTURE EVALUATION

I.4.1 ROUTING DESCRIPTION

The 16" discharge of each main feedwater pump is routed through a check valve, motor operated valve and feedwater heater before joining in the Turbine Building into a single 22" line. Before entering the Auxiliary Building, the Feedwater Line bifurcates into two 16" lines - one for each steam generator. The line to Steam Generator No. 11 enters the Auxiliary Building on the Operating Floor running in a southerly direction parallel to main steam line 11, before entering containment in the southwest quadrant. The line to Steam Generator No. 12 enters the Auxiliary Building on the Operating floor running in a southerly direction parallel to main steam line 12, before entering containment in the northwest quadrant. Each line is provided with a flow nozzle, control valve, motor operated isolation valve and anchor block before entering containment.

I.4.2 DESIGN BASIS BREAKS

Description of Break Locations

Postulated design basis pipe break locations are as shown on the Feedwater Isometric, Fig. I.4-1. These locations have been determined on the basis of calculated stress values based on the as-built system and the criteria given in Section I.2.1 for Code Class 2 and 3 piping breaks.

These consist of:

A. The terminal points which are located at the high pressure feedwater heaters, and the anchor elbow inside containment.

B. Branch point connections for the 4" feedwater control valve by-pass lines, and the feedwater heater by-pass lines.

C. Two additional points having the highest calculated stress values in the main feedwater lines to each steam generator.

At no point do the calculated stress values exceed $0.8 S_A$ or $0.8 (S_h + S_A)$, and that the two intermediate large break locations have

been selected on the basis of their having the highest calculated stress values. Some of these points correspond with branch point connections.

Required Equipment

The equipment needed for a design basis in the feedwater line is given in Table I.4-1. The loss of feedwater has been analyzed in Section 14.1.10 and provides the basis for generating Table I.4-1. Operability of this equipment provides for reactor trip and the capability to place and maintain reactor in a cold shutdown condition. Required equipment includes associated piping, cables and structures required for the equipment to perform its function.

Protection from Potential Pipe Whip Damage

Pipe Rupture restraints will be provided, where required, in order to protect required equipment listed in Table I.4-1.

Protection from Jet Impingement

Impingement barriers or guardpipes will be provided, where required, in order to protect the required equipment listed in Table I.4-1.

Protection from Adverse Environmental Conditions

Ventilation penetrations will be sealed or necessary to prevent the steam environmental from affecting required equipment located within the Control Room Air Conditioning Room, Control Room, Relay Room, Class I Area CRDM Room and Diesel Generator Rooms.

I.4.3 Design Basis Cracks

Description

The orientation and location of a design basis crack can be anywhere along the piping shown on the feedwater Isometric, Fig. I.4-1.

Required Equipment

The equipment required to place the reactor in a cold-shutdown condition is given in Table I.4-1. Required equipment includes associated piping, cabling and structures required for the equipment to perform it functions.

TABLE I.3-1

REQUIRED EQUIPMENT LIST FOR MAIN STEAM LINE BREAK

UNIT 1

COMPARTMENT LOCATION
FIGURE I.A-18

A. MECHANICAL EQUIPMENT

*Safety Injection Pumps 1A, 1B,(2A & 2B)	E
Auxiliary Feedwater Pumps 11, 12,(21 & 22)	TB
Diesel Cooling Water Pumps 12 &(22)	SH
Cooling Water Pump Strainers 11, 12,(21 & 22)	SH
Diesel Generators 11 & 12 With Auxiliaries	***
Control Room Ventilation System 121 & 122	***

B. VALVES

	VALVE	MCC
*32079 (32182) SIS Pump Suction From RWST	E	E
*32080 (32183) SIS Pump Suction From RWST	E	E
*32081 (32184) SIS Pump Suction From Boric Acid Tanks	E	E
*32082 (32185) SIS Pump Suction From Boric Acid Tanks	E	E
32025 (32030) AFWP 11 (22) Suction From Cooling Water	TB	TB
32027 (32026) AFWP 12 (21) Suction From Cooling Water	TB	TB
32264 (32265) AFWP 11 (22) Steam Supply	TB	TB
31059 (31060) AFWP 11 (22) Steam Supply Throttle Valve	TB	TB
32023 (32038) Steam Gen. 11 (21) Feedwater Isolation	X	E (X)
32024 (32029) Steam Gen. 12 (22) Feedwater Isolation	B	E (X)
31098 (31116) Main Stream Isolation Valve 11 (21)	Y	
31099 (31117) Main Steam Isolation Valve 12 (22)	B	
*31084 (31102) Atmospheric Relief Valve 11 (21)	Y	
*31089 (31107) Atmospheric Relief Valve 12 (22)	A	

C. ELECTRICAL COMPONENTS

The controls, power and protection for the mechanical equipment previously listed as well as:

Reactor Trip Breakers	B
Batteries 11, 12,(21 & 22)	TB
480 Volt Buses 110, 120,(210 & 220)	B
4160 Volt Buses 15, 16,(25 & 26)	TB

( ) Unit 2

TB - Turbine Bldg.

SH - Screen House

(X) - RELOCATED

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D. INSTRUMENTATION	Location
Steam Generator 11 (21) Pressure PT-468, 469 & 482	Y
Steam Generator 12 (22) Pressure PT-478, 479 & 483	C
Steam Generator 11 (21) Level LT-461, 462 & 463	***
Steam Generator 12 (22) Level LT-471, 742 & 473	***
*Boric Acid Tank 11 (12) Level LT-106, 172 & 190 **	***
*Boric Acid Tank 121 Level LT-102, 171 & 189 **	***

E. VENTILATION DAMPERS (CONTROL ROOM)	
34177 (34176) Outside Air Inlet	***
34145 (34142) Outside Air Inlet to Air Conditioner	***
34144 (34143) Air Conditioner Outlet	***
34180 (34178) Outside Air Inlet to PAC Filter	***
34181 (34179) Recirculation inlet to PAC Filter	***
34183 (34182) PAC Filter Outlet	***

Notes:

* These items are not required to function immediately, due to a design basis crack, but will be used during subsequent operation to achieve a cold shutdown condition.

** A fourth level channel will be provided for each boric acid storage tank; however, only one channel will be required for indication to achieve cold shutdown.

*** Outside these compartment

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TABLE I.4-1

REQUIRED EQUIPMENT FOR FEEDWATER LINE BREAK

UNIT 1
COMPARTMENT LOCATION
FIGURE I.A-18

A. MECHANICAL EQUIPMENT

*Safety Injection Pumps 1A, 1B,(2A & 2B)	E
Auxiliary Feedwater Pumps 11, 12,(21 & 22)	TB
Diesel Cooling Water Pumps 12 &(22)	SH
Cooling Water Pump Strainers 11, 12,(21 & 22)	SH
Diesel Genrators 11 & 12 With Auxiliaries	***
Control Room Ventilation System 121 & 122	***

B. VALVES

	VALVE	MEL
*32079 (32182) SIS Pump Suction From RWST	E	E
*32080 (32183) SIS Pump Suction From RWST	E	E
*32081 (32184) SIS Pump Suction From Boric Acid Tanks	E	E
*32082 (32185) SIS Pump Suction From Boric Acid Tanks	E	E
32025 (32030) AFWP 11 (22) Suction From Cooling Water	TB	TB
32027 (32026) AFWP 12 (21) Suction From Cooling Water	TB	TB
32264 (32265) AFWP 11 (22) Steam Supply	TB	TB
31059 (31060) AFWP 11 (22) Steam Supply Throttle Valve	TB	TB
32023 (32038) Steam Gen. 11 (21) Feedwater Isolation	Y	E(X)
32024 (32029) Steam Gen. 12 (22) Feedwater Isolation	B	E(X)
31098 (31116) Main Stream Isolation Valve 11 (21)	Y	
31099 (31117) Main Steam Isolation Valve 12 (22)	B	
*31084 (31102) Atmospheric Relief Valve 11 (21)	Y	
*31089 (31107) Atmospheric Relief Valve 12 (22)	A	
*31231 (31233) Pressurizer Relief Valve	***	
*31232 (31234) Pressurizer Relief Valve	***	

C. ELECTRICAL COMPONENTS

The controls, power and protection for the mechanical equipment previously listed as well as:

Reactor Trip Breakers	B
Batteries 11, 12,(21 & 22)	TB
480 Volt Buses 110, 120,(210 & 220)	B
4160 Volt Buses 15, 16,(25 & 26)	TB

( ) UNIT #2
TB - Turbine Building
SH - Screen House
(X)- Relocated

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D. INSTRUMENTATION	LOCATION
Steam Generator 11 (21) Pressure PT-468, 469 & 482	*
Steam Generator 12 (22) Pressure PT-478, 479 & 483	C
Steam Generator 11 (21) Level LT-461, 462 & 463	***
Steam Generator 12 (22) Level LT-471, 742,& 473	***
*Boric Acid Tank 11 (12) Level LT-106, 172 & 190 **	***
*Boric Acid Tank 121 Level LT-102, 171 & 189 **.	***
Steam Generator 11 (21) Steam Flow FT-464 & 465	***
Steam Generator 12 (22) Steam Flow FT-474 & 475	***
Steam Generator 11 (21) Feedwater Flow FT-466 & 467	B
Steam Generator 12 (22) Feedwater Flow FT-476 & 477	B
*Pressurizer Level LT-426, 427 & 428	***
*Pressurizer Pressure PT-429, 430 & 431	***

E. VENTILATION DAMPERS (CONTROL ROOM)	
34177 (34176) Outside Air Inlet	***
34145 (34142) Outside Air Inlet to Air Conditioner	***
34144 (34143) Air Conditioner Outlet	***
34180 (34178) Outside Air Inlet to PAC Filter	***
34181 (34179) Recirculation inlet to PAC Filter	***
34183 (34182) PAC Filter outlet	***

Notes:

* These items are not required to function immediately, due to design basis events, but will be used during subsequent operation to achieve a cold shutdown condition.

** A fourth level channel will be provided for each boric acid storage tank, however, only one channel will be required for indication to achieve cold shutdown.

*** Outside these compartments.