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SUBJECT: Submits reactor operator written exam comments.

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ENCLOSURE 3

CP&L

Carolina Power & Light Company

Harris Training Unit
Post Office Box 165
New Hill, North Carolina 27562

August 24, 1989

FILE: NTS-3501 SERIAL: HTU-89-254

Mr. Kenneth E. Brockman
US NRC - Region II
101 Marietta St. NW
Atlanta, GA 30323

SUBJECT: RO NRC Written Exam Comments NRC-624

Dear Mr. Brockman:

On August 21, 1989, Shearon Harris Nuclear Power Plant received NRC written RO examinations. The examination comments are submitted by CP&L. Copies of reference material are included where indicated.

Should you need any explanations or additional reference material, please do not hesitate to contact the SHNPP Manager - Training, Mr. A. W. Powell, at (919) 362-2618.

R. B. Richey
Manager - Harris Nuclear Project

HWS/tpw

Attachments

cc: Mr. W. H. Bradford (NRC-SHNPP)

bcc: L. H. Martin
T. A. Baxter (Shaw, Pittman, Potts & Trowbridge)
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AUGUST 21, 1989 NRC EXAM

RO EXAM GENERAL COMMENTS

1. The ability for utility training personnel to review the exam in advance is a worthwhile practice as evidenced by the relatively small number of comments made on the following pages. This is a welcome change to past NRC operator examining practice and should be continued for future exams.

2. Three of the plant-wide generic responsibilities multiple-choice questions required the examinees to make fine distinctions in wording between the correct answer and one or more of the distractors. These subtleties go on beyond the knowledge required for a licensed reactor operator in that, were the question to arise in an operational environment, the operator would consult procedures available in the Control Room. Questions 3.38 (all choices), 3.39 (choices b & c), and 3.42 (choices a,b,& c) apply.

3. More detailed comments are noted on the following pages.

NRC QUESTION 2.14

The control room has recieved a RM-11 alarm for the Tank Area Drain Transfer Pump Monitor. The Tank Area Drain Transfer Pumps are aligned to the storm drain system. According to AOP-008, "Accidental Release of Liquid Waste", which one of the following is NOT one of the automatic actions which would occur as a result of an accidental effluent release?

a. The isolation valve to the oil separator closes.

b. 1FD-109, "Tank Area Drain Pump Discharge to Storm Drains", closes if the leak is in the Tank Building.

c. The isolation valve to divert the flow to the Secondary Waste Holdup Tank opens.

d. Tank Area Drain Transfer Pumps shut off.

ANSWER 2.14

b. (1.00)

CP&L COMMENT

Page 4 of AOP-008 (attached) shows that the automatic action for an alarm on the Tank Area Drain Transfer Pump Monitor is that the Tank Area Drain Transfer Pump shuts off if it was discharging to the storm drain system. The other actions listed under Automatic Actions on that page are for an alarm of the Turbine Building Drain Monitor only and are not applicable in the situation posed by the question. As currently worded, choices a, b, and c are all correct since none of them occur in this case.

RECOMMENDATION

Either accept answers a, b, or c as correct or delete the question since three of the four choices are correct.

QUESTION 2.14

OS1 TURBINE BUILDING DRAIN OR TANK AREA LEAK

-OR-

SECTION 1.0

1.0 SYMPTOMS

Alarm Specific

1. Local radiation alarm on Tank Area Drain Transfer Pump Monitor.

2. RM-11 alarm for Tank Area Drain Transfer Pump Monitor.

3. "REFUELING WATER STORAGE LOW LEVEL" alarm. ALB 4-3-4

4. "REFUELING WATER STORAGE TANK 2/4 LOW-LOW LEVEL" alarm. ALB 4-3-3

5. "REFUELING WATER STORAGE TANK LOW-LOW 2 LEVEL" alarm. ALB 4-3-2

6. "REFUELING WATER STORAGE TANK EMPTY" alarm. ALB 4-3-5

7. RWST or RMWST Level Indication Decreasing Abnormally.

8. "RWMU STORAGE TANK MINIMUM - HIGH LEVEL" alarm. ALB 8-1-4

9. Verbal notification to the Control Room.

2.0 AUTOMATIC ACTIONS

1. Turbine Building Drain Monitors 3528

Isolation Valve to the Oil Separator shuts and the isolation valve to divert the flow to the Secondary Waste Holdup Tanks opens.

2. Tank Area Drain Transfer Pumps Monitors 3530

Drain Transfer Pumps shut off if they are discharging to the storm drain system (continue to operate if they are lined up to the FD system).

3.0 OPERATOR ACTION

3.1 Immediate Action

None

3.2 Follow-Up Action

NOTE: R — A radiological effluent release may require the initiation of the SHNPP Emergency Plan. Refer to PEP-101 and enter point X on the EAL Network.

NRC QUESTION 2.21

EOP-EPP-020, "SGTR With Loss of Reactor Coolant: Subcooled Recovery", contains a CAUTION which reads: "Steps to depressurize the RCS an terminate SI should be performed as quickly as possible after the cooldown has been initiated...". Which one of the following is the purpose of this CAUTION?

a. Minimize possible pressurized thermal shock of the reactor vessel.

b. Minimize possible pressurized thermal shock of the S/G tubes.

c. Ensure the RCP minimum seal delta-p is maintained.

d. Minimize the potential for S/G overfill.

ANSWER 2.21

a. (1.00)

CP&L COMMENT

Although the correct answer specified is a quote of the CAUTION prior to step 14 of EPP-020, it provides only half of the reason for performing a rapid cooldown and depressurization under these conditions. The Westinghouse Owners Group Emergency Response Guideline Background Documents provide additional information. In the step description for ECA-3.1 step 10 (attached) which corresponds to SHNPP EPP-020 step 14(also attached), the first sentence of the basis for that step provides a more complete rationale for quick cooldown and depressurization. The two reasons found there are to minimize both leakage of reactor coolant and radiological releases from the ruptured steam generator. The reasons provided here are directly related to the steam generator overfill concern in that a continuing leak of coolant into the steam generator will overfill it and lead to a radiological release. This release starts due to increasing steam generator pressure caused by increasing level and is exacerbated by a release of steam/water mixture with the overfill condition.

RECOMMENDATION

Accept either choices a. or d. as acceptable responses.

SGTR WITH LOSS OF REACTOR COOLANT: SUBCOOLED RECOVERY

Instructions	Response Not Obtained

****

CAUTION

Steps to depressurize the RCS and terminate SI should be performed as quickly as possible after the cooldown has been initiated to minimize possible pressurized thermal shock of the reactor vessel.

****

14. Initiate RCS Cooldown To Cold Shutdown:

Instructions	Response Not Obtained
a. Check SGs - AT LEAST ONE INTACT SG AVAILABLE	a. Cooldown using any of the following (listed in order of preference): 1) RHR system 2) IF CNMT conditions are normal, THEN dump steam using faulted SG. 3) Consult TSC AND determine whether to dump steam using faulted OR ruptured SG. GO TO Step 15.
b. Dump steam from intact SGs using any of the following (listed in order of preference): 1) Condenser steam dump 2) SG PORVs 3) Locally operate SG PORVs using OP-126, "MAIN STEAM, EXTRACTION STEAM AND STEAM DUMP SYSTEM." 4) TDAFW pump 5) MSIV before seat drains	

QUESTION 2.21
(page 2)

STEP DESCRIPTION TABLE FOR ECA-3.1 STEP 10

correlates to EPP020 step 14

STEP: Initiate RCS Cooldown To Cold Shutdown

PURPOSE: To begin or continue a controlled RCS cooldown to cold shutdown temperature as quickly as feasible in order to minimize total leakage of reactor coolant

BASIS:

The RCS must be cooled and depressurized to cold shutdown conditions as quickly as possible to minimize both leakage of reactor coolant and radiological releases from the ruptured steam generator. This step establishes a 100°F/hr cooldown rate, which balances the need for rapid RCS cooldown with the concern of pressurized thermal shock of the reactor vessel. The preferred method is steam release from the intact steam generators to the condenser since this conserves feedwater supply and minimizes radiological releases. If steam dump to the condenser is unavailable, atmospheric steam releases via the intact steam generator PORVs provides an alternative means of cooling the RCS. In the unlikely event that no intact steam generator is available, one must select either a faulted steam generator or ruptured steam generator to cool the RCS until the RHR System can support further cooldown to cold shutdown.

ACTIONS:

- Determine if RCS cooldown rate is less than 100°F/HR
- Use RHR system
- Dump steam to the condenser from intact SGs
- Dump steam from intact SG PORVs
- Dump steam from intact SGs by other plant specific means
- Control feed flow to faulted SG to cooldown RCS
- Dump steam from ruptured SG

INSTRUMENTATION:

- RCS hot leg temperature indication
- Wide range RCS cold leg temperature indication
- Condenser status indications
- Steam dump valves position indication
- SG PORVs position indication
- RHR System indication

NRC QUESTION 3.29

Match the Digital Rod Position Indication System (DRPIS) alarms in COLUMN A with their correct function in COLUMN B. (each alarm has only one correct function)

COLUMN A-ALARMS	COLUMN B-FUNCTIONS
a. "RPI Rod Deviation"	1. Indicates banks B,C,D on bottom with bank A above 6 steps.
b. "RPI Urgent"	2. Indicates + or - 12 step deviation between rod and bank demand position.
c. "One Rod At Bottom"	3. Indicates error or failure from both data cabinets.
d. "RPI Non-urgent"	4. Indicates dropped rod or improper bank sequence.
	5. Indicates + or - 12 step deviation between any 2 rods in a bank.
	6. Indicates conflict between two deviation cards.

ANSWER 3.29

a. 2 (0.5 each)
b. 3
c. 4
d. 6

CP&L COMMENT

There are two rod deviation alarms fed by DRPI. One is a local rod deviation alarm on the DRPI panel on AEP-1. The attached table 6.6 from SD-104, "Rod Control System", shows that this alarm is driven by either a shutdown rod at or below 210 steps, or any two rods in control bank differ by greater than or equal to 12 steps. A second alarm fed by DRPI is the "Rod Dev/Seq NIS Power Range Tilts" alarm on Main Control Board ALB 13 window 8-5. The attached pages from RODCS-LP-3.1 indicate this alarm actuates on rod out of sequence, +/- 12 step deviation between DRPI and bank demand, +/-12 step deviation between any two rods in a bank, or shutdown rod below 218 steps. Note that both functions 2. and 5. from the question are included for this second deviation alarm. Since the question does not specify which DRPI driven rod deviation alarm is under examination, then either function 2. or 5. satifactorily answers the question.

CP&L COMMENT TO NRC QUESTION 3.29 (contd)

RECOMMENDATION

Accept either answers 2. or 5. for part a. of this question.

QUESTION 3.29a.
(page 1)

Table 6.6
SD-104
Rod Control System

D.R.P.I. Alarms

Alarm	Location	Cause
RPI Urgent Alarm	ALB-13 * (6-1)	1. A and B Data Failure, or 2. A and B Data differs by more than one bit, or 3. Combined A and B Data is binary 39 or greater.
RPI Non-Urgent Alarm	ALB-13 * (6-2)	1. Data A Failure, or 2. Data B Failure, or 3. Central Control or Rod Deviation card removed, or 4. Rod Deviation Cards differ in output.
Two or More Rods at Bottom (See Note 1)	ALB-13 * (7-3)	1. Combined A and B Data is zero, or 2. Urgent Alarm, for 2 or more rods.
One Rod at Bottom (See Note 1)	ALB-13 * (7-4)	1. Combined A and B Data is zero, or 2. Urgent Alarm, for one or more rods.
Rod Deviation	Local DRPI ** Display	1. Shutdown rod at or below 210 steps, or 2. Any two rods in control bank differ by greater than or equal to 12 steps.
General Warning	Local DRPI Display	1. Data A Failure, or 2. Data B Failure, or 3. Urgent Alarm.

A/C 5/1

A/C 5/1

A/C 5/1

* Local DRPI Display also
** Input also sent to ERFIS for computer-generated alarm (See SD-163)

Note 1: Rod Bottom alarms are blocked by the DRPI logic when rods are withdrawn in their normal sequence during a reactor startup. During normal startup, the alarms will clear when all shutdown bank and control bank A rods are off the bottom, even though control bank B, C, and D rods remain on the bottom. However, rod bottom alarms will occur if a withdrawn rod drops or if the normal withdrawal sequence is not followed.

A/C 5/1

2.5.3 Interlocks

A. Control Bank D rod withdrawal limit (C-11)
   1. From P-A converter
   2. Bank D at 220 steps
   3. Stops pulses to bank D out
   4. Automatic only

B. Central Control Card
   1. Automatic disconnect if one card is not in agreement with the other two
   2. Generates "Central Control Failure" alarm

2.5.4 Alarms

2.5.4.1 Digital Rod Position Indication System Alarms

☆ MCB Alarm

A. Computer Alarm Rod Dev/Seq NIS Power Range Tilts
   1. On ALB-13
   2. Causes
      a. Rod out of sequence
      b. ± 12 step deviation
         - Rod
         - Bank demand position
      c. ± 12 step deviation between any two rods in bank
      d. Shutdown rod below 218 steps
   3. ± 25 steps deviations between bank demand and DRPI with rods

☆ Local Alarm

B. "RPI Rod Deviation" alarm
   1. ALB-13
   2. ± 12 step deviation between rod and bank demand position

3. LED's 1, R and 2 indicate
   a. Position of shutdown rod below deviation limit
   b. Deviations between rods in control bank exceed limit
   c. Urgent Alarm has been generated

Local alarm

C. "One Rod at Bottom" alarm (≤ 20 steps)
   1. ALB-13
   2. Causes
      a. One rod on bottom (≤ 20 steps)
      b. One bank on bottom and next sequential bank is not
   3. Defeated when banks B, C, D on bottom and bank A above six steps
   4. Indicates
      a. Dropped rod
      b. Improper bank sequence

D. "Two or More Rods at Bottom" alarm (≤ 20 steps)
   1. ALB-13
   2. Two or more rods of one bank on bottom
   3. Defeated if banks B, C, D on bottom with bank A above six steps

E. "RPI Urgent Alarm" annunciator
   1. ALB-13
   2. Error or failure from <u>both</u> data cabinets
   3. "One Rod at Bottom" alarm on ALB-13
   4. "Urgent 1, 2, 3" alarm flashing on display panel
      a. Error in both A and B data from Data cabinets A and B

NRC QUESTION 3.31

List the four (4) sources of control signals which are used by the SGLCS to position the feedwater flow control valves. (0.25 each)

ANSWER 3.31

1. Steam generator level (0.25 each)
2. Feedwater flow
3. Steam flow
4. Power demand level or reference level (first stage turbine pressure or reactor power).

CP&L COMMENT

The above answer omitted another source of a signal for use by SGLCS. Steam pressure is used for density compensation of the steam flow signal. This is shown in the text of SD-126.02 on page 9 (attached) and in figure 7.2 of the same SD. Since the question asked for signal sources, then steam pressure is an acceptable response. It actually has more impact on SGLCS operation than first stage turbine pressure since we operate with a constant programmed steam generator water level of 66%.

RECOMMENDATION

Accept steam pressure as an alternate answer. This results in having to list four answers per the question statement out of five possible alternatives for an acceptable response.

4.1 Normal Operations (continued)

The summation of the pressure and momentum effects is shown in Figure 7.8. The SGWLCS will act to maintain SG level at 66% level after these transients. The SGWLCS is designed to reduce the size and length of the level oscillations. Thus, normal level oscillations are within the bounds of reactor trip at the low-low SG level and turbine trip at the high-high SG level.

During normal operation (15-100% power) the SGWLCS provides automatic SG level control by using a three element controller which senses steam flow, feed flow, and SG level (Figure 7.2).

☆ The steam flow is sensed and corrected for density by a steam pressure detector. The resulting steam flow signal is fed to a summer. A flow error signal is produced by subtracting the feed flow signal from the steam flow signal. The flow error signal goes to a proportional plus integral (PI) controller.

The level program receives an input from the turbine impulse pressure transmitter. The impulse pressure signal is multiplied by zero and 66 percent is then added to give a constant level Program of 66 percent regardless of power level (Level program = zero x P_{imp} + 66 percent).

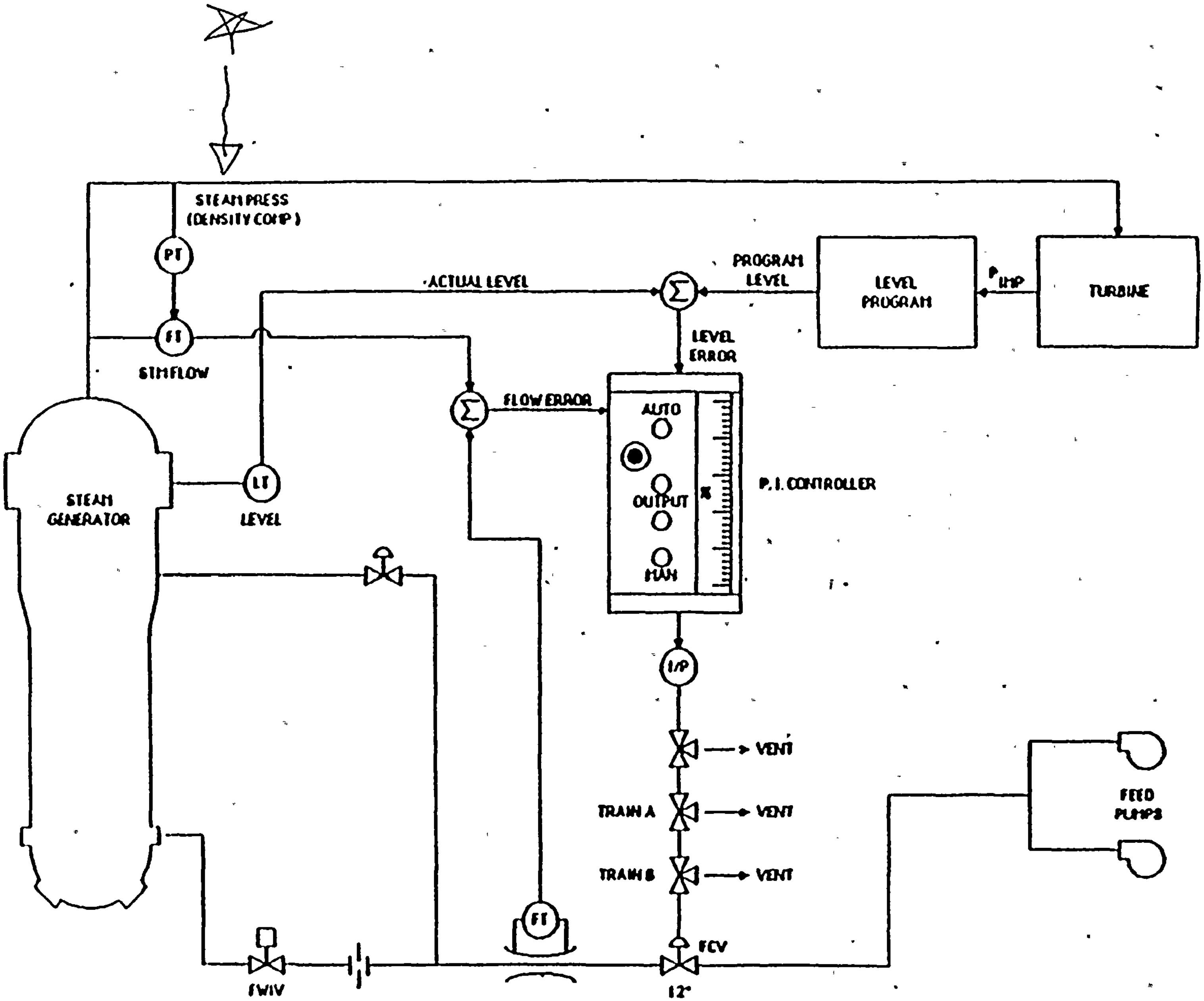
Actual SG level is sent through a lag circuit to dampen out natural oscillations in the level signal. A level error signal is produced by subtracting actual level from program level.

The level error signal is sent to the PI controller. This PI controller allows level to dominate over the flow error signal. It also eliminates steady state level and flow errors. The level and flow error signals are added to produce a total error signal. This total error signal is the output of the PI controller when it is in AUTO. The output of the controller can be manually controlled by the operator. The output then goes to the IP converter to position the FW control valve.

4.2 Start-Up and Shutdown Operations

Start-up and shutdown operation is considered low power operation, so the feedwater bypass control system (see Figure 7.3) will be used. It will give stable level control from 0-25% reactor power. Normally the change over point to and from the main feedwater control system will be at about 15% power.

This system shares the level program and level detectors with main FW Control System. In place of a flow error signal, the FW Bypass Control System uses nuclear power channel N-44 as an input of anticipated steam demand. This arrangement is used because the flow signals are unstable at low power levels and it gives better transient response.



FCV - FEEDWATER CONTROL VALVE
FWIV - FEEDWATER ISOLATION VALVE

SD 126.2
MAIN FEEDWATER CONTROL
FIGURE 7.2

QUESTION 3.31
(page 2)

NRC QUESTION 3.35

List all the signals that will generate a containment ventilation isolation signal.

ANSWER 3.35

1. High radiation (on 2/4 containment ventilation isolation monitors) (0.5)

2. Any SI signal (0.5)
   (low steam line pressure)
   (low PZR pressure)
   (high containment pressure)
   (manual initiation)

3. Manual phase A or B containment isolation actuation (0.5)

CP&L COMMENT

SHNPP has no manual containment phase B isolation. Phase B isolation can be initiated by manually actuating containment spray. Documentation of this is in SD-103 section 4.3.6 (attached) which describes how the Containment Ventilation Isolation Signal (CVIS) is actuated. It is assumed that the part of the NRC answer key in parentheses is not required for full credit since the 2/4 logic mentioned in answer item 1. is not asked for by the question statement.

RECOMMENDATION

Delete "...or B containment isolation actuation" from answer item 3. Add new answer item 4. "Manual containment spray actuation signal". Each response should be worth 0.375 vice 0.5.

4.3.2 Main Isolation (MSIS) (Figure 7.28) (continued)

provided on MCB. Main steam isolation is addressed in SD-126. The steamline isolation signal also enables auxiliary feedwater isolation.

4.3.3 Auxiliary Feedwater Isolation (Figure 7.29)

Auxiliary feedwater isolation is derived from the main steamline isolation coincident with a high steam line differential pressure (ΔP). When low steamline pressure is detected in one loop, that loop's auxiliary feedwater line is isolated.

4.3.4 Main Feedwater Isolation (MFIS) (Figure 7.24)

Main feedwater isolation consists of closure of the main feedwater valves, the feedwater isolation valves, the feedwater bypass valves, and tripping of the main feedwater pumps and the turbine. The MFIS is derived from an SI signal or a two out of four Hi-Hi steam generator signal (P-14). Reset of the bypass valves and main feedwater isolation valves is accomplished by the Train A and Train B reset switches on the MCB. Closure of only the main feedwater valves will automatically occur when the reactor is tripped (P-4) and a two-out-of-three low T_{avg} signal occurs.

4.3.5 Containment Isolation ØA (T) (Figure 7.30)

Containment isolation ØA results from either a safety injection signal (Figure 7.27) or from manual actuation of either of two MCB switches. Reset of the T signal is accomplished by actuation of the Train A and Train B Containment Isolation ØA Reset MCB switches. See SD-114 for more discussion.

4.3.6 Containment Ventilation Isolation (CVIS) (Figure 7.30)

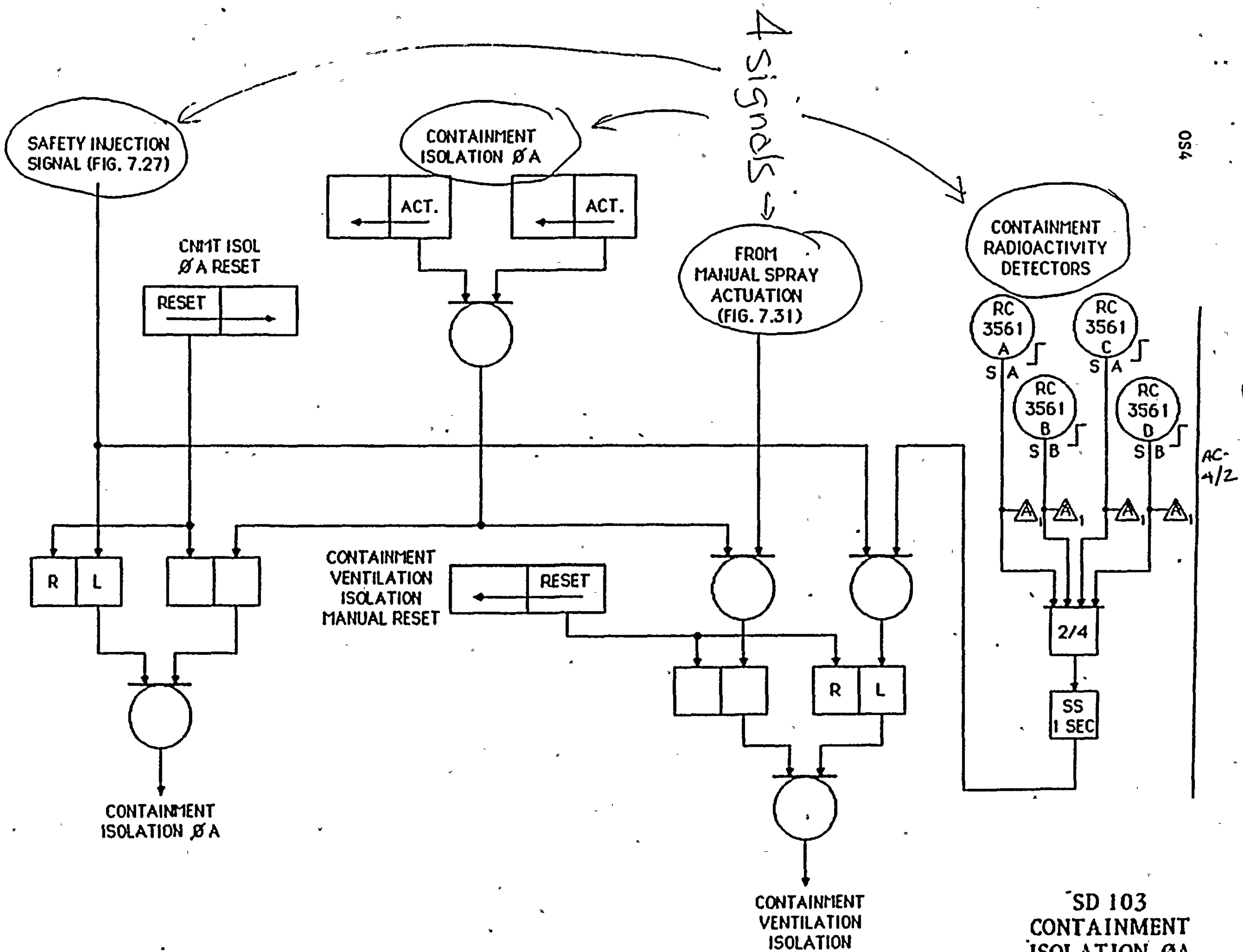
Containment ventilation isolation results from a ØA containment isolation signal, safety injection signal (Figure 7.27), from a Manual Containment spray actuation signal (Figure 7.31), or a high radiation signal from the Radiation Monitoring System containment radioactivity detectors (RM-1CR-3561A, B, C, & D). The CVIS signal can be reset by the Train A and Train B Containment Ventilation Isolation Reset switches on the MCB. See SD-114 for more discussion. (See Section 4.6)

AC-4/2

AC-4/2

4.3.7 Containment Spray (CSAS) (Figure 7.31)

Containment Spray results from either a two out of four, Hi-3 containment pressure, or simultaneous manual actuation of either group of two MCB switches. The CSAS signal can be reset by the Train A and Train B Containment Spray Reset switches on the MCB. It is noted that the manual spray actuation controls also initiate Containment Ventilation Isolation and Containment Isolation Phase B. Reference SD-112.



SD 103
CONTAINMENT
ISOLATION ØA
FIGURE 7.30

QUESTION 3.35
(page 2)

ENCLOSURE 4

NRC RESOLUTION OF FACILITY COMMENTS

RO Examination

Question 2.14

NRC resolution: Comment accepted. Question deleted from exam. Section and total point values adjusted accordingly.

Question 2.21

NRC resolution: Comment not accepted. The facility comment correctly references the basis for the initiation of RCS cooldown to Cold Shutdown. The question asked for the basis of the CAUTION preceding this step. The CAUTION addresses the reason for terminating the SI as quickly as possible "after the cooldown has been initiated". By looking at the entire Step Description for ECA-3.1 step 10, (facility only referenced the first page) the KNOWLEDGE portion describes verbatim the reason for this CAUTION. It should also be noted that this question was written by the facility representative during the exam pre-review.

Question 3.29 (a)

NRC resolution: Comment not accepted. Each alarm in the question is clearly identified by the use of quotation marks indicating the actual wording of each alarm. The alarm referenced in the facility comment, which would make #5 a correct response for (a), is the "Rod Dev/Seq NIS Power Range Tilts" alarm. The question asked for the "RPI Rod Deviation" alarm.

Question 3.31

NRC resolution: Comment partially accepted. As shown in the reference provided the P.I. controller in the SGLCS takes input from two comparators: Flow error (compensated steam flow - feed flow) and Level Error (actual level - program level). Since steam pressure is one parameter that is used to determine compensated steam flow, it will not be counted as an incorrect answer. However, to receive full credit all signals as mentioned in the answer key must be listed.

Question 3.35

NRC resolution: Comment accepted. Answer was taken from CVS-LP-3.0 p.23 which is in error. Answer key changed to reflect facility comment. Each response will be worth 0.375 vice 0.5.

ENCLOSURE 5

SIMULATOR FACILITY REPORT

Facility Licensee: Carolina Power and Light Company

Facility Docket No.: 50-400

Operating Tests Administered On: August 22 - 24, 1989

During the conduct of the simulator portion of the operating tests, the following items were observed:

ITEM	DESCRIPTION
Main Feed Pumps	It was not possible to override the automatic trips associated with the Main Feed Pumps. During a scenario in which both Main Feed Pumps were lost, the simulator went into a loss of all AC unexpectedly. This problem was reviewed and corrected while the exam team was still on site.

On two occasions the simulator froze during the running of the exam scenarios. This effected the exams in that it detracted from the sense of realism.