ENCLOSURE 1

EXAMINATION REPORT - 50-302/OL-84-02

Facility Licensee: Florida Power Corporation

Facility Name: Crystal River Unit 3

Facility Docket No. 50-302

Written examinations were administered at Crystal River Training Center near Crystal River, Florida. Oral examinations were administered at Crystal River Power Plant near Crystal River, Florida.

Chief Examiner: Sandy Lawyer — 3/1/85 Date Signed

Approved by: Bruce A. Wilson, Section Chief — 3/1/85 Date Signed

Summary:

Examinations on December 17 - 20, 1984

Examinations were administered to seven SRO candidates, six of whom passed.

Examinations were administered to four RO candidates, all of whom passed.

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REPORT DETAILS

1. Persons Examined

SRO Candidates:

Gallion, Earnest J.
Harmon, Steven F.
Long, Ronald A.
Hickle, Bruce J.
Kirk, Michael W.
Metcalf, Thomas E.
Welch, Earl E.

RO Candidates:

Ashworth, Donald C.
Carr, William G.
Garrett, Jimmy Sr.
Rawls, Ricky E.

Other Facility Employees Contacted:

*J. R. Cuneo, Lic. Op. Training Supervisor
*V. R. Roppel, Plant Engineering and Technical Services Manager
*G. L. Boldt, Plant Operations Manager
*B. E. Crane, Training Manager
*J. L. Bufe, Nuclear Compliance Specialist
*W. P. Ellsberry, Technical Training Supervisor
*J. F. Belzer, Nuclear Support Supervisor
L. Giles, Nuclear Training Instructor
C. D. Arbuthnot, Nuclear Operator Instructor
R. C. Zareck, Nuclear Operator Instructor
J. P. Haerle, Nuclear Operator Instructor
J. L. Springer, Nuclear Operator Instructor

*Attended Exit Meeting

2. Examiners:

Bruce Wilson
Mike King
Tom Morgan
*Sandy Lawyer

*Chief Examiner

3. Examination Review Meeting

At the conclusion of the written examinations, the examiners met with L. Giles, C. D. Arbuthnot, R. C. Zareck, J. P. Haerle, J. L. Springer and J. R. Cuneo to review the written examination and answer key. The following comments were made by the facility reviewers:

SRO EXAM

1. QUESTION 6.04

Facility Comment: The STM provided to the NRC was incorrect. The Emergency Diesel Generator crankcase pressure switch does not shutdown the engine; it provides an alarm function only.

NRC Resolution: The drawing provided confirmed the facility comment. However, the question did not ask whether it shutdown the engine or not. The question as stated can only be correctly answered with choice (d). No change to the answer key is required.

2. QUESTION 6.13

Facility Comment: This question is not appropriate. Memorization of remote interlocks on fuel handling equipment should not be required.

NRC Resolution: Choosing the correct answer from among four answers does not require memorization, but rather recognition. In addition, memorization of important load limits on the fuel handling bridge is required of SRO candidates.

3. QUESTION 6.14

Facility Comment: The STM provided to the NRC was incorrect and unclear. As a result, all answers are correct.

NRC Resolution: Review of RO-100 provided at the exam review confirms the facility comment. Question 6.14 has been deleted.

4. QUESTION 6.17

Facility Comment: We feel it is unreasonable to expect an SRO to know every vital load on every vital bus.

NRC Resolution: Choosing the correct answer from among four answers given does not require "memorization of every vital load on every vital bus." Recent LERs have demonstrated the importance of this subject matter. No change to the answer key is appropriate.

5. QUESTION 8.02, A, B & C

Facility Comment: 8.02A - The answer is 3 and 4. - The "B" HPI Pump would be placed in service prior to removal of "A" from service; hence, two HPI pumps would always be operable.

8.02B - The answer is 4 and 7. - (3.5.1/3.5.4) - For the same reason given above.

8.02C - The answer is:

- 1 (Shutdown to hotstandby) if the assumption is made that repair is made after initial 72 hours but before the 30 hour time expires.
- 3 (Shutdown to cold shutdown) with the assumption of no repair completed, or with no assumption.
- 4 (Shutdown not required) if assumption is made that repair is effected in the initial 72 hours.

NRC Resolution: The comments are accepted and the answer key has been changed accordingly.

6. QUESTION 8.10C

Facility Comment: The phrase (steady state power to steady state power) is used to denote equilibrium conditions at CR-3. Candidates will probably choose "Decrease" as the change direction for Xenon.

NRC Resolution: The meaning of the phrase "steady state power" was explained to all candidates during the exam. Therefore, no change to the answer key is appropriate.

7. QUESTION 8.16

Facility Comment: The material sent to the NRC is not up-to-date. A new letter has been generated changing the distribution.

NRC Resolution: The question has been deleted because of the extensive change to the fire brigade team manning requirements as verified by our review of the new letter. The answer key has been changed accordingly.

RO EXAM

1. QUESTION 1.05

Facility Comment: Answer (d) also appears to be correct.

NRC Response: Upon review of reference material, answer (d) was found to also be correct. The answer key was changed to reflect this.

2. QUESTION 1.22

Facility Comment: We do not believe this is appropriate for RO level, it is possibly OK for SRO.

NRC Response: The question was based on six curves from the plant curve book. The intent of the question was to test RO's familiarity with and basic knowledge of Control Rod Insertion limit curves and how these limits are affected by parametric changes such as number of operating RCPs and core burnup. We believe it is appropriate at RO level since all that is required to be known is that insertion limits become more restrictive under both circumstances. No change to question or answer is warranted.

3. QUESTION 1.25

Facility Comment: Answer (b) is also correct - reference Tech Spec pg. B 3/4 2-1.

NRC Response: Agree. Answer was based on T.S. pg 3/4 1-3 which did not include choice (b). Since there is no correct answer to the question, it was deleted.

4. QUESTION 2.06

Facility Comment: Choices (b) and (d) are both correct.

NRC Response: Reference STM 5-4 shows answer (b) is correct but incomplete. The 4 psi signal also opens the BWST outlet valves (DHV-34 and -35) and the sodium thiosulfate tank valves, although these valves are tagged out.

Choice (b) was incorrectly worded in that it should have said the only valves affected were the NaOH tank outlet and RB spray pump suction valves. Either choice (b) or (d) was accepted.

5. QUESTION 2.07

Facility Comment: Choice (b) is also correct. Training material provided as reference to NRC was incorrect. Reference Elementary drawing.

NRC Response: Either choice (b) or (c) was accepted based on new reference material.

6. QUESTION 2.09

Facility Comment: Choice (a) is also a correct response to the question. Reference material provided to NRC was incorrect. New reference provided was AP-402, "PSA G Annunicator Response." Number G-5-3 shows IAV-30 closing at an air pressure of $\leq$ 80 psi.

NRC Response: Either choice (a) or (d) was accepted based on reference supplied.

7. QUESTION 2.17

Facility Comment: All of the choices are incorrect. Reference provided was Elementary Diagram 208-026.

NRC Response: Question was reworded during exam because reference material provided for developing exam was suspect. Reference diagram 208-026 showed attempt to save question was unsuccessful. Since there is no correct answer to the question, it was deleted.

8. QUESTION 2.19

Facility Comment: Choice (b) and (d) are also proper answers. STM provided to develop exam was wrong. New STM was provided as reference.

NRC Response: New STM provided during exam review shows answers (a), (b), and (d) to be correct responses. All three choices will be accepted.

9. QUESTION 2.20

Facility Comment: Although there is no problem with the concept of what the question is asking for, there is a great deal of

concern about asking specifics of responses to annunciators. It is unreasonable to expect operators to know all annunicator responses and this is, in fact, what the annunciator response manual is for.

NRC Response: We acknowledge the comment and agree with the concerns expressed. The question however, was a design question and expected the operator to know some design specifics of the closed cycle cooling system rather than the response to a particular annunciator. No change to question or answer is appropriate.

10. QUESTION 3.01

Facility Comment: Choice (d) is also a correct response.

NRC Response: In choice (d), the limit of 60% was originally written as 75%. It was inadvertently changed during final exam proof and typing. Both choices (c) and (d) are accepted.

11. QUESTION 3.19

Facility Comment: The answer, choice (c) is incorrect since the valve Δp is maintained at 80 psid rather than 35. A new draft STM was provided as a reference. The answer as written was obtained from two different chapters of the plant's STM.

NRC Response: Since none of the statements are TRUE, the question will be deleted.

4. Exit Meeting

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

There were no generic weaknesses noted during the oral examination. The cooperation given to the examiners and the effort to ensure an atmosphere in the control room conducive to oral examinations was also noted and appreciated.

5. The following additional changes were made to the examination and answer key based upon NRC review during the grading process:

   a. Question 5.06.c

      Answers 3 and 4 are acceptable based on assumption of beta effective. No changes to candidates grading were required.

   b. Question 5.08.d.

      Answers 1 and 2 were accepted. Depending upon the reference material both concepts are often taught.

   c. Question 5.09.b.

      Answers 2, 3 and 4 were accepted. Although answer 2 was the correct choice from facility supplied information, other references show answer 3 is also correct. Also, there is too much overlap between the distractors.

   d. Question 7.13.a

      Question is not worded sufficiently clearly to define its intent, i.e., is a trip required for all seismic events? Procedure AP-961 does require a reactor trip as an immediate action under certain circumstances. Credit was given for both answers.

Enclosure 3

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

MASTER COPY

FACILITY: CRYSTAL RIVER

REACTOR TYPE: PWR-B&W177

DATE ADMINISTERED: 84/12/17

EXAMINER: KING, M.

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 (3.00)

True or False?

a. The differential temperature necessary to transfer heat is inversely proportional to heat flux. (0.5)

b. Pump runout is the term used to describe a centrifugal pump when it is operating with its discharge valve shut. (0.5)

c. The latent heat of vaporization is another term for the latent heat of condensation. (0.5)

d. One of the pump laws for centrifugal pumps states that power required by the pump motor is directly proportional to the square of the pump speed. (0.5)

e. The faster a centrifugal pump rotates, the greater the NPSH required to prevent cavitation. (0.5)

f. When comparing a parallel-flow heat exchanger to a counter-flow heat exchanger, the temperature difference between the two fluids along the LENGTH of the heat exchanger tubes is MORE uniform for the parallel-flow heat exchanger. (0.5)

QUESTION 5.02 (1.00)

True or False

a. At high boron concentrations (ppm), as the moderator temperature increases, the ppm boron decreases resulting in a positive (+) moderator temperature coefficient. (0.5)

b. Xenon oscillations may be dampened by increasing boron concentration. (0.5)

QUESTION 5.03 (1.00)

Which fluid system is subcooled by greater than 30 F?

	TEMP.	PRESS. (psia)
a.	540	1000
b.	560	1500
c.	665	2000
d.	640	2400

QUESTION 5.04 (1.50)

Critical Heat Flux (CHF) is defined as the heat flux at which Departure from Nucleate Boiling (DNB) occurs. For an INCREASE in each of the parameters below, tell how the CHF will change. (Consider each parameter seperately.)

Limit your answer to INCREASE, DECREASE, or REMAINS UNCHANGED.

a. Reactor Coolant Flow Rate.

b. Reactor Coolant Temperature.

c. Reactor Coolant Pressure. [3 @ 0.5 ea] (1.5)

QUESTION 5.05 (1.50)

Assume that your plant has experienced a degraded power condition and that you are monitoring the plant's cooldown on natural circulation.

Identify whether the following statements are TRUE or FALSE:

a. A slow downward trend in indicated Tave is always a good indication of well-established natural circulation flow. (0.5)

b. A difference between wide-range T h and wide-range T c of 65°F and slowly increasing indicates that natural circulation flow is developing. (0.5)

c. Natural circulation flow rate can be increased by rapidly increasing steam flow rate by ~5%. (0.5)

QUESTION 5.06 (3.00)

The reactor is shutdown with a K eff of 0.9 ~~delta K/K~~ and the source range indicates 100 cps. Rods are withdrawn and source range now indicates 200 cps.

Choose the correct answer for each of the three (3) questions below:

a. The new K eff will be?
   1. 0.93 ~~delta K/K~~
   2. 0.95 ~~delta K/K~~
   3. 0.97 ~~delta K/K~~
   4. 0.99 ~~delta K/K~~ (1.0)

b. The amount of reactivity added was?
   1. 0.0449 delta K/K
   2. 0.0526 delta K/K
   3. 0.0585 delta K/K
   4. 0.0635 delta K/K (1.0)

c. If the same amount of reactivity were added again the reactor would be:
   1. Sub-critical
   2. Critical
   3. Super-critical
   4. Prompt-critical (1.0)

QUESTION 5.07 (1.00)

Are the following statements about the Doppler Coefficient TRUE or FALSE?

a. Doppler coefficient becomes more negative from 0-100% power due to the increased overlapping of resonance peaks at higher fuel temperatures. (0.5)

b. Doppler coefficient becomes more negative over core life due to the buildup of Pu240 and fission products with large resonances in the epithermal range. (0.5)

QUESTION 5.08 (2.00)

Match the following terms with their definitions:

TERMS:

a. Natural circulation
b. Saturated Liquid
c. Enthalpy
d. Departure from Nucleate Boiling

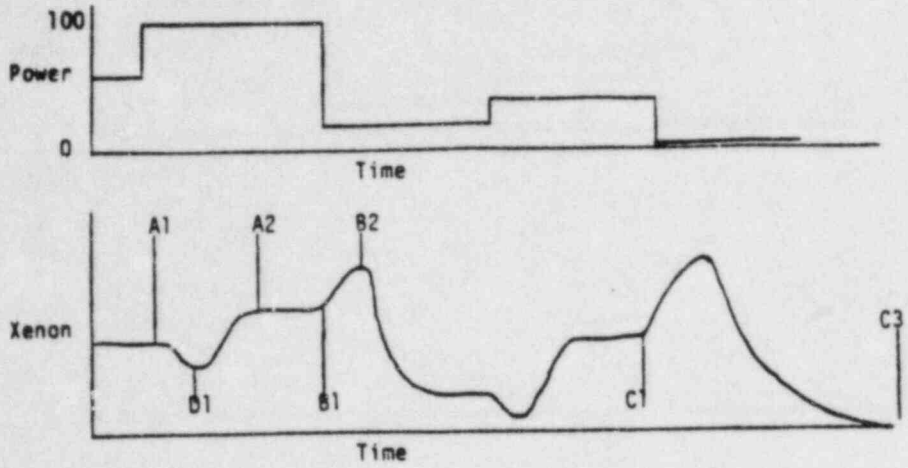
DEFINITIONS:

1. The point at which partial film boiling begins.
2. The point on the boiling curve where heat transfer surface temperature will rise sharply with little or no increase in heat flux.
3. The movement of a fluid base and the differences in density of the fluid caused by a differential temperature.
4. The total energy of a substance per unit mass.
5. A liquid that cannot absorb any more energy without starting to vaporize.
6. The internal energy of a system that is no longer available to do work.

[4 @ 0.5 ea] (2.0)

QUESTION 5.09 (3.00)

Using the following figures, choose the correct answer for each of the three (3) question asked below:



a. What is the approximate time from A1 to A2?

1. 10 hours
2. 30 hours
3. 50 hours
4. 70 hours (1.0)

b. What is the approximate time from B1 to B2?

1. 1-3 hours
2. 2-6 hours
3. 5-7 hours
4. 6-9 hours (1.0)

c. Why does Xe concentration decrease from A1 to D1?

1. Xenon decay is equal to iodine decay
2. Xenon burnout is equal to iodine decaying to Xenon
3. Xenon burnout is greater than iodine decaying to Xenon
4. Xenon decay is greater than iodine decay (1.0)

QUESTION 5.10 (2.00)

If steam goes through an ideal throttling process from a high pressure steamline to atmospheric, will the following INCREASE, DECREASE or REMAINS CONSTANT? [no explaination required]

a. entropy

b. enthalpy

c. pressure

d. specific volume [4 @ 0.5 ea] (2.0)

QUESTION 5.11 (1.00)

What percentage of delayed neutrons are born at thermal energies?

a. 49%
b. 25%
c. 7%
d. 0%

QUESTION 5.12 (2.00)

Answer the following two (2) questions with regard to Plutonium:

a. Which of the following depict how Pu239 is formed.

1. U238 + oN1 -> U239 $-B^-$ -> Np239 $-B^-$ -> Pu239

2. U235 + oN1 -> U236 +d2 -> Np238 +p1 -> Pu239

3. U238 - oN1 -> U237 $-B^-$ -> Np237 +d2 -> Pu239

4. U235 - oN1 -> U234 +He4 -> Pu238 +oN1 -> Pu239 (1.0)

b. Which of the following describes the effect Pu239 has on reactor operation:

1. Pu239 increases fuel temperature coefficient over core life.

2. Pu239 increases reactor response time for reactivity changes.

3. Pu239 increases core life due to being a fuel.

4. Pu239 increases the amount of decay heat after a shutdown. (1.0)

QUESTION 5.13 (3.00)

Indicate which of the following are TRUE and which are FALSE INDICATIONS that the point of adding heat (POAH) has been reached. [Assume normal plant operation]

a. SUR decreases

b. Pressurizer level decreases

c. T-hot increases

d. Turbine bypass controller station (Bailey) output decreases.

e. Pressurizer pressure decreases

f. T-ave increasing [6 @ 0.5 ea] (3.0)

QUESTION 6.01 (1.00)

Which of the following describes how a thermocouple will indicate when it fails open?

a. It will exhibit maximum resistance across its output leads which corresponds to a high or maximum temperature.

b. It will exhibit minimum resistance across its output leads which corresponds to a low or minimum temperature.

c. It will exhibit maximum resistance across its output leads which corresponds to a low or minimum temperature.

d. It will exhibit a different resistance across its output leads which corresponds to the temperature at the point of the failure.

QUESTION 6.02 (2.00)

Determine if the following statements about the Nuclear Instrumentation system are TRUE or FALSE.

a. The intermediate range detectors are compensated ion-chambers. The lined chamber is sensitive only to gamma rays while the unlined chamber is sensitive to both neutron and gamma rays. (0.5)

b. Undercompensation of the intermediate range detector will cause it to indicate a higher power level than actual core power. (0.5)

c. The source range detector power supply has a high voltage cutoff from the intermediate range which turns off the high voltage at 1 X 10 E-10 amps. (0.5)

d. The power range difference amplifier output is the difference in the power in the bottom and the top of the reactor core. This difference is called power imbalance. Power imbalance is equal to power in the bottom minus power in the top. (0.5)

QUESTION 6.03 (2.00)

Choose the correct statement for each of the questions asked below about the Emergency Diesel Generators.

a. The EDG can operate loaded at 3300 kw with a 0.8 power factor:

1. continuously
2. for 2000 hrs
3. for 600 hrs
4. for 30 min (1.0)

b. The following statement is refering to which one of the below listed controllers?

The CONTROLLER can be set to automatically divide and balance the load between engines parallelled on an electrical system. As the CONTROLLER reduced toward zero, the unit becomes able to change loads without changing speed. As a general rule, units running alone should have the CONTROLLLER set on zero.

1. Load Limit Control
2. Speed Droop Control
3. Compensation Adjustment Control
4. Synchronizer Control (1.0)

QUESTION 6.04 (1.00)

The 2 out of 3 low oil pressure and the 2 out of 3 high crankcase pressure shutdowns for the Emergency Diesel are activated when:

a. Generator speed is > 710 rpm for longer than 20 sec OR
Low Coolant pressure is reset for longer than 20 sec AND
Low Oil pressure is reset for longer than 20 sec.

b. Generator speed is > 810 rpm for longer than 20 sec AND
Low Coolant pressure is reset for longer than 20 sec AND
Low Oil pressure is reset for longer than 20 sec.

c. Generator speed is > 710 rpm for longer than 20 sec OR
Low Coolant pressure is reset for longer than 20 sec OR
Low Oil pressure is reset for longer than 20 sec.

d. Generator speed is > 810 rpm for longer than 20 sec OR
Low Coolant pressure is reset for longer than 20 sec AND
Low Oil pressure is reset for longer than 20 sec.

QUESTION 6.05 (1.00)

Which of the following accurately depicts the required core flood tank number and the amount of core coverage that the core flood system will provide:

a. One core flood tank will cover 3/4 of the core.

b. Two core flood tanks will cover 3/4 of the core.

c. One core flood tank will cover the entire core.

d. Two core flood tanks will cover the entire core.

QUESTION 6.06 (1.00)

With regard to the Engineered Safeguard Actuation System, determine if the following statements are TRUE or FALSE:

a. When the HPI system is bypassed, during a normal shutdown, HPI is prevented from initiating when RC pressure reaches 1500 psig, but can still be activated by a RC pressure of 500 psig. (0.5)

b. Depressing the two manual actuation pushbuttons for the LPI System, will position the LPI valves to their Engineered Safeguards position and start the decay heat pumps. (0.5)

QUESTION 6.07 (2.00)

In reference to the Control Rod Drive System answer the following two questions.

a. While in automatic on the Operator Control Panel (Diamond Panel), which of the following indicating lamps, when illuminated, will also switch the diamond panel to MANUAL?

1. Sequence-Inhibit Lamp

2. Automatic-Inhibit Lamp

3. Asymmetric Rods Lamp

4. Out-Inhibit Lamp (1.0)

b. When the Out-Limit Lamps for groups 1-8 illuminate, this indicates that at least one rod out of its respective group is at the Out-Limit of 1 1/2 inches past 100% withdrawn except _____?_____ which the Out-Limit is 91.4% withdrawn.

1. group 5

2. group 6

3. group 7

4. group 8 (1.0)

QUESTION 6.08 (1.00)

Which of the following condition(s) will put the Integrated Control System in to the tracking mode?

a. Cross Limits

b. Steam Generator Reactor Demand Hand/Auto Station in 'MANUAL'

c. A Feedwater Loop Master Hand/Auto Station in 'MANUAL'

d. Both the Diamond Control Station in 'MANUAL' AND the Reactor Demand Hand/Auto Station in 'HAND'

e. Turbine E.H.C. not in operator I.C.S. mode of control

f. A generator output breaker tripped

g. The Reactor tripped

QUESTION 6.09 (1.00)

Which of the choices listed below correctly depicts two conditions that cause I.C.S. to runback?

a. o Loss of 1 RC pump with 4 running, I.C.S. runs back to 75% reactor power at 50%/min.
   o Loss of a feedwater pump or feedwater booster pump, I.C.S. runs back to 45% unit Load demand at 50%/min.

b. o Asymmetric Rod, I.C.S. runs back to 60% reactor power at 20%/min.
   o Loss of 2 RC pumps with 4 running, I.C.S. runs back to 45% reactor power at 50%/min.

c. o Loss of 1 RC pump with 4 running, I.C.S. runs back to 75% unit load demand at 50%/min.
   o Reactor coolant flow limit, I.C.S. runsback to a reactor demand level equal to 1.1 time flow at 30%/min.

d. o Loss of either a feedwater pump or feedwater booster pump, I.C.S. runs back to 55% unit load demand at 50%/min.
   o Reactor coolant flow limit, I.C.S. runs back to a unit load demand level equal to 1.1 times flow at 20%/min.

QUESTION 6.10 (1.00)

Assuming the I.C.S. is in its normal automatic lineup and power output is at 750 MWE. Which one of the following statements most accurately describes the response the I.C.S. would take if one of the bypass valves on the 'A' side failed open?

a. The increased steam flow would start to decrease loop 'A' Tc. The delta Tc controller would reratio feedwater, cutting back on the 'A' side and increasing 'B' side feed. E.H.C. will decrease turbine throttle setting to return header pressure to setting.

b. The increased steam flow would start to decrease loop 'A' Tc. The delta Tc controller would reratio feedwater reducing 'A' feed and increasing 'B' side feed to balance delta Tc. Reactor demand would pull rods to recover Tave.

c. The increased steam flow would start to decrease steam header pressure which would then cause an error signal between header pressure and set pressure. This error signal would then be given to the control valves to close to compensate for the increased steam flow.

d. The increased steam flow would cause a decrease in Tave thereby causing the reactor demand to pull rods to compensate for the decrease. With the correction being greater than 5%, feedwater would be cross limited and increased by 2% to makeup for the increased steam flow.

QUESTION 6.11 (2.00)

Listed below are four parameters that input into the BTU calculator. For each, indicate how each would have to change [INCREASE, DECREASE or REMAIN THE SAME] in order for the BTU limit to be increased.

a. Feedwater Temperature

b. Hot Leg Temperature

c. O.T.S.G. Pressure

d. R.C. System Flow [4 @ 0.5 ea] (2.0)

QUESTION 6.12 (3.00)

Place the following Makeup & Purification System components in the proper order, starting with the origin of letdown to the suction of the makeup pumps.

a. MU & P Demins
b. RCP Seal return
c. Prefilters
d. Post filters
e. Block Orifice
f. Supply FROM DHR
g. MU Tank
h. Connections to Cation Demins
i. MUV-49
j. Supply to RM-L1
k. LPI piggy back supply conn.
l. Return TO DHR
m. Connection from FEED Supplies
n. Letdown Coolers
o. MUV-64

[15 @ 0.2 ea] (3.0)

QUESTION 6.13 (2.00)

The operation of the control rod grapple, on the Main Fuel Handling Bridge, is limited by load indication on the Dillon Load Cell.

a. The grapple cannot be LOWERED if the Dillon reads less than?

1. 1800 #
2. 2100 #
3. 600 #
4. 900 #

(1.0)

b. The grapple cannot be RAISED, if selected for orifice rod testing, if the Dillon Load Cell reading is greater than?

1. 2750 #
2. 2650 # — normal
3. 2450 # - orif on control
4. 2350 # - orifice rod testing

(1.0)

QUESTION 6.14 (1.00)

Which of the following valves will receive a close signal if any ONE of the FOUR matrix relays in the Main Steam Rupture matrix is actuated?

a. Main Feed Water Block Valve

b. Low Load Block Valve

c. Feed Water Pump Discharge Crossover Valve

d. Emergency Block Valve

QUESTION 6.15 (1.00)

Which one of the following accurately describes the purpose of the Emergency Feedwater System ?

a. Provides 2200 ppm borated water Emergency Plant Shutdown.

b. Provides 400 F demin water to the O.T.S.G. for Emergency operations.

c. Provides makeup from the condenser hotwell to the O.T.S.G.'s during startup.

d. Provides unheated, chemically treated water to the O.T.S.G.'s to allow safe cooldown.

QUESTION 6.16 (2.00)

Indicate the type of automatic fire protection system, [DELUGE, WET PIPE SPRINKLER, CARBON DIOXIDE FLOODING or FREON FE-1301], each of the following areas have.

a. Diesel Generator Rooms

b. Cable Spreading Room in the Control Complex

c. Startup Transformers

d. Basement floors of the Turbine Building

[4 @ 0.5 ea] (2.0)

QUESTION 6.17 (1.00)

Due to a fault, 120 VAC Vital Bus 3D is lost. Which one of the following communication systems is degraded or lost?

a. Intra Plant Communication

b. Safeguard Communication

c. Commercial Telephone

d. Maintance Communication

QUESTION 7.01 (1.00)

Which of the following are parameters used in the reactivity balance calculation ?

a. Tave
b. PZR. Lvl.
c. Xenon
d. Samarium
e. Rod positon
f. Total feedwater flow

QUESTION 7.02 (1.00)

Which of the following is the correct action per OP-203 if pressurizer level falls below the minimum level of the Minimum Pressurizer Level at Power, curve 1.4, of OP-103.

a. Manually initiate HPI
b. Increase makeup flow
c. Trip reactor and turbine
d. Trip all RCP's

QUESTION 7.03 (1.00)

Which of the following is a correct definition as contained in the Radiation Protection Manual, RP-101?

a. "Clean Area" - Removable contamination less than 30 dpm Beta-Gamma or 300 dpm alpha, as determined by smear surveys representing approximately 100 square centimeters of surface area.

b. "Radiation Area" - Any accessable area where a major portion of the body could exceed a dose rate of 5 mrem/hr or any 7 consecutive days a dose of 100 mrem.

c. "High Radiation Area" - Any accessable area where a major portion of the body could receive a dose rate in excess of 100 mrem/hr or in any 7 consecutive days a dose in excess of 1000 mrem.

d. "Clean Area" - Fixed surface contamination measuring less than 0.25 mrem/hr Beta-Gamma and less than 300 dpm alpha as measured by approprate survey instrument probes.

QUESTION 7.04 (3.00)

Select the condition from each of the following that requires the operator to manually trip the reactor.

a.1. Loss of RCP (3 running)
2. CRD stator temperature 165 F
3. Pzr. level of 295 "
4. Channel A Th of 602 F

b.1. CRD stator temperature of 185 F
2. Loss of 1 main feed pump
3. Loss of Pzr. heaters
4. condenser vacuum of 26" Hg.

c.1. Dropped control rod
2. BTU limit (ICS)
3. Two MSIVs close
4. 0.25 gpm OTSG tube leak

QUESTION 7.05 (2.00)

Indicate whether each of the statements below are TRUE or FALSE. (Assume unit at 90% power, steady state operation)

a. A control rod suspected of being stuck must be moved (attempted) in "Jog" speed.

b. At the conclusion of rod exercising with no auto inhibit conditions an out inhibit indication means a safety control rod not fully withdrawn.

c. Rod exercising should be performed only on down power transients, not on up power transients.

d. Motor tube extension operating temp must not exceed 450 F and stator temp must not exceed 180 F.

QUESTION 7.06 (1.00)

Identify the correct action for control rods system during a reactor startup.

a. Place the selector switch in Jog speed and withdraw the groups.

b. Latch the safety groups 4-3-2-1 in that order.

c. Regulating group rod speed must be in Jog if NI SRs indicate less than 2 cps.

d. PI's are reset as required after the out limit is obtained for the group.

QUESTION 7.07 (1.00)

Which of the following would be proper action to be taken for a plant upset with feedwater controllers in manual ?

a. Place dTc controller in auto

b. Raise feedwater flow until BTU limit in each OTSG is reached to insure adequate heat removal carabilities.

c. Feed flow should be adjusted according to RCS pressure. For RCS pressure less than 2155 psig, decrease feedflow. For RCS pressure greater than 2155 psig, increase feed flow.

d. Reduce the ICS rate limiter to 0.25% min. to allow time for operator response with feedwater controls in manual.

QUESTION 7.08 (1.00)

Choose the correct statement about the deaerator tank level control.

a. High level in the deaerator tank (~14.5 ft.) will start the second CD pump.

b. High level interlock (~14 ft.) will open HDV-83 and dump 7500 gallons to the condensate storage tank.

c. High level interlock (~14 ft.) closes HDV-50 & 54, drains for intermediate pressure FWD heaters.

d. The deaerator tank normal operating level is between 7 ft. and 14.0 ft.

QUESTION 7.09 (1.00)

The emergency diesel generator 3A is connected to it's respective bus. The emergency feedwater pump EFP-3A does not start on a ES actuation signal. Which statement below is correct ?

a. The EFP-3A is locked out from operations when the 3A diesel generator is on the bus to prevent overloading the bus.

b. Under these conditions the EFW EFP-3A must be manually started after reducing load on the diesel (if required)

c. The EFW EFP-3A will block load after the diesel is on the bus for 120 seconds.

d. The EFW EFP-3A will not start unless the respective side OTSG is less than 600 psig.

QUESTION 7.10 (2.00)

TRUE or FALSE, the following Emergency Coordinator responsibilities for decisions may not be delegated.

a. emergency classification.

b. actions to mitigate plant/core damage

c. exterior radiological surveys

d. notification requirements

QUESTION 7.11 (1.00)

TRUE or FALSE

a. The holding mode of operation of the main condenser vacuum system is used during the condenser air leak test.

b. The main condenser vacuum pump will shift from normal to the hogging mode if the standby vacuum pump fails to start.

QUESTION 7.12 (2.00)

Indicate whether the statements below are TRUE or FALSE per AP-390 during a cooldown because of a OTSG tube leak.

a. Use the emergency cooldown limits only if the condenser is available to receive steam.

b. Use the emergency limits to cooldown for large tube leaks.

c. Normal cooldown limits are not used when RCP's are operating.

d. Fuel pin compression curve may be violated during cooldown with emergency limits.

QUESTION 7.13 (2.00)

TRUE ot FALSE

a. The Shift Supervisor is required to trip the reactor upon verification of a seismic event.

b. An entry condition for AP-580, Reactor Protection System Actuation, is a manual reactor trip.

c. The immediate actions for loss of a RCP per AP-543 are to insure:
   1. control rods inserting
   2. feedwater reratioing
   3. turbine runback
   4. RCS pressure stable
   5. The AC or DC lift oil pump for tripped RCP has started.

d. With group 7 control rods at 70% withdrawn and a control rod 7.5" out of alignment, the technical specification limit has been exceeded.

QUESTION 7.14 (1.00)

During core alterations the neutron count rate from 2 neutron monitors doubles as a fuel assembly is being inserted. The correct action is ?

a. Withdraw the assembly, perform a boron analysis on the RCS, have the reactor specialist evaluate.

b. Stop fuel assembly movement, increase RCS boron 100 ppm, request reactor specialist to evaluate.

c. Stop fuel assembly movement, borate the RCS until count rate stop increasing, place the fuel assembly in a safe position, request reactor specialist evaluate.

d. Continue core alterations as this is the expected NI response during fuel assembly insertion.

QUESTION 7.15 (2.00)

There are two classifications of operating procedures, step by step and guidance. Indicate the type of procedure each of the following are.

a. OP-502,Transfer group from DC hold to auxillary bus.

b. OP-503,Initialization of plant computer.

c. OP-605,Starting of a main feed pump.

d. OP-605,Emergency feed pump operation.

QUESTION 7.16 (2.00)

You (as NSS) have given permission to the I & C technician to perform the calibration check on the emergency feed water OTSG A low low level trip.

a. The I & C Technician has how long to perform this surveillance item ?
   1. 30 minutes
   2. 1 hour
   3. 2 hours
   4. 3 hours

b. At the end of the alloted time, the I & C technician reports that he will have to repair the bistable in order to finish the calibration check. Which of the following would be required ?

   1. Declare the channel inoperable and allow I & C 72 hours to repair, before requiring a shutdown.

   2. Declare the channel inoperative and be in hot standby in six hours.

   3. Declare the channel inoperative and commence the 48 hour timing before going to hot standby.

   d. Declare the channel inoperative and place the channel in a tripped condition within 1 hour.

QUESTION 7.17 (1.00)

Select the CORRECT statement from the following:

a. Visitors at Crystal River may not receive a dose in excess of 1.25 rem/qtr even if a NRC form 4 is completed and furnished.

b. Emergency exposure (25 rem during or accidient or 75 rem for life saving) must be included in the individual radiation exposure history.

c. The Nuclear Plant Manager has the authority to allow an individual to receive up to 3000 mrem in one week for special work assignments.

d. The maximum weekly exposure is 300 mrem. The Shift Superivor may autorizer exposures to 600 mrem by use of form 912801.

QUESTION 8.01 (1.00)

Which of the following would require action per the Technical Specifications during power operations ?

a. Condensate storge tank level of 140,000 gal.

b. Hot well level of 145,000 gal.

c. Hotwell level of 8 ft. 5 in.

d. Condensate storage tank level of 33 ft.

QUESTION 8.02 (3.00)

After assuming the Nuclear Shift Supervisor watch and reviewing the logs you are aware of the following plant conditions.

1. HPI A is tagged out for maintenance (in progress for 60 hours)
2. HPI C was tested prior to tagging out HPI A
3. BWST data: level of 420,000 gals, 38 F, 2275 ppm boron
4. CFT data: level of 12.6 ft, 590 psig, 2275 ppm boron
5. Plant data: ICS in "auto", 2 Main Feed Pumps, 4 RCPs, 85% power

a. For which of the above plant conditions do Technical Specifications require entry of an action statement?

b. Which of the below Technical Specification action statements apply ?
   1. 2.2.1
   2. 3.1.3.7
   3. 3.3.1.1
   4. 3.5.1
   5. 3.5.2
   6. 3.5.3
   7. 3.5.4

c. In addition to the above plant conditions 1 thru 5 you are informed that the 3B Emergency Diesel Generator (EDG) has a large air leak in the air start motor and the system has isolated. Which of the below is the correct Technical Specification action ?
   1. Shutdown to Hot Standby
   2. Shutdown to hot Shutdown
   3. Shutdown to Cold shutdown
   4. Shutdown not required

QUESTION 8.03 (1.00)

On your shift a monthly surveillance item is discovered overdue. Required due date was 25th of the month, assume today is the 31st, and the performance of the SP has begun. All previous surveillances were completed on time as scheduled. Which of the statements below is correct about the surveillance (SP)?

a. The SP has been missed and the system must be declared inoperable until the SP is completed satisfactory.

b. The system is operable as the Technical Specification allow an monthly SP to be waived 1 month out of 3.

c. The system is operable because the technical specification allows a time extension and the extension has not been exceeded.

d. The system is inoperable because the 3.25 time interval for 3 consecutive SP was not met.

QUESTION 8.04 (2.00)

Due to an "event" you are the Acting Emergency Coordinator (AEC) per the Radiological Emergency Response Plan. Indicate whether the following statements are TRUE or False.

a. The AEC is responsible for activities in the control complex, the designated emergency coordinator is responsible for the balance of plant.

b. During an emergency the AEC is responsible for the direction of activities at all Crystal River plants (CR1 thru CR5)

c. The AEC must obtain approval from the Nuclear Plant Manager prior to ordering an site evacuation.

d. The AEC will consult with the State of Florida to determine the event classification.

QUESTION 8.05 (1.50)

TRUE or FALSE

a. The Radiation Emergency Response plan is designed to provide procedures for the reponse to incidents/accidents other than the FSAR postulated accidents.

b. An on site fatality requires at least an alert clasification to obtain required offsite medical assistance.

c. The Florida Department of Health and Rehabilitation Services must be immeadiatly notified of an exposure greater than 25 REM regardless of the emergency classification.

QUESTION 8.06 (1.00)

If required to notify the State Warning Point, Tallahassee (SWPT) the order of telephone preference is ?

a. COMM, NAWAS, SHRDTS

b. NAWAS, COMM, SHRDTS

c. SHRDTS, COMM, NAWAS

d. SHRDTS, NAWAS, COMM

(NOTE: COMM=COMMERCIAL
NAWAS=NATIONAL WARNING SYSTEM
SHRDTS=STATE HOT RING DOWN TEL. SYS.)

QUESTION 8.07 (1.00)

If a general emergency has been declared what is the minimum protective action recomendation ?

a. Evacuate all people within a 1 mile radius and shelter all people in a 2 mile radius. (affected sectors)

b. Evacuate all people within a 2 mile radius and shelter all people in a 5 mile radius. (affected sectors)

c. No protective action is to be recomended unless radiation exposure to the public will exceed 5 mr.

d. Station additional security at site entrance to prevent unathorized personnel from entering a radiation area.

QUESTION 8.08 (1.00)

Telephone notification of an emergency is completed when which of the below is established ?

a. Voice contact with responsible representative.

b. Voice contact with agency's telephone operator.

c. Voice contact with agency's secretary.

d. Emergency information placed on a recording device

QUESTION 8.09 (1.00)

TRUE or FALSE. To remain at power after a DC system is declared inoperable you must verify the operability of the redundant DC system within 2 hours.

QUESTION 8.10 (3.00)

Indicate the direction the following plant parameters will move (INCREASE, DECREASE, NO CHANGE) as a result of a power reduction from 75% to 25% (steady state ~~power~~ to steady state ~~power~~)

a. Th
b. Tc
c. xenon
d. pzr level
e. OTSG level
f. OTSG superheat

QUESTION 8.11 (2.00)

Indicate, TRUE or FALSE, whether each of the following work schedules are in compliance with the OSIM guidelines.

a. Working from 8 A.M. to 10 P.M.

b. Working day shift Monday (0800-1600) and midnights Tuesday (0000-0800).

c. Working midnight to noon (0000-1200)

d. Working Monday thru Sunday, 0800-2000

QUESTION 8.12 (1.00)

The operations study book is used to disseminate information and is considered to be part of:

a. The SS logs

b. Training material

c. SOTA's responsibilities

d. Shift relief

QUESTION 8.13 (2.00)

During a reactor startup, with power starting to indicate on the power range, a intermediate range channel fails low.

a. Which of the following is the correct action to be taken in accordance with technical specifications ?

1. With the number of operable channels one less than the total number of channels, startup and power operation may proceed provided the inoperable channel is placed in the tripped condition in one hour.

2. With the number of operable channels one less than required by the minimum channel operable requirements and with thermal power level less than or equal to 5% of rated, restore the inoperable channel to operable status prior to increasing thermal power above 5% of rated thermal power.

3. With the number of operable channels less than required by the minimum channels operable requirement, be in at least hot standby within 6 hours.

4. With the number of operable channels one less than the required minimum channels operable requirement, plant operation may continue until the next required channel functional test provided the inoperable channel is placed in the tripped condition within 4 hours.

b. While trying to satisfy the action statement in part a, the reactor power increased and mode 1 was entered. Which of the following is the correct action to be taken ?

1. Reenter mode 2 within 1 hour and complete the required action previously initiated.

2. Complete the required action and then continue the power accession.

3. Within one hour commence a reactor shutdown and be in hot standby within 6 hours.

4. Continue the power accession and within 24 hours notify the NRC of the technical specification violation.

QUESTION 8.14 (1.00)

The nuclear instrumentation required to be operable in the control room during core alterations per FP-203 is/are :

a. 2 SR

b. 1 SR

c. 2 SR and 2 IR

d. 1 SR and 1 IR

QUESTION 8.15 (1.00)

Which statement below describes the correct operator use of the PORV to prevent an over pressure trip of the reactor ?

a. The PORV is not to be used anytime by the operator if the reactor is critical unless RCS pressure exceeds the PORV setpoint.

b. The PORV block valve is disabled to prevent inadvertant closing and a dedicated operator is assigned to operate the PORV (NO other responsibilities).

c. The PORV block valve is operable and a dedicated operator is assigned to the PORV (NO other responsibilities).

d. The PORV block is throttled to prevent an uncontrollable pressure decrease while the PORV is open and the CNO is informed each time the PORV is opened.

QUESTION 8.16 (2.50)

Fill in the blanks with the required number of personnel.

The Operations department will supply __a__ personnel for the fire brigade team from each shift. The Chemistry and radiation control Dept. shall provide __b__ fire brigade team member(s) on day shift and __c__ team member(s) on the back and mid shift, __d__ day(s) a week. The maintanence Dept. shall provide __e__ team member(s) on day shift and __f__ team member(s) on the back and mid shift __g__ day(s) a week.

EQUATION SHEET

$f = ma$

$w = mg$

$E = mc^2$

$KE = 1/2\ mv^2$

$PE = mgh$

$V_f = V_o + at$

$W = v\ \Delta P$

$\Delta E = 931\ \Delta m$

$\dot{Q} = \dot{m}Cp\Delta t$

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

$Pwr = W_f \Delta h$

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

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

$SUR = 26.06/T$

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

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

$T = \ell/(\rho - \beta)$

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

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

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

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

$\Sigma = \sigma N$

$v = s/t$

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

$a = (V_f - V_o)/t$

$w = \theta/t$

$A = \frac{\pi D^2}{4}$

$\dot{m} = V_{av} A \rho$

Cycle efficiency = (Net work out)/(Energy in)

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

$\lambda = \ln 2/t_{1/2} = 0.693/t_{1/2}$

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

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

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

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

$TVL = 1.3/\mu$

$HVL = -0.693/\mu$

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

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

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

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

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

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

$\ell^* = 10^{-4}$ 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)

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

Water Parameters

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

Miscellaneous Conversions

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

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

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ANSWER 5.01 (3.00)

a. False
b. False
c. True
d. False
e. True
f. False [6 @ 0.5 ea] (3.0)

REFERENCE
Westinghouse Thermal Science, Chapters 3,5 & 10.

ANSWER 5.02 (1.00)

A. False
B. False [2 @ 0.5 ea] (1.0)

REFERENCE
B&W system descriptions

ANSWER 5.03 (1.00)

b.

REFERENCE
Thermodynamics, Fluid flow, and Heat Transfer for Nuclear Power Plants

ANSWER 5.04 (1.50)

a. Increase.
b. Decrease.
c. Increase. [3 @ 0.5 ea] (1.5)

REFERENCE
Westinghouse Thermal Science; Ch. 13, pp 33-52.

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 5.05 (1.50)

a. False
b. False
c. True [3 @ 0.5 ea] (1.5)

REFERENCE
ANO 1 AOP 1203.13 pg 1 of 5, EO 1203.01 pg 71 of 146 and
STM-1-69 pg 12

ANSWER 5.06 (3.00)

a. #2
b. #3
c. #3 [answer for part c will be graded independantly of part b]
mathematically answer is 1.0059 [3 @ 1.0 ea] (3.0)
+4

REFERENCE
Crystal River Question Bank Category 1&5 Question #17

ANSWER 5.07 (1.00)

a. False
b. True [2 @ 0.5 ea] (1.0)

REFERENCE
Crystal River Question Bank Category 1 & 5 Question #26

ANSWER 5.08 (2.00)

a - 3
b - 5
c - 4
d - 1 also 2; [4 @ 0.5 ea] (2.0)
reference - B+W Steam Book: pg 1-3
+ pg 184 of NRC Thermo, HT, FF reference

REFERENCE
Crystal River Question Bank Category 1 & 5 Question #5

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 5.09 (3.00)

a - 3
b - 2 — Distractors are too close - This is from CR3 QBank — Will accept 2/3 or 4
c - 3 [3 @ 1.0 ea] (3.0)

REFERENCE
Crystal River Question Bank Category 1&5 Question #12

ANSWER 5.10 (2.00)

a. increase
b. remain constant
c. decrease
d. increase [4 @ 0.5 ea] (2.0)

REFERENCE
Crystal River Question Bank Category 1&5 Question #22

ANSWER 5.11 (1.00)

d.

REFERENCE
Reactor Fundamentals

ANSWER 5.12 (2.00)

a. - 1
b. - 3 [2 @ 1.0 ea] (2.0)

REFERENCE
Crystal River Question Bank Category 1&5 Question #41

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 5.13 (3.00)

a. True
b. False
c. True
d. False
e. False
f. True [6 @ 0.5 ea] (3.0)

REFERENCE
B&W Operation fundamentals

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 6.01 (1.00)

c.

REFERENCE
Crystal River System Training Manual Sec 7 Non-Nuclear Instrumentation
pg STM-7-26 & 27

ANSWER 6.02 (2.00)

a. False
b. True
c. False
d. False [4 @ 0.5 ea] (2.0)

REFERENCE
Crystal River System Training Manual Sec 6 Nuclear Instrumentation
Sys pg STM-6-11, 15, 17 & 25

ANSWER 6.03 (2.00)

a. - 4
b. - 2 [2 @ 1.0 ea] (2.0)

REFERENCE
Crystal River System Training Manual Sec 10 Emergency Diesel Generators
pg STM-10-1, 37 & 38

ANSWER 6.04 (1.00)

d. [CAF]

REFERENCE
Crystal River System Training Manual Sec 10 Emergency Diesel Generators
pg STM-10-45, 46 & 47

ANSWER 6.05 (1.00)

b.

REFERENCE
Crystal River System Training Manual Sec 11 Engineered Safeguard
Actuation pg STM-11-14

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 6.06 (1.00)

a. True
b. False [2 @ 0.5 ea] (1.0)

REFERENCE
Crystal River System Training Manual Sec 11 Engineered Safeguards Acuation pg STM-11, 12 & 13

ANSWER 6.07 (2.00)

a. - 1.
b. - 3. [2 @ 1.0 ea] (2.0)

REFERENCE
Crystal River System Training Manual Sec 12 Control Rod Drive pg STM-12-13, 14 & 15

ANSWER 6.08 (1.00)

a, b, d, e & g [5 @ 0.2 ea] (1.0)

REFERENCE
Crystal River System Training Manual Sec 13 Integrated Control System pg STM-13-19

ANSWER 6.09 (1.00)

d.

REFERENCE
Crystal River System Training Manual Sec 13 Integrated Control System pg STM-13-21

ANSWER 6.10 (1.00)

c.

REFERENCE
Crystal River System Training Manual Sec 13 Integrated Control System pg STM-13-6 thru 38

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 6.11 (2.00)

a. Increase
b. Increase
c. Decrease
d. Increase [4 @ 0.5 ea] (2.0)

REFERENCE
Crystal River Question Basnk Cat 3 & 6 Question #16

ANSWER 6.12 (3.00)

n, i, e, f, j, c, h, a, m, d, l, b, g, o, k [15 @ 0.2 ea] (3.0)

REFERENCE
Crystal River Question Basnk Cat 2-6 Question #35
System Training Manual Sec 17 MU & P pg STM-17-2 Simplified Flow Diagram

ANSWER 6.13 (2.00)

a. - 1.
b. - 4. [2 @ 1.0 ea] (2.0)

REFERENCE
Crystal River System Training Manual Sec 21 Fuel Handling,
pg STM-21-47

ANSWER 6.14 (1.00)

Delete

c. [CAF]

REFERENCE
Crystal River System Training Manual Sec 27 Feedwater
pg STM-27-56, 59, 60, 61 & 67

ANSWER 6.15 (1.00)

d.

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

REFERENCE
Crystal River Feedwater System operating procedure OP-605 Rev 28 pg 2

ANSWER 6.16 (2.00)

a. - Deluge
b. - Freon FE-1301
c. - Deluge
d. - Wet Pipe Sprinkler [4 @ 0.5 ea] (2.0)

REFERENCE
Crystal River System Training Manual Sec 38 Plant Fire Protection System pg STM-38-3 & 5

ANSWER 6.17 (1.00)

a.

REFERENCE
Crystal River System Training Manual Sec 16 Communications System pg STM-16-3, 5, 10, 13 & 15

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 7.01 (1.00)

a,c,d,&e (4 @ 0.25 ea.)

REFERENCE
CR Ques. Cat 4 & 7, #27

ANSWER 7.02 (1.00)

b

REFERENCE
OP-203, pg 2

ANSWER 7.03 (1.00)

d.

REFERENCE
Radiation Protection Manual RP-101 pg 5 & 6

ANSWER 7.04 (3.00)

a. 3
b. 1
c. 3

REFERENCE
CR Ques Cat 4 & 7,#39 (OP-204,AP-521)

ANSWER 7.05 (2.00)

a. F
b. F
c. F
d. T (4 @ 0.5 ea.)

REFERENCE
OP-502 rev 11, pg 3 (sec 4.0)

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 7.06 (1.00)

b

REFERENCE
OP-502, pg 14

ANSWER 7.07 (1.00)

c

REFERENCE
OP-504 rev 7, pg 5

ANSWER 7.08 (1.00)

c

REFERENCE
OP-603 rev 21, pg 4

ANSWER 7.09 (1.00)

b

REFERENCE
OP-605 rev 28, pg 5

ANSWER 7.10 (2.00)

a. True
b. False
c. False
d. True

REFERENCE
EM-202 rev 23, pg 5

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 7.11 (1.00)

a. F

b. F

REFERENCE
OP-607 rev 9, pg 3

ANSWER 7.12 (2.00)

a. False
b. True
c. False
d. True

REFERENCE
CR Ques CAT 4 & 7 #30 (AP-390)

ANSWER 7.13 (2.00)

a. False AP-961 If ~~>~~ >.05g Trip Rx
If < .05g and indic of degraded plant perf — Trip Rx

b. True

c. True

d. True

REFERENCE
AP-961 pg 2/AP-580 rev 2, pg 1/AP-543 rev 1, pg 2/CR Tech Spec. 3/4 1-18

ANSWER 7.14 (1.00)

a

REFERENCE
FP-203 rev 12, pg 12, sec 5.18

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 7.15 (2.00)

a. guidance

b. guidance

c. guidance

d. step-by-step

REFERENCE
AI-500 pg 8 & 9

ANSWER 7.16 (2.00)

a. 2

b. 2

REFERENCE
CR Tech Spec. Table 3.3-3 action 10, pg 3/4 3-14

ANSWER 7.17 (1.00)

b.

REFERENCE
Radiation Protection Manual RP-101 pg 9, 11 & 12 and IN bulletin 84-40

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 8.01 (1.00)

a

REFERENCE
OP-603 rev 21, pg 2

ANSWER 8.02 (3.00)

a. ~~1~~,3,&4
b. 4,~~5~~,&7 (3.5.1, 3.~~5~~.2, & 3.5.4)
c. ~~4~~ 3

REFERENCE
CR Tech Specs

ANSWER 8.03 (1.00)

c

REFERENCE
CR Tech Specs

ANSWER 8.04 (2.00)

a. F
b. T
c. F
d. F

REFERENCE
Radiological Emergency Response Plan pg 6-5, sec 6.3.1

ANSWER 8.05 (1.50)

a. True
b. False
c. True

REFERENCE
Radiological Emergency Response Plan, pg 8-5/8-7/D-1

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 8.06 (1.00)

d

REFERENCE
Radiological Emergency Response Plan pg 9-6

ANSWER 8.07 (1.00)

b

REFERENCE
EM-202 rev 23, pg4

ANSWER 8.08 (1.00)

a

REFERENCE
EM-202 rev 23, pg 7

ANSWER 8.09 (1.00)

False

REFERENCE
OP-705 rev 3, pg 5

ANSWER 8.10 (3.00)

a. decreasse
b. increase
c. increase
d. no change
e. decrease
f. decrease

REFERENCE
Various CR ICS and RX theory lessons

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 8.11 (2.00)

a. False

b. False

c. True

d. False

REFERENCE
OSIM pg III-5

ANSWER 8.12 (1.00)

b

REFERENCE
OSIM pg III-11

ANSWER 8.13 (2.00)

a. 2

b. 3

REFERENCE
CR Tech Spec 3/4.3 table 3.3-1 #9 pg 3/4 3-2,3,& 4
3.0.3 pg 3/4 0-1

ANSWER 8.14 (1.00)

a

REFERENCE
FP-203 rev 12, pg 1

ANSWER 8.15 (1.00)

c

REFERENCE
OSIM sec V, pg V-22, Interoffice Corres. OPB3-204

ANSWERS -- CRYSTAL RIVER -84/12/17-KING, M.

ANSWER 8.16 (2.50)

a. 3
b. 1
c. 0
d. 7
e. 1
f. 2
g. 7

Delete

REFERENCE
OSIM sec V, pg V-21

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Master Review Copy

Enclosure 3

U. S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

Facility: Crystal River
Reactor Type: PWR B & W
Date Administered: December 17, 1984
Examiner: L. Lawyer
Candidate: _____

INSTRUCTIONS TO CANDIDATE:

Use separate paper for answers. Write answers on one side only. Staple question sheet on top of the answers sheets. Points for each question are indicated in parenthesis 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	Candidate's Score	% of Category Value	Category
25	25	_____	_____	1. Principles of Nuclear Power Plant Operation, Thermodynamics, Heat Transfer and Fluid Flow
25	25	_____	_____	2. Plant Design Including Safety and Emergency Systems
25	25	_____	_____	3. Instruments and Controls
100		_____		4. Procedures - Normal, Abnormal, Emergency, and Radiological Control
		Final Grade	_____%	TOTALS

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

_____
Candidate's Signature

CATEGORY 1: Principles of Nuclear Power Plant Operation, Thermodynamics, Heat Transfer and Fluid Flow (25.0)

1.01 Select the statement that best describes how the three heat transfer regions in the OTSG change as power increases.

	Nucleate Boiling	Film Boiling	Superheat
a.	remains constant	increases	decreases
b.	increases	remains constant	decreases
c.	decreases	remains constant	increases
d.	increases	decreases	remains constant

1.02 Which of the following statements is most nearly accurate regarding control rod worth?

(a) It is proportional to reactor power.

(b) It is proportional to rod speed.

(c) It is higher in regions of higher relative neutron flux.

(d) It is not dependent upon rod position.

1.03 Which of the following is NOT a characteristic of subcritical multiplication?

(a) If the reactor is shutdown long enough, the source range instruments will lose their ability to determine the subcritical multiplication level even though the core may still be at MOL.

(b) Doubling the indicated count rate by reactivity additions will reduce the margin to critical by approximately one half.

(c) For equal reactivity additions, it takes longer for the equilibrium subcritical multiplication level to be reached as Keff approaches unity.

(d) If ten inches of rod withdrawal increases the subcritical multiplication level by 10 cps, then twenty inches of rod withdrawal will increase the subcritical multiplication level by approximately 20 cps.

1.04 Which of the following demonstrates the effects of the delayed neutron fraction changing over core life?

(a) A lower boron concentration.
(b) A higher rod bite.
(c) A higher startup rate for equal reactivity additions.
(d) A larger (more negative) moderator temperature coefficient.

1.05 An estimated critical position has been calculated for a reactor startup that is to be performed 15 hours after a trip following a 60-day full power run. Which of the following actions will contribute to a higher actual rod position than the calculated ECP?

(a) Controlling the OTSG Levels above the low level limit.
(b) Delaying the startup six hours longer than anticipated.
(c) Increasing the APSR position for criticality from 0 to 20%.
(d) Using the 579 F reactivity vs Boron curve instead of the 532 F reactivity vs Boron curve.

1.06 Which of the following statements describes the behavior of Xenon and Samarium?

(a) After a reactor trip occurs, Xenon concentration initially increases and Samarium initially decreases.

(b) After a reactor trip occurs, Xenon will eventually decay to a Xenon free condition but a Samarium free condition will not occur until after the next refueling outage.

(c) The Xenon and Samarium peak concentration following a trip occurs at a time independent of the previous power level.

(d) Xenon concentrations may increase or decrease when taking the plant from Mode 3 to full power but Samarium will always decrease during this transient after the core's equilibrium Samarium has been reached.

1.07 Which of the following radioactive isotopes found in the reactor coolant would <u>NOT</u> indicate a leak through the fuel cladding?

(a) I-131

(b) Xe-133

(c) Co-60

(d) Kr-85

1.08 Which of the following is a true statement concerning radioactive decay? Remember the atomic number is the number of protons and the mass number is the number of neutrons plus protons.

(a) When an element decays by beta emission, the new element will have increased in atomic number by one and the mass number will remain the same as the original element.

(b) When an element decays by alpha emission, the new element will have decreased in atomic number and mass number by two, from the original element.

(c) When an element decays by neutron emission, the new element will have increased in atomic number by one and decreased in mass number by one, form the original element.

(d) When an element decays by gamma emission, the new element will have increased in atomic number by one and the mass number will remain the same as the original element.

1.09 During power operation of a nuclear reactor the design DNBR will be affected by changes in some of the operating parameters. The four operating parameters of maximum interest to the operator are:

(a) Reactor power, pressure, coolant flow, and average temperature.

(b) Reactor pressure, coolant flow, average temperature, and boron concentration.

(c) Reactor coolant flow, average temperature, boron concentration, and power.

(d) Reactor average temperature, boron concentration, power, and pressure.

1.10 With the main steam temperature and pressure at 600 F and 900 psia respectively, a main steam relief valve seat begins to leak to atmospheric pressure. The temperature of the steam three feet out of the relief valve is approximately:

(a) 600 F

(b) 532 F

(c) 444 F

(d) 212 F

1.11 The quality of steam exiting the HP turbine refers to

(a) the ratio of the liquid mass to the vapor mass.

(b) the ratio of the vapor mass to the liquid mass.

(c) the ratio of the liquid mass to the sum of the liquid and vapor masses.

(d) the ratio of the vapor mass to the sum of the liquid and vapor masses.

1.12 The reactor coolant system is subcooled by approximately _____ during Mode 3 when Tave is 400 F and the pressurizer pressure is 1000 psia.

(a) 145 F

(b) 125 F

(c) 100 F

(d) 75 F

1.13 The following signals are used to derive the BTU limit in the ICS. Indicate which of these would decrease to increase the BTU limit.

(a) Th

(b) S/G pressure

(c) RC flow

(d) FW temperature

1.14 The amount of aspirating steam (lbm/hr) used in the OTSG _____.

(a) Increases as power increases from 10 to 100%

(b) Increases as the temperature of the feedwater increases

(c) Increases as the feedwater flow decreases

(d) Decreases as the temperature of the feedwater decreases

1.15 If a centrifugal pump is operating at 1800 rpm to give 400 gpm at a discharge head of 20 psi, what would be the discharge head if the speed is increased in order to deliver 1600 gpm?

(a) 40 psi

(b) 80 psi

(c) 160 psi

(d) 320 psi

1.16 Which one of the following is NOT one of the four contributors or factors that establish equilibrium Xenon?

(a) Direct production from fission

(b) Decay of Iodine

(c) Decay of Xenon to Cs

(d) Decay of Xenon to Sm

1.17 Which one of the following is TRUE concerning the change in differential boron worth (% $\Delta k/k$) with RCS boron concentration (range of 0 to 1800 ppm) and Tave (range of 532°F of to 579°F)

(a) It increases as Tave and RCS boron concentration increase.

(b) It decreases as RCS boron concentration increases but is constant as Tave increases.

(c) It decreases as Tave and RCS boron concentration increase.

(d) It increases as Tave increases but is constant as RCS boron concentration increases.

1.18 Figure 1.18 is a representation of how the resonance peaks of U-238 "flatten out" or Doppler broaden as fuel temperature increases. Which of the following are the correct labels for the X and Y axes?

(a) X is neutron flux, Y is interaction rate.

(b) X is neutron energy, Y is microscopic capture cross section.

(c) X is atom density of U-238, Y is neutron flux.

(d) X is interaction rate, Y is neutron density.

1.19 The ratio of Pu-239 and Pu-240 atoms to U-235 atoms changes over core life. Which one of the pairs of parameters below are most affected by this change?

(a) Moderator temperature coefficient and doppler coefficient.

(b) Doppler coefficient and beta

(c) Beta and moderator temperature coefficient

(d) Moderator temperature coefficient and neutron generation time.

1.20 A moderator is necessary to slow neutrons down to thermal energies. Which of the following is the correct reason for operating with thermal instead of fast neutrons?

(a) Increased neutron efficiency since thermal neutrons are less likely to leak out of the core than fast neutrons.

(b) Reactors operating primarily on fast neutrons are inherently unstable and have a higher risk of going prompt critical.

(c) The fission cross section of the fuel is much higher for thermal energy neutrons than fast neutrons.

(d) Doppler and moderator temperature coefficients become positive as neutron energy increases.

1.21 Which one of the following factors will help, rather than hinder, natural circulation?

(a) Lowering OTSG level

(b) Lowering RCS pressure

(c) Increasing RCS temperature

(d) Lowering turbine bypass valve setpoint

1.22 Regulating rod group insertion limits change as a function of core life (EFPD) and number of operating RCPs. Which one of the following is true concerning the change in insertion limits? (An increase in area of acceptable operation means less restrictive rod insertion limits.)

(a) The area of acceptable operation decreases as you go from 4 RCP to 3 RCP operation.

(b) The area of acceptable operation increases as you go from 4 RCP to 3 RCP operation.

(c) The area of acceptable operation increases with core life.

(d) The area of acceptable operation is the same as you go from 3 RCP to 2 RCP operation.

1.23 Following a trip from full power with the reactor shutdown and 4 RCPs operating, the 125 psi bias is suddenly removed from the turbine bypass valves. Which one of the following statements best describes plant response?

(a) OTSG pressure drops and levels rise. The increased OTSG levels cause an overcooling of the RCS.

(b) The OTSG saturation temperature drops causing a decrease in RCS T_c and a rapid drop in pressurizer level.

(c) Since OTSG pressures drop 125 psi, BTU limit alarms will be received on both generators and feedwater will cut back.

(d) The resulting cooldown of the RCS will probably decrease the shutdown margin to less than Tech Spec limits.

1.24 The reactor core Safety Limit Curve (Figure 2.1-1 in the Tech Specs) is prevented from being exceeded by a combination of four RPS trips. Select the combination of RPS trips below that define the reactor trip envelope.

(a) RCS Outlet Temp.-High
Nuclear overpower
Low RCS Pressure
Overpower based on RCS Flow and Axial Imbalance

(b) Low RCS Pressure
High RCS Pressure
RCS Outlet Temp.-High
Variable Pressure - Temperature Trip

(c) High RCS Pressure
RCS Outlet Temp.-High
Overpower based on RCS Flow and Axial Imbalance
RCP Power Monitors

(d) Low RCS Pressure
Variable Pressure - Temperature Trip
Nuclear Overpower
Overpower based on RCS Flow and Axial Imbalance

~~1.25~~ delete BAW Which one of the following is NOT one of the three bases for the control rod insertion limits?

(a) Ensures acceptable power distribution limits are maintained

(b) Ensures maximum fuel clad temperature will not exceed 2200 °F following a LOCA

(c) Ensures that the minimum shutdown margin is maintained

(d) Limits the potential effects of a rod ejection accident.

END OF SECTION 1

2.0 Plant Design, Including Safety and Emergency Systems

2.01 With regard to Plant Fire Protection Systems, the deluge water system protects all but one of the following areas. Which one is NOT protected by the deluge water system?

a. Charcoal plenums in Auxiliary Building and Control Complex

b. Startup and unit auxiliary transformers

c. Diesel generator rooms

d. Cable spreading room

2.02 Select the CORRECT statement about the Makeup and Purification System.

a. The block orifice has two bypasses, (MUV-51 and MUV-48) both of which are remotely operated from the control room.

b. A temperature element (TE-5) on the letdown line alarms at 130 °F and closes the letdown cooler outlet valves (MUV-40 and MUV-41) at 135 °F.

c. The letdown line connections to the Decay Heat Removal System are 2½-inch lines prior to the prefilters and after the makeup filters.

d. The deborating demineralizer may be operated in parallel or series with the makeup demineralizers.

2.03 Select the CORRECT statement concerning the Makeup Pump Lube Oil System.

a. If the main gear oil pump control switch is in Auto, the pump will start and run for three minutes after the makeup pump starts.

b. The backup gear oil pump will start (if in Auto) when oil pressure reaches 7 psig and will automatically stop when oil pressure reaches 20 psig.

c. If the main lube oil pump control switch is in Auto, the pump will start and run for three minutes after the makeup pump starts.

d. The backup lube oil pump has no auto start provisions and can be used as a back up for the gear oil system.

2.04 With regard to the Plant Ventilation System, which one of the following Ventilation Systems are required for emergency operation?

a. Reactor Cavity Cooling Fans

b. Reactor Building Purge Supply System

c. Decay Heat Closed Cycle Cooling Pumps Air Handling Units

d. Reactor Building Operating Floor Fans

2.05 Select the CORRECT statement concerning the Nuclear Services Booster Pumps and CRD Cooling System.

a. One pump is normally operated with the other serving as backup. A drop in line flow (<100 gpm) will start the idle pump.

b. On an ES signal, the supply and return valves will close and the booster pumps will have to be manually secured.

c. SWP-2A is powered from ES MCC 3A2 and SWP-2B is powered from ES MCC 3B2.

d. Maximum allowable temperature of the cooling water is 120°F; there are no limits on minimum temperature.

2.06 With regard to the Reactor Building Spray System, which of the following statements is TRUE?

a. The two RB spray pumps are cooled by Nuclear Services Closed Cycle Cooling System.

b. An RB pressure of 4 psi arms the RB spray system by opening the NaOH Tank outlet valves and the RB spray pump suction valves.

c. An RB pressure of 30 psi starts the RB spray pumps and opens the spray pump discharge valves.

d. The RB Spray System cooling capacity is separate from the RB emergency cooling units which independently possess full post-accident cooling capacity.

2.07 A diesel-generator has been started as a result of an ESS Actuation Signal. Which of the following will NOT cause the diesel to shutdown?

a. Low oil pressure

b. High crankcase pressure

c. Remote STOP pushbutton

d. Emergency STOP pushbutton

2.08 Which one of the following correctly describes the trip system of the main turbine?

a. When the auto-stop (turbine control) oil pressure decreases, the interface trip valve will open allowing the EHC Control Oil to dump to drain.

b. When the EHC Control Oil pressure decreases, the interface trip valve will open, allowing the auto-stop (turbine control) oil to dump to drain.

c. The interface trip valve is solenoid actuated and when open, will dump both auto-stop (turbine control) oil and EHC control oil to drain.

d. A full turbine trip requires the servo valves for all four sets of turbine valves (throttle, governor, reheat and interceptor) to open.

2.09 Which of the following statements about the Instrument Air System is INCORRECT?

a. In an emergency, the Instrument Air System is automatically cross connected with the House Service Air System through IAV-30.

b. The Instrument Air System serves as a backup supply to the Condensate Polishing Air Compressors through manual valve IAV-25.

c. The normal cooling water supply is Secondary Services Closed Cycle Cooling but in extended outages, may be shifted to Nuclear Services Closed Cycle Cooling.

d. In an emergency, when cross connected with the House Service Air System, the filters and dryers are bypassed.

2.10 Which statement is TRUE concerning the Core Flood (CF) System?

a. Isolation valves CFV-5 and 6 receive an open signal following ES actuation even though they are required to be open with their breakers in the "Locked Reset" position.

b. When the breakers for CFV-5 and 6 are in the "Locked Reset" position, they lose position indication in the control room.

c. During plant operation, the CF tank levels may be increased by adding from the makeup and purification (MUP) system and decreased by draining to the Auxiliary Building Sump.

d. During plant operation, high CF Tank pressure may be relieved by venting to the Reactor Building.

2.11 Which of the following statements about the Decay Heat Removal (DHR) System is INCORRECT?

a. DHV-3 and DHV-4, RC system isolation valves to DH interlocks, are set at 284 psig RC system pressure.

b. Both trains of DHR may be simultaneously out of service only if the requirements of CP-115 (for voluntarily entering a degraded mode of operation) are met and the refueling transfer canal is flooded.

c. Maximum pressurizer level is 220 inches when DHV-3 or 4 is open and one makeup pump is in operation. (This precaution limits potential for overpressurization of the DH system.)

d. The high and low flow alarms (3400 gpm and 2800 gpm respectively) are the same for both the Injection and Recirculation Phase.

2.12 During Long-term Post-Accident cooling, which one of the following flow paths is most desirable?

a. Condition "A"; open drop line to RB Sump

b. Condition "B"; Open auxiliary spray line to pressurizer

c. Condition "C"; Combination of Conditions "A" and "B"

d. Condition "D"; Backflush with Reactor Coolant Pump.

2.13 Which of the following statements is TRUE concerning the OTSG?

a. The minimum level in the generator (low level setpoint) thermodynamically provides the reference for no-load Tave.

b. The startup range instruments will provide indication of flooding of the aspirating ports.

c. The auxiliary feedwater header penetrates near the top of the OTSG shell and sprays the feedwater on the upper cylindrical baffle.

d. Orifice plates, located in the lower downcomer section may be adjusted to balance out the internal circulation system.

2.14 Which one of the following statements concerning the Reactor Coolant Pumps is INCORRECT?

a. An RCP motor may be started three times successively from ambient temperature, or twice from rated motor temperature.

b. Sufficient lift oil pressure, Upper and Lower oil reservoir levels, and seal injection water flow are four of the starting interlocks.

c. Power must be less than 20% and Tave greater than 500°F prior to starting the fourth RCP.

d. The pump is designed for continued operation on either loss of cooling water or loss of injection fluid, but not both.

2.15 Which of the following statements concerning the Control Rod Drive System is INCORRECT?

a. When the rotor assembly rotates, the leadscrew is kept from rotating by keying it to the torque tube through the torque taker.

b. Four ball check valves are installed at the base of the thermal barrier to permit in-flow to the CRD mechanism during a reactor trip.

c. The APSRs are prevented from tripping by physical restraints on the segment arms; this prevents the arms from pivoting outward.

d. The stator coils are sequentially energized in a repetitive 2-3-2-3 manner. When rod motion ceases, three coils remain energized.

2.16 Select the combination of breakers and programmers that will NOT result in a Trip Confirm Lamp - Reactor Trip.

a. 'A' AC breaker open and 'B' AC breaker open

b. 'A' AC breaker open and DC breakers 'D' and 'F' open and 'B' programmer lamps off.

c. 'B' AC breaker open and DC breakers 'D' and 'E' open and 'A' programmer lamps off

d. DC breakers 'C' and 'E' open and 'A' programmer lamps off, and AC breakers 'D' and 'F' open and 'B' programmer lamps off.

~~2.17~~ Select the CORRECT statement regarding the automatic initiation of the Motor Driven Emergency Feedwater Pump, EFP-1.

delete

a. In the event of a station blackout, EFP-1 will automatically start five seconds after ES block 1 is loaded onto the 'A' Train D-G.

b. If an ES signal occurs, EFP-1 will be automatically tripped, if already loaded on the diesel-generator and will auto restart five seconds after ES block 4 has been started.

c. Thirty minutes after the alarm is received for exceeding the 2000 hour rating of 3000 kw, EFP-1 will be automatically tripped.

d. EFP-1 will not automatically start if EDG-3A is running and closed on its respective bus.

2.18 Select the CORRECT statement regarding the 480V to 120V AC distribution system.

a. 120V A.C. Vital buses 3A and 3B are supplied from either DC Bus 3A or 480V ES MCC 3A-1 via dual input inverters.

b. DC Bus 3A or 3B can be supplied from a standby battery charger that is powered from 480V ES MCC 3AB.

c. ICS 'X' power supply is from 120V A.C. Vital Bus 3A and ICS 'Y' power supply is from 120V A.C. Vital Bus 3B.

d. Each 120V A.C. Vital Bus can be tranferred from its normal inverter feed to the 480V ES MCC alternate feed via a Static Switch.

2.19 With regard to the Main Steam Rupture Matrix, select the INCORRECT statement.

a. If the Actuation Test Switch is in "Test M.S. Normal" when a steam rupture occurs, the Main Steam Isolation Valves will not close on the affected OTSG.

b. Both the 725 psig switches and the 600 psig switches must operate to cause the matrix to actuate.

c. The emergency block valves (FWV-34 and 35) and the emergency feedwater reg. valves (FWV-161 and 162) are included as valves that auto close when the matrix actuates.

d. During plant cooldown, at 725 psig the rupture matrix can be bypassed by depressing all four actuation PB's.

2.20 Which one of the following is NOT an indicated condition of annunciator C-3-12, "NS CCC SYST RB LEAK".

a. Differential flow to AH Units.

b. Differential flow to letdown coolers.

c. Differential flow to RC Drain Tank Cooler

d. Differential flow to RCP's

2.21 Many important pumps have annunciators which indicate when the pump is out-of-service, for example: ES Annunciator D-3-3 is labeled "DH Pump 'B' OUT OF SERV". Which one of the following is an indicated condition for this type of annunciator.

a. No breaker DC control power

b. Breaker control switch in normal after start, breaker open, breaker racked in.

c. Overload relay actuated.

d. Excessive motor amps.

2.22 The secondary cycle system is sampled for pH, Hydrazine, conductivity, oxygen, sodium and silica. Which of the following will generate a computer alarm and lead you to initiate an Abnormal procedure for Secondary Chemistry Control?

a. pH

b. Conductivity

c. Oxygen

d. Sodium

2.23 Select the INCORRECT statement regarding the Condensate Injection System.

a. Condensate injection is used for main turbine head sprays in the high pressure turbine, pump seals in the feedwater system, and valve steam sealing to prevent in leakage of air to the condensers.

b. When condensate pressure is above 220 psig the condensate pumps are supplying seal and spray water.

c. If the discharge pressure decreases to ~200 psig, the G.W.P. that has been selected will start automatically.

d. The condensate injection system supplies water to the desuperheaters in the auxiliary steam system, steam supplies to both evaporators, and the gland steam system.

2.24 Which of the following chemicals is NOT used in the Makeup and Purification System?

a. Hydrazine

b. Lithium Hydroxide

c. Sodium Thiosulfate

d. Sodium Hydroxide

2.25 Which of the following statements is INCORRECT regarding the Emergency Core Cooling System?

a. The purpose of the 600 psig CF Tank pressure is to mitigate the sudden Temperature increase following the "blow out" phenomenon.

b. Automatic initiation of HPI occurs at 1500 psi, or 500 psi decreasing RC pressure, or 4 psig RB pressure.

c. LPI pumps start on the same signals as HPI and are protected against "Dead-heading" by a recirculation line back to the BWST.

d. When the LPI actuation signal is received the BWST suction valves (DHV-34 and 35), the heat exchanger outlet valves (DHV-14 and 25), and the LPI valves (DHV-5 and 6) receive an auto open signal.

END OF SECTION 2

3.0 INSTRUMENTS AND CONTROLS

3.01 Which one of the following load limiting conditions and corresponding load limit is CORRECT?

a. Loss of 1 RC pump with 4 running - 30%/min to maximum limit of 75%

b. Loss of 2 RC Pumps with 4 running - 30%/min to maximum limit of 45%

c. Loss of feedwater booster pump - 50%/min to maximum limit of 55%

d. Asymmetric Rod - 30%/min to maximum limit of 60%.

3.02 If the Diamond or Reactor Demand Stations are in HAND, the feedwater system will accept responsibility for control of Tave only if certain conditions are met. Of the following conditions that will prevent feedwater from controlling Tave, which one is stated CORRECTLY?

a. Either steam generators high level limited

b. Either steam generator low level limited

c. Either steam generators BTU limited

d. Either loop A or B hand/auto stations in manual.

3.03 Which one of the following statements concerning the Control Rod Drive Position Indication System is TRUE?

a. The 0% switch is located 1.5 inches below the in-limit switch.

b. The 100% switch is located 1.5 inches below the out-limit switch.

c. The first rod in any group to reach the 100% switch will stop further travel of all rods in that group.

d. On group 7, the out-limit is at 91.4% withdrawn but this can be bypassed with a key switch in the control room.

3.04 The following statements concern the Control Rod Drive System. Select the CORRECT statement.

a. If the speed selector switch is left in JOG with the automatic control mode selected, the control rods will still move at RUN speed.

b. For sequence operation of groups 5 through 7, the group select switch may be in any position, including 8, during manual operation in the sequence mode.

c. Once automatic is selected; a trip, programmer lamp fault, or sequence inhibit condition will revert control to manual.

d. The Safety Rods Out Bypass Light will come on if a rod in one of the Safety Groups drops.

3.05 In the turbine bypass valve controller, +50 or +125 psi biases are sometimes applied. Select the CORRECT statement with regard to these biases.

a. Before the turbine is synchronized, a +50 psi bias is applied when all bypass valves are closed and real header pressure is less than 10 psi.

b. If the real header pressure error is 10 psi or greater, then the U.L.D. must be greater than 10% to have the +50 psi bias applied.

c. A + 125 psi bias is applied to the turbine bypass valves whenever the Turbine is Tripped.

d. The +125 psi bias is removed by pressing TRIP RESET on the Diamond panel.

3.06 Select the CORRECT statement with regard to speed control (Governor) of the Emergency Diesel Generators.

a. As a general rule, D-G units running alone should have the SPEED DROOP control set on 0 (zero).

b. The synchronizer motor, mounted on top of the governor, allows the operator to match the voltage of the D-G with running voltage before synchronizing to the system.

c. The LOAD LIMIT control may be used for shutting down the diesel by turning the LOAD LIMIT control to zero.

d. The SYNC INDICATOR, located directly below the SYNCHRONIZER control indicates if the D-G is in phase with the system.

3.07 Which one of the following statements about temperature detectors is TRUE?

a. The thermocouple is connected to one leg of a bridge circuit and as the temperature changes the output voltage across the bridge changes.

b. When a thermocouple fails open it will respond in the same manner as an RTD and will indicate a full scale reading on the meter.

c. When a thermocouple becomes shorted, a new thermocouple will exist at the point of the short and the meter will respond to the ambient temperature at the point of the short.

d. An RTD is comprised of two wires of dissimilar metals in contact with each other and generates an EMF proportional to the temperature difference between the open ends of the wires.

3.08 Which one of the following statements about the ex-core Nuclear Instrumentation is TRUE?

a. The source range signals originate in BF3 proportional counters and are amplified by pre-amps located in the reactor building.

b. The Intermediate Range detectors are compensated ion chambers. The detectors consist of two chambers; one is boron lined and is sensitive to neutrons, while the other is unlined and is sensitive to neutrons and gammas.

c. As the compensating voltage on the IR detectors is increased, the overlap with the source range and power range channels is decreased.

d. Because of gas multiplication in the BF3 detectors, gamma produced pulses are bigger than the neutron produced pulses and are therefore easy to discriminate out in the circuitry.

3.09 Which of the following is TRUE concerning the source range channel high voltage cutoff?

a. Either IR channel at 10^{-9} amps will turn off the high voltage.

b. If one IR channel fails low while at power, the source range high voltage will be re-energized.

c. Power range NI-5 or NI-6 and NI-7 or NI-8 will turn off high voltage at 10% power.

d. The high voltage is turned on from the intermediate range when the power level decreases to 10^{-9} amps.

3.10 When the RPS is in Shutdown Bypass, which one of the following is TRUE?

a. A high pressure trip of 1720 psig is administratively imposed and an overpower trip of 5% automatically imposed.

b. The high pressure trip at 2355 psig is bypassed.

c. The four trips bypassed are high temperature, low pressure, variable low pressure and flux/delta flux/flow.

d. The RCP Power Monitor trip is bypassed.

3.11 With regard to overspeed protection on the main turbine, select the one CORRECT statement.

a. There is a mechanical overspeed trip at 103% and a backup electrical overspeed trip at 111%.

b. With the Overspeed Protection Control (O.P.C.) switch in the "Test" position, the electrical overspeed trip is bypassed.

c. At approximately 103% shaft speed only the governor and interceptor valves will close, while at 111% speed, all four sets of valves will close.

d. In the "Overspeed Test" position on the O.P.C., only the Reheat and interceptor valves close.

3.12 Which one of the following statements concerning the main turbine EHC Indication Panel is INCORRECT?

a. Speed control: This light will be lit before the unit is latched and the generator output breakers are open.

b. Load control: This light will be lit when one of the generator output breakers is closed.

c. Speed channel: This light will be lit if there is a speed differential between the main speed channel and the auxiliary speed indicator.

d. Emergency Power Supply: This light will normally be lit on a startup due to the loss of the Permanent Magnet Generator (PMG).

3.13 Cross-Tie Blocking Interlocks are provided to prevent paralleling of both D-G and to prevent paralleling of both 4160v ES buses. Refer to Figure 10.15 and select the CORRECT statement.

a. If breakers 3209, 3210 and 3205 are all closed, the amber lamp (Block Closing Actuated 3206) will be lit, thus permitting breaker 3206 to be closed.

b. If breakers 3209 and (i) 3205 and 3206, or (ii) 3207 and 3208, or (iii) 3211 and 3212 are closed, the amber lamp (DG Parallel Block Act) will be lit and breaker 3210 can not be closed.

c. If the amber lamp (Block Closing Actuated 3208) is lit, it means breaker 3208 can not be closed because the 3B bus is already being fed from the 3A bus (through 3207) and no Diesels are running.

d. If both Diesels are feeding their respective buses (3209 closed and 3210 closed) all Block Closing Actuated Lamps will be lit.

3.14 The HPI actuation sequence is divided into four blocks for loading the various equipment on its electrical buses. Which one of the following examples of equipment loaded in each block is CORRECT.

	Block 1	Block 2	Block 3	Block 4
a.	Make up Pump	AHF-Run in slow speed	Decay heat pump	RB Spray pump
b.	Decay heat pump	Makeup Pump	NS Closed Cycle Pump	DH Closed Cycle Pump
c.	Makeup Pump	Emerg. NS Seawater Pump	Decay Heat Seawater Pump	RB Spray Pump
d.	AHF-Run in Slow speed	Decay heat Pump	Makeup Pump	DH Closed Cycle Pump

3.15 When conducting a plant shutdown, several operations are required to prevent inadvertent ES actuation. Which of the following statements is TRUE during a plant cooldown?

a. When RC pressure is reduced to 1800 psi, the HPI white bypass permit lights will come on.

b. If HPI was properly bypassed, the 1500 psi bistable tripped lights will not come on when pressure is reduced below this value.

c. When RC pressure reaches 900 psi, the LPI white bypass permit lights will come on allowing the operator to bypass LPI and RB spray.

d. When each channel was bypassed, its respective amber channel bypassed light would have come on, and the green channel function enabled lights and the green bypass/reset lights would have gone out.

3.16 Alarms from various area radiation monitors result in automatic actions that must be immediately verified by the operator. Which one of the following is INCORRECT?

a. RM-A1; Ensure closed AHV-1A, 1B, 1C, 1D

b. RM-A2; Ensure stopped AHF-6A, 6B, 7A, 7B

c. RM-A3; Ensure stopped AHF-11A, 11B

d. RM-A4; Ensure AHF-10 stopped

3.17 Select the INCORRECT statement concerning the Pressurizer Heater controls.

a. Heater bank A, B and C use modulating control (SCRs) while banks D and E are strictly on/off control.

b. If pressurizer level decreases to less than 30 inches, all heater banks will be de-energized.

c. Bank C has four groups of heaters which are sequenced on to prevent two groups in the same bank from coming on simultaneously.

d. Banks A and B contain only one group of heaters, have no staggered turn on, and are both fully on at 2135 psig.

3.18 Which one of the following is consistent with having the out-inhibit lamp lit on the Diamond Rod Control Panel?

a. Power >60% and a 9-inch asymmetric fault exists while in auto

b. ICS auto power is not available

c. One or more programmers has out motion with an in programmers command.

d. One group 7 rod is at the out limit.

~~3.19~~ Which one of the following statements concerning the main feedwater valve interlocks is TRUE?

delete

a. ICS provides an auto open signal to the lo load valve when the startup valve is 50% open, and an auto close signal when the startup valve is 80% closed.

b. Main block valve closes at <45% loop FW demand and FW pump control is speed controlled by loop FW error.

c. If FWV-28 is closed, and Main Block closed, 35 psid is maintained across flow control valves by associated loop ΔP.

d. Upon actuation, the main steam rupture matrix closes all main feedwater valves and prevents reopening these valves in auto mode but not in manual mode.

3.20 To start any circulating water pump the four start permissives must be satisfied. Which of the following is NOT one of the permissives?

a. Condenser vacuum of at least 9.5" Hg established

b. Lube water flow is normal (>19gpm to upper bearing)

c. Water box has been primed to ≥115 feet

d. Pump trip permit: thirty seconds have elapsed since pump last ran.

3.21 Which one of the following plant fire protection systems is NOT automatically actuated by temperature detectors?

a. Deluge water spray
b. Wet pipe sprinkler
c. Carbon dioxide flooding
d. Freon FE-1301

3.22 If all three makeup pumps are expected to be running following an ES actuation, which of the following is the CORRECT system lineup?

a. MUP A running, powered from ES Bus 'A'
MUP B standby, powered from ES Bus 'A'
MUP C standby, powered from ES Bus 'B'
A-B Selector switch in 'A'
B-C Selector switch in 'C'

b. MUP A running, powered from ES Bus 'A'
MUP B standby, powered from ES Bus 'B'
MUP C standby, powered from ES Bus 'B'
A-B selector switch in 'B'
B-C selector switch in 'C'

c. MUP A standby, powered from ES Bus 'A'
MUP B running, powered from ES Bus 'A'
MUP C standby, powered from ES Bus 'B'
A-B selector switch in 'B'
B-C selector switch in 'C'

d. MUP A running, powered from ES Bus 'A'
MUP B standby, powered from ES Bus 'A'
MUP C standby, powered from ES Bus 'B'
A-B selector switch in 'B'
B-C selector switch in 'C'

3.23 Which one of the following is TRUE concerning the "Air Fail Reset" pushbuttons for MUV-16, 31 and 51.

a. The pushbutton only indicates loss of air to the associated valve E/P controller.

b. The pushbutton indicates loss of air to E/P controllers for MUV-16 and 51 and also loss of air to the valve positioner for MUV-31.

c. On loss of air supply, the solenoid valve supplying air to the air lock valve will de-energize, causing the affected valve (16, 31 or 51) to close.

d. When air pressure has increased, depressing the air fail reset pushbutton will unlock MUV-16, 31 or 51.

3.24 Select the CORRECT statement concerning the Nuclear Services Cooling Water System (Seawater and Closed Cycle Cooling)?

a. The normal duty seawater pump, RWP-1, is backed up by emergency pumps RWP-2A and 2B, which start sequentially on low header pressure.

b. An ES signal will start both emergency pumps, RWP-2A and 2B, and will trip RWP-1 after a 15 second time delay.

c. The normal duty closed cycle pump, SWP 1A, is backed up by emergency pumps SWP 1B and 1C, which sequentially start on low header pressure.

d. If any one of the three closed cycle pumps are normally running, an ES signal will automatically start the other two.

3.25 Which of the following is TRUE concerning the OTSG level instruments?

a. The startup range (0-250") and the Operate Range (0-100%) share the same upper and lower level instrument taps

b. If a startup level transmitter fails low while at power, there will be no noticeable effect on the ICS (all subsystems in auto)

c. Interlocks from the Operate Range to the ICS include 50% level on loss of 4 RCPs and Hi level limit.

d. The startup range has a low level input to the ICS and is temperature compensated.

END OF SECTION 3

4.0 Procedures - Normal, Abnormal, Emergency and Radiological Control

4.01 Which one of the following limits and precautions of OP-504 "Integrated Control System", is INCORRRECT.

a. If a feedwater cross-limit occurs while controlling the reactor from either the reactor demand control station or the diamond, reduce reactor power to be compatible with total feedwater flow.

b. If a BTU limit occurs while in manual control of feedwater demand, place the diamond in manual and reduce reactor power until the BTU limiting condi tion just clears and investigate the cause.

c. Prior to placing the diamond control station in "Auto", verify that the power range channel is reading at least 10% power.

d. Steam generator load ratio, ΔTc, cannot be placed in "Auto" unless either feedwater demand station "A" or "B" is in "Auto".

4.02 Which of the following is NOT correct concerning the condition or probable cause of the respective area radiation alarms?

a. RM-A1; High activity in purge duct exhaust or possible RC leak

b. RM-A2; Possible makeup/letdown leak or possible steam generator tube rupture

c. RM-A3; Possible waste gas tank or piping leak

d. RM-A4; High activity in control complex ventilation return air.

4.03 Which of the following conditions requires the affected Reactor Coolant Pump to be shutdown immediately?

a. High seal stage pressure drop (less than two-thirds RCS pressure)

b. High controlled bleed off temperature of ≥170°F

c. Standpipe high level alarm

d. Total seal outflow exceeds 2.5 gpm and is gradually increasing.

4.04 Which one of the following is a Remedial Action instead of an Immediate Action in AP-580, "Reactor Protective System Actuation"?

a. Ensure main block valves closed

b. Ensure low load block valves closed

c. Trip both MFPs.

d. Close MUV-51, Letdown Block Orifice Bypass

4.05 Emergency Reactivity Control Procedure, EP-140 should be used for which one of the following conditions?

a. As a remedial action to any of the runback procedures (immediate action is to ensure control rods inserting.)

b. If there is excessive positive reactivity in the core or boration from BWST is ineffective.

c. As a remedial action to AP-580, "RPS Actuation" (immediate action is to ensure GRP 1-7 rods inserted).

d. Prior to evacuating the control room while conducting the immediate actions of AP-990," Shutdown From Outside Control Room."

4.06 In performing the follow-up actions of EP-290, "Inadequate Core Cooling", the RC pressure has reached 2300 psig and the PORV has been manually opened by the operator. When should the PORV be closed?

a. When RC pressure falls to 90-100 psig above OTSG pressure.

b. When subcooling decreases to less than 20°F.

c. When indicated pressurizer level goes off-scale high.

d. It should not be reclosed as long as full HPI is injecting.

4.07 Which one of the following reactivity control parameters is NOT part of the verifications performed during VP-540, "Runback Verificatior Procedure."

a. Imbalance

b. Quadrant Power Tilt

c. Heat Balance

d. Control rod index

4.08 Which one of the following is an INCORRECT method of verifying natural circulation as specified in VP-580, "Plant Safety Verification Procedure?"

a. Tc > Tsat of OTSG.

b. ΔT develops and stabilizes.

c. Avg of 5 highest incore thermocouples follow T_h within 10°F.

d. When OTSG pressure is lowered, then Th, Tc and incore thermocouples lower.

4.09 Which one of the following is an INCORRECT immediate action of AP-450, "Emergency Feedwater Actuation?" Ensure closed:

a. MBVs

b. MSIVs

c. LLBVs

d. SUBVs

4.10 OP-402, "Makeup and Purification System, says, "Loss of flow through makeup pump will destroy the pump within approximately _____".

a. 15 seconds

b. 1 minute

c. 3 minutes

d. 10 minutes

4.11 Which of the following is a CORRECT definition as contained in the Radiation Protection Manual, RP-101?

a. "Clean Area" - Removable contamination < 30 dpm beta-gamma or 300 dpm alpha, as determined by smear surveys representing approximately 100 cm^2 of surface area.

b. "Radiation Area" - Any accessible area where a major portion of the body could exceed a dose rate of 5 mrem/hr or in any seven consecutive days a dose in excess of 100 mrem.

c. "High Radiation Area" - Any accessible area where a major portion of the body could receive a dose rate in excess of 100 mrem/hr or, in any seven consecutive days a dose in excess of 1000 mrem.

d. "Clean Area" - Fixed surface contamination measuring < 0.25 mrem/hr beta-gamma and < 300 dpm alpha as measured by appropriate survey instrument probes.

4.12 Select the CORRECT statement from the following:

a. Visitors at Crystal River may not receive a dose in excess of 1.25 Rem/Qtr. even if an NRC Form 4 is completed and furnished.

b. Emergency Exposures (25 Rem during an accident or 75 Rem for life-saving) must be included in the individuals radiation exposure history.

c. The Nuclear Plant Manager has the authority to allow individuals to receive up to 3000 mrem in one week for special work assignments.

d. The maximum weekly exposure is 300 mrem. The Shift Supervisor may authorize exposures 600 mrem by use of Form 912801.

4.13 Which one of the following Crystal River emergency procedures would list these entry "symptoms" and "condition":

Symptoms	Condition
1. Neutron Flux raising	Excessive reactivity exist in core without automatic protection features
2. RC pressure raising or Pzr level raising	

a. EP-120, "Inadequate Shutdown Value"

b. EP-140, "Emergency Reactivity Control"

c. EP-220, "Pressurized Thermal Shock"

d. EP-260, "Inadequate Decay Heat Removal"

4.14 Which one of the following procedures has no Immediate Action?

a. EP-120, "Inadequate Shutdown Value"

b. EP-140, "Emergency Reactivity Control"

c. EP-220, "Pressurized Thermal Shock"

d. EP-260, "Inadequate Decay Heat Removal"

4.15 Crystal River emergency procedure EP-220, "Pressurized Thermal Shock" lists as a remedial action, "Reduce Subcooling to minimum:" Which is one of the following RC pressure and subcooling margins are appropriate for this remedial action?

a. ≤ 500 psig - 20°F

b. ≤ 500 psig - 50°F

c. ≥ 1500 psig - 20°F

d. ≥ 1500 psig - 50°F

4.16 Which one of the following is true of emergency procedure EP-390, "Steam Generator Tube Rupture"?

a. Entry Symptom: Subcooling Margin Monitor < 0°F, Incore thermocouples selected.

b. Entry Symptom: OTSGs are at 95% or greater on the operating range and rising.

c. Immediate action: Start load reduction at 5%/min.

d. Immediate action: Lower and maintain OTSG Tsat. 90-110°F less than Tsat. for the existing RC pressure.

4.17 According to 10 CFR 20, which one of the following is equal to one rem?

a. A dose of 1 rad due to X, gamma or beta radiation.

b. A dose of 1 rad due to X or gamma radiation, or 0.1 rad due to beta radiation.

c. A dose of 0.1 rad due to alpha particles or fast neutrons.

d. A dose of 0.1 rad due to alpha particles or 0.2 rad due to beta radiation or 0.33 rad due to thermal neutrons.

4.18 There are two classifications of operating procedures (according to AI-500), step-by-step and guidance. Identify the one procedure below that is to be followed step-by-step.

a. OP-502, "Transfer Group from DC Hold to Auxiliary Bus."

b. OP-503, "Initialization of Plant Computer"

c. OP-605, "Starting of a Main Feedwater Pump"

d. OP-605, "Emergency Feed Pump Operation"

4.19 Which one of the following conditions requires the operator to manually trip the reactor?

a. Loss of RCP (3 running)

b. CRD stator temperature 165°F

c. Pzr. level of 295 inches

d. Channel A Th of 602°F

4.20 Which one of the following conditions requires the operator to manually trip the reactor?

a. CRD stator temperature of 185°F

b. Loss of 1 main feed pump

c. Loss of Pzr heaters

d. Condenser vacuum of 26" Hg.

4.21 Which one of the following conditions requires the operator to manually trip the reactor?

a. Dropped control rod

b. BTU limit (ICS)

c. Two MSIVs close

d. 0.25 gpm OTSG tube leak

4.22 Select the one statement below which is correct for the plant at 90% power, steady state operation.

a. a control rod suspected of being stuck must be moved (attempted) in "jog" speed.

b. at the conclusion of rod exercising with no auto inhibit conditions, an out inhibit indication means a safety control rod not fully withdrawn.

c. Rod exercising should be performed only on down power transients, not on up power transients.

d. Motor tube extension operating temperature must not exceed 450°F and stator temperature must not exceed 180°F.

4.23 Which one of the following statements about the deaerator tank level control is correct?

a. High level in the deaerator tank (~14.5 ft.) will start the second CD pump.

b. High level interlock (~14 ft.) will open HDV-83 and dump 7500 gallons to the condensate storage tank.

c. High level interlock (~14 ft.) closes HDV-50 and 54, drains for intermediate pressure feedwater heaters.

d. The deaertor tank normal operaing level is between 7 feet and 14.0 feet.

4.24 Which of the following would be proper action to be taken for a plant upset with feedwater controllers in manual?

a. Place ΔTc controller in Auto.

b. Raise feedwater flow until BTU limit in each OTSG is reached to ensure adequate heat removal capabilities.

c. Feed flow should be adjusted according to RCS pressure. For RCS pressure less than 2155 decrease feedflow; for RCS pressure greater than 2155 increase feedflow.

d. Reduce the ICS rate limiter to 0.25%/min. to allow time for operator response with feedwater controls in manual.

4.25 Cooling water flow to the CRDs must be:

a. at least 130 GPM if RCS temperature is above 180°F
b. 10°F above the dew point at the reactor vessel head.
c. at least 125°F.
d. a maximum of 180°F

END OF EXAM

EQUATION SHEET

$Q = m\Delta h$

$Q = UA\Delta T$

$x^3_p = xw$

$Q = mcp\Delta T$

$$DNBR = \frac{Q_c}{Q_x}$$

$P = P_o 10\ SUR(t)$

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

$$SUR = \frac{26.06}{T}$$

$$T = \frac{\beta - p}{\lambda p}$$

$$T = \frac{l^*}{p} + \frac{\beta - p}{\lambda p}$$

$$p = \frac{Keff-1}{Keff}$$

$$p = \frac{K_2 - K_1}{K_2 K_1}$$

$$\frac{CR1}{CR2} = \frac{1 - Keff_2}{1 - Keff_1}$$

$RR = \Sigma f \theta t h$

$$SCR = \frac{S}{1-Keff}$$

$$M = \frac{CR_1}{Cr_o}$$

$x^2(ft) = xw$

$l^* = 10^{-5}$ sec

$A = \lambda N$

$$\lambda = \frac{\ln 2}{t_{\frac{1}{2}}}$$

$N = N_o e^{(-\lambda t)}$

$$t_{\frac{1}{2}} = \frac{0.693}{\lambda}$$

$$R/_{hr} = \frac{6CEn}{d^2}$$

$\lambda = 0.1\ sec^{-1}$

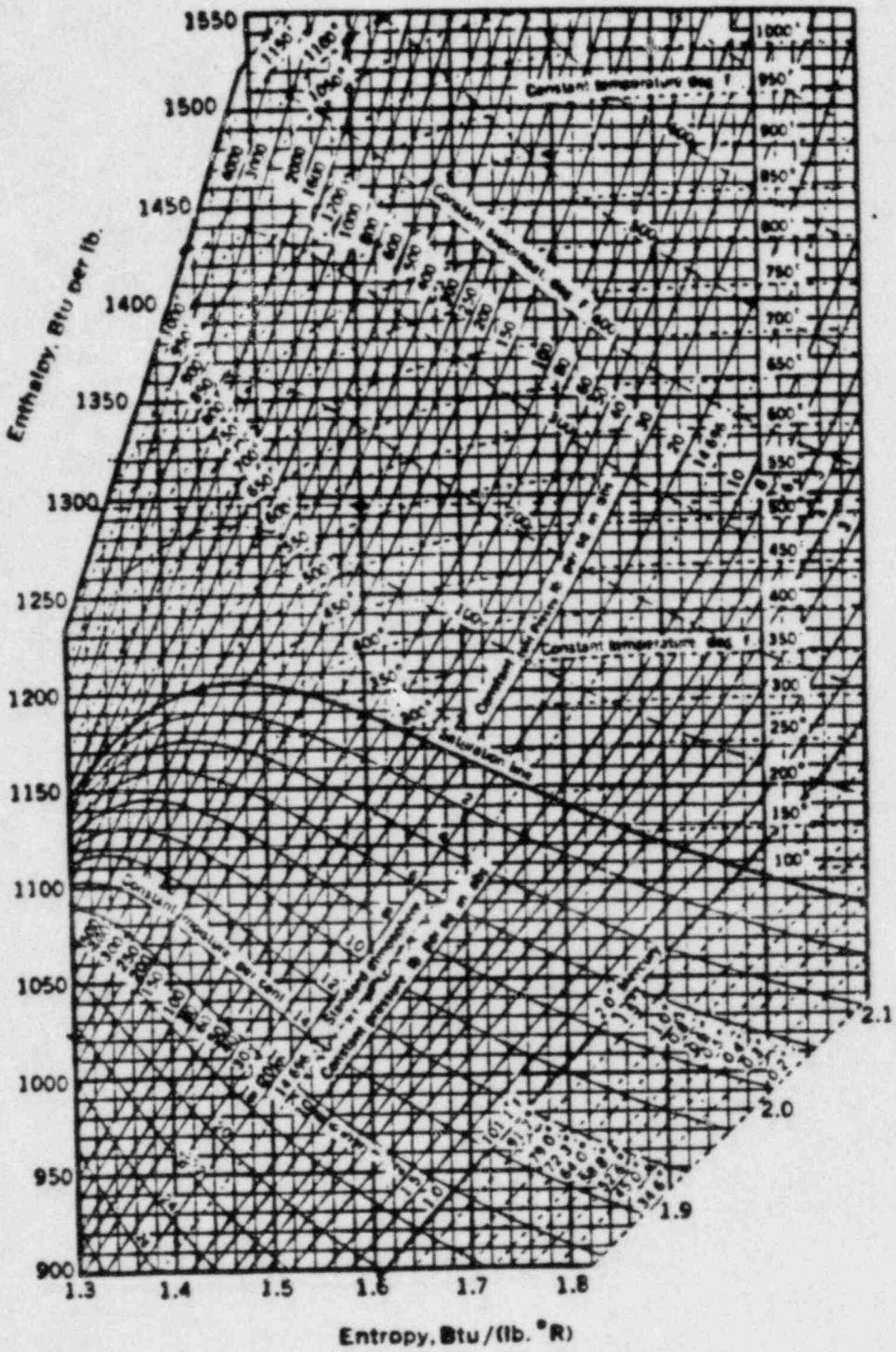
$q\ 1\text{-}2 = h_2 - h_1$

$q = h\ a\ \Delta\ t$

$x^2 = xw$

$KE_1 + h_1 + q_{12} = KE_2 + h_2 + w_{12}$

Where:
1) KE is Kenetic energ
2) w is work done
3) q is the heat transferred
4) h is the enthalpy



Mollier diagram for steam

Abs pres. psia (Sat temp. °F)		Temperature °F 200	300	400	500	600	700	800	900	1000	1100	1200	1400
1 (101.74)	v	392.6	452.3	512.0	571.6	631.2	690.8	750.4	809.9	869.5	929.1	988.7	1107.8
	h	1150.4	1195.8	1241.7	1288.3	1335.7	1383.8	1432.8	1482.7	1533.5	1585.2	1637.7	1745.7
	s	2.0512	2.1153	2.1720	2.2233	2.2702	2.3137	2.3542	2.3923	2.4283	2.4625	2.4952	2.5566
5 (162.24)	v	78.16	90.25	102.26	114.22	126.16	138.10	150.03	161.95	173.87	185.79	197.71	221.6
	h	1148.8	1195.0	1241.2	1288.0	1335.4	1383.6	1432.7	1482.6	1533.4	1585.1	1637.7	1745.7
	s	1.8718	1.9370	1.9942	2.0456	2.0927	2.1361	2.1767	2.2148	2.2509	2.2851	2.3178	2.3792
10 (193.21)	v	38.85	45.00	51.04	57.05	63.03	69.01	74.98	80.95	86.92	92.88	98.84	110.77
	h	1146.6	1193.9	1240.6	1287.5	1335.1	1383.4	1432.5	1482.4	1533.2	1585.0	1637.6	1745.6
	s	1.7927	1.8595	1.9172	1.9689	2.0160	2.0596	2.1002	2.1383	2.1744	2.2068	2.2413	2.3028
14.696 (212.00)	v		30.53	34.68	38.78	42.86	46.94	51.00	55.07	59.13	63.19	67.25	75.37
	h		1192.8	1239.9	1287.1	1334.8	1383.2	1432.3	1482.3	1533.1	1584.8	1637.5	1745.5
	s		1.8160	1.8743	1.9261	1.9734	2.0170	2.0576	2.0958	2.1319	2.1662	2.1989	2.2603
20 (227.96)	v		22.36	25.43	28.46	31.47	34.47	37.46	40.45	43.44	46.42	49.41	55.37
	h		1191.6	1239.2	1286.6	1334.4	1382.9	1432.1	1482.1	1533.0	1584.7	1637.4	1745.4
	s		1.7808	1.8396	1.8918	1.9392	1.9829	2.0235	2.0618	2.0978	2.1321	2.1648	2.2263
40 (267.25)	v		11.040	12.628	14.168	15.688	17.198	18.702	20.20	21.70	23.20	24.69	27.68
	h		1186.8	1236.5	1284.8	1333.1	1381.9	1431.3	1481.4	1532.4	1584.3	1637.0	1745.1
	s		1.6994	1.7608	1.8140	1.8619	1.9058	1.9467	1.9850	2.0212	2.0555	2.0883	2.1498
60 (292.71)	v		7.259	8.357	9.403	10.427	11.441	12.449	13.452	14.454	15.453	16.451	18.446
	h		1181.6	1233.6	1283.0	1331.8	1380.9	1430.5	1480.8	1531.9	1583.8	1636.6	1744.8
	s		1.6492	1.7135	1.7678	1.8162	1.8605	1.9015	1.9400	1.9762	2.0106	2.0434	2.1049
80 (312.03)	v			6.220	7.020	7.797	8.562	9.322	10.077	10.830	11.582	12.332	13.830
	h			1230.7	1281.1	1330.5	1379.9	1429.7	1480.1	1531.3	1583.4	1636.2	1744.5
	s			1.6791	1.7346	1.7836	1.8281	1.8694	1.9079	1.9442	1.9787	2.0115	2.0731
100 (327.81)	v			4.937	5.589	6.218	6.835	7.446	8.052	8.656	9.259	9.860	11.060
	h			1227.6	1279.1	1329.1	1378.9	1428.9	1479.5	1530.8	1582.9	1635.7	1744.2
	s			1.6518	1.7085	1.7581	1.8029	1.8443	1.8829	1.9193	1.9538	1.9867	2.0484
120 (341.25)	v			4.081	4.636	5.165	5.683	5.195	6.702	7.207	7.710	8.212	9.214
	h			1224.4	1277.2	1327.7	1377.8	1428.1	1478.8	1530.2	1582.4	1635.3	1743.9
	s			1.6287	1.6869	1.7370	1.7822	1.8237	2.8625	1.8990	1.9335	1.9664	2.0281
140 (353.02)	v			3.468	3.954	4.413	4.861	5.301	5.738	6.172	6.604	7.035	7.895
	h			1221.1	1275.2	1326.4	1376.8	1427.3	1478.2	1529.7	1581.9	1634.9	1743.5
	s			1.6087	1.6683	1.7190	1.7645	1.8063	1.8451	1.8817	1.9163	1.9493	2.0110
160 (363.53)	v			3.008	3.443	3.849	4.244	4.631	5.015	5.396	5.775	6.152	6.906
	h			1217.6	1273.1	1325.0	1375.7	1426.4	1477.5	1529.1	1581.4	1634.5	1743.2
	s			1.5908	1.6519	1.7033	1.7491	1.7911	1.8301	1.8667	1.9014	1.9344	1.9962
180 (373.06)	v			2.649	3.044	3.411	3.764	4.110	4.452	4.792	5.129	5.466	6.136
	h			1214.0	1271.0	1323.5	1374.7	1425.6	1476.8	1528.6	1581.0	1634.1	1742.9
	s			1.5745	1.6373	1.6894	1.7355	1.7776	1.8167	1.8534	1.8882	1.9212	1.9831
200 (381.79)	v			2.361	2.726	3.060	3.380	3.693	4.002	4.309	4.613	4.917	5.521
	h			1210.3	1268.9	1322.1	1373.6	1424.8	1476.2	1528.0	1580.5	1633.7	1742.6
	s			1.5594	1.6240	1.6767	1.7232	1.7655	1.8048	1.8415	1.8763	1.9094	1.9713
220 (389.86)	v			2.125	2.465	2.772	3.066	3.352	3.634	3.913	4.191	4.467	5.017
	h			1206.5	1266.7	1320.7	1372.6	1424.0	1475.5	1527.5	1580.0	1633.3	1742.3
	s			1.5453	1.6117	1.6652	1.7120	1.7545	1.7939	1.8308	1.8656	1.8987	1.9607
240 (397.37)	v			1.9276	2.247	2.533	2.804	3.068	3.327	3.584	3.839	4.093	4.597
	h			1202.5	1264.5	1319.2	1371.5	1423.2	1474.8	1526.9	1579.6	1632.9	1742.0
	s			1.5319	1.6003	1.6546	1.7017	1.7444	1.7839	1.8209	1.8558	1.8889	1.9510
260 (404.42)	v				2.063	2.330	2.582	2.827	3.067	3.305	3.541	3.776	4.242
	h				1262.3	1317.7	1370.4	1422.3	1474.2	1526.3	1579.1	1632.5	1741.7
	s				1.5897	1.6447	1.6922	1.7352	1.7748	1.8118	1.8467	1.8799	1.9420
280 (411.05)	v				1.9047	2.156	2.392	2.621	2.845	3.066	3.286	3.504	3.938
	h				1260.0	1316.2	1369.4	1421.5	1473.5	1525.8	1578.6	1632.1	1741.4
	s				1.5796	1.6354	1.6834	1.7265	1.7662	1.8033	1.8383	1.8716	1.9337
300 (417.33)	v				1.7675	2.005	2.227	2.442	2.652	2.859	3.065	3.269	3.674
	h				1260.0	1316.2	1368.3	1420.6	1472.8	1525.2	1578.1	1631.7	1741.0
	s				1.5701	1.6268	1.6751	1.7184	1.7582	1.7954	1.8305	1.8638	1.9260
350 (431.72)	v				1.4923	1.7036	1.8980	2.084	2.266	2.445	2.622	2.798	3.147
	h				1251.5	1310.9	1365.5	1418.5	1471.1	1523.8	1577.0	1630.7	1740.3
	s				1.5481	1.6070	1.6563	1.7002	1.74[illegible]	1.777[illegible]	1.8[illegible]	1.8463	1.9086
400 (444.59)	v				1.2651	1.4770	1.6508	1.8161	1.97[illegible]	2.13[illegible]	2.29[illegible]	2.445	2.751
	h				1245.1	1306.9	1362.7	1416.4	146[illegible]	1522.4	157[illegible]	1629.6	1739.5
	s				1.5281	1.5894	1.6398	1.6842	1.724[illegible]	1.762[illegible]	1.79[illegible]	1.8311	1.893[illegible]

Table [illegible] Superheated Steam – *Continued*

Abs Pressure (Sat Temp)		Sat Water	Sat Steam	Temperature – Degrees Fahrenheit 450	500	550	600	650	700	750	800	900	1000	1100	1200	1300	1400	1000
	Sh			5.40	55.40	105.40	155.40	205.40	255.40	305.40	355.40	455.40	555.40	655.40	755.40	855.40	955.40	1055.40
600	v	0.01934	1.3610	1.1738	1.2941	1.3836	1.4763	1.5646	1.6499	1.8151	1.9759	2.1339	2.2901	2.4450	2.5987	2.7515	2.9037	
(644.60)	h	424.17	1294.6	1208.8	1245.1	1277.5	1307.4	1335.9	1363.4	1417.0	1470.1	1523.3	1576.9	1631.2	1686.7	1741.9	1798.2	
	s	0.6217	1.4847	1.4894	1.5787	1.5611	1.5901	1.6163	1.6406	1.6850	1.7255	1.7637	1.7988	1.8375	1.8647	1.8955	1.9250	
	Sh			60	50.60	100.60	150.60	200.60	250.60	300.60	350.60	450.60	550.60	650.60	750.60	850.60	950.60	1050.60
629	v	0.01947	1.1057	1.1071	1.2148	1.3113	1.4007	1.4856	1.5676	1.7258	1.8795	2.0304	2.1795	2.3273	2.4739	2.6196	2.7647	
(649.40)	h	429.56	1294.7	1205.7	1247.4	1275.4	1305.8	1334.5	1362.3	1416.7	1468.4	1522.7	1576.4	1630.8	1685.8	1741.6	1798.0	
	s	0.6276	1.4802	1.4808	1.5206	1.5547	1.5835	1.6100	1.6345	1.6791	1.7197	1.7575	1.7932	1.8269	1.8591	1.8899	1.9195	
	Sh				45.97	95.97	145.97	195.97	245.97	345.97	445.97	545.97	645.97	745.97	845.97	945.97	1045.97	
648	v	0.01960	1.0554		1.1517	1.2454	1.3319	1.4138	1.4926	1.6445	1.7918	1.9363	2.0790	2.2203	2.3605	2.4998	2.6384	
(654.03)	h	434.77	1294.8		1239.7	1273.4	1304.7	1333.2	1361.1	1415.3	1468.7	[illegible]	1575.9	1630.4	1685.5	1741.2	1797.7	
	s	0.6332	1.4759		1.5137	1.5474	1.5772	1.6040	1.6286	1.6734	1.7142	[illegible]	1.7878	1.8216	1.8538	1.8847	1.9143	
	Sh				41.50	91.50	141.50	191.50	241.50	341.50	441.50	541.50	641.50	741.50	841.50	941.50	1041.50	
664	v	0.01959	1.0097		1.0939	1.1852	1.2691	1.3482	1.4247	1.5703	1.7117	1.8504	1.9872	2.1226	2.2569	2.3903	2.5230	
(658.50)	h	439.83	1294.8		1238.9	1271.3	1302.5	1331.8	1360.0	1414.4	1468.0	1521.5	1575.4	1629.9	1685.1	1740.9	1797.4	
	s	0.6387	1.4718		1.5080	1.5409	1.5711	1.5987	1.6230	1.6680	1.7089	1.7469	1.7826	1.8165	1.8488	1.8797	1.9093	
	Sh				37.18	87.18	137.18	187.18	237.18	337.18	437.18	537.18	637.18	737.18	837.18	937.18	1037.18	
680	v	0.01967	0.9668		1.0409	1.1300	1.2115	1.2881	1.3615	1.5023	1.6384	1.7716	1.9030	2.0330	2.1619	2.2900	2.4173	
(662.82)	h	444.75	1294.8		1234.1	1269.1	1300.8	1330.5	1358.8	1413.6	1467.3	1520.9	1574.9	1629.5	1684.7	1740.6	1797.2	
	s	0.6439	1.4677		1.4990	1.5346	1.5652	1.5925	1.6176	1.6628	1.7038	1.7419	1.7777	1.8116	1.8439	1.8748	1.9045	
	Sh				32.99	82.99	132.99	182.99	232.99	332.99	432.99	532.99	632.99	732.99	832.99	932.99	1032.99	
690	v	0.01975	0.9276		0.9919	1.0791	1.1584	1.2377	1.3037	1.4397	1.5708	1.6990	1.8256	1.9507	2.0746	2.1977	2.3200	
(667.01)	h	449.52	1294.7		1231.2	1267.0	1299.1	1329.1	1357.7	1412.7	1466.6	1520.3	1574.4	1629.1	1684.4	1740.3	1796.9	
	s	0.6490	1.4639		1.4921	1.5296	1.5595	1.5871	1.6123	1.6578	1.6990	1.7371	1.7730	1.8069	1.8393	1.8707	1.8998	
	Sh				28.93	78.93	128.93	178.93	228.93	328.93	428.93	528.93	628.93	728.93	828.93	928.93	1028.93	
699	v	0.01982	0.8914		0.9466	1.0371	1.1094	1.1816	1.2504	1.3819	1.5085	1.6323	1.7542	1.8746	1.9940	2.1125	2.2302	
(671.07)	h	454.18	1294.5		1228.3	1264.8	1297.4	1327.7	1356.5	1411.8	1465.9	1519.7	1573.9	1628.7	1684.0	1740.0	1796.7	
	s	0.6540	1.4601		1.4853	1.5223	1.5539	1.5818	1.6072	1.6530	1.6943	1.7325	1.7684	1.8024	1.8348	1.8657	1.8954	
	Sh				24.99	74.99	124.99	174.99	224.99	324.99	424.99	524.99	624.99	724.99	824.99	924.99	1024.99	
708	v	0.01990	0.8577		0.9045	0.9884	1.0640	1.1342	1.2010	1.3284	1.4508	1.5704	1.6880	1.8042	1.9193	2.0336	2.1471	
(675.01)	h	458.71	1294.4		1225.3	1262.5	1295.7	1326.3	1355.3	1410.9	1465.1	1519.1	1573.4	1628.2	1683.6	1739.7	1796.4	
	s	0.6587	1.4565		1.4786	1.5164	1.5485	1.5767	1.6023	1.6483	1.6897	1.7280	1.7640	1.7981	1.8305	1.8615	1.8911	
	Sh				21.16	71.16	121.16	171.16	221.16	321.16	421.16	521.16	621.16	721.16	821.16	921.16	1021.16	
718	v	0.01998	0.8264		0.8653	0.9479	1.0217	1.0907	1.1562	1.2787	1.3972	1.5129	1.6266	1.7388	1.8500	1.9603	2.0699	
(678.84)	h	463.14	1294.2		1222.2	1260.3	1293.9	1324.9	1354.2	1410.0	1464.4	1518.6	1572.9	1627.8	1683.3	1739.4	1796.1	
	s	0.6634	1.4529		1.4720	1.5106	1.5431	1.5717	1.5975	1.6438	1.6853	1.7237	1.7598	1.7839	1.8263	1.8573	1.8870	
	Sh				17.43	67.43	117.43	167.43	217.43	317.43	417.43	517.43	617.43	717.43	817.43	917.43	1017.43	
728	v	0.02006	0.7871		0.8287	0.9100	0.9824	1.0492	1.1125	1.2324	1.3473	1.4593	1.5693	1.6780	1.7855	1.8921	1.9980	
(682.57)	h	467.47	1293.9		1219.1	1258.0	1292.1	1323.4	1353.0	1409.2	1463.7	1518.0	1572.4	1627.4	1682.9	1739.1	1795.9	
	s	0.6679	1.4495		1.4654	1.5049	1.5380	1.5668	1.5929	1.6394	1.6811	1.7196	1.7556	1.7898	1.8223	1.8533	1.8831	
	Sh				13.80	63.80	113.80	163.80	213.80	313.80	413.80	513.80	613.80	713.80	813.80	913.80	1013.80	
738	v	0.02013	0.7697		0.7944	0.8746	0.9456	1.0109	1.0726	1.1892	1.3008	1.4093	1.5160	1.6211	1.7252	1.8284	1.9309	
(686.20)	h	471.70	1293.[illegible]		1215.9	1255.6	1290.3	1322.0	1351.8	1408.3	1463.0	1517.4	1571.9	1627.0	1682.6	1738.8	1795.6	
	s	0.6723	1.[illegible]		1.4590	1.4993	1.5329	1.5621	1.5884	1.6351	1.6769	1.7155	1.7517	1.7859	1.8184	1.8494	1.8792	
	Sh				5.11	55.11	105.11	155.11	205.11	305.11	405.11	505.11	605.11	705.11	805.11	905.11	1005.11	
758	v	0.02037	0.7084		0.7173	0.7954	0.8634	0.9254	0.9835	1.0929	1.1969	1.2979	1.3969	1.4944	1.5905	1.6864	1.7813	
(694.85)	h	481.84	1291.8		1207.6	1249.8	1285.7	1318.3	1348.7	1408.0	1461.2	1515.5	1570.7	1626.9	1683.6	1739.9	1796.9	
	s	1.6828	1.4382		1.4430	1.4858	1.5207	1.5507	1.5775	1.6249	1.6671	1.7056	1.7422	1.7765	1.8092	1.8403	1.8701	
	Sh					46.92	96.92	146.92	196.92	296.92	396.97	496.92	596.97	696.92	796.97	896.92	996.92	
798	v	0.02050	0.6556			0.7271	0.7928	0.8520	0.9072	1.0102	1.1078	1.2023	1.2948	1.3858	1.4757	1.5647	1.6530	
(703.08)	h	491.60	1291.8			1243.4	1281.0	1314.6	1345.6	1403.7	1459.4	1514.4	1569.4	1624.8	1680.7	1737.2	1794.3	
	s	0.6928	1.4304			1.4726	1.5090	1.5399	1.5673	1.6154	1.6580	1.6970	1.7335	1.7679	1.8006	1.8318	1.8617	
	Sh					39.16	89.16	139.16	189.16	289.16	389.16	489.16	589.16	689.16	789.16	889.16	989.16	
754	v	0.02069	0.6095			0.6676	0.7313	0.7882	0.8409	0.9388	1.0306	1.1195	1.2063	1.2916	1.3759	1.4592	1.5419	
(510.84)	h	500.89	1290.7			1236.9	1276.1	1310.7	1342.5	1401.5	1457.6	1512.9	1568.7	1623.8	1679.8	1736.4	1793.6	
	s	0.7022	1.4232			1.4598	1.4977	1.5296	1.5577	1.6065	1.6494	1.6886	1.7252	1.7598	1.7926	1.8239	1.8538	
	Sh					31.79	81.79	131.79	181.79	281.79	381.79	481.79	581.79	681.79	781.79	881.79	981.79	
778	v	0.02087	0.5690			0.6151	0.6774	0.7323	0.7828	0.8759	0.9631	1.0470	1.1289	1.2093	1.2885	1.3669	1.4446	
(518.21)	h	509.81	1199.4			1230.1	1271.1	1306.8	1339.3	1399.1	1455.8	1511.4	1566.9	1622.7	1678.9	1735.7	1792.9	
	s	0.7111	1.4163			1.4472	1.4869	1.5198	1.5484	1.5980	1.6413	1.6807	1.7175	1.7522	1.7851	1.8164	1.8464	
	Sh					24.76	74.76	124.76	174.76	274.76	374.76	474.76	574.76	674.76	774.76	874.76	974.76	
804	v	0.02105	0.5330			0.5683	0.6296	0.6829	0.7315	0.8205	0.9034	0.9830	1.0606	1.1366	1.2115	1.2855	1.3588	
(525.24)	h	518.40	1198.0			1223.0	1265.9	1302.8	1336.0	1396.8	1454.0	1510.0	1565.7	1621.6	1678.0	1734.9	1792.3	
	s	0.7197	1.4096			1.4347	1.4763	1.5102	1.5396	1.5899	1.6336	1.6733	1.7107	1.7450	1.7780	1.8094	1.8395	
	Sh					18.05	68.05	118.05	168.05	268.05	368.05	468.05	568.05	668.05	768.05	868.05	968.05	
828	v	0.02123	0.5009			0.5263	0.5869	0.6388	0.6858	0.7713	0.8504	0.9262	0.9998	1.0720	1.1430	1.2131	1.2825	
(531.95)	h	526.70	1196.4			1215.5	1260.6	1298.6	1332.7	1394.4	1452.2	1508.5	1564.4	1620.6	1677.1	1734.1	1791.6	
	s	0.7279	1.4032			1.4223	1.4659	1.5010	1.5311	1.5822	1.6263	1.6662	1.7033	1.7382	1.7713	1.8028	1.8329	

Sh = superheat, F
v = specific volume, cu ft per lb
h = enthalpy, Btu per lb
s = entropy, Btu per R per lb

TABLE D-1a
Properties of Dry Saturated Steam (continued)
Pressure

Abs press, psia	Temp, °F	Specific volume		Enthalpy			Entropy		
		Sat liquid	Sat vapor	Sat liquid	Evap	Sat vapor	Sat liquid	Evap	Sat vapor
P	t	v_f	v_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g
120	341.25	0.01789	3.728	312.44	877.9	1190.4	0.4916	1.0962	1.5878
130	347.32	0.01796	3.455	318.81	872.9	1191.7	0.4995	1.0817	1.5812
140	353.02	0.01802	3.220	324.82	868.2	1193.0	0.5069	1.0682	1.5751
150	358.42	0.01809	3.015	330.51	863.6	1194.1	0.5138	1.0556	1.5694
160	363.53	0.01815	2.834	335.93	859.2	1195.1	0.5204	1.0436	1.5640
170	368.41	0.01822	2.675	341.09	854.9	1196.0	0.5266	1.0324	1.5590
180	373.06	0.01827	2.532	346.03	850.8	1196.9	0.5325	1.0217	1.5542
190	377.51	0.01833	2.404	350.79	846.8	1197.6	0.5381	1.0116	1.5497
200	381.79	0.01839	2.288	355.36	843.0	1198.4	0.5435	1.0018	1.5453
250	400.95	0.01865	1.8438	376.00	825.1	1201.1	0.5675	0.9588	1.5263
300	417.33	0.01890	1.5433	393.84	809.0	1202.8	0.5879	0.9225	1.5104
350	431.72	0.01913	1.3260	409.69	794.2	1203.9	0.6056	0.8910	1.4966
400	444.59	0.0193	1.1613	424.0	780.5	1204.5	0.6214	0.8630	1.4844
450	456.28	0.0195	1.0320	437.2	767.4	1204.6	0.6356	0.8378	1.4734
500	467.01	0.0197	0.9278	449.4	755.0	1204.4	0.6487	0.8147	1.4634
550	476.94	0.0199	0.8424	460.8	743.1	1203.9	0.6608	0.7934	1.4542
600	486.21	0.0201	0.7698	471.6	731.6	1203.2	0.6720	0.7734	1.4454
650	494.90	0.0203	0.7083	481.8	720.5	1202.3	0.6826	0.7548	1.4374
700	503.10	0.0205	0.6554	491.5	709.7	1201.2	0.6925	0.7371	1.4296
750	510.86	0.0207	0.6092	500.8	699.2	1200.0	0.7019	0.7204	1.4223
800	518.23	0.0209	0.5687	509.7	688.9	1198.6	0.7108	0.7045	1.4153
850	525.26	0.0210	0.5327	518.3	678.8	1197.1	0.7194	0.6891	1.4085
900	531.98	0.0212	0.5006	526.6	668.8	1195.4	0.7275	0.6744	1.4020
950	538.43	0.0214	0.4717	534.6	659.1	1193.7	0.7355	0.6602	1.3957
1000	544.61	0.0216	0.4456	542.4	649.4	1191.8	0.7430	0.6467	1.3897
1100	556.31	0.0220	0.4001	557.4	630.4	1187.7	0.7575	0.6205	1.3780
1200	567.22	0.0223	0.3619	571.7	611.7	1183.4	0.7711	0.5956	1.3667
1300	577.46	0.0227	0.3293	585.4	593.2	1178.6	0.7840	0.5719	1.3559
1400	587.10	0.0231	0.3012	598.7	574.7	1173.4	0.7963	0.5491	1.3454
1500	596.23	0.0235	0.2765	611.6	556.3	1167.9	0.8082	0.5269	1.3351
2000	635.82	0.0257	0.1878	671.7	463.4	1135.1	0.8619	0.4230	1.2849
2500	668.13	0.0287	0.1307	730.6	360.5	1091.1	0.9126	0.3197	1.2322
3000	695.36	0.0346	0.0858	802.5	217.8	1020.3	0.9731	0.1885	1.1615
3206.2	705.40	0.0503	0.0503	902.7	0	902.7	1.0580	0	1.0580

TABLE D-1.0*
Properties of Dry Saturated Steam *
Pressure

Abs press. psia	Temp. °F	Specific volume		Enthalpy			Entropy		
		Sat liquid	Sat vapor	Sat liquid	Evap	Sat vapor	Sat liquid	Evap	Sat vapor
p	t	v_f	v_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g
1.0	101.74	0.01614	333.6	69.70	1036.3	1106.0	0.1326	1.8456	1.9782
2.0	126.08	0.01623	173.73	93.99	1022.2	1116.2	0.1749	1.7451	1.9200
3.0	141.48	0.01630	118.71	109.37	1013.2	1122.6	0.2008	1.6855	1.8863
4.0	152.97	0.01636	90.63	120.86	1006.4	1127.3	0.2198	1.6427	1.8625
5.0	162.24	0.01640	73.52	130.13	1001.0	1131.1	0.2347	2.6094	1.8441
6.0	170.06	0.01645	61.98	137.96	996.2	1134.2	0.2472	1.5820	1.8292
7.0	176.85	0.01649	53.64	144.76	992.1	1136.9	0.2581	1.5586	1.8167
8.0	182.86	0.01653	47.34	150.79	988.5	1139.3	0.2674	1.5383	1.8057
9.0	188.28	0.01656	42.40	156.22	985.2	1141.4	0.2759	1.5203	1.7962
10	193.21	0.01659	38.42	161.17	982.1	1143.3	0.2835	1.5041	1.7876
14.696	212.00	0.01672	26.80	180.07	970.3	1150.4	0.3120	1.4446	1.7566
15	213.03	0.01672	26.29	181.11	969.7	1150.8	0.3135	1.4415	1.7549
20	227.96	0.01683	20.089	196.16	960.1	1156.3	0.3356	1.3962	1.7319
25	240.07	0.01692	16.303	208.42	952.1	1160.6	0.3533	1.3606	1.7139
30	250.33	0.01701	13.746	218.82	945.3	1164.1	0.3680	1.3313	1.6993
35	259.28	0.01708	11.898	227.91	939.2	1167.1	0.3807	1.3063	1.6870
40	267.25	0.01715	10.498	236.03	933.7	1169.7	0.3919	1.2844	1.6763
45	274.44	0.01721	9.401	243.36	928.6	1172.0	0.4019	1.2650	1.6669
50	281.01	0.01727	8.515	250.09	924.0	1174.1	0.4110	1.2474	1.6585
55	287.07	0.01732	7.787	256.30	919.6	1175.9	0.4193	1.2316	1.6509
60	292.71	0.01738	7.175	262.09	915.5	1177.6	0.4270	1.2168	1.6438
65	297.97	0.01743	6.655	267.50	911.6	1179.1	0.4342	1.2032	1.6374
70	302.92	0.01748	6.206	272.61	907.9	1180.6	0.4409	1.1906	1.6315
75	307.60	0.01753	5.816	277.43	904.5	1181.9	0.4472	1.1787	1.6259
80	312.03	0.01757	5.472	282.02	901.1	1183.1	0.4531	1.1676	1.6207
85	316.25	0.01761	5.168	286.39	897.8	1184.2	0.4587	1.1571	1.6158
90	320.27	0.01766	4.896	290.56	894.7	1185.3	0.4641	1.1471	1.6112
95	324.12	0.01770	4.652	294.56	891.7	1186.2	0.4692	1.1376	1.6068
100	327.81	0.01774	4.432	298.40	888.8	1187.2	0.4740	1.1286	1.6026
110	334.77	0.01782	4.049	305.66	883.2	1188.9	0.4832	1.1117	1.5948

TABLE D-1b
Properties of Dry Saturated Steam *(continued)*
Temperature

Temp °F	Abs. press. psia	Specific volume		Enthalpy			Entropy		
		Sat liquid	Sat vapor	Sat liquid	Evap	Sat vapor	Sat liquid	Evap	Sat vapor
t	p	v_f	v_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g
350	134.63	0.01799	3.342	321.63	870.7	1192.3	0.5029	1.0754	1.5783
360	153.04	0.01811	2.957	332.18	852.2	1194.4	0.5158	1.0519	1.5677
370	173.37	0.01823	2.625	342.79	853.5	1196.3	0.5286	1.0287	1.5573
380	195.77	0.01836	2.335	353.45	844.6	1198.1	0.5413	1.0059	1.5471
390	220.37	0.01850	2.0836	364.17	835.4	1199.6	0.5539	0.9832	1.5371
400	247.31	0.01864	1.8633	374.97	826.0	1201.0	0.5664	0.9608	1.5272
410	276.75	0.01878	1.6700	385.83	816.3	1202.1	0.5788	0.9386	1.5174
420	308.83	0.01894	1.5000	396.77	806.3	1203.1	0.5912	0.9166	1.5078
430	343.72	0.01910	1.3495	407.79	796.0	1203.8	0.6035	0.8947	1.4982
440	381.59	0.01926	1.2171	418.90	785.4	1204.3	0.6158	0.8730	1.4887
450	422.6	0.0194	1.0993	430.1	774.5	1204.6	0.6280	0.8513	1.4793
460	466.9	0.0196	0.9944	441.4	763.2	1204.6	0.6402	0.8298	1.4700
470	514.7	0.0198	0.9009	452.8	751.5	1204.3	0.6523	0.8083	1.4606
480	566.1	0.0200	0.8172	464.4	739.4	1203.7	0.6645	0.7868	1.4513
490	621.4	0.0202	0.7423	476.0	726.8	1202.8	0.6766	0.7653	1.4419
500	680.8	0.0204	0.6749	487.8	713.9	1201.7	0.6887	0.7438	1.4325
520	812.4	0.0209	0.5594	511.9	686.4	1198.2	0.7130	0.7006	1.4136
540	962.5	0.0215	0.4649	536.6	656.6	1193.2	0.7374	0.6568	1.3942
560	1133.1	0.0221	0.3868	562.2	624.2	1186.4	0.7621	0.6121	1.3742
580	1325.8	0.0228	0.3217	588.9	588.4	1177.3	0.7872	0.5659	1.3532
600	1542.9	0.0236	0.2668	610.0	548.5	1165.5	0.8131	0.5176	1.3307
620	1786.6	0.0247	0.2201	646.7	503.6	1150.3	0.8398	0.4664	1.3062
640	2059.7	0.0260	0.1798	678.6	452.0	1130.5	0.8679	0.4110	1.2789
660	2365.4	0.0278	0.1442	714.2	390.2	1104.4	0.8987	0.3485	1.2472
680	2708.1	0.0305	0.1115	757.3	309.9	1067.2	0.9351	0.2719	1.2071
700	3093.7	0.0369	0.0761	823.3	172.1	995.4	0.9905	0.1484	1.1389
705.4	3206.2	0.0503	0.0503	902.7	0	902.7	1.0580	0	1.0580

TABLE D-1b
Properties of Dry Saturated Steam *(continued)*
Temperature

Temp. °F	Abs. press. psia	Specific volume		Enthalpy			Entropy		
		Sat liquid	Sat vapor	Sat liquid	Evap	Sat vapor	Sat liquid	Evap	Sat vapor
t	p	v_f	v_g	h_f	h_{fg}	h_g	s_f	s_{fg}	s_g
32	0.08854	0.01602	3306	0.00	1075.8	1075.8	0.0000	2.1877	2.1877
35	0.09995	0.01602	2947	3.02	1074.1	1077.1	0.0061	2.1709	2.1770
40	0.12170	0.01602	2444	8.05	1071.3	1079.3	0.0162	2.1435	2.1597
45	0.14752	0.01602	2036.4	13.06	1068.4	1081.5	0.0262	2.1167	2.1429
50	0.17811	0.01603	1703.2	18.07	1065.6	1083.7	0.0361	2.0903	2.1264
60	0.2563	0.01604	1206.7	28.06	1059.9	1088.0	0.0555	2.0393	2.0948
70	0.3631	0.01606	867.9	38.04	1054.3	1092.3	0.0745	1.9902	2.0647
80	0.5069	0.01608	633.1	48.02	1048.6	1096.6	0.0932	1.9428	2.0360
90	0.6982	0.01610	468.0	57.99	1042.9	1100.9	0.1115	1.8972	2.0087
100	0.9492	0.01613	350.4	67.97	1037.2	1105.2	0.1295	1.8531	1.9826
110	1.2748	0.01617	265.4	77.94	1031.6	1109.5	0.1417	1.8106	1.9577
120	1.6924	0.01620	203.27	87.92	1025.8	1113.7	0.1645	1.7694	1.9339
130	2.2225	0.01625	157.34	97.90	1020.0	1117.9	0.1816	1.7296	1.9112
140	2.8886	0.01629	123.01	107.89	1014.1	1122.0	0.1984	1.6910	1.8894
150	3.718	0.01634	97.07	117.89	1008.2	1126.1	0.2149	1.6537	1.8685
160	4.741	0.01639	77.29	127.89	1002.3	1130.2	0.2311	1.6174	1.8485
170	5.992	0.01645	62.06	137.90	996.3	1134.2	0.2472	1.5822	1.8293
180	7.510	0.01651	50.23	147.92	990.2	1138.1	0.2630	1.5480	1.8109
190	9.339	0.01657	40.96	157.95	984.1	1142.0	0.2785	1.5147	1.7932
200	11.526	0.01663	33.64	167.99	977.9	1145.9	0.2938	1.4824	1.7762
210	14.123	0.01670	27.82	178.05	971.6	1149.7	0.3090	1.4508	1.7598
212	14.696	0.01672	26.80	180.07	970.3	1150.4	0.3120	1.4446	1.7566
220	17.186	0.01677	23.15	188.13	965.2	1153.4	0.3239	1.4201	1.7440
230	20.780	0.01684	19.382	198.23	958.8	1157.0	0.3387	1.3901	1.7288
240	24.969	0.01692	16.323	208.34	952.2	1160.5	0.3531	1.3609	1.7140
250	29.825	0.01700	13.821	216.48	945.5	1164.0	0.3675	1.3323	1.6998
260	35.429	0.01709	11.763	228.64	938.7	1167.3	0.3817	1.3043	1.6860
270	41.858	0.01717	10.061	238.84	931.8	1170.6	0.3958	1.2769	1.6727
280	49.203	0.01726	8.645	249.06	924.7	1173.8	0.4096	1.2501	1.6597
290	57.556	0.01735	7.461	259.31	917.5	1176.8	0.4234	1.2238	1.6472
300	67.013	0.01745	6.466	269.59	910.1	1179.7	0.4369	1.1980	1.6350
310	77.68	0.01755	5.626	279.92	902.6	1182.5	0.4504	1.1727	1.6231
320	89.66	0.01765	4.914	290.28	894.9	1185.2	0.4637	1.1478	1.6115
330	103.06	0.01776	4.307	300.68	887.0	1187.7	0.4769	1.1233	1.6002
340	118.01	0.01787	3.788	311.13	879.0	1190.1	0.4900	1.0992	1.5891

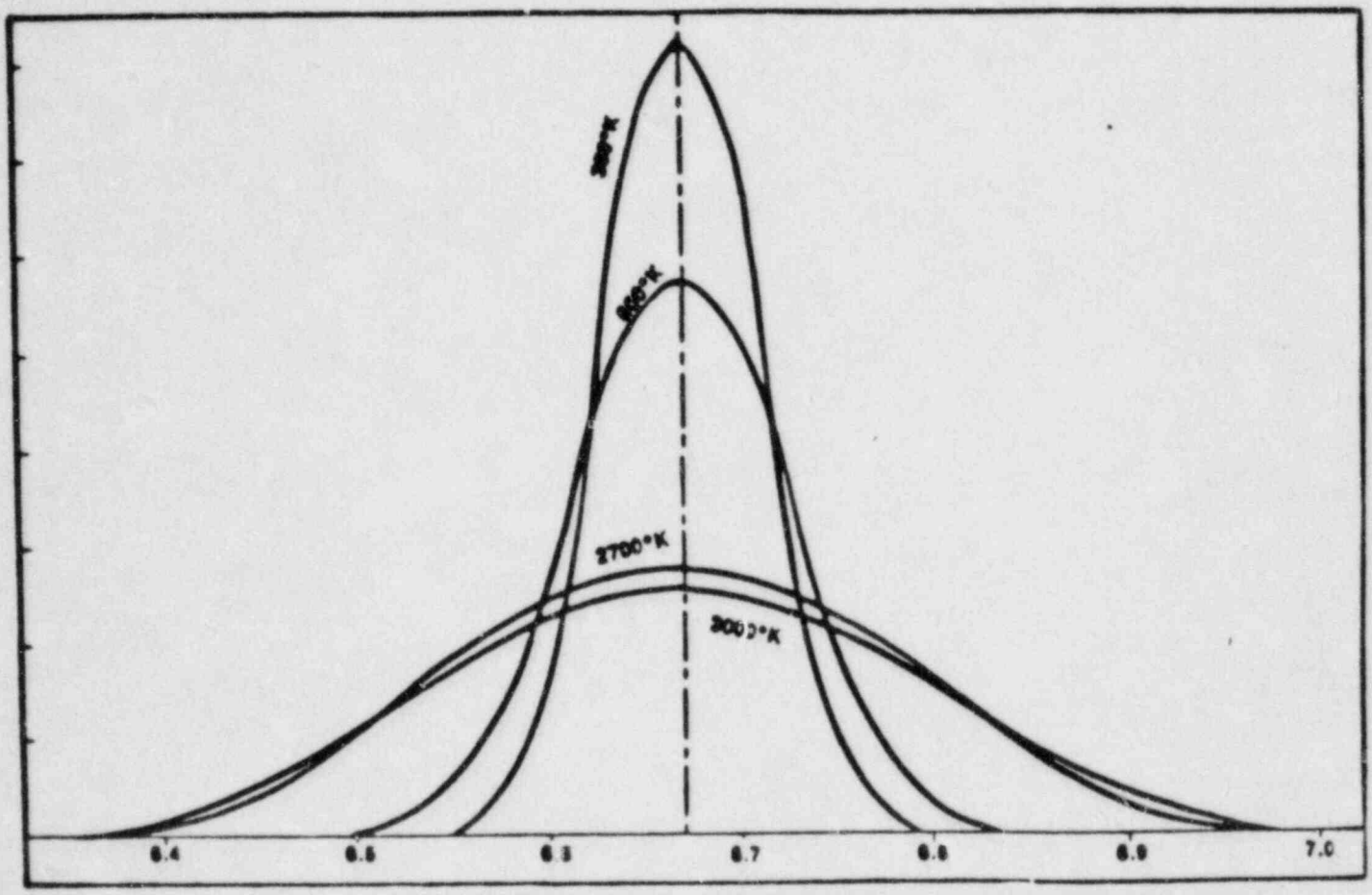
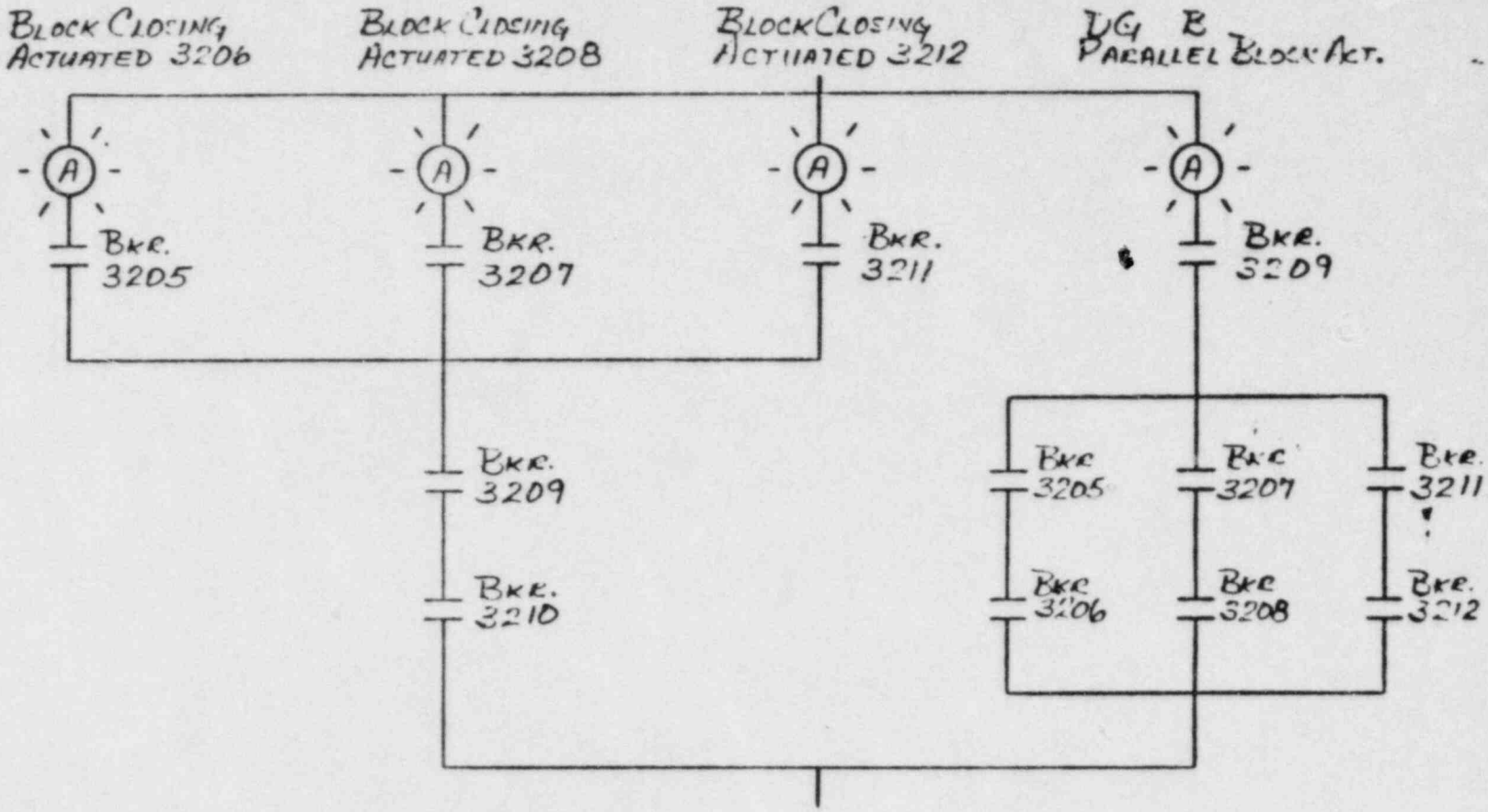


Fig. 1.18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A
BKR. 3205
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BKR 3205
BKR 3207
BKR. 3211
BKR 3206
BKR 3208
BKR. 3212

Master Review Copy

CRYSTAL RIVER: CATEGORY 1

ANSWERS

1.01 (b)
Ref: STM 2-41 (fig. 14)

1.02 (c)
Ref: Duke Power Company, FNRE

1.03 (d)
Ref: NUS, NETRO

1.04 (c)
Ref: NUS, NETRO

1.05 (c) or (d)
Ref: Duke Power Company, FNRE, Pg. 237

1.06 (d)
Ref: Duke Power Company, FNRE

1.07 (c)
Ref: North Anna FSAR, Table 15.1-5

1.08 (a)
Ref: Nuclear Reactor Analysis, Dunderstadt & Hamilton, Pg. 13

1.09 (a)
Ref: Duke Power Co., FNRE

1.10 (c)
Ref: Steam Tables or Mollier Diagram

1.11 (d)
Ref: North Anna, Thermo Lesson Plans, pg. 4

1.12 (a)
Ref: Steam Tables
Tsat @1000 psia = 544.6 ° - 400 ° = 144.6

1.13 (b)
Ref: Oconee question bank

1.14 (a)
Ref: Oconee question bank - Q #150

1.15 (d)
Ref: Duke Power Co. Thermo, HT & FF, pg 161
Also; Cr 3, Question Bank #4

1.16 (d)
Ref: CR3; Categ 1, Question 9

1.17 (c)
Ref: CR3, Plant Curve book, curve 3.2 A & B (OP-103)

1.18 (b)
Ref: Doppler Coefficient, M. G. Woram Pg. 7

1.19 (b)
Ref: Paraphrase CR3 Question Categ 1. No. 13

1.20 (c)
Ref: Duke Power Company, FNRE

1.21 (d)
Ref: CR3 Question, Categ. 1, No. 54. (Paraphrase)

1.22 (a)
Ref: CR3 Curve Book, Curves 4.1 to 4.4 c

1.23 (b)
Ref: CR3 Curve Book

1.24 (b)
Ref: T.S. Figure 2.1-1

~~1.25~~ ~~(b)~~
~~Ref: T.S. B 3/41~~ 3
delete
BAW

CATEGORY 2: Answers

2.01 (d)

Ref: STM 38-3/5

2.02 (c)

Ref: STM 17-4/5

2.03 (a)

Ref: STM 17-11/12

2.04 (c)

Ref: STM 22-13/40

2.05 (b)

Ref: STM 23-7 and OP-502, pg 3

2.06 (d) + (b) ✓

Ref: STM 5-1/4

2.07 (c) + (b) ✓

Ref: STM 10-47

2.08 (a)

Ref: STM 28-5

2.09 (d) + (a)

Ref: STM 36-4

2.10 (c)

Ref: STM-4 and OP-401, pg 2/10

2.11 (b)

Ref: OP-404, pg 4 & 5

2.12 (a)

Ref: OP-404, pg 32

2.13 (d)

Ref: STM 2-7/54

2.14 (c)

Ref: STM 2-66/106

2.15 (d)

Ref: STM 12-4/7

2.16 (c)

Ref: STM 12-13

~~2.17 (d)~~ delete

Ref: Attached description and OP-605, pg 5

2.18 (d)

Ref: Dwg EC-206-017 and OP-703, pg 9

2.19 (a) (b) + (d)

Ref: STM : 27-63/68
New STM

2.20 (c)

Ref: AP-303, ESD Annunciator Response

2.21 (a)

Ref: AP-304, ESD Annunciator Response

2.22 (b)

Ref: AP-1071 and STM-21/25

2.23 (a)

Ref: STM 25-13/14

2.24 (c)

Ref: STM 18-1

2.25 (c)

Ref: STM 4-6/12

3.0 INSTRUMENTS AND CONTROLS - ANSWERS

3.01 (c) + (d)
REF: STM-13-21

3.02 (c)
REF: STM-13-34

3.03 (b)
REF: STM-12-11/12

3.04 (a)
REF: STM-12-18/20

3.05 (d)
REF: STM 13-15/16

3.06 (a)
REF: STM 10-36/37

3.07 (c)
REF: STM 7-2/27

3.08 (a)
REF: STM 6-3/17

3.09 (c)
REF: STM 6-11

3.10 (d)
REF: STM 9-11/21
also T.S. pg 2-6

3.11 (c)
REF: STM-28-6/8

3.12 (a)
REF: STM-28-14

3.13 (b)
REF: STM-10-56/57

3.14 (c)
REF: STM 11-10

3.15 (d)
REF: STM 11-24

3.16 (b)
REF: AP-241/242/243/244

3.17 (b)
REF: STM 2-121/122

3.18 (a)
REF: B&W CRD description pg 43

~~3.19 (c)~~ delete B&W
~~REF: STM 27-59~~/60

3.20 (a)
REF: STM 35-7

3.21 (d)
REF: STM 38-3/5

3.22 (d)
REF: STM 17-14

3.23 (d)
REF: STM 17-17/18

3.24 (b)
REF: STM 23-2/4

3.25 (c)
REF: STM 24-7

4.0 Procedures

4.01 (b)

REF: OP -504

4.02 (d)
REF: AP-241/242/243/245

4.03 (b)

REF: OP-302, pg. 4&5

4.04 (c)

REF: AP-580

4.05 (b)

REF: EP-140

4.06 (a)

REF: EP-290, pg. 4.

4.07 (c)

REF: VP-540, pg. 3

4.08 (a)

REF: VP-580

4.09 (b)

REF: AP-450, pg. 2

4.10 (a)

REF: OP-402, pg. 4

4.11 (d)

REF: RP-101, pg. 5&6

4.12 (b)

REF: RP-101, and IN-84-40

4.13 (a)

REF: EP-120 "Inadequate Shutdown Value" pg. 1 of 5

4.14 (d)

REF: EP-260 "Inadequate Decay Heat Removal" pg. 1 of 6

4.15 (c)

REF: EP-220 "Pressurized Thermal Shock" pg. 2 of 7

4.16 (c)

REF: EP-390, "Steam Generator Tube Rupture" pg. 1, 2 of 11

4.17 (a)

REF: 10 CFR 20, 20.4

4.18 (d)

REF: AI-500, pg 8&9

4.19 (c)

REF: CR Ques. Cat 4&7, #39 (OP-204, AP-521)

4.20 (a)

REF: CR Ques. Cat 4&7, #39 (OP-204, AP-521)

4.21 (c)

REF: CR Ques. Cat 4&7, #39 (OP-204, AP-521)

4.22 (d)

REF: OP-502, Rev. 11, pg. 3 (sect. 4)

4.23 (c)

REF: OP-603, Rev. 21, pg. 4

4.24 (c)

REF: OP-504, Rev. 7, Pg. 5

4.25 (b)

REF: CRNS OP-502, pg.3

AUTOMATIC INITIATION OF MOTOR DRIVEN EMERGENCY FEEDWATER PUMP EFP-1

Prior to the present refueling outage at Crystal River Unit 3, an automatic start of the motor-driven emergency feedwater pump (EFP-1) was not possible during a station blackout (loss of offsite power). Modifications summarized below, have been made to control circuits for EFP-1 that now permit an automatic start with a station blackout.

In the event of a station blackout coincident with either a loss of both main feedwater pumps or low-low levels in both Once Through Steam Generators (OTSGs), EFP-1 will automatically start five (5) seconds after Engineered Safeguards (ES) Block 1 is loaded onto the "A" train diesel generator.

If an ES Actuation Signal occurs concurrently, or anytime after the above-listed conditions occur, EFP-1 will be automatically tripped, if already loaded on the diesel generator, and automatically restarted five (5) seconds after ES Block 4 has been started. This assures that ES Blocks have priority loading on the diesel generators.

Under worse case conditions of ES Actuation with "B" Train diesel generator unavailable, concurrent with a station blackout condition, the automatic starting of EFP-1 will result in a voltage drop to 69.7% of nominal (4000 Volts) voltage. The voltage drop, however, will last only 43% of the load-sequence time interval and will, therefore, preclude problems with operating rotational equipment. In addition, equipment such as contactors will remain energized since the design dropout voltage is 55% of nominal.

With the addition of EFP-1 to the loads associated with ES Blocks 1 through 4, the "A" train diesel generator, under worst case conditions, will be operating at 3181 kW, which is 96.4% of the 30-minute rating of 3300 kW. In order not to exceed this rating, a watt transducer that monitors the diesel generator output has been installed. Alarms will be seen in the Control Room when the 2000-hour rating of 3000 kW is exceeded, and again when 25 of the 30 minutes have been expended. At 30 minutes, EFP-1 will be automatically tripped and subsequent breaker closure will be prevented until the trip circuit is manually reset. Resetting the trip circuit will be administratively controlled.

FPC considers this design change a short-term solution. Long-term solutions are still under consideration and future design changes will be submitted as these final solutions are determined.