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RECIP.NAME RECIPIENT AFFILIATION
RUBENSTEIN,L. Division of Project Management

SUBJECT: Forwards responses to round one,set six questions from Plant Systems & Power Systems Branches.Responses to open items from previous question sets encl. 566 RPT

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	AD PLANT SYS	1	0	AD REAC SAFETY	1	0
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	OELD	1	0			
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	30 ACRS	10	10			

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Washington Public Power Supply System
A JOINT OPERATING AGENCY

P. O. Box 968 3000 Geo. Washington Way Richland, Washington 99352 Phone (509) 375-5000

August 14, 1979
G02-79-144

Docket No. 50-397

Director, Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Mr. L. Rubenstein, Chief
Branch No. 4
Division of Project Management

Subject: WPPSS NUCLEAR PROJECT NO. 2
RESPONSES TO ROUND ONE QUESTIONS,
SET FIVE - PLANT SYSTEMS, PSB

Reference: Letter, S. A. Varga (NRC) to N. Strand (WPPSS), "First Round Questions on the WNP-2 OL Application - Plant Systems, PSB, AB, SEB, OLB," dated March 16, 1979.

Dear Mr. Rubenstein:

Attached please find sixty (60) copies of the responses to round one, set six questions from the Plant Systems and Power Systems Branches. Also included are a number of responses to open items from previous question sets.

Very truly yours,

DL Renberger

D. L. RENBERGER
Assistant Director
Technology

DLR:SAG:sg

Attachment: Responses to Round One Questions (60)

cc: I. Littman - WPPSS, NY - wo/att
JJ Verderber - B&R, NY - "
JJ Byrnes - B&R, NY "
RC Root - B&R, Site "
HR Canter - B&R, NY "
C. Bryant - BPA "
E. Chang - GE, San Jose w/att (4)
J. Ellwanger - B&R, NY w/att (4)
FA Maclean - GE, San Jose w/att (1)
NS Reynolds - Debevoise & Liberman w/att (1)
ND Lewis - w/att (1)
WNP-2 Files - w/att (1)

B001 SE 1/60

Responses to Round One Questions
Set Five - Plant Systems, PSB

STATE OF WASHINGTON)
) ss
COUNTY OF BENTON   )

D. L. RENBERGER, Being first duly sworn, deposes and says: That he is the Assistant Director, Technology, for the WASHINGTON PUBLIC POWER SUPPLY SYSTEM, the applicant herein; that he is authorized to submit the foregoing on behalf of said applicant; that he has read the foregoing and knows the contents thereof; and believes the same to be true to the best of his knowledge.

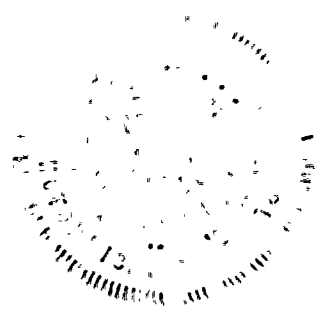
DATED August 10, 1979

D L Renberger
D. L. RENBERGER

On this day personally appeared before me D. L. RENBERGER to me known to be the individual who executed the foregoing instrument and acknowledged that he signed the same as his free act and deed for the uses and purposes therein mentioned.

GIVEN under my hand and seal this 10th day of August, 1979.

Reba B. Helgeson
Notary Public in and for the State of Washington
Residing at Richland



Washington Public Power Supply System
A JOINT OPERATING AGENCY

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Responses to Round One Questions
Set Five - Plant Systems, PSB

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) ss
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DATED August 11, 1979

D. L. Renberger

D. L. RENBERGER

On this day personally appeared before me D. L. RENBERGER to me known to be the individual who executed the foregoing instrument and acknowledged that he signed the same as his free act and deed for the uses and purposes therein mentioned.

GIVEN under my hand and seal this 10th day of August, 1979.

Reba B. Helgerson

Notary Public in and for the State of Washington
Residing at Richland

WNP-2

Round One, Set Six

Plant Systems Branch

005.1

Q. 005.1

In order that we might evaluate your compliance with the Codes and Standards Rule, Section 50.55A of 10CFR Part 50, identify the edition Section III of the ASME Boiler and Pressure Vessel Code and the applicable code addenda for the following Quality Group A components within the reactor coolant pressure boundary identified in Table 3.2-1 of the FSAR. These components are: (1) the reactor pressure vessel; (2) the main steam and feedwater piping inboard of the outermost isolation valves; (3) the piping of other interconnecting systems inboard of the outermost isolation valves; (4) the main steam isolation valves; (5) the explosive valves of the standby liquid control systems; and (6) the system or isolation valves of other interconnecting systems.

Response:

Please see the attached Table 5.1-1.

Table 5.1-1

Requested Item Per Question	WNP-2 Installation	Applicable Code Per 10CFR 50.55(a)*	Purchase Order Date	Actual Code Used
1) Reactor Pressure Vessel	N/A	1971 code, no addenda	11/71	1971 code, summer '71 addenda (para. NB 3338.2 is Winter '71 addenda)
2) Main Steam & Feed-water Piping	Shop Fabricated	1971 code, Winter '73 addenda	10/74	1971 code, Winter '73 addenda
	Field Fabricated	1971 code, Summer '73 addenda	5/74	1971 code, Winter '73 addenda
	Main Steam	1971 code, Winter '71 addenda	9/72	1971 code, Summer '72 addenda
3) Piping of Inter-connecting Systems	Shop Fabricated	Same as (2)		
	Field Fabricated	Same as (2)		
	Recirc System Piping**			
4) MSIV's	N/A	1971 code, Summer '71 addenda	4/71	1971 code, Winter '71 addenda
5) SLCS Explosive Valves	N/A	1971 code, Winter '72 addenda	12/73	1971 code, Winter '72 addenda
6) Other Valves of Interconnecting Systems	Velan Valves I	1971 code, Summer '73 addenda	1/74	1971 code, Winter '73 addenda
	Anchor Darling Valves	1971 code, Winter '72 addenda	7/73	1971 code, Winter '73 addenda
	Velan Valves II	1971 code, Summer '72 addenda	1/73	1971 code, Winter '72 addenda
	Borg - Warner Valves	1971 code, Summer '73	5/74	1971 code, Winter '73 addenda
	Recirc and Crosby Valves**			

* CP issued 3/73
** See Table 5.2-5 of the FSAR

Round One, Set Six

Power Systems Branch

40.34 - 40.74

Q. 40.34

Provide a list of the following items, by voltage class, for the electrical penetrations in the containment: 1) the I^2t rating; 2) the maximum predicted fault currents; 3) an identification of the maximizing faults; 4) the protective equipment setpoints; and 5) the expected clearing times.

Response:

Please see the attachment for information requested. The information in the table indicates that no single fault will cause a loss of penetration seal integrity due to excessive heating. The I^2t of the maximum expected fault, is in every case, less than the I^2t rating of the penetration.

PENETRATION NUMBER	TYPE	CABLE SIZE (NOTE 4)	I^2T RATING	MAXIMUM FAULT (AMPS)	Maximizing FAULT	PROTECTIVE EQUIP: SET POINT (AMPS)	TYPE	CLEARING TIME (SECONDS
X-103 A-D	MV (6.9KV)	1000 MCM	6.8×10^8	56,206	NOTE 1	1000	BRKP	.1333
X-104 "	LV (480V)	# 1/o AWG	3.9×10^7	17,340	NOTE 2	60	FUSE	.01
" "	" "	#4 AWG	1.2×10^7	12,060	NOTE 2	30	FUSE	.01
" "	" "	#10 AWG	8.4×10^5	5,267	NOTE 2	15	FUSE	.01
X-105 "	Control & Ind.	#14 AWG	1.2×10^5	356	NOTE 3	20	FUSE	.5
X-107 A,B	LV (480V)& Control	#10 AWG	8.4×10^5	5,267	NOTE 2	15	FUSE	.01
" "	" "	#14 AWG	1.2×10^5	62.5	NOTE 4	10	FUSE	6.0
" "	" "	#16 AWG	N.A.	Neg.*	N.A.	N.A.	N.A.	N.A.
X-100 A-D	Neutron Monit.	Inst. Cables	N.A.	Neg.*	N.A.	N.A.	N.A.	N.A.
X-101 A-D	Control Rod Posit.	Inst. Cables	N.A.	Neg.*	N.A.	N.A.	N.A.	N.A.
X-102 A,B	T/C & RTD	Inst. Cables	N.A.	Neg.*	N.A.	N.A.	N.A.	N.A.

*Negligible

Notes:

1. Maximum momentary fault current available at 6.9KV switchgear bases serving power cables passing through penetrations is assumed to be available at the penetrations themselves.

2. The maximum fault current at any 480V motor control center was assumed to be available at the closest motor control center feeding through the penetrations, the cable impedance from the motor control center to the penetration was considered.

3. Fault value for cables AP7AE - 9021,3,4,5 feeding motor space heaters from power panel PP-7A-E.

4. Maximum momentary fault current available at motor control center control transformer secondaries serving control cables passing through penetrations is assumed to be available at the penetrations themselves.

Q. 40.35

Your description in Appendix C of the FSAR regarding the conformance of the electrical penetrations in the containment of the WNP-2 facility with the staff's positions in Regulatory Guide 1.63, Revision 2, "Electrical Penetration Assemblies in Containment Structures for Light-Water-Cooled Nuclear Power Plants," July 1978, does not provide sufficient information to allow an independent evaluation of your design. Demonstrate in detail how your design of hese electrical penetrations is in compliance with the requirements of IEEE Standard 279-71.

Response:

WNP-2 design is in compliance with Regulatory Guide 1.63, Revision 0, Position 1. Protective devices for all cables entering penetrations are backed up by similar devices which would clear cable faults in the event a short circuit fault develops and the primary protective device fails to open.

To illustrate this point, assume a feeder failure in the Reactor Recirculation Pump RRC-P-1A feeder where the feeder breaker (RRA) failed to open. In this case, the switchgear bus protective devices will sense the fault and will trip the main bus breaker (N2-5 or S-5). Cable faults inside the penetration would not remain uncleared.

040.36 RSP In addition to the undervoltage scheme currently provided to detect a loss of offsite power at the safety busses, we require the WNP-2 facility to have a second level of voltage protection, including a time delay, to protect the onsite power system from any adverse effects that could result from a sustained degraded voltage condition in the offsite power system. The design criteria for this second level of voltage protection are:

a. The selection of the voltage and time set points shall be determined by an analysis of the voltage requirements of the safety-related loads at all onsite system distribution levels.

b. The voltage protection shall incorporate coincidence logic to preclude spurious trips of the offsite power source.

c. The time delay which is selected shall be based on the following considerations: (1) the allowable time delay, including a conservative margin, shall not exceed the maximum time delay that is assumed in the appropriate accident analyses in Section 15 of the FSAR; (2) the time delay shall minimize the effect of short duration disturbances which might reduce the availability of the offsite power source(s); and (3) the allowable time duration of a degraded voltage condition at all distribution system levels shall not result in failure of safety-related systems or components.

d. The voltage sensors shall automatically initiate the disconnection of offsite power sources whenever the voltage set point and time delay limits have been exceeded.

e. The voltage sensors shall be designed to satisfy the following requirements: (1) the equipment will be Class IE and will be physically located at, and electrically connected to, the emergency switchgear; (2) independent undervoltage protection will be provided for each division of emergency power; (3) the equipment will have the capability to be tested and calibrated during power operation; and (4) annunciation must be provided in the control room for any bypasses incorporated into the design.

f. The Technical Specifications for the WNP-2 facility, will include: (1) the limiting conditions for operation; (2) the surveillance requirements; (3) the trip set points, including their minimum and maximum limits; and (4) the allowable values of voltage and time delay for the second level voltage protection sensors and its associated time delay devices (i.e., the delayed trip).

Response to 40.36:

A second level of undervoltage protection for the onsite power system is in the design process. The criteria listed in the question are being used as the design basis. The description of the undervoltage protection scheme in section 8.3.1.1.1, page 8.3-4 will be revised accordingly.

Q. 040.37
RSP
(040.02)

We require that the load-shedding function of the diesel-generator bus automatically prevent load shedding of the emergency bus due to a degraded voltage once the diesel-generator is supplying power to the emergency bus. Moreover, the design shall also include the capability of the load shedding function described above to be automatically reinstated if the diesel-generator supply breaker is tripped. Your proposed design of the load-shedding function of the diesel-generator bus is not clear from your response to Item 040.02 since your response merely references Sections 8.3.1.1.1, 8.3.1.1.8.1.7 and 8.3.1.1.8.1.7 and 8.3.1.1.8.2.7. Our review of these sections indicates that your answer is not responsive to the question. Accordingly, provide the details of your design and state your intent to comply with our position on this matter. Alternatively, provide justification for any exceptions taken to our position.

We further require that the Technical Specification for the WNP-2 facility include a test requirement to demonstrate, during shutdown, the full functional operability of the bypass and reinstatement feature at least once in an 18 month period. Proper operation shall be determined by verifying that after an interruption of the onsite power supply, the loads are shed from the emergency busses in accordance with the design requirements and that subsequent loading of the onsite sources is through the load sequencer.

Response:

The load shedding function of the diesel-generator bus will prevent load shedding of the emergency bus due to the undervoltage relay settings. Maximum voltage dip projected to occur on the emergency busses as a result of motor starting when the diesel generator is supplying the bus is 81.9% of nominal bus voltage. Since the Class 1E bus undervoltage relays are set at 69% of nominal bus voltage, reinstitution of load shedding as a result of voltage dip due to motor starting will not occur.

Technical Specifications for the WNP-2 facility will include a test requirement to verify that upon interruption of onsite power the loads are shed from the emergency busses and the loading of the onsite sources is through the load sequencer. The test frequency is during shutdown at least once in an 18 month period. The Technical Specifications will be submitted for review approximately one year before fuel load.

Q. 40.38

It is our position that the voltage levels at the safety-related busses be optimized for both the full bus load and the minimum bus load conditions that are expected throughout the anticipated range of voltage variations of the offsite power source. This optimization is to be achieved by an appropriate adjustment of the voltage tap settings of the intervening transformers. Accordingly, we require that you verify the adequacy of this design feature by actual measurements. Provide a description of your test procedure for making this verification. Indicate how the results of this verification program will be compared with the voltages discussed in Section 8.3.1.2.4 of the FSAR. (This Section was added in response to Item 040.01 of our request for additional information.)

Response:

Due to inherent limitations on varying offsite grid voltage it is not possible to verify the adequacy of this design feature by actual measurements. During the Loss of Power and Safety Testing preoperational test, voltage data will be taken which will verify system performance as designed. See revised FSAR section 14.2.12.1.37 which describes this test.*

*Draft FSAR page changes attached.

14.2.12.1.37 Loss of Power and Safety Testing Preoperational Test

a. Purpose

To verify the operation of the 230/115KV, 6.9KV, 4.16KV and 480V distribution systems.

To verify the integrated ability of the plant electrical distribution and safety systems to operate on normal and standby power sources during accident conditions.

To verify that loss of a single AC or DC distribution system division (exclusive of the HPCS diesel-generator and batteries) will not prevent the remaining systems from actuating during an accident condition.

b. Prerequisites

The System Lineup Tests have been completed and the procedure has been reviewed by TWG and approved by the Startup and Operations Manager. Initiation of testing has been approved by Startup and Operations Manager. The 125V DC system and the ECCS are available to support testing.

c. General Test Methods and Acceptance Criteria

Verification of the 230/115 KV, 6.9KV, 4.16KV and 480V distribution system operatibility shall be demonstrated by the following:

(1) Demonstration of circuit integrity and integrated operation of circuit breakers, controls and interlocks, instrumentation, automatic transfer features and protective devices and alarms.

(2) Demonstration of proper system response to a loss of the 230 KV and 115KV distribution systems independently and simultaneously both with and without LOCA/Containment Isolation signals.

(3) Demonstration of proper system response to a loss of the 230/115KV distribution systems and on individual standby Diesel-Generators during an ECCS/Containment Isolation actuation.

Signals for these tests shall be simulated from the actual initiating devices when this is practical.

Q. 40.39

Provide a description of the physical arrangement which connects the field cables inside containment to the containment penetrations (e.g., connectors, splices, or terminal blocks). Indicate how you will provide assurance that these physical interfaces are qualified to withstand a postulated loss-of-coolant accident (LOCA) or the environment resulting from a postulated steam line break.

Response:

Attached for your information is a copy of the electrical penetration data sheets which describe the physical arrangement used to connect the field cables inside containment to the containment penetrations.

Assurance that these physical interfaces are qualified to withstand postulated loss-of-coolant or steam line break accident environments is through required prototype testing of each penetration type with the required load or signal applied using the connector type to be furnished and installed with the penetration.

TABLE 1

ELECTRICAL PENETRATION ASSEMBLY DATA SHEET

PENETRATION			CONDUCTORS PER PENETRATION					TERMINATIONS		
Type NO.	(Tag no) Service	Qty.	Size	Voltage	Ampacity (Continuous) (8)	Description	Qty	Length	Type	Box
1	NEUTRON	4	75-OHM 7 STR #26 AWG	3000	---	Triaxial (1)	3	As Req.	Bulkhead Mounted Connector	Yes
	MONITORING		135-OHM 7 STR #34 AWG	2000	---	Triaxial (1a)	4	As Req.	Bulkhead Mounted Connector	
	(X-100A, B, C, D)		#18 AWG	1000	---	SIS 90°C	143	3 ft.	Crimp Splices	
2	CONTROL ROD	4	#18 AWG	600	---	SIS 90°C	750	As Req.	Box Mounted Connector (note 2)	Yes
	POSITION IND		#18 AWG	600	---	Chromel	55	As Req.	Box Mounted Connector (note 2)	
	(X-101A, B,C,D)		#18 AWG.	600	---	Alumel	55	As Req.	Box Mounted Connector (note 2)	
3	THERMOCOUPLE	2	#18 AWG	600	---	Copper (3)	448	3 ft.	Pigtail with	Yes
	AND RTD		#18 AWG	600	---	Constantan (3)	224	3 ft.	Parallel Crimp	
	(X-102A, 102B)		#16 AWG	600	---	Copper (4)	228	3 ft.	Connector	
4	CONTROL AND	4		600	10 AMP	SIS 90°C	20	As Req.	Terminal Block	Yes
	INDICATION		#14 (min)	600	5 AMP	SIS 90°C	450	As Req.	Terminal Block	
	(X-105A,B,C,D)		#14 (min)	600	5 AMP	SIS 90°C (6)	26	As Req.	Terminal Block	
5	LOW VOLTAGE	4	#1/0 (min)	600	80 AMP	SIS 90°C	10	4 ft.	Pigtail With Crimp Splice	Yes
	POWER xc		#4 (min)	600	45 AMP	SIS 90°C	26	4 ft.	↓	
	(X-104A,B,C,D)		#10 (min)	600	20 AMP	SIS 90°C	150	As Req.	Terminal Block	
			2/c #18 AWG	600	---	Copper Constantan (5)	2	3 ft.	Pigtail on Outboard End Only	
6	MEDIUM VOLTAGE	4	(See Note 7)	8000	700 AMP	Shielded	3	4 ft.	Pigtail With Compress. Type Lug	Yes
	POWER		250 MCM	600	---	SIS 90°C	1	4 ft.	↓	
	(X-103A,B,C,D)		2/c #18 AWG	600	---	Copper Constantan (5)	2	3 ft.	Pigtail on Outboard End Only	

Rev. 1. 8/14/75

TABLE 1 (CONT.)

ELECTRICAL PENETRATIONS ASSEMBLY DATA SHEET

PENETRATION			CONDUCTORS FOR PENETRATION					TERMINATIONS		
Type No.	(Tag No.) Service	Qty.	Size	Voltage	Ampacity Continuous (A)	Description	Qty.	Length	Type	Box
7	LOW VOLTAGE POWER, CONTROL & INDICATION (X-107 A,B)	2	#10 AWG (Min	1000	15 AMP	SIS 90°C	85	As Req.	Terminal Block	Yes
			#14 AWG (Min	600	5 AMP	SIS 90°C	170	As Req.	Terminal Block	
		*	2/c #16 AWG Shielded	600	----	Copper-Constanton	30	4 Ft.	Pigtail With Parellel Crimp Connector	
			2/c #16 AWG Shielded	600	----	Twisted Pair Copper	25	4 Ft.		
	Replacement Module P For Type 7 Penetration (X-107A,B)	2 *	#16AWG (Min) Shielded	600V	----	Copper-Constanton Twisted Pair	40	4 Ft.	Pigtail With Parellel Crimp Connector	Yes
			#16AWG (Min) Shielded	600V	----	Copper Twisted Pair	15	4 Ft.		

* Contractor to provide two new modules "P", others to replace existing modules with the new ones.

Note: Two groups of 8-TSP Copper-Constantan Conductors shall be formed and each group enclosed in a copper braid with an overall jacket covering.

3

Rev. 3, 9-15-76

C.O.#6

NOTES FOR TABLE 1

(1) Raychem No. 10496 or functional equivalent.

(1a) Raychem No. 10495 or functional equivalent.

(2) On the inboard or drywell side of the penetration the wires shall be connected to 13 conductor connectors, each connector shall have 11 #18 AWG copper wires, one #18 chromel and one #18 alumel wire.

On the outboard or reactor building side of the penetration, each group of 11 #18 AWG wires shall be connected to a 13 conductor connector. All connectors shall be mounted on the side of termination box which shall have removable covers so that the penetration assembly conductors between the connector and the pressure seal can be exposed. The pairs of thermocouple wires shall be grouped into 6 pair thermocouple connectors.

(3) Thermocouple wires for Type 3 penetration shall be individual conductors for copper, constantan and copper drain wire, electrically equivalent to the cables.

(4) For use as 3/C cable for RTD leads only.

(5) Shielded thermocouple pair with drain wire for penetration temperature monitoring.

(6) Two groups of 13 conductors shall be formed, and each group enclosed in a continuous metallic conduit through the entire penetration assembly and extending four feet beyond the termination conduit (see Drawing SE559).

(7) On the inboard or drywell side of the penetration the 8 kv cable will be connected to 3-500 MCM/ø and on the outboard or reactor building side of the penetration the 8 kv cable will be connected to 3-500 MCM/ø.

(8) These values are the minimum requirements for a Normal Operating Temperature of 135°F as indicated on Table 2.

(9) Rayehem No. 10483 or functional equivalent.

Q. 40.40

Provide a listing of all motor-operated valves in the WNP-2 facility which require a power lock-out to meet the single failure criterion. Indicate in detail how you satisfy this requirement.

Response:

WNP-2 design does not include the use of power lock-outs on motor-operated valves to meet the single failure criterion.

Q. 40.41

Discuss the capability of the battery chargers of the emergency power system to properly function and remain stable upon the disconnection of the batteries, including a discussion of any anticipated modes of operation which would require a disconnection of the batteries (e.g., when applying an equalizing charge).

Response:

The battery chargers for the Division I and II DC Power Systems are not capable of remaining stable while supplying the load unless the battery is connected. There are no normal modes of operation where the battery will be disconnected from the charger and load. The charger and battery will be connected for applying and equalizing charge. It is anticipated that the charger will be disconnected from the battery and the load during maintenance checks of the charger low and high voltage level alarms and the high level shunt trip. The charger will be stable under this no-load condition.

Q. 40.42

Indicate in detail how the design of the d-c power system provides assurance that safety-related equipment will be protected from damaging overvoltages caused by the battery chargers either as a result of faulty voltage regulation or operator error.

Response:

The design of the WNP-2 battery chargers provides assurance that safety related equipment will be protected from damaging overvoltages as a result of faulty charger voltage regulation or operator error by alarms and a high voltage shutdown feature. Normal system float voltage is 2.25 volts/cell. Should the voltage increase to approximately 2.37 volts/cell, a high voltage alarm is sounded. At approximately 2.40 volts/cell the high voltage shutdown relay trips the charger output breaker, disconnecting the charger from its respective bus, thus protecting the equipment from further voltage increase. The controls for these alarms/trips are located inside the respective battery charger cabinet precluding inadvertent operator error. Below are tabulated the respective alarm/shutdown settings for the three WNP-2 system voltages:

Nominal System Voltage	Number of Cells	Float Voltage Setpoint (Vdc)	High Trip Point (Vdc)	High Shutdown Trip Point (Vdc)
± 24 vdc	24	± 26.5 - 27.0	± 28.0 - 28.5	± 28.5 - 29.0
125 vdc	58	130 - 130.5	136 - 138	138 - 140
250 vdc	116	259 - 261	272 - 276	276 - 280

Q. 040.043

Review the electrical control circuits for all safety-related equipment to provide assurance that disabling of one component does not, through incorporation in other inter-locking or sequencing controls, render other components inoperable. All modes of test, operation, and failure should be considered. Describe and state the results of your review.

Response:

The WNP-2 physical and electrical separation criteria does not require that the disabling of any safety related component does not render any other safety related component inoperable.

The WNP-2 design is consistent with Federal Regulations and Industry Codes and Standards which require that a sufficient number of circuits and equipment be maintained such that protective functions required during and following any design basis event, when taken with any single failure, can be accomplished.

This design approach does not preclude the disabling of safety system components, either intra-division or interdivision, from failure of other intra-division or interdivision components during all plant operating modes unless that failure can result in the loss of a protective function. An analysis of this position is contained in sections 7.2, 7.3, 7.4 and 7.6 where compliance with IEEE 279-1971 paragraphs 4.2, 4.5, 4.6, 4.7, and 4.12 are addressed for each safety system.

Q. 40.44

During our review of the Hatch 2 application for an operating license, we identified certain potential problems that could be caused by the motor-generator sets of the reactor protection system (RPS). These problems were related to the operating characteristics of these motor-generator sets which might exceed the envelopes of acceptable values of voltage and frequency, thereby adversely affecting the connected loads. Indicate whether the motor-generator sets in the WNP-2 RPS are similar to those in the Hatch 2 facility. If they are, provide: (1) a commitment to the generic resolution of this item;* or (2) justification for the use of these motor-generator sets in the WNP-2 facility.

Response:

WPPSS has the subject motor-generator set type and was made aware of the problem in reference (1). In reference (2), WPPSS committed to the generic resolution of the problem with General Electric. The motor-generator will be supplied with Class IE qualified equipment to monitor and protect the connected loads from unacceptable values of voltage and frequency. The generic design and qualification plan supplied by GE has been approved by the NRC as satisfying the requirements of IEEE 379-1972, Section 6.6.

References: (1) NRC to WPPSS letter, "Reactor Protection System Power Supplies (WPPSS-2)", dated Aug. 11, 1978.

(2) WPPSS to NRC letter, same subject, dated Sept. 21, 1978.

*Refer to the attached letter dated February 23, 1979, RS Boyd to GG Sherwood, "Reactor Protection System Power Supply Protective Circuitry."

040.45 (9.5.2) The information in Section 9.5.2 of the FSAR regarding the onsite communications system does not adequately discuss the capabilities of this system during anticipated transients and postulated accidents. Accordingly, provide the following information:

a. Identify all working stations on the plant site where it may be necessary for plant personnel to communicate with either the control room or the emergency shutdown panel during and/or following transients and/or accidents, including fires, to mitigate the consequences of the event and to achieve a safe cold shutdown of the WNP-2 facility.

b. Indicate the types of communication systems available at each of the working stations identified in Item (a) above.

c. Indicate the maximum sound levels that could exist at each of the working stations identified in Item (a) for all transients and accident conditions.

d. Indicate the maximum background noise level which would not adversely affect communication with the control room using: (1) the page party communications systems; and (2) any other additional communication system provided for that working station.

e. Describe the performance requirements and acceptance tests for the communication systems at the onsite working stations identified in Item (a) to provide assurance that effective communication with either the control room or the emergency shutdown panel is possible under all conditions.

f. Identify and describe the power source(s) provided for each of the communications systems.

g. Discuss the protective measures taken to assure a functionally operable onsite communication system, including the considerations given to: (1) component failures; (2) a loss of power; and (3) the severing of a communication line or trunk as a result of an accident or fire.

Response:

a. Areas where it may be necessary to have communications with the control room or the shutdown room during various accident conditions are as follows:

** #1 RPS Room, el. 467', Radwaste Bldg.
** Local Feed Pump Control Station, el. 441', Turbine Bldg.
Hotwell Level Control Station, el. 441', Turbine Bldg.
Nonvital 4160V Swgr., el. 471', Turbine Bldg.
** Vital 4160V Swgr SM-7, el. 467', Radwaste Bldg.
* Vital 4160V Swgr SM-8, el. 467', Radwaste Bldg.
Diesel Generator Bldg. Corridor, el. 441', Diesel Generator Bldg.
Standby SW Bldg. #1
Standby SW Bldg. #2
Circulating Water Pumphouse
** ECCS Equipment, el. 420' & 441', Reactor Bldg.
RHR Valve Room #1, el. 471', Reactor Bldg.
RHR Valve Room #2, el. 471', Reactor Bldg.
Containment Air Compressors, el. 501', Reactor Bldg.
Reactor Closed Cooling Pumps, el. 548', Reactor Bldg.
Hydrogen Recombiner, el. 572', Reactor Bldg.
Main Guardhouse

*
** See response to (b)

b. Each of the stations listed in (a) have PABX telephone and sound powered telephone communications. The PABX is also referred to as the Private Digital Telephone System (PDTS). The PABX telephones are equipped for use with headsets. All stations except those marked with an asterisk (*) or a double asterisk (**) have capability for a 2-way radio communication. A portable radio can communicate with base stations in the Communications Room in the Radwaste Bldg. and/or a base station in the Primary Guard House. The base station in the Communications Room has remote control stations in both the Main Control Room and the Remote Shutdown Room.

Those marked with a single asterisk can be reached by radio from the base stations, but cannot talk back because of shielding by the building concrete and steel.

Those stations marked with a double asterisk are shielded by the building so that no radio communication is possible.

c. Sound levels in all but the Diesel Generator Rooms are the same as normal during accident or transient conditions. All areas noted in (a) have capability for using headsets. Noise cancelling microphones are used where noise levels are known to be high. Sound booths are used in areas such as the Diesel Generator Rooms.

The PA system speakers have volume controls which can be adjusted to the ambient noise level.

d. Noise levels will not be known until the plant is operational. At the time volume controls will be adjusted and noise cancelling microphones will be installed. Known noisy areas have access to telephones nearby that are shielded from the noise by walls.

e. The description of the Plant Communications System Preoperational Test is contained in FSAR section 14.2.12.1.49. In addition to the items mentioned in section (d) above, any problems identified with the communications systems during the preoperational test program will be detailed on a Startup Problem Report and the resolution will be documented. Also during Startup Test No. 28 (Shutdown from Outside the Main Control Room described in section 14.2.12.3.28) any deficiencies in the communication system involving the emergency shutdown panel will be identified and resolved.

f. The PABX telephone and the PA systems are supplied power from the Division A uninterruptible power supply which is backed up by the 250V battery. The attendants console is powered from a nearby utility receptacle. If power is lost to the console, telephone communications within the plant complex will not be affected, however, incoming calls will not go through.

The sound powered telephone system uses voice generated power only.

The radio base station in the Communications Room is powered from the Division A UPS. The base station in the Primary Guardhouse is connected to the UPS in the Guardhouse.

g. Protective measures taken to assure a functionally operable communications system for component failures, loss of power and the severing of a communications line or trunk are:

<u>Component Failures</u>

- All telephone instruments are plugged into jacks for easy replacement.
- The PABX telephone switchgear is built up with plug in modular circuit boards so that spare boards can be quickly plugged in to replace failed boards.

Component Failures (cont'd)

- o The PABX telephone switchgear has redundant central processing unit mini-computers with automatic switching from a failed computer to the redundant computer.
- o The sound powered telephone system backs up the PABX system in case of a major failure of the switchgear.
- o Several telephones are connected directly to the telephone company's central office to operate independently of the PABX. These include telephones in the Main Control Room, Remote Shutdown Room, Primary Guardhouse and Plant Superintendent's office.
- o The PA system has duplex amplifiers. Failure of one causes automatic transfer to the other.
- o The PA system is also supervised to detect and annunciate failure of the amplifiers and circuits to speakers.
- o The PA system also has redundant circuits for overlapping speaker coverage on each floor.
- o Two radio base stations provide redundancy in case of component failure.
- o Portable radios can communicate with each other or offsite over one of two repeaters on Rattlesnake Mountain without reliance on the base stations.

Loss of Power

- o The PABX Telephone System and the PA System are powered from the Division A UPS as noted in "f" above.
- o Radio base stations receive power from UPS sources as noted in "f" above.
- o Sound powered telephones operate without power.
- o Portable radios use batteries.

Severing of Lines or Trunks

- o Radios do not require offsite lines and can be used in lieu of telephones if their lines are cut.

Severing of Lines or Trunks

- o Portable radios can be used if the antennae leads to the base stations are severed.
- o Several telephones are connected to the BPA microwave system. These can be used to communicate with other WPPSS facilities and BPA if telephone company lines are severed.

Q. 40.46
(9.5.3)

Identify the vital areas and the hazardous (e.g., high radiation) areas where emegerncy lighting is needed for safe shutdown of the reactor and the evacuation of personnel in the event of an accident, including fires. Provide a tabulation of these emergency lighting systems in the WNP-2 facility.

Response:

1. Those areas identified in the answer to question 40.45 (part a.) are provided with emergency lighting to facilitate communications and equipment operation which may be needed for safe shutdown of the plant in the event of an accident.

2. Those "radiation areas" and "high radiation areas" depicted by the colors blue, orange, and red on the Radiation Zone Drawings contained in the FSAR, Chapter 12.3, Figures 12.3-1 through 12.3-6, are provided with emergency lighting to facilitate evacuation of personnel in the event of an accident or fire.

3. In addition, the remainder of those vital areas, not included in items 1. and 2. above, i.e., the main control room, the access route to the remote shutdown room, and the remote shutdown room are provided with various emergency lighting systems as described in the FSAR, Section 9.5.3.2.

Q. 40.47
(9.5.4)

In Section 9.5.4.1 of the FSAR, you do not specifically reference ANSI Standard N195, "Fuel Oil Systems for Standby Diesel Generators," for the emergency diesel engine fuel oil storage and transfer system. Indicate whether the design of this system complies with the cited standard. If not, provide justification for non-compliance. (Refer to paragraph II.12 of Section 9.5.4, Revision 1, of the Standard Review Plan (SRP), NUREG-75/087.)

Response:

The design, materials and physical arrangement meet the requirements of ANSI N-195.*

*See attached draft revision

9.5.4 DIESEL GENERATOR FUEL OIL STORAGE AND TRANSFER SYSTEM

9.5.4.1 Design Bases

a. The fuel oil storage and transfer system for the standby diesel generators is designed to perform its operational function during emergency conditions assuming any single active or passive failure of one of its components.

b. The onsite storage capacity of each subsystem provides for continuous operation of each diesel generator for at least seven days while satisfying post-LOCA maximum load demands.

c. The design of the system conforms to IEEE Standards 308 and 387 and ANSI standard N195. The equipment within the system conforms to the applicable codes and standards of ASME, ASTM, ANSI, DEMA, IEEE, API, and NFPA.

d. The system piping is designed to ASME Section III, Class 3 and Seismic Category I requirements. (See Table 9.5-6 for equipment design codes). Except for the diesel oil storage tanks, all portions of the system, including the fuel oil day tanks, are protected from tornado missiles by enclosure in Seismic Category I structures. The diesel oil storage tanks are buried for protection and to maximize containment of postulated oil spills. The system is not subject to flooding since the site is not subject to flooding.

9.5.4.2 System Description

The fuel oil storage and transfer system consists of separate, independent diesel oil supply subsystems serving each of the two tandem diesel engine generators (1A and 1B) and the HPCS diesel engine generator. Each of these subsystems consists of a 100% capacity fuel oil storage tank, a transfer pump, one day tank, interconnecting piping and valves, and associated instruments and controls. The fuel oil transfer piping of diesel generators 1A and 1B is arranged such that either transfer pump may transfer diesel oil from its storage tank to either day tank, if required. The system diagram is shown on Figure 9.5-4.

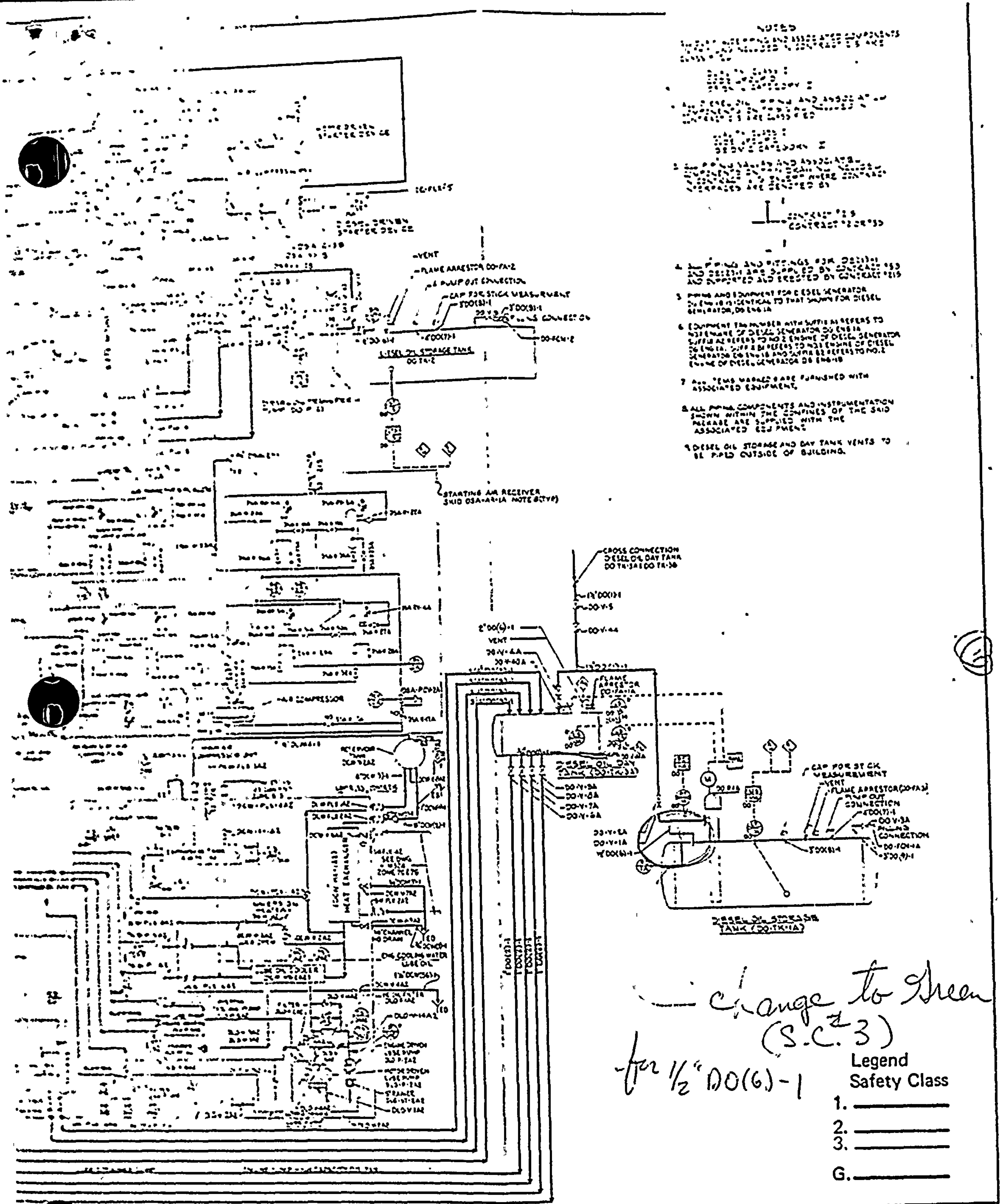
Q. 40.48
RSP
(9.5.4)

In Figure 9.5-4 of the FSAR, you identify the 1/2 inch minimum flow line, DO(6)-1, as non-safety class G piping. This is unacceptable. Accordingly, we require this line to be designed to seismic Category I criteria and satisfy the requirements for safety Class 3. Revise your design accordingly.

Response:

The 1/2 inch minimum flow line DO(6)-1 is designed to seismic category I, ASME Section III, Class 3 and Quality Class I. This is as indicated by note 2 on Figure 9.5-4. The color coding for this line on Figure 9.5-4 will be corrected.*

* See attached draft revision.



WASHINGTON PUBLIC POWER SUPPLY SYSTEM
NUCLEAR PROJECT NO. 2

DIESEL OIL AND MISC. SYSTEMS

FIGURE 9.5-4

Q. 40.49

In Section 9.5.4.3 of the FSAR, you state that diesel fuel oil is available from local sources. Identify the sources where diesel fuel oil of acceptable quality will be available and the distances from these sources to the WNP-2 facility. Discuss how fuel oil will be delivered onsite under extremely unfavorable environmental conditions. (Refer to Paragraph III.5.6 of Section 9.5.4, Revision 1, of the SRP.)

Response:

Below are a few of the possible sources of acceptable quality diesel fuel oil:

1. Mobil Oil Co.
   Columbia Oil Co. Distributor
   1345 Lee Blvd.
   Richland, Wash. (15 miles from WNP-2)

2. Chevron USA
   Wondrack Distributing
   529 E. Kennewick Ave.
   Kennewick, Wash. (28 minles from WNP-2)

3. McCall Oil Co.
   812 N. Washington
   Pasco, Wash. (34 miles from WNP-2)

4. Mobil Oil Co.
   1711 13th Ave. S.W.
   Seattle, Wash. (220 miles from WNP-2)

5. Mobil Oil Co.
   P.O. Box 03420
   Portland, Ore. (230 miles from WNP-2)

The most probable method of delivery is by truck. Since there is a variety of routes available to WNP-2 traffic, it is anticipated that access will be maintained. However if truck transport is not feasible due to adverse conditions; railroad delivery is an alternate option.

Q. 040.50
(9.5.4)

In 9.5.4.3 of the FSAR, you state that the materials selected for the diesel fuel oil system assures adequate corrosion protection, thereby minimizing fuel oil contamination. We find this statement to be too general in nature to be meaningful. Accordingly, revise the FSAR to provide a more explicit description of the protection provided for underground piping. If coatings which provide protection against corrosion are being considered for piping and tanks, identify the standards which will govern their application. Discuss the provisions to provide an impressed current type of cathodic protection system, in addition to water-proof protective coatings, for the WNP-2 fuel oil storage and transfer system. The purpose of this cathodic protection is to minimize corrosion of buried piping or equipment. If cathodic protection is not incorporated into the WNP-2 facility, provide justification for the omission. (Refer to Paragraph III.4 of Section 9.5.4, Revision 1, of the SRP.)

Response:

The adequate corrosion protection stated in section 9.5.4.3 refers to the interior surface of the piping and storage tanks of the diesel oil system.* The exterior surfaces of the buried piping and components are coated with coal tar enamel and oil application of coating and covering are in strict accordance with AWWA specification C203.

Diesel oil pipe lines between the storage and day tanks run through culvert pipe sleeves at about six feet below the Diesel-Generator Building floor. Diesel oil pipe lines extanding under the Diesel-Generator Building do not receive full protection from the exterior rectifier-anode system because of the electrical shielding effect of the ground grid and foundation reinforcing and structural steel. Since the earth area under the Diesel-Generator Building is sheltered and hence relatively much drier than the earth exterior to this building, no additional cathodic protection system is provided or required.

* See draft revised FSAR page.

A single failure analysis of the fuel oil storage and transfer system for diesel generators 1A and 1B is presented in Table 9.5-7. Although a single failure may result in loss of fuel to one diesel generator, the other diesel generator can provide sufficient capacity for emergency conditions, including safe shutdown of the reactor (see 8.3) coincident with loss of offsite power.

Each diesel oil storage tank of generator 1A or 1B has a capacity of 60,000 gallons which is more than sufficient to supply oil for one diesel generator for seven days. In addition, each day tank has a capacity of 3000 gallons. The diesel generator fuel consumption at 100% generator rating of 4650 Kw is 340 gal/hr. The HPCS diesel oil storage tank (50,000 gallons) and its associated day tank are also adequate to sustain operation of the HPCS diesel for at least seven days.

The minimum site storage of seven days (even assuming the loss of one storage tank serving diesel generators 1A and 1B) is considered adequate time for obtaining additional fuel oil, if required. Fuel can be available at the site within six hours from local sources (Pasco, Washington), or from more remote terminals within 12 to 24 hours.

Materials selected for this system assure adequate corrosion protection for the interior surfaces of piping storage and day tanks to minimize fuel oil contamination. Piping systems are ASME SA- 106, Grade B. Buried storage tanks are constructed of ASME SA-515, Grade 70, with a 3/16" corrosion allowance and exteriors coated with coal tar enamel. Application of coating and covering is in strict accordance with AWWA specification C203. The diesel oil day tank is constructed of ASME SA-283, Grade C, with 3/16" corrosion allowance. A fuel oil filter and stainer system is provided in each fuel line to eliminate passage of particles five microns or greater in size to the engine injectors.

9.5.4.4 Testing and Inspection Requirements

System components are inspected and cleaned prior to installation. Instruments are calibrated during testing and automatic controls are tested for actuation at the proper set points. Alarm functions are checked for operability and limits during plant preoperational testing. Automatic actuation of system components is tested periodically in accordance with Chapter 16, Technical Specifications. The system is operated and tested initially with regard to flow paths, flow capacity, and mechanical operability in accordance with Chapter 14.

Q. 40.51
(9.5.4)

In Section 9.5.4.4 of the FSAR, you describe the testing and inspection procedures for the diesel fuel oil system. Provide the specific standards which will be followed to assure a reliable supply of fuel oil to the emergency diesel-generators. (Refer to Paragraphs III.3 and III.4 of Section 9.5.4, Revision 1, of the SRP.)

Response:

The specific standards that will be followed to assure a reliable supply of fuel oil to the emergency diesel-generators are:

(1) ASTM-D270-65, Standard Method of Sampling Petroleum and Petroleum Products.

(2) ASTM-D975-74, Standard Clarification of Diesel Fuel Oils.

(3) Manufactures Diesel Fuel Recommendations, Maintenance Instructions 1750 Rev. D, March 1973, EMD - General Motors Corporation.

Additional clarifications are included in revised section 9.5.4.4.*

*Draft page change attached.

requirements of ASTM-D 975-74 "Standard Specification for Diesel Fuels" or the requirements of the diesel manufacturers whichever is most restrictive

To assure quality and reliability of the fuel supplied to the emergency generators, certification will be required that the delivered fuel conforms to the ~~specified standard~~. Samples of delivered fuel will be tested to measure INSERT ATTACHED ~~viscosity and percent of moisture and sediment~~. Inspection of stored fuel is scheduled to be made at 92 day intervals to also measure viscosity, moisture and sediment. Over limit indications from the above tests will initiate immediate corrective action to ensure the required quality of fuel is available for operation of the emergency diesel generators.

(Single tank composite samples will be obtained using ASTM D-270-65, Standard Method of Sampling Petroleum and Petroleum Products)

9.5.4.5 Instrumentation Requirements

Each diesel oil storage tank is provided with local level indicators and high and low level switches which actuate alarm annunciators in the main control room. Each day tank is provided with two level switches and a float switch which perform the following functions:

a. Start and stop the transfer pump to maintain level in the day tank.

b. Actuate an alarm in the main control room upon low level.

c. Actuate an alarm in the main control room, close supply valve and shutoff transfer pump, upon high-high level.

Each transfer pump discharge line is provided with local pressure indicators. The system maintains the proper supply of diesel oil in each day tank by means of the float switches in the day tanks which signal the corresponding pump motor starters to automatically start and stop the transfer pumps.

The main control room is provided with high and low level annunciators for all the tanks in the system and with control switches for remote control of each complete transfer system train.

Local indication of differential pressure is provided across the duplex filters in the fuel oil supply lines to the diesel engines of diesel generators 1A and 1B.

INSERT TO PAGE 9.5-61

specific or API gravity, flash point and visual examination. These tests are those predominantly used by the petroleum industry for rapid checking of products being shipped via pipeline or other bulk methods. The API gravity provides assurance the diesel is in the proper grade range, flash point will assure the fuel has not been diluted with gasoline or other lighter gravity product and the visual examination will serve to detect suspended solids and free water contamination. An analysis to assure the delivered fuel meets the more restrictive of the property specifications provided in ASTM-D975-74 or the manufactures recommendations will be completed within 15 days of the transfer.

Q. 40.52
(9.5.4)

In Section 9.5.4.2 of the FSAR, you state that the diesel-generator fuel oil storage tank is provided with an individual fill and vent line. Indicate whether these lines are located indoors or outdoors and state the height above finished grade at which these lines are terminated. If these lines are located outdoors, discuss the provisions made in your design to prevent the entrance of water or dust into the storage tank during adverse environmental conditions.

Response:

This question was answered in response to question number 40.15.*

*Answer submitted to NRC in advance of FSAR amendment with Round One, Set Two responses, WPPSS to NRC letter G02-79-45. March 21, 1979.

Question 040.53

Discuss how you will detect or prevent the growth of algae in the diesel fuel storage tanks. If algae were detected in these storage tanks, describe the method(s) you proposed to clean the affected tanks. (Refer to paragraph III.4 of Section 9.5.4, Revision 1, of the SRP).

Response

The growth of algae in liquid hydrocarbons is not a new problem. All hydrocarbon fuels are sterilized by the high temperatures encountered in the refining process, however, they become contaminated by micro-organisms upon contact with air and other contaminated fuels during storage and shipping. These micro-organisms, primarily bacteria and fungi exist harmlessly in moisture-free fuel, passing through fuel systems without causing any problems. However, in the presence of water, they begin to metabolize at a rate determined by the micro-organisms' environment.

The design and location of the WNP-2 diesel fuel oil storage tanks considered water intrusion as an important factor. The tanks are buried under several feet of soil but are well above ground water or flood level (see FSAR section 2.4). Since the tanks are buried, they will not be subjected to the daily thermal cycles which lead to the introduction of water by condensation on the inside of the metal tank walls. Condensation is a major source of water introduction. To further prevent introduction of water, each batch of diesel fuel will be examined for free water before transfer to the storage tanks. Any water noted, by quarterly sampling and testing, that accumulates in the tanks will be removed.

The Supply System is presently investigating the testing method that can be used to detect the presence of micro-organisms. Test kits are available from several companies. In addition, the filters in the fuel oil system will be examined for micro-organism build up during routine preventive maintenance. Build up can be detected by observing the condition of filters and noting the odor after disassembly. Severe build up can be noted by the odor, typically hydrogen sulfide, and slimy texture of the filtered medium.

If micro-organisms become a problem, microbiocide additives can be introduced into the diesel fuel oil to prevent the growth of micro-organisms. Two types of additive fuel soluble and water soluble are available. Selection of the additive would depend on the form of water present, i.e., suspended or free at a distinct fuel-water interface.

Removal of micro-organisms from the fuel oil can be accomplished in several ways. Severe accumulation of micro-organisms will be removed by draining, manually cleaning the storage tanks, day tanks, and other portions of the fuel oil system and addition of fresh diesel fuel. Micro-organism contamination that is not severe can be removed by the use of a centrifuge or other purification system.

Q. 40.54
(9.5.5)

Describe how the design of the WNP-2 diesel engine cooling water system provides assurance that all components and piping are filled with water. (Refer to Paragraph III.2 of Section 9.5.5, Revision 1, of the SRP).

Response:

To assure that all components and piping are initially filled with water a demineralized water supply is temporarily connected to the 1 1/4" fill-drain connection located on the engine base at the cooling water pump end. Filling the cooling water system from the bottom up allows entrapped air to be vented to the expansion tank.

Q. 040.55
(9.5.5)

In Section 8.3.1.1.8.1.11 of the FSAR, you state that the WNP-2 diesel-generators are automatically started and then run without any electrical loads following a postulated LOCA if offsite power is available at the 4.16 kV Class 1E busses. Discuss how long the Division 1 and 2 diesel generators can run unloaded without a degradation of the diesel engine performance or without a loss of reliability. Provide a similar discussion for the Division 3 diesel generator which supplies power to the high pressure core spray system.

Response:

Section 8.3.1.1.8.1.11 of the FSAR for the Division 1 and 2 diesels and 8.3.1.8.2.11 of the FSAR for the HPCS diesel refer to lightly loaded conditions of less than 50% of nameplate rating. Lightly loaded implies loading conditions of 0% to 50%, including the unloaded condition.

As stated in the above referenced sections, the Division 1, 2 and 3 diesel-generating units can run for four (4) hours in the unloaded condition without a degradation of the diesel engine performance or without loss of reliability. Administrative procedures are employed to manually load the diesels to meet the necessary limit.

Q. 40.56
(9.5.5)

In 9.5.5.2 of the FSAR, you state that each diesel engine cooling water system is provided with an expansion tank to provide for system expansion and for venting air from the system. In addition, the expansion tank is intended to: (1) provide for minor system leaks at pump shaft seals, valve stems and other components; and (2) maintain the required net positive suction head (NPSH) at the cooling water system circulating pump. Indicate the size of the expansion tank and state its location. Demonstrate by analysis that the size of the expansion tank is adequate to: (1) maintain the required NPSH at the pump; and (2) provide makeup water for seven days of continuous operation of the diesel engine at its full rated load without the addition of water into the expansion tank. Alternatively, provide a Seismic Category I Safety Class 3 makeup water supply for the expansion tank.

Response:

The 94 gallon expansion tank is mounted on the diesel engine skid approximately 20" above the cooling water system circulating pumps.

Diesel generator unit reliability including the functions required of the circulating water pump and expansion tank were demonstrated prior to installation (see 8.3.1.1.9). Periodic testing and maintenance assure continued reliability.

The expansion tank is provided with a level sight glass which is mounted on the front with instructions that indicate minimum water level. An alarm is provided in the control room to annunciate in case of low water level. A Seismic Category I Safety Class 3 connection will be provided so water can be supplied from the Seismic I standby service water system to the expansion tank.

Q. 40.57
(9.5.6)

Describe the instrumentation, controls, sensors and alarms in the starting air system which alert the operator when the design parameters of this system are exceeded. Discuss the actions of the operator if this system annunciates an alarm in the control room. Our concern is whether there is sufficient time for the operator to take appropriate action.

Response:

For description of instrumentation, controls, sensors and alarms in the starting air system see paragraph 9.5.6.2.

When the main control room operator receives the diesel generator trouble alarm he will be required to dispatch an equipment operator to the local panel to assess the problem. The annunciator window on the diesel generator local control panel will show one or both of the following:

Starting air pressure of air receivers	LOW
Air Start Solenoid Valves	FAILURE

The equipment operator will be able to inform the main control room operator of his findings, via the inplant telephone system. Depending upon the nature of the problem, the operator will instruct the equipment operator to take appropriate action to rectify the condition or possibly manually start additional and diverse safety equipment.

Emergency DG systems are redundant, therefore no credit is taken for operator action for an assumed failure in a single unit.

Q. 40.58
(9.5.8)

In Figure 9.5-5 of the FSAR, you show the location of the diesel engine air intake louvers. Discuss the effect of adverse meteorological conditions (i.e., heavy or freezing rain, ice, snow or a severe dust storm) on the availability of the emergency diesel-generators. (Refer to Paragraph III.5 of Section 9.5.8, Revision 1, of the SRP.)

Response:

The diesel-generator building intake louvers are located from 2' 6" to 15' 2" above grade level. The louvers are designed to minimize the amount of entrained snow and moisture that can pass through them and into the building. Air passing through the louvers must follow a tortuous path to get to the air intake filters. The changes in direction will result in depositing the entrained moisture. Floor drains are provided to drain off any accumulated water. The size and construction of the louvers would prevent them from becoming blocked by freezing rain or snow.

The case of severe dust storms was discussed in the response to Question 10.16.

It is not anticipated that these meteorological conditions will effect the availability of the diesel-generators.

Q. 40.59
(9.5.8)

Describe the instrumentation, controls, sensors and alarms of the diesel engine combustion air intake and exhaust system which alert the reactor operator when the design parameters of this system are exceeded. Discuss the actions of the operator if this system annunciates an alarm in the control room. As before, our concern is the time available for an operator to take appropriate action. (Refer to Paragraphs II.1 and II.4 of Section 9.5.8, Revision 1, of the SRP).

Response:

Alarms are not provided on DG exhaust and intake parameters. Other upset conditions are monitored and annunciated on local instrument panels and brought to the main control room operators attention in the form of a single trouble annunciator.

The air filter for the turbocharged diesel engine is the panel type oil bath filter. This type filter is self cleaning during operation, and air restriction due to a clogged filter is not considered a relevant possibility. The panel type oil bath filters provide efficient air filtration with a minimum of maintenance. These filters are inspected, drained and cleaned periodically as recommended by the manufacturer.

The diesel exhaust is also an open flow system with no evident potential for development of restriction. Diesels are tested periodically as required by Technical Specification, therefore, any unforseen degradations would become evident in the performance parameters upon which DG operability is based.

Emergency DG systems are redundant therefore no credit is taken for operator action for an assumed failure in a single unit.

Q. 40.60
(10.2)

Expand your discussion of the turbine speed control and overspeed protection system. Provide additional explanation of the turbine and generator electrical load following capability for the turbine speed control system with the aid of system schematics (including turbine control and extraction steam valves to the heaters). Tabulate the individual speed control protection devices (normal emergency and backup), the design speed (or range of speed) at which each device begins operation to perform its protective function (in terms of percent of normal turbine operating speed). In order to evaluate the adequacy of the control and overspeed protection system provide schematics and include identifying numbers to valves and mechanisms (mechanical and electrical) on the schematics. Describe in detail, with references to the identifying numbers, the sequence of events in a turbine trip including response time, and show that the turbine stabilizes. Provide the results of a failure mode and effects analysis for the overspeed protection systems. Show that a single steam valve failure cannot disable the turbine overspeed trip from functioning. (SRP 10.2, Part III, items 1, 2, 3 and 4).

Response:

1) Provide additional explanation of the turbine and generator electrical load following capability for the turbine speed control system with the aid of system schematics (including turbine control and extraction steam valves to the heaters).

   Answer: See the response to question 40.63 and revised FSAR section 7.7.1.5 (including Figures 7.7-9 and 7.7-10).*

2) Tabulate the individual speed control protection devices (normal, emergency and backup), the design speed (or range of speed) at which each device begins operation to perform its protective function (in terms of percent of normal turbine operating speed).

   Answer: See revised FSAR page 10.2-5.*

*Draft FSAR page changes attached.

3) In order to evaluate the adequacy of the control and overspeed protection system provide schematics and include identifying numbers to valves and mechanisms (mechanical and electrical) on the schematics. Describe in detail, with references to the identifying numbers, the sequence of events in a turbine trip including response times, and show that the turbine stabilizes.

Answer: See new Figure 10.2-10 and revised pages 10.2-5, 10.2-6, and 10.2-7.*

4) Provide the results of a failure mode and effects analysis for the overspeed protection systems. Show that a single steam valve failure cannot disable the turbine overspeed trip from functioning.

Answer: See revised pages 10.2-5, 10.2-6, and 10.2-7.*

*Draft page changes attached.

The turbine generator is intended for base load operation. Normal load swings are limited to the rate of change of power output of the nuclear steam supply system.

The turbine generator, under automatic flow control, is capable of ramp load changes of 1 percent per second to a maximum of 35 percent at the full recirculation flow power level without bypass or control rod motion. ~~Exclusive of the limit of recirculation flow control, the ramp load change rate from control rod movement is 60 MW thermal per minute.~~

10.2.1.1 Functional Limitations Imposed by Design or Operational Characteristics of the Reactor Coolant System

The turbine control valves are capable of full stroke opening and closure within 7 seconds for adequate pressure control performance. Normal control valve closure is shown in Figure 10.2-3.

10.2.1.1.1 Turbine Stop Valve Fast Closure

During an event resulting in turbine stop valve fast closure, turbine inlet steam flow is not reduced faster than permitted by Figure 10.2-1.

10.2.1.1.2 Turbine Control Valve Fast Closure

During an event resulting in turbine control valve fast closure, turbine inlet steam flow is not reduced faster than permitted by Figure 10.2-2.

10.2.1.1.3 Automatic Load Maneuvering Capability

Within the automatic load following region of the power flow operating map, steam flow automatically responds to a load demand step as follows:

1. 0.9x in 10 sec for $|x| \leq 10\%$

2. 0.9x in x sec for $|x| > 10\%$

where x is in percent of power at rated core flow on the rod line in which the transient takes place.

The hydrogen gas supply system includes storage cylinders and pressure regulators for control of the hydrogen gas, and a circuit for supplying and controlling the carbon dioxide used in purging the generator during filling and degasing operations. To prevent hydrogen leakage by the generator shaft seals, a hydrogen seal oil system is provided. The hydrogen seal oil system, which includes pumps and controls, deaerates the oil before it is sent to the shaft seals.

Steam is transported from the reactor by four main steam lines and flows through the turbine stop valves and control valves to the high pressure turbine. The steam lines are combined upstream of the stop and control valves. The turbine bypass valves are located upstream of the turbine stop valves to permit steam bypass to the main condenser during transient conditions.

Two branch lines from the main steam header supply steam to the two second-stage reheaters per moisture separator. The steam for the two first-stage reheaters per moisture separator is supplied by extraction lines from the high pressure turbine (See Figure 10.3-1). The moisture separator/reheaters remove the moisture from the high pressure turbine exhaust steam and superheat the steam prior to admission to the low pressure turbines, thereby improving overall cycle efficiency. Extraction steam from the high pressure turbine is used in the first-stage reheater and for feedwater heating in heaters No. 5 & 6. Extraction steam from the low pressure turbines is used for the first, second, third, and fourth stage feedwater heaters. Moisture separator/reheater relief valves are provided to prevent over-pressurizing the moisture separator/reheaters and the crossover lines in the event of crossover stop or intercept valve closure; these relief valves discharge to the main condenser.

The turbine generator is equipped with a digital electrohydraulic (DEH) control system [illegible]. The DEH system consists of an electronic governor using solid state control in combination with a high pressure hydraulic system completely independent of the turbine lubricating system. The high pressure fluid supply is from a dual pump system in which one pump is a back-up for the other. The fluid is a fire resistant synthetic. The system includes electrical control circuits for speed control, load control, and valve positioning. The turbine control system includes an overspeed trip mechanism, steam admission valves, emergency stop valves, crossover intercept valves, and an initial pressure regulator. See 7.7.1 for a detailed description of the turbine control system.

There are ~~three~~ four methods of turbine overspeed control protection. They are:

a. Governor (DEH)

b. Overspeed protection controller (OPC)

c. Mechanical overspeed trip mechanism.

d. Electrical overspeed trip.

The governor, digital electrohydraulic control system maintains the turbine speed within 2-3 rpm. The speed is maintained as long as the load demand does not exceed the capability of the turbine generator unit.

The overspeed protection controller's primary function is to avoid excessive turbine overspeed such that a turbine trip is avoided. ~~The OPC, at 103% of rated speed, closes~~ At 103% of rated speed, the OPC solenoids [(D) figure 10.2-10] open, closing the governor and intercept valves to arrest the overspeed before it reaches the trip setting of 111% of rated speed.

No # ~~The intercept valves are modulated until the entrapped steam in the reheater is removed.~~ After the turbine coastdown to synchronous speed, the digital system takes control and maintains the turbine generator at synchronous speed. The turbine generator is then ready to be resynchronized.

If the turbine accelerates to 111% of rated speed, the mechanical overspeed trip mechanism trips the turbine. Tripping is accomplished by outward movement of the mechanical overspeed trip mechanism weight [(B) figure 10.2-10] due to high centrifugal forces caused by excessive turbine speed. The mechanical trip mechanism causes the high pressure hydraulic trip fluid to be released to the drain. All of the steam valves will trip closed thereby excluding all steam from entering the turbine. ~~The tripped valves are the throttle, reheat stop and intercept valves.~~ The turbine speed is thereby maintained below 120% of rated speed and the unit will coastdown to turning gear operation. ~~See Figures No. 10.2-7, 10.2-8 and 10.2-9.~~

The turbine overspeed control system equipment and electrical wiring may be destroyed by a postulated piping failure; however, this loss would not interfere with turbine trip due to the fail-safe feature of the mechanical overspeed trip mechanism.

In addition an electrical overspeed trip set at approximately 4 RPM higher than the mechanical overspeed will energize the solenoid trip [(C) figure 10.2-10] which also dumps the high pressure hydraulic trip fluid to drain. See Figures No. 10.2-7, 10.2-8 and 10.2-9. The results are the same as the mechanical overspeed trip. This setpoint differential permits each trip device to be tested separately.

A missile may destroy the electromagnetic speed pickups and associated electrical wiring, but the final line of protection is the mechanical overspeed trip mechanism. Missile damage to it or its associated hydraulic lines would result in a loss of high pressure fluid thereby causing turbine trip.

The operation of the governor is continuously observed during turbine generator operation. Detection of turbine speed variation is accomplished by the speed-control unit, discussed in 10.2.5.1. The overspeed protection controller ~~and~~ the mechanical overspeed trip mechanism, and electrical overspeed trip are inspected and tested periodically during reactor operation. The manner and frequency of the inspection and testing will take into consideration the manufacturer's recommendations in conjunction with the plant generating requirements. ~~Details of this inspection and testing program will be established along with other balance-of-plant inspection and testing requirements, a program currently in progress.~~

Instrumentation for the turbine generator is provided in the control room and is described in 7.7.1.

The turbine is equipped for normal operations with a shaft-driven lubricating oil pump, an a-c motor-driven lubricating oil pump for startup and shutdown or for emergencies whenever oil pressure falls below set pressure, and an a-c motor-driven turning gear oil pump. The turbine is also provided with a d-c motor-driven lubricating oil pump with power supplied from storage batteries for emergency operation.

The turbine shaft is supplied with "clean" (essentially non-radioactive) sealing steam which prevents outleakage of steam from the high-pressure turbine and inleakage of air to the low pressure turbines. An evaporator generates essentially non-radioactive steam for turbine gland sealing (See 10.4-3).

Over-pressure protection of the turbine exhaust hoods and the main condenser shell is provided by rupture diaphragms on the exhaust hoods.

The turbine incorporates protective devices including the exhaust hood relief diaphragms, exhaust hood temperature alarm and trip, pilot dump valve for closing the extraction steam non-return valves, low vacuum alarm and trip, thrust bearing wear alarm and trip, and low bearing oil pressure alarm and trip.

¶ [INSERT 'A']

INSERT "A" TO PAGE 10.2-6

The turbine has three separate and distinct trip mechanisms. Refer to Figure 10.2-10.

1. OPC(A) - These solenoids are energized when the turbine is at 103% of rated speed. When they are open, the EH fluid is dumped from the governor, intercept, and air pilot valves.

2. Auto Stop Oil Trip Valve (F) - This valve opens whenever the auto stop oil is dumped as the result of a turbine trip. This dumps the EH fluid from all the turbine valves.

3. In addition when the auto stop oil pressure drops below a preset value, pressure switch 63-2/AST(H) energizes solenoid 20/ET(G) which also dumps the EH fluid from all the turbine valves.

The main steam ~~stop~~ throttle and control valves are located in the steam chest assembly which is parallel to the axis of the high pressure turbine. The closure time is .2 seconds for the ~~stop~~ throttle valves and .25 seconds for the control valves. Since the valves are in series, if one valve fails to close, the other valve will stop the steam flow. A failure of one valve causes the other valves to increase or decrease their closing opening to compensate for that valve. If one valve fails open at low load condition, the other valves close. If the closing of the other valves is not enough to compensate for that valve, the turbine overspeeds thereby increasing the generator output frequency.

The reheat stop and intercept valves are inline valves located in the crossover piping between the moisture separator/reheater and low pressure turbine. The closure time for these valves is .15 seconds.

Each of the extraction steam lines has a reverse current valve and a gate valve, with the exception of the extraction lines to low pressure heater number 1. These valves are located near the condenser. Upon turbine trip the reverse current valves close. The closure time for these valves is .5 seconds. Because of the fast closure time and the short distance between these valves and the extraction points at the turbine, the amount of steam in these lines does not effect the turbine coastdown following a turbine trip.

10.2.3 TURBINE DISK INTEGRITY

Analysis of potential turbine missile hazards and drawings showing the orientation of the turbine with respect to important structures are presented in 3.5. Discussions concerning disk materials and their properties, design, and inspection are available in References 10.2-1 and 10.2-2.

10.2.4 SAFETY EVALUATION

The steam entering the high pressure turbine may contain fission, coolant activation and activated corrosion products. The anticipated concentration of nitrogen-16, which is the dominant radionuclide entering the high pressure turbine, is discussed in 12.2. Moisture separation and transit time between the high pressure and low pressure turbines reduces the concentration of radionuclides in the steam prior to entering the low pressure turbine. Most of the gaseous radioactivity is removed by the steam-jet air ejector and routed to the off-gas system (Refer to 11.3). The condensate in the condenser hotwell contains significantly less radioactive material than the inlet steam.

Access to the turbine area is controlled. Radiation levels associated with turbine components and shielding requirements are discussed in Chapter 12.

The following abnormal transient analyses have been made for a component failure in the turbine generator system and are included in Chapter 15:

a. Generator load rejection

b. Turbine trip

c. Turbine trip with failure of generator breakers to open

d. Pressure regulator failure

e. Main steam line isolation valve closure

All of the abnormal transient analyses listed above show that the resultant overpressure transient effects of the associated component failures are below the reactor coolant pressure boundary design pressure limit.

10.2.5 INSTRUMENTATION

The turbine generator utilizes a digital electrohydraulic control (DEH) system which controls the speed, load, pressure, and flow for startup and planned operations. The DEH system trips the unit when required. The DEH system also ~~operates~~ positions the turbine stop valves, bypass valves, control valves, ~~intercept valves~~ and other protective devices. Turbine generator instrumentation is provided for operational analysis and malfunction diagnosis.

The automatic control functions which interface with the reactor protection system are discussed in 7.7.1.

The digital electrohydraulic control system combines solid-state electronics and high pressure hydraulics to control steam flow through the turbine. The control system has six major units:

a. Speed control unit

b. Load control unit

c. Valve positioning control unit

d. Pressure regulator unit

e. Bypass control unit

f. Automatic load following control unit

10.2.5.1 Speed Control Unit

The speed control unit receives a speed signal from the shaft speed pickup and compares it to a speed reference signal to produce a speed error signal. The speed control unit also differentiates the speed signal to produce an acceleration signal. This signal is compared to the acceleration reference to produce an acceleration error signal. The acceleration error signal is integrated and combined with the speed error signal to produce an output to the load control unit. Overspeed protection and control are discussed in 10.2.2. During normal operation with the turbine-generator on line, the speed error signal will be essentially zero.

10.2.5.2 Load Control Unit

The load control unit accepts the speed ~~acceleration~~ error signal, conditions it to establish the proper signal for the applicable control valve servo positioners, compares the ~~speed~~ load ~~acceleration~~ error signal with a preselected load set signal, and provides the output signals to position the control ~~and combined intercept~~ valves on the turbine. The load control unit also accepts the limit signals (e.g., load limit, power load unbalance limit, etc.) and combines them to modify or limit the output signals.

10.2.5.3 Valve Positioning Control Unit

The valve positioning control units are electrohydraulic, closed-loop, servomechanism position control systems which receive the control valve flow signal from the low-valve gate. The valve positioning control unit compares the output of the load control unit with the pressure regulator unit and selects the lower of the two.

In this manner, during normal operation and within the load following capability of the reactor recirculation flow control system, the pressure regulator and turbine-generator control system maintain reactor pressure and turbine speed. The speed control and load control units generate the necessary signals to position the control valves through a low-valve gate over which the pressure regulator unit exercises its influence. The pressure unit, operating with the bypass control and automatic load following control, regulates the turbine inlet pressure, in conjunction with varying reactor recirculation system flow, to meet the increased or decreased load demands. Abnormal turbine operation is discussed in 7.7.1.

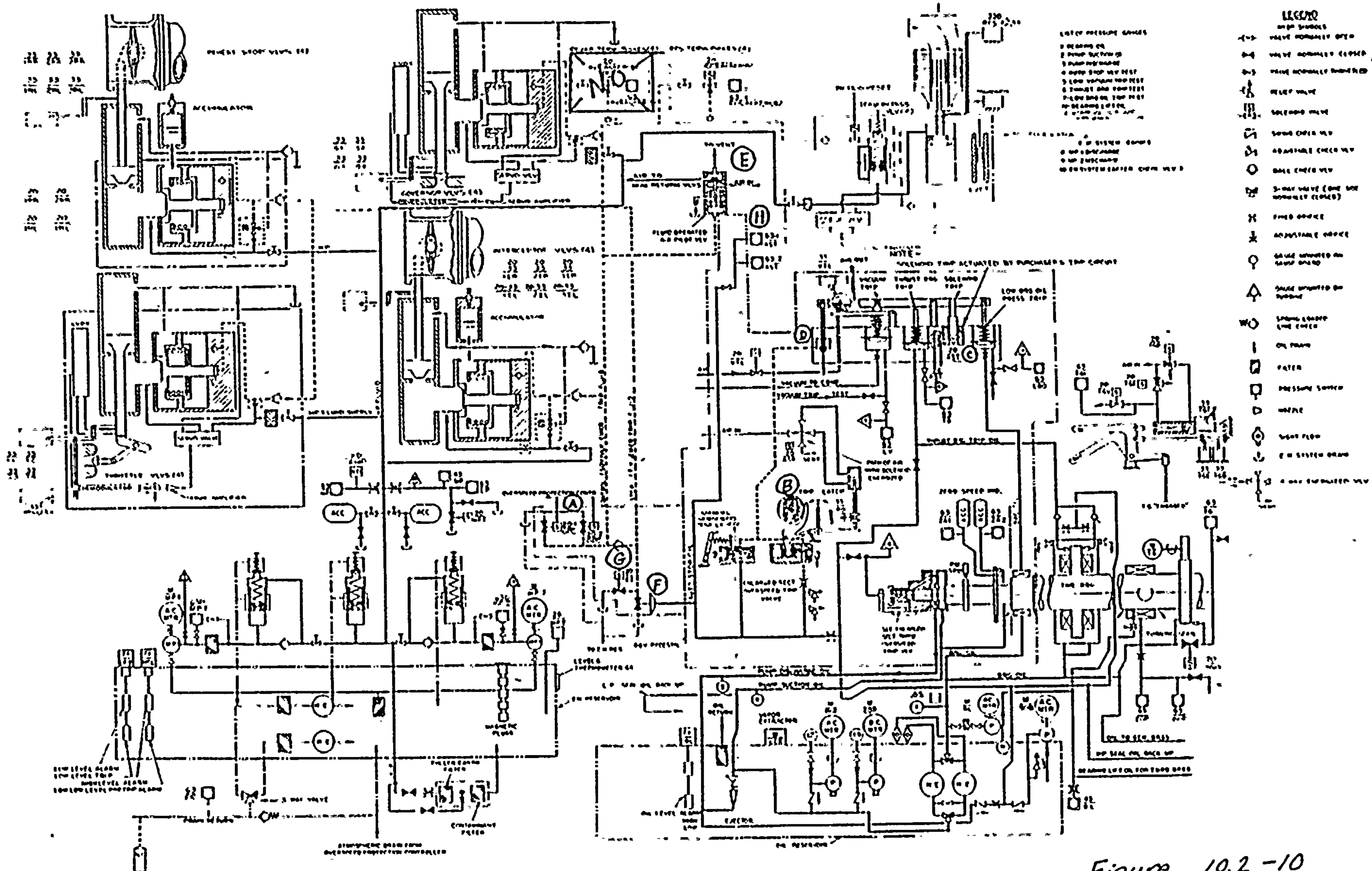


Figure 10.2-10

Electro-Hydraulic HP Fluid and Lube Oil Diagram

S.O. 13A3631 725J426-1

7.7.1.4.5.3 Set Points

The subject system has no safety set points.

7.7.1.5 Pressure Regulator and Turbine-Generator System - Instrumentation and Controls

7.7.1.5.1 System Identification

7.7.1.5.1.1 General

One of the features of direct cycle boiling water reactors is the direct passage of the nuclear boiler generated steam through the turbine and regenerative system. In this system the turbine is slaved to the reactor in that all (except steam to the moisture separator reheaters) steam generated by the reactor is normally accepted by the turbine. The operation of the reactor demands that a pressure regulator concept be employed to maintain required (within the range of the regulator controller proportional band setting) turbine inlet pressure at a particular load with load following ability accomplished by variation of the reactor recirculation flow.

The turbine pressure regulator normally controls the turbine governor valves to maintain required (within the range of the regulator controller proportional band setting) turbine inlet pressure at a particular ~~load~~ value. In addition, the pressure regulator also operates the steam bypass valves such that a portion of nuclear boiler rated flow can be bypassed when operating at steam flow loads above that which can be accepted by the turbine as well as during the startup and shutdown phase.

The overall turbine-generator and pressure control system accomplishes the following:

a. Control turbine speed and turbine acceleration.

b. Operate the steam bypass system to keep reactor pressure within limits, and avoid large power transients.

c. Control main turbine inlet pressure within the proportional band setting of the pressure regulator.

d. Match nuclear steam supply to turbine steam requirements by the following functions:

7.7.1.5.3 Equipment Design

7.7.1.5.3.1 General

BWR pressure control is accomplished by controlling main steam pressure immediately upstream of the main turbine stop and governor valves through modulation of the turbine governor or steam-bypass valves. Command signals to these valves are generated by redundant control elements using the sensed turbine inlet pressure signals as the feedback, as shown in Figure 7.7-10. For normal operation, the turbine governor valves regulate steam pressure; however, whenever the total steamflow demand from the pressure regulator exceeds the capacity of the turbine governor valves, the pressure control system sends the excess steamflow directly to the main condenser, through the steam bypass valves. The plant ability to follow grid-system load demands is enabled by adjusting reactor power level by varying reactor recirculation flow (manually or automatically), or by manually moving control rods. In response to the resulting steam production changes, the pressure control system adjusts the turbine governor valve to accept the steam output change, thereby regulating steam pressure. In addition, when the reactor is automatically following turbine speed/load demands, the pressure control system permits an immediate steamflow response to fast changes in load demand, [illegible] utilizing part of the stored energy in the vessel.

7.7.1.5.3.2 Steam Pressure Control

During normal plant operation, steam pressure is controlled by the main turbine governor valves, positioned in response to the pressure regulation demand signal. (See Figure 7.7-9.) The steam bypass valves are normally closed. When the reactor is in the automatic load-following mode, fast-load demand changes require an early initial response in turbine steamflow preceding the actual change in steam production. This is accomplished by temporary, automatic adjustments to the pressure setpoint. Because the fast response in turbine steamflow (equivalent load) acts to reduce the load-demand error, as seen by the reactor recirculation controls, as well as tending to reduce neutron flux, an additional forcing-function is provided.

As an example of the use of the pressure regulator setpoint adjustment, suppose an increase in plant load is demanded by an increased turbine-generator requirement. The turbine-generator demands more steam to maintain its constant speed. The turbine control system, by means of the fast response

value

feedback loop, adjusts the pressure regulator setpoint to a temporary lower valve. This temporary decrease in setpoint permits the turbine governor valves to open to meet the turbine-generator steam demand while the reactor recirculation flow change is being made.

Since the fast response feedback loop momentarily changes the steam flow, which in turn results in momentary steam flow signal (equivalent load signal) feedback, a compensatory feedforward loop is fed to the load demand summing function to cancel out this momentary feedback effect.

Two essentially identical regulators are provided so that the one with the greatest steam flow demand is the controlling regulator. A separate pressure tap for each regulator is provided at the turbine inlet.

The turbine governor valve signal is limited, after passage through the low valve gate, so that the signal cannot exceed a value corresponding to full opening of the main control valves at 105 percent normal boiler rated conditions. Thus, if the reactor is subjected to an excessive load demand when the turbine control valves reach full open, the control signal error developed at the bias signal for bypass valve actuation will still increase and cause bypass valve actuation.

Control for the turbine governor valve is designed so that the valves will close upon loss of control system electric power or loss of hydraulic system pressure.

7.7.1.5.3.3 Steam Bypass System

The steam bypass equipment is designed to control steam pressure when reactor steam generation exceeds turbine requirements such as during startup (pressure, speed ramping and synchronizing), sudden load reduction, and cooldown.

The bypass capacity of the system is 25% of NSSS rated steam flow; sudden load reductions of up to the capacity of the steam bypass can be accommodated without reactor scram.

Normally, the bypass valves are held closed and the pressure regulator controls the turbine governor valves, directing all steam flow to the turbine. If the speed governor or the load limiter restricts steam flow to the turbine, the regulator controls system pressure by opening the bypass valves. If the capacity of the bypass valves is exceeded while the turbine cannot accept an increase in steam flow, the system pressure will rise and reactor protection system action will cause shutdown of the reactor.

The bypass valves are an automatically-operated, regulating type which are proportionally controlled by the turbine pressure regulator and control system.

The turbine control system provides a signal to the bypass valves corresponding to the error between the turbine governor valve opening required by the controlling pressure regulator and the turbine governor valve position demanded by the output of the low value gate circuit. (See Figures ~~7.7-9).~~ ~~7.7~~-10 7.7-9 and 7.7-10) An adjustable bias signal is provided to maintain the bypass valves closed for momentary differences during normal operational transients.

7.7.1.5.3.4 Turbine Speed/Load Control System

The control signals supplied by the ~~EHC~~ pressure regulator to the turbine control system and the signals which the pressure regulator requires from the turbine control system are shown in Figures 7.7-~~10~~ 9 and 10. The turbine control system is designed to receive and supply the following signals;

a. Signal 1 - The load demand signal ~~has a range from zero at~~ varies from no load ~~to [illegible] at~~ to rated load.

b. Signal 2 - The pressure control signal ~~will~~ varies from ~~zero to~~ no load to ~~15 volts at~~ rated load.

c. Signal 3 - The flow limit signal range ~~will be -2.5 volts at~~ varies from 50 percent flow to ~~[illegible]~~ 140 percent flow.

d. Signal 4 - The governor valve position (flow) demand signal varies ~~from zero to +5 volts corresponding~~ the valves to ~~valves~~ closed ~~to fully~~ or open. The turbine flow limiter limits the governor valve position demand signal so that it does not exceed the value corresponding to valves fully open. Signal 4 is used by the ~~EHC~~ pressure regulator to operate the bypass valves when high steam pressure causes the pressure control signal, Signal 2, to be higher than Signal 4.

Turbine governor valves are designed so the valves will close on loss of control system electric power or hydraulic pressure.

Bypass valves and controls are designed so the valves will close on loss of control system electric power or hydraulic pressure.

7.7.1.5.3.5 Turbine Speed-Load Control Interfaces

7.7.1.5.3.5.1 Normal Operation

During base-load plant operation, the turbine load reference is held above the desired load, such that the pressure regulation demand governs the turbine governor valves. During automatic load-following operation, turbine speed-load demand fluctuations, through appropriate signal conditioning, cause the reactor recirculation flow to vary the core flow and therefore reactor steam generation, resulting in the desired change in turbine power output. When the turbine load demand increase exceeds the limits of the reactor recirculation system automatic-flow-control range, further increases in turbine output are prevented by the pressure regulator maintaining steam pressure.

7.7.1.5.3.5.2 Behavior of Turbine Outside of Normal Operation

a. Turbine Startup

Prior to turbine startup, sufficient reactor steam-flow is generated to permit the steam bypass valves to maintain reactor pressure control while the turbine is brought up to speed and synchronized under its speed-load control.

b. Partial Load Rejection

During partial-load rejection transients, which are apparent to the reactor as a reduction in turbine load demand resulting from an increase in generator (or grid) frequency above rated, the turbine-pressure control scheme allows the reduced turbine speed-load demand to ~~[illegible]~~ bias the pressure regulation demand and thereby directly regulate the turbine control valves.

c. Not Used

d. Turbine Shutdown or Turbine-Generator Trip

During turbine shutdown or turbine-generator trip conditions, the main turbine stop valves and governor valves are, or will be, closed. Reactor steamflow will then be passed through the steam bypass valves under steam pressure control, and through the reactor safety/relief valves, as needed.

Four turbine first stage pressure switches, which measure equivalent steam flow, are provided for bypassing the stop valve closure and governor valve fast closure inputs at low power levels.

7.7.1.5.3.5.4 Turbine-Generator to Main Steam Isolation System Interface

7.7.1.5.3.5.4.1 Main Condenser Vacuum Switches

There are four independent main condenser vacuum switches for the purpose of providing an isolation signal to the NSSS main steam isolation valves. Each vacuum switch has its own isolation (root) valve and pressurizing source connection for testing. Pressure switch contacts open on low vacuum. The vacuum switch setting is selected so that it is compatible with safe turbine and main condenser operating and design conditions should loss of vacuum occur. Condenser vacuum switches are also discussed in 7.3.1.1.2.4.1.13.

7.7.1.5.3.6 Testability

Testing controls are provided for testing the turbine valve reactor protection system interface signal switches in the following ways:

a. Actuate each ~~stop~~ throttle valve individually to the 10% closed point with no interaction with other valves.

~~b. Actuate the following pairs of stop valves to the 10% closed point, one pair at a time: 1 and 2; 3 and 4; 1 and 3; 2 and 4.~~

b. Actuate one governor valve fast closure hydraulic oil pressure switch at a time by actuating test valves in the pressure switch sensing line.

c. Individually test each main condenser low vacuum switch.

7.7.1.5.4 Environmental Considerations

The turbine-generator control system is required to operate in the normal plant environment for power generation purposes only.

Instruments and controls on the turbine that experience the turbine building normal design environment are listed in Table 3.11-1. The logic, remote control units, and instrument terminals located in the control room experience the environment listed in Table 3.11-1.

7.7.1.5.5 Operational Considerations

7.7.1.5.5.1 General Information

Process variable which are controlled by the pressure regulator, speed/load control system are displayed on the turbine-generator section of the main control board. Manual and automatic control modes for the various turbine-generator operational modes (such as startup, normal operation, and shutdown), are available to the operator from the main control board. Auto display lights are provided to inform the operator as to the operating mode of the turbine-generator unit.

In the event of control malfunction during an automatic control mode, control is transferred to the manual mode with attendant alarm to alert the operator of the condition.

At least two pressure control channels, operating redundantly, receive inputs from independent pressure transducers in the main steam line upstream of the main steam stop valves and from the pressure reference unit. Main steam pressure indications and pressure setpoint adjustments/indications are located on the turbine control panel. Pressure set point adjustment is ~~limited to~~ about one psi per sec. ~~by motor speed~~ In the event of failure of either regulator, alarm communication is provided in the main control room.

insert "B" see next page for insert.

7.7.1.5.5.2 Reactor Operator Information

The NSSS pressure regulator will have the following or equivalent controls and information displayed in the main control room:

a. Main steam pressure transducer output regulator A.

b. Main steam pressure transducer output regulator B.

c. Main steam pressure regulator set point A.

d. Main steam pressure regulator set point B.

INSERT "B" TO PAGE 7.7-44

when in manual and using the normal raise/lower pressure set point adjust. In "fast action" the pressure set point adjust is about 10 psi per sec. When the pressure set point adjust is in auto, the rate is determined by the operator entered value. The maximum auto rate is limited by a constant entered in the computer system using a keylock switch.

e. Individual bypass valve position indicator.

~~f. Individual bypass valve demand control signal.~~

f ~~g.~~ Bypass valve test controls.

g ~~h.~~ Pressure regulator selection control.

7.7.1.5.5.3 Set Points

Safety set points associated with this system are discussed and tablulated in 7.2.2.1 and 7.3.1.1.2.13.3.

7.7.1.6 Neutron Monitoring System - Traversing In-core Probe (TIP) Subsystem - Instrumentation and Controls

7.7.1.6.1 System Identification

7.7.1.6.1.1 General

Flux readings along the axial length of the core are obtained by fully inserting the traversing ion chamber into one of the calibration guide tubes, then taking data as the chamber is withdrawn. The data goes directly to the computer. One traversing chamber and its associated drive mechanism is provided for each group of up to nine fixed in-core assemblies.

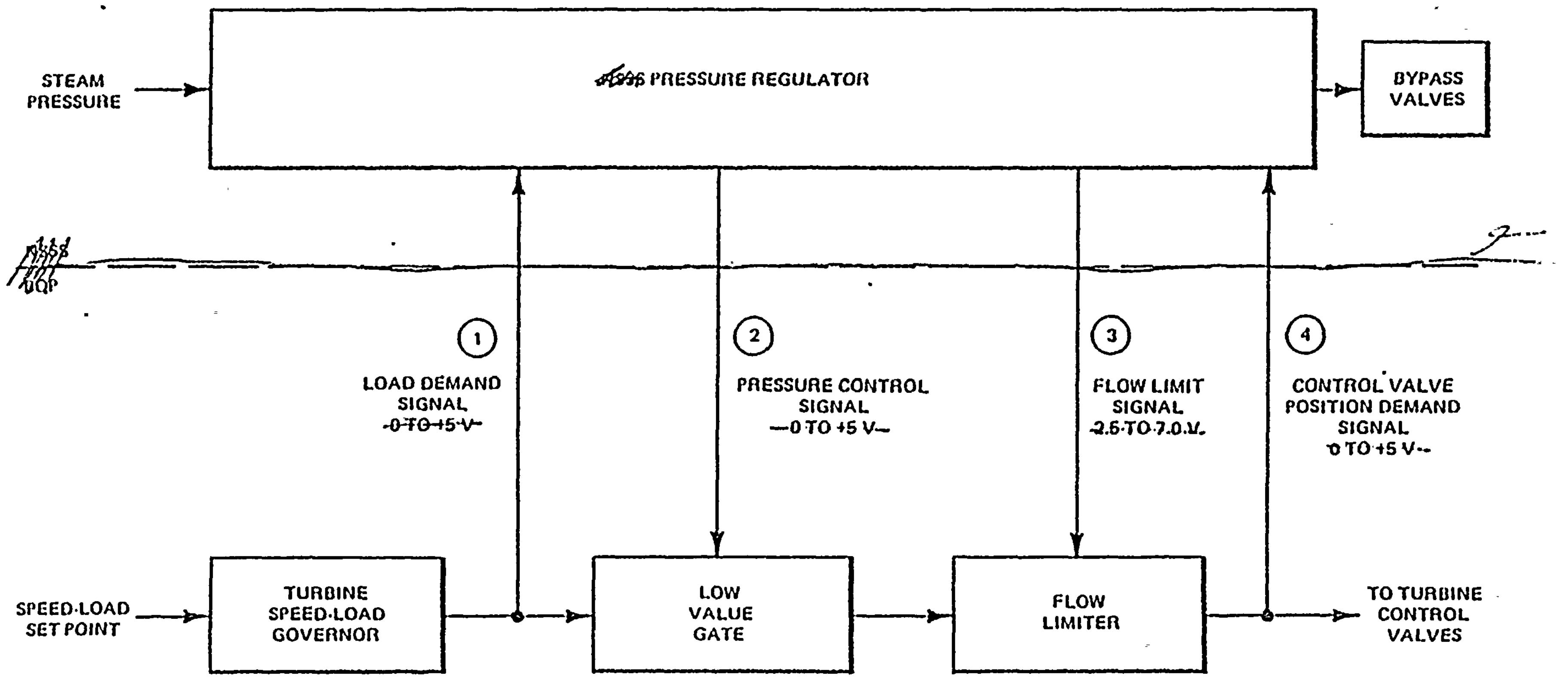
The control of the subject system is discussed in this section.

7.7.1.6.1.2 Classification

This system is a power generation system, and is classified as not related to safety.

7.7.1.6.1.3 Reference Design

Table 7.1-2 lists reference design information. The subject instrumentation and control system is an operational system and has no safety function. Therefore, there are no safety design differences between this system and those of the reference design facilities. This system is functionally identical to the referenced system.



WASHINGTON PUBLIC POWER SUPPLY SYSTEM
NUCLEAR PROJECT NO. 2

SIMPLIFIED DIAGRAM PRESSURE CONTROL SYSTEM.

FIGURE 7.7-9

Q. 40.61
(10.2)

Provide a discussion of the inservice inspection program for the throttle-stop valve, the control valve, the reheat stop valve and interceptor steam valve. Discuss the capability for testing of essential components during operation of the turbine-generator system. (Refer to Paragraph III.5 and III.6 of Section 10.2, Revision 1, of the SRP.)

Response:

See revised Section 10.2.2.*

*Draft page changes attached.

The main steam stop and control valves are located in the steam chest assembly which is parallel to the axis of the high pressure turbine. The closure time is .2 seconds for the stop valves and .25 seconds for the control valves.

A failure of one valve causes the other valves to increase or decrease their opening to compensate for that valve. If one valve fails open at low load condition, the other valves close. If the closing of the other valves is not enough to compensate for that valve, the turbine overspeeds thereby increasing the generator output frequency.

The reheat stop and intercept valves are inline valves located in the crossover piping between the moisture separator/reheater and low pressure turbine. The closure time for these valves is .15 seconds.

Insert Attached →

Each of the extraction steam lines has a reverse current valve and a gate valve, with the exception of the extraction lines to low pressure heater number 1. These valves are located near the condenser. Upon turbine trip the reverse current valves close. The closure time for these valves is .5 seconds. Because of the fast closure time and the short distance between these valves and the extraction points at the turbine, the amount of steam in these lines does not effect the turbine coastdown following a turbine trip.

10.2.3 TURBINE DISK INTEGRITY

Analysis of potential turbine missile hazards and drawings showing the orientation of the turbine with respect to important structures are presented in 3.5. Discussions concerning disk materials and their properties, design, and inspection are available in References 10.2-1 and 10.2-2.

10.2.4 SAFETY EVALUATION

The steam entering the high pressure turbine may contain fission, coolant activation and activated corrosion products. The anticipated concentration of nitrogen-16, which is the dominant radionuclide entering the high pressure turbine, is discussed in 12.2. Moisture separation and transit time between the high pressure and low pressure turbines reduces the concentration of radionuclides in the steam prior to entering the low pressure turbine. Most of the gaseous radioactivity is removed by the steam-jet air ejector and routed to the off-gas system (Refer to 11.3). The condensate in the condenser hotwell contains significantly less radioactive material than the inlet steam.

INSERT to page 10.2-7

The valves described above will be closed monthly by using the "Valve Test Mode" of the turbine control system. Pressure variations caused by closing a governor valve cause the other governor valves to open. Therefore, testing must be done at a reduced power level to provide sufficient margin for pressure control. Details of the pressure control system are discussed in Section 7.7.1.5.

In addition, one of each valve will have its internals inspected once every three years.

Q. 40.62
(10.2)

Provide a complete list of turbine-generator protective trips. Separate these trips into two categories: (1) those that will trip the turbine due to mechanical faults; and (2) those that will trip the turbine due to electric faults in the generator.

Response:

The following tabulation is a list of the turbine-generator protective trips:

Mechanical Faults	Electric Faults
Low vacuum	Generator differential relay
Thrust bearing wear	Reverse phase
Low oil pressure	Field relay
Overspeed	Generator overvoltage
Manual	Generator overcurrent on startup
Anti-motoring	Generator overvoltage on startup
Low EH (electro-hydraulic) fluid level	Generator directional overcurrent
Reactor high water level	Unit overall differential (Generator and main stepup transformer)

Q. 40.63
(10.2)

Provide in Section 10.2.5.6 of the FSAR, information regarding the turbine-generator automatic load-following function.

Response:

Section 10.2.5.6 was revised in Amendment 3 to the FSAR to contain load-following information. See also the response to 40.60.

Q. 40.64
(10.4.1)

Discuss the means taken to prevent galvanic corrosion of the condenser tubes and other components. (Refer to Paragraph III.1 of Section 10.4.1, Revision 1, of the SRP.)

Response:

See revised Section 10.4.1.3.*

*Draft page changes attached.

During transient conditions, the condenser is designed to receive turbine bypass steam and feedwater heater and drain tank high-level discharges. The condenser is also designed to receive relief valve discharges from moisture separators, feedwater heater shells, steam seal regulators, and various steam supply lines.

The condenser is cooled by the circulating water system described in 10.4.5.

Air inleakage and non-condensible gases, are removed by the main condenser evacuation system described in 10.4.2.

Before leaving the condenser, the condensate is deaerated to reduce the level of dissolved oxygen to less than 0.005cc per liter.

10.4.1.3 Safety Evaluation

During operation, radioactive steam, gases, and condensate are present in the shell of the main condenser. The inventory of radioactive contaminants during operation is discussed in 12.2.1.2.2.7. Shielding for and controlled access to the main condenser is provided in Chapter 12.

Hydrogen generation buildup during operation is prevented by continuous evacuation of the main condenser. During shutdown, there are no hydrogen sources to the condenser.

The main condenser is not required for safe shutdown of the reactor and does not perform safety functions. Due to the distance of the main condenser from safety-related equipment, there will be no damage to safety equipment from flooding caused by failure of the condenser. The low pressure turbine is directly connected to the condenser.

Exhaust hood overheating protection is provided by sprays located downstream of the last-stage blades of the turbine.

Loss of main condenser vacuum causes the turbine to trip. Should the turbine stop valves, control valves, or bypass valves fail to close upon loss of condenser vacuum, rupture diaphragms on each turbine exhaust connection to the condenser protect the condenser and turbine exhaust hoods against overpressurization. In this event, steam would exhaust to the turbine building.

→ [# Insert from next page]

INSERT TO PAGE 10.4-3

The material selection and application in the condenser design does not require galvanic corrosion protection. The tube and tube sheet material are copper alloys with the same galvanic potential. The steel water box is covered with an epoxy coating which protects it from galvanic corrosion. If the epoxy coating fails, galvanic corrosion will occur in the water box. Therefore, the structural integrity of the tubes and the tube sheet will not be affected.

Q. 40.65
(10.4.1)

Discuss the effect of any degradation of the main condenser (i.e., leakage or a partial loss of vacuum) on reactor operation. (Refer to Paragraph III.1 of Section 10.4.1, Revision 1, of the SRP.)

Response:

See revised Section 10.4.1.3.*

*Draft page changes attached.

During transient conditions, the condenser is designed to receive turbine bypass steam and feedwater heater and drain tank high-level discharges. The condenser is also designed to receive relief valve discharges from moisture separators, feedwater heater shells, steam seal regulators, and various steam supply lines.

The condenser is cooled by the circulating water system described in 10.4.5.

Air inleakage and non-condensible gases, are removed by the main condenser evacuation system described in 10.4.2.

Before leaving the condenser, the condensate is deaerated to reduce the level of dissolved oxygen to less than 0.005cc per liter.

10.4.1.3 Safety Evaluation

During operation, radioactive steam, gases, and condensate are present in the shell of the main condenser. The inventory of radioactive contaminants during operation is discussed in 12.2.1.2.2.7. Shielding for and controlled access to the main condenser is provided in Chapter 12. [INSERT 'A']

Hydrogen generation buildup during operation is prevented by continuous evacuation of the main condenser. During shutdown, there are no hydrogen sources to the condenser.

The main condenser is not required for safe shutdown of the reactor and does not perform safety functions. [INSERT 'B'] Due to the distance of the main condenser from safety-related equipment, there will be no damage to safety equipment from flooding caused by failure of the condenser. ~~The low pressure turbine is directly connected to the condenser~~.

Exhaust hood overheating protection is provided by sprays located downstream of the last-stage blades of the turbine.

Loss of main condenser vacuum causes the turbine to trip. Should the turbine stop valves, control valves, or bypass valves fail to close upon loss of condenser vacuum, rupture diaphragms on each turbine exhaust connection to the condenser protect the condenser and turbine exhaust hoods against overpressurization. In this event, steam would exhaust to the turbine building.

INSERT 'A' TO PAGE 10.4-3

The means of controlling and detecting the leakage of this radioactive inventory in and out of the main condenser is discussed in sections 11.3 and 11.5.2.2.

INSERT 'B' TO PAGE 10.4-3

However, degradation of the condenser in the form of a leak, loss of circulating water, or air ejector malfunction could lead to a loss of condenser vacuum which removes the effective ability of the condenser as a heat sink. As a consequence, loss of vacuum provides a main steam isolation valve closure signal. Refer to sections 7.3.1.1.2.4.1.13 and 7.7.1.5.3.5.4.1 for a further description.

Q. 040.66
(10.4.1)

Discuss the possible mechanisms for either hydrogen production in the exhaust steam side of the condenser or hydrogen carry-over from the reactor. Indicate the estimated rate of hydrogen accumulation in standard cubic feet per minute. Discuss how a buildup of hydrogen is prevented in the WNP-2 main condenser. (Refer to Paragraph III.1 of Section 10.4.1, Revision 1, of the SRP.)

Response:

See revised Section 10.4.1.3.*

*Draft page change attached

During transient conditions, the condenser is designed to receive turbine bypass steam and feedwater heater and drain tank high-level discharges. The condenser is also designed to receive relief valve discharges from moisture separators, feedwater heater shells, steam seal regulators, and various steam supply lines.

The condenser is cooled by the circulating water system described in 10.4.5.

Air inleakage and non-condensible gases, are removed by the main condenser evacuation system described in 10.4.2.

Before leaving the condenser, the condensate is deaerated to reduce the level of dissolved oxygen to less than 0.005cc per liter.

10.4.1.3 Safety Evaluation

During operation, radioactive steam, gases, and condensate are present in the shell of the main condenser. The inventory of radioactive contaminants during operation is discussed in 12.2.1.2.2.7. Shielding for and controlled access to the main condenser is provided in Chapter 12.

Hydrogen generation buildup during operation is prevented by continuous evacuation of the main condenser by the air removal system (see subsection 10.4.2) and the off gas system (see subsection 11.3.2). ~~During shutdown, there are no hydrogen sources to the condenser.~~
The main condenser is not required for safe shutdown of the reactor and does not perform safety functions. Due to the distance of the main condenser from safety-related equipment, there will be no damage to safety equipment from flooding caused by failure of the condenser. The low pressure turbine is directly connected to the condenser.

Exhaust hood overheating protection is provided by sprays located downstream of the last-stage blades of the turbine.

Loss of main condenser vacuum causes the turbine to trip. Should the turbine stop valves, control valves, or bypass valves fail to close upon loss of condenser vacuum, rupture diaphragms on each turbine exhaust connection to the condenser protect the condenser and turbine exhaust hoods against overpressurization. In this event, steam would exhaust to the turbine building.

The principal mechanism for the generation of hydrogen and oxygen is the radiolytic decomposition of water. The radiolytic decomposition rate at rated power. ~~(corrected to 130° F and 1 atmosphere pressure)~~ is 128scfm of hydrogen and 64scfm of oxygen.

Q. 40.67
(10.4.1)

Discuss the means for detecting, controlling and correcting leakage of the cooling water in the condenser tubes into the condensate. (Refer to Paragraph III.2.a at Section 10.4.1, Revision 1, of the SRP.)

Response:

See revised Section 10.4.1.5.*

*Draft page changes attached.

10.4.1.4 Tests and Inspections

The condenser shell receives a field hydrostatic test prior to initial operation. This test consists of filling the condenser shell with water and, inspecting the entire tube sheet and shell welds and surfaces for visible leakage and/or excessive deflection.

The tube side of the condenser is hydrostatically field tested at 5 psi above design pressure. Pressure is maintained for thirty minutes. No visible leaks or loss of pressure is acceptable.

10.4.1.5 Instrumentation

The condenser shell is provided with local and remote hotwell level and pressure indication. The remote indication is by means of indicators and alarms in the main control room. The condensate level in the condenser hotwell is maintained within proper limits by automatic controls which provide for transfer of condensate to and from the condensate storage tanks as needed to satisfy the requirements of the steam system. Condensate temperature is measured in the outlet line of the condensate pumps.

Turbine exhaust hood temperature is monitored and controlled with water sprays to provide protection from exhaust hood overheating.

A high condenser backpressure alarm is provided at approximately 5 inches Hg absolute. Turbine trip is activated on loss of main condenser vacuum with backpressure reaching or exceeding a set point of approximately 10 inches Hg absolute.

Water box pressure and temperature measurements are provided.

Replace with attached insert

~~Conductivity~~ elements located in troughs at the ~~bottom~~ of the tube sheets ~~detect leakage of circulating~~ water into the condenser steam space.

INSERT TO PAGE 10.4-4

Circulating water in leakage to the main condenser is monitored by conductivity elements located in the tube sheet troughs, conductivity of the condensate demineralizer influent (both which alarm in the main control room) and a condenser hot well sampling and conductivity measuring system for characterizing leakage. Leakage is controlled (prevented) to the extent possible by maintaining chemistry control in the circulating water to provide optimization between scale formation and corrosion. Tube leakage is corrected by isolating and draining the tube sections containing leaking tubes and then locating and plugging the leaking tube.

Question 040.68 (Ref.: FSAR 10.4.1)

Provide the permissible cooling water inleakage and time of operation with inleakage to assure that the condensate/feedwater quality can be maintained within safe limits (Reference: Paragraph III.2.b, Section 10.4.1, Rev. 1, Standard Review Plan).

Response

Primary coolant water quality is maintained by limiting the feedwater conductivity to < 0.1 umho/cm and by a reactor water cleanup system. The feedwater quality is maintained by the condensate filter demineralizer system which is designed to permit sustained operation at a condenser inleakage of 36 gpm with a 3:1 cation to anion resin ratio and 0.2 pounds per square foot precoat loading. The design includes provision for higher filter demineralizer precoat loadings with variable cation to anion resin ratios wherein condenser inleakage up to 108 gpm can be tolerated.

Time of operation for any level of inleakage is subject to controlling feedwater conductivity to ≤ 0.1 umho/cm and maintenance of 50 percent of the system installed ion exchange capacity. The time of operation influencing factors are: 1) frequency of precoating (one hour maximum), 2) precoat level (0.3#/ft^2 maximum), 3) cation/anion ratio (chemically equivalent mixture preferred), 4) concentration of ionic species in the circulating water at a given cycle of concentration, and 5) the percent pass removal of ionic constituents.

Q. 40.69
(10.4.1)

Indicate and describe the means of detecting radioactive leakage into and out of the main condenser. Indicate what provisions have been incorporated into the WNP-2 facility to preclude unacceptable accidental release of radioactivity to the environment. (Refer to Paragraph III.2.b of Section 10.4.1, Revision 1, of the SRP.)

Response:

Please see revised Section 10.4.1.3.* The main condenser evacuation system maintains a vacuum to remove noncondensible gases from the condenser, including air and radioactive gaseous products originating in the reactor. This effluent is discharged to the gaseous radwaste system. See Section 11.3 for a description of this system. Monitoring and control of release paths from the gaseous radwaste system and other potential release paths from the condenser (e.g., turbine building exhaust, circulating water, etc.) is described in Section 11.5.2. See also Sections 10.4.2.3 and 10.4.2.5.

*Draft page change attached to Question 40.65.

Q. 40.70
(10.4.1)

Discuss the operation of the main steam line isolation valves if there is a loss of condenser vacuum. (Refer to Paragraph III.3b of Section 10.4.1, Revision 1, of the SRP.)

Response:

See revised Sections 10.4.1.5, 7.3.1.1.2.4.1.13, and 7.3.2.2.2.3.1.12,*
See also the response to 40.65.

*Draft page changes attached.

10.4.1.4 Tests and Inspections

The condenser shell receives a field hydrostatic test prior to initial operation. This test consists of filling the condenser shell with water and, inspecting the entire tube sheet and shell welds and surfaces for visible leakage and/or excessive deflection.

The tube side of the condenser is hydrostatically field tested at 5 psi above design pressure. Pressure is maintained for thirty minutes. No visible leaks or loss of pressure is acceptable.

10.4.1.5 Instrumentation

The condenser shell is provided with local and remote hotwell level and pressure indication. The remote indication is by means of indicators and alarms in the main control room. The condensate level in the condenser hotwell is maintained within proper limits by automatic controls which provide for transfer of condensate to and from the condensate storage tanks as needed to satisfy the requirements of the steam system. Condensate temperature is measured in the outlet line of the condensate pumps.

Turbine exhaust hood temperature is monitored and controlled with water sprays to provide protection from exhaust hood overheating.

A high condenser backpressure alarm is provided at approximately 5 inches Hg absolute. Turbine trip is activated on loss of main condenser vacuum with backpressure reaching or exceeding a set point of approximately 10 inches Hg absolute.

Water box pressure and temperature measurements are provided.

Conductivity elements located in troughs at the bottom of the tube sheets detect leakage of circulating water into the condenser steam space.

The main steam isolation valves are tripped closed when the condenser vacuum reaches or exceeds a setpoint of approximately 23 inches Hg absolute. See section 7.3.1.1.2.4.1.13 for further description.

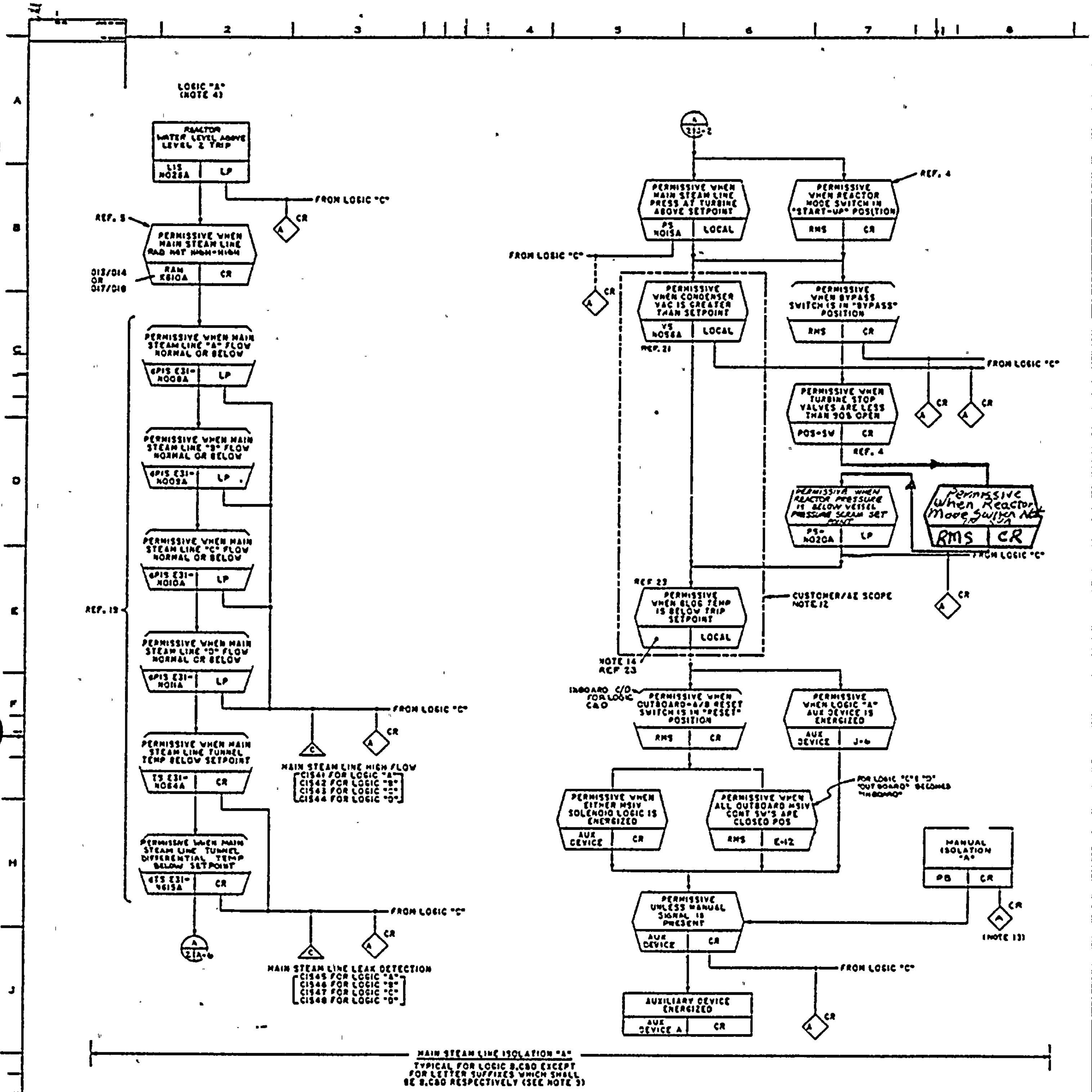

LOGIC "A" (NOTE 4)
REACTOR WATER LEVEL ABOVE LEVEL 2 TRIP
LIS N026A | LP
FROM LOGIC "C"
REF. 5
PERMISSIVE WHEN MAIN STEAM LINE RAD NOT HIGH-HIGH
RAM K610A | CR
PERMISSIVE WHEN MAIN STEAM LINE "A" FLOW NORMAL OR BELOW
PERMISSIVE WHEN MAIN STEAM LINE "B" FLOW NORMAL OR BELOW
PERMISSIVE WHEN MAIN STEAM LINE "C" FLOW NORMAL OR BELOW
PERMISSIVE WHEN MAIN STEAM LINE "D" FLOW NORMAL OR BELOW
PERMISSIVE WHEN MAIN STEAM LINE TUNNEL TEMP BELOW SETPOINT
PERMISSIVE WHEN MAIN STEAM LINE TUNNEL DIFFERENTIAL TEMP BELOW SETPOINT
REF. 13
MAIN STEAM LINE HIGH FLOW
C1S41 FOR LOGIC "A"
C1S42 FOR LOGIC "B"
C1S43 FOR LOGIC "C"
C1S44 FOR LOGIC "D"
MAIN STEAM LINE LEAK DETECTION
C1S45 FOR LOGIC "A"
C1S46 FOR LOGIC "B"
C1S47 FOR LOGIC "C"
C1S48 FOR LOGIC "D"
PERMISSIVE WHEN MAIN STEAM LINE PRESS AT TURBINE ABOVE SETPOINT
PS N015A | LOCAL
PERMISSIVE WHEN REACTOR MODE SWITCH IN "START-UP" POSITION
RMS | CR
REF. 4
PERMISSIVE WHEN CONDENSER VAC IS GREATER THAN SETPOINT
VS N056A | LOCAL
REF. 21
PERMISSIVE WHEN BYPASS SWITCH IS IN "BYPASS" POSITION
PERMISSIVE WHEN TURBINE STOP VALVES ARE LESS THAN 90% OPEN
POS-SW | CR
PERMISSIVE WHEN REACTOR PRESSURE IS BELOW VESSEL PRESSURE SCRAM SET POINT
PS-N020A | LP
Permissive when Reactor Mode Switch
RMS | CR
REF 23
PERMISSIVE WHEN BLDG TEMP IS BELOW TRIP SETPOINT
LOCAL
CUSTOMER/AE SCOPE NOTE 12
NOTE 14 REF 23
INBOARD C/D FOR LOGIC C&D
PERMISSIVE WHEN OUTBOARD-A/B RESET SWITCH IS IN "RESET" POSITION
PERMISSIVE WHEN LOGIC "A" AUX DEVICE IS ENERGIZED
AUX DEVICE | J-6
PERMISSIVE WHEN EITHER MSIV SOLENOID LOGIC IS ENERGIZED
PERMISSIVE WHEN ALL OUTBOARD MSIV CONT SW'S ARE CLOSED POS
RMS | E-12
FOR LOGIC "C"&"D" "OUTBOARD" BECOMES "INBOARD"
MANUAL ISOLATION "A"
PB | CR
(NOTE 13)
PERMISSIVE UNLESS MANUAL SIGNAL IS PRESENT
AUX DEVICE | CR
AUXILIARY DEVICE ENERGIZED
AUX DEVICE A | CR
MAIN STEAM LINE ISOLATION "A"
TYPICAL FOR LOGIC B,C&D EXCEPT FOR LETTER SUFFIXES WHICH SHALL BE B,C&D RESPECTIVELY (SEE NOTE 3)

Fig 7.3-11b

RHR system high space and differential temperature trips are interlocked with the RHR system to provide system isolation when leakage is detected.

7.3.1.1.2.4.1.11.7 Subsystem Testability

Testability is discussed in 7.3.2.2.2.3.1.10.

7.3.1.1.2.4.1.12 Not Used

7.3.1.1.2.4.1.13 Main Condenser Vacuum Trip

7.3.1.1.2.4.1.13.1 Subsystem Identification

In addition to the present turbine stop valve trip resulting from low condenser vacuum which is a standard component of turbine system instrumentation, a main steamline isolation valve trip from a low condenser vacuum instrumentation system is provided, and meets the safety design basis of the nuclear steam supply shutoff and primary containment isolation systems. During plant startup the main steam line isolation valve trip is bypassed. See section 7.3.2.2.2.3.1.12 for further description. The main turbine condenser low vacuum signal would indicate a leak in the condenser. Initiation of automatic closure of various Class A valves will prevent excessive loss of reactor coolant and the release of significant amounts of radioactive material from the nuclear system process barrier. Upon detection of turbine condenser low vacuum, the following lines will be isolated:

a. All four main steamlines,

b. Main steamline drain,

c. Reactor water sample line.

The turbine condenser low vacuum trip setting was selected far enough above the normal operating vacuum to avoid spurious isolation, yet low enough to provide an isolation signal prior to the rupture of the condenser and subsequent loss of reactor coolant and release of radioactive material.

7.3.1.1.2.4.1.13.2 Subsystem Power Supplies

Logic divisions A and C and one solenoid of both the inboard and outboard main steam line isolation valves are supplied from reactor protection system bus A.

Logic divisions B and D and the second solenoid of both the inboard and outboard main steam line isolation valves are supplied from reactor protection system bus B.

7.3.2.2.2.3.1.12 Operating Bypasses (IEEE 279-1971 Paragraph 4.12)

a. PCRVICS:

The isolation valve control system has two bypasses. One is the main steam line low pressure bypass which is imposed by means of the mode switch in the other-than-run mode. The mode switch cannot be left in this position with neutron flux measuring power above 10% of rated power imposing a scram. Therefore the bypass is considered to be removed in accordance with the intent of IEEE 279-1971, although it is a manual action that removes it rather than an automatic one.

The low condenser vacuum bypass is imposed by means of a manual bypass switch in conjunction with closure of the turbine stop valves, the mode switch in the other-than-run mode, and reactor pressure being below the low pressure interlock. Bypass removal is accomplished automatically by the opening of the turbine stop valves or raising reactor pressure above the interlock pressure and manually by placing the bypass switch in the normal position or placing the mode switch in the run position. Hence, the bypass is considered to be removed in accordance with IEEE 279-1971.

In the case of the motor operated valves, automatic or manual closure can be prevented by shutting off electric power to the motor starters. This action will be indicated by annunciators in the main control room.

As in other engineered safeguards systems many of the sensors for process variables operate from instrument lines hooked up, by necessity, with root valves and instrument valves. Shutting off these valves in certain selected combinations can disable redundant sensors and thus prevent operation of the system. Precautions are taken to preclude such a possibility by providing administrative control of access to instrument valves.

b. Reactor Building Ventilation Exhaust Plenum Radiation Monitoring Subsystem:

This design requirements is not applicable to this protective function.

Q. 40.71
(10.4.1)

Indicate what design provisions have been incorporated into the WNP-2 facility to preclude failures of either the condenser tubes or other components resulting from: (1) a turbine by-pass blowdown; or (2) other high temperature drains into the condenser shell. (Refer to Paragraph III.3.c of Section 10.4.1, Revision 1, of the SRP.)

Response:

See revised Section 10.4.1.2 and 10.4.4.2.*

*Draft page changes attached.

The main condenser is designed to accept a maximum of 25% of the rated reactor steam flow from the turbine bypass system (described in 10.4.4) plus 75% of the rated reactor steam flow through the turbine. This steam flow is accommodated without increasing the condenser backpressure to the turbine trip set point or exceeding the allowable turbine exhaust temperature.

The main condenser is designed to deaerate the condensate and provide an oxygen content in the hotwell condensate not exceeding 0.005cc per liter over the entire load range.

The condenser hotwell is designed to contain the condensate that is required during five minutes of full power operation of the turbine. Baffling in the hotwell provides a minimum of three minutes condensate hold-up time which permits the decay of short lived radioactive isotopes.

Condenser construction is designed in accordance with requirements of the Heat Exchange Institute, Standards for Steam Surface Condensers (October, 1971).

The piping associated with the condenser is designed, fabricated, inspected, and erected in accordance with ANSI B31.1 (October, 1971). Seismic category, safety class and design codes are given in 3.2.

10.4.1.2 System Description

Steam from the low pressure turbine is exhausted directly downward into the condenser shells through exhaust openings in the bottom of the turbine casings and is condensed. The condenser serves as a heat sink for several other flows, such as exhaust steam from the reactor feedwater pump turbines, cascading feedwater heater drains, air ejector condenser drains, gland seal steam condenser drain, feedwater heater shell operating vents, turbine gland seals, and the off-gas preheater drains.

Other flows to the condenser originate from the startup vents of the condensate pumps, the reactor feedwater pumps, condensate booster pumps, and condensate pumps, feedwater line startup flushing, reactor feedwater pump turbine drains, low-point drains, ~~and~~ condensate makeup, and feedwater heater dumps or drains. All high temperature drains into the condenser shell have impingement baffles or spray pipes to prevent the steam and entrained water particles from impinging upon the surface of the tubes. Stainless steel lagging is provided where required to protect other condenser components. ~~The description of the~~ The bypass valves are described in section 10.4.4.2

10.4.4 TURBINE BYPASS SYSTEM

10.4.4.1 Design Bases

a. The turbine bypass system controls reactor steam pressure by sending excess steam flow directly to the main condenser. This permits independent control of reactor pressure and power during reactor vessel heatup to rated pressure prior to and while the turbine is brought up to speed and synchronized under turbine speed-load control and when cooling down the reactor. Following main turbine generator trips and during power operation when the reactor steam generation exceeds the transient turbine steam requirements, the turbine bypass controls reactor overpressure within its capacity and in accordance with the steam generation rate.

b. The turbine bypass system capacity is 25 percent of rated reactor steam flow. The bypass system can accommodate a 25 percent turbine load rejection without causing a significant change in reactor steam flow.

c. The turbine bypass valves are capable of remote manual operation.

10.4.4.2 System Description

The turbine bypass system consists of four hydraulically operated control valves which are mounted on a valve manifold. (See Figure 10.4-8) They are connected to the main steam line header upstream of the turbine main stop valves by four 10 inch lines. Each valve outlet discharges into the manifold which is piped directly to pressure-reducing perforated pipes located in the condenser shell (Figure 10.3-1).

The four individual valves are called "drag" valves as they lower the pressure of the steam by reducing its flow velocity before it enters the condenser system. The steam flow velocity is reduced by diverting the main flow into many individual passages, each containing a series of right angle turns with each turn reducing the pressure of the steam. By controlling the amount of minute passages through which the steam passes, the flow velocity and therefore the pressure is controlled.

Q. 40.72
(10.4.1)

In Section 10.4.1.4 of the FSAR, you discuss the tests and the initial field inspection of the main condenser. However, you do not indicate the frequency and extent of inservice inspection of this component. Accordingly, provide this information. (Refer to the first paragraph of the Acceptance Criteria in Section 10.4.1, Revision 1, of the SRP.)

Response:

See revised Section 10.4.1.4.*

*Draft page changes attached.

10.4.1.4 Tests and Inspections

The condenser shell receives a field hydrostatic test prior to initial operation. This test consists of filling the condenser shell with water and, inspecting the entire tube sheet and shell welds and surfaces for visible leakage and/or excessive deflection.

The tube side of the condenser is hydrostatically field tested at 5 psi above design pressure. Pressure is maintained for thirty minutes. No visible leaks or loss of pressure is acceptable.

10.4.1.5 Instrumentation

The condenser shell is provided with local and remote hotwell level and pressure indication. The remote indication is by means of indicators and alarms in the main control room. The condensate level in the condenser hotwell is maintained within proper limits by automatic controls which provide for transfer of condensate to and from the condensate storage tanks as needed to satisfy the requirements of the steam system. Condensate temperature is measured in the outlet line of the condensate pumps.

Turbine exhaust hood temperature is monitored and controlled with water sprays to provide protection from exhaust hood overheating.

A high condenser backpressure alarm is provided at approximately 5 inches Hg absolute. Turbine trip is activated on loss of main condenser vacuum with backpressure reaching or exceeding a set point of approximately 10 inches Hg absolute.

Water box pressure and temperature measurements are provided.

Conductivity elements located in troughs at the bottom of the tube sheets detect leakage of circulating water into the condenser steam space.

Inservice inspection on the condenser is limited to monitoring the following variables:

a. Condenser vacuum. If good vacuum is not being obtained, the flow of air leaving the steam jet air ejector is checked to determine if air inleakage is a problem.

b. Conductivity measurements taken by the tube leak detection system. ~~is described in our response to Question 040.51.~~

c. Air accumulation in the top of the water boxes.

d. Circulating water pressure drop across the condenser. This is an indication of flow blockage.

[illegible]

Q. 40.73
(10.4.4)

Provide a discussion regarding the measures you have taken to provide assurance that a failure of a high energy line in the turbine by-pass system will not have an adverse effect on, or preclude operation of, the turbine speed controls or any safety-related components or systems located close to the turbine by-pass system. (Refer to Paragraph III.4 of Section 10.4.4, Revision 1, of the SRP.)

Response:

All safety-related components and the turbine speed control system are located remote from the turbine by-pass piping and valves. The by-pass system is located on the second floor of the turbine building (See Fig. 1.2-4) and the speed control and safety-related components are located on the floor above, thus being separated by a concrete floor and wall and making any adverse affects extremely unlikely. In any case, as described in Section 10.2.2, the turbine overspeed protection system is a fail-safe design.

As stated in the section:

> "The turbine overspeed control system equipment and electrical wiring may be destroyed by a postulated piping failure; however, this loss would not interfere with the turbine trip due to the fail-safe feature of the mechanical overspeed trip mechanism.
>
> A missile may destroy the electromagnetic speed pickups and associated electrical wiring, but the final line of protection is the mechanical overspeed trip mechanism. Missile damage to it or its associated hydraulic lines would result in a loss of high pressure fluid thereby causing turbine trip."

In addition, as described in the response to Question 10.12, no analysis is necessary of the effects of a steam line break on the safety related components in the Turbine Building since the complete loss of this equipment could occur for such an event without the loss of capability to bring the plant to a cold shutdown or mitigate the radiological consequences of such an incident even assuming a single failure in the safety systems that remain unaffected.

Q. 40.74
(10.4.4)

In Section 10.4.4.4 of the FSAR, you discuss the tests and the initial field inspection of the turbine bypass system. However, you do not indicate the frequency and extent of inservice testing and inspection of this system. Accordingly, provide this information. (Refer to Paragraph II.3 of Section 10.4.4, Revision 1, of the SRP.)

Response:

See revised Section 10.4.4.4.*

*Draft page changes attached.

10.4.4.4 Tests and Inspections

The opening and closing of the turbine bypass system valves is checked during initial startup and shutdown for performance and timing. The bypass steam lines upstream of the bypass valves are hydrostatically tested to confirm leak tightness. Radiography and visual inspection of all pipe weld joints are performed on this piping.

Each turbine bypass valve can be tested independently and remotely during plant operation. The testing is conducted once a month for each turbine bypass valve by stroking the valve open and shut using the "Valve Test Mode" of the turbine control system.

10.4.4.5 Instrumentation

The controls and valves are designed so that the bypass valves shut if the control system lost its electric power or hydraulic pressure. For testing the bypass valves during operation, the stroke time of the individual valves is increased during testing to limit the rate of bypass flow increase and decrease to approximately 1%/sec of reactor rated flow.

Upon turbine trip or generator load rejection, the start of bypass steam flow is not delayed more than 0.1 second after the start of the stop valve or the control valve fast closure motion. A minimum of 80% of the rated bypass capacity is established within 0.3 seconds after the start of the stop valve or the control valve closure motion. For more detail refer to 7.7.1.5.

10.4.5 CIRCULATING WATER SYSTEM

10.4.5.1 Design Bases

The circulating water system is designed to provide cooling water for the condenser utilizing the atmosphere as a heat sink via mechanical induced draft cooling towers. The cooling towers are designed to remove 7.962×10^9 BTU/hr from the circulating water. In addition, the cooling towers are designed to cool the plant service water during normal operation and the standby service water during shutdown operation. The heat gained in the condenser (7.703×10^9 BTU/hr) is removed in six circular mechanical draft cooling towers. The operation of the towers is not essential to the safety of the plant.

Makeup for tower evaporation, wind loss, and blowdown is obtained from the Columbia River by makeup pumps. Cooled blowdown from the cooling towers is discharged to the river.

Open Items from Previous Sets

22.039
423.014
423.023(b)

Q. 22.039

Describe the analysis performed to establish the size of the suction screens in the reactor heat removal system. Provide a drawing showing the suction screen assembly.

Response:

The screen size for the suction strainers on the residual heat removal system is based on the more restrictive criteria set by the pump manufacturer or the spray nozzle orifice opening.

The pump manufacturer imposed a maximum particle size of three thirty-seconds (3/32) of an inch based on the size of the smallest orifice/flow path in the pump mechanical seal. This is significantly more restrictive than the requirement imposed by the spray nozzles which have an orifice opening of seventeen sixty-fourths (17/64) of an inch. Accordingly, the strainers will be specified to prevent the passage of particles three thirty-seconds of an inch or greater.

The suction strainers are presently being procured, and until Vendor Drawings can be supplied the following data apply to the strainers:

Primary Service Rating: ANSI 1501-1

Quality Class I

Seismic Category I

Cleanliness Class B

Applicable Code: Strainer materials and fabrication shall meet ASME III-2 requirements. The "N" stamp shall not be applied since the strainers cannot be hydrostatically tested.

Materials: Strainer body shall be stainless steel 304 or 316, or engineer approved equal, suitable for submergence in high quality water during a 40 year lifetime.

Strainers shall be conical or cylindrical. Open flow area shall be as large as possible subject to dimensional constraints below. Strainer hole diameter shall be three thirty-seconds (3/32) of an inch. Strainers are to be attached to ANSI 150# RF Flanges.

Quantity	Nominal Diameter (inches)	Maximum Length (inches)	Flow (per strainer) gpm
10	24	22	4200
2	8	14	300
2	6	12	290

Head loss shall be limited to four (4) feet or water assuming the strainer 50% clogged and a water temperature of 220^{o} F.

Acceleration loads are currently under development in concert with the Mark II hydrodynamic load program. They are to be applied concurrently with the load due to process flow through the 50% clogged strainer and a 25 psid (equivalent static) load applied across the projected area of the strainer which results in the most limiting total loading.

Question 423.14: In response to Item 423.4, you modified Section 14.2.4.1.5 of the FSAR to address the matter of significant modifications or repairs to safety-related systems. Define the term "significant modifications and repairs" and designate the group or individuals authorized to determine the significance of a modification or repair and to determine the requirements for retesting the affected system. Indicate how modifications and repairs which are not considered significant, are to be controlled.

Response:

See revised Section 14.2.4.1.5 of the FSAR.* The term "significant" has been deleted and summary description of Startup Problems Reports, Deficiency Reports and Work Requests have been added for clarity. All modifications on systems components or structures after provisional acceptance until release for operation are authorized and documented by Project Engineering Directive (PED) or Startup Problem Reports (SPR) which are reviewed by WPPSS Project Engineering. The assigned test engineer will determine the appropriate retesting or inspection procedures. To ensure that proper retesting of the system which was repaired or modified, Startup Problem Reports, Startup Deficiency Reports and Startup Work Requests (which allow contractors to install approved modifications) are approved for closure by the Startup Superintendent.

*Draft page changes attached.

14.2.4.1.5 Equipment Maintenance and Modifications During Preoperation Testing

~~Significant~~ Modifications or repair to safety related systems will be implemented as a result of a formal system of problem and deviation reporting. Disposition of problems, will be implemented by work requests ~~with design instructions for required changes in design.~~ requiring mechanical or electrical changes or repair by contractors

see insert attached

a. Problem reports, deviation reports and work requests are administered through closed-loop procedural controls to assure resolutions.

b. Retest requirements will be identified, attached to, or referenced by work request number in test files.

c. Design changes will be coordinated by the WPPSS Engineering Division for review by the original design organization or a qualified alternate.

d. Problem and deviation reports, work requests, design change documentation, retest results, and procurement records for safety related systems will be filed in assembled packages or with appropriate cross referencing for retrieveability.

14.2.4.1.6 Preoperational Test Summary

Upon completion of the preoperational test, the test engineer will prepare a test report which includes a summary of the conduct of the test, and evaluation of the test results with reference to the acceptance criteria, and a description of problems encountered and corrective actions taken or proposed. This report will be attached to the official copy of the test.

14.2.4.1.7 Evaluation of Preoperational Test Data

Upon completion of the test, a copy of the official test procedure, data, the test summary, and other applicable attachments will be transmitted to each member of the Test Working Group responsible for review.

14.2.4.1.8 Preoperational Test Records

The Startup Program Manager will maintain all official test records (the copy of the test procedure containing the original test data and signatures and all attachments) until completion of the test program. See 14.2.6 for details of the test records handling and retention program.

14.2.4.2 Administrative Procedures for Startup Testing

a. Startup Problem Reports (SPR), Startup Deficiency Reports (SDR) and Startup Work Requests (SWR) are administered through closed-loop procedural controls to assure resolutions. A completed SPR, SDR and SWR is approved for closure by the Startup Superintendent.

b. Startup Problem Reports (SPR) are used to report design deficiencies and are coordinated by the WPPSS Project Engineering Division for resolution by the original design organization or qualified alternate. The SPR's are reviewed by Project Engineering and a Project Engineering Directive (PED) is issued to define plant modifications or changes that are required. A Startup Work Request (SWR) is then issued to perform the plant modification by contractor personnel or a Startup Deficiency Report is issued to defer the work or have it performed by Startup personnel.

c. Startup Deficiency Reports (SDR) are used to report and track non-design related deficiencies. If required, an SWR will be issued to perform the repair work to resolve the non-design related deficiency, by contractor personnel. Work accomplished by Startup personnel can be accomplished by the SDR without issuing an SWR.

d. Retest requirements will be identified on the SWR or SDR and attached to, or referenced by work request number in test files.

e. Startup Problem and ~~Deviation~~ Deficiency Reports, Startup Work Requests, design change documentation, retest results, and procurement records for safety related systems will be filed in assembled packages or with appropriate cross referencing for retrieveability.

Q. 423.23 (b)

Modify the test abstract for the reactor core isolation cooling (RCIC) system to provide for five cold, quick starts of the system. Indicate the system conditions for a cold, quick start. The Level 1 acceptance criteria in your FSAR refer to operating restrictions presented in Figure 14.2-3 of the FSAR if these acceptance criteria are not met. However, this figure does not contain these restrictions. Provide the appropriate operating restrictions if Level 1 criteria are not met.

Response:

See the revised description for the RCIC startup test (Section 14.2.12.3.14). Also included is a new FSAR figure 14.2-5 "RCIC Acceptance Criteria Curves for Capacity and Activation Time."* The revised test description contains the five cold, quick starts referred to in the question. They are summarized below for clarity.

Cold Start	Conditions	Purpose
1	Rated Pressure, injection to vessel	Establish final controller settings
2	Rated Pressure, injection to vessel	Demonstrate final controller settings
3	Rated Pressure, injection to vessel	Demonstrate initiation from remote control room
4	Rated Pressure, discharge to CST	Establish surveillance test base data
5	150 psig reactor Pressure, discharge to CST	Establish surveillance test base data

*Draft FSAR pages attached.

14.2.12.3.14 Test Number 14 - RCIC System

14.2.12.3.14.1 Purpose

The purpose of this test is to verify the proper operation of the Reactor Core Isolation Cooling (RCIC) system over its expected operating pressure range.

14.2.12.3.14.2 Prerequisites

The preoperational tests have been completed, the POC has reviewed and approved the test procedures and initiation of testing. ~~Initial turbine operation (uncoupled) must be performed to verify satisfactory operation and over-speed trip. The Auxiliary Steam System is available to supply turbine steam. Instrumentation has been installed and calibrated, and sufficient water is available to meet specified purity requirements. The following systems must be operational to the extent necessary to conduct the test: Reactor Vessel, Suppression Pool, Condensate Supply System, and Instrument Air.~~

14.2.12.3.14.3 Description

The RCIC system test consists of two parts: Injection to the condensate storage tank and injection to the reactor vessel. ~~The CST injections consist of controlled and quick starts at reactor pressures ranging from 150 psig (10.5 kg/cm^2) to rated, with corresponding pump discharge pressures throttled between 250 psig (17.6 kg/cm^2) and 1220 psig (85.8 kg/cm^2). During this part of the testing, proper operation of the system will be verified and adjustments made as required to meet this criteria. The reactor vessel injection will consist of a cold quick start of the system with all flow routed to the reactor vessel at >25% power.~~

Insert attached

14.2.12.3.14.4 Criteria

<u>Level 1</u>

The time from actuating signal to required flow must be less than 30 seconds at any reactor pressure between 150 psig (10.5 kg/cm^2) and rated.

INSERT TO PAGE 14.2-109

The initial CST injections consist of manual and automatic starts at 150 psi and at rated reactor pressure. The pump discharge pressure during these tests is throttled to 100 psi above reactor pressure. The initial testing is for demonstrating operability and making initial controller adjustments. This is followed by vessel injections beginning with cold RCIC hardware. "Cold" being defined as a minimum three days without any kind of RCIC operation.

The vessel injections verify the adequacy of the startup transient and also included steady state controller adjustments. Two consecutive vessel injections starting from cold conditions and with the same equipment settings are necessary to demonstrate system reliability. One of these injections is done using the remote control room.

After final controller settings are determined, CST injections at rated pressure and 150 psig pressure are done with initially cold RCIC equipment. These runs provide a benchmark for future surveillance testing.

A demonstration of extended operation of 30 minutes of continuous running or until pump and turbine oil temperature is stabilized is scheduled at a convenient time during the test program.

During vessel injections all reactor steam is routed to the turbine bypass valves. The steam admission valves of the main and feedwater turbines are closed whenever the reactor power is above the moisture carryover threshold.

With pump discharge at any pressure between 150 psig (10.5 kg/cm^2) and 1220 psig (85.8 kg/cm^2), the required flow is 600 gpm. (The limit of 1220 psig includes a conservatively high value of 100 psi for line losses. The measured value may be used if available.)

The RCIC turbine must not trip off during startup.

If any Level 1 criteria are not met, the reactor operation will ~~only~~ be ~~allowed to operate up to a~~ restricted to the power level defined by Figure 14.2-~~2~~ 3 ~~of the Startup Test Instructions~~. This restriction is in addition to any restrictions defined by the technical Specification.

Level 2

The turbine gland seal consenser system shall be capable of preventing steam leakage to the atmosphere.

The differential pressure switch for the RCIC steam supply line high flow isolation trip shall be adjusted to actuate at 300% of the maximum required steady state flow.

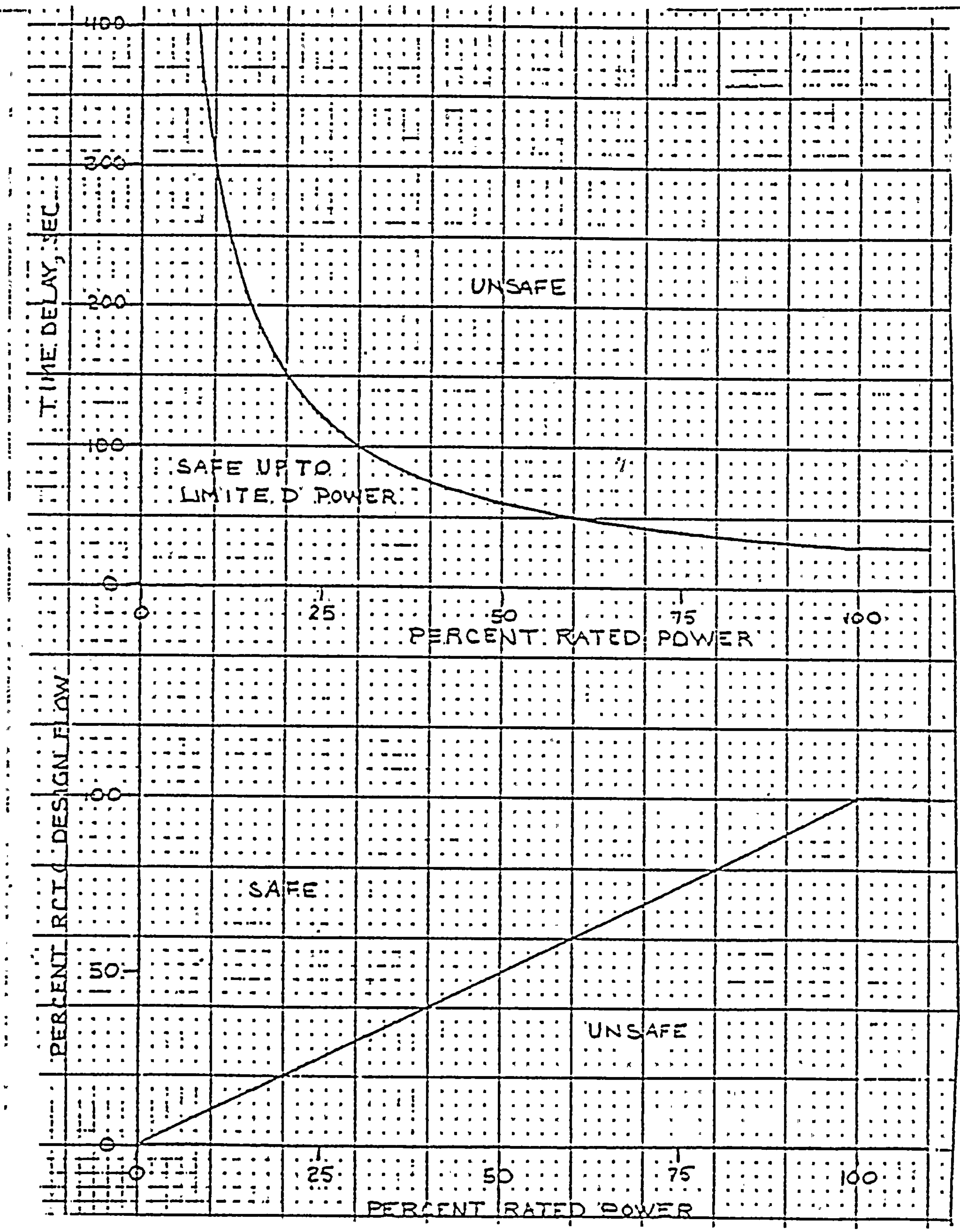


Figure 14.2-5

RCIC ACCEPTANCE CRITERIA CURVES FOR CAPACITY AND ACTUATION TIME DURING POWER ASCENSION TESTING