ENCLOSURE 1

EXAMINATION REPORT - 50-416/OL-85-01

Facility Licensee: Mississippi Power and Light Company
P. O. Box 23054
Jackson, MS 39205

Facility Name: Grand Gulf Nuclear Station

Facility Docket No.: 50-416

Written, oral, and simulator examinations were administered at Grand Gulf Nuclear Station near Port Gibson, Mississippi.

Chief Examiner: John F. Munro — 10/31/85
John F. Munro — Date Signed

Approved by: Bruce A. Wilson — 11/4/85
Bruce A. Wilson, Section Chief — Date Signed

Summary:

Examinations on August 12-16, 1985

Written, oral and simulator examinations were administered to 13 candidates; six of whom passed.

REPORT DETAILS

1. Facility Employees Contacted:

*J. Cross, Plant General Manager
*G. Lhamon, Operations Training Supervisor
M. Shelly, Simulator Supervisor
*K. Beatty, Operations Training Superintendent
C. Bottemiller, Training Instructor
*J. Yelverton, Manager of Plant Support
*J. Robertson, Operations Superintendent
*M. Wright, Plant Manager for Operations
*R. Rogers, Technical Support to Plant General Manager
*J. Bailey, Compliance

*Attended Exit Meeting

2. Examiners:

*J. Munro, NRC
S. Guenther, NRC
K. Brockman, NRC

*Chief Examiner

3. Examination Review Meeting

At the conclusion of the written examinations, the examiners provided G. Lhamon, Operations Training Supervisor, with a copy of the written examination and answer key for review. The following comments were made by the facility reviewers:

a. SRO Exam

(1) Question 6.06 - The question is unclear since it does not specify that only the referenced annunciator was received. If it was assumed that other annunciators were received, then answer b would be correct. Since students cannot state assumptions on multiple choice questions, full credit should be given for answer b or c.

NRC Resolution - The question wording is straightforward and indicates the only conditions that are abnormal with the plant "... operating normally at power ...". No other assumptions are required for the examinee to conclude the correct response. No change to the answer key is warranted.

(2) Question 6.23 - The answer key for this question references GGNS Lesson Plan OP-N32-2-501. Although the answer given by the key is in one portion of the lesson plan, a more complete answer is presented in section 1.4.a.6.d of the lesson plan. This section lists a Turbine Trip as well as the two answers given in the key. Therefore, a Turbine Trip should also be considered a correct response. A copy of the lesson plan is attached for your reference (Attachment I).

NRC Resolution - Section 1.4.a.b.d of the referenced facility lesson plan supports the inclusion of a Turbine Trip as a correct response. The answer key has been modified accordingly.

(3) Question 7.02 - This question requested the 3 immediate operator actions following a failure of rods to insert on a scram with power at 6%. ONEP 05-1-02-I-1 requires the operator to enter EP-10 if power is greater than 5%. Only if power is less than 5% does the referenced ONEP give other immediate actions. Therefore, it is requested that consideration be given to accepting reasonable actions from EP-10 as correct responses, as well as those other actions listed in the ONEP. A copy of ONEP 05-1-02-I-1 is attached for your reference (Attachment II).

NRC Resolution - A typographical error caused the incorrect presentation of the question as detailed in the comment. The question is invalid as written. Delete from exam.

(4) Question 7.06 - This question asked for three (3) conditions to be met prior to restoring a system to service following an automatic isolation per ONEP 05-1-02-III-5. The referenced ONEP does not require three conditions, but rather lists only two conditions for verification of system integrity. These two conditions are:

a) verification that the system is intact; and
b) verification that the operation of the system will not result in an uncontrolled release to the environment.

The remaining verbage of the sentence states methods by which these two conditions can be verified i.e., visual inspection of accessible areas and/or observation of available Process Radiation Monitoring instrumentation and other available indications for inaccessible areas. Since the caution statement in the referenced ONEP is admittedly poorly worded and examinees were undoubtedly confused by the question, it is requested that this question be removed from the examination. If not removed, generous latitude should be given when considering other reasonable answers. ONEP 05-1-02-III-5 is attached for your references (Attachment III).

NRC Resolution - A conservative reading of the procedure indicates that three conditions, as per the answer key, should be verified prior to system restoration. Procedural shortcomings with regard to clarity should be evaluated by the facility and appropriate changes effected. No change to the answer key is warranted.

(5) Question 7.09 - IOI 03-1-01-1 actually lists 9 conditions in section 6.2.17 to be met prior to transfer to run. Any four (4) of these nine requirements should be given full credit, rather than the 5 listed in the answer key. IOI-03-1-01-1 is attached for your reference (Attachment IV).

NRC Resolution - A review of section 6.2.17 of the referenced procedure and the question wording supports the inclusion of additional administrative conditions as correct responses. The question will be reworded for future use to distinguish between plant parametric conditions and administrative conditions. The answer key has been changed accordingly.

(6) Question 7.11 - Administrative Procedure 01-S-06-2, section 6.6.2.d states that operators need only to memorize the entry conditions for EP-1, EP-3 and EP-10, other Emergency Procedures then are entered from these. This is done to minimize the effort necessary to recognize an entry into an Emergency Procedure and therefore, minimize the chance of human error. Although operators are to be generally familiar with the Emergency Procedures other than EP-1, EP-3 and EP-10, they may not know the precise entry conditions.

Technical Specification 3.6.3 gives a limit of 120° for suppression pool temperature before requiring depressurization of the reactor.

Because of the similarity between the Technical Specifications and the requirements of EP-5 and due to the proximity of answer b to the limit of Technical Specification 3.6.3, we are concerned that the examinees may have confused the requirements and hence answered b vice d. It is requested that answer b be given consideration for full credit. A copy of Administrative Procedure 01-S-06-2 is attached for your use (Attachment V).

NRC Resolution - The depressurization directed by the action statement of Technical Specification 3.6.3.1 is allowed to be completed within a 12-hour timeframe and is therefore not analogous to the "Rapid Depressurization" required by EP-5. The question is presented in a multiple choice format to determine the examinee's understanding of the procedure's entry conditions by recognition, rather than by memorization. No change to the answer key is warranted.

(7) Question 7.20 - The answer given in the answer key reflects the system limitation (65 mw) as given in the caution note prior to step 5.2 of the referenced IOI 03-1-01-2. However, step 5.2 gives a procedural limitation of 25 mw. Therefore, full credit should be given for an answer of 25 mw, as well as the answer given in the key. IOI 03-1-01-2 is attached for your use (Attachment VI).

NRC Resolution - Since the question did not specifically request a systematic limitation, the procedural limitation value of 25 mw will be considered as an acceptable answer to part a. Additionally, an alternative answer of "no available indication" will be required for part b to ensure consistency between the conditions of the question and an answer of 25 mw. The answer key has been changed accordingly.

(8) Question 8.06 - The procedure referenced states "When performing electrical lineup and when applicable, verify ...". (underline ours). Since the question did not reference any applicable or specific breaker, consideration should be given to other reasonable answers and credit given for these other answers as appropriate. A copy of procedure 02-S-01-2 is attached for your reference (Attachment VII).

NRC Resolution - The question is clearly worded to elicit generic requirements of a governing administrative procedure. No change to the answer key is warranted.

b. RO Exam

(1) Question 2.06 - The GGNS Lesson Plan referenced (OP-P33-501) was in error in stating a sampling subsystem station was located on the refueling floor. It should have stated the sample station was on the 185' elevation of the containment. Since the incorrect reference to the refuel floor in the question could have caused the examinees confusion, consideration should be given to reasonable answers other than those listed in the key.

NRC Resolution - Acknowledged. The incorrect facility reference material invalidates the question as written. Delete from exam.

(2) Question 2.07 - The lesson plan referenced gives three limitations imposed on the Standby Service Water (SSW) System by a loss of instrument air:

(a) causes all air operated valves to fail shut
(b) loss of make-up water to basins
(c) isolation of fill tank

It further states that loss of air does not affect overall operation of the system. The hypochlorite and acid additions were not mentioned in the lesson plan since these operations are performed manually, rather than by using the installed systems. Therefore, reasonable answers other than the loss of chemical addition capability should be considered.

NRC Resolution - The loss of the ability for both sulfuric acid and hypochloritec injection is detailed by both the facility system description P-41 and the Off-Normal Procedure for "Loss of Instrument Air", 05-1-02-V-9. Alternative answers will only be accepted if consistent with the Automatic Actions of the "Loss of Instrument Air" procedure as it pertains to the SSW system. The answer key has been modified accordingly.

(3) Question 2.20 - As well as the answer listed in the key, Technical Specification Table 3.3.7.1-1, item 6, footnote (h) notes other conditions rather than just hi-hi activity in the air intake duct (such as two downscales) which will result in an automatic isolation of the Control Room Ventilation System. Responses consistent with this Technical Specification should be given full credit.

NRC Resolution - Acknowledged. The Control Room Ventilation Radiation Monitor signal logic combinations described by Technical Specification Table 3.3.7.1-1 will be considered acceptable alternative answers. The answer key has been modified accordingly.

(4) Question 3.17 - Same comments as for Question 6.23 on the SRO exam.

NRC Resolution - See Resolution (2) per part a., SRO Exam.

(5) Question 4.01 - Same comments as for Question 8.06 on the SRO exam.

NRC Resolution - See Resolution (8) per part a., SRO Exam.

(6) Question 4.03 - Same comments as for Question 7.02 on the SRO exam.

NRC Resolution - See Resolution (3) per part a., SRO Exam.

(7) Question 4.06 - Same comments as for Question 7.06 on the SRO exam.

NRC Resolution - See Resolution (4) per part a., SRO Exam.

(8) Question 4.09 - Same comments as for Question 7.09 on the SRO exam.

NRC Resolution - See Resolution (5) per part a., SRO Exam.

(9) Question 4.19 - Same comments as for Question 7.20 on the SRO exam.

NRC Resolution - See Resolution (7) per part a., SRO Exam.

4. Exit Meeting

At the conclusion of the site visit, the examiners met with representatives of the plant staff to discuss the results of the examination. Those individuals who clearly passed the oral examination were identified.

There was no generic weaknesses (greater than 75 percent of candidates giving incorrect answers to one examination topic) noted during the oral examination.

The cooperation given to the examiners and the effort to ensure an atmosphere in the control room conducive to oral examinations was also noted and appreciated.

The licensee did not identify as proprietary any of the material provided to or reviewed by the examiners.

Master

ENCLOSURE 3

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

FACILITY: GRAND GULF 1

REACTOR TYPE: BWR-GE6

DATE ADMINISTERED: 85/08/12

EXAMINER: MUNRO,J

APPLICANT: _____

INSTRUCTIONS TO APPLICANT:

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up six (6) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
25.00	~~25.00~~ 24.00			1. PRINCIPLES OF NUCLEAR POWER PLANT OPERATION, THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW
~~26.50~~ 25	~~26.97~~ 25.6			2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS
24.00	~~23.08~~ 24.6			3. INSTRUMENTS AND CONTROLS
~~25.00~~ 23.5	~~24.00~~ ~~24.1~~			4. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
~~100.50~~ 97.5	100.00			TOTALS

FINAL GRADE _____%

All work done on this examination is my own. I have neither given nor received aid.

_____
APPLICANT'S SIGNATURE

THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW

QUESTION 1.01 (1.00)

Which of the following statements correctly describes the behavior of the void coefficient of reactivity?

a. It becomes more negative as the void fraction decreases.

b. It becomes less negative as fuel temperature increases.

c. It becomes less negative as core size increases.

d. It becomes more negative as moderator temperature increases.

QUESTION 1.02 (1.00)

What are the units of neutron flux?

a. neutrons / cm cubed

b. neutrons / cm / second

c. neutrons / cm squared - second

d. neutrons / cm squared

QUESTION 1.03 (1.00)

The rate of change of power in a nuclear reactor is governed by the average neutron generation time (l-av). How does l-av change as the core ages?

a. l-av INCREASES due to the DECREASE in the effective delayed neutron fraction (B-bar) over core life.

b. l-av DECREASES due to the DECREASE in the effective delayed neutron fraction (B-bar) over core life.

c. l-av INCREASES due to the INCREASE in the effective delayed neutron fraction (B-bar) over core life.

d. l-av DECREASES due to the INCREASE in the effective delayed neutron fraction (B-bar) over core life.

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.04 (1.00)

Which of the following radiation exposures would inflict the GREATEST biological damage to man?

a. 1 Rem of GAMMA

b. 1 Rem of ALPHA

c. 1 Rem of NEUTRON

d. NONE of the above; they are all equivalent

QUESTION 1.05 (1.00)

Which of the following correctly describes the Maximum Fraction of Limiting Power Density (MFLPD)?

a. LHGR-actual / LHGR-limit ; must be maintained < 1

b. LHGR-limit / LHGR-actual ; must be maintained > 1

c. LHGR-limit / LHGR-actual ; must be maintained < 1

d. LHGR-actual / LHGR-limit ; must be maintained > 1

QUESTION 1.06 (1.00)

When does a constant-speed centrifugal pump motor draw the LEAST current?

a. at 'runout' conditions

b. at its 'operating point'

c. while 'cavitating'

d. at 'shutoff head' conditions

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW

QUESTION 1.07 (1.00)

Which of the following equations is used to perform a BWR reactor heat balance?

NOTE: c=CRD; f=Feedwater; s=Steam; ri=RWCU in; ro=RWCU out

a. $\dot{Q}\text{-rx} = (w_c + w_f) \times h_s + w_{ro} \times h_{ro} + \dot{Q}\text{-rad} - w_f \times h_f - w_{ri} \times h_{ri} - w_c \times h_c - \dot{Q}\text{-pump}$

b. $\dot{Q}\text{-rx} = (w_c + w_f) \times h_s + w_{ri} \times h_{ri} + \dot{Q}\text{-rad} - w_f \times h_f - w_{ro} \times h_{ro} - w_c \times h_c - \dot{Q}\text{-pump}$

c. $\dot{Q}\text{-rx} = (w_c + w_f) \times h_s + w_{ro} \times h_{ro} + \dot{Q}\text{-pump} - w_f \times h_f - w_{ri} \times h_{ri} - w_c \times h_c - \dot{Q}\text{-rad}$

d. $\dot{Q}\text{-rx} = w_f \times h_f + w_{ri} \times h_{ri} + \dot{Q}\text{-rad} - (w_c + w_f) \times h_s - w_{ro} \times h_{ro} - w_c \times h_c - \dot{Q}\text{-pump}$

QUESTION 1.08 (2.00)

a. DEFINE "Critical Power".

b. Which one of the following conditions would tend to INCREASE the Critical Power level assuming all other variables remain unchanged?

1. Inlet subcooling is DECREASED
2. Reactor pressure is DECREASED
3. The axial power peak is RAISED
4. Coolant flow rate is DECREASED

QUESTION 1.09 (1.00)

Which of the following actions will INCREASE your plant's thermodynamic cycle efficiency?

a. DECREASING power from 100% to 25% .

b. LOWERING condenser vacuum from 29" to 25".

c. REMOVING a high pressure FW heater from service.

d. DECREASING the amount of condensate depression.

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.10 (1.00)

The change in reactivity associated with a change in Keff from 0.920 to 1.004 is approximately...

a. 0.080

b. 0.084

c. 0.087

d. 0.091

QUESTION 1.11 (1.50)

Using the enclosed Mollier Diagram, LIST the following property values for steam with an enthalpy of 1390 BTU/lbm and an entropy of 1.568 BTU/lbm - F.

a. Pressure

b. Temperature

c. Superheat

QUESTION 1.12 (1.00)

FILL IN THE BLANKS

The reactor period for any reactor shortly after a scram will be _____ seconds because of _____.

QUESTION 1.13 (1.00)

CALCULATE the QUALITY of a 540 degree F vapor-liquid mixture whose specific enthalpy is 1175 BTU/lbm.

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW

QUESTION 1.14 (2.00)

The attached figure (15.3-4) illustrates a transient that could occur at a BWR.

GIVEN: (1) A fast closure of BOTH recirc. FCVs at 11% per second.
(2) No operator actions are taken.
(3) Valve closure begins at time = 0 seconds.

EXPLAIN the cause of the following recorder indications:

a. The peak in inlet subcooling at ~11 seconds on graph (a).

b. The dip in reactor pressure at ~8 seconds on graph (b).

c. The peak in vessel steam flow from ~12-15 seconds on graph (c).

d. The reactor scram at ~8 seconds on graph (d).

QUESTION 1.15 (1.00)

Adding latent heat to liquid water at saturated conditions will...

a. increase the temperature of the water.

b. change the water to steam at the same temperature.

c. change the water to steam at a slightly higher temperature.

d. decrease its subcooling by making it boil.

QUESTION 1.16 (1.00)

Water is an excellent neutron moderator. What are TWO (2) NUCLEAR FACTORS which make water the moderator of choice for most commercial reactors?

QUESTION 1.17 (1.00)

ANSWER THE FOLLOWING TRUE OR FALSE

a. A control rod's worth varies directly with effective core size.

b. The slope of the integral rod worth curve is greatest where the differential rod worth is the highest.

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

QUESTION 1.18 (2.00)

A significant amount of excess reactivity must be loaded into a core at BOL so that 100% power can be attained at the end of a fuel cycle. For each of the following, LIST the approximate value of K-excess which must be loaded to overcome that negative reactivity component at rated-equilibrium conditions.

a. Moderator temp increase
b. Void fraction increase
c. Samarium buildup
d. Xenon buildup

QUESTION 1.19 (1.50)

LIST three (3) factors upon which a reactor's decay heat generation rate is dependent.

QUESTION 1.20 (1.00)

Which of the following is NOT a characteristic of Subcritical Multiplication?

a. The subcritical neutron level is directly proportional to the neutron source strength.

b. Doubling the indicated count rate by reactivity additions will reduce the margin to criticality by approximately one-half.

c. For equal reactivity additions, it takes longer for the new equilibrium count rate to be reached, as K-eff approaches unity.

d. A single notch of rod withdrawal will produce an equivalent equilibrium count rate increase whether Keff is 0.88 or 0.92.

(***** CATEGORY 01 CONTINUED ON NEXT PAGE *****)

THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW

QUESTION 1.21 (1.00)

The reactor trips from full power, equilibrium xenon conditions. Twenty-four hours later the reactor is brought critical and power level is maintained on range 5 of the IRMs for several hours. Which of the following statements is CORRECT concerning control rod motion during this period?

a. Rods will have to be withdrawn due to xenon build-in.

b. Rods will have to be rapidly inserted since the critical reactor will cause a high rate of xenon burnout.

c. Rods will have to be inserted since xenon will closely follow its normal decay rate.

d. Rods will approximately remain as is as the xenon establishes its equilibrium value for this power level.

(***** END OF CATEGORY 01 *****)

QUESTION 2.01 (1.00)

Which of the following is the only normally CLOSED valve in the RCIC steam supply flow path in the at power Standby lineup?

a. Steam Supply Valve (F045)

b. Outboard Steam Isolation Valve (F064)

c. Turbine Trip Throttle Valve

d. Turbine Governor Valve

QUESTION 2.02 (1.00)

Which of the following sequences of components correctly reflects the normal RCIC water flow path for injection into the Reactor?

a. CST - Pump - "B" FW Line, upstream of FW Flow detector

b. CST - Pump - "B" FW Line, downstream of FW Flow detector

c. CST - Pump - "A" FW Line, upstream of FW Flow detector

d. CST - Pump - "A" FW Line, downstream of FW Flow detector

QUESTION 2.03 (1.00)

What is(are) the automatic isolation signal(s) to the RCIC Vacuum Breaker Isolation Valves(F077,F078)? Setpoints required.

QUESTION 2.04 (1.00)

How would a loss of service air affect the operation of the Standby Liquid Control System (SBLC)?

a. The SBLC tank level indication would be inoperable.

b. The SBLC tank air sparger would be inoperable.

c. The SBLC tank level indication and air sparger would be inoperable.

d. It would have NO impact since the instrument air system supplies all SBLC needs.

(***** CATEGORY 02 CONTINUED ON NEXT PAGE *****)

QUESTION 2.05 (1.00)

The containment flooding mode of RHR is available as a backup when virtually all other means to keep the core covered have failed. Briefly DESCRIBE the flowpath established during the containment flooding mode.

QUESTION 2.06 (1.50) Delete From Exam

The containment building sampling subsystem station located on the refueling floor provides a central location for monitoring and grab sampling what three (3) fluid systems?

QUESTION 2.07 (1.50)

The Instrument Air System provides air for the operation of various valves within the Standby Service Water System (SSW). LIST three (3) limitations imposed on the SSW system by a loss of Instrument Air.

QUESTION 2.08 (1.00)

The plant is operating at power with A, B, and C CCW pumps running and NONE of the pumps selected for STANDBY operation. A LOSP occurs and the diesels start and tie in normally. How will the CCW system respond during this transient?

a. The LSS panel will auto start the "B" CCW pump on ESF power 20 seconds after the bus is reenergized.

b. Either the "A" or "B" CCW pumps can be started manually on ESF power after the buses are reenergized.

c. SSW will automatically tie in to the main CCW supply header on decreasing header pressure.

d. The "B" CCW pump can be manually started by the operator on ESF power after the bus is reenergized.

(***** CATEGORY 02 CONTINUED ON NEXT PAGE *****)

QUESTION 2.09 (2.00)

Briefly DESCRIBE the operation of the PSW system under each of the following operating modes:

a. 'Local' Automatic

b. 'Cascade' Automatic

QUESTION 2.10 (1.50)

Answer the following with regard to the SRVs / ADS:

a. Which ADS interlock / permissive signal is NOT bypassed (i.e. must be present) to allow manual initiation of ADS from the 601 panel? (0.5)

b. Panels 601 and 631 have red and green SRV indicating lights. An illuminated red light on P601 indicates that _____ while an illuminated red light on P631 indicates that _____. (BE SPECIFIC.)

(Arrow Switch)

QUESTION 2.11 (1.50)

LIST six (6) methods of detecting reactor coolant leakage within the drywell.

QUESTION 2.12 (1.50)

LIST three (3) purposes of the A, B, and / or C RHR jockey pumps.

QUESTION 2.13 (1.50)

Fill in the following blanks with the appropriate (if any) LPCS injection valve (F005) interlocks and setpoints:

Manual opening of F005 with the handswitch is prohibited when _____(a)___. If power is available, F005 will auto open on a LPCS initiation signal of _____(b)_____ or _____(c)_____. Once open, _____(d)_____ signal will auto close the valve. If the auto open signal is manually overridden the valve will reopen automatically if _____(e)_____.

(***** CATEGORY 02 CONTINUED ON NEXT PAGE *****)

QUESTION 2.14 (.50)

Reactor pressure is 900 psig and LPCS is running in response to a valid initiation signal. What is the approximate expected flow indication on the pump discharge flow meter on the 601 panel?

QUESTION 2.15 (1.00)

Reactor Feed Pump (RFP) turbine speed is controlled by either a Motor Speed Changer (MSC) or an Electric Automatic Positioner (EAP). The EAP ...(CHOOSE ONE)

a. ... will control the RFP turbine's speed only if its speed signal is greater than that from the MSC.

b. ...is normally used to control feed flow rate over a turbine speed of 0 - 5500 rpm.

c. ..., unlike the MSC, does NOT afford the capability of manual speed control by use a local handwheel.

d. ...will lock in place to prevent a ramp response to a false signal, if it loses its signal from the flow controller.

QUESTION 2.16 (1.50)

The Upper Containment Pool serves different functions depending on the plant's operating mode or condition at the time. STATE the various functions of the Upper Containment Pool.

QUESTION 2.17 (1.00)

What provides the motive force for the Suppression Pool Cleanup System in each of the following lineups?

a. Normal flowpath

b. Emergency flowpath

QUESTION 2.18 (2.00)

LIST FOUR (4) signals which will result in a DIRECT trip of the RWCU recirculation pumps.

(***** CATEGORY 02 CONTINUED ON NEXT PAGE *****)

QUESTION 2.19 (1.50)

The Containment Recirculation Charcoal Filter Trains normally take air from the _____(a)_____, but can also draw a suction from _____(b)____ and _____(c)_____. Air from the filters is normally returned to _____(d)_____, but can also be directed to the _____(e)_____.

QUESTION 2.20 (2.00)

LIST the four (4) signals which will result in an automatic isolation of the Control Room Ventilation System.

(***** END OF CATEGORY 02 *****)

QUESTION 3.01 (1.00)

Assume that APRM "B" currently has 14 operable LPRM inputs and is reading 65% power. Which of the following indication(s) and/or action(s) will occur as a result of 1 LPRM (of the 14 remaining LPRM inputs to APRM "B") failing downscale? Assume NO operator action.

a. LPRM downscale alarm - APRM "B" reading < 65%

b. LPRM downscale alarm - APRM "B" reading > 65%

c. LPRM downscale alarm - APRM INOP Trip and Alarm - Rod Block - APRM "B" reading 65%

d. LPRM downscale alarm - APRM INOP Trip and Alarm - Rod Block - 1/2 Scram - APRM "B" reading 65%

QUESTION 3.02 (1.00)

Which of the following axial location sequences correctly describe the axial locations of LPRMs in the core?

a. BAF - "A"@+9" - "B"@+27" - "C"@+45" - "D"@+63"

b. BAF - "A"@+18" - "B"@+54" - "C"@+90" - "D"@+126"

c. BAF - "D"@+9" - "C"@+27" - "B"@+45" - "A"@+63"

d. BAF - "D"@+18" - "C"@+54" - "B"@+90" - "A"@+126"

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.03 (2.00)

For each of the following situations (i and ii) select the correct Feedwater Control System / plant response from the list (a through e) which follows. An answer may be used more than once, and NO operator actions are taken.

a. Reactor water level decreases and stabilizes at a lower level.

b. Reactor water level decreases and initiates a reactor scram.

c. Reactor water level increases and stabilizes at a higher level.

d. Reactor water level increases and initiates a turbine trip and Reactor Scram.

e. None of the above.

i. The plant is operating at 90% power in 3-element control when the HPCS system inadvertently initiates and injects.

ii. The plant is operating at 100% power, in 3-element control, when one Feed Flow Detector FAILS DOWNSCALE.

QUESTION 3.04 (1.00)

The reactor is critical at approximately 10 psig and the 'RX Heatup and Pressurization' phase of 03-1-01-1,RX SU is being performed. The narrow range P-680 level instruments read the following 'approximate' values:

NR LT-N004A 37"
NR LT-N004B 38"
NR LT-N004C 37"

The WIDE RANGE P-680 indicators should read which of the following approximate values?

a. 0 inches.

b. 15 inches

c. 38 inches

d. 60+ inches

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.05 (1.00)

Which of the following is NOT a symptom that you would expect to see as a result of a "Jet Pump Riser Failure"? Assume Recirc Flow Control is in "Flux Manual".

a. DECREASE in failed Jet Pump flow.

b. DECREASE in core differential pressure.

c. DECREASE in reactor (APRM) power.

d. INCREASE in indicated core flow.

QUESTION 3.06 (1.00)

The plant is operating normally at power when you receive a "Pump A Seal Staging Flow High/Low" alarm and note a DECREASE in No.2 Recirc Pump seal pressure. Which of the following failures would cause this indication?

a. Failure of No. 1 seal

b. Failure of No. 2 seal

c. Plugging of the No. 1 internal restricting/breakdown orifice

d. Plugging of the No. 2 internal restricting/breakdown orifice

QUESTION 3.07 (2.00)

Briefly explain what condition(s) will generate EACH of the following indications on the Operator Control Module.

a. Data Fault

b. Scram Valves

c. Channel Disagree

d. Insert Required

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.08 (1.00)

a. Fill in the following blank:
Above the HPSP, continous withdrawal of a control rod is automatically limited to _____ notch(es). (0.5)

b. What is the reason for this limitation? (0.5)

QUESTION 3.09 (3.00)

Consider a Recirc Pump Fast to Slow Speed transfer:

a. After "tripping CB-5", certain permissives must be met to "close CB-2" and complete the speed transfer. Indicate the 8 permissives (in 2 groupings) that are left blank on Figure 9 - Transfer Sequence. (2.0)

b. Briefly explain the reason for "tripping the FCV to Manual" in the sequence. (1.0)

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.10 (1.00)

The plant is operating at 100% power with Recirc Flow control in "Flux Manual". An operator inadvertently INCREASES the "Pressure Reference Set" on the EHC Turbine Control System by 5 psig.

ASSUME: 1. No further operator action.
2. All other EHC control settings are normal.
3. Starting Parameters:
- TCVs (MSCV & LPSCVs) - 100% Steam Flow Position
- BSCVs - 0% Steam Flow Position
- Rx Power - 100% Rated Thermal Power
- Rx Pressure - 1025 psig

NOTES: All valve %s are in % Steam Flow Position.
See Figure 7 (EHC Logic Diagram) for information.

Which of the following most accurately describes both the INITIAL RESPONSE and FINAL STATUS of the different parameters and components?

Note: Circle 1 answer, for Final entries below for Initial & Final Response.

	a	b	c	d
INITIAL RESPONSE				
- TCVs	Partial Close (<100%)	Partial Close (<100%)	Partial Close (<100%)	No Change
-BSCVs	No Change	Partial Open (>0%)	No Change	Partial Open (>0%)
-Rx Power	Increase	No Change	Increase	Decrease
-Rx Pressure	Increase	No Change	Increase	Decrease
FINAL STATUS				
-TCVs	~100%	Partial Close (<100%)	0%	~100%
-BSCVs	0%	Partial Open (>0%)	Open (as necessary) *	0%
-Rx Power	>100%	>100%	~0%	<100%
-Rx Pressure	>1025 psig	>1025 psig	~920 psig	<1025 psig

* Open as necessary for SD Pressure Control

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.11 (1.00)

Which of the following will NOT result in the COMMANDS DISAGREE lamp being lit for RC & IS ?

a. Depressing the COMMAND DISAGREE "1": SHIFT INHIBIT PB

b. Depressing the COMMAND DISAGREE "2": SHIFT INHIBIT PB

c. Depressing the MASTER TEST PB (CLOCK FREQUENCY Section)

d. Depressing the COMMAND INHIBIT PB's.

QUESTION 3.12 (1.00)

The General Area Radiation Monitors (ARMs) have installed check sources. These sources...

a. are normally shielded and are exposed by depressing the green backlit Check Source pushbutton.

b. are automatically exposed every 17 minutes to test proper module response.

c. do not affect the ARM's indicated background radiation level in those areas monitored.

d. aid in the detection of equipment malfunctions which cause downscale trips.

QUESTION 3.13 (1.00)

How would an SRM detector respond to a pin hole leak which causes a gradual decrease in Argon gas pressure?

a. Gamma and neutron sensitivity would DECREASE.

b. Gamma sensitivity would DECREASE but neutron sensitivity would REMAIN UNCHANGED.

c. GAMMA sensitivity would REMAIN UNCHANGED but neutron sensitivity would DECREASE.

d. Both gamma and neutron sensitivity would REMAIN UNCHANGED.

(***** CATEGORY 03 CONTINUED ON NEXT PAGE *****)

QUESTION 3.14 (2.00)

The plant is operating at 100% RTP when APRM 'A' fails upscale and results in a reactor half-scram. Utilizing the attached RPS trip logic diagrams (Figures #141 A thru C) DESCRIBE in a STEP-BY-STEP fashion (with regard to the opening/closing, energizing/deenergizing of ALL applicable contacts and relays) how the APRM upscale trip results in an actuation of the scram solenoid.

NOTE: IF THE ATTACHED DIAGRAMS CAN NOT BE EASILY READ, ASSIGN THE CONTACTS/RELAYS, ETC NUMBERS AND REFER TO THEM IN YOUR ANSWER.

QUESTION 3.15 (1.00)

A LOCA signal is received. The DG's start and their output breakers close at time t=0. Which of the following loads is correctly matched with its Load Shed and Sequence System (LSSS) sequencing time?

a. LPCS pump at time t=5 sec

b. RHR pump C at time t=0 sec

c. SSW pump A at time t=15 sec

d. HPCS pump at time t=0 sec

QUESTION 3.16 (3.00)

Provide the following information with regard to the ATWS AND the RPT Recirculation Pump trips:

a. Initiation signals and applicable setpoints

b. Actions / components actuated

c. Bypasses (automatic and manual, if any)

QUESTION 3.17 (1.00)

Under what 2 conditions will the EHC System 'Load Reference Control' AUTOMATICALLY switch OFF?

(***** END OF CATEGORY 03 *****)

QUESTION 4.01 (1.50)

With the exception of breaker position, what THREE (3) items should an operator check on a breaker during the performance of a system lineup checksheet per Control and Use of Operations Section Directives, 02-S-01-2? Consider Local checks only.

QUESTION 4.02 (1.00)

With a stuck control rod, ONEP-05-1-02-IV-1, "CRD Malfunctions", instructs the operator to INCREASE drive water pressure in an attempt to initiate control rod movement. With the reactor at FULL POWER conditions, SELECT the MAXIMUM differential pressure to which the drive water may be raised.

a. 90 psid

b. 260 psid

c. 350 psid

d. 500 psid

QUESTION 4.03 (1.50) Delete From Exam

A reactor SCRAM has occurred, but NOT all of the control rods have inserted to less than the 06 position. Reactor power is indicated as 6% on the APRM's. LIST the three (3) immediate operator action steps that are required per ONEP-05-1-02-I-1, "Reactor Scram."

NOTE: LIMIT YOUR RESPONSE TO THOSE ACTION STEPS REQUIRED FOR REACTIVITY CONTROL.

QUESTION 4.04 (1.00)

SOI-04-1-01-P75-1, "Standby Diesel Generator" cautions the operator NOT to operate the diesel generator without air pressure. EXPLAIN the basis for this caution.

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.05 (1.00)

Assume that adequate core cooling CANNOT be maintained and "Alternate Shutdown Cooling" must be established per EP-8. DESCRIBE the RPV cooling water flowpath that should be established per EP-8.

NOTE: INCLUDE IN YOUR DESCRIPTION THE SYSTEMS/COMPONENTS WHICH ARE USED.

QUESTION 4.06 (1.50)

Per ONEP-05-1-02-III-5, "Automatic Isolations", LIST the three (3) conditions which must be met before a system can be restored to service. Assume an automatic isolation HAS OCCURRED and that the cause of the isolation HAS BEEN determined.

QUESTION 4.07 (1.00)

Per EP-2, "Emergency Cooldown", which of the following most accurately describes how SRV operation should be used to control pressure, if needed?

NOTE: ASSUME THAT THE INSTRUMENT AIR SYSTEM IS OPERATING PROPERLY

a. Use numerous SRV's, with short pressure reductions (~ 50 psig) to equalize Suppression Pool heatup.

b. Use fewer SRV blowdowns, with increased pressure reductions to minimize SRV cyclic stresses.

c. Depressurize with a sustained SRV opening to maximize the emergency cooldown rate.

d. Allow the SRV's to operate by mechanical actuation to ensure design pressure control and heat dispersion.

QUESTION 4.08 (1.00)

IOI-03-1-01-3, "Plant Shutdown", cautions the operator to reduce reactor pressure to approximately 400 psig, if possible, when it is desired to maintain a HOT SHUTDOWN condition. EXPLAIN the basis for this caution.

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.09 (2.00)

Per IOI-03-1-01-1, "Cold Shutdown to Generator Carrying Minimum Load," LIST four (4) conditions which must be met/satisfied prior to placing the Mode Switch in RUN.

NOTE: INCLUDE SETPOINTS, IF APPLICABLE

QUESTION 4.10 (1.50)

LIST the three (3) types of Radiation Work Permits (RWP's) which may be used to control access/account for personnel exposure.

QUESTION 4.11 (1.00)

Immediate Actions in ONEP-05-1-02-I-4, "Loss of Off Site Power", direct the operator to ensure that certain DC Oil Pumps automatically start (or start them manually). Which of the following is NOT one of these pumps?

a. RFPT DC Oil Pump

b. Diesel Generator DC Oil Pump

c. Main Turbine DC Oil Pump

d. Main Generator DC Seal Oil Pump

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.12 (1.00)

The Control Room is declared uninhabitable and evacuated. The immediate operator actions for 'Shutdown From the Remote Shutdown Panel', ONEP-05-1-III-1, are completed. RCIC then ISOLATES. Level subsequently decreases to Level 2. Restoration of level USING RCIC requires which of the following?

ASUME THAT THE THREE CONDITIONS NEEDED FOR RESETTING AN ISOLATION, PER ONEP-05-1-02-III-5, 'AUTOMATIC ISOLATIONS', HAVE BEEN MET.

a. No Operator Action. RCIC will restart automatically.

b. Operator Action. Close RCIC TURB TRIP/THROT VLV; Place RCIC TURB FLO CONT in manual at minimum setting; Re-open RCIC TURB TRIP/THROT VLV and establish flow.

c. Operator Action. Close RCIC TURB TRIP/THROT VLV; reset RCIC TURB TRIP logic; RCIC will now restart automatically.

d. NONE OF THE ABOVE. RCIC cannot be restarted from the Remote Shutdown Panel after isolation.

QUESTION 4.13 (1.50)

ONEP-05-1-02-III-3, 'Decrease in Recirculation System Flow Rate', directs operator actions for an unexpected decrease in reactor coolant system flow rate.

FILL IN THE BLANKS

(After the unexpected decrease), if both recirculation loops are still operating, transfer the FCV's to ____(a)____. Balance loop flows to within ____(b)____ at less than 70% core flow, or to within ____(c)____ at greater than 70% core flow.

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.14 (1.00)

A plant startup is in progress and condenser vacuum is being established in accordance with IOI-03-1-01-1, 'Cold Shutdown to Generator Carrying Minimum Load'. What is the proper sequence for component/subsystem startups?

a. Steam Seal Exhauster, Steam Seal Header, Mechanical Vacuum Pump, Steam Jet Air Ejector.

b. Steam Seal Header, Steam Seal Exhauster, Mechanical Vacuum Pump, Steam Jet Air Ejector.

c. Mechanical Vacuum Pump, Steam Seal Exhauster, Steam Seal Header, Steam Jet Air Ejector.

d. Steam Seal Exhauster, Mechanical Vacuum Pump, Steam Seal Header, Steam Jet Air Ejector.

QUESTION 4.15 (1.00)

Per ONEP-05-1-02-V-1, 'Loss of Component Cooling Water', a loss of CCW may be either complete or partial. In which of the following instances would reduced flow (partial loss) be treated as a COMPLETE LOSS of CCW?

a. Reactor Recirc Pump temperatures above the HI alarm setpoint.

b. RWCU NRHX Outlet temperature above the HI alarm setpoint.

c. CCW Discharge Header pressure below the LO alarm setpoint.

d. CRD Pump Oil temperature above the HI alarm setpoint.

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.16 (1.00)

The unit is operating at 70% RTP; you notice power start to increase with NO CHANGE in recirculation flow or rod position. You suspect a "Loss of Feedwater Heating." Which of the following is required/appropriate per ONEP-05-1-02-V-5?

a. A 30% reduction in Recirc Flow, monitored by Recirc Flow indication.

b. A 30% Power Reduction, using Recirc Flow, monitored by APRM's.

c. Insertion of Shallow Rods, to maintain proper flux shape, prior to reducing Recirc Flow.

d. Insertion of Power Rods, to maintain proper flux shape, prior to reducing Recirc Flow.

QUESTION 4.17 (2.00)

EP-3, EP-5, and EP-7 caution the operator to observe certain limitations on Suppression Pool Level and Temperature when operating HPCS, LPCS, RHR, and/or RCIC.

a. COMPLETE THE FOLLOWING: (1.5)

Suppression Pool Level shall not be less than ____(1)____.

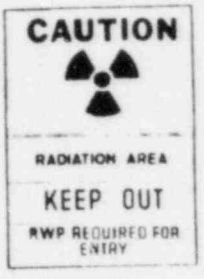
Suppression Pool Temperature shall not exceed ____(2)____ during HPCS, LPCS, and/or RHR operation; it shall not exceed ____(3)____ during RCIC operation.

b. STATE the basis for these temperature/level limitations on the Suppression Pool. (0.5)

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.18 (1.00)

You enter an area posted with the following sign:



LIST the MINIMUM and MAXIMUM exposure rates for this area.

QUESTION 4.19 (1.00)

When raising power per IOI-03-1-01-2, "Power Operations," you are cautioned to maintain the Load Demand Limited (LDL) value close to the Actual Generator Load (AGL) value.

a. STATE how much the LDL value may exceed the AGL value. (0.5)

b. STATE how you would know if this limit were exceeded (EXCLUDING THE DIGITAL METERS ON 1H13-P680-9D). (0.5)

QUESTION 4.20 (.50)

You are conducting a shutdown of the CRDH system, per SOI-04-1-01-C11-1. You open Drain Valve 107xx to drain the water accumulators. State the local indication(s) which should be used to determine that the accumulator is fully drained.

(***** CATEGORY 04 CONTINUED ON NEXT PAGE *****)

QUESTION 4.21 (1.00)

With regard to the Protective Tagging System Procedure, 01-S-06-01:

The minimum level of qualification for an Independent Verifier (per this procedure) shall be ... (CHOOSE ONE)

a. ...journeyman level

b. ...NOB for operations

c. ...NOA for operations

d. ...Shift Supervisor

(***** END OF CATEGORY 04 *****)

(********** END OF EXAMINATION **********)

$f = ma$ $\quad v = s/t$

$w = mg$ $\quad s = V_o t + 1/2\ at^2$

$E = mc^2$

$KE = 1/2\ mv^2$ $\quad a = (V_f - V_o)/t$ $\quad A = \lambda N$ $\quad A = A_o e^{-\lambda t}$

$PE = mgh$

$V_f = V_o + at$ $\quad w = \theta/t$ $\quad \lambda = \ln 2/t_{1/2} = 0.693/t_{1/2}$

$t_{1/2}^{eff} = \dfrac{[(t_{1/2})(t_b)]}{[(t_{1/2}) + (t_b)]}$

$W = v\ \Delta P$ $\quad A = \dfrac{\pi D^2}{4}$

$\Delta E = 931\ \Delta m$ $\quad \dot{m} = V_{av} A \rho$

$\dot{Q} = \dot{m} \Delta h$

$\dot{Q} = \dot{m} C_p \Delta t$ $\quad I = I_o e^{-\Sigma x}$

$\dot{Q} = UA \Delta T$

$Pwr = W_f \Delta h$ $\quad I = I_o e^{-\mu x}$

$I = I_o\ 10^{-x/TVL}$

$TVL = 1.3/\mu$

$HVL = -0.693/\mu$

$P = P_o 10^{sur(t)}$

$P = P_o e^{t/T}$

$SUR = 26.06/T$ $\quad SCR = S/(1 - K_{eff})$

$CR_x = S/(1 - K_{eff_x})$

$SUR = 26\rho/\ell^* + (\beta - \rho)T$ $\quad CR_1(1 - K_{eff1}) = CR_2(1 - K_{eff2})$

$T = (\ell^*/\rho) + [(\beta - \rho)/\bar{\lambda}\rho]$ $\quad M = 1/(1 - K_{eff}) = CR_1/CR_o$

$T = \ell/(\rho - \beta)$ $\quad M = (1 - K_{effo})/(1 - K_{eff1})$

$T = (\beta - \rho)/(\bar{\lambda}\rho)$ $\quad SDM = (1 - K_{eff})/K_{eff}$

$\rho = (K_{eff} - 1)/K_{eff} = \Delta K_{eff}/K_{eff}$ $\quad \ell^* = 10^{-4}$ seconds

$\bar{\lambda} = 0.1$ seconds^{-1}

$\rho = [(\ell^*/(T K_{eff})] + [\bar{\beta}_{eff}/(1 + \bar{\lambda}T)]$

$I_1 d_1 = I_2 d_2$

$I_1 d_1^{\ 2} = I_2 d_2^{\ 2}$

$P = (\Sigma \phi V)/(3 \times 10^{10})$ $\quad R/hr = (0.5\ CE)/d^2 (meters)$

$R/hr = 6\ CE/d^2$ (feet)

$\Sigma = \sigma N$

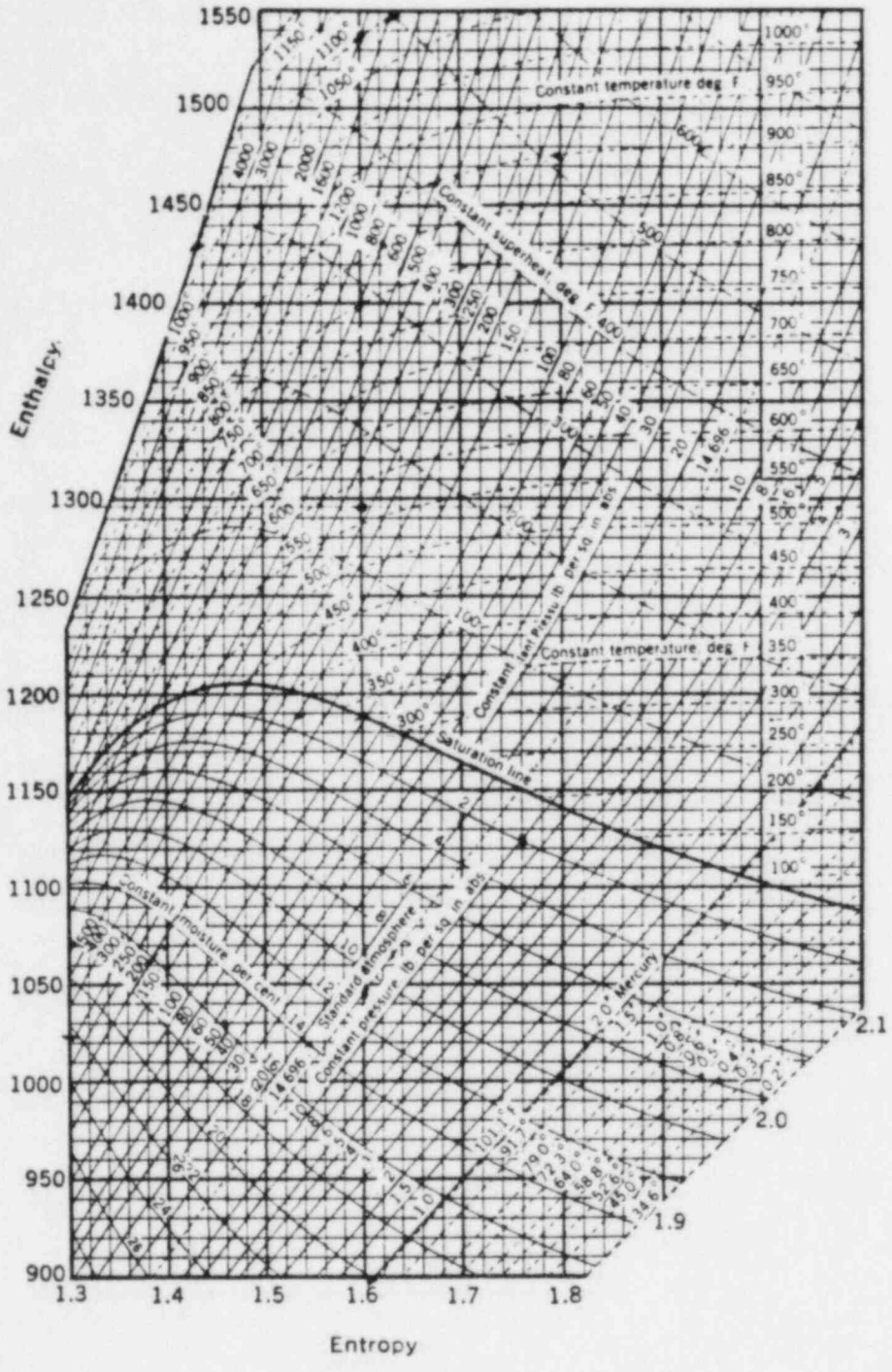
Water Parameters

1 gal. = 8.345 lbm.
1 gal. = 3.78 liters
1 ft^3 = 7.48 gal.
Density = 62.4 lbm/ft^3
Density = 1 gm/cm^3
Heat of vaporization = 970 Btu/lbm
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in. Hg.
1 ft. H_2O = 0.4335 lbf/in.

Miscellaneous Conversions

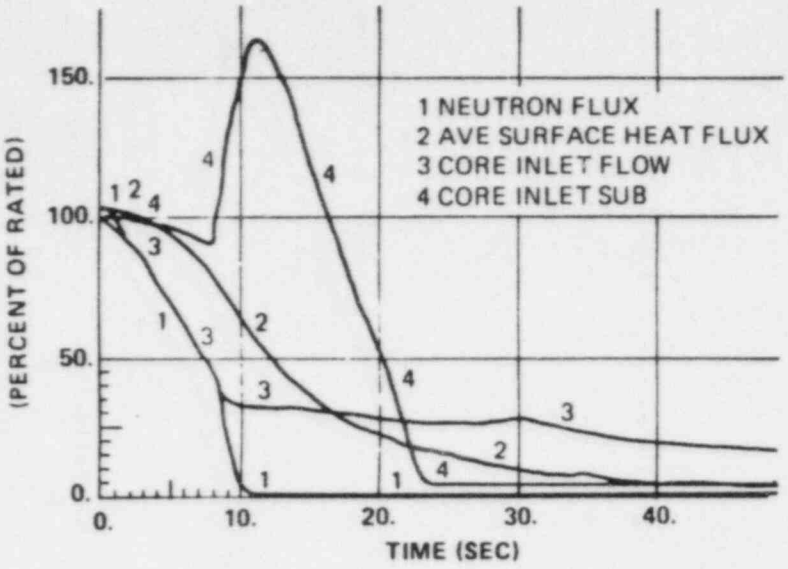
1 curie = 3.7×10^{10} dps
1 kg = 2.21 lbm
1 hp = 2.54×10^3 Btu/hr
1 mw = 3.41×10^6 Btu/hr
1 in = 2.54 cm
°F = 9/5°C + 32
°C = 5/9 (°F-32)
1 BTU = 778 ft-lbf

e = 2.718

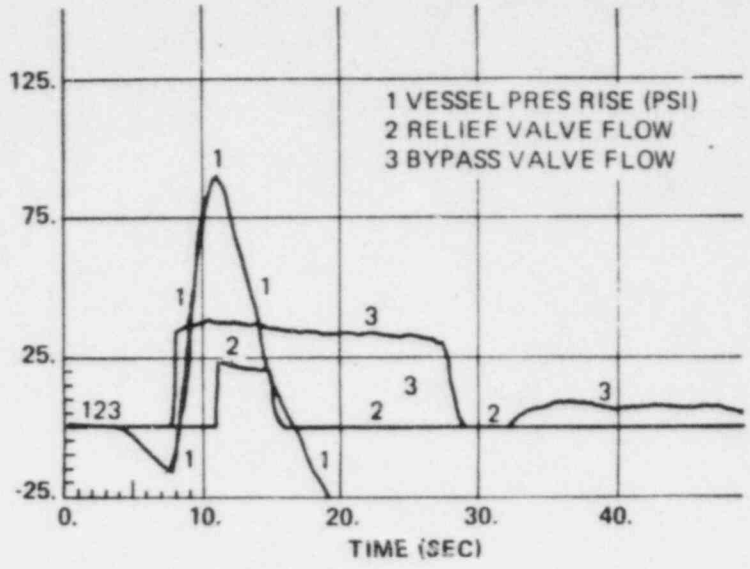


Mollier diagram for steam

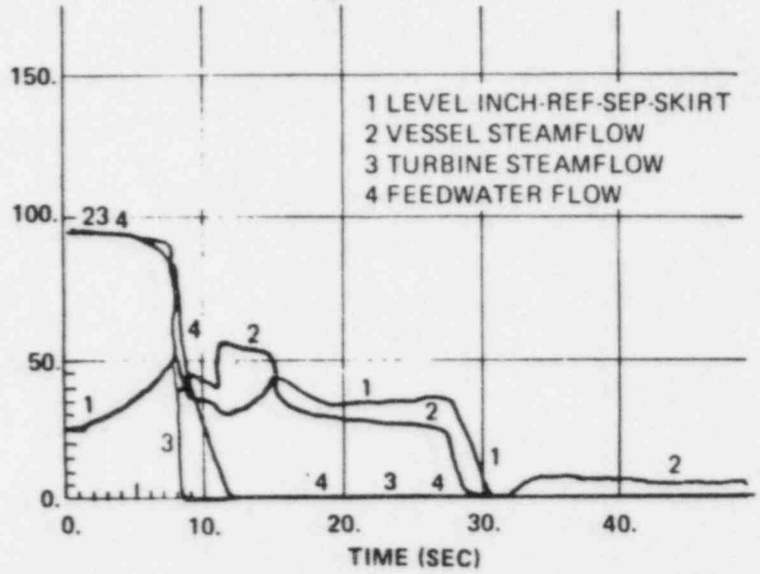
(a.)



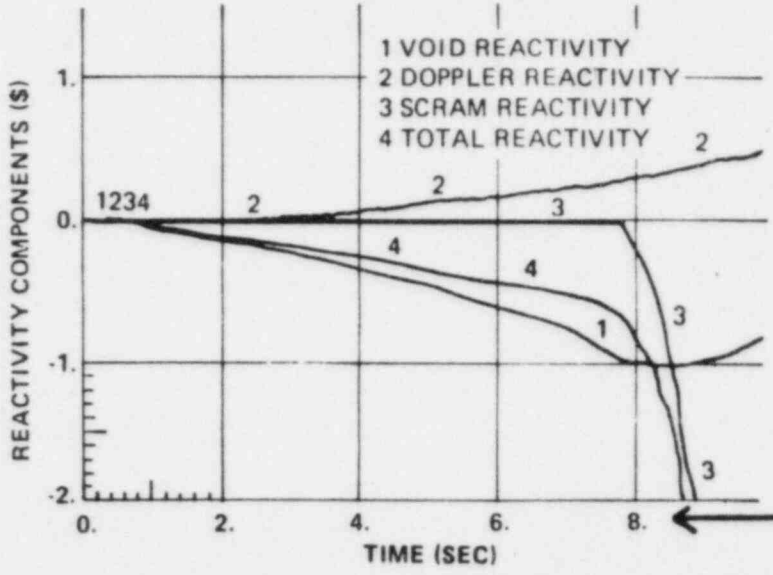
(b.)



(c.)



(d.)



NOTE: DIFFERENT TIME SCALE

MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNIT 2 FINAL SAFETY ANALYSIS REPORT	FAST CLOSURE OF BOTH MAIN RECIRCULATION VALVES AT 11% P ECOND FIGURE 15.3 – 4

Temp F	Press. psia	Volume, ft³/lb			Enthalpy, Btu/lb			Entropy, Btu/lb x F			Temp F
		Water v_f	Evap v_{fg}	Steam v_g	Water h_f	Evap h_{fg}	Steam h_g	Water s_f	Evap s_{fg}	Steam s_g	
32	0.08859	0.01602	3305	3305	-0.02	1075.5	1075.5	0.0000	2.1873	2.1873	32
35	0.09991	0.01602	2948	2948	3.00	1073.8	1076.8	0.0061	2.1706	2.1767	35
40	0.12163	0.01602	2446	2446	8.03	1071.0	1079.0	0.0162	2.1432	2.1594	40
45	0.14744	0.01602	2037.7	2037.8	13.04	1068.1	1081.2	0.0262	2.1164	2.1426	45
50	0.17795	0.01602	1704.8	1704.8	18.05	1065.3	1083.4	0.0361	2.0901	2.1262	50
60	0.2561	0.01603	1207.6	1207.6	28.06	1059.7	1087.7	0.0555	2.0391	2.0946	60
70	0.3629	0.01605	868.3	868.4	38.05	1054.0	1092.1	0.0745	1.9900	2.0645	70
80	0.5068	0.01607	633.3	633.3	48.04	1048.4	1096.4	0.0932	1.9426	2.0359	80
90	0.6981	0.01610	468.1	468.1	58.02	1042.7	1100.8	0.1115	1.8970	2.0086	90
100	0.9492	0.01613	350.4	350.4	68.00	1037.1	1105.1	0.1295	1.8530	1.9825	100
110	1.2750	0.01617	265.4	265.4	77.98	1031.4	1109.3	0.1472	1.8105	1.9577	110
120	1.6927	0.01620	203.25	203.26	87.97	1025.6	1113.6	0.1646	1.7693	1.9339	120
130	2.2230	0.01625	157.32	157.33	97.96	1019.8	1117.8	0.1817	1.7295	1.9112	130
140	2.8892	0.01629	122.98	123.00	107.95	1014.0	1122.0	0.1985	1.6910	1.8895	140
150	3.718	0.01634	97.05	97.07	117.95	1008.2	1126.1	0.2150	1.6536	1.8686	150
160	4.741	0.01640	77.27	77.29	127.96	1002.2	1130.2	0.2313	1.6174	1.8487	160
170	5.993	0.01645	62.04	62.06	137.97	996.2	1134.2	0.2473	1.5822	1.8295	170
180	7.511	0.01651	50.21	50.22	148.00	990.2	1138.2	0.2631	1.5480	1.8111	180
190	9.340	0.01657	40.94	40.96	158.04	984.1	1142.1	0.2787	1.5148	1.7934	190
200	11.526	0.01664	33.62	33.64	168.09	977.9	1146.0	0.2940	1.4824	1.7764	200
210	14.123	0.01671	27.80	27.82	178.15	971.6	1149.7	0.3091	1.4509	1.7600	210
212	14.696	0.01672	26.78	26.80	180.17	970.3	1150.5	0.3121	1.4447	1.7568	212
220	17.186	0.01678	23.13	23.15	188.23	965.2	1153.4	0.3241	1.4201	1.7442	220
230	20.779	0.01685	19.364	19.381	198.33	958.7	1157.1	0.3388	1.3902	1.7290	230
240	24.968	0.01693	16.304	16.321	208.45	952.1	1160.6	0.3533	1.3609	1.7142	240
250	29.825	0.01701	13.802	13.819	218.59	945.4	1164.0	0.3677	1.3323	1.7000	250
260	35.427	0.01709	11.745	11.762	228.76	938.6	1167.4	0.3819	1.3043	1.6862	260
270	41.856	0.01718	10.042	10.060	238.95	931.7	1170.6	0.3960	1.2769	1.6729	270
280	49.200	0.01726	8.627	8.644	249.17	924.6	1173.8	0.4098	1.2501	1.6599	280
290	57.550	0.01736	7.443	7.460	259.4	917.4	1176.8	0.4236	1.2238	1.6473	290
300	67.005	0.01745	6.448	6.466	269.7	910.0	1179.7	0.4372	1.1979	1.6351	300
310	77.67	0.01755	5.609	5.626	280.0	902.5	1182.5	0.4506	1.1726	1.6232	310
320	89.64	0.01766	4.896	4.914	290.4	894.8	1185.2	0.4640	1.1477	1.6116	320
340	117.99	0.01787	3.770	3.788	311.3	878.8	1190.1	0.4902	1.0990	1.5892	340
360	153.01	0.01811	2.939	2.957	332.3	862.1	1194.4	0.5161	1.0517	1.5678	360
380	195.73	0.01836	2.317	2.335	353.6	844.5	1198.0	0.5416	1.0057	1.5473	380
400	247.26	0.01864	1.8444	1.8630	375.1	825.9	1201.0	0.5667	0.9607	1.5274	400
420	308.78	0.01894	1.4808	1.4997	396.9	806.2	1203.1	0.5915	0.9165	1.5080	420
440	381.54	0.01926	1.1976	1.2169	419.0	785.4	1204.4	0.6161	0.8729	1.4890	440
460	466.9	0.0196	0.9746	0.9942	441.5	763.2	1204.8	0.6405	0.8299	1.4704	460
480	566.2	0.0200	0.7972	0.8172	464.5	739.6	1204.1	0.6648	0.7871	1.4518	480
500	680.9	0.0204	0.6545	0.6749	487.9	714.3	1202.2	0.6890	0.7443	1.4333	500
520	812.5	0.0209	0.5386	0.5596	512.0	687.0	1199.0	0.7133	0.7013	1.4146	520
540	962.8	0.0215	0.4437	0.4651	536.8	657.5	1194.3	0.7378	0.6577	1.3954	540
560	1133.4	0.0221	0.3651	0.3871	562.4	625.3	1187.7	0.7625	0.6132	1.3757	560
580	1326.2	0.0228	0.2994	0.3222	589.1	589.9	1179.0	0.7876	0.5673	1.3550	580
600	1543.2	0.0236	0.2438	0.2675	617.1	550.6	1167.7	0.8134	0.5196	1.3330	600
620	1786.9	0.0247	0.1962	0.2208	646.9	506.3	1153.2	0.8403	0.4689	1.3092	620
640	2059.9	0.0260	0.1543	0.1802	679.1	454.6	1133.7	0.8686	0.4134	1.2821	640
660	2365.7	0.0277	0.1166	0.1443	714.9	392.1	1107.0	0.8995	0.3502	1.2498	660
680	2708.6	0.0304	0.0808	0.1112	758.5	310.1	1068.5	0.9365	0.2720	1.2086	680
700	3094.3	0.0366	0.0386	0.0752	822.4	172.7	995.2	0.9901	0.1490	1.1390	700
705.5	3208.2	0.0508	0	0.0508	906.0	0	906.0	1.0612	0	1.0612	705.5

TABLE A.2 PROPERTIES OF SATURATED STEAM AND SATURATED WATER (TEMPERATURE)

Press. psia	Temp F	Volume, ft³/lb			Enthalpy, Btu/lb			Entropy, Btu/lb x F			Energy, Btu/lb		Press. psia
		Water	Evap	Steam	Water	Evap	Steam	Water	Evap	Steam	Water	Steam	
		v_f	v_{fg}	v_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g	u_f	u_g	
0.0886	32.018	0.01602	3302.4	3302.4	0.00	1075.5	1075.5	0	2.1872	2.1872	0	1021.3	0.0886
0.10	35.023	0.01602	2945.5	2945.5	3.03	1073.8	1076.8	0.0061	2.1705	2.1766	3.03	1022.3	0.10
0.15	45.453	0.01602	2004.7	2004.7	13.50	1067.9	1081.4	0.0271	2.1140	2.1411	13.50	1025.7	0.15
0.20	53.160	0.01603	1526.3	1526.3	21.22	1063.5	1084.7	0.0422	2.0738	2.1160	21.22	1028.3	0.20
0.30	64.484	0.01604	1039.7	1039.7	32.54	1057.1	1089.7	0.0641	2.0168	2.0809	32.54	1032.0	0.30
0.40	72.869	0.01606	792.0	792.1	40.92	1052.4	1093.3	0.0799	1.9762	2.0562	40.92	1034.7	0.40
0.5	79.586	0.01607	641.5	641.5	47.62	1048.6	1096.3	0.0925	1.9446	2.0370	47.62	1036.9	0.5
0.6	85.218	0.01609	540.0	540.1	53.25	1045.5	1098.7	0.1028	1.9186	2.0215	53.24	1038.7	0.6
0.7	90.09	0.01610	466.93	466.94	58.10	1042.7	1100.8	0.3	1.8966	2.0083	58.10	1040.3	0.7
0.8	94.38	0.01611	411.67	411.69	62.39	1040.3	1102.6	0.1117	1.8775	1.9970	62.39	1041.7	0.8
0.9	98.24	0.01612	368.41	368.43	66.24	1038.1	1104.3	0.1264	1.8606	1.9870	66.24	1042.9	0.9
1.0	101.74	0.01614	333.59	333.60	69.73	1036.1	1105.8	0.1326	1.8455	1.9781	69.73	1044.1	1.0
2.0	126.07	0.01623	173.74	173.76	94.03	1022.1	1116.2	0.1750	1.7450	1.9200	94.03	1051.8	2.0
3.0	141.47	0.01630	118.71	118.73	109.42	1013.2	1122.6	0.2009	1.6854	1.8864	109.41	1056.7	3.0
4.0	152.96	0.01636	90.63	90.64	120.92	1006.4	1127.3	0.2199	1.6428	1.8626	120.90	1060.2	4.0
5.0	162.24	0.01641	73.515	73.53	130.20	1000.9	1131.1	0.2349	1.6094	1.8443	130.18	1063.1	5.0
6.0	170.05	0.01645	61.967	61.98	138.03	996.2	1134.2	0.2474	1.5820	1.8294	138.01	1065.4	6.0
7.0	176.84	0.01649	53.634	53.65	144.83	992.1	1136.9	0.2581	1.5587	1.8168	144.81	1067.4	7.0
8.0	182.86	0.01653	47.328	47.35	150.87	988.5	1139.3	0.2676	1.5384	1.8060	150.84	1069.2	8.0
9.0	188.27	0.01656	42.385	42.40	156.30	985.1	1141.4	0.2760	1.5204	1.7964	156.28	1070.8	9.0
10	193.21	0.01659	38.404	38.42	161.26	982.1	1143.3	0.2836	1.5043	1.7879	161.23	1072.3	10
14.696	212.00	0.01672	26.782	26.80	180.17	970.3	1150.5	0.3121	1.4447	1.7568	180.12	1077.6	14.696
15	213.03	0.01673	26.274	26.29	181.21	969.7	1150.9	0.3137	1.4415	1.7552	181.16	1077.9	15
20	227.96	0.01683	20.070	20.087	196.27	960.1	1156.3	0.3358	1.3962	1.7320	196.21	1082.0	20
30	250.34	0.01701	13.7266	13.744	218.9	945.2	1164.1	0.3682	1.3313	1.6995	218.6	1087.9	30
40	267.25	0.01715	10.4794	10.497	236.1	933.6	1169.8	0.3921	1.2844	1.6765	236.0	1092.1	40
50	281.02	0.01727	8.4967	8.514	250.2	923.9	1174.1	0.4112	1.2474	1.6586	250.1	1095.3	50
60	292.71	0.01738	7.1562	7.174	262.2	915.4	1177.6	0.4273	1.2167	1.6440	262.0	1098.0	60
70	302.93	0.01748	6.1875	6.205	272.7	907.8	1180.6	0.4411	1.1905	1.6316	272.5	1100.2	70
80	312.04	0.01757	5.4536	5.471	282.1	900.9	1183.1	0.4534	1.1675	1.6208	281.9	1102.1	80
90	320.28	0.01766	4.8777	4.895	290.7	894.6	1185.3	0.4643	1.1470	1.6113	290.4	1103.7	90
100	327.82	0.01774	4.4133	4.431	298.5	888.6	1187.2	0.4743	1.1284	1.6027	298.2	1105.2	100
120	341.27	0.01789	3.7097	3.728	312.6	877.8	1190.4	0.4919	1.0960	1.5879	312.2	1107.6	120
140	353.04	0.01803	3.2010	3.219	325.0	868.0	1193.0	0.5071	1.0681	1.5752	324.5	1109.6	140
160	363.55	0.01815	2.8155	2.834	336.1	859.0	1195.1	0.5206	1.0435	1.5641	335.5	1111.2	160
180	373.08	0.01827	2.5129	2.531	346.2	850.7	1196.9	0.5328	1.0215	1.5543	345.6	1112.5	180
200	381.80	0.01839	2.2689	2.287	355.5	842.8	1198.3	0.5438	1.0016	1.5454	354.8	1113.7	200
250	400.97	0.01865	1.8245	1.8432	376.1	825.0	1201.1	0.5679	0.9585	1.5264	375.3	1115.8	250
300	417.35	0.01889	1.5238	1.5427	394.0	808.9	1202.9	0.5882	0.9223	1.5105	392.9	1117.2	300
350	431.73	0.01913	1.3064	1.3255	409.8	794.2	1204.0	0.6059	0.8909	1.4968	408.6	1118.1	350
400	444.60	0.0193	1.14162	1.1610	424.2	780.4	1204.6	0.6217	0.8630	1.4847	422.7	1118.7	400
450	456.28	0.0195	1.01224	1.0318	437.3	767.5	1204.8	0.6360	0.8378	1.4738	435.7	1118.9	450
500	467.01	0.0198	0.90787	0.9276	449.5	755.1	1204.7	0.6490	0.8148	1.4639	447.7	1118.8	500
550	476.94	0.0199	0.82183	0.8418	460.9	743.3	1204.3	0.6611	0.7936	1.4547	458.9	1118.6	550
600	486.20	0.0201	0.74962	0.7698	471.7	732.0	1203.7	0.6723	0.7738	1.4461	469.5	1118.2	600
700	503.08	0.0205	0.63505	0.6556	491.6	710.2	1201.8	0.6928	0.7377	1.4304	488.9	1116.9	700
800	518.21	0.0209	0.54809	0.5690	509.8	689.6	1199.4	0.7111	0.7051	1.4163	506.7	1115.2	800
900	531.95	0.0212	0.47968	0.5009	526.7	669.7	1196.4	0.7279	0.6753	1.4032	523.2	1113.0	900
1000	544.58	0.0216	0.42435	0.4460	542.6	650.4	1192.9	0.7434	0.6476	1.3910	538.6	1110.4	1000
1100	556.28	0.0220	0.37863	0.4006	557.5	631.5	1189.1	0.7578	0.6216	1.3794	553.1	1107.5	1100
1200	567.19	0.0223	0.34013	0.3625	571.9	613.0	1184.8	0.7714	0.5969	1.3683	566.9	1104.3	1200
1300	577.42	0.0227	0.30722	0.3299	585.6	594.6	1180.2	0.7843	0.5733	1.3577	580.1	1100.9	1300
1400	587.07	0.0231	0.27871	0.3018	598.8	576.5	1175.3	0.7966	0.5507	1.3474	592.9	1097.1	1400
1500	596.20	0.0235	0.25372	0.2772	611.7	558.4	1170.1	0.8085	0.5288	1.3373	605.2	1093.1	1500
2000	635.80	0.0257	0.16260	0.1883	672.1	465.2	1138.3	0.8625	0.4256	1.2881	662.6	1068.6	2000
2500	668.11	0.0286	0.10209	0.1307	731.7	361.6	1093.3	0.9139	0.3206	1.2345	718.5	1032.9	2500
3000	695.33	0.0343	0.05073	0.0850	801.8	218.4	1020.3	0.9723	0.1891	1.1619	782.8	973.1	3000
3208.2	705.47	0.0508	0	0.0508	906.0	0	906.0	1.0612	0	1.0612	875.9	875.9	3208.2

TABLE A.3 PROPERTIES OF SATURATED STEAM AND SATURATED WATER (PRESSURE)

SYSTEM LESSON PLAN

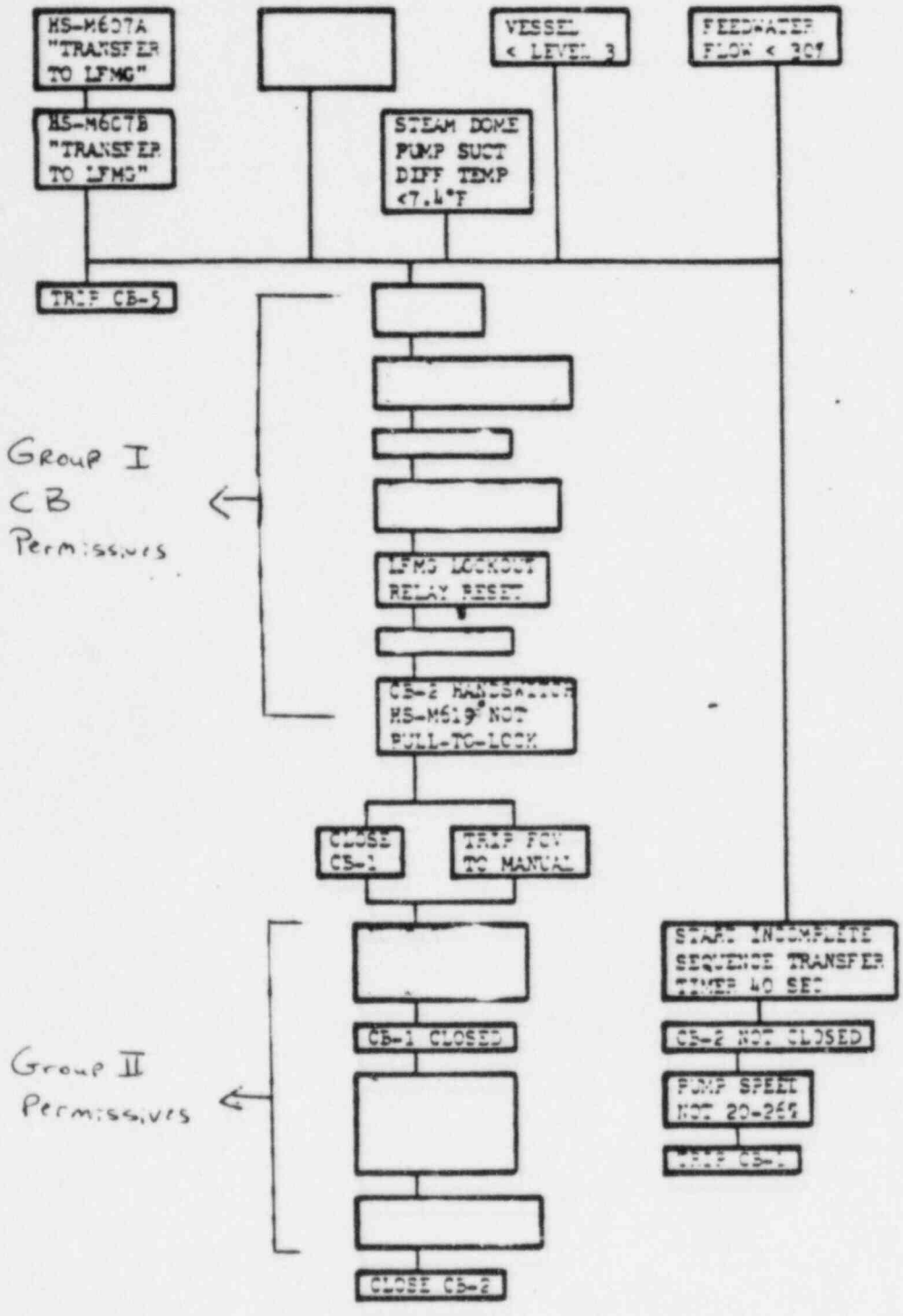


FIGURE 9. FAST SPEED TO SLOW SPEED TRANSFER SEQUENCE

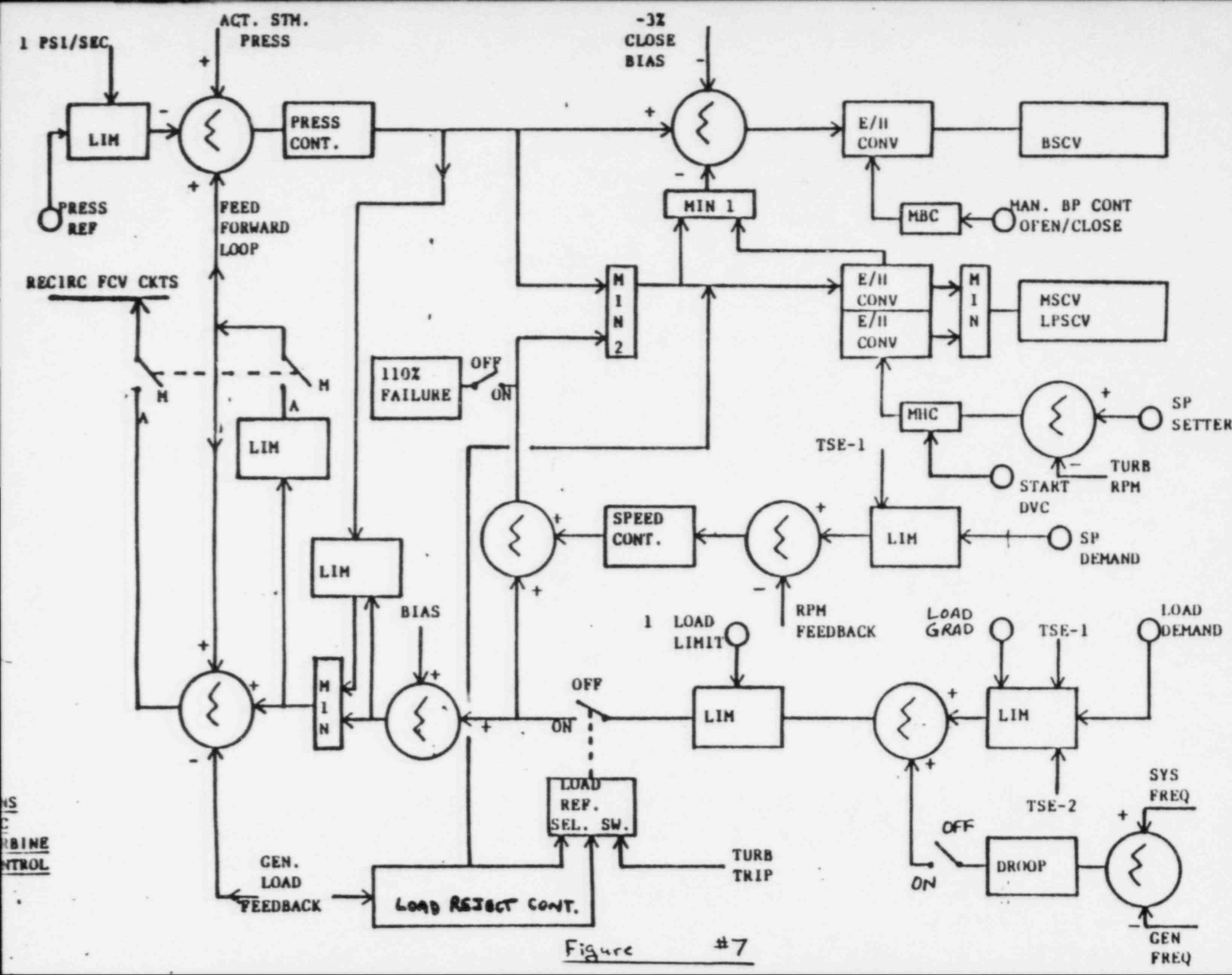

1 PSI/SEC
ACT. STM. PRESS
-3% CLOSE BIAS
LIM
PRESS CONT.
E/H CONV
BSCV
PRESS REF
FEED FORWARD LOOP
MIN 1
MBC
MAN. BP CONT OPEN/CLOSE
RECIRC FCV CKTS
MIN 2
E/H CONV
E/H CONV
MIN
MSCV LPSCV
110% FAILURE
OFF
ON
M
A
LIM
MHC
SP SETTER
TSE-1
START DVC
TURB RPM
SPEED CONT.
LIM
SP DEMAND
LIM
BIAS
RPM FEEDBACK
1 LOAD LIMIT
LOAD GRAD
TSE-1
LOAD DEMAND
MIN
OFF
ON
LIM
LIM
LOAD REF. SEL. SW.
TSE-2
SYS FREQ
OFF
ON
DROOP
GEN. LOAD FEEDBACK
LOAD REJECT CONT.
TURB TRIP
GEN FREQ

Figure #7

SYSTEM LESSON PLAN

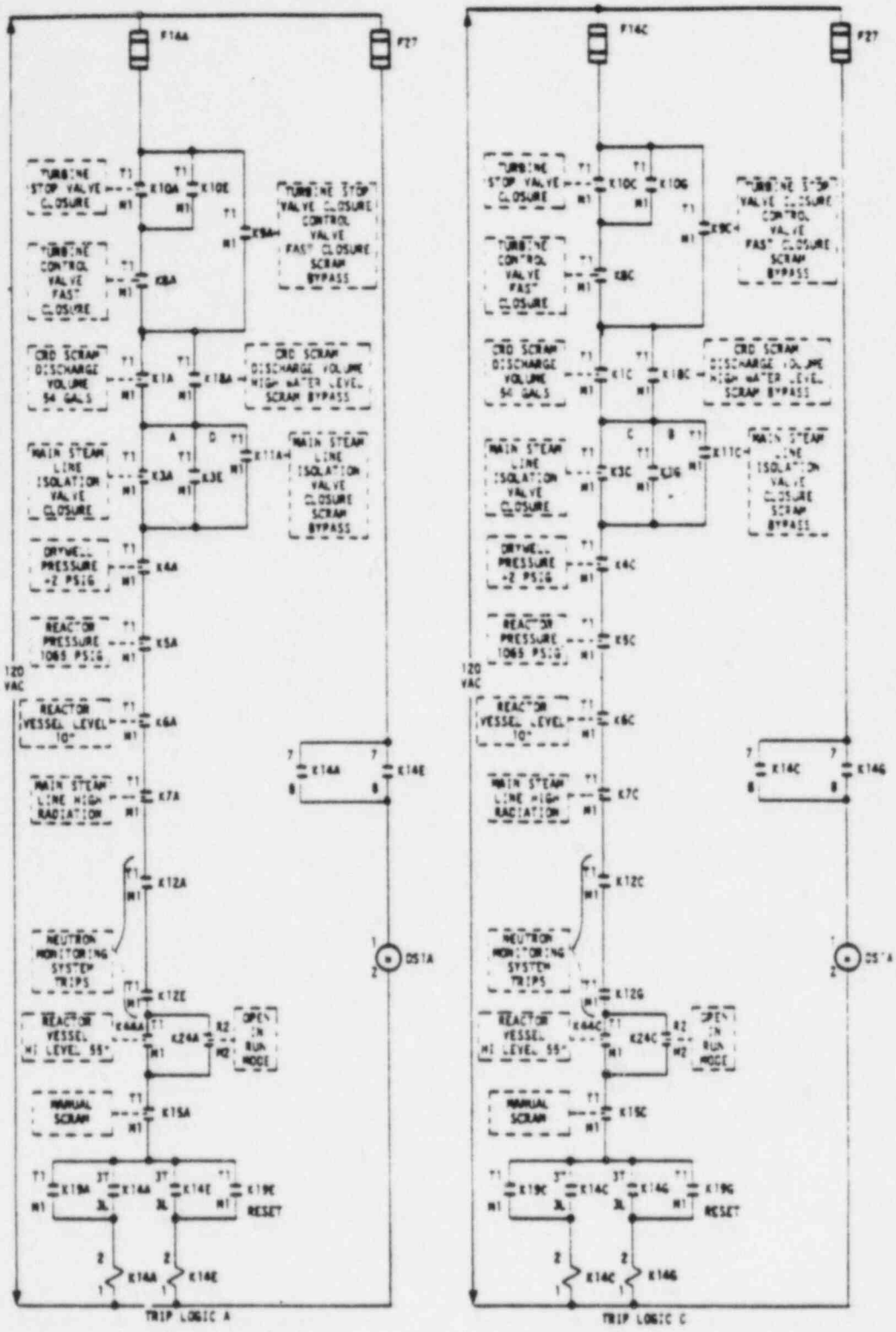


FIGURE 141A RPS TRIP SYSTEM A

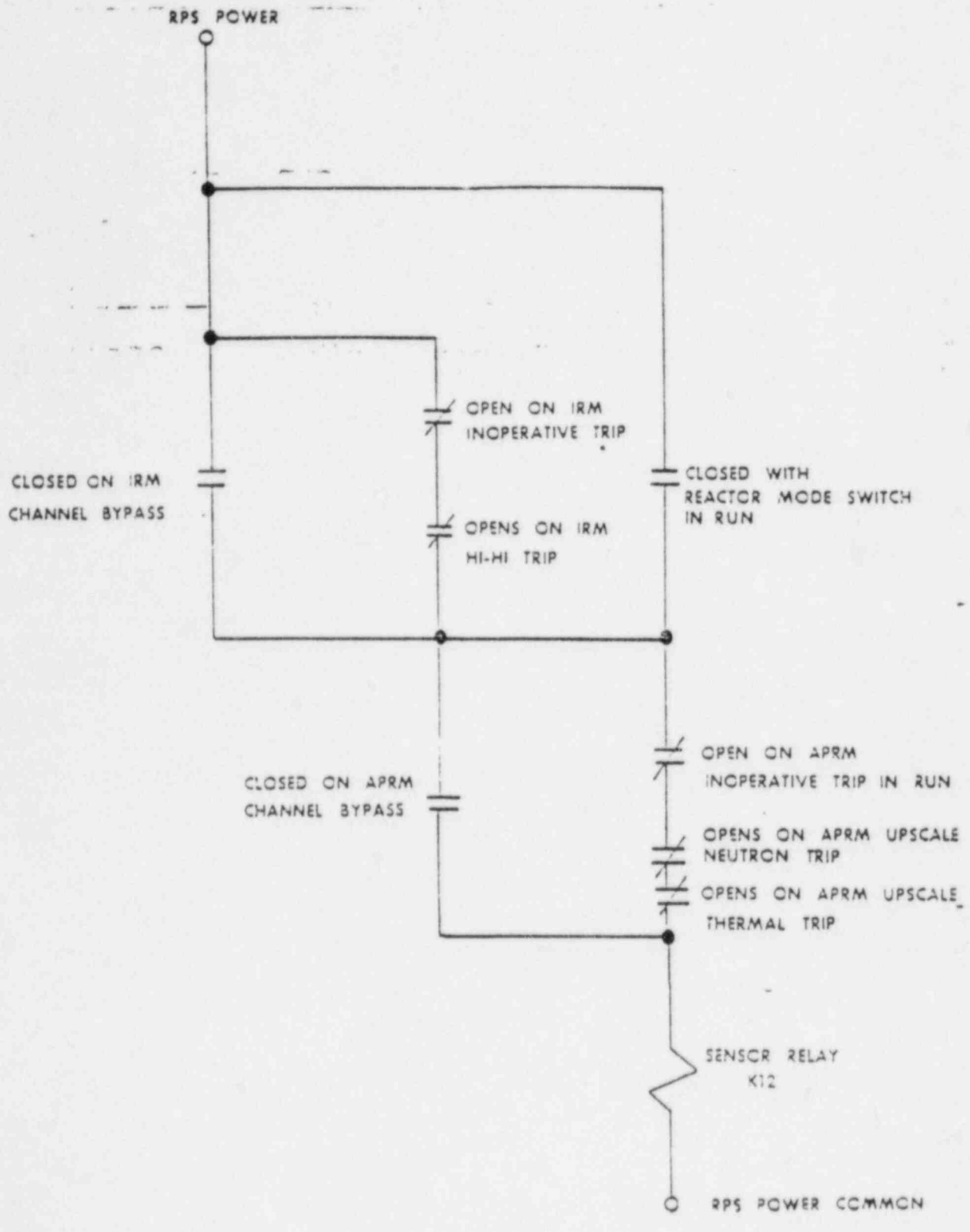


Figure 1418 IRM/APRM Scram Sensor Channel Circuit (Typical of 8)

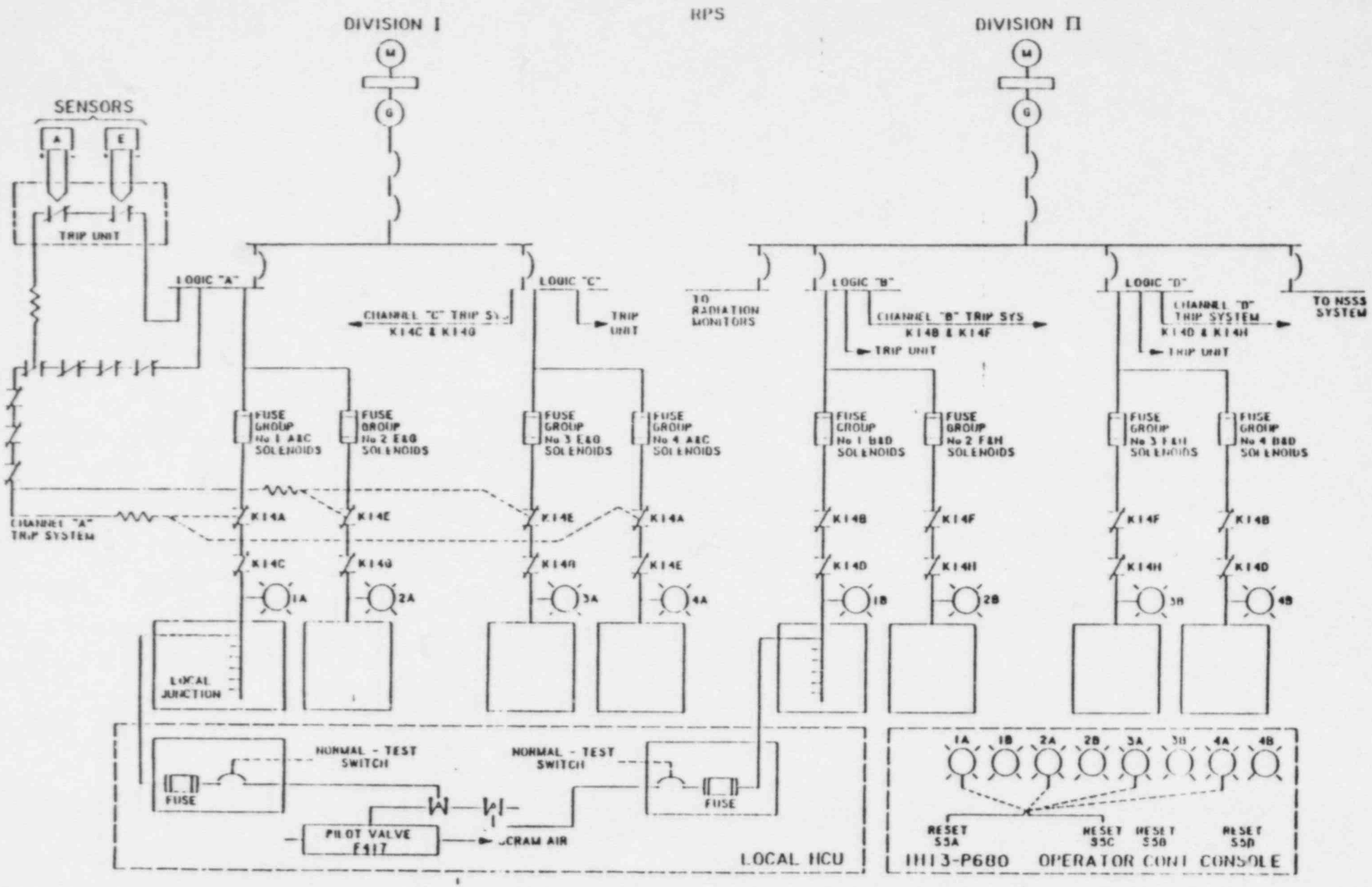

RPS
DIVISION I
DIVISION II
SENSORS
A
E
TRIP UNIT
LOGIC "A"
LOGIC "C"
CHANNEL "C" TRIP SYS
K14C & K14G
TRIP UNIT
TO RADIATION MONITORS
LOGIC "B"
CHANNEL "B" TRIP SYS
K14B & K14F
TRIP UNIT
LOGIC "D"
CHANNEL "D" TRIP SYSTEM
K14D & K14H
TRIP UNIT
TO NSSS SYSTEM
FUSE GROUP No 1 A&C SOLENOIDS
FUSE GROUP No 2 E&G SOLENOIDS
FUSE GROUP No 3 E&G SOLENOIDS
FUSE GROUP No 4 A&C SOLENOIDS
FUSE GROUP No 1 B&D SOLENOIDS
FUSE GROUP No 2 F&H SOLENOIDS
FUSE GROUP No 3 F&H SOLENOIDS
FUSE GROUP No 4 B&D SOLENOIDS
CHANNEL "A" TRIP SYSTEM
K14A
K14E
K14C
K14G
K14E
K14A
K14G
K14E
K14B
K14F
K14D
K14H
K14F
K14B
K14H
K14D
1A
2A
3A
4A
1B
2B
3B
4B
LOCAL JUNCTION
NORMAL - TEST SWITCH
NORMAL - TEST SWITCH
FUSE
FUSE
PILOT VALVE E417
SCRAM AIR
LOCAL HCU
1A 1B 2A 2B 3A 3B 4A 4B
RESET SSA
RESET SSC
RESET SSB
RESET SSD
IH13-P680 OPERATOR CONT CONSOLE

FIGURE 14IC

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 1.01 (1.00)

c

REFERENCE
BFNP REACTIVITY COEFFICIENTS LP,P.3
GGNS OP-NP-513,P.9-10

ANSWER 1.02 (1.00)

c

REFERENCE
BFNP NUCLEAR REACTIONS LP,P. 7
GGNS OP-NP-505,P.4

ANSWER 1.03 (1.00)

b

REFERENCE
BFNP NEUTRON SLOWING DOWN AND DIFFUSION LP,P.6-8
GGNS OP-NP-510,P.6,9;511,P.4

ANSWER 1.04 (1.00)

d

REFERENCE
BFNP MCD BWR LP,P.4
GGNS OP-RP-502,P.5-7

ANSWER 1.05 (1.00)

a

REFERENCE
BFNP LHGR AND BASES LP,P.8-9
GGNS MCD, THERMAL LIMITS, P.74

THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 1.06 (1.00)

d

REFERENCE
BFNP PUMPS LP,P.5-6
GGNS OP-HF-514

ANSWER 1.07 (1.00)

a

REFERENCE
GGNS OP-AD-545,P. 4

ANSWER 1.08 (2.00)

a. The assembly power which would cause the onset of transition boiling at some point in the assembly. (1.0)

b. 2

REFERENCE
BFNP TRANSITION BOILING & ATLAS TESTING LP,P.5-6
GEXL CORRELATION & CRITICAL POWER LP,P.3
GGNS MCD, THERMAL LIMITS, P.26,32-33

ANSWER 1.09 (1.00)

d

REFERENCE
BFNP RANKINE CYCLE LP,P.5,7-8
GGNS OP-HF-505

ANSWER 1.10 (1.00)

d

THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

REFERENCE
GGNS OP-NP-511,P.3

ANSWER 1.11 (1.50)

a. 1000 psia

b. 800 F

c. 255 F

REFERENCE
GGNS OP-HF-503,P.22-24

ANSWER 1.12 (1.00)

-80 seconds

the longest-lived delayed neutron precursor (Br-87) (0.5ea/1.0)

REFERENCE
GGNS OP-NP-518,P.6

ANSWER 1.13 (1.00)

(1175 - 536.6) / 657.5 = 0.971

REFERENCE
GGNS OP-HF-503,P.5

ANSWER 1.14 (2.00)

a. Due to the pressure spike.

b. Due to the decrease in reactor power.

c. Due to the cycling of SRVs.

d. Due to vessel high level (L8).

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

REFERENCE
GGNS FSAR FIG. 15.3-4

ANSWER 1.15 (1.00)

b

REFERENCE
GGNS OP-HF-502,P.7

ANSWER 1.16 (1.00)

1. It (hydrogen) has a high microscopic scattering cross section .

2. It (hydrogen) has a high logarithmic energy decrement per collision.

REFERENCE
GGNS OP-NP-502,P.9

ANSWER 1.17 (1.00)

a. True

b. True

REFERENCE
GGNS OP-NP-512,P.13-14

ANSWER 1.18 (2.00)

a. 4.77%
b. 3.8%
c. 1.0%
d. 3.0%

REFERENCE
GGNS OP-NP-518,P.2,9 (CAF) **********

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 1.19 (1.50)

1. power level
2. time at power
3. time since shutdown

REFERENCE
GGNS OP-NP-518,P.7

ANSWER 1.20 (1.00)

d

REFERENCE
EIH, L-RQ-605 (15)
GGNS, OP-NP-515,P.4-7

ANSWER 1.21 (1.00)

c

REFERENCE
BFNP XENON & SAMARIUM LP, P.4,12
GGNS LP OP-NP-514, p. 5-10

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 2.01 (1.00)

a

REFERENCE
GGNS LP OP-E51-501

ANSWER 2.02 (1.00)

b

REFERENCE
GGNS LP OP-E51-501

ANSWER 2.03 (1.00)

- Hi DW Pressure [.3], 1.39 psig [.1]
- AND- [.2]
- RCIC Stm Pressure Low [.3], 60 psig [.1] (1.0)

REFERENCE
GGNS LP OP-E51-501, p.9

ANSWER 2.04 (1.00)

b

REFERENCE
BFNP LP#39,P.18
GGNS OP-C41-501,P.5,20

ANSWER 2.05 (1.00)

Flow is established from SSW loop B [0.5] to RHR loop B LPCI injection line [0.5].

REFERENCE
GGNS OP-P41-501,P.14
SD-E12,P.40

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 2.06 (1.50) Delete Question/Answer JPM

1. Reactor water
2. RWCU system water
3. CRD system water

REFERENCE
GGNS OP-P33-501,P.4,5

ANSWER 2.07 (1.50)

1. Loss of ability to make up water to the cooling tower basins.
2. Loss of ability to make up water to the SSW fill tank.
3. Loss of ability to inject sulfuric acid into the basin.
4. Loss of ability to inject hypochlorite into the basin. (3@0.5ea/1.5)
5. Accepted other answers that are in Accordance with Loss of Instrument Air Procedure as refers to SSW. JPM

REFERENCE
GGNS OP-P41-501,P.22
SD-P41,P.36-37
Proc. 05-1-02-V-9 JPM

ANSWER 2.08 (1.00)

d

REFERENCE
GGNS SD-P42,P.3,19

ANSWER 2.09 (2.00)

a. Each operating pump FCV is automatically controlled to maintain its respective pump's desired flow.

b. All operating pump FCVs are automatically controlled to maintain desired pressure on the common (36") header.

REFERENCE
GGNS OP-P44/47-501,P.3,7

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 2.10 (1.50)

a. The ECCS pump discharge pressure interlocks (0.5)

b. 601 - the tail pipe pressure switch has picked up
631 - the (B) solenoid is energized (0.5ea/1.0)

REFERENCE
GGNS OP-E22-2-501,P.7,9-10

ANSWER 2.11 (1.50)

1. Drywell cooler temperature
2. Drywell cooler condensate flow
3. DWEDS / DWFDS fill rate
4. Recirc pump seal leak det.
5. Vessel head seal leak det.
6. Valve packing leak det.
7. Drywell pressure
8. Drywell air monitoring (6@0.25/1.5)

REFERENCE
GGNS OP-E31-501,P.10-14

ANSWER 2.12 (1.50)

1. Prevent RHR water hammer
2. Minimize LPCI injection time
3. The A & B pumps provide FWLCS seal water
4. The C pump provides suppression pool level transmitter reference leg fill (3@0.5ea/1.5)

REFERENCE
GGNS OP-E12-501,P.10
OP-E32/38-501,P.13-14

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 2.13 (1.50)

a. > 50 psig reactor pressure after a 15 minute time delay
b. Rx level 1 / -150.3"
c. High drywell pressure / 1.39 psig
d. No
e. the initiation signal is reset (0.3ea/1.5)

REFERENCE
GGNS OP-E21-501,P.7

ANSWER 2.14 (.50)

zero gpm

REFERENCE
GGNS OP-E21-501,P.12,17

ANSWER 2.15 (1.00)

d

REFERENCE
USNRC BWR-4 Systems Manual, pp 3.3-8 - 3.3-10
EIH: HNP-x-1001; HNP-x-1286
GGNS LP OP-N21-501 p.10
GGNS SIM. MAL. 121

ANSWER 2.16 (1.50)

1. Shielding when the reactor is in operation
2. Storage space for the steam dryer and moisture separator assemblies and for fuel transfer during refueling
3. Post-LOCA suppression pool makeup water source

REFERENCE
GGNS SD-M41-1,P.12-13

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 2.17 (1.00)

a. Refueling water transfer pumps

b. 'C' RHR pump

REFERENCE
GGNS OP-N22/P60-501,P.6-7

ANSWER 2.18 (2.00)

BFNP: 1. Inlet inboard isolation valve (69-1) not fully open.
2. Inlet outboard isolation valve (69-2) not fully open.
3. Reactor return isolation valve (69-12) fully closed.
4. Pump flow <= 90 gpm for 7 seconds.
5. Pump cooling water (RBCCW) outlet temp. high (140F) (4@0.5ea)

GGNS: 1. Pump cooling water (CCW) temp high (195F)
2. Pump suction flow low (<70 gpm after 15 sec pump run)
3. F001 closed [0.25] and any of F250, 251, 252, 253 not full open [0.25]
4. Isolation valve F004 not fully open
5. Motor Protection Device Activated (4@0.5ea)

REFERENCE
BFNP LP#13,P.10
GGNS SD-G33/G36,P.5

ANSWER 2.19 (1.50)

a. Containment cooling coolers discharge plenum
b. Drywell
c. Rx water sampling station vent hood
d. Containment cooling coolers suction plenum
e. Auxiliary building penthouse exhaust vent

REFERENCE
GGNS SD-M41,P.7-8

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 2.20 (2.00)

1. High-high activity in the air intake duct
2. High chlorine gas concentration in the air intake duct
3. Low reactor water level (-42")
4. High drywell pressure (2 psig)
5. Accepted other signals IAW TS Table 3.3.7.1-1. GM

REFERENCE

GGNS SD-Z51,P.13

TS Table 3.3.7.1-1 GM

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 3.01 (1.00)

a

REFERENCE
GGNS LP OP-C51-4-501

ANSWER 3.02 (1.00)

b

REFERENCE
GGNS LP OP-C51-3-501

ANSWER 3.03 (2.00)

i. c

ii. d

REFERENCE
BFNP: LP#12,P.24;TRANSIENT #20;OI-57,P.53
EIH: L-RO-726
GGNS LP OP-C34-501
GGNS SIM. MAL. 125 & 69

ANSWER 3.04 (1.00)

d

REFERENCE
BFNP: L/P #3
EIH: GPNT, Vol. VI, Chapter 2.3-3, 5, Fig 2.3(3)
L-RQ-712, pp 4, 5, 19
GGNS LP OP-B21-501
GGNS LP OP-C34-501

CAF

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 3.05 (1.00)

d

REFERENCE
BFNP: BF-OI-68, pp 28, 29
EIH: EIH Simulator, Malfunction #36
GGNS SIM. MAL. 11

ANSWER 3.06 (1.00)

c

REFERENCE
BFNP: LP#7, P. 28
EIH: L-RQ-714, Figure 714-6; HNP-2-2447
GGNS SD B33-1 p. 5 & 6
GGNS LP OP-B33-1-501 p. 5
GGNS ARI B33-FAL-L603A

ANSWER 3.07 (2.00)

a. More than 1 RPIS Reed SW. closed per channel of RACS

b. Indication that all pairs of scram valves on all HCUs are not in the same state

c. Indication that the RGDS finds disagreement between the signals received from the 2 RACS

d. Indication that the withdrawn rod must be fully inserted before any other control rod can be moved

(0.5 ea)

REFERENCE
GGNS LP OP-C11-2-501

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 3.08 (1.00)

a. 2 (0.5)

b. To prevent an excessive change in the LHGR. (0.5)

REFERENCE
GGNS LP OP-C11-2-501

ANSWER 3.09 (3.00)

a. Group 1: -- CB-1 Fully Inserted
-- CB-2 Fully Inserted
-- CB-5 Open
-- CB-5 opposite loop Open
-- CB-2 Open
Group 2: -- Pump Speed 20% - 26%
-- Pump Motor Voltage not <75V for 4 Sec.
-- LFMG at Rated Voltage (.25 ea)

b. Prevents valve cycling [0.5] when Recirc Pump speed changes [0.5]
REFERENCE
GGNS OP-N33-1

ANSWER 3.10 (1.00)

a

REFERENCE
GGNS LP OP-N32-2-501

ANSWER 3.11 (1.00)

c

REFERENCE
GGNS: SOI-04-1-01-C11-1, pp 2, 3

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 3.12 (1.00)

d

REFERENCE
GGNS OP-D21-501,P.9
SD-D21,P.6

ANSWER 3.13 (1.00)

a

REFERENCE
BFNP LP#19,P.5-6
GGNS SD-C51-2,P.16

ANSWER 3.14 (2.00)

1) APRM 'A' fails upscale -> relay K12A deenergizes (0.4)
2) -> NMS contacts K12A in RPS Trip Logic A open (0.4)
3) -> Relays K14A & E deenergize -(0.4)
4) -> Contacts K14A & E open (0.4)
5) -> Scram solenoids for RPS A deenergize (0.4)

REFERENCE
BFNP: L/P #28
EIH: L-RQ-720, Fig 720-1a, -1b, -2a, -2b, -3a, -3b
GPNT, Vol. VI, Chapter 9.3.1-2, 3, 4
GGNS: SD-C71,P.2-7

ANSWER 3.15 (1.00)

b

REFERENCE
GGNS OP-R21-501,P.7,17,21

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 3.16 (3.00)

	ATWS	RPT
a.	-1125 psig -level 2 (-42")	-TCV fast closure -TSV trip
b.	-opens CB-2 -opens CB-5	-opens CB-3 -opens CB-4 -initiates Fast to Slow Transfer
c.	-ATWS Test Switches (HS-M616A/B)	-auto if < 30% first stg press -keylock switches on RPS logic (0.5ea)

REFERENCE
GGNS SD-B33-1,P.23-24,21

ANSWER 3.17 (1.00)

Load Reference Control automatically switches off during:

1. a load rejection below 12% power (power <12% for > 5 sec.), or -
2. a load rejection above 35% power (0.5 ea)

REFERENCE
GGNS LP OP-N32-2-501

→ 3. Turbine Trip Per Section 1.4.3.6.d of LP JDM

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 4.01 (1.50)

The following checks should be made:

- Breaker charging springs charged. (0.5)
- Charging motor disconnect switch on. (0.5)
- Control power on. (0.5)

REFERENCE
GGNS Proc. 02-S-01-2
GGNS LP OP-AD-539

ANSWER 4.02 (1.00)

c

REFERENCE
EIH: HNP-2-1933, p 2
GGNS: ONEP-05-1-02-IV-1

ANSWER 4.03 (1.50) Delete Question / Answer JPM

1. Place the RPS (Div 1, 2, 3, & 4) CRD Discharge Volume HI Trip Bypass Switches in the BYPASS position.
2. Place the RPS (Div 1, 2, 3, & 4) Scram Reset Switches in the RESET position and verify that the scram resets.
3. Allow the HCU's to recharge, then drive the control rods that are not full-in to position 00. (0.5 ea)

REFERENCE
GGNS: ONEP-05-1-02-I-1, p 3

ANSWER 4.04 (1.00)

Without air pressure the D/G shutdown features are inhibited.

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

REFERENCE
GGNS: ONEP-04-1-01-P75-1, p 3

ANSWER 4.05 (1.00)

Establish LPCS or LPCI flow from the Suppression Pool with injection to the RPV (0.5) and open two (2) SRV's to establish return flow to the Suppression Pool. (0.5)

REFERENCE
GGNS: 05-S-01-EP-8, pp 1, 2

ANSWER 4.06 (1.50)

1. Verification of system integrity by visual inspection of accessible areas and/or
2. Verification of system integrity by available indication(s) for inaccessible areas (PRM's, etc) and
3. Verification that operation of the system will not result in uncontrolled release to the environment. (0.5 ea)

REFERENCE
GGNS: ONEP-05-1-02-III-5, p 3

ANSWER 4.07 (1.00)

b

REFERENCE
GGNS: 05-5-01-EP-2, p 6

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 4.08 (1.00)

To minimize the feedwater-to-reactor differential temperature (and feedwater nozzle thermal stress).

REFERENCE
GGNS: IOI-03-1-01-3, p 2

ANSWER 4.09 (2.00)

1. Main Steam Line Pressure > 850 psig.
2. Main Steam Line Low Pressure Alarm cleared.
3. All operable APRM's indicating > 5% power.
4. All APRM Downscale Alarms cleared.
5. Transfer one (1) IRM/APRM Recorder in each Division to APRM and Place IRM recorders in Slow Speed (4 @ 0.5 each)
6. Also Accepted Administrative Verifications per STEP 6.2.17 of Procedure. JDM

REFERENCE
GGNS: IOI-03-1-01-1, pp 47, 48

ANSWER 4.10 (1.50)

1. Work Permit (WP)
2. Surveillance Permit (SP)
3. General Access Permit (GAP) (0.5 each)

REFERENCE
GGNS: 01-S-08-2, pp 17, 18

ANSWER 4.11 (1.00)

b

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

REFERENCE
GGNS: ONEP-05-1-02-I-4, p 3

ANSWER 4.12 (1.00)

d

REFERENCE
GGNS: ONEP-05-1-II-1, p 4

ANSWER 4.13 (1.50)

a. Loop Manual

b. 10%

c. 5% (0.5 each)

REFERENCE
GGNS: ONEP-05-1-02-III-3, p 2

ANSWER 4.14 (1.00)

a

REFERENCE
BFNP: BF-OI-66, pp 5-7
EIH: HNP-1001, pp 19, 20
GGNS: IOI-03-1-01-1, p 33; SOI-04-1-01-N33-1, p 4

ANSWER 4.15 (1.00)

a

REFERENCE
GGNS: ONEP-05-1-02-V-1, p 1

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 4.16 (1.00)

b

REFERENCE
EIH: HNP-2-1946
GGNS: ONEP-05-1-02-V-5, p 2

ANSWER 4.17 (2.00)

a. (1) 14.5 feet
(2) 212 deg F
(3) 140 deg F (0.5 each)

b. To ensure that there is adequate NPSH for the respective ECCS pumps.

REFERENCE
GGNS: EP-3, p 6; EP-5, p 2; EP-7, p 1

ANSWER 4.18 (1.00)

GGNS: 2.5 mR/hr - < 100 mR/hr (0.125 credit for 100 mR/hr)

REFERENCE
EIH: GET Handbook, p 25
GGNS: 01-S-08-2, p 15

ANSWER 4.19 (1.00)

a. 65 MW (+0, -5 MW) ← (OR) → a. 25 mw (0.5)

b. EHC INFL STOP LRL Light - OR - EHC Lock-up preventing LDL increases

b. No annunciator indication. (0.5)

Per Step 5.2 of Procedure JM

REFERENCE
GGNS: IOI-03-1-01-2, p 7

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 4.20 (.50)

a. Gas Pressure (PI-R131) remains constant

REFERENCE
GGNS: SOI-04-1-01-C11-1, p 9

ANSWER 4.21 (1.00)

b

REFERENCE
GGNS: Procedure 01-S-06-01

Master

ENCLOSURE 3

U. S. NUCLEAR REGULATORY COMMISSION
SENIOR REACTOR OPERATOR LICENSE EXAMINATION

FACILITY: GRAND GULF 1

REACTOR TYPE: BWR-GE6

DATE ADMINISTERED: 85/08/12

EXAMINER: MUNRO,J

APPLICANT: _____

INSTRUCTIONS TO APPLICANT:

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up six (6) hours after the examination starts.

CATEGORY VALUE	% OF TOTAL	APPLICANT'S SCORE	% OF CATEGORY VALUE	CATEGORY
26.50	~~25.1~~ ~~24.77~~ 24.75			5. THEORY OF NUCLEAR POWER PLANT OPERATION, FLUIDS, AND THERMODYNAMICS
28.50	~~27~~ ~~26.64~~ 26.62			6. PLANT SYSTEMS DESIGN, CONTROL, AND INSTRUMENTATION
~~25.5~~ ~~26.00~~ 25.98	~~23.2~~ ~~24.30~~ 24.28			7. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
26.00	~~24.6~~ ~~24.30~~ 24.28			8. ADMINISTRATIVE PROCEDURES, CONDITIONS, AND LIMITATIONS
~~105.5~~ ~~107.00~~ 105.48	100.00			TOTALS

FINAL GRADE _____%

All work done on this examination is my own. I have neither given nor received aid.

_____
APPLICANT'S SIGNATURE

QUESTION 5.01 (1.00)

The rate of change of power in a nuclear reactor is governed by the average neutron generation time (l-av). How does l-av change as the core ages?

a. l-av INCREASES due to the DECREASE in the effective delayed neutron fraction (B-bar) over core life.

b. l-av DECREASES due to the DECREASE in the effective delayed neutron fraction (B-bar) over core life.

c. l-av INCREASES due to the INCREASE in the effective delayed neutron fraction (B-bar) over core life.

d. l-av DECREASES due to the INCREASE in the effective delayed neutron fraction (B-bar) over core life.

QUESTION 5.02 (1.00)

Which of the following radiation exposures would inflict the GREATEST biological damage to man?

a. 1 Rem of GAMMA

b. 1 Rem of ALPHA

c. 1 Rem of NEUTRON

d. NONE of the above; they are all equivalent

QUESTION 5.03 (1.00)

When does a constant-speed centrifugal pump motor draw the LEAST current?

a. at 'runout' conditions

b. at its 'operating point'

c. while 'cavitating'

d. at 'shutoff head' conditions

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.04 (1.00)

Which of the following equations is used to perform a BWR reactor heat balance?

NOTE: c=CRD; f=Feedwater; s=Steam; ri=RWCU in; ro=RWCU out

a. $\dot{Q}\text{-rx} = (w_c + w_f) \times h_s + w_{ro} \times h_{ro} + \dot{Q}\text{-rad} - w_f \times h_f - w_{ri} \times h_{ri} - w_c \times h_c - \dot{Q}\text{-pump}$

b. $\dot{Q}\text{-rx} = (w_c + w_f) \times h_s + w_{ri} \times h_{ri} + \dot{Q}\text{-rad} - w_f \times h_f - w_{ro} \times h_{ro} - w_c \times h_c - \dot{Q}\text{-pump}$

c. $\dot{Q}\text{-rx} = (w_c + w_f) \times h_s + w_{ro} \times h_{ro} + \dot{Q}\text{-pump} - w_f \times h_f - w_{ri} \times h_{ri} - w_c \times h_c - \dot{Q}\text{-rad}$

d. $\dot{Q}\text{-rx} = w_f \times h_f + w_{ri} \times h_{ri} + \dot{Q}\text{-rad} - (w_c + w_f) \times h_s - w_{ro} \times h_{ro} - w_c \times h_c - \dot{Q}\text{-pump}$

QUESTION 5.05 (2.00)

a. DEFINE 'Critical Power'.

b. Which one of the following conditions would tend to INCREASE the Critical Power level assuming all other variables remain unchanged?

1. Inlet subcooling is DECREASED
2. Reactor pressure is DECREASED
3. The axial power peak is RAISED
4. Coolant flow rate is DECREASED

QUESTION 5.06 (1.00)

Which of the following conditions will result in the largest (MOST negative) Doppler/fuel temperature coefficient?

a. 1000F fuel temperature with 10% voids

b. 2000F fuel temperature with 10% voids

c. 1000F fuel temperature with 30% voids

d. 2000F fuel temperature with 30% voids

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.07 (2.00)

The reactor is supercritical on a 60-second period in the source range at BOL. Assuming no further rod movements and the following initial conditions, CALCULATE the FINAL STABLE values of reactor temperature and pressure. Show assumptions and calculations where necessary.

a. Reactor temperature 281 F (1.5)
b. Reactor pressure 35.3 psig (0.5)

QUESTION 5.08 (1.00)

A new Periodic NSS Core Performance Log (P1) is run and several LPRMs are noted to have a Base Crit Code of 2. What does this indicate to the operator AND what should be done to correct the situation?

QUESTION 5.09 (1.50)

a. BRIEFLY DESCRIBE the Sm-149 transient response following a shutdown from a 100% equilibrium condition and a subsequent restart to 100% power after a three-month outage. (1.0)

b. HOW does the 100% equilibrium Sm-149 concentration compare with the 50% power equilibrium concentration? (<, >, =) (0.5)

QUESTION 5.10 (1.50)

Using the enclosed Mollier Diagram, LIST the following property values for steam with an enthalpy of 1390 BTU/lbm and an entropy of 1.568 BTU/lbm - F.

a. Pressure

b. Temperature

c. Superheat

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.11 (1.50)

Four variables are combined to form a dimensionless constant called the Reynolds number which describes the type of flow, either laminar or turbulent, in a system. LIST three (3) of these four variables.

QUESTION 5.12 (1.00)

FILL IN THE BLANKS

The reactor period for any reactor shortly after a scram will be _____ seconds because of _____.

QUESTION 5.13 (1.00)

Which of the following post accident containment hydrogen contributors is dependent on the radiation field intensity inside containment for the amount of hydrogen released?

a. $Zr + H_2O \rightarrow ZrO + H_2$

b. $2H_2O \rightarrow 2H_2 + O_2$

c. $2Al + 3H_2O \rightarrow Al_2O_3 + 3H_2$

d. $Fe + H_2O \rightarrow FeO + H_2$

QUESTION 5.14 (1.00)

CALCULATE the QUALITY of a 540 degree F vapor-liquid mixture whose specific enthalpy is 1175 BTU/lbm.

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.15 (1.50)

For each of the following meteorological / evaporative cooling parameter changes, state whether you would expect condenser vacuum to INCREASE (lower absolute pressure), DECREASE (higher absolute pressure), or REMAIN UNCHANGED.

a. Relative humidity increases from 60% to 90%.

b. A temperature inversion occurs.

c. Ambient temperature drops from 90 F to 80 F.

QUESTION 5.16 (1.00)

The THRESHOLD power below which PCI failures do not occur is known to DECREASE with fuel burnup. STATE two (2) reasons for this decrease in the PCI threshold.

QUESTION 5.17 (1.00)

Adding latent heat to liquid water at saturated conditions will...

a. increase the temperature of the water.

b. change the water to steam at the same temperature.

c. change the water to steam at a slightly higher temperature.

d. decrease its subcooling by making it boil.

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.18 (2.00)

The attached figure (15.4-5) illustrates a transient that could occur at a BWR.

GIVEN: (1) A fast opening of BOTH recirc. FCVs at 11% per second.
(2) No operator actions are taken.
(3) Valve ~~closure~~ OPEN. begins at time = 0 seconds.

EXPLAIN the cause of the following recorder indications:

a. The decrease in core inlet flow after ~10 seconds on graph (a).

b. The peak in vessel pressure at ~~~10~~ ~1.5 to 2 seconds on graph (b).

c. The decrease in feedwater flow between ~23-30 seconds on graph (c).

d. The reactor scram at ~1.5 seconds on graph (d).

QUESTION 5.19 (1.00)

Water is an excellent neutron moderator. What are TWO (2) NUCLEAR FACTORS which make water the moderator of choice for most commercial reactors?

QUESTION 5.20 (1.50)

LIST three (3) factors upon which a reactor's decay heat generation rate is dependent.

(***** CATEGORY 05 CONTINUED ON NEXT PAGE *****)

QUESTION 5.21 (1.00)

Which of the following is NOT a characteristic of Subcritical Multiplication?

a. The subcritical neutron level is directly proportional to the neutron source strength.

b. Doubling the indicated count rate by reactivity additions will reduce the margin to criticality by approximately one-half.

c. For equal reactivity additions, it takes longer for the new equilibrium count rate to be reached, as K-eff approaches unity.

d. A single notch of rod withdrawal will produce an equivalent equilibrium count rate increase whether Keff is 0.88 or 0.92.

(***** END OF CATEGORY 05 *****)

QUESTION 6.01 (1.00)

Assume that APRM 'B' currently has 14 operable LPRM inputs and is reading 65% power. Which of the following indication(s) and/or action(s) will occur as a result of 1 LPRM (of the 14 remaining LPRM inputs to APRM 'B') failing downscale? Assume NO operator action.

a. LPRM downscale alarm - APRM 'B' reading < 65%

b. LPRM downscale alarm - APRM 'B' reading > 65%

c. LPRM downscale alarm - APRM INOP Trip and Alarm - Rod Block - APRM 'B' reading 65%

d. LPRM downscale alarm - APRM INOP Trip and Alarm - Rod Block - 1/2 Scram - APRM 'B' reading 65%

QUESTION 6.02 (1.00)

Which of the following axial location sequences correctly describe the axial locations of LPRMs in the core?

a. BAF - 'A'@+9' - 'B'@+27' - 'C'@+45' - 'D'@+63'

b. BAF - 'A'@+18' - 'B'@+54' - 'C'@+90' - 'D'@+126'

c. BAF - 'D'@+9' - 'C'@+27' - 'B'@+45' - 'A'@+63'

d. BAF - 'D'@+18' - 'C'@+54' - 'B'@+90' - 'A'@+126'

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.03 (2.00)

For each of the following situations (i and ii) select the correct Feedwater Control System / plant response from the list (a through e) which follows. An answer may be used more than once, and NO operator actions are taken.

a. Reactor water level decreases and stabilizes at a lower level.

b. Reactor water level decreases and initiates a reactor scram.

c. Reactor water level increases and stabilizes at a higher level.

d. Reactor water level increases and initiates a turbine trip and Reactor Scram.

e. None of the above.

i. The plant is operating at 90% power in 3-element control when the HPCS system inadvertently initiates and injects.

ii. The plant is operating at 100% power, in 3-element control, when one Feed Flow Detector FAILS DOWNSCALE.

QUESTION 6.04 (1.00)

The reactor is critical at approximately 10 psig and the "RX Heatup and Pressurization" phase of 03-1-01-1,RX SU is being performed. The narrow range P-680 level instruments read the following "approximate" values:

NR LT-N004A	37"
NR LT-N004B	38"
NR LT-N004C	37"

The WIDE RANGE P-680 indicators should read which of the following approximate values?

a. 0 inches.

b. 15 inches

c. 38 inches

d. 60+ inches

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.05 (1.00)

Which of the following is NOT a symptom that you would expect to see as a result of a "Jet Pump Riser Failure"? Assume Recirc Flow Control is in "Flux Manual".

a. DECREASE in failed Jet Pump flow.

b. DECREASE in core differential pressure.

c. DECREASE in reactor (APRM) power.

d. INCREASE in indicated core flow.

QUESTION 6.06 (1.00)

The plant is operating normally at power when you receive a "Pump A Seal Staging Flow High/Low" alarm and note a DECREASE in No.2 Recirc Pump seal pressure. Which of the following failures would cause this indication?

a. Failure of No. 1 seal

b. Failure of No. 2 seal

c. Plugging of the No. 1 internal restricting/breakdown orifice

d. Plugging of the No. 2 internal restricting/breakdown orifice

QUESTION 6.07 (1.00)

Which of the following is the only normally CLOSED valve in the RCIC steam supply flow path in the at power Standby lineup?

a. Steam Supply Valve (F045)

b. Outboard Steam Isolation Valve (F064)

c. Turbine Trip Throttle Valve

d. Turbine Governor Valve

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.08 (1.00)

Which of the following sequences of components correctly reflects the normal RCIC water flow path for injection into the Reactor?

a. CST - Pump - "B" FW Line, upstream of FW Flow detector

b. CST - Pump - "B" FW Line, downstream of FW Flow detector

c. CST - Pump - "A" FW Line, upstream of FW Flow detector

d. CST - Pump - "A" FW Line, downstream of FW Flow detector

QUESTION 6.09 (1.00)

What is(are) the automatic isolation signal(s) to the RCIC Vacuum Breaker Isolation Valves(F077,F078)? Setpoints required.

QUESTION 6.10 (2.00)

Briefly explain what condition(s) will generate EACH of the following indications on the Operator Control Module.

a. Data Fault

b. Scram Valves

c. Channel Disagree

d. Insert Required

QUESTION 6.11 (1.00)

a. Fill in the following blank:
Above the HPSP, continous withdrawal of a control rod is automatically limited to _____ notch(es). (0.5)

b. What is the reason for this limitation? (0.5)

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.12 (3.00)

Consider a Recirc Pump Fast to Slow Speed transfer:

a. After 'tripping CB-5', certain permissives must be met to 'close CB-2' and complete the speed transfer. Indicate the 8 permissives (in 2 groupings) that are left blank on Figure 9 - Transfer Sequence. (2.0)

b. Briefly explain the reason for 'tripping the FCV to Manual' in the sequence. (1.0)

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.13 (1.00)

The plant is operating at 100% power with Recirc Flow control in "Flux Manual". An operator inadvertently INCREASES the "Pressure Reference Set" on the EHC Turbine Control System by 5 psig.

ASSUME: 1. No further operator action.
2. All other EHC control settings are normal.
3. Starting Parameters:
- TCVs (MSCV & LPSCVs) - 100% Steam Flow Position
- BSCVs - 0% Steam Flow Position
- Rx Power - 100% Rated Thermal Power
- Rx Pressure - 1025 psig

NOTES: All valve %s are in % Steam Flow Position.
See Figure 7 (EHC Logic Diagram) for information.

Which of the following most accurately describes both the INITIAL RESPONSE and FINAL STATUS of the different parameters and components?
Note: Only 1 Answer, Read entire Column for Initial & Final Response.

	a	b	c	d
INITIAL RESPONSE				
- TCVs	Partial Close (<100%)	Partial Close (<100%)	Partial Close (<100%)	No Change
-BSCVs	No Change	Partial Open (>0%)	No Change	Partial Open (>0%)
-Rx Power	Increase	No Change	Increase	Decrease
-Rx Pressure	Increase	No Change	Increase	Decrease
FINAL STATUS				
-TCVs	~100%	Partial Close (<100%)	0%	~100%
-BSCVs	0%	Partial Open (>0%)	Open (as necessary) *	0%
-Rx Power	>100%	>100%	~0%	<100%
-Rx Pressure	>1025 psig	>1025 psig	~920 psig	<1025 psig

* Open as necessary for SD Pressure Control

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.14 (1.00)

How would a loss of service air affect the operation of the Standby Liquid Control System (SBLC)?

a. The SBLC tank level indication would be inoperable.

b. The SBLC tank air sparger would be inoperable.

c. The SBLC tank level indication and air sparger would be inoperable.

d. It would have NO impact since the instrument air system supplies all SBLC needs.

QUESTION 6.15 (1.00)

The containment flooding mode of RHR is available as a backup when virtually all other means to keep the core covered have failed. Briefly DESCRIBE the flowpath established during the containment flooding mode.

QUESTION 6.16 (1.00)

The General Area Radiation Monitors (ARMs) have installed check sources. These sources...

a. are normally shielded and are exposed by depressing the green backlit Check Source pushbutton.

b. are automatically exposed every 17 minutes to test proper module response.

c. do not affect the ARM's indicated background radiation level in those areas monitored.

d. aid in the detection of equipment malfunctions which cause downscale trips.

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.17 (1.00)

The plant is operating at power with A, B, and C CCW pumps running and NONE of the pumps selected for STANDBY operation. A LOSP occurs and the diesels start and tie in normally. How will the CCW system respond during this transient?

a. The LSS panel will auto start the "B" CCW pump on ESF power 20 seconds after the bus is reenergized.

b. Either the "A" or "B" CCW pumps can be started manually on ESF power after the buses are reenergized.

c. SSW will automatically tie in to the main CCW supply header on decreasing header pressure.

d. The "B" CCW pump can be manually started by the operator on ESF power after the bus is reenergized.

QUESTION 6.18 (1.50)

Answer the following with regard to the SRVs / ADS:

a. Which ADS interlock / permissive signal is NOT bypassed (i.e. must be present) to allow manual initiation of ADS from the 601 panel? (0.5)

b. Panels 601 and 631 have red and green SRV indicating lights. An illuminated red light on P601 indicates that _____ while an illuminated red light on P631 indicates that _____. (BE SPECIFIC.)

(APRM Scram)

QUESTION 6.19 (1.50)

Fill in the following blanks with the appropriate (if any) LPCS injection valve (F005) interlocks and setpoints:

Manual opening of F005 with the handswitch is prohibited when _____(a)_____. If power is available, F005 will auto open on a LPCS initiation signal of _____(b)_____ or _____(c)_____. Once open, _____(d)_____ signal will auto close the valve. If the auto open signal is manually overridden the valve will reopen automatically if _____(e)_____.

(***** CATEGORY 06 CONTINUED ON NEXT PAGE *****)

QUESTION 6.20 (.50)

Reactor pressure is 900 psig and LPCS is running in response to a valid initiation signal. What is the approximate expected flow indication on the pump discharge flow meter on the 601 panel?

QUESTION 6.21 (1.00)

Reactor Feed Pump (RFP) turbine speed is controlled by either a Motor Speed Changer (MSC) or an Electric Automatic Positioner (EAP). The EAP ...(CHOOSE ONE)

a. ... will control the RFP turbine's speed only if its speed signal is greater than that from the MSC.

b. ...is normally used to control feed flow rate over a turbine speed of 0 - 5500 rpm.

c. ..., unlike the MSC, does NOT afford the capability of manual speed control by use of a local handwheel.

d. ...will lock in place to prevent a ramp response to a false signal, if it loses its signal from the flow controller.

QUESTION 6.22 (2.00)

The plant is operating at 100% RTP when APRM "A" fails upscale and results in a reactor half-scram. Utilizing the attached RPS trip logic diagrams (Figures #141 A thru C) DESCRIBE in a STEP-BY-STEP fashion (with regard to the opening/closing, energizing/deenergizing of ALL applicable contacts and relays) how the APRM upscale trip results in an actuation of the scram solenoid.

NOTE: IF THE ATTACHED DIAGRAMS CAN NOT BE EASILY READ, ASSIGN THE CONTACTS/RELAYS, ETC NUMBERS AND REFER TO THEM IN YOUR ANSWER.

QUESTION 6.23 (1.00)

Under what 2 conditions will the EHC System "Load Reference Control" AUTOMATICALLY switch OFF?

(***** END OF CATEGORY 06 *****)

QUESTION 7.01 (1.00)

With a stuck control rod, ONEP-05-1-02-IV-1, 'CRD Malfunctions', instructs the operator to INCREASE drive water pressure in an attempt to initiate control rod movement. With the reactor at FULL POWER conditions, SELECT the MAXIMUM differential pressure to which the drive water may be raised.

a. 90 psid

b. 260 psid

c. 350 psid

d. 500 psid

QUESTION 7.02 (1.50) DELETED From Exam See Report

A reactor SCRAM has occurred, but NOT all of the control rods have inserted to less than the 06 position. Reactor power is indicated as 6% on the APRM's. LIST the three (3) immediate operator action steps that are required per ONEP-05-1-02-I-1, 'Reactor Scram.'

NOTE: LIMIT YOUR RESPONSE TO THOSE ACTION STEPS REQUIRED FOR REACTIVITY CONTROL.

QUESTION 7.03 (1.00)

SOI-04-1-01-P75-1, 'Standby Diesel Generator' cautions the operator NOT to operate the diesel generator without air pressure. EXPLAIN the basis for this caution.

QUESTION 7.04 (1.00)

Assume that adequate core cooling CANNOT be maintained and 'Alternate Shutdown Cooling' must be established per EP-8. DESCRIBE the RPV cooling water flowpath that should be established per EP-8.

NOTE: INCLUDE IN YOUR DESCRIPTION THE SYSTEMS/COMPONENTS WHICH ARE USED.

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.05 (1.50)

EXCLUDING specific control room annunciators, LIST three (3) symptoms, per ONEP-05-1-02-I-5 'Resin Intrusion into the Reactor Vessel', that would be indicative of such an event.

QUESTION 7.06 (1.50)

Per ONEP-05-1-02-III-5, 'Automatic Isolations', LIST the three (3) conditions which must be met before a system can be restored to service. Assume an automatic isolation HAS OCCURRED and that the cause of the isolation HAS BEEN determined.

QUESTION 7.07 (1.00)

Per EP-2, 'Emergency Cooldown', which of the following most accurately describes how SRV operation should be used to control pressure, if needed?

NOTE: ASSUME THAT THE INSTRUMENT AIR SYSTEM IS OPERATING PROPERLY

a. Use numerous SRV's, with short pressure reductions (~ 50 psig) to equalize Suppression Pool heatup.

b. Use fewer SRV blowdowns, with increased pressure reductions to minimize SRV cyclic stresses.

c. Depressurize with a sustained SRV opening to maximize the emergency cooldown rate.

d. Allow the SRV's to operate by mechanical actuation to ensure design pressure control and heat dispersion.

QUESTION 7.08 (1.00)

IOI-03-1-01-3, 'Plant Shutdown', cautions the operator to reduce reactor pressure to approximately 400 psig, if possible, when it is desired to maintain a HOT SHUTDOWN condition. EXPLAIN the basis for this caution.

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.09 (2.00)

Per IOI-03-1-01-1, "Cold Shutdown to Generator Carrying Minimum Load," LIST four (4) conditions which must be met/satisfied prior to placing the Mode Switch in RUN.

NOTE: INCLUDE SETPOINTS, IF APPLICABLE

QUESTION 7.10 (1.50)

LIST the three (3) types of Radiation Work Permits (RWP's) which may be used to control access/account for personnel exposure.

QUESTION 7.11 (1.00)

Which of the following fulfills an Entry Condition into EP-5, " Rapid RPV Depressurization"?

a. Drywell temperature near the cold reference leg instrument vertical runs has INCREASED to within 93 deg F of the RPV saturation temperature.

b. Suppression Pool temperaure has INCREASED to a value of 122 deg F.

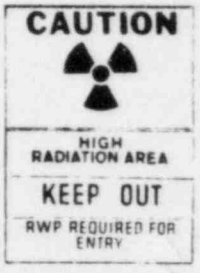
c. Containment pressure has INCREASED to a value of 5.6 psig.

d. Containment temperature has INCREASED to a value of 201 deg F.

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.12 (1.00)

You enter an area posted with the following sign:



LIST the minimally acceptable PERSONAL and PORTABLE dosimetry required for entry into this area.

QUESTION 7.13 (1.00)

The Control Room is declared uninhabitable and evacuated. The immediate operator actions for "Shutdown From the Remote Shutdown Panel", ONEP-05-1-III-1, are completed. RCIC then ISOLATES. Level subsequently decreases to Level 2. Restoration of level USING RCIC requires which of the following?

ASUME THAT THE THREE CONDITIONS NEEDED FOR RESETTING AN ISOLATION, PER ONEP-05-1-02-III-5, "AUTOMATIC ISOLATIONS", HAVE BEEN MET.

a. No Operator Action. RCIC will restart automatically.

b. Operator Action. Close RCIC TURB TRIP/THROT VLV; Place RCIC TURB FLO CONT in manual at minimum setting; Re-open RCIC TURB TRIP/THROT VLV and establish flow.

c. Operator Action. Close RCIC TURB TRIP/THROT VLV; reset RCIC TURB TRIP logic; RCIC will now restart automatically.

d. NONE OF THE ABOVE. RCIC cannot be restarted from the Remote Shutdown Panel after isolation.

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.14 (1.50)

ONEP-05-1-02-III-3, "Decrease in Recirculation System Flow Rate", directs operator actions for an unexpected decrease in reactor coolant system flow rate.

FILL IN THE BLANKS

(After the unexpected decrease), if both recirculation loops are still operating, transfer the FCV's to ____(a)____. Balance loop flows to within ____(b)____ at less than 70% core flow, or to within ____(c)____ at greater than 70% core flow.

QUESTION 7.15 (1.00)

A plant startup is in progress and condenser vacuum is being established in accordance with IOI-03-1-01-1, "Cold Shutdown to Generator Carrying Minimum Load". What is the proper sequence for component/subsystem startups?

a. Steam Seal Exhauster, Steam Seal Header, Mechanical Vacuum Pump, Steam Jet Air Ejector.

b. Steam Seal Header, Steam Seal Exhauster, Mechanical Vacuum Pump, Steam Jet Air Ejector.

c. Mechanical Vacuum Pump, Steam Seal Exhauster, Steam Seal Header, Steam Jet Air Ejector.

d. Steam Seal Exhauster, Mechanical Vacuum Pump, Steam Seal Header, Steam Jet Air Ejector.

QUESTION 7.16 (1.00)

Per ONEP-05-1-02-V-1, "Loss of Component Cooling Water", a loss of CCW may be either complete or partial. In which of the following instances would reduced flow (partial loss) be treated as a COMPLETE LOSS of CCW?

a. Reactor Recirc Pump temperatures above the HI alarm setpoint.

b. RWCU NRHX Outlet temperature above the HI alarm setpoint.

c. CCW Discharge Header pressure below the LO alarm setpoint.

d. CRD Pump Oil temperature above the HI alarm setpoint.

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.17 (1.00)

The unit is operating at 70% RTP; you notice power start to increase with NO CHANGE in recirculation flow or rod position. You suspect a "Loss of Feedwater Heating." Which of the following is required/appropriate per ONEP-05-1-02-V-5?

a. A 30% reduction in Recirc Flow, monitored by Recirc Flow indication.

b. A 30% Power Reduction, using Recirc Flow, monitored by APRM's.

c. Insertion of Shallow Rods, to maintain proper flux shape, prior to reducing Recirc Flow.

d. Insertion of Power Rods, to maintain proper flux shape, prior to reducing Recirc Flow.

QUESTION 7.18 (1.00)

ONEP-05-1-02-VI-2, "Hurricanes, Tornadoes, and Severe Weather", provides direction to the operator concerning verification/ utilization of the Emergency Diesel Generators upon receipt of a severe weather warning. Which of the following most correctly describes these directions?

a. Verify EDG Operability by performing appropriate Surveillance Tests on D/G's 11, 12, and 13 within 1 hour.

b. Manually start EDG's 11 and 12. Load these diesels with their ESF Buses and SEPARATE these Buses from Off-Site power.

c. Manually start EDG's 11 and 12. Pick up approximately 50% of the ESF Bus load and MAINTAIN these Buses synchronized with Off-Site power.

d. Verify EDG Operability by performing appropriate Surveillance Tests on D/G's 11, 12, and 13 within 1 hour. Load D/G 13 with Division III loads and SEPARATE it from Off-Site power.

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.19 (2.00)

EP-3, EP-5, and EP-7 caution the operator to observe certain limitations on Suppression Pool Level and Temperature when operating HPCS, LPCS, RHR, and/or RCIC.

a. COMPLETE THE FOLLOWING: (1.5)

Suppression Pool Level shall not be less than ____(1)____.

Suppression Pool Temperature shall not exceed ____(2)____ during HPCS, LPCS, and/or RHR operation; it shall not exceed ____(3)____ during RCIC operation.

b. STATE the basis for these temperature/level limitations on the Suppression Pool. (0.5)

QUESTION 7.20 (1.00)

When raising power per IOI-03-1-01-2, "Power Operations," you are cautioned to maintain the Load Demand Limited (LDL) value close to the Actual Generator Load (AGL) value.

a. STATE how much the LDL value may exceed the AGL value. (0.5)

b. STATE how you would know if this limit were exceeded (EXCLUDING THE DIGITAL METERS ON 1H13-P680-9D). (0.5)

QUESTION 7.21 (.50)

You are conducting a shutdown of the CRDH system, per SOI-04-1-01-C11-1. You open Drain Valve 107xx to drain the water accumulators. State the local indication(s) which should be used to determine that the accumulator is fully drained.

(***** CATEGORY 07 CONTINUED ON NEXT PAGE *****)

QUESTION 7.22 (1.00)

Upon recovering from a 'Loss of Off Site Power', ONEP-1-02-I-4 cautions the operator that either the SJAE's be isolated -OR- the condenser vacuum be broken PRIOR to re-energizing MCC's 11B42, 12B42, and 14B22. Which of the following is the basis for this caution?

a. Prevent large reverse flows in the Off Gas system.

b. Prevent inadvertent initiation of the Mechanical Vacuum Pumps.

c. Prevent establishing combustible gas mixtures in the charcoal adsorbers.

d. Prevent electrically tripping the cooling compressors in the Off Gas System.

(***** END OF CATEGORY 07 *****)

QUESTION 8.01 (1.00)

With regard to the Surveillance Program Procedure, 01-S-06-12:

Answer with True or False:

a. The Shift Supervisor may approve a special test for the purpose of satisfying a Technical Specification requirement.

b. A system, which has a TS surveillance procedure that makes the system/equipment inoperative, is NOT subject to the restriction(s) of the applicable TS LCO ACTION statement during the performance of this surveillance procedure.

QUESTION 8.02 (1.00)

Which of the following choices will correctly complete the blanks for the MCPR LCO listed below?

The MCPR shall be equal to or ____(1)____than ____(2)____ MCPR(f) ____(3)____MCPR(p) limits at indicated core flow and THERMAL POWER as shown in Figures 3.2.3-1 and 3.2.3-2.

NOTE: Figures 3.2.3-1 and 3.2.3-2 are enclosed for reference.

	(1)	(2)	(3)
a.	greater	the smaller of the	or
b.	less	the larger of the	or
c.	greater	both	and
d.	less	both	and

QUESTION 8.03 (1.00)

What are the minimum number of operable SRM channel(s) required for the following Operational Conditions?

OPERATIONAL CONDITION	NUMBER OF SRMs
-2- (with IRMs Range 2 or below)	------
-3-	------
-4-	------

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.04 (1.00)

The APRM Trip Setpoint Formula is (.66W+48%)T. Which of the following choices correctly details the definition of "T" AND when it is applied?

a. T = FRTP/MFLPD ; T applied if < 1.0

b. T = MFLPD/FRTP ; T applied if < 1.0

c. T = FRTP/MFLPD ; T applied if > 1.0

d. T = MFLPD/FRTP ; T applied if > 1.0

QUESTION 8.05 (3.00)

Answer the following with regard to the Control of Temporary Alterations Procedure, 01-S-06-3:

a. The removal or installation of temporary electrical leads or jumpers identified in an approved procedure or Maintenance Work Order are not considered Temporary Alterations provided the procedure or MWO meets TWO requirements. What are these two requirements? (1.0)

b. The mimimum level of qualification for an Independent Verifier (per this procedure) shall be ... (CHOOSE ONE) (1.0)

1. ... journeyman level → And for Temporary Alterations

2. ... NOB for operations

3. ... NOA for operations

4. ... Shift Supervisor

c. Which of the following colors must the wire for Temporary Jumpers be made from? (1.0)

1. Purple

2. Orange

3. Green

4. No Color Specified

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.06 (1.50)

With the exception of breaker position, what THREE (3) items should an operator check on a breaker during the performance of a system lineup checksheet per Control and Use of Operations Section Directives, 02-S-01-2? Consider Local checks only.

QUESTION 8.07 (1.00)

The Shift Supervisor may use duplicates of controlled Operations Section Directives provided that the duplicate is NOT used for a period of time greater than ... (CHOOSE ONE)

a. ...8 hours

b. ...12 hours

c. ...24 hours

d. ...7 days

QUESTION 8.08 (1.00)

What are the Two (2) provisoes/stipulations that must be met in order to allow 'out of sequence' completion of IOI procedural steps?

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.09 (2.00)

With regard to the Protective Tagging System Procedure, 01-S-06-01:

a. Fill in the following blanks: (1.0)

"All red tags will be independently verified for all Safety Related systems and components. Safety Related components in Non-Safety Related systems will be determined through the use of a ____(1)____ list. Any ____(1)____ list component shall be indepently verified, unless for ALARA reasons, the ALARA committee recommends otherwise. The ____(2)____ will authorize deletion of independent verification."

b. The minimum level of qualification for an Independent Verifier (per this procedure) shall be ... (CHOOSE ONE) (1.0)

1. ...journeyman level
2. ...NOB for operations
3. ...NOA for operations
4. ...Shift Supervisor

QUESTION 8.10 (.50)

Given the following conditions on the unit:

Mode Switch - Shutdown
Temperature - 180 deg F
Pressure - 0 psig
Level - 36 inches
RHR - SDC Mode
RPV Head Bolts are Detensioned

State the Operational Condition of the plant as described above.

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.11 (1.00)

The plant is at 60% power with only one outstanding LCO:

- The LPCS pump is INOP due to an in-progress (1 day) repair. There is no estimate of repair time.

Ten minutes into the shift, DG 12 fails to start twice during the performance of a scheduled surveillance and is declared INOP. There is no estimate of repair time.

Which of the following actions most correctly detail the allowances and/or limitations imposed by the Technical Specifications in this instance?

NOTE: APPLICABLE TSs ARE ENCLOSED FOR REFERENCE.

a. Be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

b. Power Operation may continue for 12 hours; and then, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

c. Power Operation may continue for 72 hours; and then, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

d. Power Operation may continue for 6 days; and then, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.12 (1.00)

Fill in the blank with one of the following TS terms:

"A _____ shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent channels measuring the same parameter."

a. Channel Calibration

b. Channel Check

c. Channel Functional Test

d. Logic System Functional Test

QUESTION 8.13 (1.50)

List the three(3) Refuel position interlocks required to be operable per the Technical Specifications for the performance of any Core Alteration. Assume the Reactor Mode Switch is locked in Refuel.

QUESTION 8.14 (1.00)

With regard to the Control of Refueling Operations Procedure, 01-S-06-10:

Answer with True or False:

a. An SRO will be present on the Containment Refueling Floor at all times when any Core Alterations are in progress.

b. When irradiated fuel movement not involving Core Alterations is in progress, an SRO will be in charge either in the Containment or the Refueling Building.

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.15 (1.00)

The plant is at 60% power with only one outstanding LCO:

- Hydrogen Recombiner 'A' is INOP due to an in-progress (1 day) repair. It is anticipated that repairs and return to service will be complete in two(2) weeks.

Ten minutes into the shift an Instrument Technician reports that the Hydrogen Recombiner 'B' 'PWR ADJ' Potentiometer is faulty and will produce only a zero(0) power level signal.

Which of the following actions most correctly detail the allowances and/or limitations imposed by the Technical Specifications in this instance?

NOTE: APPLICABLE TSs ARE ENCLOSED FOR REFERENCE.

a. Operational Condition 1 may be maintained for approximately 29 days .

b. Within 1 hour measures must be initiated to place the unit in at least HOT SHUTDOWN within the next 12 hours.

c. Within 1 hour measures must be initiated to place the unit in at least STARTUP within the next 6 hours.

d. Within 1 hour measures must be initiated to place the unit in at least STARTUP within the next 6 hours and in at least HOT SHUTDOWN within the following 6 hours.

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.16 (2.00)

MATCH the following emergency classifications to their appropriate definitions.

a.	Unusual Event	1.	The occurrence of an event or events which involve actual or likely major failures of the plant functions needed for the protection of the public.
b.	Alert	2.	The occurrence of an event or events which indicate a POTENTIAL degradation of the level of safety of the plant.
c.	Site Area Emergency	3.	Events are in process or have occurred which involve actual or imminent substantial core degradation or melting with the potential for loss of containment integrity and substantial releases of large amounts of radioactive material off-site.
d.	General Emergency	4.	The occurrence of an event or events which involve an actual or potential SUBSTANTIAL degradation of the level of safety of the plant.

QUESTION 8.17 (1.00)

In accordance with 10 CFR 55, "if a licensee has not been actively performing the functions of an operator or senior operator for a period of ___(1)___ months, or longer, he shall, prior to resuming activities licensed pursuant to this part, demonstrate to the Commission that his knowledge and understanding of facility operation and administration are satisfactory."

FILL IN THE BLANK WITH ONE OF THE FOLLOWING TIMES:

a. 4

b. 6

c. 12

d. 24

(***** CATEGORY 08 CONTINUED ON NEXT PAGE *****)

QUESTION 8.18 (1.00)

Unit 1 is operating at 75% rated thermal power. Channel Functional Tests are performed on all of the MSL Radiation Monitoring System channels. Channels A and D test UNSAT; Channels B and C test SAT. Maintenance has no estimate of repair time and will not be able to commence troubleshooting and repair for at least 16 - 20 hours.

Which of the following actions most correctly detail the allowances and/or limitations imposed by the Technical Specifications in this instance?

NOTE: APPLICABLE TSs ARE ENCLOSED FOR REFERENCE

a. Be in at least HOT SHUTDOWN within 12 hours.

b. Be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the next 24 hours.

c. Place MSL Rad Mon Channel "A" in the tripped condition within one hour -AND- be in at least HOT SHUTDOWN within 12 hours.

d. Place MSL Rad Mon Channel "A" in the tripped condition within one hour -AND- be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the next 24 hours.

QUESTION 8.19 (2.00)

STATE the four (4) basic PCIOMR rules currently in effect at GGNS (i.e. exposure < 3.3 Gwd/ST).

QUESTION 8.20 (1.50)

Technical Specifications define SHUTDOWN MARGIN as ...

"SHUTDOWN MARGIN shall be the amount of reactivity by which the reactor is subcritical or would be subcritical assuming ... and the reactor is in the shutdown condition; ... "

List the plant conditions which complete the definition of SHUTDOWN MARGIN.

(***** END OF CATEGORY 08 *****)
(********** END OF EXAMINATION **********)

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 5.01 (1.00)

b

REFERENCE
BFNP NEUTRON SLOWING DOWN AND DIFFUSION LP,P.6-8
GGNS OP-NP-510,P.6,9;511,P.4

ANSWER 5.02 (1.00)

d

REFERENCE
BFNP MCD BWR LP,P.4
GGNS OP-RP-502,P.5-7

ANSWER 5.03 (1.00)

d

REFERENCE
BFNP PUMPS LP,P.5-6
GGNS OP-HF-514

ANSWER 5.04 (1.00)

a

REFERENCE
GGNS OP-AD-545,P.10

ANSWER 5.05 (2.00)

a. The assembly power which would cause the onset of transition boiling at some point in the assembly. (1.0)

b. 2

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

REFERENCE
BFNP TRANSITION BOILING & ATLAS TESTING LP,P.5-6
GEXL CORRELATION & CRITICAL POWER LP,P.3
GGNS MCD, THERMAL LIMITS, P.26,32-33

ANSWER 5.06 (1.00)

c

REFERENCE
BFNP REACTIVITY COEFFICIENTS LP,P.3,15
GGNS OP-NP-513, P.13-14

ANSWER 5.07 (2.00)

a. Assume: B=0.007
lambda=0.1/sec
alpha M=-1E -4 delta k/k/F [.25]
Using: T = B - p / lambda x p [.25]
p = B / lambda x T + 1
p = 0.007 / (0.1)(60) + 1
p = 0.007 / 7 = 0.001 delta k/k [0.5]

(0.001dk/k) / (-1E -4dk/k/F) = 10 F temperature rise
and a final temperature of 291 F [0.5] (1.5)

b. Indicated reactor pressure = ~43.5 psig (0.5)

REFERENCE
BFNP REACTIVITY COEFF. LP
REACTOR POWER & REACTOR PERIOD LP
GGNS OP-NP-511

ANSWER 5.08 (1.00)

Some "critical" LPRM strings' Base distributions are out of tolerance (the strings' difference distribution exceeds about 15% of the average of the string) [0.5] and a new OD-1 (or OD-2) should be run [0.5].

REFERENCE
GGNS MCD,THERMAL LIMITS,P.80

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 5.09 (1.50)

a. It will increase to a maximum concentration in ~20 days [0.5] and return to the 100% equilibrium value in ~6 days [0.5]. (1.0)

b. They are equal. (0.5)

REFERENCE
GGNS OP-NP-514,P.10-11

ANSWER 5.10 (1.50)

a. 1000 psia

b. 800 F

c. 255 F

REFERENCE
GGNS OP-HF-503,P.22-24

ANSWER 5.11 (1.50)

1. Viscosity

2. Density

3. Velocity

4. Diameter (0.5ea/1.5)

REFERENCE
GGNS MCD, CORE COOLING MECHANICS,P.24

ANSWER 5.12 (1.00)

-80 seconds

the longest-lived delayed neutron precursor (Br-87) (0.5ea/1.0)

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

REFERENCE
GGNS OP-NP-518,P.6

ANSWER 5.13 (1.00)

b

REFERENCE
GGNS OP-PC-505,P.6-10

ANSWER 5.14 (1.00)

(1175 - 536.8) / 657.5 = 0.971

REFERENCE
GGNS OP-HF-503,P.5

ANSWER 5.15 (1.50)

a. Decrease

b. Decrease

c. Increase

REFERENCE
GGNS OP-HF-506,P.20-21

ANSWER 5.16 (1.00)

1. Neutron embrittlement of the cladding.

2. Thermally induced pellet growth.

3. Inward motion of the cladding walls (creepdown). (2@0.5ea/1.0)

REFERENCE
GGNS MCD, PCIOMR, P.7

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 5.17 (1.00)

b

REFERENCE
GGNS OP-HF-502,P.7

ANSWER 5.18 (2.00)

a. Due to recirc. pump trip on low vessel level 2.

b. Due to the spike in reactor power.

c. Due to the vessel level recovery -OR-
Due to the feed pump trip on high vessel level 8.

d. Due to APRM high flux.

REFERENCE
GGNS FSAR FIGURE 15.4.-5

ANSWER 5.19 (1.00)

1. It (hydrogen) has a high microscopic scattering cross section .

2. It (hydrogen) has a high logarithmic energy decrement per collision.

REFERENCE
GGNS OP-NP-502,P.9

ANSWER 5.20 (1.50)

1. power level
2. time at power
3. time since shutdown

REFERENCE
GGNS OP-NP-518,P.7

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 5.21 (1.00)

d

REFERENCE
EIH, L-RQ-605 (15)
GGNS, OP-NP-515,P.4-7

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 6.01 (1.00)

a

REFERENCE
GGNS LP OP-C51-4-501

ANSWER 6.02 (1.00)

b

REFERENCE
GGNS LP OP-C51-3-501

ANSWER 6.03 (2.00)

i. c

ii. d

REFERENCE
BFNP: LP#12,P.24;TRANSIENT #20;OI-57,P.53
EIH: L-RQ-726
GGNS LP OP-C34-501
GGNS SIM. MAL. 125 & 69

ANSWER 6.04 (1.00)

d

REFERENCE
BFNP: L/P #3
EIH: GPNT, Vol. VI, Chapter 2.3-3, 5, Fig 2.3(3)
L-RQ-712, pp 4, 5, 19
GGNS LP OP-B21-501
GGNS LP OP-C34-501

CAF

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 6.05 (1.00)

d

REFERENCE
BFNP: BF-OI-68, pp 28, 29
EIH: EIH Simulator, Malfunction #36
GGNS SIM. MAL. 11

ANSWER 6.06 (1.00)

c

REFERENCE
BFNP: LP#7,P. 28
EIH: L-RQ-714, Figure 714-6; HNP-2-2447
GGNS SD B33-1 p. 5 & 6
GGNS LP OP-B33-1-501 p. 5
GGNS ARI B33-FAL-L603A

ANSWER 6.07 (1.00)

a

REFERENCE
GGNS LP OP-E51-501

ANSWER 6.08 (1.00)

b

REFERENCE
GGNS LP OP-E51-501

ANSWER 6.09 (1.00)

- Hi DW Pressure [.3], 1.39 psig [.1]
- AND- [.2]
- RCIC Stm Pressure Low [.3], 60 psig [.1] (1.0)

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

REFERENCE
GGNS LP OP-E51-501, p.9

ANSWER 6.10 (2.00)

a. More than 1 RPIS Reed SW. closed per channel of RACS

b. Indication that all pairs of scram valves on all HCUs are not in the same state

c. Indication that the RGDS finds disagreement between the signals received from the 2 RACS

d. Indication that the withdrawn rod must be fully inserted before any other control rod can be moved

(0.5 ea)

REFERENCE
GGNS LP OP-C11-2-501

ANSWER 6.11 (1.00)

a. 2 (0.5)

b. To prevent an excessive change in the LHGR. (0.5)

REFERENCE
GGNS LP OP-C11-2-501

ANSWER 6.12 (3.00)

a. Group 1: -- CB-1 Fully Inserted
-- CB-2 Fully Inserted
-- CB-5 Open
-- CB-5 opposite loop Open
-- CB-2 Open
Group 2: -- Pump Speed 20% - 26%
-- Pump Motor Voltage not <75V for 4 Sec.
-- LFMG at Rated Voltage (.25 ea)

b. Prevents valve cycling [0.5] when recirc pump speed changes [0.5]

REFERENCE

GGNS OP-N33-1

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 6.13 (1.00)

a

REFERENCE
GGNS LP OP-N32-2-501

ANSWER 6.14 (1.00)

b

REFERENCE
BFNP LP#39,P.18
GGNS OP-C41-501,P.5,20

ANSWER 6.15 (1.00)

Flow is established from SSW loop B [0.5] to RHR loop B LPCI injection line [0.5].

REFERENCE
GGNS OP-P41-501,P.14
SD-E12,P.40

ANSWER 6.16 (1.00)

d

REFERENCE
GGNS OP-021-501,P.9
SD-D21,P.6

ANSWER 6.17 (1.00)

d

REFERENCE
GGNS SD-P42,P.3,19

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 6.18 (1.50)

a. The ECCS pump discharge pressure interlocks (0.5)

b. 601 - the tail pipe pressure switch has picked up
631 - the (B) solenoid is energized (0.5ea/1.0)

REFERENCE
GGNS OP-E22-2-501,P.7,9-10

ANSWER 6.19 (1.50)

a. > 50 psig reactor pressure after a 15 minute time delay
b. Rx level 1 / -150.3"
c. High drywell pressure / 1.39 psig
d. No
e. the initiation signal is reset (0.3ea/1.5)

REFERENCE
GGNS OP-E21-501,P.7

ANSWER 6.20 (.50)

zero gpm

REFERENCE
GGNS OP-E21-501,P.12,17

ANSWER 6.21 (1.00)

d

REFERENCE
USNRC BWR-4 Systems Manual, pp 3.3-8 - 3.3-10
EIH: HNP-x-1001; HNP-x-1286
GGNS LP OP-N21-501 p.10
GGNS SIM. MAL. 121

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 6.22 (2.00)

1) APRM "A" fails upscale -> relay K12A deenergizes (0.4)
2) -> NMS contacts K12A in RPS Trip Logic A open (0.4)
3) -> Relays K14A & E deenergize (0.4)
4) -> Contacts K14A & E open (0.4)
5) -> Scram solenoids for RPS A deenergize (0.4)

REFERENCE
BFNP: L/P #28
EIH: L-RQ-720, Fig 720-1a, -1b, -2a, -2b, -3a, -3b
GPNT, Vol. VI, Chapter 9.3.1-2, 3, 4
GGNS: SD-C71,P.2-7

ANSWER 6.23 (1.00)

Load Reference Control automatically switches off during:

1. a load rejection below 12% power (power <12% for > 5 sec.), or
2. a load rejection above 35% power (0.5 ea)

REFERENCE
GGNS LP OP-N32-2-501

3. Turb. Trip per Section 1.4.2.6.d of LP JAM

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 7.01 (1.00)

c

REFERENCE
EIH: HNP-2-1933, p 2
GGNS: ONEP-05-1-02-IV-1

ANSWER 7.02 (1.50) Question/answer deleted JTM

1. Place the RPS (Div 1, 2, 3, & 4) CRD Discharge Volume HI Trip Bypass Switches in the BYPASS position.
2. Place the RPS (Div 1, 2, 3, & 4) Scram Reset Switches in the RESET position and verify that the scram resets.
3. Allow the HCU's to recharge, then drive the control rods that are not full-in to position 00. (0.5 ea)

REFERENCE
GGNS: ONEP-05-1-02-I-1, p 3

ANSWER 7.03 (1.00)

Without air pressure the D/G shutdown features are inhibited.

REFERENCE
GGNS: ONEP-04-1-01-P/S-1, p 3

ANSWER 7.04 (1.00)

Establish LPCS or LPCI flow from the Suppression Pool with injection to the RPV (0.5) and open two (2) SRV's to establish return flow to the Suppression Pool. (0.5)

REFERENCE
GGNS: 05-S-01-EP-8, pp 1, 2

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 7.05 (1.50)

1. An unexplained increase in reactor water conductivity (0.25) accompanied by a very low pH (0.25).
2. An unexplained increase in reactor water activity.
3. An unexplained decrease in reactor power (due to the increased surface tension of the water).
4. An unexplained increasae in levels on the MSL RAD monitors (and possibly the OG RAD monitors).
5. An unexplained change in condensate or RWCU F/D parameters (particularly flow or d/P). (3 @ 0.5 ea)

REFERENCE
GGNS: ONEP-05-1-02-I-5, p 2

ANSWER 7.06 (1.50)

1. Verification of system integrity by visual inspection of accessible areas and/or
2. Verification of system integrity by available indication(s) for inaccessible areas (PRM's, etc) and
3. Verification that operation of the system will not result in uncontrolled release to the environment. (0.5 ea)

REFERENCE
GGNS: ONEP-05-1-02-III-5, p 3

ANSWER 7.07 (1.00)

b

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

REFERENCE
GGNS: 05-5-01-EP-2, p 6

ANSWER 7.08 (1.00)

To minimize the feedwater-to-reactor differential temperature (and feedwater nozzle thermal stress).

REFERENCE
GGNS: IOI-03-1-01-3, p 2

ANSWER 7.09 (2.00)

1. Main Steam Line Pressure > 850 psig.
2. Main Steam Line Low Pressure Alarm cleared.
3. All operable APRM's indicating > 5% power.
4. All APRM Downscale Alarms cleared.
5. Transfer one (1) IRM/APRM Recorder in each Division to APRM and Place IRM recorders in Slow Speed (4 @ 0.5 each)

6. Also Accepted Administrative Verifications per STEP 6.2.17 of Procedure, JBM

REFERENCE
GGNS: IOI-03-1-01-1, pp 47, 48

ANSWER 7.10 (1.50)

1. Work Permit (WP)
2. Surveillance Permit (SP)
3. General Access Permit (GAP) (0.5 each)

REFERENCE
GGNS: 01-S-08-2, pp 17, 18

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 7.11 (1.00)

d

REFERENCE
GGNS: EP-5, Section 2.1
EP-3, Sections 3.1.5, 3.2.3, 3.3.6, 3.5.3

ANSWER 7.12 (1.00)

Personal Dosimeter (Low Range) (0.25) TLD (0.25)
Alarming Dosimeter (or Portable Survey Instrument) (0.5)
(-OR- HP Surveillance)

REFERENCE
GGNS: 01-S-08-2, pp 15, 16

ANSWER 7.13 (1.00)

d

REFERENCE
GGNS: ONEP-05-1-II-1, p 4

ANSWER 7.14 (1.50)

a. Loop Manual

b. 10%

c. 5% (0.5 each)

REFERENCE
GGNS: ONEP-05-1-02-III-3, p 2

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 7.15 (1.00)

a

REFERENCE
BFNP: BF-OI-66, pp 5-7
EIH: HNP-1001, pp 19, 20
GGNS: IOI-03-1-01-1, p 33; SOI-04-1-01-N33-1, p 4

ANSWER 7.16 (1.00)

a

REFERENCE
GGNS: ONEP-05-1-02-V-1, p 1

ANSWER 7.17 (1.00)

b

REFERENCE
EIH: HNP-2-1946
GGNS: ONEP-05-1-02-V-5, p 2

ANSWER 7.18 (1.00)

b

REFERENCE
GGNS: ONEP-05-1-02-VI-2

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 7.19 (2.00)

a. (1) 14.5 feet
(2) 212 deg F
(3) 140 deg F (0.5 each)

b. To ensure that there is adequate NPSH for the respective ECCS pumps. (0.5)

REFERENCE
GGNS: EP-3, p 6; EP-5, p 2; EP-7, p 1

ANSWER 7.20 (1.00)

a. 65 MW (+0, -5 MW) ← (OR) → d. 25 MW (0.5)

b. EHC INFL STOP LRL Light - OR - EHC Lock-up preventing LDL increases ← (OR) → b. No Available indication (0.5)

Per STEP 5.2 of Procedure

REFERENCE
GGNS: IOI-03-1-01-2, p 7

ANSWER 7.21 (.50)

a. Gas Pressure (PI-R131) remains constant

REFERENCE
GGNS: SOI-04-1-01-C11-1, p 9

ANSWER 7.22 (1.00)

a

REFERENCE
GGNS: ONEP-1-02-I-4, p 3

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 8.01 (1.00)

a. True

b. False

REFERENCE
GGNS Proc. 01-S-06-12

ANSWER 8.02 (1.00)

c

REFERENCE
GGNS TS 3.2.3

ANSWER 8.03 (1.00)

-Operational Condition 2 -- 4 SRMs (.34)

-Operational Condition 3 -- 2 SRMs (.33)

-Operational Condition 4 -- 2 SRMs (.33)

REFERENCE
GGNS TS 3.3.7.6

ANSWER 8.04 (1.00)

a

REFERENCE
GGNS TS 3.2.2

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 8.05 (3.00)

a. The procedure or MWO must:

- Specify that SS be notified of removal and/or installation. (0.5)
- Specify requirement for independent verification on Safety Related Systems. (0.5)

b. 3 (1.0)

c. 1 (1.0)

REFERENCE
GGNS Proc. 01-S-06-3
GGNS LP OP-AD-524

ANSWER 8.06 (1.50)

The following checks should be made:

- Breaker charging springs charged. (0.5)
- Charging motor disconnect switch on. (0.5)
- Control power on. (0.5)

REFERENCE
GGNS Proc. 02-S-01-2
GGNS LP OP-AD-539

ANSWER 8.07 (1.00)

c

REFERENCE
GGNS Proc. 02-S-01-2
GGNS LP OP-AD-539

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 8.08 (1.00)

The two provisoes are:

- The sequence of major evolutions is not changed. (0.5)
- The intent of the instruction is not changed. (0.5)

REFERENCE
GGNS Proc. 02-S-01-2

ANSWER 8.09 (2.00)

a. (1) 'Q-Valve' (0.5)
(2) Operations Superintendent (0.5)

b. 2 (1.0)

REFERENCE
GGNS Proc. 01-S-06-01

ANSWER 8.10 (.50)

Refueling/Operational Condition 5

REFERENCE
GGNS TSs Table 1.2

ANSWER 8.11 (1.00)

a

REFERENCE
GGNS TS 3.8.1.1

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 8.12 (1.00)

b

REFERENCE
GGNS TSs Definitions

ANSWER 8.13 (1.50)

1. ONE-Rod-out.
2. Refuel Platform position.
3. Refuel Platform Main Hoist loaded. (0.5 ea.)

REFERENCE
GGNS TS 3.9.1

ANSWER 8.14 (1.00)

a. True
b. True

REFERENCE
GGNS Proc. 01-S-06-10
GGNS LP OP-AD-525

ANSWER 8.15 (1.00)

d

REFERENCE
GGNS TSs 3.0.3 & 3.6.7.1

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 8.16 (2.00)

a. 2

b. 4

c. 1

d. 3

REFERENCE
EIH: GET Handbook, pp 57, 58, 60, 61
HNP-x-4420, HNP-x-4520, HNP-x-4620, HNP-x-4720

GGNS Proc. 10-S-01-2,3,4 & 5

ANSWER 8.17 (1.00)

a

REFERENCE
10 CFR 55.31.e

ANSWER 8.18 (1.00)

d

REFERENCE
EIH: U2 TS, 3.3.1, 3.3.2

GGNS TSs 3.3.1 & 3.3.2

ANSWERS -- GRAND GULF 1 -85/08/12-MUNRO,J

ANSWER 8.19 (2.00)

1. Threshold power is 14.0 Kw/ft.
2. Nominal rate is 0.11 Kw/ft/hr with a max. step of 0.2 Kw/ft and a max. rate over any 4 hour period of 0.12 Kw/ft/hr.
3. A 12-hour wait at the final power.
4. If power is lowered before ramp or soak completion then continue pre-conditioning from 1 Kw/ft below the previous level.

(0.5 ea)

REFERENCE
GGNS MCD, PCIOMR, P.11-13

ANSWER 8.20 (1.50)

- all rods fully inserted except for the single control rod of highest reactivity worth which is assumed to be fully withdrawn
- cold (68 deg. F)
- xenon free

(0.5 ea)

REFERENCE
GGNS TSs Definitions

$F = ma$ $\quad v = s/t$

$w = mg$ $\quad s = V_o t + 1/2\ at^2$

$E = mc^2$

$KE = 1/2\ mv^2$ $\quad a = (V_f - V_o)/t$ $\quad A = \lambda N$ $\quad A = A_o e^{-\lambda t}$

$PE = mgh$

$V_f = V_o + at$ $\quad w = \theta/t$ $\quad \lambda = \ln 2/t_{1/2} = 0.693/t_{1/2}$

$W = v\ \Delta P$ $\quad A = \frac{\pi D^2}{4}$ $\quad t_{1/2}^{eff} = \frac{[(t_{1/2})(t_b)]}{[(t_{1/2}) + (t_b)]}$

$\Delta E = 931\ \Delta m$ $\quad \dot{m} = V_{av} A_p$

$\dot{Q} = \dot{m} \Delta h$ $\quad I = I_o e^{-\Sigma x}$

$\dot{Q} = \dot{m} C_p \Delta t$

$\dot{Q} = UA \Delta T$ $\quad I = I_o e^{-\mu x}$

$Pwr = W_f \Delta h$ $\quad I = I_o\ 10^{-x/TVL}$

$TVL = 1.3/\mu$

$P = P_o 10^{SUR(t)}$ $\quad HVL = -0.693/\mu$

$P = P_o e^{t/T}$

$SUR = 26.06/T$ $\quad SCR = S/(1 - K_{eff})$

$CR_x = S/(1 - K_{effx})$

$SUR = 26\rho/\ell^* + (\beta - \rho)T$ $\quad CR_1(1 - K_{eff1}) = CR_2(1 - K_{eff2})$

$T = (\ell^*/\rho) + [(\beta - \rho)/\bar{\lambda}\rho]$ $\quad M = 1/(1 - K_{eff}) = CR_1/CR_o$

$T = \ell/(\rho - \beta)$ $\quad M = (1 - K_{effo})/(1 - K_{eff1})$

$T = (\beta - \rho)/(\bar{\lambda}\rho)$ $\quad SDM = (1 - K_{eff})/K_{eff}$

$\rho = (K_{eff} - 1)/K_{eff} = \Delta K_{eff}/K_{eff}$ $\quad \ell^* = 10^{-4}$ seconds

$\bar{\lambda} = 0.1$ seconds^{-1}

$\rho = [\ell^*/(T K_{eff})] + [\bar{\beta}_{eff}/(1 + \bar{\lambda}T)]$

$I_1 d_1 = I_2 d_2$

$P = (\Sigma\phi V)/(3 \times 10^{10})$ $\quad I_1 d_1^{\ 2} = I_2 d_2^{\ 2}$

$\Sigma = \sigma N$ $\quad R/hr = (0.5\ CE)/d^2 (meters)$

$R/hr = 6\ CE/d^2$ (feet)

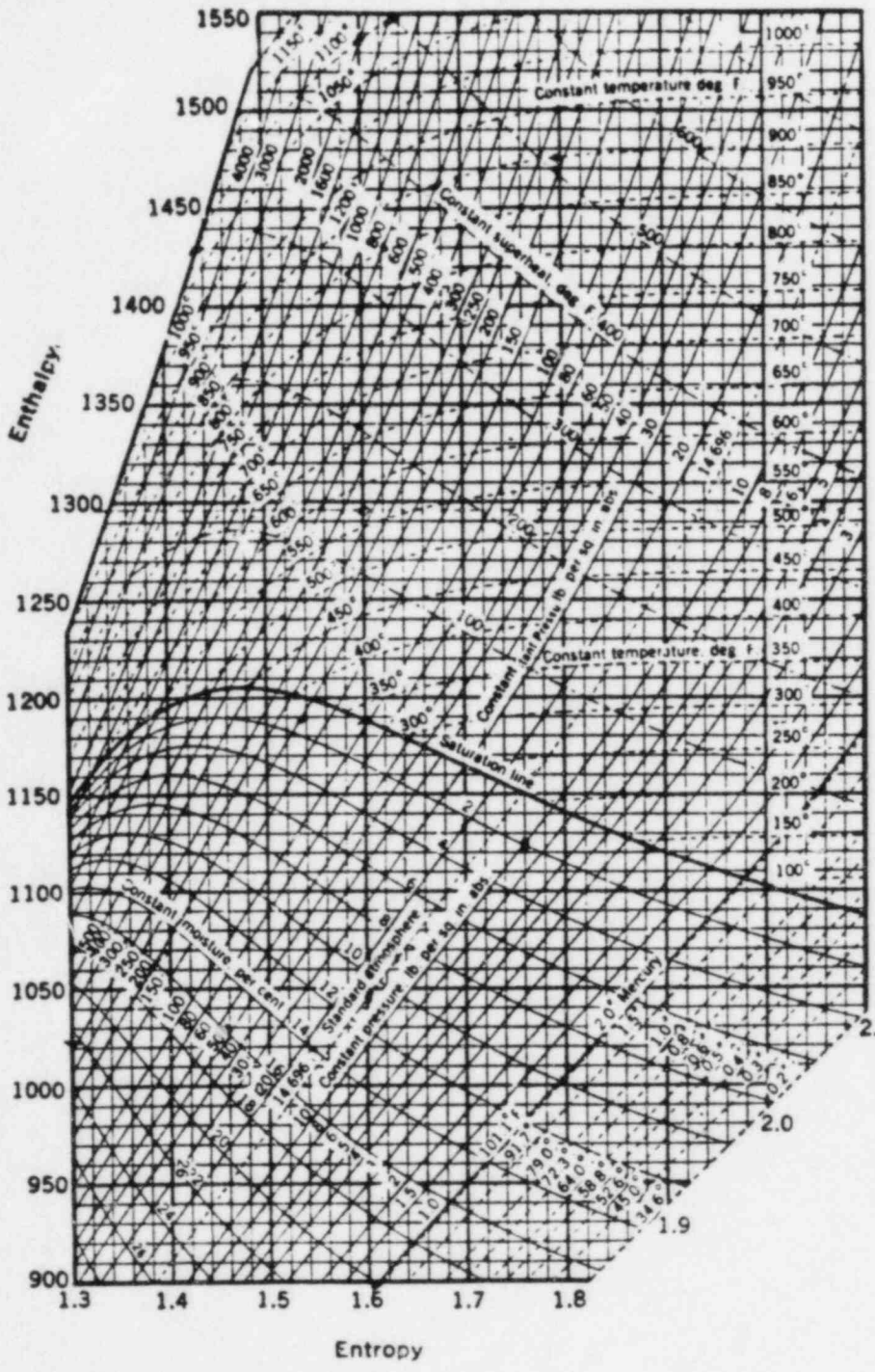
Water Parameters

1 gal. = 8.345 lbm.
1 gal. = 3.78 liters
1 ft^3 = 7.48 gal.
Density = 62.4 lbm/ft^3
Density = 1 gm/cm^3
Heat of vaporization = 970 Btu/lbm
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in. Hg.
1 ft. H_2O = 0.4335 lbf/in.

Miscellaneous Conversions

1 curie = 3.7×10^{10} dps
1 kg = 2.21 lbm
1 hp = 2.54×10^3 Btu/hr
1 mw = 3.41×10^6 Btu/hr
1 in = 2.54 cm
°F = 9/5°C + 32
°C = 5/9 (°F-32)
1 BTU = 778 ft-lbf

e = 2.718



Mollier diagram for steam

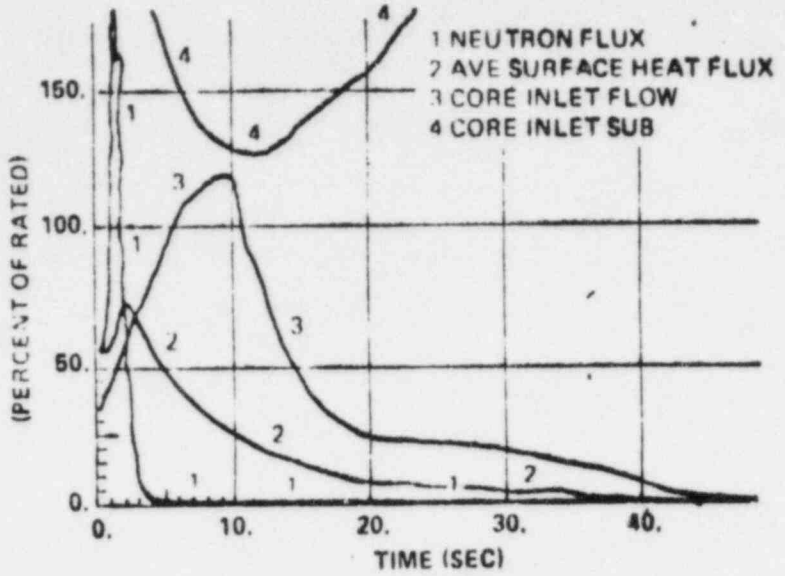
Press. psia	Temp F	Volume, ft³/lb			Enthalpy, Btu/lb			Entropy, Btu/lb x F			Energy, Btu/lb		Press. psia
		Water	Evap	Steam	Water	Evap	Steam	Water	Evap	Steam	Water	Steam	
		v_f	v_{fg}	v_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g	u_f	u_g	
0.0886	32.018	0.01602	3302.4	3302.4	0.00	1075.5	1075.5	0	2.1872	2.1872	0	1021.3	0.0886
0.10	35.023	0.01602	2945.5	2945.5	3.03	1073.8	1076.8	0.0061	2.1705	2.1766	3.03	1022.3	0.10
0.15	45.453	0.01602	2004.7	2004.7	13.50	1067.9	1081.4	0.0271	2.1140	2.1411	13.50	1025.7	0.15
0.20	53.160	0.01603	1526.3	1526.3	21.22	1063.5	1084.7	0.0422	2.0738	2.1160	21.22	1028.3	0.20
0.30	64.484	0.01604	1039.7	1039.7	32.54	1057.1	1089.7	0.0641	2.0168	2.0809	32.54	1032.0	0.30
0.40	72.869	0.01606	792.0	792.1	40.92	1052.4	1093.3	0.0799	1.9762	2.0562	40.92	1034.7	0.40
0.5	79.586	0.01607	641.5	641.5	47.62	1048.6	1096.3	0.0925	1.9446	2.0370	47.62	1036.9	0.5
0.6	85.218	0.01609	540.0	540.1	53.25	1045.5	1098.7	0.1028	1.9186	2.0215	53.24	1038.7	0.6
0.7	90.09	0.01610	466.93	466.94	58.10	1042.7	1100.8	0.3	1.8966	2.0083	58.10	1040.3	0.7
0.8	94.38	0.01611	411.67	411.69	62.39	1040.3	1102.6	0.1117	1.8775	1.9970	62.39	1041.7	0.8
0.9	98.24	0.01612	368.41	368.43	66.24	1038.1	1104.3	0.1264	1.8606	1.9870	66.24	1042.9	0.9
1.0	101.74	0.01614	333.59	333.60	69.73	1036.1	1105.8	0.1326	1.8455	1.9781	69.73	1044.1	1.0
2.0	126.07	0.01623	173.74	173.76	94.03	1022.1	1116.2	0.1750	1.7450	1.9200	94.03	1051.8	2.0
3.0	141.47	0.01630	118.71	118.73	109.42	1013.2	1122.6	0.2009	1.6854	1.8864	109.41	1056.7	3.0
4.0	152.96	0.01636	90.63	90.64	120.92	1006.4	1127.3	0.2199	1.6428	1.8626	120.90	1060.2	4.0
5.0	162.24	0.01641	73.515	73.53	130.20	1000.9	1131.1	0.2349	1.6094	1.8443	130.18	1063.1	5.0
6.0	170.05	0.01645	61.967	61.98	138.03	996.2	1134.2	0.2474	1.5820	1.8294	138.01	1065.4	6.0
7.0	176.84	0.01649	53.634	53.65	144.83	992.1	1136.9	0.2581	1.5587	1.8168	144.81	1067.4	7.0
8.0	182.86	0.01653	47.328	47.35	150.87	988.5	1139.3	0.2676	1.5384	1.8060	150.84	1069.2	8.0
9.0	188.27	0.01656	42.385	42.40	156.30	985.1	1141.4	0.2760	1.5204	1.7964	156.28	1070.8	9.0
10	193.21	0.01659	38.404	38.42	161.26	982.1	1143.3	0.2836	1.5043	1.7879	161.23	1072.3	10
14.696	212.00	0.01672	26.782	26.80	180.17	970.3	1150.5	0.3121	1.4447	1.7568	180.12	1077.6	14.696
15	213.03	0.01673	26.274	26.29	181.21	969.7	1150.9	0.3137	1.4415	1.7552	181.16	1077.9	15
20	227.96	0.01683	20.070	20.087	196.27	960.1	1156.3	0.3358	1.3962	1.7320	196.21	1082.0	20
30	250.34	0.01701	13.7266	13.744	218.9	945.2	1164.1	0.3682	1.3313	1.6995	218.8	1087.9	30
40	267.25	0.01715	10.4794	10.497	236.1	933.6	1169.8	0.3921	1.2844	1.6765	236.0	1092.1	40
50	281.02	0.01727	8.4967	8.514	250.2	923.9	1174.1	0.4112	1.2474	1.6585	250.1	1095.3	50
60	292.71	0.01738	7.1562	7.174	262.2	915.4	1177.6	0.4273	1.2167	1.6440	262.0	1098.0	60
70	302.93	0.01748	6.1875	6.205	272.7	907.8	1180.6	0.4411	1.1905	1.6316	272.5	1100.2	70
80	312.04	0.01757	5.4536	5.471	282.1	900.9	1183.1	0.4534	1.1675	1.6208	281.9	1102.1	80
90	320.28	0.01766	4.8777	4.895	290.7	894.6	1185.3	0.4643	1.1470	1.6113	290.4	1103.7	90
100	327.82	0.01774	4.4133	4.431	298.5	888.6	1187.2	0.4743	1.1284	1.6027	298.2	1105.2	100
120	341.27	0.01789	3.7097	3.728	312.6	877.8	1190.4	0.4919	1.0960	1.5879	312.2	1107.6	120
140	353.04	0.01803	3.2010	3.219	325.0	868.0	1193.0	0.5071	1.0681	1.5752	324.5	1109.6	140
160	363.55	0.0181S	2.8155	2.834	336.1	859.0	1195.1	0.5206	1.0435	1.5641	335.5	1111.2	160
180	373.08	0.01827	2.5129	2.531	346.2	850.7	1196.9	0.5328	1.0215	1.5543	345.6	1112.5	180
200	381.80	0.01839	2.2689	2.287	355.5	842.8	1198.3	0.5438	1.0016	1.5454	354.8	1113.7	200
250	400.97	0.01865	1.8245	1.8432	376.1	825.0	1201.1	0.5679	0.9585	1.5264	375.3	1115.8	250
300	417.35	0.01889	1.5238	1.5427	394.0	808.9	1202.9	0.5882	0.9223	1.5105	392.9	1117.2	300
350	431.73	0.01913	1.3064	1.3255	409.8	794.2	1204.0	0.6058	0.8909	1.4968	408.6	1118.1	350
400	444.60	0.0193	1.14162	1.1610	424.2	780.4	1204.6	0.6217	0.8630	1.4847	422.7	1118.7	400
450	456.28	0.0195	1.01224	1.0318	437.3	767.5	1204.8	0.6360	0.8378	1.4738	435.7	1118.9	450
500	467.01	0.0198	0.90787	0.9276	449.5	755.1	1204.7	0.6490	0.8148	1.4639	447.7	1118.8	500
550	476.94	0.0199	0.82183	0.8418	460.9	743.3	1204.3	0.6611	0.7936	1.4547	458.9	1118.6	550
600	486.20	0.0201	0.74962	0.7698	471.7	732.0	1203.7	0.6723	0.7738	1.4461	469.5	1118.2	600
700	503.08	0.0205	0.63505	0.6556	491.6	710.2	1201.8	0.6928	0.7377	1.4304	488.9	1116.9	700
800	518.21	0.0209	0.54809	0.5690	509.8	689.6	1199.4	0.7111	0.7051	1.4163	506.7	1115.2	800
900	531.95	0.0212	0.47968	0.5009	526.7	669.7	1196.4	0.7279	0.6753	1.4032	523.2	1113.0	900
1000	544.58	0.0216	0.42436	0.4460	542.6	650.4	1192.9	0.7434	0.6476	1.3910	538.6	1110.4	1000
1100	556.28	0.0220	0.37863	0.4006	557.5	631.5	1189.1	0.7578	0.6216	1.3794	553.1	1107.5	1100
1200	567.19	0.0223	0.34013	0.3625	571.9	613.0	1184.8	0.7714	0.5969	1.3683	566.9	1104.3	1200
1300	577.42	0.0227	0.30722	0.3299	585.6	594.6	1180.2	0.7843	0.5733	1.3577	580.1	1100.9	1300
1400	587.07	0.0231	0.27871	0.3018	598.8	576.5	1175.3	0.7966	0.5507	1.3474	592.9	1097.1	1400
1500	596.20	0.0235	0.25372	0.2772	611.7	558.4	1170.1	0.8085	0.5288	1.3373	605.2	1093.1	1500
2000	635.80	0.0257	0.16266	0.1883	672.1	466.2	1138.3	0.8625	0.4256	1.2881	662.6	1068.6	2000
2500	668.11	0.0288	0.10209	0.1307	731.7	361.6	1093.3	0.9139	0.3206	1.2345	718.5	1032.9	2500
3000	695.33	0.0343	0.05073	0.0850	801.8	218.4	1020.3	0.9728	0.1891	1.1619	782.8	973.1	3000
3208.2	705.47	0.0508	0	0.0508	906.0	0	906.0	1.0612	0	1.0612	875.9	875.9	3208.2

TABLE A.3 PROPERTIES OF SATURATED STEAM AND SATURATED WATER (PRESSURE)

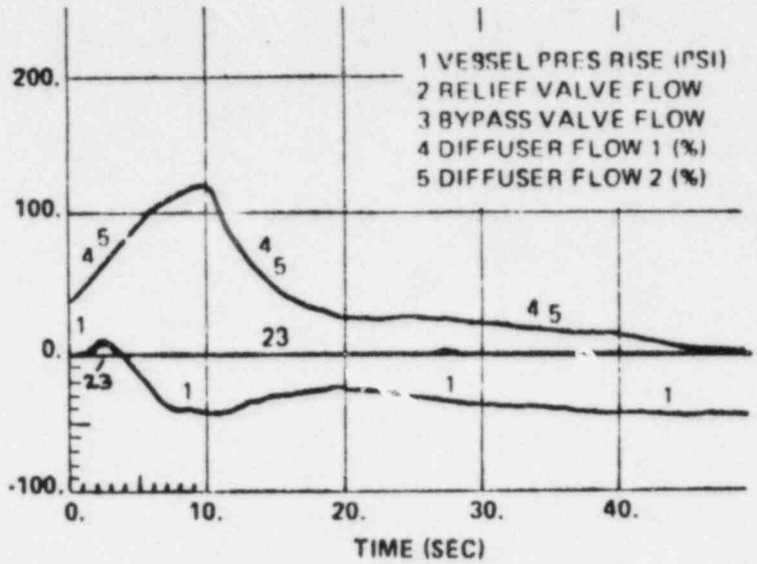
Temp F	Press. psia	Volume, ft³/lb			Enthalpy, Btu/lb			Entropy, Btu/lb x F			Temp F
		Water v_f	Evap v_{fg}	Steam v_g	Water h_f	Evap h_{fg}	Steam h_g	Water s_f	Evap s_{fg}	Steam s_g	
32	0.08859	0.01602	3305	3305	-0.02	1075.5	1075.5	0.0000	2.1873	2.1873	32
35	0.09991	0.01602	2948	2948	3.00	1073.8	1076.8	0.0061	2.1706	2.1767	35
40	0.12163	0.01602	2446	2446	8.03	1071.0	1079.0	0.0162	2.1432	2.1594	40
45	0.14744	0.01602	2037.7	2037.8	13.04	1068.1	1081.2	0.0262	2.1164	2.1426	45
50	0.17795	0.01602	1704.8	1704.8	18.05	1065.3	1083.4	0.0361	2.0901	2.1262	50
60	0.2561	0.01603	1207.6	1207.6	28.06	1059.7	1087.7	0.0555	2.0391	2.0946	60
70	0.3629	0.01605	868.3	868.4	38.05	1054.0	1092.1	0.0745	1.9900	2.0645	70
80	0.5068	0.01607	633.3	633.3	48.04	1048.4	1096.4	0.0932	1.9426	2.0359	80
90	0.6981	0.01610	468.1	468.1	58.02	1042.7	1100.8	0.1115	1.8970	2.0086	90
100	0.9492	0.01613	350.4	350.4	68.00	1037.1	1105.1	0.1295	1.8530	1.9825	100
110	1.2750	0.01617	265.4	265.4	77.98	1031.4	1109.3	0.1472	1.8105	1.9577	110
120	1.6927	0.01620	203.25	203.26	87.97	1025.6	1113.6	0.1646	1.7693	1.9339	120
130	2.2230	0.01625	157.32	157.33	97.96	1019.8	1117.8	0.1817	1.7295	1.9112	130
140	2.8892	0.01629	122.98	123.00	107.95	1014.0	1122.0	0.1985	1.6910	1.8895	140
150	3.718	0.01634	97.05	97.07	117.95	1008.2	1126.1	0.2150	1.6536	1.8686	150
160	4.741	0.01640	77.27	77.29	127.96	1002.2	1130.2	0.2313	1.6174	1.8487	160
170	5.993	0.01645	62.04	62.06	137.97	996.2	1134.2	0.2473	1.5822	1.8295	170
180	7.511	0.01651	50.21	50.22	148.00	990.2	1138.2	0.2631	1.5480	1.8111	180
190	9.340	0.01657	40.94	40.96	158.04	984.1	1142.1	0.2787	1.5148	1.7934	190
200	11.526	0.01664	33.62	33.64	168.09	977.9	1146.0	0.2940	1.4824	1.7764	200
210	14.123	0.01671	27.80	27.82	178.15	971.6	1149.7	0.3091	1.4509	1.7600	210
212	14.696	0.01672	26.78	26.80	180.17	970.3	1150.5	0.3121	1.4447	1.7568	212
220	17.186	0.01678	23.13	23.15	188.23	965.2	1153.4	0.3241	1.4201	1.7442	220
230	20.779	0.01685	19.364	19.381	198.33	958.7	1157.1	0.3388	1.3902	1.7290	230
240	24.968	0.01693	16.304	16.321	208.45	952.1	1160.6	0.3533	1.3609	1.7142	240
250	29.825	0.01701	13.802	13.819	218.59	945.4	1164.0	0.3677	1.3323	1.7000	250
260	35.427	0.01709	11.745	11.762	228.76	938.6	1167.4	0.3819	1.3043	1.6862	260
270	41.856	0.01718	10.042	10.060	238.95	931.7	1170.6	0.3960	1.2769	1.6729	270
280	49.200	0.01726	8.627	8.644	249.17	924.6	1173.8	0.4098	1.2501	1.6599	280
290	57.550	0.01736	7.443	7.460	259.4	917.4	1176.8	0.4236	1.2238	1.6473	290
300	67.005	0.01745	6.448	6.466	269.7	910.0	1179.7	0.4372	1.1979	1.6351	300
310	77.67	0.01755	5.609	5.626	280.0	902.5	1182.5	0.4506	1.1726	1.6232	310
320	89.64	0.01766	4.896	4.914	290.4	894.8	1185.2	0.4640	1.1477	1.6116	320
340	117.99	0.01787	3.770	3.788	311.3	878.8	1190.1	0.4902	1.0990	1.5892	340
360	153.01	0.01811	2.939	2.957	332.3	862.1	1194.4	0.5161	1.0517	1.5678	360
380	195.73	0.01836	2.317	2.335	353.6	844.5	1198.0	0.5416	1.0057	1.5473	380
400	247.26	0.01864	1.8444	1.8630	375.1	825.9	1201.0	0.5667	0.9607	1.5274	400
420	308.78	0.01894	1.4808	1.4997	396.9	806.2	1203.1	0.5915	0.9165	1.5080	420
440	381.54	0.01926	1.1976	1.2169	419.0	785.4	1204.4	0.6161	0.8729	1.4890	440
460	466.9	0.0196	0.9746	0.9942	441.5	763.2	1204.8	0.6405	0.8299	1.4704	460
480	566.2	0.0200	0.7972	0.8172	464.5	739.6	1204.1	0.6648	0.7871	1.4518	480
500	680.9	0.0204	0.6545	0.6749	487.9	714.3	1202.2	0.6890	0.7443	1.4333	500
520	812.5	0.0209	0.5386	0.5596	512.0	687.0	1199.0	0.7133	0.7013	1.4146	520
540	962.8	0.0215	0.4437	0.4651	536.8	657.5	1194.3	0.7378	0.6577	1.3954	540
560	1133.4	0.0221	0.3651	0.3871	562.4	625.3	1187.7	0.7625	0.6132	1.3757	560
580	1326.2	0.0228	0.2994	0.3222	589.1	589.9	1179.0	0.7876	0.5673	1.3550	580
600	1543.2	0.0236	0.2438	0.2675	617.1	550.6	1167.7	0.8134	0.5196	1.3330	600
620	1786.9	0.0247	0.1962	0.2208	646.9	506.3	1153.2	0.8403	0.4689	1.3092	620
640	2059.9	0.0260	0.1543	0.1802	679.1	454.6	1133.7	0.8686	0.4134	1.2821	640
660	2365.7	0.0277	0.1166	0.1443	714.9	392.1	1107.0	0.8995	0.3502	1.2498	660
680	2708.6	0.0304	0.0808	0.1112	758.5	310.1	1068.5	0.9365	0.2720	1.2086	680
700	3094.3	0.0366	0.0386	0.0752	822.4	172.7	995.2	0.9901	0.1490	1.1390	700
705.5	3208.2	0.0508	0	0.0508	906.0	0	906.0	1.0612	0	1.0612	705.5

TABLE A.2 PROPERTIES OF SATURATED STEAM AND SATURATED WATER (TEMPERATURE)

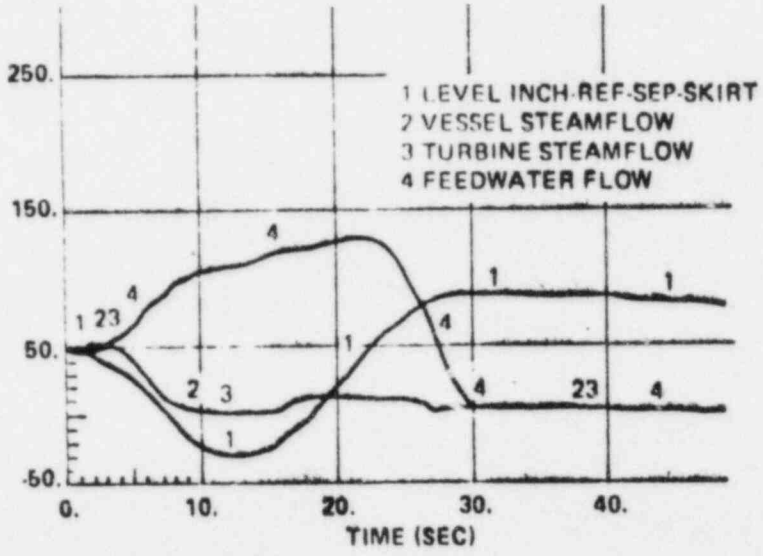
A.



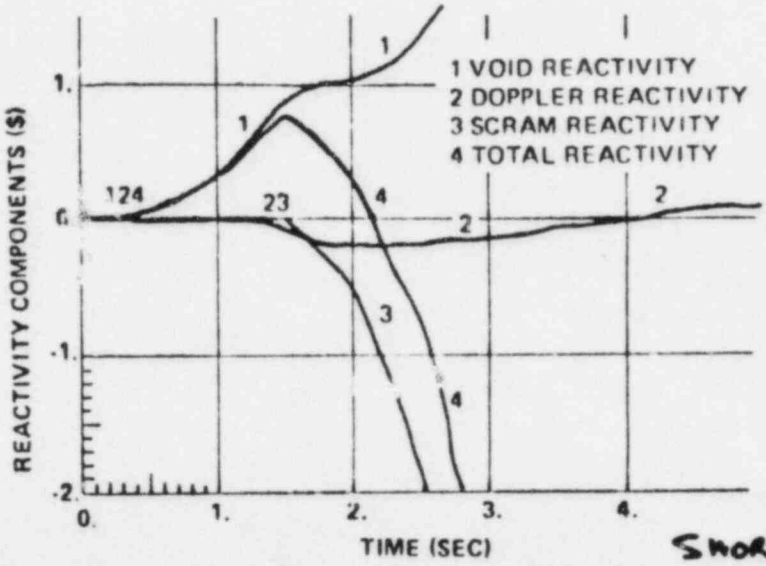
B.



C.



D.



NOTE: SHORTER TIME SCALE

MISSISSIPPI POWER & LIGHT COMPANY GRAND GULF NUCLEAR STATION UNITS 1 & 2 FINAL SAFETY ANALYSIS REPORT	FAST OPENING OF BOTH MAIN RECIRCULATION LOOP VALVES AT 11% PER SECOND FIGURE 15.4 – 5

SYSTEM LESSON PLAN

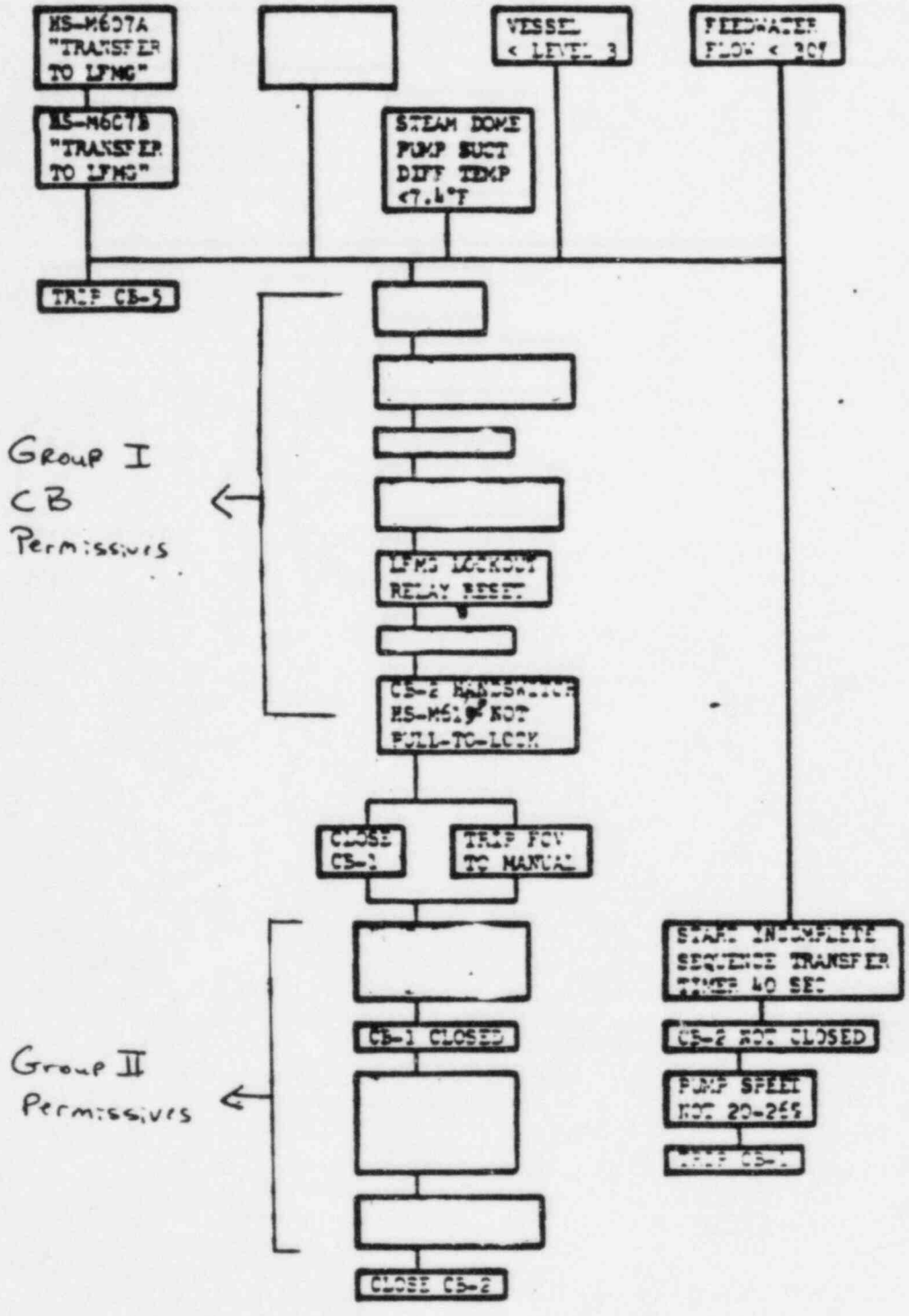


FIGURE 9. FAST SPEED TO SLOW SPEED TRANSFER SEQUENCE

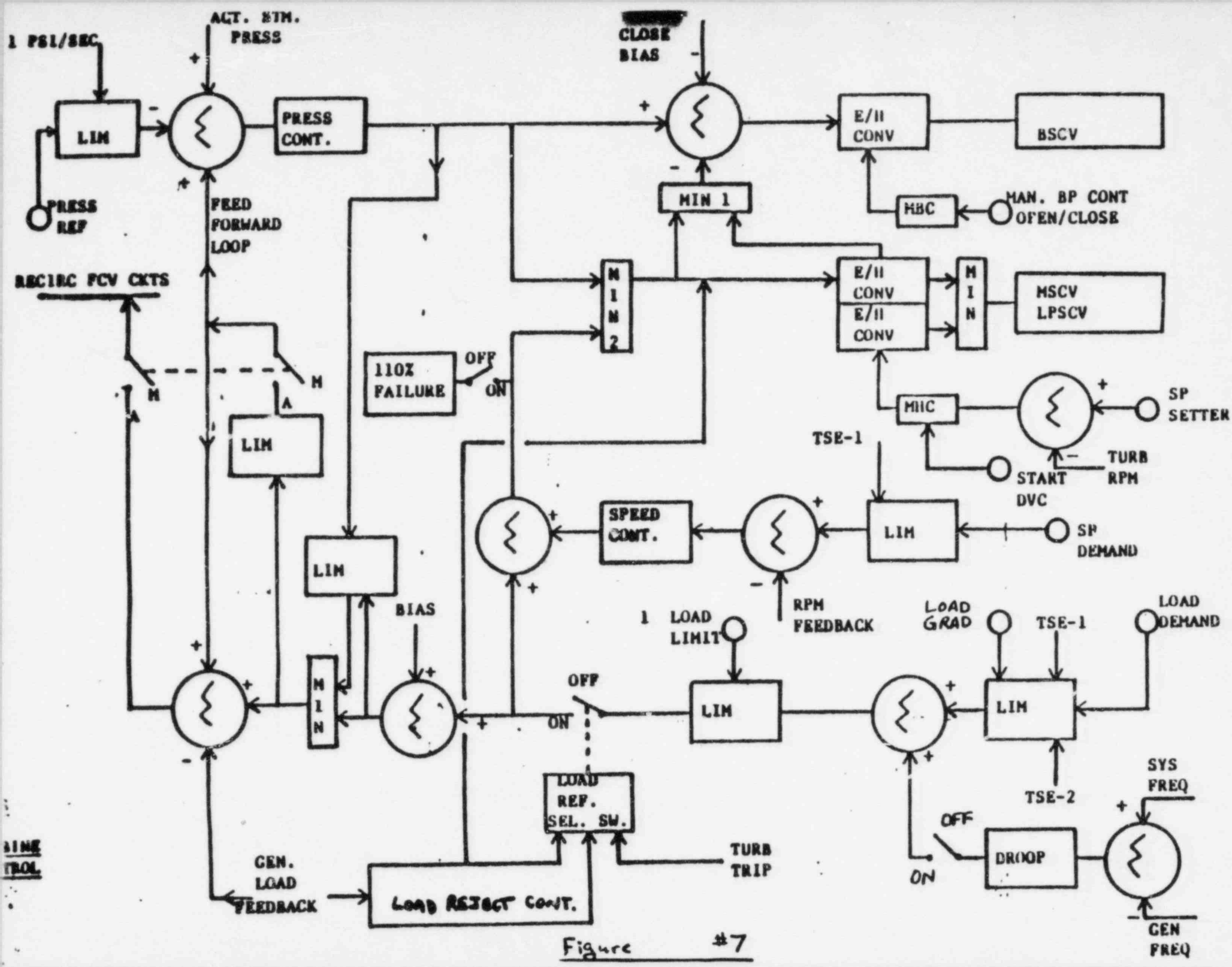

1 PSI/SEC
ACT. STM. PRESS
CLOSE BIAS
LIM
PRESS CONT.
E/H CONV
BSCV
PRESS REF
FEED FORWARD LOOP
MIN 1
MBC
MAN. BP CONT OPEN/CLOSE
RECIRC FCV CKTS
MIN 2
E/H CONV
E/H CONV
MIN
MSCV LPSCV
110% FAILURE
OFF
ON
M
A
LIM
MHC
SP SETTER
TSE-1
TURB RPM
START DVC
SPEED CONT.
LIM
SP DEMAND
LIM
BIAS
RPM FEEDBACK
1 LOAD LIMIT
LOAD GRAD
TSE-1
LOAD DEMAND
MIN
OFF
ON
LIM
LIM
TSE-2
SYS FREQ
LOAD REF. SEL. SW.
TURB TRIP
OFF
DROOP
ON
GEN. LOAD FEEDBACK
LOAD REJECT CONT.
GEN FREQ

Figure #7

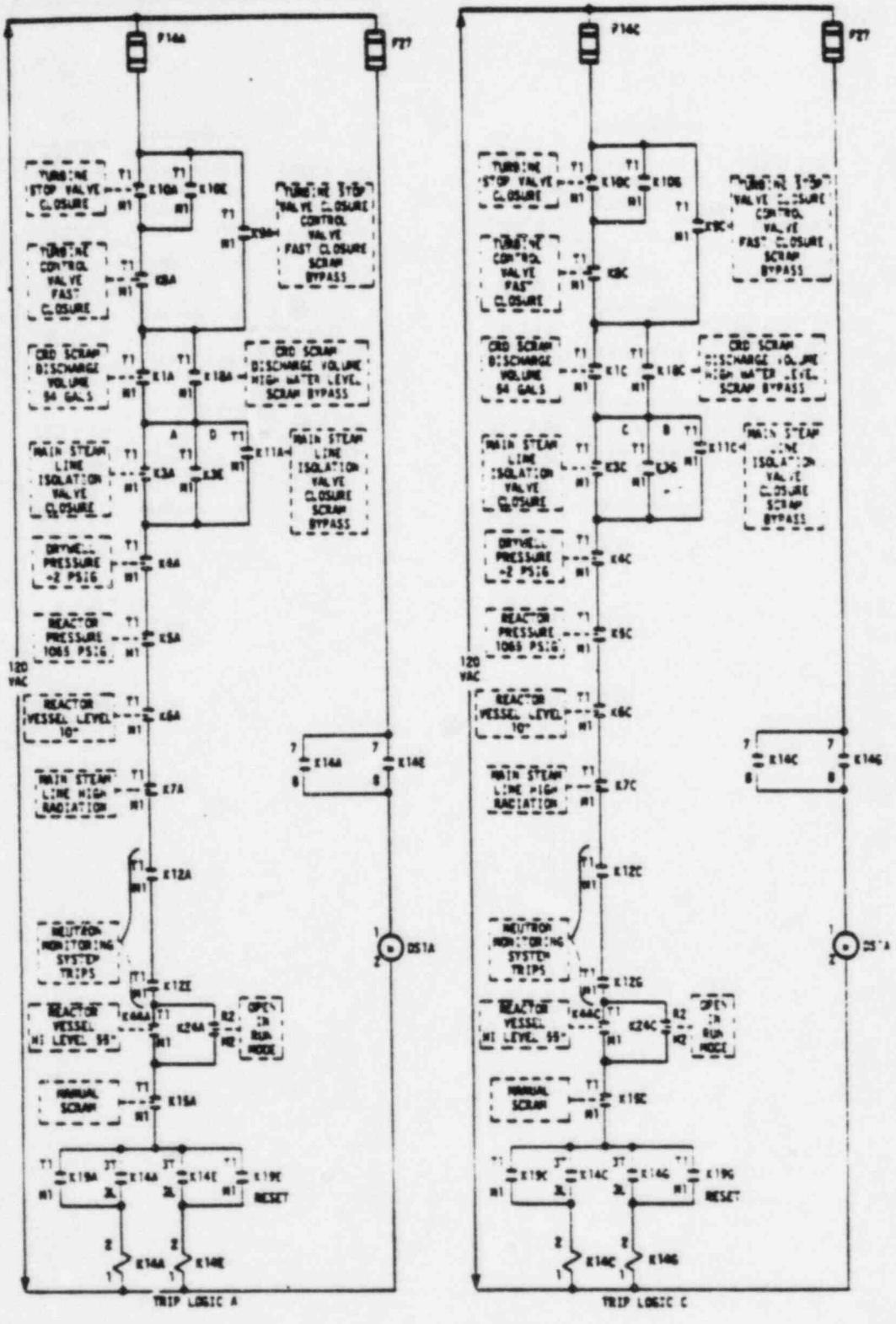


FIGURE 141A RPS TRIP SYSTEM A

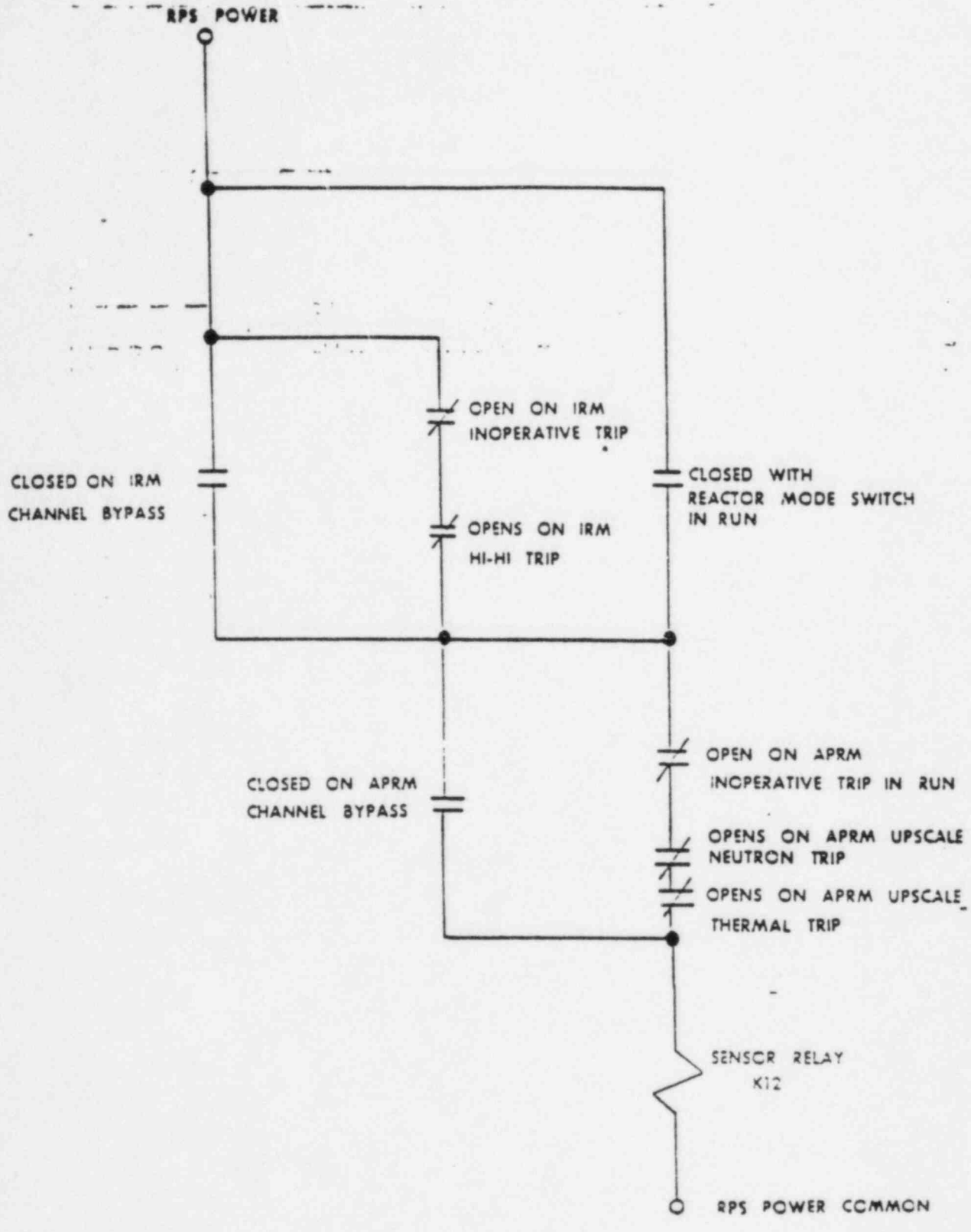


Figure 1418 IRM/APRM Scram Sensor Channel Circuit (Typical of 8)

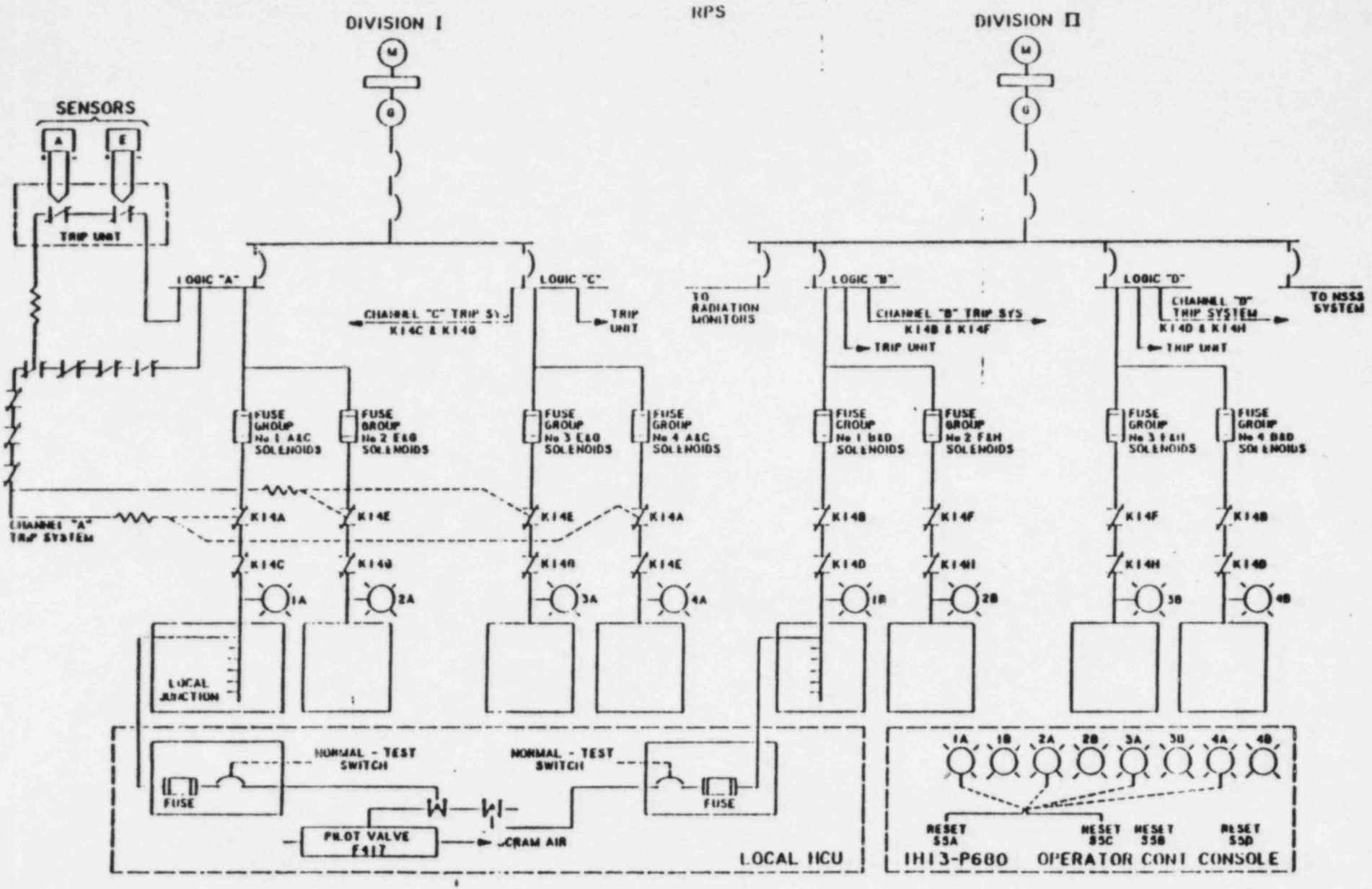

RPS
DIVISION I
DIVISION II
SENSORS
A
E
TRIP UNIT
LOGIC "A"
LOGIC "C"
LOGIC "B"
LOGIC "D"
TO RADIATION MONITORS
TO NSSS SYSTEM
CHANNEL "C" TRIP SYS
K14C & K14G
TRIP UNIT
CHANNEL "B" TRIP SYS
K14B & K14F
TRIP UNIT
CHANNEL "B" TRIP SYSTEM
K14D & K14H
TRIP UNIT
FUSE GROUP No 1 A&C SOLENOIDS
FUSE GROUP No 2 E&G SOLENOIDS
FUSE GROUP No 3 E&G SOLENOIDS
FUSE GROUP No 4 A&C SOLENOIDS
FUSE GROUP No 1 B&D SOLENOIDS
FUSE GROUP No 2 F&H SOLENOIDS
FUSE GROUP No 3 F&H SOLENOIDS
FUSE GROUP No 4 B&D SOLENOIDS
CHANNEL "A" TRIP SYSTEM
K14A
K14E
K14C
K14G
K14B
K14F
K14D
K14H
1A
2A
3A
4A
1B
2B
3B
4B
LOCAL JUNCTION
NORMAL - TEST SWITCH
NORMAL - TEST SWITCH
FUSE
FUSE
PILOT VALVE SOLT
SCRAM AIR
LOCAL HCU
1A 1B 2A 2B 3A 3B 4A 4B
RESET 55A
RESET 55C
RESET 55B
RESET 55D
IH13-P680 OPERATOR CONT CONSOLE

FIGURE 1416

TECHNICAL SPECIFICATIONS

3.0.1	OPERABILITY
3.0.2	
3.0.3	
3.0.4	
3.2.2	(Figures 3.2.3-1 & 3.2.3-2 Only) - MCPR
3.3.1	Reactor Protection System Instrumentation
3.3.2	Isolation Actuation Instrumentation
3.5.1	ECCS - Operating
3.6.7.1	Containment Hydrogen Recombiner System
3.8.1.1	A.C. Sources - Operating

3/4.0 APPLICABILITY

LIMITING CONDITION FOR OPERATION

3.0.1 Compliance with the Limiting Conditions for Operation contained in the succeeding Specifications is required during the OPERATIONAL CONDITIONS or other conditions specified therein; except that upon failure to meet the Limiting Conditions for Operation, the associated ACTION requirements shall be met.

3.0.2 Noncompliance with a Specification shall exist when the requirements of the Limiting Condition for Operation and associated ACTION requirements are not met within the specified time intervals. If the Limiting Condition for Operation is restored prior to expiration of the specified time intervals, completion of the Action requirements is not required.

3.0.3 When a Limiting Condition for Operation is not met, except as provided in the associated ACTION requirements, within one hour action shall be initiated to place the unit in an OPERATIONAL CONDITION in which the Specification does not apply by placing it, as applicable, in:

1. At least STARTUP within the next 6 hours,
2. At least HOT SHUTDOWN within the following 6 hours, and
3. At least COLD SHUTDOWN within the subsequent 24 hours.

Where corrective measures are completed that permit operation under the ACTION requirements, the ACTION may be taken in accordance with the specified time limits as measured from the time of failure to meet the Limiting Condition for Operation. Exceptions to these requirements are stated in the individual Specifications.

This specification is not applicable in OPERATIONAL CONDITION 4 or 5.

3.0.4 Entry into an OPERATIONAL CONDITION or other specified condition shall not be made unless the conditions for the Limiting Condition for Operation are met without reliance on provisions contained in the ACTION requirements. This provision shall not prevent passage through or to OPERATIONAL CONDITIONS as required to comply with ACTION requirements. Exceptions to these requirements are stated in the individual Specifications.

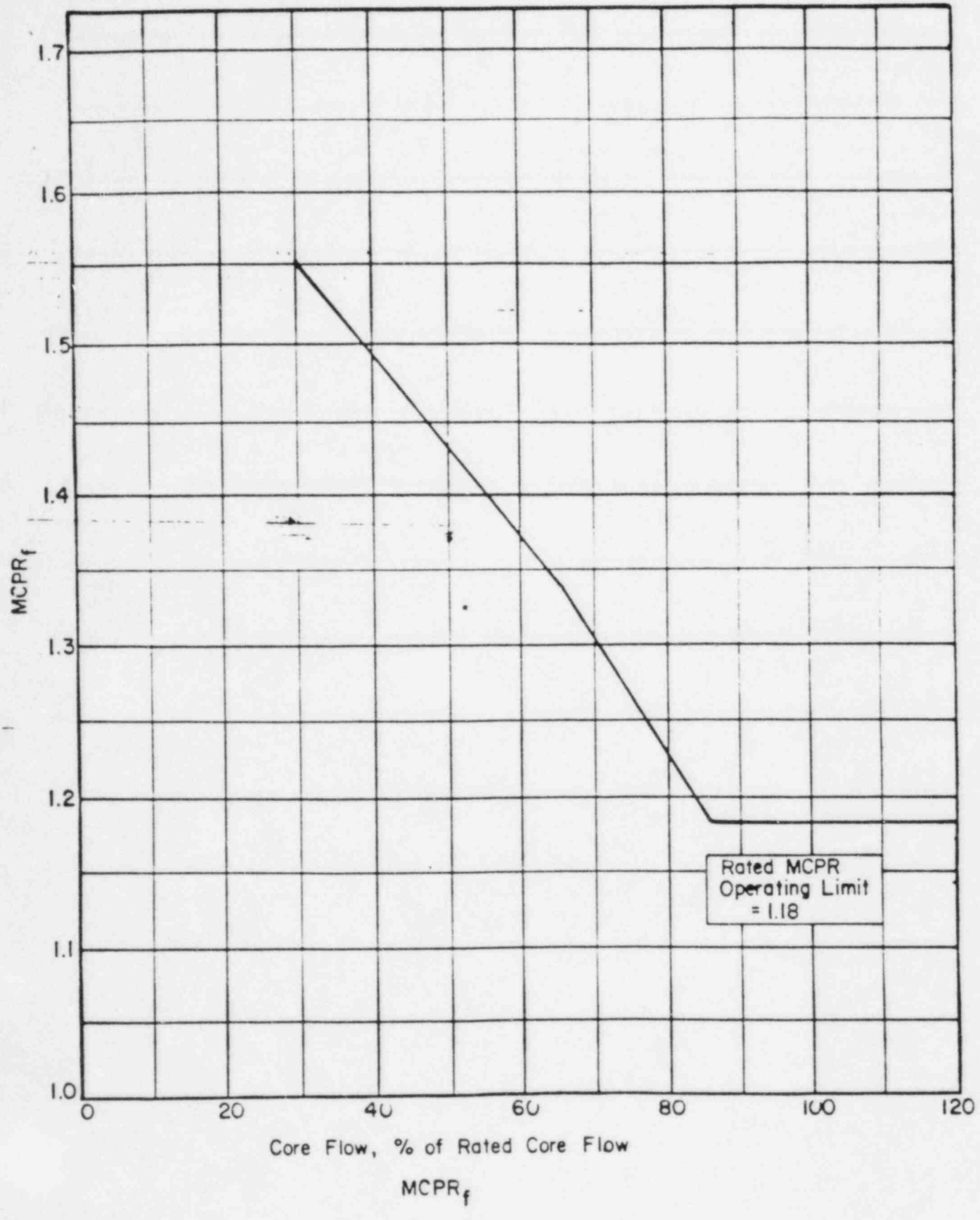

1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
MCPR$_f$
0
20
40
60
80
100
120
Core Flow, % of Rated Core Flow
Rated MCPR
Operating Limit
= 1.18
MCPR$_f$

FIGURE 3.2.3-1

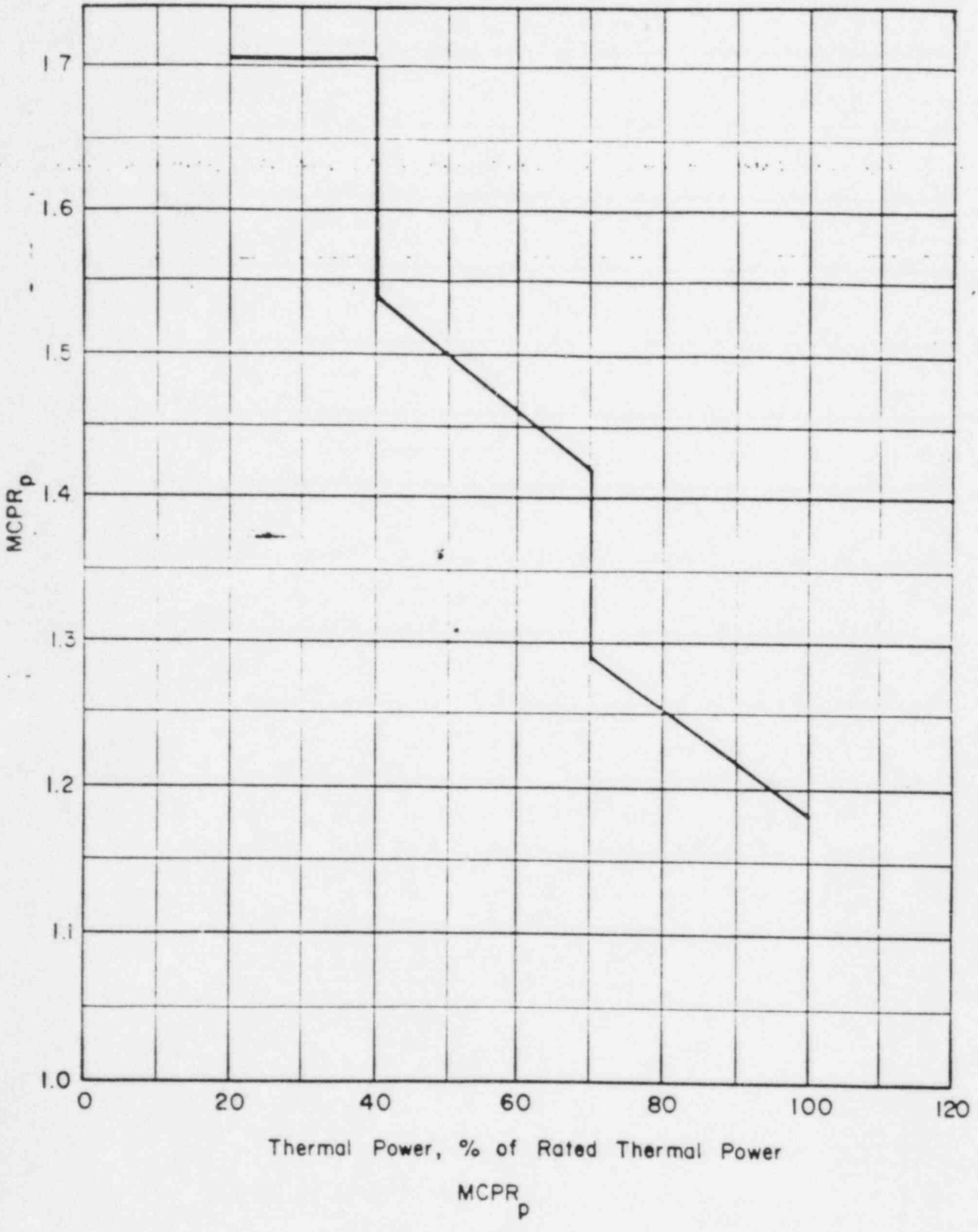

1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
MCPR$_p$
0
20
40
60
80
100
120
Thermal Power, % of Rated Thermal Power
MCPR$_p$

FIGURE 3.2.3-2

3/4.3 INSTRUMENTATION

3/4.3.1 REACTOR PROTECTION SYSTEM INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.1 As a minimum, the reactor protection system instrumentation channels shown in Table 3.3.1-1 shall be OPERABLE with the REACTOR PROTECTION SYSTEM RESPONSE TIME as shown in Table 3.3.1-2.

APPLICABILITY: As shown in Table 3.3.1-1.

ACTION:

a. With the number of OPERABLE channels less than required by the Minimum OPERABLE Channels per Trip System requirement for one trip system, place the inoperable channel and/or that trip system in the tripped condition* within one hour. The provisions of Specification 3.0.4 are not applicable.

b. With the number of OPERABLE channels less than required by the Minimum OPERABLE Channels per Trip System requirement for both trip systems, place at least one trip system** in the tripped condition within one hour and take the ACTION required by Table 3.3.1-1.

SURVEILLANCE REQUIREMENTS

4.3.1.1 Each reactor protection system instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION operations for the OPERATIONAL CONDITIONS and at the frequencies shown in Table 4.3.1.1-1.

4.3.1.2 LOGIC SYSTEM FUNCTIONAL TESTS and simulated automatic operation of all channels shall be performed at least once per 18 months.

4.3.1.3 The REACTOR PROTECTION SYSTEM RESPONSE TIME of each reactor trip functional unit shown in Table 3.3.1-2 shall be demonstrated to be within its limit at least once per 18 months. Each test shall include at least one channel per trip system such that all channels are tested at least once every N times 18 months where N is the total number of redundant channels in a specific reactor trip system.

---

*An inoperable channel need not be placed in the tripped condition where this would cause the Trip Function to occur. In these cases, the inoperable channel shall be restored to OPERABLE status within 2 hours or the ACTION required by Table 3.3.1-1 for that Trip Function shall be taken.

**The trip system need not be placed in the tripped condition if this would cause the Trip Function to occur. When a trip system can be placed in the tripped condition without causing the Trip Function to occur, place the trip system with the most inoperable channels in the tripped condition; if both systems have the same number of inoperable channels, place either trip system in the tripped condition.

TABLE 3.3.1-1

REACTOR PROTECTION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	APPLICABLE OPERATIONAL CONDITIONS	MINIMUM OPERABLE CHANNELS PER TRIP SYSTEM (a)	ACTION
1. Intermediate Range Monitors:			
a. Neutron Flux - High	2	3	1
	3, 4	3	2
	5(b)	3	3
b. Inoperative	2	3	1
	3, 4	3	2
	5	3	3
2. Average Power Range Monitor (c):			
a. Neutron Flux - High, Setdown	2	3	1
	3	3	2
	5(b)	3	3
b. Flow Biased Simulated Thermal Power - High	1	3	4
c. Neutron Flux - High	1	3	4
d. Inoperative	1, 2	3	1
	3	3	2
	5	3	3
3. Reactor Vessel Steam Dome Pressure - High	1, 2(d)	2	1
4. Reactor Vessel Water Level - Low, Level 3	1, 2	2	1
5. Reactor Vessel Water Level-High, Level 8	1(e)	2	4
6. Main Steam Line Isolation Valve - Closure	1(e)	4	4
7. Main Steam Line Radiation - High	1, 2(d)	2	5
8. Drywell Pressure - High	1, 2(f)	2	1

TABLE 3.3.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION

FUNCTIONAL UNIT	APPLICABLE OPERATIONAL CONDITIONS	MINIMUM OPERABLE CHANNELS PER TRIP SYSTEM (a)	ACTION
9. Scram Discharge Volume Water Level - High	1, 2	2	1
	5(g)	2	3
10. Turbine Stop Valve - Closure	1(h)	4	6
11. Turbine Control Valve Fast Closure, Valve Trip System Oil Pressure - Low	1(h)	2	6
12. Reactor Mode Switch Shutdown Position	1, 2	2	1
	3, 4	2	7
	5	2	3
13. Manual Scram	1, 2	2	1
	3, 4	2	8
	5	2	9

TABLE 3.3.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION

ACTION

ACTION 1 - Be in at least HOT SHUTDOWN within 12 hours.

ACTION 2 - Verify all insertable control rods to be inserted in the core and lock the reactor mode switch in the SHUTDOWN position within one hour.

ACTION 3 - Suspend all operations involving CORE ALTERATIONS*, and insert all insertable control rods within one hour.

ACTION 4 - Be in at least STARTUP within 6 hours.

ACTION 5 - Be in STARTUP with the main steam line isolation valves closed within 6 hours or in at least HOT SHUTDOWN within 12 hours.

ACTION 6 - Initiate a reduction in THERMAL POWER within 15 minutes and reduce turbine first stage pressure to less than the automatic bypass setpoint within 2 hours.

ACTION 7 - Verify all insertable control rods to be inserted within one hour.

ACTION 8 - Lock the reactor mode switch in the SHUTDOWN position within one hour.

ACTION 9 - Suspend all operations involving CORE ALTERATIONS*, and insert all insertable control rods and lock the reactor mode switch in the SHUTDOWN position within one hour.

*Except movement of IRM, SRM or special movable detectors, or replacement of LPRM strings provided SRM instrumentation is OPERABLE per Specification 3.9.2.

TABLE 3.3.1-1 (Continued)

REACTOR PROTECTION SYSTEM INSTRUMENTATION

TABLE NOTATIONS

(a) A channel may be placed in an inoperable status for up to 2 hours for required surveillance without placing the trip system in the tripped condition provided at least one OPERABLE channel in the same trip system is monitoring that parameter.

(b) The "shorting links" shall be removed from the RPS circuitry prior to and during the time any control rod is withdrawn* per Specification 3.9.2 and shutdown margin demonstrations performed per Specification 3.10.3.

(c) An APRM channel is inoperable if there are less than 2 LPRM inputs per level or less than 14 LPRM inputs to an APRM channel.

(d) This function is not required to be OPERABLE when the reactor pressure vessel head is unbolted or removed per Specification 3.10.1.

(e) This function shall be automatically bypassed when the reactor mode switch is not in the Run position.

(f) This function is not required to be OPERABLE when DRYWELL INTEGRITY is not required.

(g) With any control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

(h) This function shall be automatically bypassed when turbine first stage pressure is less than 30%** of the value of turbine first stage pressure in psia, at valves wide open (VWO) steam flow, equivalent to THERMAL POWER less than 40% of RATED THERMAL POWER.

*Not required for control rods removed per Specification 3.9.10.1 or 3.9.10.2.
**Initial setpoint. Final setpoint to be determined during startup test program. Any required change to this setpoint shall be submitted to the Commission within 90 days of test completion.

3/4.3.2 ISOLATION ACTUATION INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.2 The isolation actuation instrumentation channels shown in Table 3.3.2-1 shall be OPERABLE with their trip setpoints set consistent with the values shown in the Trip Setpoint column of Table 3.3.2-2 and with ISOLATION SYSTEM RESPONSE TIME as shown in Table 3.3.2-3.

APPLICABILITY: As shown in Table 3.3.2-1.

ACTION:

a. With an isolation actuation instrumentation channel trip setpoint less conservative than the value shown in the Allowable Values column of Table 3.3.2-2, declare the channel inoperable until the channel is restored to OPERABLE status with its trip setpoint adjusted consistent with the Trip Setpoint value.

b. With the number of OPERABLE channels less than required by the Minimum OPERABLE Channels per Trip System requirement for one trip system, place the inoperable channel(s) and/or that trip system in the tripped condition* within one hour. The provisions of Specification 3.0.4 are not applicable.

c. With the number of OPERABLE channels less than required by the Minimum OPERABLE Channels per Trip System requirement for both trip systems, place at least one trip system** in the tripped condition within one hour and take the ACTION required by Table 3.3.2-1.

SURVEILLANCE REQUIREMENTS

4.3.2.1 Each isolation actuation instrumentation channel shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL FUNCTIONAL TEST and CHANNEL CALIBRATION operations for the OPERATIONAL CONDITIONS and at the frequencies shown in Table 4.3.2.1-1.

4.3.2.2 LOGIC SYSTEM FUNCTIONAL TESTS and simulated automatic operation of all channels shall be performed at least once per 18 months.

4.3.2.3 The ISOLATION SYSTEM RESPONSE TIME of each isolation trip function shown in Table 3.3.2-3 shall be demonstrated to be within its limit at least once per 18 months. Each test shall include at least one channel per trip system such that all channels are tested at least once every N times 18 months, where N is the total number of redundant channels in a specific isolation trip system.

---

*An inoperable channel need not be placed in the tripped condition where this would cause the Trip Function to occur. In these cases, the inoperable channel shall be restored to OPERABLE status within 2 hours or the ACTION required by Table 3.3.2-1 for that Trip Function shall be taken.

**The trip system need not be placed in the tripped condition if this would cause the Trip Function to occur. When a trip system can be placed in the tripped condition without causing the Trip Function to occur, place the trip system with the most inoperable channels in the tripped condition; if both systems have the same number of inoperable channels, place either trip system in the tripped condition.

TABLE 3.3.2-1

ISOLATION ACTUATION INSTRUMENTATION

TRIP FUNCTION	VALVE GROUPS OPERATED BY SIGNAL (a)	MINIMUM OPERABLE CHANNELS PER TRIP SYSTEM (b)	APPLICABLE OPERATIONAL CONDITION	ACTION
1. PRIMARY CONTAINMENT ISOLATION				
a. Reactor Vessel Water Level-Low Low, Level 2	6A, 7, 8, 10(c)(d)	2	1, 2, 3 and #	20
b. Reactor Vessel Water Level-Low Low Level 2 (ECCS - Division 3)	6B	4	1, 2, 3 and #	29
c. Reactor Vessel Water Level-Low Low Low, Level 1 (ECCS - Division 1 and Division 2)	5(n)(o)	2	1, 2, 3 and #	29
d. Drywell Pressure - High	6A, 7(c)(d)	2	1, 2, 3	20
e. Drywell Pressure-High (ECCS - Division 1 and Division 2)	5(n)(o)	2	1, 2, 3	29
f. Drywell Pressure-High (ECCS - Division 3)	6B	4	1, 2, 3	29
g. Containment and Drywell Ventilation Exhaust Radiation - High High	7	2(e)	1, 2, 3 and *	21
h. Manual Initiation	6A, 7, 8, 10(c)(d)	2	1, 2, 3 and *#	22
2. MAIN STEAM LINE ISOLATION				
a. Reactor Vessel Water Level-Low Low Low, Level 1	1	2	1, 2, 3	20
b. Main Steam Line Radiation - High	10(f)	2	1, 2, 3	23
c. Main Steam Line Pressure - Low	1	2	1	24
d. Main Steam Line Flow - High	1	8	1, 2, 3	23
e. Condenser Vacuum - Low	1	2	1, 2,** 3**	23

TABLE 3.3.2-1 (Continued)

ISOLATION ACTUATION INSTRUMENTATION

TRIP FUNCTION	VALVE GROUPS OPERATED BY SIGNAL (a)	MINIMUM OPERABLE CHANNELS PER TRIP SYSTEM (b)	APPLICABLE OPERATIONAL CONDITION	ACTION
2. MAIN STEAM LINE ISOLATION (Continued)				
f. Main Steam Line Tunnel Temperature - High	1	2	1, 2, 3	23
g. Main Steam Line Tunnel Δ Temp. - High	1	2	1, 2, 3	23
h. Manual Initiation	1, 10	2	1, 2, 3	22
3. SECONDARY CONTAINMENT ISOLATION				
a Reactor Vessel Water Level-Low Low, Level 2	N.A. (c)(d)(h)	2	1, 2, 3, and #	25
b. Drywell Pressure - High	N.A. (c)(d)(h)	2	1, 2, 3	25
c. Fuel Handling Area Ventilation Exhaust Radiation - High High	N.A. (j)	2	1, 2, 3, and *	25
d. Fuel Handling Area Pool Sweep Exhaust Radiation - High High	N.A. (j)	2	1, 2, 3, and *	25
e. Manual Initiation	N.A. (c)(d)(h)	2	1, 2, 3	26
	N.A. (c)(d)(h)	2	*	25
4. REACTOR WATER CLEANUP SYSTEM ISOLATION				
a. Δ Flow - High	8	1	1, 2, 3	27
b. Δ Flow Timer	8	1	1, 2, 3	27
c. Equipment Area Temperature - High	8	1/room	1, 2, 3	27
d. Equipment Area Δ Temp. - High	8	1/room	1, 2, 3	27
e. Reactor Vessel Water Level - Low Low, Level 2	8	2	1, 2, 3	27

TABLE 3.3.2-1 (Continued)

ISOLATION ACTUATION INSTRUMENTATION

TRIP FUNCTION	VALVE GROUPS OPERATED BY SIGNAL (a)	MINIMUM OPERABLE CHANNELS PER TRIP SYSTEM (b)	APPLICABLE OPERATIONAL CONDITION	ACTION
4. REACTOR WATER CLEANUP SYSTEM ISOLATION (Continued)				
f. Main Steam Line Tunnel Ambient Temperature - High	8	1	1, 2, 3	27
g. Main Steam Line Tunnel Δ Temp. - High	8	1	1, 2, 3	27
h. SLCS Initiation	8(i)	1	1, 2, 5##	30
i. Manual Initiation	8	2	1, 2, 3	26
5. REACTOR CORE ISOLATION COOLING SYSTEM ISOLATION				
a. RCIC Steam Line Flow - High				
1. Pressure	4	1	1, 2, 3	27
2. Time Delay	4	1	1, 2, 3	27
b. RCIC Steam Supply Pressure - Low	4, 9(m)	1	1, 2, 3	27
c. RCIC Turbine Exhaust Diaphragm Pressure - High	4	2	1, 2, 3	27
d. RCIC Equipment Room Ambient Temperature - High	4	1	1, 2, 3	27
e. RCIC Equipment Room Δ Temp. - High	4	1	1, 2, 3	27
f. Main Steam Line Tunnel Ambient Temperature - High	4	1	1, 2, 3	27
g. Main Steam Line Tunnel Δ Temp. - High	4	1	1, 2, 3	27
h. Main Steam Line Tunnel Temperature Timer	4	1	1, 2, 3	27

TABLE 3.3.2-1 (Continued)

ISOLATION ACTUATION INSTRUMENTATION

TRIP FUNCTION	VALVE GROUPS OPERATED BY SIGNAL (a)	MINIMUM OPERABLE CHANNELS PER TRIP SYSTEM (b)	APPLICABLE OPERATIONAL CONDITION	ACTION
5. REACTOR CORE ISOLATION COOLING SYSTEM ISOLATION				
i. RHR Equipment Room Ambient Temperature - High	4	1/room	1, 2, 3	27
j. RHR Equipment Room Δ Temp. - High	4	1/room	1, 2, 3	27
k. RHR/RCIC Steam Line Flow - High	4	1	1, 2, 3	27
l. Manual Initiation	4(k)	1	1, 2, 3	26
m. Drywell Pressure-High (ECCS-Division 1 and Division 2)	9(m)	1	1, 2, 3	27
6. RHR SYSTEM ISOLATION				
a. RHR Equipment Room Ambient Temperature - High	3	1/room	1, 2, 3	28
b. RHR Equipment Room Δ Temp. - High	3	1/room	1, 2, 3	28
c. Reactor Vessel Water Level - Low, Level 3	3	2	1, 2, 3	28
d. Reactor Vessel (RHR Cut-in Permissive) Pressure - High	3(l)	2	1, 2, 3	28
e. Drywell Pressure - High	3(l)	2	1, 2, 3	28
f. Manual Initiation	3	2	1, 2, 3	26

TABLE 3.3.2-1 (Continued)
ISOLATION ACTUATION INSTRUMENTATION

ACTION

ACTION 20 - Be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the next 24 hours.

ACTION 21 - Close the affected system isolation valve(s) within one hour or:
a. In OPERATIONAL CONDITION 1, 2, or 3, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.
b. In OPERATIONAL CONDITION *, suspend CORE ALTERATIONS, handling of irradiated fuel in the primary containment and operations with a potential for draining the reactor vessel.

ACTION 22 - Restore the manual initiation function to OPERABLE status within 48 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

ACTION 23 - Be in at least STARTUP with the associated isolation valves closed within 6 hours or be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the next 24 hours.

ACTION 24 - Be in at least STARTUP within 6 hours.

ACTION 25 - Establish SECONDARY CONTAINMENT INTEGRITY with the standby gas treatment system operating within one hour.

ACTION 26 - Restore the manual initiation function to OPERABLE status within [illegible] hours or close the affected system isolation valves within the next hour and declare the affected system inoperable.

ACTION 27 - Close the affected system isolation valves within one hour and declare the affected system inoperable.

ACTION 28 - Within one hour lock the affected system isolation valves closed, or verify, by remote indication, that the valve is closed and electrically disarmed, or isolate the penetration(s) and declare the affected system inoperable.

ACTION 29 - Close the affected system isolation valves within one hour and declare the affected system or component inoperable or:
a. In OPERATIONAL CONDITION 1, 2 or 3 be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.
b. In OPERATIONAL CONDITION # suspend CORE ALTERATIONS and operations with a potential for draining the reactor vessel.

ACTION 30 - Declare the affected SLCS pump inoperable.

NOTES

* When handling irradiated fuel in the primary or secondary containment and during CORE ALTERATIONS and operations with a potential for draining the reactor vessel.

** The low condenser vacuum MSIV closure may be manually bypassed during reactor SHUTDOWN or for reactor STARTUP when condenser vacuum is below the trip setpoint to allow opening of the MSIVs. The manual bypass shall be removed when condenser vacuum exceeds the trip setpoint.

\# During CORE ALTERATIONS and operations with a potential for draining the reactor vessel.

\#\# With any control rod withdrawn. Not applicable to control rods removed per Specification 3.9.10.1 or 3.9.10.2.

(a) See Specification 3.6.4, Table 3.6.4-1 for valves in each valve group.

TABLE 3.3.2-1 (Continued)
ISOLATION ACTUATION INSTRUMENTATION

NOTES (Continued)

(b) A channel may be placed in an inoperable status for up to 2 hours for required surveillance without placing the trip system in the tripped condition provided at least one other OPERABLE channel in the same trip system is monitoring that parameter.
(c) Also actuates the standby gas treatment system.
(d) Also actuates the control room emergency filtration system in the isolation mode of operation.
(e) Two upscale-Hi Hi, one upscale-Hi Hi and one downscale, or two downscale signals from the same trip system actuate the trip system and initiate isolation of the associated containment and drywell isolation valves.
(f) Also trips and isolates the mechanical vacuum pumps.
(g) Deleted.
(h) Also actuates secondary containment ventilation isolation dampers and valves per Table 3.6.6.2-1.
(i) Closes only RWCU system isolation valves G33-F001, G33-F004, and G33-F251.
(j) Actuates the Standby Gas Treatment System and isolates Auxiliary Building penetration of the ventilation systems within the Auxiliary Building.
(k) Closes only RCIC outboard valves. A concurrent RCIC initiation signal is required for isolation to occur.
(l) Valves E12-F037A and E12-F037B are closed by high drywell pressure. All other Group 3 valves are closed by high reactor pressure.
(m) Valve Group 9 requires concurrent drywell high pressure and RCIC Steam Supply Pressure-Low signals to isolate.
(n) Valves E12-F042A and E12-F042B are closed by Containment Spray System initiation signals.
(o) Also isolates valves E61-F009, E61-F010, E61-F056, and E61-F057 from Valve Group 7.

3/4.5 EMERGENCY CORE COOLING SYSTEMS

3/4.5.1 ECCS - OPERATING

LIMITING CONDITION FOR OPERATION

3.5.1 ECCS divisions 1, 2 and 3 shall be OPERABLE with:

a. ECCS division 1 consisting of:

1. The OPERABLE low pressure core spray (LPCS) system with a flow path capable of taking suction from the suppression pool and transferring the water through the spray sparger to the reactor vessel.

2. The OPERABLE low pressure coolant injection (LPCI) subsystem "A" of the RHR system with a flow path capable of taking suction from the suppression pool and transferring the water to the reactor vessel.

3. Eight OPERABLE ADS valves.

b. ECCS division 2 consisting of:

1. The OPERABLE low pressure coolant injection (LPCI) subsystems "B" and "C" of the RHR system, each with a flow path capable of taking suction from the suppression pool and transferring the water to the reactor vessel.

2. Eight OPERABLE ADS valves.

c. ECCS division 3 consisting of the OPERABLE high pressure core spray (HPCS) system with a flow path capable of taking suction from the suppression pool and transferring the water through the spray sparger to the reactor vessel.

APPLICABILITY: OPERATIONAL CONDITION 1, 2* # and 3*.

ACTION:

a. For ECCS division 1, provided that ECCS divisions 2 and 3 are OPERABLE:

1. With the LPCS system inoperable, restore the inoperable LPCS system to OPERABLE status within 7 days.

2. With LPCI subsystem "A" inoperable, restore the inoperable LPCI subsystem "A" to OPERABLE status within 7 days.

3. With the LPCS system inoperable and LPCI subsystem "A" inoperable, restore at least the inoperable LPCI subsystem "A" or the inoperable LPCS system to OPERABLE status within 72 hours.

4. Otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.**

*The ADS is not required to be OPERABLE when reactor steam dome pressure is less than or equal to 135 psig.

#See Special Test Exception 3.10.5.

**Whenever two or more RHR subsystems are inoperable, if unable to attain COLD SHUTDOWN as required by this ACTION, maintain reactor coolant temperature as low as practical by use of alternate heat removal methods.

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

b. For ECCS division 2, provided that ECCS divisions 1 and 3 are OPERABLE:

1. With either LPCI subsystem "B" or "C" inoperable, restore the inoperable LPCI subsystem "B" or "C" to OPERABLE status within 7 days.

2. With both LPCI subsystems "B" and "C" inoperable, restore at least the inoperable LPCI subsystem "B" or "C" to OPERABLE status within 72 hours.

3. Otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours*.

c. For ECCS division 3, provided that ECCS divisions 1 and 2 and the RCIC system are OPERABLE:

1. With ECCS division 3 inoperable, restore the inoperable division to OPERABLE status within 14 days.

2. Otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

d. For ECCS divisions 1 and 2, provided that ECCS division 3 is OPERABLE:

1. With LPCI subsystem "A" and either LPCI subsystem "B" or "C" inoperable, restore at least the inoperable LPCI subsystem "A" or the inoperable LPCI subsystem "B" or "C" to OPERABLE status within 72 hours.

2. With the LPCS system inoperable and either LPCI subsystems "B" or "C" inoperable, restore at least the inoperable LPCS system or the inoperable LPCI subsystem "B" or "C" to OPERABLE status within 72 hours.

3. Otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours*.

*Whenever two or more RHR subsystems are inoperable, if unable to attain COLD SHUTDOWN as required by this ACTION, maintain reactor coolant temperature as low as practical by use of alternate heat removal methods.

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

e. For ECCS divisions 1 and 2, provided that ECCS division 3 is OPERABLE and divisions 1 and 2 are otherwise OPERABLE:

1. With one of the above required ADS valves inoperable, restore the inoperable ADS valve to OPERABLE status within 14 days or be in at least HOT SHUTDOWN within the next 12 hours and reduce reactor steam dome pressure to $\leq$ 135 psig within the next 24 hours.

2. With two or more of the above required ADS valves inoperable, be in at least HOT SHUTDOWN within 12 hours and reduce reactor steam dome pressure to $\leq$ 135 psig within the next 24 hours.

f. With an ECCS discharge line "keep filled" pressure alarm instrumentation channel inoperable, perform Surveillance Requirement 4.5.1.a.1 at least once per 24 hours.

g. With an ECCS header delta P instrumentation channel inoperable, restore the inoperable channel to OPERABLE status with 72 hours or determine ECCS header delta P locally at least once per 12 hours; otherwise declare the associated ECCS inoperable.

h. In the event an ECCS system is actuated and injects water into the Reactor Coolant System, a Special Report shall be prepared and submitted to the Commission pursuant to Specification 6.9.2 within 90 days describing the circumstances of the actuation and the total accumulated actuation cycles to date. The current value of the useage factor for each affected safety injection nozzle shall be provided in this Special Report whenever its value exceeds 0.70.

*Whenever two or more RHR subsystems are inoperable, if unable to attain COLD SHUTDOWN as required by this ACTION, maintain reactor coolant temperature as low as practical by use of alternate heat removal methods.

3/4.6.7 ATMOSPHERE CONTROL

CONTAINMENT HYDROGEN RECOMBINER SYSTEMS

LIMITING CONDITION FOR OPERATION

3.6.7.1 Two independent containment hydrogen recombiner systems shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1 and 2.

ACTION:

With one containment hydrogen recombiner system inoperable, restore the inoperable system to OPERABLE status within 30 days or be in at least HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.6.7.1 Each containment hydrogen recombiner system shall be demonstrated OPERABLE:

a. At least once per 6 months by verifying during a recombiner system functional test that the minimum heater sheath temperature increases to greater than or equal to 700°F within 90 minutes. Maintain ≥700°F for at least 2 hours.

b. At least once per 18 months by:

1. Performing a CHANNEL CALIBRATION of all control room recombiner instrumentation and control circuits.

2. Verifying the integrity of all heater electrical circuits by performing a resistance to ground test within 30 minutes following the above required functional test. The resistance to ground for any heater phase shall be greater than or equal to 10,000 ohms.

3. Verifying during a recombiner system functional test that the heater sheath temperature increases to greater than or equal to 1200°F within 5 hours and is maintained between 1150°F and 1300°F for at least 4 hours.

4. Verifying through a visual examination that there is no evidence of abnormal conditions within the recombiner enclosure; i.e, loose wiring or structural connections, deposits of foreign materials, etc.

c. [DELETED]

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

A.C. SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.8.1.1 As a minimum, the following A.C. electrical power sources shall be OPERABLE:

a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system, and

b. Three separate and independent diesel generators, each with:

1. Separate day fuel tanks containing a minimum of 220 gallons of fuel.

2. A separate fuel storage system containing a minimum of:

a) 48,000 gallons of fuel each for diesel generators 11 and 12, and

b) 39,000 gallons of fuel for diesel generator 13.

3. A separate fuel transfer pump.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, and 3.

ACTION:

a. With either one offsite circuit or diesel generator 11 or 12 of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirements 4.8.1.1.1.a within one hour and 4.8.1.1.2.a.4,* for one diesel generator at a time, within two hours and at least once per 8 hours thereafter; restore at least two offsite circuits and diesel generators 11 and 12 to OPERABLE status within 72 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

b. With one offsite circuit and diesel generator 11 or 12 of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirements 4.8.1.1.1.a within one hour and 4.8.1.1.2.a.4,* for one diesel generator at a time, within two hours and at least once per 8 hours thereafter; restore at least one of the inoperable A.C. sources to OPERABLE status within 12 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours. Restore at least two offsite circuits and diesel generators 11 and 12 to OPERABLE status within 72 hours from time of initial loss or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

*Specification 4.8.1.1.2.a.4 must be performed for diesel generator 13 only when the HPCS system is OPERABLE.

LIMITING CONDITION FOR OPERATION (Continued)

ACTION (Continued)

c. With either diesel generator 11 or 12 of the above required A.C. electrical power sources inoperable, in addition to ACTION a or b above, as applicable, verify within 2 hours that all required systems, subsystems, trains, components and devices that depend on the remaining diesel generator 11 or 12 as a source of emergency power are also OPERABLE; otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

d. With two of the above required offsite circuits inoperable, demonstrate the OPERABILITY of three diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4*, for one diesel generator at a time, within two hours and at least once per 8 hours thereafter, unless the diesel generators are already operating; restore at least one of the inoperable offsite circuits to OPERABLE status within 24 hours or be in at least HOT SHUTDOWN within the next 12 hours. With only one offsite circuit restored to OPERABLE status, restore at least two offsite circuits to OPERABLE status within 72 hours from time of initial loss or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

e. With diesel generators 11 and 12 of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirements 4.8.1.1.1.a within one hour and 4.8.1.1.2.a.4*, within two hours and at least once per 8 hours thereafter; restore at least one of the inoperable diesel generators 11 and 12 to OPERABLE status within 2 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours. Restore both diesel generators 11 and 12 to OPERABLE status within 72 hours from time of initial loss or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

f. With diesel generator 13 of the above required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirements 4.8.1.1.1.a within one hour and 4.8.1.1.2.a.4, for one diesel generator at a time, within two hours and at least once per 8 hours thereafter; restore the inoperable diesel generator 13 to OPERABLE status within 72 hours or declare the HPCS system inoperable and take the ACTION required by Specification 3.5.1.

*Specification 4.8.1.1.2.a.4 must be performed for diesel generator 13 only when the HPCS system is OPERABLE.