U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-255/OL-85-01

Docket No. 50-255 License No. DPR-20

Licensee: Consumers Power Company
Rt. 2, Box 154
Covert, MI 49043

Facility Name: Palisades

Examination Administered At: Palisades Generating Station and Midland Training Center

Examination Conducted: July 3, 10, and 11, 1985

Examiner(s): R L Higgins — 7/26/85
R. L. Higgins — Date

T M Burdick — 7-26-85
T. M. Burdick — Date

Approved By: R L Higgins for — 7/26/85
J. I. Mc Millen, Chief — Date
Operating Licensing Section

Examination Summary

The written examinations were administered on July 3, 1985 (Report No. 50-255/OL-85-01)
The simulator examinations were administered on July 10, 1985. The plant walk-through examinations were administered on July 11, 1985. Written, simulator and plant walk-through replacement examinations were administered to 2 instructor certification candidates. Written requalification examinations were administered to 5 Senior Reactor Operators and 3 Reactor Operators. The written SRO requalification examination was identical to the SRO replacement examination administered to the two instructors except for Section 5, which was developed by the licensee. The written RO requalification examination was similar to an NRC replacement examination, except for Section 1, which was developed by the licensee.
Results: Both instructors passed all three portions of the replacement examination. Four Senior Reactor Operators passed the written requalification examination.

REPORT DETAILS

1. Examiners

R. L. Higgins, Region III, Chief Examiner
T. M. Burdick, Region III

2. Examination Review Meeting

On July 3, 1985, at the conclusion of the written examination, the examiners met with the following facility personnel to review the SRO and RO examinations:

L. Schmiedeknecht, Simulator Instructor
J. Watson, Nuclear Instructor II
M. King, Shift Engineer
S. Wawro, Shift Supervisor
N. Pope, Nuclear Operator Training Consultant
D. Turcott, Nuclear Operator Training Consultant
R. Heimsath, Simulator Supervisor

The following facility comments and NRC responses were made concerning the RO examination:

QUESTION 2.19

Which one of the following is most accurate regarding the fuel handling system?

a. The refueling machine interlocks include an upmotion hoist stop if the local area monitor exceeds a predetermined radiation setpoint.

b. In order to receive a new fuel bundle in the new fuel elevator the interlock for raising the elevator to the surface of the pool must be overridden.

c. Withdrawal, insertion and transfer procedures for control rods are identical to those for fuel except the mast must be rotated 180 degrees with respect to the angular position used for handling fuel bundles.

d. Fuel transfer interlocks require that both tilt machines be in the horizontal position to perform a transfer and transfer travel will be stopped if cable tension exceeds the high limit.

FACILITY COMMENT:

It appears that both B & D could be correct. Along with the key answer, Attachment 1 should be considered.

Reference: Attachment 1
Lesson Plan Module 29, Refueling System and Equipment, Section c, Reactor Side Fuel Handling Machine, Page 13.

NRC RESPONSE:

Agree. The answer was modified to award full credit for either response "b" or "d".

QUESTION 3.02

a. What four types of detectors are used in the nuclear instrumentation systems?

b. Why are there two detectors used in each of the power range safety channels?

FACILITY COMMENT:

There are only three types of detectors utilized in the Palisades Nuclear Instrument System. The proportional detectors are not utilized.

Reference: Attachment 2
System Lesson Note, Page 7.6-8

NRC RESPONSE:

Agree. "Proportional detectors" were eliminated from the answer.

QUESTION 3.04

State the meaning of the following annunciator window conditions.

a. fast flashing

b. slow flashing

FACILITY COMMENT:

The correct answer is "anytime the alarm condition has cleared either before or after acknowledgement."

Reference: Attachment 3
SOP-40, Palisades Nuclear Plant System Operating Procedure, Annunciators, Page 3

NRC RESPONSE:

Agree. The answer for part "b" was modified to eliminate the phrase "before acknowledgement."

QUESTION 3.05

What does it mean to "time integrate" as described in the steam generator water level control system chapter? Why is this necessary?

FACILITY COMMENT:

This question is outside of the knowledge requirements as listed in NUREG-1021, Section ES-202, Part 3, page 2 of 6. The question is specific to Steam Generator Level Control, but the answer is generic in nature.

NRC RESPONSE:

Disagree. "Time integrate" is a term describing the operating characteristic of a control system used at Palisades and is clearly within the scope of operator knowledge as enumerated in NUREG-1021.

QUESTION 3.07

a. How is the regulation of steam pressure to the AFW pump turbine assured during a loss of instrument air?

b. In what mode must the FIC and HIC be in to facilitate automatic AFW flow control?

c. When is the FIC placed in the pseudo-automatic mode?

FACILITY COMMENT:

The term "pseudo-automatic" is neither used in our procedures, nor is it used as common jargon in our Plant.

The Procedures used is 'Manual/Auto Control.'

NRC RESPONSE:

Disagree. The term "pseudo-automatic" is used several times in the reference provided by the licensee. The licensee should revise its reference material to replace inaccurate terminology with terminology actually used at the facility.

QUESTION 4.09

a. What are the heatup AND cooldown rates for the primary coolant system AND the pressurizer?

b. What is the minimum primary coolant system pressure for operating primary coolant pumps?

c. What plant condition (excluding accidents) does not allow all primary coolant pumps in operation?

FACILITY COMMENT FOR PART A:

The Technical Specification limits for heatup and cooldown rates (100°F/hr in the Primary Coolant System and 200°F/hr in the Pressurizer) should also be acceptable answers for this question.

Reference: Attachment 4
Palisades Technical Specifications, Section 3.1.2, Page 3-4

NRC RESPONSE:

Agree. The answer was expanded to award full credit for the Technical Specification limits.

FACILITY COMMENT FOR PART B:

According to SOP-1, 250 psia is an acceptable answer.

Reference: Attachment 5
SOP-1, Palisades Nuclear Plant System Operating Procedure, Primary Coolant System, Page 2

NRC RESPONSE:

Agree. The answer was changed to 250 psia.

QUESTION 4.11

a. Why should the boron concentration be equalized between the shutdown cooling system and the SIRW tank PRIOR to decreasing the PCS pressure below 300 psia?

b. At what point in the draining of the primary cooling system does cavitation of the shutdown cooling system pumps become a concern?

FACILITY COMMENT:

According to SOP-1, "below the centerline of the hot leg" should also be an acceptable answer.

Reference: Attachment 6
SOP-1, Palisades Nuclear Plant System Operating Procedure, Primary Coolant System, Page 17

NRC RESPONSE:

Agree. The answer for part "b" was expanded to grant full credit for the response "below the centerline of the hot leg."

The following facility comments and NRC responses were made concerning the SRO examination:

QUESTION 5.04b

When is the violation of the rod power dependent insertion limits acceptable?

FACILITY COMMENT:

An additional/alternate answer is "during low power physics testing and CRDM exercising, but only for the duration of the test."

Reference: Attachment 7
Technical Specifications, Section 3.10.7, Page 3-61

NRC RESPONSE:

Agree. The answer was modified to include "low power physics testing and CRDM exercising" as acceptable responses.

QUESTION 5.10

One method of introducing lithium 7 into the PCS is by charging using the chemical addition tank. Name two other ways in which lithium 7 enters the PCS.

FACILITY COMMENT:

An additional answer is "by injection of Lithium via the Chemical and Volume Control System Chemical Addition Tank and Metering Pump."

Reference: Attachment 8
COP-1, PCS Chemical Additions for Hydrazine and Lithium, Page 1

NRC RESPONSE:

Disagree. The question required two methods besides the chemical addition tank. The answer was not changed.

QUESTION 6.01

What three trips will be defeated by the zero power mode bypass?

FACILITY COMMENT:

The answer key has three trips listed:

1. Steam Generator Pressure
2. low Primary Coolant System flow
3. TMLP

System Lesson Note #14, page 23 has the Steam Generator Pressure Trip listed as "A" Steam Generator Pressure or "B" Steam Generator Pressure Trip.

An acceptable answer should be any three of the following:

1. "A" Steam Generator Pressure
2. "B" Steam Generator Pressure
3. low Primary Coolant System flow

Reference: Attachment 9
System Lesson Note #14, Reactor Protective System, Page 23

NRC RESPONSE:

Disagree. "A steam generator pressure" and "B steam generator pressure" are both "steam generator pressure" trips. The answer was not changed.

QUESTION 6.03

What will cause the incore detectors to generate a signal when the reactor is shutdown and subcritical?

FACILITY COMMENT:

This question is misleading in that it does not ask if the signal is measurable or not. If the signal is measurable then the answer key is correct. If the signal is not measurable then decay or source neutrons must be taken into account to generate a signal.

With the reactor shutdown and no other parameters stated in the question, decay or source neutrons will also generate a signal in the in-core detectors.

Reference: Attachment 10
Lesson Plan Module
Prevention/Mitigation of Core Damage, Section F.4.A.11

NRC RESPONSE:

Disagree. The facility reference states that detector sensitivity is low enough that no output is normally measurable when the core is shutdown, but a signal may be generated if the temperature of the incore exceeds 600°F. The source neutron flux is extremely low, nearly a factor of one billion less than the full power flux, so there would absolutely be no signal generated by decay or source neutrons. The answer was not changed.

QUESTION 6.06

Name the three relief valves which discharge to the Quench Tank.

FACILITY COMMENT:

Answer key lists:

1. letdown line relief
2. SIT drain relief
3. shutdown cooling relief

Additionally, there are other relief valves that discharge into the quench tank. These are the PORV's and Safety Relief Valves from the Pressurizer. The answer key should reflect these additional valves.

Reference: Attachment 11
M-201, sheet 2, rev. 3 and sheet 3, rev. 1, Piping and Instrument Diagram, Primary Coolant System

NRC RESPONSE:

Agree. The answer was modified to give credit for the PORV's and safety relief valves.

QUESTION 6.16

What is the starting sequence of the fire system pumps? Include setpoints.

FACILITY COMMENT:

There are conflicting setpoints between the answer key and the SOP-21, Section 7.1. This section has the following setpoints:

P9A - 90 psig
P9B - 80 psig
P41 - 65 psig

Reference: Attachment 12
SOP-21, Palisades Nuclear Plant System Operating Procedure, Fire Protection System, Section 7.1, Page 2

NRC RESPONSE:

Agree. The answer was modified to accept either 80 or 75 psig for P9B, and either 65 or 60 psig for P41. The facility should revise its reference material to make the information accurate and consistent.

QUESTION 6.20

What three conditions will cause the emergency diesel generator breaker to automatically open?

FACILITY COMMENT:

There are more than three conditions which open the breaker. They are as follows:

loss of generator excitation
overload
engine trip
generator differential relay
2400V bus transfer

The question did not state under what conditions the Diesel Generator was running. The examiner could also list diesel engine trips and have the following acceptable answers:

overspeed
low bearing oil pressure
overcrank

The 2400 V bus transfer relays (faster transfer) trip the output breaker and this breaker cannot be closed for 1.5 seconds. Again the question did not state the conditions under which the diesel was running.

Reference: Attachment 13
Palisades Schematic Diagram, E-139, sheet 1, rev. 15 and Palisades Logic Diagram, E-17, sheet 2, rev. 8

NRC RESPONSE:

Agree. The answer was modified to accept the following responses in addition to those already listed: 2400 V bus transfer, overspeed, low bearing oil pressure and overcrank. The System Lesson Notes which describe the diesel generator, System Lesson Notes #33, do not list these four trips. The facility should update its reference material so that the material will be accurate, consistent and complete.

QUESTION 7.15b

What action should be taken if the running HPSI pumps are not maintaining this minimum flow rate?

FACILITY COMMENT:

Another acceptable answer could be as follows:

"If an increase in flow is not indicated, immediately stop the pump."

Reference: Attachment 14
SOP-3, Palisades Nuclear Plant System Operating Procedure, Safety Injection and Shutdown Cooling System, Section 7.1.1, Page 5

NRC RESPONSE:

Agree. The question did not stipulate the circumstances under which the HPSI pump was operating: during pump performance testing or during a loss of coolant accident. The answer was expanded to award full credit for the response: "immediately stop the pump."

QUESTION 8.22

In order to maintain PCS temperature above 325°F, 240 volt AC power panels No. 1 and 2 and their associated ACB breaker distribution system, located in the _____, and 125 volt DC buses ____ must be operable.

a. auxiliary building; D10 and D20
b. auxiliary building; No. 1 and 2
c. switchyard; D10 and D20
d. switchyard; No. 1 and 2

FACILITY COMMENT:

SOP-30 and Plant personnel routinely call DC buses D10 and D20 by the name of the DC Bus 1 and DC Bus 2, respectively. This would make both answers C and D correct.

Reference: Attachment 15
SOP-30, Palisades Nuclear Plant System Operating Procedure, Station Power, Section 7.1.1. Note Pages 15 and WD 950, sheet 17

NRC RESPONSE:

Agree. The answer was changed to award full credit for either choice "c" or "d".

QUESTION 8.29

Which of the following radioactive liquid monitors is addressed in Technical Specification Table 3.24-1?

a. Steam generator blowdown monitor (RE-0707)
b. Failed Fuel Monitor (RE-0202)
c. Component Cooling Water Monitor (RE-0915)
d. Circulating Water Discharge Monitor (RE-1323)

FACILITY COMMENT:

RE-0202 is addressed in Technical Specifications Table 4.2.1. Since both RE-0707 and RE-0202 (letdown) are possible choices, both should be allowed as answers.

Reference: Attachment 16
Palisades Technical Specifications, Table 4.2.1, Item 1

NRC RESPONSE:

Agree. The question's intent was to determine whether the examinee knew which radioactive liquid monitor was mentioned anywhere in Technical Specifications, not necessarily in Table 3.24-1. The answer was expanded to grant full credit to choice "b".

3. Exit Meeting

On July 10, 1985, at the conclusion of the simulator examinations, the examiners met with the following utility personnel to discuss generic observations made during the simulator examinations:

J. Onnen, Midland Training Center Supervisor
R. Heimsath, Simulator Supervisor
R. Simmons, Simulator Instructor
L. Schmiedeknecht, Simulator Instructor

The following topics were discussed:

a. Completed Estimated Critical Position Forms corresponding to each startup initial condition need to be kept available in order to expedite startup scenarios.

b. Checklists corresponding to each initial condition need to completed and kept on file to reduce the possibility of confusion at the beginning of the scenario.

On July 11, 1985, at the conclusion of the plant walk-through examinations, the examiners met with the following utility and NRC personnel to discuss generic observations made during the plant walk through examinations:

J. G. Lewis, Plant Technical Director
W. G. Merwin, Training Supervisor
R. B. Heimsath, Simulator Supervisor
D. F. Turcott, Training Consultant
C. S. Kozup, Operations Superintendent
A. F. Brookhouse, Plant Shift Operations Supervisor
J. R. Schepers, Plant Chemistry and Radioactive Waste Superintendent
D. J. Fitzgibbons, Licensing Engineer
E. R. Swanson, Senior Resident Inspector (NRC)

The following observations were made by the examiners during the course of the examinations:

a. Both instructor certification examinees passed their simulator and plant walk-through examinations.

b. Though the areas of the plant which have been cleaned in conjunction with a recently initiated plant cleanup program were clean, most areas of the plant were in a poor state of cleanliness.

c. A steam leak caused humidity and temperature to be so excessive that some of the portions of the auxiliary building could only be entered for extremely short periods of time. The humidity from this steam leak caused condensation in the Shift Supervisor's office which resulted in damage to the false ceiling.

d. The copy of Volume 10 of the Code of Federal Regulations maintained by the Shift Supervisor's office was out of date. The current edition is the January 1, 1985 revision; the copy in the Shift Supervisor's office was revised as of January 1, 1978.

e. No procedure for shutting one Main Steam Isolation Valve was maintained in the cabinet which contained the Main Steam Isolation Valve controls.

f. The last-minute withdrawal of the only examinee taking the Reactor Operator examination caused some confusion and delay at the beginning of the written examination. Though the licensee is commended for withdrawing individuals whose prospects for passing are marginal, had the NRC been notified several days in advance, the delay and confusion which existed at the beginning of the written examination would have been avoided.

g. Only two instructor certification examinations, and no license examinations, were conducted. Had requalification examinations not been administered at the same time, the examination trip would have been inefficient use of scarce NRC examiner resources. In the future, examination trips will not be scheduled if only two examinees will be administered examinations.

h. The portions of the requalification examination prepared by the licensee, Section 1 and 5, were comprehensive and relevant, but lacked in-depth questions. The questions in the licensee-prepared sections addressed the "what," but did not sufficiently sample the examinees' knowledge of the "why" or "how" of reactor theory or heat transfer.

MASTER

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

FACILITY: PALISADES

REACTOR TYPE: PWR-CE

DATE ADMINISTERED: 85/07/~~09~~ 03

EXAMINER: T BURDICK

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			1. PRINCIPLES OF NUCLEAR POWER PLANT OPERATION, THERMODYNAMICS, HEAT TRANSFER AND FLUID FLOW
25.00	25.00			2. PLANT DESIGN INCLUDING SAFETY AND EMERGENCY SYSTEMS
25.00	25.00			3. INSTRUMENTS AND CONTROLS
25.00	25.00			4. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
100.00	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 1.01 (1.00)

What is an inverse multiplication plot?

QUESTION 1.02 (1.00)

What is the definition of Shutdown Margin?

QUESTION 1.03 (2.50)

a. What are the three reasons for establishing regulating group insertion limits? (1.5)

b. What is the four pump zero-power rod insertion limit? (1.0)

QUESTION 1.04 (1.00)

What is Quadrant Power Tilt?

QUESTION 1.05 (1.00)

What is Axial Offset?

QUESTION 1.06 (1.00)

What are the two reasons that the reactivity effect of xenon 135 is greater that that of samarium 149?

QUESTION 1.07 (1.00)

What is the equilibrium value of xenon reactivity at 100% power?

QUESTION 1.08 (1.00)

How does the concentration of Samarium 149 change after a reactor trip from power?

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

QUESTION 1.09 (1.00)

Why must PCS hydrogen concentration be reduced below 5 cc/kg prior to opening the PCS?

QUESTION 1.10 (1.00)

What is DNB?

QUESTION 1.11 (2.00)

Although DNB is not an observable parameter, four observable parameters are related to it. Name these four parameters.

QUESTION 1.12 (2.00)

What would the pressurizer relief valves discharge temperature be if quench tank temperature is 5 psig, there is a steam bubble in the pressurizer and PCS pressure is:

a. 2035 psig (1.0)

b. 885 psig (1.0)

QUESTION 1.13 (2.00)

If the moisture content of steam from the steam generator is excessively high, will the power level calculated using the heat balance be erroneously high or low? Explain.

QUESTION 1.14 (2.00)

How do the available NPSH and the required NPSH change as the flow rate through the pump increases?

QUESTION 1.15 (1.00)

Name two indications of pump cavitation.

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

QUESTION 1.16 (1.50)

Name six indications of void formation in the RCS, other than erratic indication on the startup neutron detectors.

QUESTION 1.17 (1.00)

The reactor power level is 10% and increasing at .5 decades per minute. What will the power level be in one minute?

QUESTION 1.18 (1.00)

State whether the fuel temperature coefficient becomes more negative, less negative or remains the same as the core ages.

QUESTION 1.19 (1.00)

What causes the embrittlement of the metal in the reactor vessel as the reactor operates?

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

QUESTION 2.01 (.50)

Which one of the following is most accurate?

a. air blast breaker operation is limited to within ten seconds following the selection of the breaker to be operated.

b. 345 KV air blast breakers, with the exception of 25H9 (main generator breaker), are equipped with relays to perform automatic reclosure.

c. The breaker feedback supervisory system will send a followup pneumatic signal to open or close a breaker if the breaker fails to respond to a signal after a time delay.

d. 345 KV air blast breakers contain redundant sets of contacts to ensure continued reliable power even if one pair of contacts are damaged.

QUESTION 2.02 (.50)

Which one of the following is most accurate?

a. Incoming 4160 vac breakers can be operated from the switchgear if the breaker mode switch is in test.

b. Power may be backfed through the main transformer when the turbine is out of service for an extended period if the generator excitation circuit disconnect links are removed.

c. Automatic fast load transfer between the startup and station transformer takes place when either suffers a fault or the turbine or generator trip

d. Interlocks prevent parallelling double ended 480 vac load centers through tie breakers because doing so would exceed feeder breaker trip ratings.

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

QUESTION 2.03 (.50)

Which one of the following is most accurate?

a. The diesel generator is designed to start and be fully loaded within 20 seconds.

b. Cooling water jacket and stator winding heaters are provided to maintain the generator in 'start readiness'.

c. Each diesel has sufficient fuel capacity to run under worst case conditions for 28 hours before fuel transfer is necessary.

d. The diesel may be operated for 35 minutes at 2500 KW without service water available if the cooling water jacket temperature is 120 deg. or less at startup.

QUESTION 2.04 (.50)

Which one of the following most accurately represents diesel generator limitations?

a. 3125 KW at 0.9 power factor for continuous operation.

b. 2750 KW overload limit for two hours.

c. 3525 KW overload limit for 1/2 hour.

d. 3750 KW overload limit for 5 minutes.

QUESTION 2.05 (.50)

Which one of the following most accurately represents diesel generator control?

a. The engine governor controls the air flow to the engine thereby controlling engine speed and load.

b. The UNIT mode of governor control allows the diesel generator to operate isochronous.

c. An electrical governor backs up the mechanical governor and is set at a slightly higher speed.

d. Modulation of air flow to the engine is governed by the speed of the turbocharger.

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

QUESTION 2.06 (.50)

Which one of the following is most accurate in regard to diesel generator protection?

a. The overspeed trip will actuate if engine speed attains 990-1035 rpm for 120 seconds or more.

b. The overcrank relay has a 35 second time delay from the initiation of a diesel start.

c. The overspeed trip incorporates a solenoid operated plunger which overrides the governor to stop the engine.

d. The engine lube oil pressure trip is actuated at 40 psig following a 20 second delay after the alarm at 60 psig.

QUESTION 2.07 (.50)

Which one of the following is most accurate?

a. Manual closure of the diesel generator output breaker is blocked if the synchronizing equipment is bypassed for dead bus transfer.

b. Automatic closure of the diesel generator output breaker is blocked by the overcurrent and differential relays which do not override manual operation.

c. Electrical fault relays trip the diesel generator breaker, exciter and shut off fuel to the engine.

d. Automatic closure of the DG output breaker is blocked and a trip signal initiated for 15 seconds upon initiation of fast transfer.

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

QUESTION 2.08 (.50)

Which one of the following is most accurate in regard to Containment Spray?

a. The system consists of three pump and heat exchanger sets and all necessary piping, instruments and accessories.

b. The system is designed so that one of the three pumps will limit the containment pressure to less than the design value following DBA.

c. Containment spray must be cooled since the hydrazine in solution would vaporize readily and could not control PH of the water.

d. The system is arranged in standby status so that on containment high pressure conditions it is only necessary to start the containment spray pump and open the header isolation valves.

QUESTION 2.09 (.50)

Choose the one that is most accurate in regard to the instrument and service air system.

a. All air compressors are fitted with teflon piston rings to eliminate the need for oil lubrication of the cylinders.

b. Air dryers use electric heaters to drive moisture from the air before the air enters the instrument air header.

c. Each compressor is loaded and unloaded individually by seperate pressure switches which are backed up by a common pressure switch.

d. When a compressor is operated in the hand mode it will run loaded constantly to carry the base load.

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

QUESTION 2.10 (.50)

Which one of the following is most accurate in regard to the main generator seal oil system?

a. The seal oil system is designed to maintain normal hydrogen pressure with a 2 psi differential between the oil and gas pressure.

b. The primary seal oil backup source is the main shaft oil pump when the turbine is above 2/3 synchronous operating speed.

c. The main generator output capability is primarily dependent upon the pressure developed by the seal oil source during operation.

d. The normal seal oil pressure is in an operating range of 60 to 75 psig.

QUESTION 2.11 (.50)

Which one of the following is most accurate in regard to the Engineered Safeguards and Emergency Power system?

a. 2400 vac buses 1C and 1D feeder breakers can be operated at the switch gear in the operating position.

b. The Engineered Safeguards system includes two 2400 vac buses, two 480 vac load centers, and two motor control centers, two preferred ac buses and two 125 vdc distribution centers.

c. Automatic closure of a 2400 vac station power or startup transformer incoming breaker to buses 1C and 1D will occur when voltage is restored to the transformer.

d. During normal operations both dc buses are interconnected by a manual breaker and the battery on each bus is kept fully charged.

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

QUESTION 2.12 (.50)

Which one of the following is most accurate in regard to fire protection?

a. The fire protectiion system provides a backup water supply to critical service water, main feed water and the spent fuel pool.

b. The jockey pump cycles intermittently to maintain a 90 - 100 psig pressure on the fire main header.

c. The hose reels are located throughout the plant such that all areas of the turbine and auxiliary buildings are within 75 feet of a 35 psig fog nozzle.

d. The diesel fire pump uses two 12 vdc batteries wired in parallel to provide adequate starting current.

QUESTION 2.13 (.50)

Which one of the following is most accurate in regard to plant communications?

a. The public address system is powered from the startup transformer to assure reliability for paging but does not require power for station to station communication.

b. A continuous siren is a fire alarm indicating personnel should remain where they are whereas a broken siren is a plant evacuation signal.

c. The plant has radio communications links with the NRC, state police, Kalamazoo and the Jackson power controller.

d. The control room can initiate public address paging to any of five site areas which overrides any transmission from another station.

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

QUESTION 2.14 (.50)

Which one of the following is most accurate in regard to heating, ventilation, and air conditining systems.

a. The control room ventilation system automatically goes into full recirculation for high containment pressure or radiation or full purge for fire.

b. The containment air cooling system is sized such that two of the four units will limit containment pressure to less than design following a DBA.

c. The containment air cooling units employ two matched fans with direct connected motors of which one operates normally while both operate during post accident conditions.

d. A leaking containment air cooling unit coil is detected through the use of a level switch should the leak rate exceed 20 gpm.

QUESTION 2.15 (.50)

Which one of the following is most accurate regarding radioactive waste disposal?

a. The radwaste evaporator reduces the concentration of all radioactive isotopes except tritium and seperates the boric acid from the processed waste.

b. The distillate from the radwaste evaporator is normally processed through a polishing demineralizer to further reduce the boron and tritium concentrations.

c. The clean radioactive liquid waste section is distinguished from the dirty waste section by the fact that it handles the low activity effluents.

d. Unwanted or poor quality boric acid is sent to the treated waste monitoring tanks for temporary storage and eventual disposal.

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

QUESTION 2.16 (.50)

Which one of the following is most accurate in regard to the area radiation monitoring system.

a. Area monitor readouts display individual channel outputs using a red scale for mrem per hour and cpm on a black scale which have numerous selectable ranges.

b. Area monitor readouts display individual channel outputs using a red scale for the eight decade scale and a black scale for any one of several selectable three decade scales all of which are in mrem per hour

c. Containment area monitors, RIA 2316-2317, are in use only during power operations and have key operated on-off switches.

d. The fail/reset pushbutton/light is normally lighted and extinguishes if the detector is placed in the source check mode.

QUESTION 2.17 (.50)

Which one of the following is most accurate in regard to the process radiation monitoring system?

a. The process radiation monitoring system utilizes GM tubes for gamma detection and scintillation detectors for beta radiation.

b. An air particulate radiation monitor employs a replaceable cartridge filter to remove partriculate from the sample stream for counting.

c. Offline process monitors have sample flow alarms to indicate the loss of sample flow which renders the process monitor inoperable.

d. Gaseous process monitors use a moving filter tape to remove particulate matter from the sample stream before measuring for activity.

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

QUESTION 2.18 (.50)

Which one of the following is most accurate in regard to the fuel pool cooling system?

a. The water in the refueling cavity can be cooled and clarified with or without the spent fuel cooling function in progress.

b. The shutdown cooling system may be used as a backup for fuel pool cooling any time shutdown cooling is not required for core cooling.

c. The fuel cooling system takes a suction off the bottom of the pool to ensure that solids do not accumulate but are filtered out.

d. Of the total cooling system flow, a small portion is diverted to the heat exchanger for temperature control while the remainder is filtered.

QUESTION 2.19 (.50)

Which one of the following is most accurate regarding the fuel handling system?

a. The refueling machine interlocks include an upmotion hoist stop if the local area monitor exceeds a predetermined radiation setpoint.

b. In order to receive a new fuel bundle in the new fuel elevator the interlock for raising the elevator to the surface of the pool must be overridden.

c. Withdrawal, insertion and transfer procedures for control rods are identical to those for fuel except the mast must be rotated 180 degrees with respect to the angular position used for handling fuel bundles.

d. Fuel transfer interlocks require that both tilt machines be in the horizontal position to perform a transfer and transfer travel will be stopped if cable tension exceeds the high limit.

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

QUESTION 2.20 (.50)

Which one of the following is most accurate regarding the safety injection system?

a. SIS equipment that is required to operate following a DBA is designed for ambient conditions of 283 degrees F, 55 psig and 100% relative humidity.

b. The safety injection flowpath to the reactor vessel is through a nozzle on each of the four cold leg pipes.

c. The SIT's are passive components which flood the reactor core with borated water under 250 psig of pressure via check valves and penetrations on the RCS cold leg pipes.

d. The SIT's contain borated water at a concentration of 1720 ppm which is sufficient to maintain the core subcritical by three percent at 60 deg. f. with all control rods out.

QUESTION 2.21 (.50)

Which one of the following is most accurate regarding the safety injection system?

a. The LPSI pumps are designed to provide a small quantity of borated water at low pressure whereas the HPSI pumps are designed to provide large quantities of borated water at high pressure.

b. Spillage out a RCS break is limited to a maximum of 40% by use of the flow meters in each injection line and the throttling capability of each safety injection valve.

c. The recirculation actuation signal opens the containment sump valves and closes the SIRW tank valves with overlapping stroke times to ensure mixing and adequate NPSH during the transfer.

d. During the accident, if the recirculation mode is actuated, the operator takes precautions to prevent the HPSI pumps from overpressurizing the RCS.

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

QUESTION 2.22 (.50)

Which one of the following is most accurate regarding the shutdown cooling system?

a. The LPSI pumps must be slowly brought to equilibrium temperature with the PCS when being placed in service so as not to exceed thermal design transient limits.

b. Relief valves are provided in the system to prevent overpressurization due to thermal expansion of fluids in isolated sections of piping.

c. HPSI, LPSI or CS pumps can be used to transfer water from the SIRWT to the reactor cavity via the SDCS and also from the cavity back to the SIRWT.

d. The SDCS is used during the early stages of plant startup to control the primary coolant system temperature but must be discontinued when the PCS reaches 270 deg. F. and 325 psig.

QUESTION 2.23 (.50)

Which one of the following is most accurate regarding the chemical and volume control system?

a. Letdown flow is depressurized in two stages before being cooled down in two stages prior to entering the demineralizers.

b. Boration at end-of-life results in excessive amounts of waste when using the feed and bleed method and boration via ion exchange is more suitable.

c. The blending system will supply borated makeup to the SIRWT at 1720 ppm at a maximum rate of approximately 120 gpm.

d. The regenerative heat exchanger is designed to maintain a letdown outlet temperature below 250 deg. F. under normal operating conditions.

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

QUESTION 2.24 (.50)

The volume control tank is designed to accomodate a ____ power reduction without makeup system operation and the accumulation of ____ gallons of water during dilution.

a. 100%, 100

b. 50%, 10000

c. 75%, 1000

d. 100%, 1000

QUESTION 2.25 (.50)

The variable speed charging pump has a capacity of ____ to ____ gpm and a nominal flowrate of ____ gpm.

a. 30, 60, 40

b. 30, 55, 44

c. 33, 53, 44

d. 35, 55, 45

QUESTION 2.26 (.50)

Concentrated boric acid storage tanks provide a source of ____ weight percent boric acid at ____ deg. F.

a. 6.25, 100

b. 6.5, 180

c. 6.25, 140

d. 6.5, 120

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

QUESTION 2.27 (.50)

Primary coolant pumps:

a. Use a high inertia flywheel to prevent reverse flow when the pump is idle.

b. Use three shaft seals each of which can withstand one third of normal system pressure.

c. Prevent reverse rotation when idle which would be detrimental to the pump and motor due to a lack of lubrication.

d. Provide a source of heat input to the primary coolant system.

QUESTION 2.28 (.50)

The quench tank normal operating parameters include ____ psig, ____ deg. F. and ____ % level.

a. 10, 120, 70

b. 5, 150, 50

c. 3, 100, 50

d. 7, 90, 80

QUESTION 2.29 (.50)

The total control rod drive mechanism stroke is ____ inches at ____ inches per minute.

a. 132, 46

b. 144, 36

c. 140, 40

d. 138, 38

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

QUESTION 2.30 (2.00)

a. State the total KW output from pressurizer heaters.

b. How can the heaters be used to force continuous pressurizer spray flow?

QUESTION 2.31 (2.00)

a. Name the two buses that power the primary coolant pumps.

b. How would a loss of one bus affect the flow of primary coolant in each loop?

QUESTION 2.32 (2.00)

a. Assuming it is in service, when will a deborating demineralizer no longer remove boron?

b. HOW and WHERE is a check valve in the CVCS system used as a relief valve?

QUESTION 2.33 (2.00)

a. How can the atmospheric steam dumps be controlled manually if they were opened by the quick opening override bistable after a turbine trip?

b. State the capacity of the secondary safety valves, atmospheric steam dumps and turbine bypasses in percent of total steam flow.

QUESTION 2.34 (2.00)

a. Which oil pump(s) provide auto stop oil pressure for the EH control system?

b. What dictates whether the EH system is in speed control or load control?

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

QUESTION 2.35 (.50)

Which one of the following is most accurate regarding the component cooling water system?

a. Three sets of pumps and heat exchangers each provide about 50% of the total heat removal capacity required during shutdown cooling.

b. Valve stops were incorporated on the CCW heat exchanger critical service water outlet flow control valves to limit flow during a DBA condition concurrent with a single failure of a diesel generator.

c. The 16" butterfly outlet valves on the service water side of the CCW heat exchangers are used to maintain CCW temperature from day to day as heat loads change.

d. CCW containment isolation valves close on a simultaneous SIAS and low CCW pressure but will fail open if control air is lost.

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

QUESTION 3.01 (1.50)

a. Where does the high power rate-of-change trip signal originate from?

b. When is the high power rate-of-change trip bypassed?

c. What are the two sources of bypass signals for the high power rate-of-change trip?

QUESTION 3.02 (2.00)

a. What ~~four~~ Three types of detectors are used in the nuclear instrumentation systems?

b. Why are there two detectors used in each of the power range safety channels?

QUESTION 3.03 (2.00)

State the meaning of the following colored matrix lights for the given control rod.

COLOR	ROD TYPE
a. white	part length
b. blue	shutdown

QUESTION 3.04 (2.00)

State the meaning of the following annunciator window conditions.

a. fast flashing

b. slow flashing

QUESTION 3.05 (2.00)

What does it mean to 'time integrate' as described in the steam generator water level control system chapter? Why is this necessary?

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

QUESTION 3.06 (2.00)

Name two EH system faults that will cause automatic shift of turbine control from operator auto [imp in or speed control] to imp out or manual.

QUESTION 3.07 (1.50)

a. How is the regulation of steam pressure to the AFW pump turbine assured during a loss of instrument air?

b. In what mode must the FIC and HIC be in to facilitate automatic AFW flow control?

c. When is the FIC placed in the pseudo-automatic mode?

QUESTION 3.08 (2.00)

a. How does an operator place a service water pump in standby?

b. Why does the standby service water pump lose it's standby pump status after it starts?

c. When is the standby pump feature not possible for service water?

d. Why must the operator place the standby service water pump control switch to "close" after an automatic start?

QUESTION 3.09 (2.00)

How does the component cooling water pump operation differ regarding the DBA sequencer as compared to the normal shutdown sequencer?

QUESTION 3.10 (2.00)

a. What is the meaning of a diesel generator local panel "engine trouble" alarm lit and the absence of any other alarms.

b. What parameter does the diesel generator exciter-regulator vary to control generator output voltage?

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

QUESTION 3.11 (2.00)

List all control signals and setpoints that:

a. Turn backup heaters ON

b. Turn backup heaters OFF

QUESTION 3.12 (2.00)

State five functions provided by the primary coolant system hot and/or cold leg RTD's.

QUESTION 3.13 (2.00)

List eight parameters or signals monitored on the primary coolant pump and motor assembly.

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

QUESTION 4.01 (2.00)

A standing order concerning the introductioin of water into the turbine from feedwater heaters recommends that the operator NOT trip the turbine until it reaches 14 mils vibration. Explain why this is necessary.

QUESTION 4.02 (2.00)

A problem with meeting Technical Specifications for the concentrated boric acid storage tanks was identified when a loss of one diesel generator is assumed with a concurrent loss of offsite power.

a. What is the temporary resolution to this problem?

b. Why is this a necessary action?

QUESTION 4.03 (2.00)

State the reason for disabling the PORV's above 325 deg. F.

QUESTION 4.04 (2.00)

a. How often are recorder charts checked?

b. What is verified on a recorder chart check?

c. How are these checks documented?

d. What is required if changes are made to the recorder chart time or scale?

QUESTION 4.05 (2.00)

a. What is the difference between the Reactor Logbook and the Control Room Logbook?

b. Who normally maintains each one?

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

QUESTION 4.06 (2.00)

What are the prerequisites for removing one DG from service when the plant is less than 325 deg. F.?

QUESTION 4.07 (1.50)

a. What two types of system valves are operations staff NOT required to operate?

b. Name two cases where valves require locks.

c. Name two acceptable valve locking methods.

QUESTION 4.08 (2.00)

a. What must be done before repositioning a valve or breaker found to be in a position other than that specified. [1.0]

b. Can a repositioner and a verifier be the same person for the same job? [.5]

c. What is done with the lock of a breaker positioned in other than it's normally locked position? [.5]

QUESTION 4.09 (1.50)

a. What are the heatup AND cooldown rates for the primary coolant system AND the pressurizer?

b. What is the minimum primary coolant system pressure for operating primary coolant pumps?

c. What plant condition [excluding accidents] does not allow all primary coolant pumps in operation?

QUESTION 4.10 (2.00)

Under what conditions would an emergency boration NOT be required if the power dependent insertion limit alarm actuates while the reactor is critical?

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

QUESTION 4.11 (2.00)

a. Why should the boron concentration be equalized between the shutdown cooling system and the SIRW tank PRIOR to decreasing the PCS pressure below 300 psia?

b. At what point in the draining of the primary cooling system does cavitation of the shutdown cooling system pumps become a concern?

QUESTION 4.12 (1.00)

What possible electrical transmission system disturbance can cause an excessive load increase according to procedure ONP 9?

QUESTION 4.13 (1.00)

"LOSS OF COOLANT ACCIDENT" procedure EOP 8.1 includes the high startup rate alarm and high power level reactor trip as symptoms. Why?

QUESTION 4.14 (2.00)

a. Why does the procedure for natural circulation require the operator to wait ten minutes after tripping the primary coolant pumps before verifying that natural circulation has been established?

b. What could cause T cold to be higher than T hot in the idle loop while cooling down using natural circulation on the opposite loop?

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

MASTER

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 1.01 (1.00)

The plot of counts initial over new counts (1/M) versus a reactivity condition such as rod height or fuel loaded or boron concentration.

REFERENCE
12.2-2

ANSWER 1.02 (1.00)

Instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all control rods are fully inserted (.5) except for the most reactive rod which is assumed to be withdrawn. (.5)

REFERENCE
Technical Specification 1.1

ANSWER 1.03 (2.50)

a. Shutdown margin (.50); individual rod worth (.50); hot channel factors (.50)

c. 43% inserted on group 2 OR [T.S.]
70 inches withdrawn on group 2 OR [T.S.]
8 inches withdrawn on group 3 OR [D.L.]
88 inches withdrawn on group 2 [D.L.] (1.0)

REFERENCE
a. Technical Specification 3.10.5.a
b. Technical Specification 3.10 Basis
c. Technical Specification Figure 3-6
Technical Data Book, Figure 1.9

ANSWER 1.04 (1.00)

The difference between reactor power in any core quadrant and the average in all quadrants. (1.0)

REFERENCE
Technical Specification 1.1

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANCWER 1.05 (1.00)

The difference between the power in the lower half of the core and the upper half of the core divided by the sum of the powers in the lower half and upper half of the core.

REFERENCE
Technical Specification 1.1

ANSWER 1.06 (1.00)

Xenon 135 has a higher absorption cross section (.5) and a higher fission yield. (.5)

REFERENCE
Reactor Theory, Chapter 20, p 10.1-2

ANSWER 1.07 (1.00)

2.63 %

REFERENCE
Technical Data Book Figure 2.1

ANSWER 1.08 (1.00)

The concentration of samarium 149 builds up to a maximum value in approximately 500 hours after the trip.

REFERENCE
Reactor Theory, Chapter 20, p 10.5-3

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 1.09 (1.00)

Hydrogen solubility decreases when PCS pressure is reduced. (.5) Opening the PCS at high hydrogen concentration will cause hydrogen to come out of solution, creating an explosion hazard. (.5)

REFERENCE
SOP 1 step 7.1.5.m

ANSWER 1.10 (1.00)

Heat flux above which there is a sharp reduction in the heat transfer coefficient.

REFERENCE
Technical Specification 2.1

ANSWER 1.11 (2.00)

Reactor power; PCS flow, temperature and pressure

REFERENCE
Technical Specification 2.1

ANSWER 1.12 (2.00)

a. 230 F (1.0)

b. 310 F (1.0)

REFERENCE
EOP 8.1 step 3.5.d
Steam Tables

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 1.13 (2.00)

Erroneously high. (.5) The energy content per mass of steam will actually be lower than that assumed in the heat balance calculation, which assumes that the steam leaving the steam generator is nearly 100% quality (no moisture content). (1.5)

REFERENCE
GOP 12
Steam Tables

ANSWER 1.14 (2.00)

Available NPSH decreases (1.0)
Required NPSH increases (1.0)

REFERENCE
Westinghouse Thermal Hydraulic Principles and Applications to the PWR II, p 10-56

ANSWER 1.15 (1.00)

Two of the following:
1. excessive noise (.5)
2. excessive vibration (.5)
3. low suction pressure (.5)
4. fluctuating pump amps (.5)
5. fluctuating discharge pressure (.5)
6. excessively low flow (.5)

REFERENCE
Westinghouse Thermal Hydraulic Principles and Applications to the PWR II, p 10-54

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 1.16 (1.50)

Six of the following:
1. Core outlet temperatures higher than saturation. (.25)
2. Core differential temperature greater than 47 F. (.25)
3. Incore thermocouples showing erratic indication. (.25)
4. Hot leg temperature erratic or increasing. (.25)
5. Cold leg temperature erratic. (.25)
6. Charging a known volume of water into the PCS does not result in a corresponding increase in pressurizer level. (.25)
7. Pressurizer level increases more than expected when using auxiliary spray. (.25)
8. Unanticipated letdown flow greater than charging flow. (.25)

REFERENCE
ONP 21 step 4.16

ANSWER 1.17 (1.00)

31.6%

REFERENCE
Reactor Theory, 16, page 6.4-2

ANSWER 1.18 (1.00)

more negative

REFERENCE
Reactor Theory, 19 , page 9.1-2

ANSWER 1.19 (1.00)

Fast neutron irradiation of the metal.

REFERENCE
T.S. 3.1.2

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 2.01 (.50)

a.

REFERENCE
chapter 32

ANSWER 2.02 (.50)

d.

REFERENCE
chapter 33 page 10

ANSWER 2.03 (.50)

c.

REFERENCE
SFD 9-4-1, pages 5 & 6

ANSWER 2.04 (.50)

b.

REFERENCE
SFD 9-4-1, page 6

ANSWER 2.05 (.50)

b.

REFERENCE
SFD 9-4-1, page 22

ANSWER 2.06 (.50)

b.

ANSWERS -- PALISADES -85/07/09-T BURDICK

REFERENCE
SFD 9-4-1, pages 24,25,26

ANSWER 2.07 (.50)

c.

REFERENCE
SFD 9-4-2, page 7

ANSWER 2.08 (.50)

d.

REFERENCE
chapter 26, pages 2,3,13

ANSWER 2.09 (.50)

a.

REFERENCE
SFD 6.2.1

ANSWER 2.10 (.50)

b.

REFERENCE
chapter 31

ANSWER 2.11 (.50)

a.

REFERENCE
chapter 33, page 6

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 2.12 (.50)

c.

REFERENCE
chapter 34, page 3

ANSWER 2.13 (.50)

d.

REFERENCE
chapter 35, page 4

ANSWER 2.14 (.50)

d.

REFERENCE
chapter 23, page 22

ANSWER 2.15 (.50)

a.

REFERENCE
chapter 37

ANSWER 2.16 (.50)

b.

REFERENCE
chapter 38

ANSWER 2.17 (.50)

c.

ANSWERS -- PALISADES -85/07/09-T BURDICK

REFERENCE
chapter 38

ANSWER 2.18 (.50)

a.

REFERENCE
chapter 40

ANSWER 2.19 (.50)

b. or d j

REFERENCE
SFD 1-11

ANSWER 2.20 (.50)

b.

REFERENCE
chapter 10

ANSWER 2.21 (.50)

c.

REFERENCE
chapter 10

ANSWER 2.22 (.50)

b.

REFERENCE
chapter 9

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 2.23 (.50)

c.

REFERENCE
chapter 6

ANSWER 2.24 (.50)

d.

REFERENCE
chapter 6, page 26

ANSWER 2.25 (.50)

c.

REFERENCE
chapter 6, page 28

ANSWER 2.26 (.50)

c.

REFERENCE
chapter 6, page 34

ANSWER 2.27 (.50)

d.

REFERENCE
chapter 4, page 4

ANSWER 2.28 (.50)

c.

ANSWERS -- PALISADES -85/07/09-T BURDICK

REFERENCE
chapter 3, page 23

ANSWER 2.29 (.50)

a.

REFERENCE
chapter 2, page 3

ANSWER 2.30 (2.00)

a. 1500 KW

b. By placing backup heaters in manual.

REFERENCE
chapter 5, page 7, 10

ANSWER 2.31 (2.00)

a. 1A and 1B

b. One pump in each loop is lost reducing the flow in both.

REFERENCE
chapter 4, page 13, 16

ANSWER 2.32 (2.00)

a. When it is boron saturated. [1.0]

b. The check valve is spring loaded closed and opens when pressure is greater than spring force.[.5] It is used on the charging line at the letdown heat exchanger. [.5]

REFERENCE
chapter 6, page 42

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 2.33 (2.00)

a. Reset the turbine trip relay 30 seconds after the trip.

b. 1. safeties - 9% each OR 104% total

2. atmospheric - 7% each OR 30 % total

3. bypass - 5%

REFERENCE
SFD 5.3

ANSWER 2.34 (2.00)

a. Main oil pump [.5] and seal oil backup pump. [.5]

b. The position of the generator output breaker.

REFERENCE
chapter 19

ANSWER 2.35 (.50)

b.

REFERENCE
SFD 1-11

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 3.01 (1.50)

a. wide range logrithmic channels [.5]

b. below 10^-4 percent [.25] and above 15 percent [.25]

c. wide range logrithmic [.25] and power range safety channels [.25]

REFERENCE
chapter 11, page 6 and 7

ANSWER 3.02 (2.00)

a. ~~1. proportional counter~~
2. fission chamber
3. uncompensated ion chamber
4. rhodium wire [~~.25~~ .13 each]

b. To allow measurement and comparison of the upper and lower halves of the core.

REFERENCE
chapter 11, pages 7-11

ANSWER 3.03 (2.00)

a. moving [1.0]

b. between the upper and shutdown control rod insertion limits [1.0]

REFERENCE
chapter 13, page 7

ANSWER 3.04 (2.00)

a. incoming alarm before acknowledgement

b. return to normal ~~before acknowledgement~~

REFERENCE
chapter 14, page 25

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 3.05 (2.00)

"Time integration" is an amplificatiion of the process deviation over time. [1.0]

It is necessary to maintain the desired setpoint constant. [1.0]

REFERENCE
chapter 17, page 7

ANSWER 3.06 (2.00)

a. If the speed reference deviates 600 rpm from actual speed.

b. If the load reference output is 30% less than impulse pressure transmitter output when the system is in the IMP mode.

c. If the impulse pressure transmitter is out of it's normal operating band.

d. If the load reference counter output is 30% higher than impulse pressure transmitter output and VPL has not been reached.

REFERENCE
chapter 19, page 36

ANSWER 3.07 (1.50)

a. nitrogen accumulator backup to instrument air

b. both in automatic

c. when the HIC is in manual

REFERENCE
SFD 5.7, page 6

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 3.08 (2.00)

a. The manual pushbutton for that pump is actuated.

b. To prevent automatic restart if the pump should fail to start the first time.

c. When only one pump is running.

d. To establish the pump's trip alarm circuit. .5 5 [.25 each]

REFERENCE
chapter 24, page 12

ANSWER 3.09 (2.00)

The DBA sequencer automatically starts CCW pumps whereas the normal shutdown sequencer does not.

REFERENCE
SFD 1-11, page 11

ANSWER 3.10 (2.00)

a. loss of dc control power to the DG

b. DG field current

REFERENCE
SFD 9-4-1, page 23 and 28

ANSWER 3.11 (2.00)

a. 1. Low pressurizer pressure of 1970 psia.
2. Pressurizer level deviation of +4.6% increasing. 3 Allowed

b. 1. High pressurizer pressure of 1985 psia.
2. Pressurizer level deviation of +4.6% decreasing.
3. Low pressurizer level of 36% [5 at .4 each]
4 normal

ANSWERS -- PALISADES -85/07/09-T BURDICK

REFERENCE
chapter 5, page 8

ANSWER 3.12 (2.00)

1. T average input
2. Delta-T input
3. Thermal margin/low pressure trip
4. indication/alarm
5. PORV low pressure setpoint

REFERENCE
chapter 3, pages 29-30

ANSWER 3.13 (2.00)

1. lower seal cavity temperature
2. controlled bleed off temperature
3. controlled bleed off flow rate
4. upper seal cavity pressure
5. middle seal cavity pressure
6. lower seal cavity pressure
7. motor stator temperature
8. upper guide bearing temperature
9. lower guide bearing temperature
10. upward thrust bearing temperature
11. downward thrust bearing temperature
12. upper motor oil level
13 lower motor oil level
14. assembly vibration
15. CCW flow
16. reverse rotation
17. motor oil lift pressure [8 @.25 each]

REFERENCE
chapter 4, table 4-1

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 4.01 (2.00)

Tripping the turbine earlier may result in worse damage as it passes through the critical speed zone.

REFERENCE
S.O. 18

ANSWER 4.02 (2.00)

a. Anytime routine evolutions will reduce a CBAST level to less than T.S. requirements then use "B" tank.

b. "A" tank is available for injection when either diesel is OOS with a loss of offsite power.

REFERENCE
S.O. 28

ANSWER 4.03 (2.00)

To prevent a possible LOCA during a fire in the cable spreading room.

REFERENCE
S.O.52

ANSWER 4.04 (2.00)

a. At least once per shift. [.5]

b. Check to see that marking is clearly visible [.25] and that timing is correct [.25].

c. Mark the chart with the time and date. [.5]

d. Note changes on the chart. [.5]

REFERENCE
4.01, page 15

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 4.05 (2.00)

a. The Reactor Logbook is for primary systems [.5] while the Control Room Logbook is for secondary systems [.5].

b. CO 2 maintains the Reactor Logbook [.5] and CO 1 maintains the Control Room Logbook [.5].

REFERENCE
4.01

ANSWER 4.06 (2.00)

At least one service water pump [1] and one component cooling water pump [1] must be operable on the operable diesel generator train.

REFERENCE
4.01, page 20

ANSWER 4.07 (1.50)

a. sample valves [.25] and instrument valves [.25]

b. 1. valves in a safety system
2. manual containment isolation valves
3. valves in the main flowpath of a safety system
4. vents and drains that could result in greater than 5% of main flow
5. vents and drains that receive no routine inspection [2 @ .25 each]

c. 1. lead seal
2. chain and padlock
3. key switch [2 @ .25 each]

REFERENCE
4.02, page 1-3

ANSWERS -- PALISADES -85/07/09-T BURDICK

ANSWER 4.08 (2.00)

a. get SS authorization first

b. no

c. leave it unlocked

REFERENCE
4.02, page 3

ANSWER 4.09 (1.50)

a. 1. PCS - 60 degrees per hour [.25] on 100°F/hr T.S. limit 3
2. PZR - 150 degrees per hour [.25] on 200 °F/Hr T.S. limit 3

b. 250 psig [0.5]

c. PCS less than 400 degrees [0.5]

REFERENCE
SOP 1, pages 2 and 3

ANSWER 4.10 (2.00)

during an emergency power reduction

REFERENCE
SOP 2A, S.O.f.

ANSWER 4.11 (2.00)

a. To prevent opening the SI check valves.

b. When the level reaches the top of the hot leg. 2 at or below centerline of the hot leg 3

ANSWER 4.12 (1.00)

low system frequency

4. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL

ANSWERS -- PALISADES -85/07/09-T BURDICK

REFERENCE
ONP 9, 3.2.e

ANSWER 4.13 (1.00)

LOCA due to a rod ejection

REFERENCE
EOP 8.1.j and k.

ANSWER 4.14 (2.00)

a. Due to increased loop transport time.

b. Heat input to PCS from the idle steam generator.

REFERENCE
ONP-21, 4.2 and 4.12

CONSUMERS POWER COMPANY

NUCLEAR TRAINING CENTER

Instructor Lesson Plan

Program Title: Nuclear Operator Training Lesson Plan No. 7/3/85

Course: R. O. Requal Exam & Key

Module: Section 1

Topic:

Revision: 0

L. Schmiedknecht/R. Heimsath 7/1/85
Originator Date

R. Bloomfield 7/2/85
Subject Matter - Technical Reviewer Date

B. Doty Robert W. Doty for Bill Marvin 7/2/85
Approved - Training Supervisor Date

bp0983 0001a1#3

Consumers Power Company

NUCLEAR OPERATIONS DEPARTMENT
Document Review Sheet

Document Title	Document Number	Revision	Revision Number	Page
R.O. Requal Exam & Key -- Section 1	NA	NA	NA	1 of 2

Item Number	Page and/or Section Number	Comments	Response or Resolution
1.2		Typo "withdrawal"	OK RBH
1.3.B		Acceptable response should also include "remains constant" depending upon reference used.	remove remains constant RBH
1.4	answer	change "814.8 ppm/%ΔP" to "848 ppm/%ΔP" answer should give a range of acceptable values based upon use of graphs (not calculations). or remove "Boration Volume Addition" graph which forces student to perform calculation using formula.	I agree corrected ranges & value.
1.5		Grammar --- change "affect" to "effect."	corrected RBH
1.5.C		answer not necessarily correct. Since the main condenser is a saturated system, the NPSH required is also changed by a decrease in circ water temp/cond. press. ∴ answer is not obvious. Recommend changing question (part c only).	replaced NPSH w/ Plant efficiency RBH
1.8		Typo -- Change "for" to "from"	corrected RBH

Reviewer	Organization	Date	Review Coordinator	Date	Document Sponsor	Date
R.A. Bloomfield	Pal-Contractor	7/2/85	T. Kennedy	7/2/85	T. Kennedy	7/2/85

Form 3110 1-82

Consumers Power Company

NUCLEAR OPERATIONS DEPARTMENT
Document Review Sheet

Document Title	Document Number	Revision	Revision Number	Page
R.O. Requal Exam & Key -- Section 1	NA	NA	NA	2 of 2

Item Number	Page and/or Section Number	Comments	Response or Resolution
1.8		Mollier diagram does not have values for lines of constant pressure (cut off @ top during photocopying).	fixed KBH
1.9		Change exam to agree with key, i.e. change "ago" (on exam) to "after trip."	corrected exam. KBH

Reviewer	Organization	Date	Review Coordinator	Date	Document Sponsor	Date
K Bloomfield	P&I		[signature]	7/2/85	[signature]	7/2/85

Consumers Power Company

PERSONAL AND CONFIDENTIAL

NOTD

EXAMINATION COVER SHEET

Name _____ Social Security No _____

Company Consumer Power Company Please Circle: 06*02 CP Co Employee
Applicable No: 06*03 Non-CP Co Employee

Work Location Palisades

Department _____ ZIS No 600421

Course Annual Requal Exam UFI No 06*26/19

Class No 7/3/85 Exam No 1 of 1

Reverification _____ Instructor _____

Date Administered 7/3/85 Administered by NRC

Date Graded _____ Graded by _____

Grade _____

"Cheating on exams shall be cause for disciplinary action in accordance with the applicable General Order or Working Agreement. All incidents of cheating shall be reported to the cognizant supervisor(s) and the Director - Nuclear Operations Training Department, and shall result in immediate forfeiture of the student's exam."

I was given the opportunity to review the correct responses to this examination.

Signed _____

Date _____

EQUATION SHEET

$f = ma$

$w = mg_2$

$E = mc^2$

$KE = 1/2\ mv^2$

$PE = mgn$

$V_f = V_o + at$

$W = v\ \Delta P$

$\Delta E = 931\ \Delta m$

$\dot{Q} = \dot{m}C\rho\Delta t$

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

$Pwr = W_f \Delta h$

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

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

$SUR = 26.06/T$

$SUR = 26\rho/\ell^* = (\beta - \rho)T$

$T = (\ell^*/\rho) + [(\beta - \rho)/\bar{\lambda}\rho]$

$T = \ell^*/\rho$

$T = (\beta - \rho)/(\bar{\lambda}\rho)$

$\rho = (K_{eff}-1)/K_{eff} = \Delta K_{eff}/K_{eff}$

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

$P = (\Sigma\phi V)/(3 \times 10^{10})$

$\Sigma = \sigma N$

$v = s/t$

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

$a = (V_f - V_o)/t$

$w = \theta/t$

Cycle efficiency = (Network out)/(Energy in)

$A = \lambda N \qquad A = A_o e^{\lambda t}$

$\lambda = \ell n 2/t_{1/2} = 0.693/t_{1/2}$

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

$I = I_o e^{-\Sigma x}$

$I = I_o e^{-\mu x}$

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

$TVL = 1.3/\mu$

$HVL = -0.693/\mu$

$SCR = S/(1 - K_{eff})$

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

$CR_1\ (1 - K_{eff1}) = CR_2\ (1 - k_{eff2})$

$M = 1/(1 - K_{eff}) = CR_1/CR_o$

$M = (1 - K_{effo})/(1 - K_{eff1})$

$SDM = (1 - K_{eff})/K_{eff}$

$\ell^* = 10^{-5}$ seconds

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

$I_1 d_1 = I_2 d_2$

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

$R/hr = (0.5\ CE)/d^2 (meters)$

$R/hr = 6CE/d^2$ (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 (At Atm. Press)
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in Hg
1 ft H_2O = 0.4335 lbf/in^2
1 in Hg = 0.491 lbf/in^2

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

FORMULA SHEET

I. Boron Addition

A. HOT_V Gal. B.A. $= 5.77 \times 10^4 \ln \frac{(B.A.T.k.\ PPM\text{-}PC(Initial)}{(B.A.T.k.\ PPM\text{-}PC(Final)}$

B. $COLD_V$ Gal. B.A. $= 8.48 \times 10^4 \ln \frac{(B.A.T.k.\ PPM\text{-}PC(Initial)}{(B.A.T.k.\ PPM\text{-}PC(Final)}$

C. V Gal. B.A. for desired PPM increase $= \frac{\text{Gal. of Water to Borate} \times \text{Desired PPM increase}}{\text{B.A.T.k. PPM}}$

II. Dilution

A. HOT_V Gal. PMW $= 5.77 \times 10^4 \ln \frac{(PC\ Initial)}{(PC\ Final)}$

B. $COLD_V$ Gal. PMW $= 8.48 \times 10^4 \ln \frac{(PC\ Initial)}{(PC\ Final)}$

III. Blend Ratio

$\frac{B.A.T.k.\ PPM}{PC\ PPM} - 1 = \frac{\#of\ Gal.\ PMW}{1\ Gal.\ B.A.}$

REVIEWED BY

DMKennedy 4-5-83
Reactor Engineer

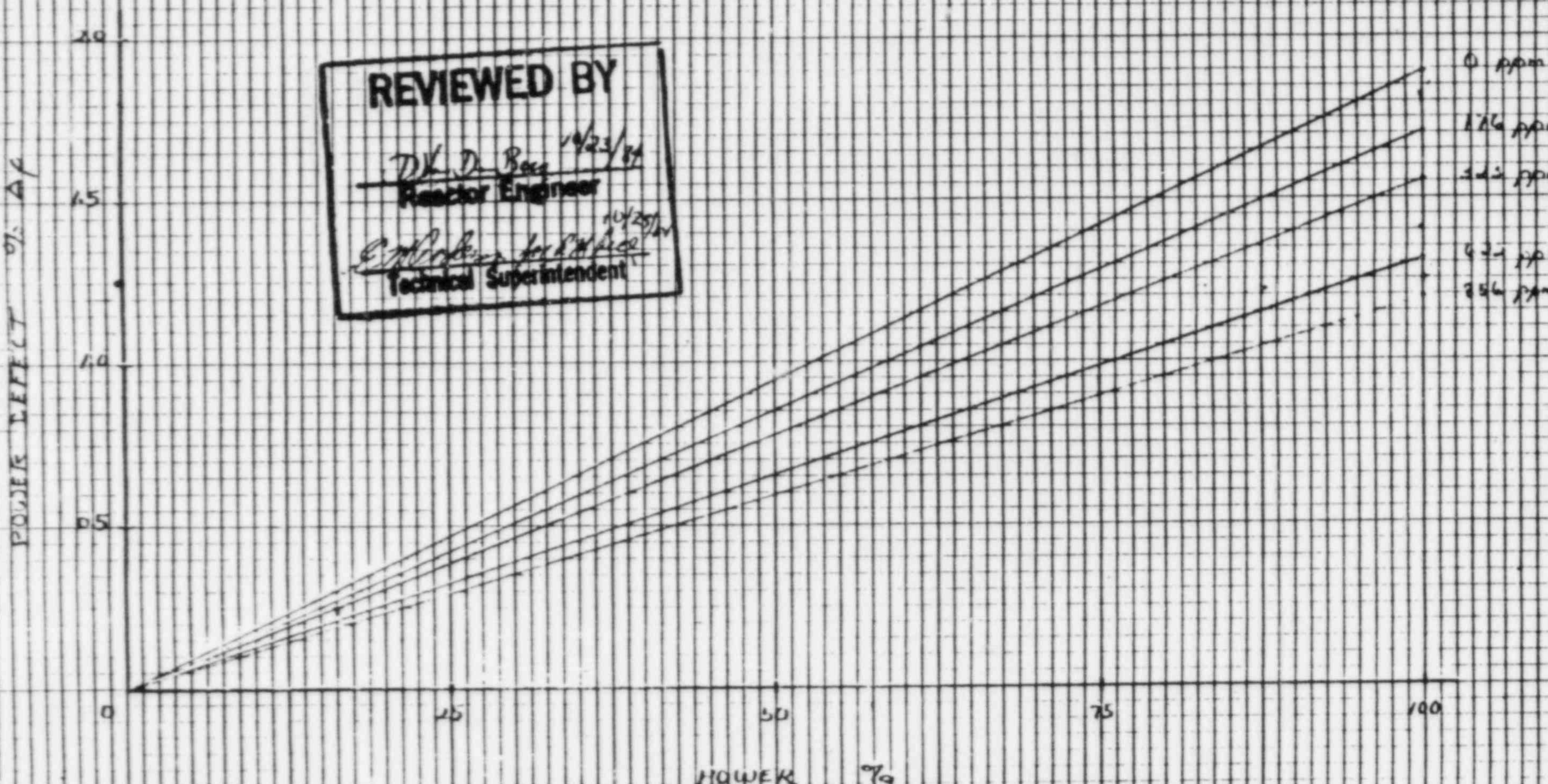
4/9/83
Technical Superintendent

FIGURE 3.1, Rev 2

POWER DEFECT

vs.

POWER



REVIEWED BY

10/23/84
Reactor Engineer

10/25/84
Technical Superintendent

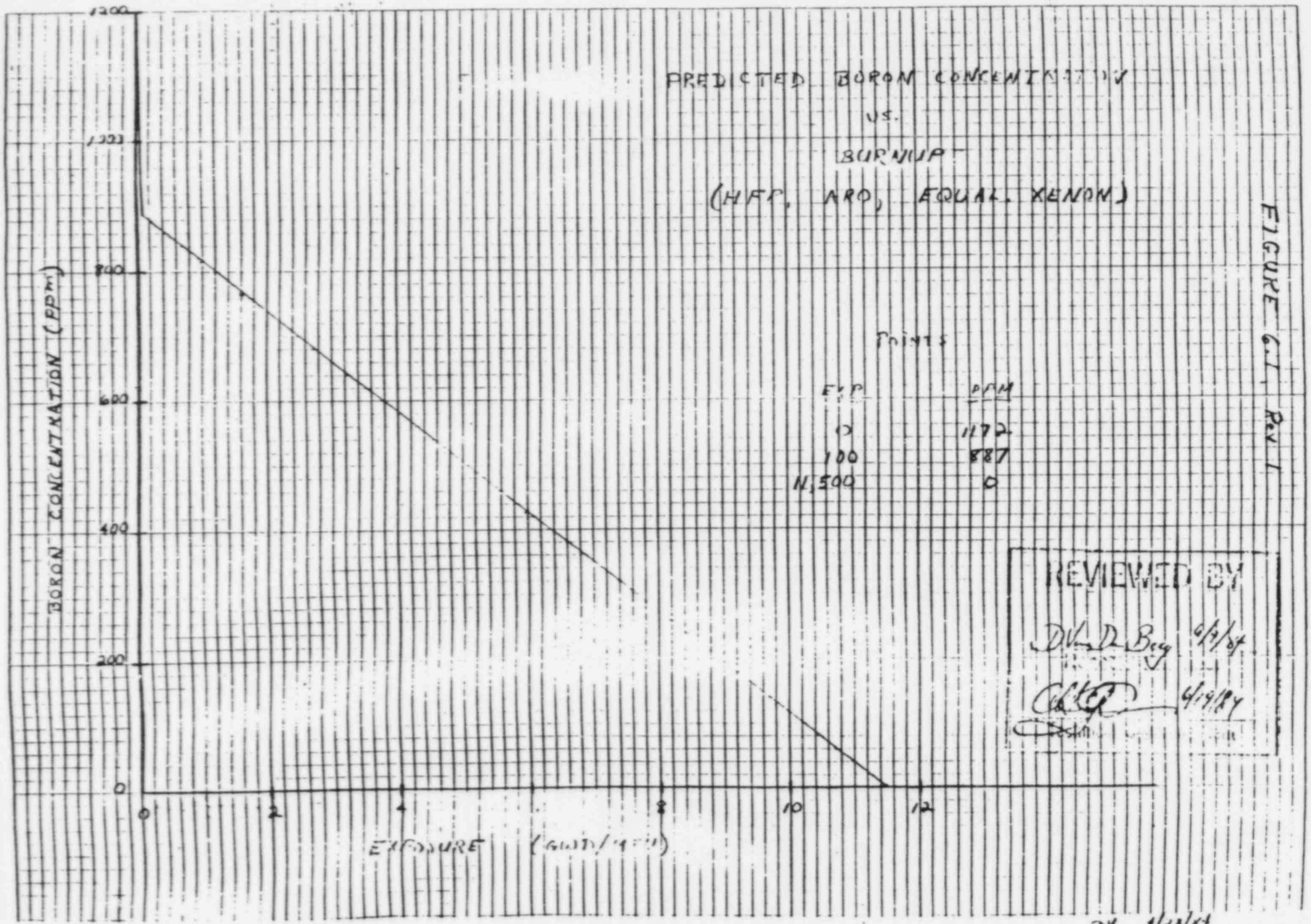


FIGURE 6.1-1 Rev. 1

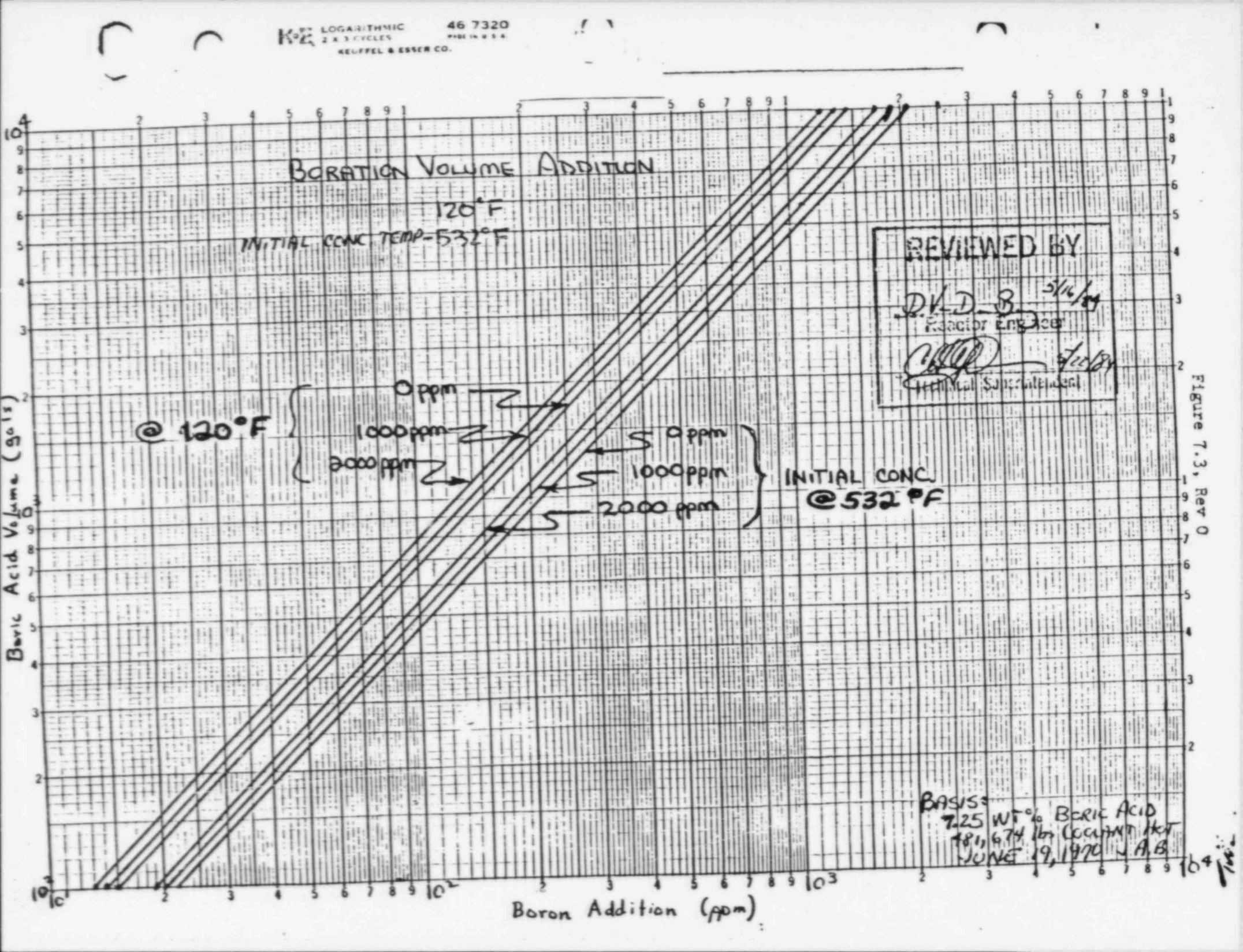


Figure 7.3, Rev 0

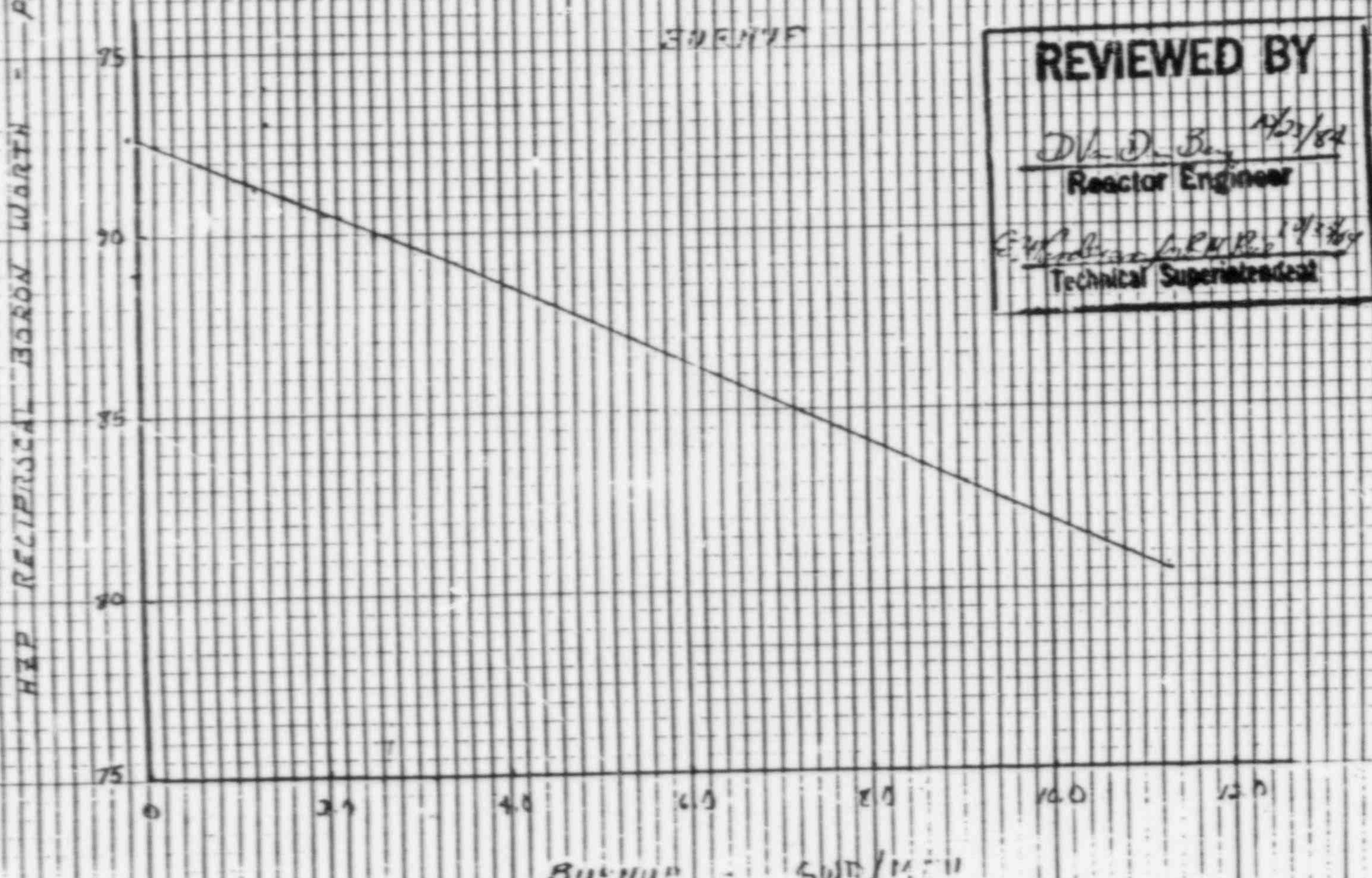
Section 4

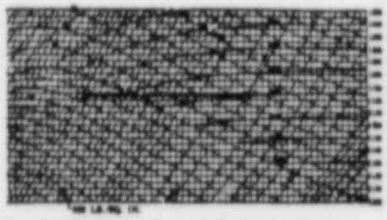
FIGURE 4.1, REV. II

HZP RECIPROCAL BORON WORTH

vs.

BURNUP





to Use the Mollier Diagram to Determine Quality from Calorimeter Data.

Pressure in calorimeter considerable (14,696 lb. per sq. in. abs.).
Temperature in calorimeter 300 deg. F.
Pressure in steam mains 200 lb. per sq. in. abs.
Per cent moisture from chart, 1.7 per cent.
Quality 98.3 per cent.

ENTROPY

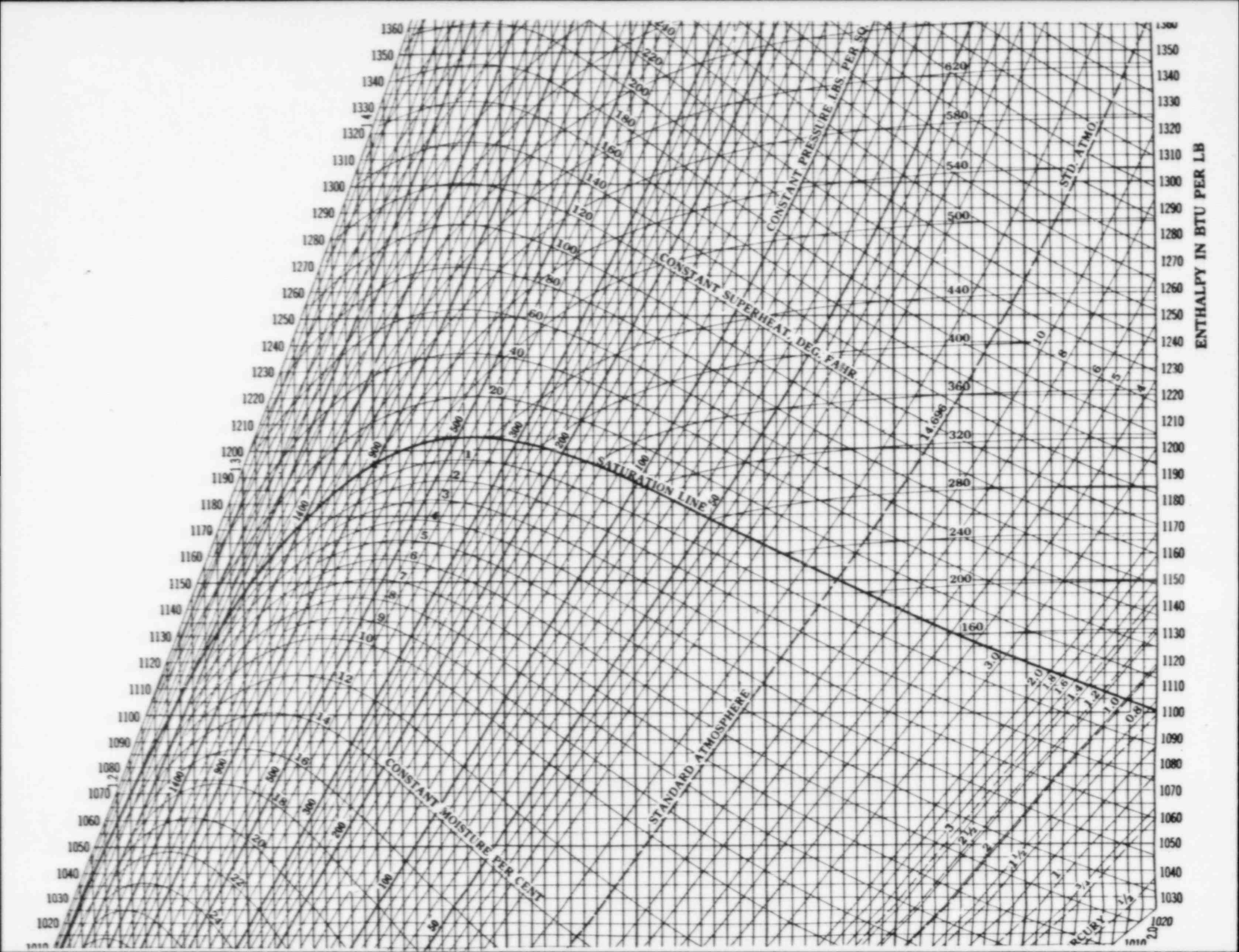
ENTHALPY OR HEAT CONTENT

Mollier Diagram

The values shown on this chart are in accordance with the tabulations established for the Third International Steam Tables Conference and are derived from the properties of the perfect vapor as described in "Thermodynamic Properties of Vapors" by Dr. E. F. Lafe of Combustion Engineering Corporation, at the Spring Meeting of the American Society of Mechanical Engineers, May 13, 1940, and subsequently published in the "Transactions of the A.S.M.E." Feb. 1941.

Reprinted from STEAM TABLES published by
COMBUSTION ENGINEERING, INC.
Windsor, Conn., 1940

ENTROPY


ENTHALPY IN BTU PER LB
CONSTANT PRESSURE LBS. PER SQ
STD. ATMO
CONSTANT SUPERHEAT, DEG. FAHR
SATURATION LINE
STANDARD ATMOSPHERE
CONSTANT MOISTURE PER CENT

SECTION 1 RO EXAM

1.1 For equal reactivity additions at BOC and EOC state which point in core life would result in a higher S.U.R. (ie. BOC or EOC). (1.0)

1.2 State the reason for overlap of control rod groups 1-4 for withdrewal and insertion. (1.0)

1.3 A. State how the fuel temperature coefficient changes over core life. (ie. more negative, less negative, remains constant) (.5)

B. State how (ie, more negative, less negative, remains constant) the fuel temperature defect changes over core life. (.5)

1.4 The plant is operating at 100% steady state power with a primary boron concentration of 323 ppm. Using the graphs provided, calculate the gallons of boron that will need to be added to reduce reactor power to 50%. (Show all work) (Assume BAST conc. = 12,000 ppm.) (2.0)

1.5 What effect (increase, decrease, remains the same) will a 20°F decrease in main condenser circulating water inlet temperature have on the following plant parameters.(assume 100% power, condenser back pressure is 4" Hg). (2.0)

A. Condenser vacuum

B. Main generator output

C. Plant efficiency

D. Turbine work

1.6 Which of the statements below describes the result of installing two identical centrifugal pumps in parallel? Assume discharge is to atmosphere. (1.0)

A. Total discharge flow of the two is the same as the discharge of a single pump, but output pressure is doubled.

B. Total discharge flow of the two is twice that of a single pump, but the output pressure remains the same as the single pump.

C. Total discharge flow and the output pressure of the two is twice that of a single pump.

D. Total discharge flow of the two is the same as the discharge of a single pump, but the output pressure is squared.

1.7 In which case would the individual rod worth be higher? (1.0)

Case 1: All rods are fully withdrawn and rod #33 drops into the core.

Case 2: All rods are fully inserted except for rod #33 which is fully withdrawn.

1.8 With the plant at 0% power, Tave at 532°F and steam generator pressure at 900 psia, a steam leak is suspected in an instrument line from 'A' S/G. Using the Mollier diagram provided, answer the following questions.

A. State the temperature of the water in the steam generator. (.25)

B. State the temperature of the steam exiting the leak in the steam generator. (.25)

C. Is the steam exiting the leak subcooled, saturated or superheated. (.25)

1.9 The plant was operating at 100% power for the past two (2) months and tripped off due to a loss of 'A' and 'B' 4160 V busses. For the following variables, state how the primary system flow rate will be effected. (*ie, increase, decrease or remain the same).

Assume all other parameters constant and 15 minutes after trip.

A. An atmospheric steam dump valve sticks open and depressurized 'A' S/G to 700 psia. (.5)

B. Primary System pressure decreases to 1700 psia. (.5)

C. Using the Auxiliary Feedwater System, both S/G levels are increased from 20% to 40%. (.5)

1.10 The plant is operating at 100% and decreasing to 50% power for maintenance activities. One secondary code safety lifts at 55% power level. Choose one of the following actions that could best aid in reseating the code safety. (.75)

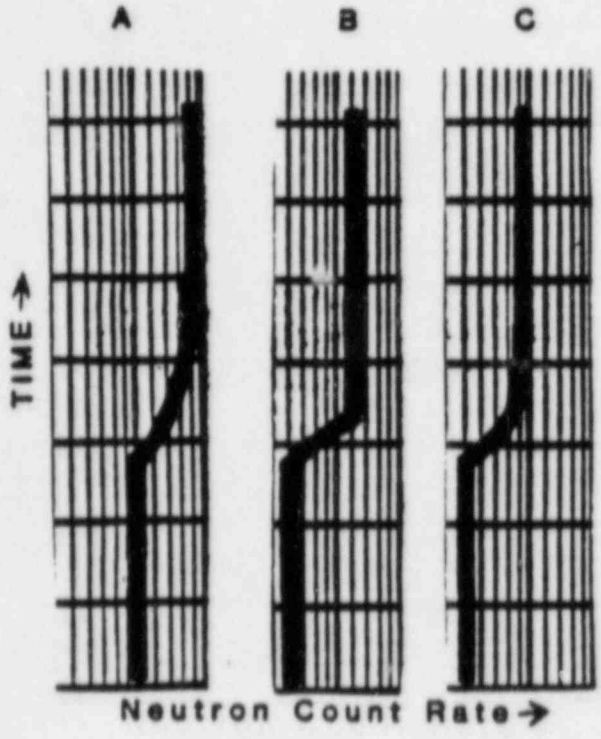
A. Increase Tave and decrease Turbine Load

B. Maintain Tave constant and decrease Turbine Load

C. Decrease Tave and increase Turbine Load

D. Increase Tave and maintain Turbine Load constant

1.11 The graphs below were made by equal positive reactivity additions in a subcritical reactor. Choose the graph that indicates being closest to approaching criticality. (1.0) 1.67



1.12 For a reactor trip after operating at 100% power for the past two (2) months.

A. State the value for decay heat in % power one (1) minute after the trip. (.5) .83

B. State the amount of time to reach peak Xenon after the trip. (.5) .83

C. State the amount of boron required to be added to compensate for one control rod that failed to fully insert during the trip. (.5) .83

D. State the expected SUR after the prompt drop. (.5) .83

SECTION 1 RO EXAM KEY

1.1 For equal reactivity additions at BOC and EOC state which point in core life would result in a higher S.U.R. (ie. BOC or EOC). (1.0)

ANSWER

EOC

Reference: Lesson Plan NOT 4.4-02-17 Obj. C

Lesson Plan NOT 4.4-02-23 Obj B.2 and D.3

1.2 State the reason for overlap of control rod groups 1-4 for withdrewal and insertion. (1.0)

ANSWER (1 point of either)

To allow a smooth and continuous rate of change of reactivity

or

Prevent the rates of reactivity change and the worth of the individual control rods from exceeding the selected limiting values

Reference: FSAR 5.1-12, 7.5-6, Tech. Spec. 3.10, Advanced Systems Lesson Plan 26B, Obj. 1B and 26A

1.3 A. State how the fuel temperature coefficient changes over core life. (ie. more negative, less negative, remains constant) (.5)

B. State how (ie, more negative, less negative, remains constant) the fuel temperature defect changes over core life. (.5)

ANSWER

A. More negative

B. Less negative

Reference: Lesson Plan NOT 4.4-02-21 Obj. B

1.4 The plant is operating at 100% steady state power with a primary boron concentration of 323 ppm. Using the graphs provided, calculate the gallons of boron that will need to be added to reduce reactor power to 50%. (Show all work) (Assume BAST conc. = 12,000 ppm.) (2.0)

ANSWER

Power defect from 100% to 50% power =
$1.55\%\Delta\rho - .78\%\Delta\rho = .77\%\Delta\rho \pm .05\%\Delta\rho$

Power defect from 100% to 50% power = 1.55% -.78% = .77% ± .05%
(.5 pt.)

HZP reciprocal boron worth = 84.8 ± .5 ppm/%$\Delta\rho$
(.5 pt.)

The ppm of boron needed = (84.8 ppm/%)(.77%) =
65.296 ppm boron ± 4.3 ppm
(.5 pt.)

Gallons of Boric Acid = $5.77 \times 10^4 \ln \frac{12000\text{ppm} - 323\text{ ppm}}{12000\text{ppm} - 388.3} =$

$5.77 \times 10^4 \ln \frac{11677\text{ppm}}{11611.7\text{ppm}} =$

323.5 gal ± 6%
or
from graph 320 gal ± 20 gal. (.5 pt.)

Reference: Advanced System Lesson Plan 75A, Obj 18, Technical Data Book

1.5 What effect (increase, decrease, remains the same) will a 20°F decrease in main condenser circulating water inlet temperature have on the following plant parameters.(assume 100% power, condenser back pressure is 4" Hg). (2.0)

A. Condenser vacuum

B. Main generator output

C. Plant Efficiency

D. Turbine work

ANSWER (.5 each)

A. Increase

B. Increase

C. Increase

D. Increase

Reference: Lesson Plan NOT 4.4-08-02, Obj. 5, Sb.

1.6 Which of the statements below describes the result of installing two identical centrifugal pumps in parallel? Assume discharge is to atmosphere. (1.0)

A. Total discharge flow of the two is the same as the discharge of a single pump, but output pressure is doubled.

B. Total discharge flow of the two is twice that of a single pump, but the output pressure remains the same as the single pump.

C. Total discharge flow and the output pressure of the two is twice that of a single pump.

D. Total discharge flow of the two is the same as the discharge of a single pump, but the output pressure is squared.

ANSWER

B. Total discharge flow of the two is twice that of a single pump, but the output pressure remains the same as the single pump (1.0)

Reference: Lesson Plan NOT 4.4-08-03, Obj. B.1.c, B.1.d

1.7 In which case would the individual rod worth be higher? (1.0)

Case 1: All rods are fully withdrawn and rod #33 drops into the core.

Case 2: All rods are fully inserted except for rod #33 which is fully withdrawn.

ANSWER

Case 2: (1.0)

Reference: Lesson Plan NOT 4.4-02-21, Obj. C.1

1.8 With the plant at 0% power, Tave at 532°F and steam generator pressure at 900 psia, a steam leak is suspected in an instrument line from 'A' S/G. Using the Mollier diagram provided, answer the following questions.

A. State the temperature of the water in the steam generator. (.25)

B. State the temperature of the steam exiting the leak in the steam generator. (.25)

C. Is the steam exiting the leak subcooled, saturated or superheated. (.25)

ANSWER

A. 532°F (.25)

B. ≅300°F ± 10% (.25)

C. Superheated (.25)

Reference: Lesson Plan NOT 4.4-08-01, Obj. B.9.a

1.9 The plant was operating at 100% power for the past two (2) months and tripped off due to a loss of 'A' and 'B' 4160 V busses. For the following variables, state how the primary system flow rate will be effected. (ie, increase, decrease or remain the same).

Assume all other parameters constant and 15 minutes after trip.

A. An atmospheric steam dump valve sticks open and depressurized 'A' S/G to 700 psia. (.5)

B. Primary System pressure decreases to 1700 psia. (.5)

C. Using the Auxiliary Feedwater System, both S/G levels are increased from 20% to 40%. (.5)

ANSWER

A. Increase (.5)

B. Remain the same (.5)

C. Increase (.5)

Reference: Advanced System Lesson Plan 24a, Obj. 3, Thermo Dynamics Heat Transfer and Fluid Flow, Reactor Heat Transfer.

1.10 The plant is operating at 100% and decreasing to 50% power for maintenance activities. One secondary code safety lifts at 55% power level. Choose one of the following actions that could best aid in reseating the code safety. (.75)

A. Increase Tave and decrease Turbine Load

B. Maintain Tave constant and decrease Turbine load

C. Decrease Tave and increase Turbine load

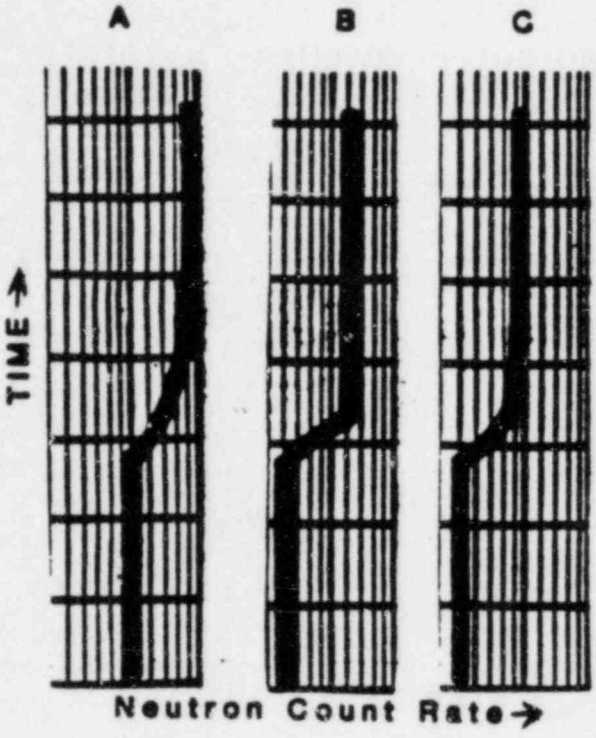
D. Increase Tave and maintain Turbine load constant

ANSWER

C

Reference: Advanced System Lesson Plan 18b, Obj. 15

1.11 The graphs below were made by equal positive reactivity additions in a subcritical reactor. Chose the graph that indicates being closest to approaching criticality. (1.0)



ANSWER

A

Reference: Nuclear Physics Course - NUS Chapter 12.4-4

1.12 For a reactor trip after operating at 100% power for the past two (2) months.

A. State the value for decay heat in % power one (1) minute after the trip. (.5)

B. State the amount of time to reach peak Xenon after the trip. (.5)

C. State the amount of boron required to be added to compensate for one control rod that failed to fully insert during the trip. (.5)

D. State the expected SUR after the prompt drop. (.5)

ANSWER

A. 5% ± 2% (.5)

B. 9 ± 1 hour (.5)

Reference: Tech Data Book

C. 225 ppm boron or to cold shutdown conc. (.5)

Reference: ONP-7

D. -1/3 or -.33 DPM or -80 period (.5)

Reference: Nuclear Physics - Simulator Training

MASTER

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

FACILITY: PALISADES

REACTOR TYPE: PWR-CE

DATE ADMINISTERED: 85/07/~~09~~03

EXAMINER: HIGGINS, R.

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	_____	_____	5. THEORY OF NUCLEAR POWER PLANT OPERATION, FLUIDS, AND THERMODYNAMICS
25.00	25.00	_____	_____	6. PLANT SYSTEMS DESIGN, CONTROL, AND INSTRUMENTATION
25.00	25.00	_____	_____	7. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL
25.00	25.00	_____	_____	8. ADMINISTRATIVE PROCEDURES, CONDITIONS, AND LIMITATIONS
100.00	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 (2.00)

The reactor is being made critical by dilution. Fuel burnup at the time of critical approach is 2.6 GWD/MTU. The estimated critcal boron concentration is 800 ppm. Criticality is attained when boron concentration reaches 870 ppm. What action does GOP 3 require the operator to take? Defend your answer. Refer to Figure 5.1.

QUESTION 5.02 (2.00)

With a constant .75 DPM startup rate, how long will it take for power to increase from the power at which the reactor is considered critical for administrative control to the lowest power level for power operation? SHOW YOUR WORK!

QUESTION 5.03 (1.50)

Explain how the total control rod worth changes with increasing core age.

QUESTION 5.04 (2.00)

a. What are the three reasons for establishing regulating group insertion limits? (1.0)

b. When is the violation of the rod power dependent insertion limits acceptable? (.5)

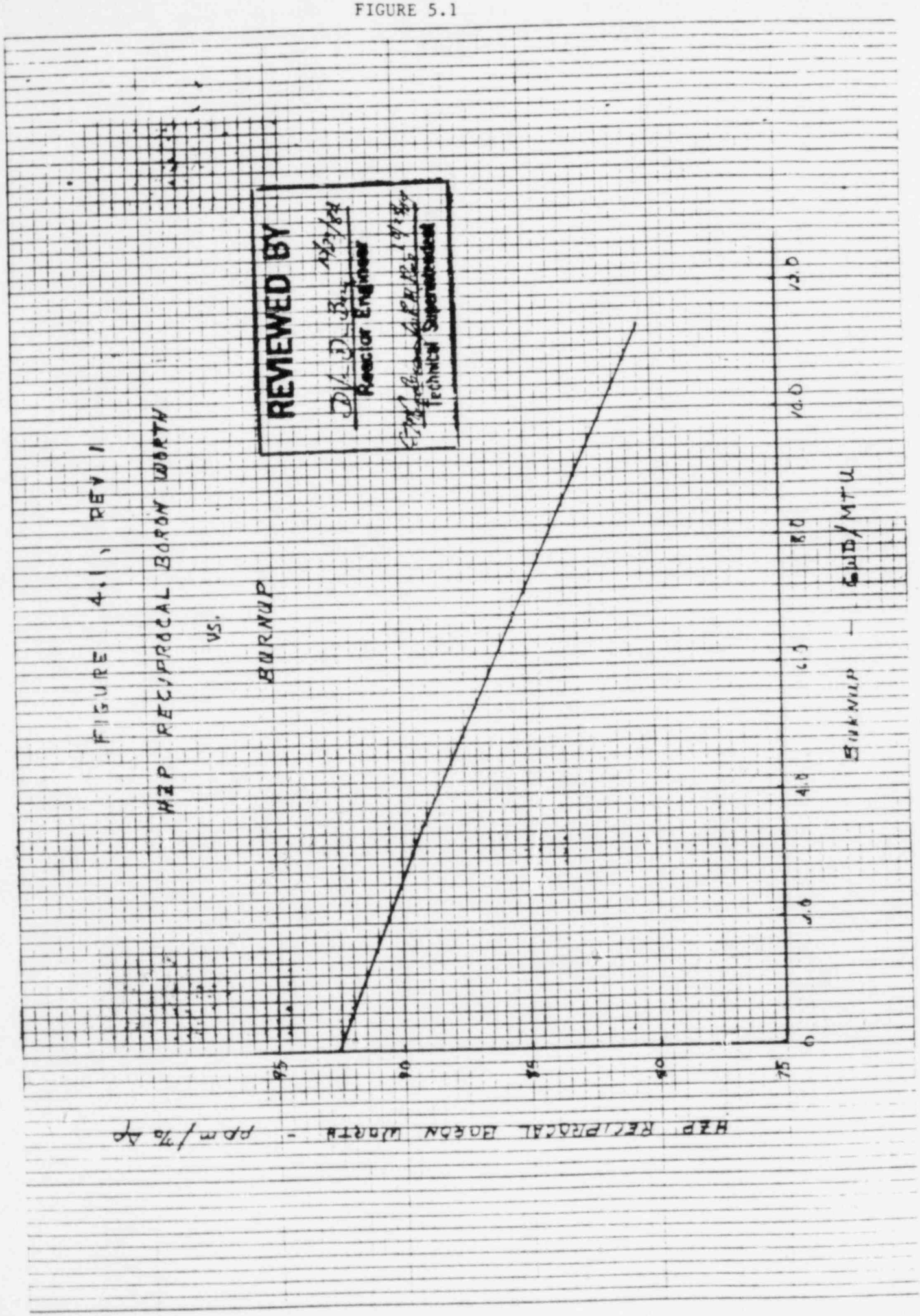
c. What is the four pump zero-power rod insertion limit? (.5)

QUESTION 5.05 (1.50)

Explain why a severely damaged core could experience a recriticality even though all control rods are inserted and the proper boron concentration is maintained.

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

FIGURE 5.1



QUESTION 5.06 (1.00)

a. When is the Quadrant Power Tilt limit applicable? (.5)

b. What action must be taken if Quadrant Power Tilt exceeds 15% when the the Quadrant Power Tilt limit is applicable? (.5)

QUESTION 5.07 (2.00)

Expain why the peak xenon worth after a reactor trip from 100% power is nearly twice that of a reactor trip from 50% power, even though the equilibrium xenon worth at 100% power is much less than twice the equilibrium xenon worth at 50% power.

QUESTION 5.08 (1.00)

A positive reactivity addition occurs in the core after a trip from power because of the increase in concentration of a certain fissile isotope. What is the name of this fissile isotope and why does its concentration increase after a trip?

QUESTION 5.09 (1.00)

PCS pH control is provided by lithium 7 hydroxide. Why is lithium 7 hydroxide used instead of lithium hydroxide made from natural lithium?

QUESTION 5.10 (1.00)

One method of introducing lithium 7 into the PCS is by charging using the chemical addition tank. Name two other ways in which lithium 7 enters the PCS.

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

QUESTION 5.11 (2.00)

Hydrazine is added to the PCS for oxygen control during PCS heatup (when PCS temperature is between 230 and 250 F) and hydrogen is added to the PCS for oxygen control when the reactor is operating.

a. Why isn't hydrogen used for oxygen control during PCS heatup? (1.0)

b. Why isn't hydrazine used for oxygen control when the reactor is operating? (1.0)

QUESTION 5.12 (1.00)

Name two automatic trips provided to prevent the core from violating DNB.

QUESTION 5.13 (1.00)

What would the pressurizer relief valves discharge temperature be if quench tank pressure is 5 psig, there is a steam bubble in the pressurizer and PCS pressure is:

a. 2035 psig (.5)

b. 885 psig (.5)

QUESTION 5.14 (1.00)

How do the available NPSH and the required NPSH change as the flow rate through the pump increases?

QUESTION 5.15 (1.00)

What is pump run-out?

QUESTION 5.16 (1.00)

Name two indications of pump cavitation.

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

QUESTION 5.17 (1.00)

Explain why the pressure/temperature limits curves must be redrawn periodically to account for increased radiation exposure of the reactor vessel.

QUESTION 5.18 (1.00)

What is meant by the term 'reflux boiling'?

QUESTION 5.19 (1.00)

After severe fuel clad damage has occurred, excessive core flow may adversely affect core cooling. Explain why.

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

QUESTION 6.01 (1.00)

What three trips will be defeated by the zero power mode bypass?

QUESTION 6.02 (2.00)

Where are the following neutron detectors used at Palisades?

a. Boron tri-fluoride proportional counter (.5)

b. Fission chamber (.5)

c. Ion chamber (.5)

d. Rhodium detector (.5)

QUESTION 6.03 (1.00)

What will cause the incore detectors to generate a signal when the reactor is shutdown and subcritical?

QUESTION 6.04 (1.00)

Describe the effects of the following reactor protective system faults:

a. Shorting of a logic matrix to ground. (.5)

b. Loss of power to a logic matrix. (.5)

QUESTION 6.05 (2.00)

Give two reasons why an anti-reverse rotation device is necessary in the design of the Primary Coolant Pumps.

QUESTION 6.06 (1.00)

Name the three relief valves which discharge to the Quench Tank.

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

QUESTION 6.07 (1.00)

What is the advantage of using the deborating ion exchanger for reducing PCS boron concentration at EOL?

QUESTION 6.08 (1.00)

Why is a relief valve needed between the shutdown cooling system isolation valves (MO-3015 and 3016)?

QUESTION 6.09 (2.00)

a. Under what condition will the atmospheric steam dump valves be stroked rapidly to their full open position? (1.0)

b. Why would an error in the steam dump controller setting not cause an uncontrolled PCS cooldown? (1.0)

QUESTION 6.10 (1.00)

How does a turbine trip affect the feedwater regulating valves and the feed pump turbines?

QUESTION 6.11 (1.50)

Explain the automatic starting sequence for the AFW pumps upon receipt of an Auto Feed Actuation Signal (AFAS).

QUESTION 6.12 (1.00)

Describe the steam generator recirculation flow path during cold shutdown.

QUESTION 6.13 (1.50)

Explain how a safety injection actuation signal in conjunction with a loss of site power affects the component cooling water system.

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

QUESTION 6.14 (1.00)

What two signals will cause the isolation of non-critical service water from critical service water?

QUESTION 6.15 (2.00)

a. What two chemicals are added to the containment spray system and why is each added? (1.0)

b. When, after the initiation of containment spray, are each of these chemicals added? (1.0)

QUESTION 6.16 (1.00)

What is the starting sequence of the fire system pumps? Include setpoints.

QUESTION 6.17 (1.00)

Why must the use of breathing air in containment be restricted if one of the plant main air compressors is running hot?

QUESTION 6.18 (1.00)

What is the purpose of the generator seal oil cooler service water booster pump P-44?

QUESTION 6.19 (1.00)

What is the purpose of the cardox system on the main generator?

QUESTION 6.20 (1.00)

What three conditions will cause the emergency diesel generator breaker to automatically open?

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

7. PROCEDURES - NORMAL, ABNORMAL, EMERGENCY AND RADIOLOGICAL CONTROL

QUESTION 7.01 (1.50)

Should personnel observing leakage from a potentially radioactive plant system shut upstream and downstream isolation valves in order to stop the leak? Explain.

QUESTION 7.02 (1.00)

What immediate actions should personnel take if the red alarm light on a constant air monitor comes on?

QUESTION 7.03 (2.00)

What are the two major differences between a critical approach with only one operable startup detector and a critical approach with two operable startup detectors?

QUESTION 7.04 (1.00)

What action must be taken if pressurizer sprays are operated when the differential temperature between spray water and pressurizer water exceeds 200 F?

QUESTION 7.05 (1.00)

When must low temperature over-pressure protection be in service?

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

QUESTION 7.06 (2.50)

a. PCS pressure must be equal to or greater than ___ when primary coolant pumps are operating. (.5)

b. PCS temperature must be greater than ___ to operate three primary coolant pumps. (.5)

c. During power operation, a minimum differential temperature of ___ must be maintained between the pressurizer and the PCS loops. (.5)

d. The minimum shutdown margin which must be maintained when only three primary coolant pumps are operating at hot shutdown and above is ___. (.5)

e. Containment isolation must be manually actuated if PCS pressure drops below ___ during a LOCA. (.5)

QUESTION 7.07 (1.00)

What in-plant group must be notified and what record-keeping requirements must be met immediately after any emergency use of the atmospheric steam dumps?

QUESTION 7.08 (1.50)

Explain why control valve CV-0951 must not be open if either control valve CV-0950 or CV-0913 is open. Refer to Figure 7.8.

QUESTION 7.09 (1.00)

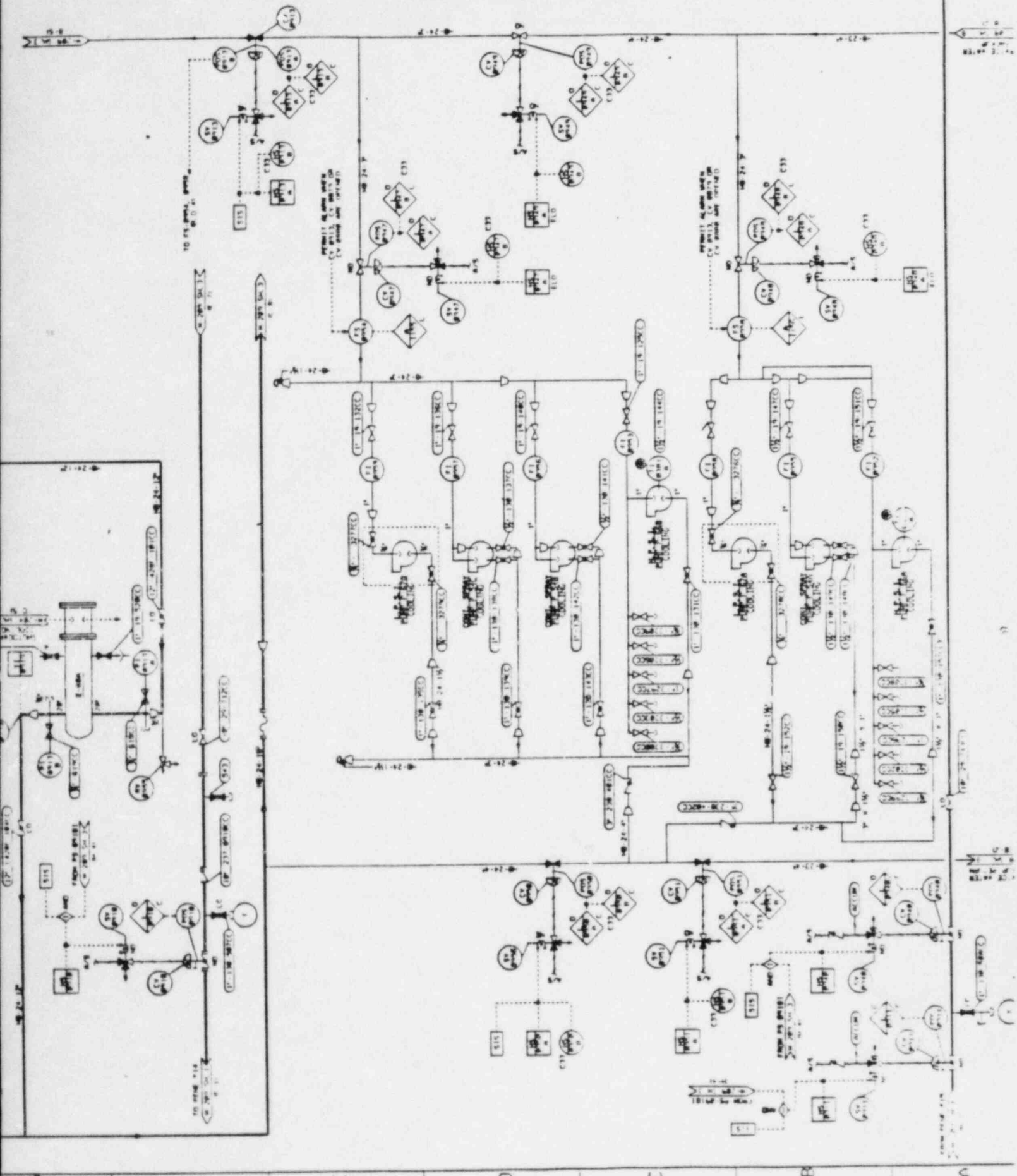
Why are vented tanks containing boric acid prohibited from being pressurized?

QUESTION 7.10 (1.00)

Why must the draining of a safety injection tank be stopped if tank pressure falls below 20 psig?

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

FIGURE 7.8



QUESTION 7.11 (1.50)

When pumping surplus water from the spent fuel pool to the SIRW tank SFP113 is shut and SFP127 is open. Why must SFP127 be shut prior to opening SFP113 when restoring the spent fuel pool cooling system to its normal lineup? Refer to Figure 7.11.

QUESTION 7.12 (1.00)

Why can't the refueling machine's automatic hoist underload shutdown interlock be used when moving a control rod?

QUESTION 7.13 (1.00)

If the turbine has not tripped and the generator breakers have not opened after a reactor trip, the turbine, and then, if necessary, the generator, are manually tripped. Why is the turbine tripped first?

QUESTION 7.14 (1.00)

Name two steam generator indications which are indicative of steam generator dryout.

QUESTION 7.15 (1.50)

a. What is the minimum required HPSI pump flow rate? (.5)

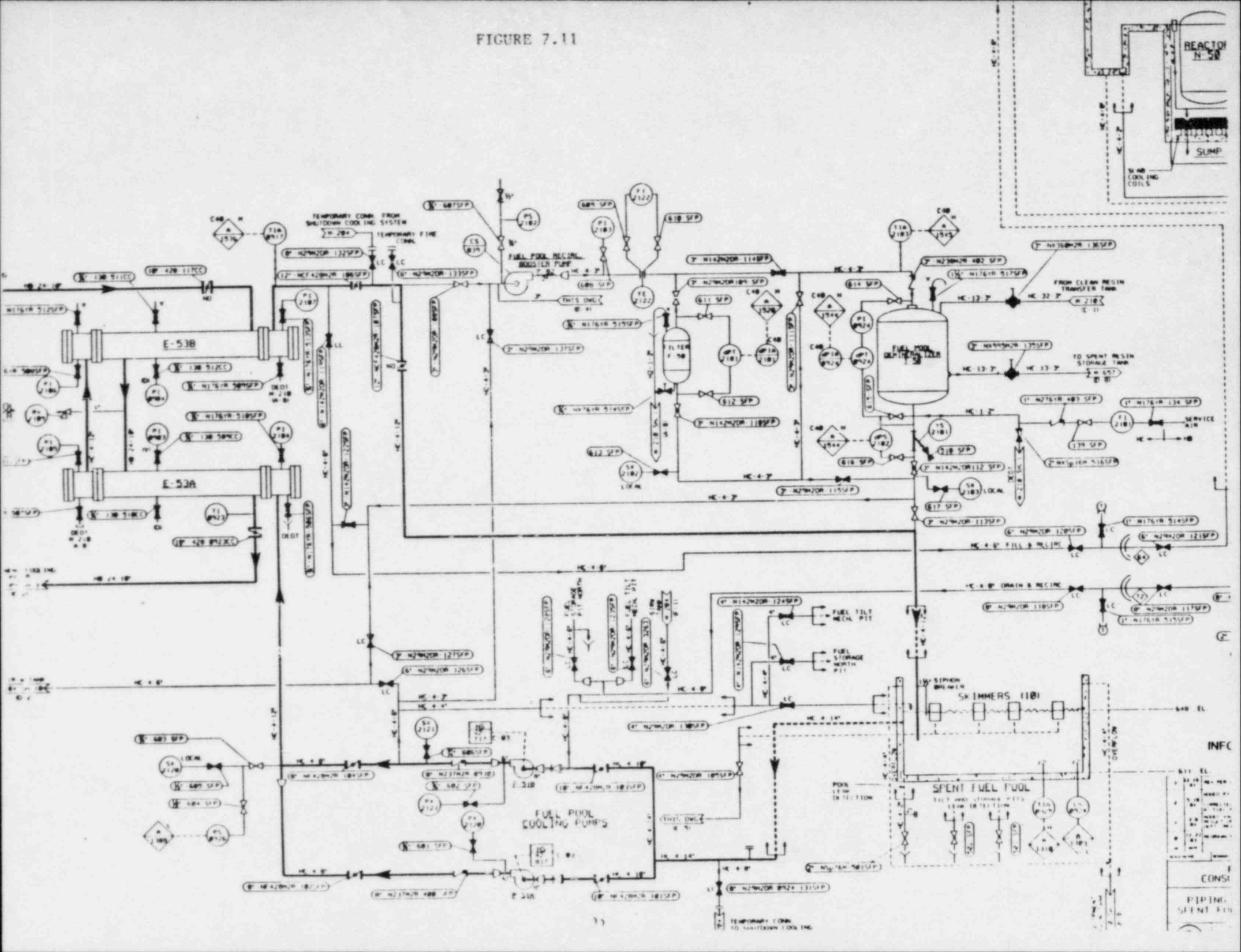
b. What action should be taken if the running HPSI pumps are not maintaining this minimum flow rate? (1.0)

QUESTION 7.16 (1.00)

Why must the safety injection tanks be vented or isolated two hours after a LOCA?

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

FIGURE 7.11


E-53B
E-53A
FUEL POOL RECIRC. BOOSTER PUMP
FUEL POOL COOLING PUMPS
SKIMMERS (10)
SPENT FUEL POOL
FUEL TILT MECH. PIT
FUEL STORAGE NORTH PIT
SUMP
SUMP COOLING COILS
TEMPORARY CONN. FROM SHUTDOWN COOLING SYSTEM
TEMPORARY FIRE CONN.
FROM CLEAN RESIN TRANSFER TANK
TO SPENT RESIN STORAGE TANK
SERVICE AIR
SIPHON BREAKER
FUEL POOL LEAK DETECTION
TEMPORARY CONN. TO SHUTDOWN COOLING

QUESTION 7.17 (1.00)

How can the reactor be cooled if no steam generators are operable and RCS pressure is too high for shutdown cooling?

QUESTION 7.18 (1.00)

Why must RCS pressure be controlled at least 100 psi above steam generator pressure during a steam generator tube rupture?

QUESTION 7.19 (1.50)

While at power, indication is lost on all wide range log recorders, power range recorders, feed water regulation valve and turbine governor valve position indicators.

a. What failure has occurred? (.5)

b. What four immediate actions must be taken? (1.0)

QUESTION 7.20 (1.00)

Why are the primary coolant pumps manually tripped 5 seconds after the reactor is tripped if a safety injection has occurred?

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

QUESTION 8.01 (.50)

Which of the following conditions is NOT required for containment integrity?

a. All non-automatic containment isolation valves are closed.

b. The equipment door is properly closed and sealed.

c. Both doors in each personnel air lock are properly closed and sealed.

d. All automatic containment isolation valves are operable or are locked closed.

QUESTION 8.02 (.50)

After operating for 10 days in cycle 6 at 90% power, power is increased to 93% by boron dilution at the fastest permissible rate. How long did this power increase take?

a. six hours

b. th ee hours

c. one hour

d. one-half hour

QUESTION 8.03 (.50)

Above ____ power, the high level feedwater heater alarm lights should stay out. If the level in any feedwater heater rises above the _____ and continues increasing, bypass the heater immediately.

a. 15%; top of the sight glass

b. 15%; dump valve opening

c. 25%; top of the sight glass

d. 25%; dump valve opening

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

QUESTION 8.04 (.50)

If no feedwater heaters are available, power operation is:

a. limited to 600 MWe.

b. limited to 300 MWe.

c. limited to 150 MWe.

d. not permitted.

QUESTION 8.05 (.50)

When feedwater heaters must be bypassed at load, they should be bypassed _____ the load is decreased so that the effectiveness of the shell drains will not be reduced due to the _____ extraction pressures at a lower load.

a. before; decreased

b. before; increased

c. after; decreased

d. after; increased

QUESTION 8.06 (.50)

If a feedwater heater tube ruptures resulting in water induction into the turbine, trip the turbine _____, and _____ bypass the feedwater heater with the ruptured tube and the next higher pressure feedwater heater.

a. immediately; immediately

b. if turbine vibration exceeds 14 mils; immediately

c. immediately; after the turbine is tripped

d. if turbine vibration exceeds 7 mils; after the turbine is tripped

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

QUESTION 8.07 (.50)

If the ice loading limits of the 345 KV transmission lines are exceeded:

a. place the plant in hot standby.

b. reduce power to 8% and take the turbine off the line.

c. reduce power to 150 MWe.

d. reduce power to 300 MWe.

QUESTION 8.08 (.50)

True or False. When performing Technical Specifications Surveillances, redundant equipment must be test started prior to beginning the surveillance unless specifically exempted by the test procedure.

QUESTION 8.09 (.50)

True or False. A component undergoing regular surveillance is considered inoperable until its performance indicates it to be operable.

QUESTION 8.10 (.50)

Tave shall not exceed _____ as measured by the average of _____.

a. 560.8 F; all sixteen safety instruments.

b. 560.8 F for any loop; that loop's safety instruments.

c. 562.8 F; all sixteen safety instruments.

d. 562.8 F for any loop; that loop's safety instruments.

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

QUESTION 8.11 (.50)

If the primary to secondary leak rate exceeds _____ for any period of steady state operation greater than 24 consecutive hours, immediately _____.

a. .1 gpm; commence a controlled plant shutdown.

b. .1 gpm; trip the reactor and carryout EOP 1.

c. .6 gpm; commence a controlled plant shutdown.

d. .6 gpm; trip the reactor and carryout EOP 1.

QUESTION 8.12 (.50)

Upon finding people trapped in a stuck elevator _____. Only the _____ has the authorization to open a stuck elevator car for the removal of passengers.

a. manually move the car to a position level with the nearest floor; Shift Supervisor

b. manually move the car to a position level with the nearest floor; Duty and Call Superintendent

c. open the electrical breakers which supply power to operate the car; Shift Supervisor

d. open the electrical breakers which supply power to operate the car; Duty and Call Superintendent

QUESTION 8.13 (.50)

If a component with a defeated or removed overpressure protective device is placed in service, controls must be established to ensure that applied pressure is no greater than:

a. hydrostatic test pressure.

b. relief valve setpoint.

c. 75% of hydrostatic test pressure.

d. 75% of relief valve setpoint.

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

QUESTION 8.14 (.50)

Entries into the personnel air lock are administratively controlled by _____ only after authorization has been granted by the _____.

a. use of a radiation work permit; Shift Supervisor.

b. activating the entrance card reader for door 83A; Shift Supervisor.

c. use of a radiation work permit; Radiation Safety Supervisor.

d. activating the entrance card reader for door 83A; Radiation Safety Supervisor.

QUESTION 8.15 (.50)

PORV breakers shall be open above _____ due to the possibility of _____.

a. 200 F; brittle fracture of the PCS.

b. 200 F; fire in the cable spreading room.

c. 325 F; brittle fracture of the PCS.

d. 325 F; fire in the cable spreading room.

QUESTION 8.16 (.50)

If a feedwater regulating valve is pinned open when a low steam generator pressure safety actuation occurs, the required action is to immediately trip the:

a. condensate pumps.

b. feedwater stop valves.

c. feedwater regulating valves.

d. feedwater pumps.

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

QUESTION 8.17 (.50)

When LCO requirements cannot be satisfied because of circumstances in excess of those addressed in Technical Specifications, within _____ action shall be taken to place the unit in _____.

a. six hours; at least cold shutdown within the next 24 hours.

b. six hours; at least hot standby within the next six hours.

c. one hour; at least cold shutdown within the next 24 hours.

d. one hour; at least hot standby within the next six hours.

QUESTION 8.18 (.50)

True or False. Entry into a plant condition for which all applicable LCOs are not met is allowed provided applicable provisions in the ACTION requirements are met.

QUESTION 8.19 (.50)

Containment integrity must be established if PCS temperature exceeds ____; containment cooling systems must be operable if _____.

a. 210 F; the reactor is critical.

b. 325 F; the reactor is critical.

c. 210 F; PCS temperature exceeds 325 F.

d. 325 F; PCS temperature exceeds 325 F.

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

QUESTION 8.20 (.50)

Except for containment leak rate tests, internal pressure shall not exceed _____. Boron dilution to less than _____ shutdown boron concentration shall not be made unless containment integrity is established.

a. 3 psig; refueling

b. 3 psig; cold

c. 1 psig; refueling

d. 1 psig; cold

QUESTION 8.21 (.50)

Which of the following ~~are~~ 15 NOT required to be operable in order to maintain PCS temperature above 325 F?

a. Preferred AC bus Y10

b. MCC number 5

c. 480 volt distribution bus 11

d. 2400 volt bus 1E

QUESTION 8.22 (.50)

In order to maintain PCS temperature above 325 F, 240 volt AC power panels No. 1 and 2 and their associated ACB breaker distribution system, located in the _____, and 125 volt DC buses _____ must be operable.

a. auxiliary building; D10 and D20

b. auxiliary building; No. 1 and 2

c. switchyard; D10 and D20

d. switchyard; No. 1 and 2

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

QUESTION 8.23 (.50)

Which of the following conditions does NOT have to be satisfied immediately prior to performing refueling operations involving core geometry changes?

a. Both control room emergency air cleanup systems operable.

b. PCS boron concentration of 1720 ppm or greater.

c. Two source range neutron monitors operable.

d. Both shutdown cooling heat exchangers in operation.

QUESTION 8.24 (.50)

Which of the following instrumentation systems is required to be operable when PCS temperature is below 325 F?

a. Pressurizer code safety relief valve temperature monitor

b. Auxiliary feed flow rate meter

c. Containment hydrogen monitor

d. Pressurizer code safety relief valve acoustic monitor

QUESTION 8.25 (.50)

If the Safety Limit for PCS pressure is exceeded, Technical Specification 6.7.1 requires:

a. the reactor to be shutdown immediately.

b. PCS pressure to be reduced to nominal operating pressure immediately.

c. the reactor to be placed in cold shutdown within six hours.

d. the reactor to be placed in hot stanoby within one hour.

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

QUESTION 8.26 (.50)

Any time the specific activity of the PCS exceeds _____ microcuries per gram dose equivalent iodine 131 or the specific activity of the secondary coolant in a steam generator exceeds _____ microcuries per gram, the reactor must be shutdown within 6 hours.

a. 1.0; 1.0

b. 40.0; 1.0

c. 1.0; 0.1

d. 40.0; 0.1

QUESTION 8.27 (.50)

When PCS temperature is below 250 F a _____ high pressure safety injection pump(s) shall be operable.

a. minimum of one

b. minimum of two

c. maximum of one

d. maximum of two

QUESTION 8.28 (.50)

The reactor can not be maintained above 2% power for more than one hour unless _____ safety injection tanks and _____ secondary system safety valves are operable.

a. 3; 23

b. 4; 23

c. 3; 24

d. 4; 24

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

QUESTION 8.29 (.50)

Which of the following radioactive liquid monitors is addressed in Technical Specification Table 3.24-1?

a. Steam generator blowdown monitor (RE-0707)

b. Failed Fuel Monitor (RE-0202)

c. Component Cooling Water Monitor (RE-0915)

d. Circulating Water Discharge Monitor (RE-1323)

QUESTION 8.30 (.50)

What is the quarterly whole body radiation exposure administrative limit a 17 year old employee?

a. 0 mrem

b. 300 mrem

c. 500 mrem

d. 1250 mrem

QUESTION 8.31 (.50)

The _____ must be activated for an Alert; but the _____ need not be activated for an Alert.

a. EOF; TSC

b. TSC; OSC

c. OSC; TSC

d. TSC; EOF

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

QUESTION 8.32 (.50)

Which of the following individuals will be located in the OSC?

a. Radiation Protection Supervisor

b. Reactor Engineer

c. Plant Operations Manager

d. Plant Operations Superintendent

QUESTION 8.33 (.50)

Permission of the _____ is required prior to exceeding 10 CFR 20 dose limits during an emergency. The emergency whole body radiation exposure limit for lifesaving actions is _____ REM

a. Radiation Protection Supervisor; 25

b. Radiation Protection Supervisor; 75

c. Site Emergency Director; 25

d. Site Emergency Director; 75

QUESTION 8.34 (.50)

True or False. Potassium Iodide is a safety option provided to emergency workers -- they are not required to take it.

QUESTION 8.35 (.50)

Any valve may be locked with the approval of the _____.

a. Shift Engineer

b. Shift Supervisor

c. Operations Superintendent

d. Engineering and Maintenance Manager

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

QUESTION 8.36 (.50)

If, during the performance of a System Checklist, a breaker is found to be improperly positioned, the _____ shall authorize it to be placed in its proper position.

a. Shift Engineer

b. Shift Supervisor

c. Operations Superintendent

d. Plant Manager

QUESTION 8.37 (.50)

All caution tags issued shall be controlled by the Caution Tag Log, except those placed and removed in accordance with:

a. switching and tagging orders.

b. maintenance orders.

c. equipment outage requests.

d. Technical Specification surveillance tests.

QUESTION 8.38 (.50)

All nuclear safety related interlocks/bypasses shall be approved by the _____, except those _____.

a. Plant Manager or Duty and Call Superintendent; left in place shorter than one shift.

b. Plant Manager or Duty and Call Superintendent; installed using built-in bypass controls.

c. Shift Engineer or Shift Supervisor; left in place shorter than one shift.

d. Shift Engineer or Shift Supervisor; installed using built-in bypass controls.

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

QUESTION 8.39 (.50)

True or False. Urgent maintenance is assigned a priority of 1 or 2.

QUESTION 8.40 (.50)

Administrative Procedures prohibit caution tags from being used to:

a. document a temporary setpoint for installed plant equipment.

b. identify equipment which is unreliable.

c. identify jumpers, links and bypasses.

d. identify plugged floor drains.

QUESTION 8.41 (.50)

True or False. CRIT stickers shall be used in place of caution tags on control panels because caution tags could obstruct other indications.

QUESTION 8.42 (.50)

The quarterly verification of specified Red Workmen's Protective Tags may be waived by the _____ if _____.

a. Operations Superintendent; operability tests are performed on the specific component.

b. Operations Superintendent; significant radiation exposure would result.

c. Shift Supervisor; operability tests are performed on the specific component.

d. Shift Supervisor; significant radiation exposure would result.

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

QUESTION 8.43 (.50)

When immediate action is required for unplanned work of short duration, permission of the _____ is needed to authorize entry into a radiation controlled area without an RWP. Entry is permissible if _____.

a. Duty and Call Superintendent or Health Physics Superintendent; dedicated Radiation Safety Technician coverage is provided.

b. Duty and Call Superintendent or Health Physics Superintendent; an ALARA review is performed prior to the entry.

c. Radiation Safety Supervisor or Shift Supervisor; dedicated Radiation Safety Technician coverage is provided.

d. Radiation Safety Supervisor or Shift Supervisor; an ALARA review is performed prior to the entry.

QUESTION 8.44 (.50)

Dose to fertile females shall be restricted to a maximum whole body dose of 500 mrem during any _____. Females are to be considered _____ unless documented evidence to the contrary is received.

a. quarter; fertile

b. quarter; infertile

c. nine month period; fertile

d. nine month period; infertile

QUESTION 8.45 (.50)

The secondary dosimetry device used to monitor whole body gamma radiation dose is the _____. Operations personnel are _____ issued neutron TLDs.

a. secondary TLD; normally

b. secondary TLD; rarely

c. pocket dosimeter; normally

d. pocket dosimeter; rarely

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

QUESTION 8.46 (.50)

Permission to exceed a whole body radiation dose of 5000 mrem per year requires the approval of the Plant General Manager, the _____ and the Vice President of Nuclear Operations.

a. Radiological Services Manager

b. Health Physicist Superintendent

c. Director of Radiological Services

d. Radiation Safety Supervisor

QUESTION 8.47 (.50)

True or False. If a confined area is not on the list of confined spaces posted in the control room, a confined space entry permit is not needed to enter it.

QUESTION 8.48 (.50)

If an individual is required to enter a confined space in an emergency, he shall do all of the following EXCEPT _____.

a. notify the Shift Supervisor.

b. complete a confined space entry permit.

c. use an approved self contained breathing apparatus.

d. wear a harness with an attached lifeline.

QUESTION 8.49 (.50)

Steps requiring inspection by a Radiation Safety Technician are designated by:

a. a lower case 'e'.

b. the word HOLDPOINT.

c. the word CAUTION.

d. a circle 'R'.

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

QUESTION 8.50 (.50)

The word NOTE is used to:

a. specify contingency action which may have to be taken.

b. provide supplemental information.

c. identify hazards to equipment.

d. denote hazards to personnel.

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

MASTER

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 5.01 (2.00)

From Figure 5.1, boron worth is 90 ppm per percent $\Delta\rho$. Since criticality was attained 70 ppm too early, the discrepancy between predicted and actual critical condition is (70) x (1%)/(90) = 77.8% $\Delta\rho$, which is equivalent to an error of .00778. (1.0)
This error is greater than .0075, so the operator should maintain reactor power below 10^{-4}% and recheck criticality calculations, boron concentration and control rod positions. (1.0)

REFERENCE
GCL 3 step 2.3.3

ANSWER 5.02 (2.00)

1. Power level at which the reactor is considered critical for administrative control is 10^{-4}%. (.5)
2. Lowest power level for power operation is 2%. (.5)
3. $P = P_0\ 10$ exp (SUR x time) (.2)
4. $P/P_0 = 10$ exp (SUR x time) (.2)
5. log P/P_0 = SUR x time (.2)
6. time = (log P/P_0)(1/SUR) = (log $2/10^{-4}$)(1/.75) (.2)
7. time = 4.3/.75 = 5.73 minutes (.2)

REFERENCE
Technical Specification 1.1
Reactor Theory, Chapter 16, p 6.4-2

ANSWER 5.03 (1.50)

Control rod worth increases. (.5) Fuel burnsout and boron concentration is reduced (.5), making the core less absorptive and the rods relatively more absorptive. (.5)

REFERENCE
Reactor Theory, Chapter 20, p 9.5-1

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 5.04 (2.00)

a. Shutdown margin (.33); individual rod worth (.33); hot channel factors (.34)
b. When it is necessary to rapidly reduce power to avoid or minimize a situation harmful to plant personnel or equipment. (.5) OR during low power physics testing and CRDM reworking. (.5)
c. 43% inserted on Group 2 (Tech Spec); or
70 inches withdrawn on Group 2 (Tech Spec); or
8 inches withdrawn on Group 3 (Data Logger); or
88 inches withdrawn on Group 2 (Data Logger) (.5)

REFERENCE
a. Technical Specification 3.10.5.a
b. Technical Specification 3.10 Basis or 3.10.7
c. Technical Specification Figure 3-6
Technical Data Book, Figure 1.9

ANSWER 5.05 (1.50)

Core geometry becomes altered (.75) and boron can be removed from the core as temperature falls or as coolant boils off. (.75)

REFERENCE
Mitigation of Core Damage, p 12

ANSWER 5.06 (1.00)

a. When power exceeds 50%. (.5)

b. Place the reactor in hot standby within 12 hours. (.5)

REFERENCE
Technical Specification 3.23.3

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 5.07 (2.00)

Equilibrium xenon worth at power is not a linear function of power, since xenon burnout increases as power increases. (.5)
Peak xenon after a trip occurs because of the continuing production of xenon from iodine decay and the absence of xenon burnout. (.5)
Since the equilibrium value of iodine 135 is nearly a linear function of power, the iodine 135 inventory at 100% power will be almost twice as great as the inventory at 50% power. (.5)
With twice as much iodine to decay, xenon peak reactivity after a trip from 100% power will be almost twice as great as the peak after a trip from 50% power. (.5)

REFERENCE
Technical Data Book, Figure 2.2
Reactory Theory, Chapter 20, p 10.3-1

ANSWER 5.08 (1.00)

Plutonium 239, which builds up after a trip due to the decay of Neptunium 239.

REFERENCE
Reactor Theory, Chapter 21, p 11.2-2

ANSWER 5.09 (1.00)

Lithium hydroxide made from natural lithium contains lithium 6 (.5), which has a high absorption cross section for thermal neutrons and will split into an alpha particle and tritium if it absorbs a neutron. (.5)

REFERENCE
System Lesson Notes #6, p 3

ANSWER 5.10 (1.00)

1. Displacement of lithium 7 from the cation resin of the mixed bed purification ion exchanger. (.5)
2. Absorption of a neutron by boron 10 and its subsequent decay by alpha emission. (.5)

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

REFERENCE
System Lesson Notes #6, p 22

ANSWER 5.11 (2.00)

a. Hydrogen needs gamma rays to cause it to react with oxygen. (.5) The gamma flux after the reactor has been shutdown an appreciable length of time is too low to cause the hydrogen to combine with the oxygen. (.5)

b. Hydrazine will decompose at high temperatures. (.5) Hydrazine which does not decompose will be completely removed by the purification ion exchangers. (.5)

REFERENCE
System Lesson Notes #6, p 7

ANSWER 5.12 (1.00)

Two of the following:
1. High power (.5)
2. Low PCS flow (.5)
3. TMLP (.5)

REFERENCE
Technical Specifications 2.3.1, 2.3.2 and 2.3.4

ANSWER 5.13 (1.00)

a. 230 F (.5)

b. 310 F (.5)

REFERENCE
EOP 8.1 step 3.5.d
Steam Tables

ANSWER 5.14 (1.00)

Available NPSH decreases (.5)
Required NPSH increases (.5)

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

REFERENCE
Westinghouse Thermal Hydraulic Principles and Applications to the PWR II, p 10-56

ANSWER 5.15 (1.00)

A condition of maximum flow in a pump occurring when the pump head equals zero.

REFERENCE
Westinghouse Thermal Hydraulic Principles and Applications to the PWR II, p 10-81

ANSWER 5.16 (1.00)

Two of the following:
1. excessive noise (.5)
2. excessive vibration (.5)
3. low suction pressure (.5)
4. fluctuating pump amps (.5)
5. fluctuating discharge pressure (.5)
6. excessively low flow (.5)

REFERENCE
Westinghouse Thermal Hydraulic Principles and Applications to the PWR II, p 10-54

ANSWER 5.17 (1.00)

Fast neutron irradiation of the reactor vessel will raise its reference transition temperature.

REFERENCE
Technical Specification 3.1.2

ANSWER 5.18 (1.00)

Boiling in the core such that steam flows through the hot leg to the steam generator tubes, condenses into a liquid, then flows back down the hot leg into the core.

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

REFERENCE
Natural Circulation Lesson Plan, Drawing #1

ANSWER 5.19 (1.00)

Core geometry may be disturbed, blocking flow through the core.

REFERENCE
Mitigation of Core Damage, p 12

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 6.01 (1.00)

S/G pressure (.33)
Low PCS flow (.33)
TMLP (.34)

REFERENCE
Exam #3 Key, Module 28b, question 4.b
System Lesson Notes #14, p 23

ANSWER 6.02 (2.00)

a. Boronometer (.5)

b. Startup range channel (.25) and Wide range channel (.25)

c. Power range channel (.5)

d. Incore detector (.5)

REFERENCE
System Lesson Notes #6, p 20, and #11, p 8, 11
System Lesson Plan 28a, p 1

ANSWER 6.03 (1.00)

Incore temperature at the axial location exceeding 600 F.

REFERENCE
Mitigation of Core Damage, p 25

ANSWER 6.04 (1.00

a. No effect (ground detector circuit indication) (.5)

b. Initiates a trip (.5)

REFERENCE
System Lesson Notes #14, p 6

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 6.05 (2.00)

1. Limit backflow through an idle pump (.5), thus reducing core bypass flow. (.5)
2. Prevent starting a pump which is reverse rotating (.5), limiting the amount of time the motor experiences starting current. (.5)

REFERENCE
Palisades NOTD exam #1, Mod 24d, question 2

ANSWER 6.06 (1.00)

Letdown line relief (RV-2006) (.33)
Safety injection tanks drain relief (RV-3161) (.33)
Shutdown cooling relief (RV-3164) (.34)
~~Pressurizer safety valves~~ (.33)
REFERENCE
M-201 sheet 3 Pressurizer PORV's (.33)

ANSWER 6.07 (1.00)

To reduce the amount of water which must be processed by the radwaste system.

REFERENCE
System Lesson Plan 25a, p 15

ANSWER 6.08 (1.00)

Protect the piping between the shutdown cooling isolation valves (.5) from pressure developed due to a sudden temperature increase inside of the containment. (.5)

REFERENCE
System Lesson Notes #9, p 11

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 6.09 (2.00)

a. When the plant is operating above 557 F Tavg (.5) at the time of a turbine trip. (.5)

b. The narrow range temperature instrument is used, which has a minimum output corresponding to 515 F. (1.0)

REFERENCE
System Lesson Notes #18, System Functional Description 5.3, p 13 and 14

ANSWER 6.10 (1.00)

Feedwater regulating valves fail as is (.5), while the feedwater pump turbines ramp down to a speed adequate for excess heat removal. (.5)

REFERENCE
System Lesson Notes #17, p 3

ANSWER 6.11 (1.50)

1. 5 seconds after the AFAS, pump P8A starts (.5)
2. If P8A fails to start or flow is less than 50 gpm within 15 seconds of the AFAS, pump P8C starts (.5)
3. If P8C fails to start of if flow is less than 50 gpm within 80 seconds after the AFAS, the steam control valves for P8B get an open signal (.5)

REFERENCE
System Lesson Plan 19b, p 8

ANSWER 6.12 (1.00)

Water flows out the bottom blowdowns (.2), through the steam generator blowdown pumps (.2), the blowdown heat exchanger (.2), the #3 demin (.2) and back into the steam generator at the former surface blowdown connection. (.2)

REFERENCE
System Lesson Notes #28, p 6

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 6.13 (1.50)

1. P-52A and B start after 23 seconds (.5)
2. P-52C is placed in standby after 40 seconds (.5), then starts if pressure is less than 80 psig (.5)

REFERENCE
System Lesson Plan 15b, p 7

ANSWER 6.14 (1.00)

Containment high pressure (.5) and Safety Injection (.5)

REFERENCE
System Lesson Plan 15a, p8

ANSWER 6.15 (2.00)

a. Hydrazine - to enhance iodine removal by containment spray (.5)
   Sodium Hydroxide - to raise the pH of the recirculated water to enhance iodine retention (.5)

b. Hydrazine - added at the initiation of containment spray (.5)
   Sodium Hydroxide - added during recirculation (.5)

REFERENCE
System Lesson Notes #26, p 2 and 4

ANSWER 6.16 (1.00)

P9A - 90 psig Fire System Header Pressure (.33)
P9B - 75 psig Fire System Header Pressure (.33) or 80 psig
P41 - 60 psig Fire System Header Pressure (.33) or 65 psig

REFERENCE
System Lesson Notes #34, p 17
SOP-21 step 7.1

ANSWER 6.17 (1.00)

The teflon rings will release toxic fumes.

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

REFERENCE
System Lesson Notes #27, System Functional Description 6.2.1, p 6

ANSWER 6.18 (1.00)

Insure service water pressure is greater than seal oil pressure in case of a leak in the seal ~~water~~ oil heat exchanger.

REFERENCE
System Lesson Plan 15a, p 11

ANSWER 6.19 (1.00)

To provide carbon dioxide for purging the main generator of air prior to filling with hydrogen (.5) and purging the main generator of hydrogen in case it is necessary to open the generator for maintenance. (.5)

REFERENCE
System Lesson Notes #31, p 15

ANSWER 6.20 (1.00)

Loss of generator excitation (.33)
Overload (.33)
Generator differential relay action (.34)

REFERENCE
System Lesson Notes #33, p 15
Logic Diagram E-17, sheet 2

overspeed
overcrank
low bearing oil pressure
2400 V bus transfer

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 7.01 (1.50)

No. (.5) Shutting valves may: 1. damage system components (1.0)
2. increase leakage (1.0)
3. increase personnel exposure (1.0)

Any one of the three explanations, or other reasonable e planation, will be awarded full credit.

REFERENCE
Admin Proc 7.00 step 2.0.a.1

ANSWER 7.02 (1.00)

1. Proceed to the change room at access control (.5)
2. Perform a whole body frisk (.5)

REFERENCE
Admin Proc 7.00 step 5.0.b

ANSWER 7.03 (2.00)

1. An inverse multiplication plot must be used if only one startup detector is operable (.5); it is optional if 2 startup detectors are operable (.5).
2. Rods must be fully withdrawn and the reactor diluted to critical if only one startup detector is operable (.5); dilution to critical is optional if two startup detectors are operable, in which case rods are only withdrawn to the predicted critical positon (.5).

REFERENCE
GCL 3 steps 2.3 and 2.4

ANSWER 7.04 (1.00)

Log the time, differential temperature and pressurizer pressure in the reactor logbook.

REFERENCE
SOP 1 step 4.0.m

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 7.03 (1.00)

One of the following situations:
1. PCS pressure is below 300 F and 400 psi
2. shutdown cooling isolation valves MO-3015 and 3016 are open
3. shutdown cooling cooling system is in service

REFERENCE
SOP 1 step 4.0.q
SOP 3 step 4.0.g

ANSWER 7.06 (2.50)

a. 250 psia

b. 250 F

c. 32 F

d. 3.75%

e. 1250 psia

REFERENCE
SOP 1 steps 4.0.c, 4.0.o, 5.0.e, 5.0.g
EOP 8.1 step 3.3

ANSWER 7.07 (1.00)

notify the chemical laboratory to sample the steam generators for activity (.5)
record in the control room logbook the length of time the dumps are open (.5)

REFERENCE
SOP 7 step 5.0.d

ANSWER 7.08 (1.50)

Prevent dumping the contents of the component cooling system directly into the lake.

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

REFERENCE
SOP 15 step 5.0

ANSWER 7.09 (1.00)

Overpressurization and rupture of the tank can occur if the vent is plugged with boric acid.

REFERENCE
SOP 17A step 5.6

ANSWER 7.10 (1.00)

Prevent drawing a vacuum and imploding the safety injection tank.

REFERENCE
SOP 3 step 7.5.4.a

ANSWER 7.11 (1.50)

Prevent overflowing the spent fuel pool.

REFERENCE
SOP 27 step 6.1.5.10

ANSWER 7.12 (1.00)

A control rod is too light.

REFERENCE
SOP 28 step 5.5

ANSWER 7.13 (1.00)

To maintain a load on the turbine to slow it down faster. OR
To maintain main generator excitation in order to keep the primary coolant pumps energized so PCS flow will be maintained longer.

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

REFERENCE
EOP 1 step 3
System Lesson Notes #33, p 5

ANSWER 7.14 (1.00)

1. wide range level below -125% (.5)
2. steam generator pressure below the saturation pressure of the PCS (.5)

REFERENCE
EOP 1 step 4.7

ANSWER 7.15 (1.50)

a. 30 gpm (.5)

b. Trip the charging pumps one at a time until the flow rate of the running HPSI pumps exceeds 30 gpm. (.5) If all charging pumps are tripped and HPSI flow remains below 30 gpm, trip one HPSI pump if both are running and one is needed. (.5)
OR Trip the HPSI pumps (1.0)

REFERENCE
EOP 8.1 step 4.15.b.1
SOP 3 step 7.1.1

ANSWER 7.16 (1.00)

Prevent the introduction of noncondensable gases into the PCS.

REFERENCE
EOP 8.1 step 4.16

ANSWER 7.17 (1.00)

Run at least one HPSI pump and open both pressurizer PORVs.

REFERENCE
EOP 8.1 attachment 6

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 7.18 (1.00)

Prevent dilution of the PCS

REFERENCE
EOP 8.2 step 4.7

ANSWER 7.19 (1.50)

a. Loss of Instrument Bus Y01 (.5)

b. 1. Trip the reactor (.25)
2. Isolate letdown (close CV-2001) (.25)
3. Close the primary coolant pump controlled bleedoff containment isolation valve (CV-2083) and insure the primary coolant pump controlled bleedoff relief stop valve (CV-2191) is open. (.25)
4. Activate the site emergency plan (.25)

REFERENCE
ONP 24.5 step 3.0

ANSWER 7.20 (1.00)

Reduce inventory loss out of a hot leg break.

REFERENCE
Mitigation of Core Damage, p 33

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 8.01 (.50)

c

REFERENCE
Tech Spec 1.4

ANSWER 8.02 (.50)

b

REFERENCE
Standing Order No. 8

ANSWER 8.03 (.50)

d

REFERENCE
Standing Order No. 14, 2.A and C

ANSWER 8.04 (.50)

d

REFERENCE
Standing Order No. 14, 3.C

ANSWER 8.05 (.50)

a

REFERENCE
Standing Order No. 14, 3.A

ANSWER 8.06 (.50)

b

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

REFERENCE
Standing Order No. 18

ANSWER 8.07 (.50)

a

REFERENCE
Standing Order No. 22

ANSWER 8.08 (.50)

False

REFERENCE
Standing Order No. 35

ANSWER 8.09 (.50)

False

REFERENCE
Standing Order No. 35

ANSWER 8.10 (.50)

c

REFERENCE
Standing Order No. 40

ANSWER 8.11 (.50)

a

REFERENCE
Standing Order No. 41

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 8.12 (.50)

c

REFERENCE
Standing Order No. 41

ANSWER 8.13 (.50)

d

REFERENCE
Standing Order No. 43

ANSWER 8.14 (.50)

b

REFERENCE
Standing Order No. 44

ANSWER 8.15 (.50)

d

REFERENCE
Standing Order No. 52

ANSWER 8.16 (.50)

a

REFERENCE
Standing Order No. 55

ANSWER 8.17 (.50)

d

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

REFERENCE
Technical Specification 3.0.3

ANSWER 8.18 (.50)

False

REFERENCE
Technical Specification 3.0.4

ANSWER 8.19 (.50)

c

REFERENCE
Standing Order No. 54, 3.4.1;
Technical Specifications 1.1, 3.6.1.a

ANSWER 8.20 (.50)

d

REFERENCE
Standing Order 54, 3.6

ANSWER 8.21 (.50)

b

REFERENCE
Standing Order No. 54, 3.7.1

ANSWER 8.22 (.50)

c or d

REFERENCE
Standing Order No. 54, 3.7.1
SOP 30 step 7.1.1

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 8.23 (.50)

d

REFERENCE
Technical Specifications 1.1 and 3.8.1
Standing Order No. 54, 3.8.1.i and 3.14.1

ANSWER 8.24 (.50)

c

REFERENCE
Standing Order No. 54, Table 3.17.4, Numbers 23 and 24
Technical Specification Table 3.17.4, No. 9

ANSWER 8.25 (.50)

a

REFERENCE
Technical Specification 6.7.1

ANSWER 8.26 (.50)

d

REFERENCE
Technical Specifications 3.1.4 and 3.1.5

ANSWER 8.27 (.50)

c

REFERENCE
Technical Specification 3.3.2.g

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 8.28 (.50)

b

REFERENCE
Technical Specification 3.1.7.c and 3.3.1.b

ANSWER 8.29 (.50)

a or b

REFERENCE
Technical Specification Table 3.24-1
System Lesson Notes #38, p 18
Technical Specification Table 4.2.1, item 1

ANSWER 8.30 (.50)

a

REFERENCE
Admin Procedure 7.04 step 5.1.b

ANSWER 8.31 (.50)

d

REFERENCE
Site Emergency Plan, 3.0

ANSWER 8.32 (.50)

a

REFERENCE
Site Emergency Plan 5.3.3

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 8.33 (.50)

d

REFERENCE
EI - 12.3 step 5.8

ANSWER 8.34 (.50)

True

REFERENCE
EI - 12.3 step 5.9.2

ANSWER 8.35 (.50)

c

REFERENCE
Admin Proc 4.02 step 5.1.e

ANSWER 8.36 (.50)

b

REFERENCE
Admin Proc 4.02 step 7.2.1

ANSWER 8.37 (.50)

d

REFERENCE
Admin Proc 4.03 step 8.1

ANSWER 8.38 (.50)

b

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

REFERENCE
Admin Proc 4.03 step 9.2

ANSWER 8.39 (.50)

False

REFERENCE
Admin Proc 5.01 step 8.2

ANSWER 8.40 (.50)

d

REFERENCE
Admin Procedures 4.03 steps 8.0, 9.1.1.b and 9.2, and 5.05 step 5.1

ANSWER 8.41 (.50)

False

REFERENCE
Admin Proc 4.03 step 11.0

ANSWER 8.42 (.50)

b

REFERENCE
Admin Proc 4.03 step 6.5.2

ANSWER 8.43 (.50)

c

REFERENCE
Admin Proc 7.03 step 5.3

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

ANSWER 8.44 (.50)

c

REFERENCE
Admin Proc 7.04 step 5.2.a

ANSWER 8.45 (.50)

a

REFERENCE
Admin Proc 7.04 steps 5.3.2.a and 5.4.d

ANSWER 8.46 (.50)

c

REFERENCE
Admin Proc 7.04 Table 1

ANSWER 8.47 (.50)

False

REFERENCE
Admin Proc 8.07 step 5.1

ANSWER 8.48 (.50)

b

REFERENCE
Admin Proc 8.07 step 9.3

ANSWER 8.49 (.50)

d

ANSWERS -- PALISADES -85/07/09-HIGGINS, R.

REFERENCE
Admin Proc 10.41 step 5.6

ANSWER 8.50 (.50)

b

REFERENCE
Admin Proc 10.41 step 5.6

CONSUMERS POWER COMPANY

NUCLEAR TRAINING CENTER

Instructor Lesson Plan

Program Title: Nuclear Operator Training Lesson Plan No. SRO 7/3/85

Course: SRO Requal Exam & Key

Module: Section 5

Topic:

Revision: 0

L. Schmiedknecht/ R. Heimsath 7/1/85
Originator Date

R. Bloomfield 7/2/85
Subject Matter - Technical Reviewer Date

B. Doty Robert W. Doty for Bill Marvin 7/2/85
Approved - Training Supervisor Date

Consumers Power Company

NUCLEAR OPERATIONS DEPARTMENT
Document Review Sheet

Document Title	Document Number	Revision	Revision Number	Page
SRO Requal Exam and Key -- Section 5	NA	NA	NA	1 of 1

Item Number	Page and/or Section Number		Comments	Response or Resolution
5.2		✓	Answer 2 should include "(or relatively long $t_{1/2}$)"	I agree, RHemmerath (corrected)
5.3		✓	Question assumes a negative moderator temperature coefficient and should state such.	Included for EOL conditions. RBH RHR
~~5.3~~ RHR	5.3	✓	The greater negative reactivity insertion will occur @ 500°F IAW P_{H_2O} vs Temp Relationship. Answer should be changed to reflect correct answer.	I agree, RBH answer corrected. RHR
5.6		✓	Answer B. An acceptable response should also be "stays relatively the same." The answer to this question is dependent upon the reference :. either answer (less neg or the same) should be allowed.	removed STAY the same as a possible answer RBH RHR
~~5.10.a~~	5.10.a	✓	Change question to read as follows. "The change in pump discharge head is proportional to the change in speed squared for a centrifugal pump in a system."	agree, Question rewritten as indicated. RBH.
5.12			Question should state the reference, i.e. - "IAW Tech Specs ..." or an acceptable answer should also be "High Power Trip"	all plant references indicate TM/LP + Low Flow setpt RBH RHR

Reviewer	Organization	Date	Review Coordinator	Date	Document Sponsor	Date
RR Bousfield	Pal. - contractor	7/2/85	RHemmerath	7/2/85	RHemmerath	7/2/85

Form 3110 1-82

Consumers Power Company

PERSONAL AND CONFIDENTIAL

NOTD
EXAMINATION COVER SHEET

Name _____ Social Security No _____

Company Consumer Power Company Please Circle: 06*02 CP Co Employee
Applicable No: 06*03 Non-CP Co Employee

Work Location Palisades

Department _____ EIS No 600421

Course Annual Requal Exam UFI No 06*20/19

Class No 7/3/85 Exam No 1 of 1

Reverification _____ Instructor _____

Date Administered 7/3/85 Administered by NRC

Date Graded _____ Graded by _____

Grade _____

"Cheating on exams shall be cause for disciplinary action in accordance with the applicable General Order or Working Agreement. All incidents of cheating shall be reported to the cognizant supervisor(s) and the Director - Nuclear Operations Training Department, and shall result in immediate forfeiture of the student's exam."

I was given the opportunity to review the correct responses to this examination.

Signed _____

Date _____

EQUATION SHEET

$f = ma$

$w = mg_2$

$E = mc^2$

$KE = 1/2\ mv^2$

$PE = mgn$

$V_f = V_o + at$

$W = v\ \Delta P$

$\Delta E = 931\ \Delta m$

$\dot{Q} = mC\rho\Delta t$

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

$Pwr = W_f \Delta h$

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

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

$SUR = 26.06/T$

$SUR = 26\rho/\ell^* = (\beta - \rho)T$

$T = (\ell^*/\rho) + [(\beta - \rho)/\bar{\lambda}\rho]$

$T = \ell^*/\rho$

$T = (\beta - \rho)/(\bar{\lambda}\rho)$

$\rho = (K_{eff}^{-1})/K_{eff} = \Delta K_{eff}/K_{eff}$

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

$P = (\Sigma\phi V)/(3 \times 10^{10})$

$\Sigma = \sigma N$

$v = s/t$

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

$a = (V_f - V_o)/t$

$w = \theta/t$

Cycle efficiency = (Network out)/(Energy in)

$A = \lambda N \qquad A = A_o e^{\lambda t}$

$\lambda = \ell n 2/t_{1/2} = 0.693/t_{1/2}$

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

$I = I_o e^{-\Sigma x}$

$I = I_o e^{-\mu x}$

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

$TVL = 1.3/\mu$

$TVL = -0.693/\mu$

$SCR = S/(1 - K_{eff})$

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

$CR_1\ (1 - K_{eff1}) = CR_2\ (1 - k_{eff2})$

$M = 1/(1 - K_{eff}) = CR_1/CR_o$

$M = (1 - K_{effo})/(1 - K_{eff1})$

$SDM = (1 - K_{eff})/K_{eff}$

$\ell^* = 10^{-5}$ seconds

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

$I_1 d_1 = I_2 d_2$

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

$R/hr = (0.5\ CE)/d^2 (meters)$

$R/hr = 6CE/d^2$ (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 (At Atm Press)
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in Hg
1 ft H_2O = 0.4335 lbf/in^2
1 in Hg = 0.491 lbf/in^2

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

SECTION 5 SRO EXAM

5.1 State the reason for overlap of control rod groups 1-4 for withdrawal and insertion. (1.0)

5.2 State three (3) reasons why tritium is more of a problem than other radioactive isotopes found in the plant. (1.0)

5.3 For EOC conditions, is there a difference in the net reactivity for a 1°F. change in moderator temperature where the moderator temperature is 70°F. as opposed to 500°F.? If there is a difference, at which temperature is the most negative reactivity inserted? (1.5)

5.4 What effect does the buildup of Pu-239 over core life have on reactor control for equal reactivity additions at BOC and EOC? (1.0)

5.5 State three (3) reasons for control rod power dependent insertion limits. (1.5)

5.6 a. Is the reciprocal boron worth greater at the BOC or EOC? (.75)

b. Does fuel temperature defect become more negative, or less negative over core life? (.75)

5.7 List three ways in which gammas react with matter. (1.0)

5.8 True or False (1.5)

a. The leak rate from a closed system can be reduced by reducing pressure within the system.

b. The definition of enthalpy is the sum of internal energy and external energy of a substance.

c. The definition of natural convection is heat flow as a result of density changes in a working fluid.

5.9 With the plant operating at 100 percent power, the water level in 5A and B feedwater heaters (shell side) increases above the normal control level, would you expect the temperature of the water exiting the tube side to remain constant, increase or decrease? (.5)

5.10 True or False

a. Pump discharge head is proportional to the change in speed squared for a centrifugal pump in a system. (.5)

b. Neutron flux causes steel in the reactor vessel to become more ductile at given temps. (.5)

5.11 In regards to a restriction type flow measuring device, the following questions deal with the relationship of flow to pressure and pressure to velocity.

a. Which of the following accurately describes the relationship between flow and pressure through the restriction? (.5)

1. Flow $\propto$ Δ Pressure

2. Flow $\propto \frac{1}{\Delta \text{Pressure}}$

3. $\text{Flow}^2 \propto$ Pressure

4. Flow $\propto \sqrt{\Delta \text{Pressure}}$

b. Which of the following describes the relationship of Pressure (P) and Velocity (V) through a restriction? (.5)

1. P↑ V↓
2. P↓ V↑
3. P↓ V↓
4. P↑ V↑

5.12 List the two Reactor Protection System trips which protect against Departure from Nucleate Boiling. (1.5)

5.13 Indicate for the following events if the Cooling Tower pump motor amps will increase, decrease or remain the same.

a. Increase circulating water temp by 20°F. (.25)

b. Decrease in voltage on 'F' and 'G' busses. (.25)

c. Increase in Stator Temp. (.25)

d. Throttle discharge valve to increase pump suction basin level. (.25)

SECTION 5 SRO EXAM KEY

5.1 State the reason for overlap of control rod groups 1-4 for withdrawal and insertion. (1.0)

ANSWER

To allow a smooth and continuous rate of change of reactivity or prevent the rates of reactivity change and the worth of individual control rods from exceeding the selected limiting values.

Reference: FSAR 5.1-12, 7.5-6
Tech Specs 3.10
Adv Sys LP 26A, Objective 1 and 26B, Objective 10

5.2 State three (3) reasons why tritium is more of a problem than other radioactive isotopes found in the plant. (1.0)

ANSWER

a. Any two of the following at .33 each

1. Tritium emits a low-energy beta and is hard to detect
2. Tritium has a 12 year half life of relatively long $T_{\frac{1}{2}}$
3. Tritium can diffuse through metal
4. Tritium is an isotope of hydrogen, so it cannot be filtered or chemically removed
5. Tritium can easily enter a human's body

Reference: Tech Specs, Nuclear Physics, Chemistry

5.3 For EOC conditions, is there a difference in the net reactivity addition for a 1°F. change in moderator temperature where the moderator temperature is at 70°F. as opposed to 500°F.? If there is a difference, at which temperature is the most negative reactivity inserted? (1.5)

ANSWER

Yes (.75)
500°F. (.75)

Reference: LP NOT 4.4-02-17, Obj F, I
LP NOT 4.4-02-18, Obj B

5.4 What effect does the buildup of Pu-239 over core life have on reactor control for equal reactivity additions at BOC and EOC? (1.0)

ANSWER (1.0)

For equal reactivity additions, the SUR would be higher at EOC than BOC. (Higher SUR = Shorter Period.)

Reference: LP NOT 4.4-02-20, Obj D-3
LP NOT 4.4-02-15, Obj B-2

5.5 State three (3) reasons for control rod power dependent insertion limits. (1.5)

ANSWER

1. Ensure shutdown margin limits are satisfied (.5)
2. Limit individual rod worth (.5)
3. Limit hot channel factors (.5)

Reference: Technical Specification 3-60
Advanced System Lesson Plan 26B, Objective 8

5.6 a. Is the reciprocal boron worth greater at the BOC or EOC? (.75)

b. Does fuel temperature defect become more negative or less negative over core life? (.75)

ANSWER

a. BOC (.75)
b. Less negative (.75)

Reference: Tech Data Book
LP NOT 4.4-02-21, Obj B

5.7 List three ways in which gammas react with matter. (1.0)

ANSWER

Photoelectric effect (.33)
Comptons scattering (.33)
Pair production (.33)

Reference: LP NOT 4.4-02-04, Obj C

5.8 True or False (1.5)

a. The leak rate from a closed system can be reduced by reducing pressure within the system.

b. The definition of enthalpy is the sum of internal energy and external energy of a substance.

c. The definition of natural convection is heat flow as a result of density changes in a working fluid.

ANSWER

a. True (.5)
b. False (.5)
c. True (.5)

Reference: LP NOT 4.4-08-01, Obj A-2-d
LP NOT 4.4-08-01, Obj 6a
LP NOT 4.4-08-01, Obj C-1.a.1

5.9 With the plant operating at 100 percent power, the water level in 5A and B feedwater heaters (shell side) increases above the normal control level, would you expect the temperature of the water exiting the tube side to remain constant, increase or decrease? (.5)

ANSWER

Decrease

Reference: Advanced System Lesson Plan 18C, Objective 5

5.10 True or False

a. Pump discharge head is proportional to the change in speed squared for a centrifugal pump in a system. (.5)

b. Neutron flux causes steel in the reactor vessel to become more ductile at given temps. (.5)

ANSWER

a. True (.5)
b. False (.5)

Reference: LP NOT 4.4-08-03, Obj B-1.d.2.b
LP NOT 4.4-08-03, Obj B

5.11 In regards to a restriction type flow measuring device, the following questions deal with the relationship of flow to pressure and pressure to velocity.

a. Which of the following accurately describes the relationship between flow and pressure through the restriction? (.5)

1. Flow $\propto \Delta$ Pressure

2. Flow $\propto \frac{1}{\Delta \text{Pressure}}$

3. $\text{Flow}^2 \propto$ Pressure

4. Flow $\propto \sqrt{\Delta \text{Pressure}}$

ANSWER

4

Reference: I&C 07-01-02

b. Which of the following describes the relationship of Pressure (P) and Velocity (V) through a restriction? (.5)

1. P↑ V↓
2. P↓ V↑
3. P↓ V↓
4. P↑ V↑

ANSWER

2

Reference: I&C 07-01-02

5.12 List the two Reactor Protection System trips which protect against Departure from Nucleate Boiling. (1.5)

ANSWER

1. Low Flow (.75)

2. TMLP (.75)

Reference: TS Sect 2.3

5.13 Indicate for the following events if the Cooling Tower pump motor amps will increase, decrease or remain the same.

a. Increase circulating water temp by 20°F. (.25)

ANSWER

Decrease

Reference: LP NOT 4.4-08-03, Objective B
Advanced System Lesson Plan 17C, Obj 2

b. Decrease in voltage on 'F' and 'G' busses. (.25)

ANSWER

Increase

Reference: LP NOT 4.4-03-01, Obj A
Adv Systems LP 17, Obj 2

c. Increase in Stator Temp. (.25)

ANSWER

Increase

Reference: LP NOT 4.4-03-01, Obj D
Adv Systems LP 17, Obj 2

d. Throttle discharge valve to increase pump suction basin level. (.25)

ANSWER

Decrease

Reference: LP NOT 4.4-08-03, Obj B
Adv Sys LP 17, Obj 2