QUESTIONS REPORT

for HLT-29 rebuttal Questions

014A4.04 001/2/2/RPI/MEM 2.7/2.7/NEW/FA011005/RO/

Question 20:

Unit 2 is starting up the reactor after a reactor trip. DRPI shows all rods on the bottom and the step counters show the At Power rod positions prior to the reactor trip.

IAW UOP-1.3, Startup of Unit following an At Power Reactor Trip, the ROD CONTROL STARTUP RESET switch on the MCB is taken to the RESET position. Which one of the following will result from this action?

A✓ The Bank Overlap Unit will indicate zero.

B. FF3, DRPI Urgent Failure, annunciator will come into alarm.

C. FF1, Rod Cont Urgent Failure, annunciator will come into alarm.

D. Rod Insertion Limit computer will generate a rod position Lo and Lo-Lo alarm.

A. Correct - **The Bank Overlap Unit will indicate zero.**
This is one of six actions that occur when the ROD CONTROL STARTUP RESET switch on the MCB is taken to the RESET position.

B. Incorrect - This alarm could be confused with the Rod Cont Urgent Failure annunciator.

C. Incorrect - This alarm will clear, not come in to alarm, if in alarm and the condition corrected when the ROD CONTROL STARTUP RESET switch is taken to the RESET position.

D. Incorrect - This is a correct answer if the ROD CONTROL STARTUP RESET switch on the MCB is taken to the RESET position while at 100% power.

Prior to doing a reactor startup, all counters should be set to zero, and any urgent failures should be cleared. The rod control startup reset switch on the MCB performs the following six functions:
1. Resets the step counters on MCB to zero.
2. Resets the master cycler 0-5 counter to zero (This will ensure correct group action.)
3. Resets the slave cyclers 0-127 counters to zero (This will ensure correct sequence of a step.)
4. Resets the bank overlap unit 0-999 counter to zero (This will ensure correct bank overlap.)
5. Resets all urgent failure alarms if the conditions have been corrected.
6. Resets the pulse-to-analog convertors in the rod position indication system to zero (This will ensure correct insertion limit surveillance.)

QUESTIONS REPORT
for HLT-29 rebuttal Questions

014A4.04 Ability to manually operate and/or monitor in the control room:
Re-zeroing of rod position prior to startup

Explain the purpose and operation including the design features and functions, capacities,
and protective interlocks of the following major component associated with the Rod Control System (OPS40204I02):
•Rod Control Startup Reset Switch

POSITION:

During a normal shutdown, GRPI step counters are run down to zero along with the P-A converter. At C-114, the RIL Lo and Lo-Lo alarms will come into alarm. During the subsequent startup, when the ROD CONTROL STARTUP RESET switch is placed in RESET position, these alarms will NOT actuate since they are already in alarm (in solid) and due to the fact that the P-A converter is already at zero and the step counters are also at zero steps.

When a reactor trip occurs, the GRPI counters and the P-A converter will be at the last known rod position. In this condition the the RIL Lo and Lo-Lo alarms will NOT be in alarm due to the P-A converter is still indicating rods at the post trip condition and the RIL computer determining the limit to be at the zero power limit of C-114.

During the subsequent reactor startup when the ROD CONTROL STARTUP RESET switch is placed in RESET position, the RIL Lo and Lo-Lo alarms will come into alarm since the the P-A converter is reading D-230 and is being reset to zero telling the RIL computer the rods at zero steps (indicating that the control banks are at zero steps) and the computed RIL being at the zero power limit of "C" at 114 steps.

This question is asked from the standpoint that the GRPI counters are at the full power position and apparently no other actions have been completed because GRPI is not reset. One has to assume that the rod position Lo and Lo-Lo alarms are NOT in at this time due to the above discussion. This would be expected for a Rx trip recovery since GRPI is in the at power position. Therefore the alarms WILL come into alarm when the ROD CONTROL STARTUP RESET switch is placed in RESET position.

Answer "A" was chosen as the correct response on the key because it is a direct action listed in the lesson plans which result from resetting the ROD CONTROL STARTUP RESET switch. Resetting the ROD CONTROL STARTUP RESET switch performs the following actions as listed in the lesson plan:

1. Resets the step counters on MCB to zero.
2. Resets the master cycler 0-5 counter to zero (This will ensure correct group action.)
3. Resets the slave cyclers 0-127 counters to zero (This will ensure correct

sequence of a step.)

4. Resets the bank overlap unit 0-999 counter to zero (This will ensure correct bank overlap.)
5. Resets all urgent failure alarms if the conditions have been corrected.
6. Resets the pulse-to-analog (P to A) converters in the rod position indication system to zero (This will ensure correct insertion limit surveillance.)

RECOMMENDATION:

We recommend to NRC change the key to answer "A" and "D" as being correct.

Hypothesis of why the exam team missed this on review.
This question was initially written as being at 100% power and the ROD CONTROL STARTUP RESET switch is taken to the RESET position, what will happen?

During the validation process the validators commented that this was a 5 level of hardness. This question was changed several times and the final date of print was Oct 27. The question was then validated and reviewed and we missed that fact.

the condition is cleared, the urgent failure can be cleared by depressing the rod control alarm reset push button on the MCB, or by locally resetting the urgent failure alarm at the logic or power cabinets. Rod Control Startup Reset Switch

Prior to doing a reactor startup, all counters should be set to zero, and any urgent failures should be cleared. The rod control startup reset switch on the MCB performs the following six functions:

1. Resets the step counters on MCB to zero.
2. Resets the master cycler 0-5 counter to zero (This will ensure correct group action.)
3. Resets the slave cyclers 0-127 counters to zero (This will ensure correct sequence of a step.)
4. Resets the bank overlap unit 0-999 counter to zero (This will ensure correct bank overlap.)
5. Resets all urgent failure alarms if the conditions have been corrected.
6. Resets the pulse-to-analog convertors in the rod position indication system to zero (This will ensure correct insertion limit surveillance.)

The rod control startup reset switch should not be used unless all rods are on the bottom.

Power Cabinet Non-Urgent Failure

A power cabinet non-urgent failure will be caused by a loss of any one of four DC power supply modules in the power cabinet (main and auxiliary, +24 and -24V DC). This may be due to low line voltage, a blown fuse, or failure of the module's AC supply. If only one of each redundant pair fails, the other will continue supplying the cabinet's DC circuits through a blocking diode arrangement. The non-urgent failure does not affect rod motion.

A power cabinet non-urgent failure will annunciate the ROD CONTROL NON-URGENT FAILURE alarm on the MCB. The alarm will automatically clear when the non-urgent failure clears.

The +24V DC power supplies have status lights on the front of the power cabinets (PS1 and PS2). These status lights must be checked within one hour of receiving the ROD CONTROL NON-URGENT FAILURE alarm. If both status lights are not lit, then at least one +24V DC power supply must be reset within one hour or rod drops may occur due to a depleted backup battery.

Logic Cabinet Non-Urgent Failure

NOTE:
- **All surveillance reviews, whether it is for the nightly review or for a Mode change, should be performed in an environment free from distractions. It is the responsibility of the person performing the review, and the person performing the verification to establish such an environment (including moving to an empty office if necessary) before commencing the task, and to ensure they are not distracted from the task. (IR 1-95-297)**
- **It is intended that the following step be completed within a reasonable time frame, however, it is not meant to be a stopping point until it is completed. The operating crew should perform this step in parallel with the remainder of this procedure.**

____ / SSS ____ / SSS 5.6.5 Verify a Weekly STP Schedule list of Operations STPs required for Modes 3, 2 and 1 exists. IF required, THEN review the Operations Surveillance Schedules and prepare a Weekly STP Schedule list of Operations STPs required for Modes 3, 2 and 1 for the next 7 day period. Following verification, provide this list to the Shift Supervisor.

____ / 5.6.6 Ensure that no MODE 2 LCOs exist.

____ / *5.7 IF reactor decay heat diminishes to the point where gland seal can NOT be maintained, THEN place auxiliary steam on Unit 2 per FNP-1-SOP-55.1, AUXILIARY STEAM AND CONDENSATE SYSTEM, and gland seal on auxiliary steam per FNP-1-SOP-28.4, GLAND SEALING STEAM SYSTEM. IF necessary, THEN place a hogger in operation, FNP-1-SOP-28.5, CONDENSER AIR REMOVAL SYSTEM.

NOTE: IF less than 2 reactor coolant pumps are running in Mode 3, THEN the rod control system shall be disabled for rod withdrawal.

5.8 WHEN all reactor trip conditions have cleared, THEN perform the following:

____ / 5.8.1 Verify reactor trip breakers closed.

____ / 5.8.2 Reset Rod Control Start-up Reset switch.

____ / 5.8.3 Verify Bank Overlap Unit is reset to 0.

____ / 5.8.4 Withdraw shutdown banks A and B.

NOTE: <u>WHEN</u> the reactor is critical, the low low Tavg Alarm shall be verified reset (RX COOLANT LOOPS 1A, 1B or 1C TAVG LO-LO annunciator HF4) <u>AND</u> all RCS Loop Tavg shall be verified greater than or equal to 547°F, <u>OR</u> each reactor coolant loop Tavg shall be verified greater than or equal to 541°F every 30 minutes per FNP-1-STP-35.l, UNIT STARTUP TECHNICAL SPECIFICATION VERIFICATION. (Technical Specification 3.4.2)

3.27 On FNP-1-STP-35.1, UNIT STARTUP TECHNICAL SPECIFICATION VERIFICATION, record time of criticality, the temperature of last observed lowest reading Tavg prior to criticality and the time of the observation

3.28 Smoothed SUR is useful in anticipating the trend in reactor power and RCS TAVG especially when there is a positive moderator temperature coefficient. The expected moderator temperature coefficient can be obtained by referring to Curve 5. It is important to remember that while using smoothed SUR to anticipate trends, the actual parameters to be controlled are reactor power level and RCS average temperature. Appropriate response to control temperature must be taken even if smoothed SUR does not show a change. **{CMT 0009899}**

3.29 Correct operation of the SGFP speed control system is very important for proper steam generator water level control system operation. Ensure feed header to steam header ΔP is being maintained at the correct program value. **{CMT 0009899}**

NOTE:
- **TAVG changes affect NI indicated power but do not affect ΔT indicated power. Consider TAVG value when comparing NI and ΔT indications. (IR 1-94-118)**
- **Thermal streaming should simultaneously affect all three ΔT loops in a similar way -- if only a single loop ΔT deviates from calorimetric power or is markedly different from the other loops, an instrumentation problem may be indicated.**

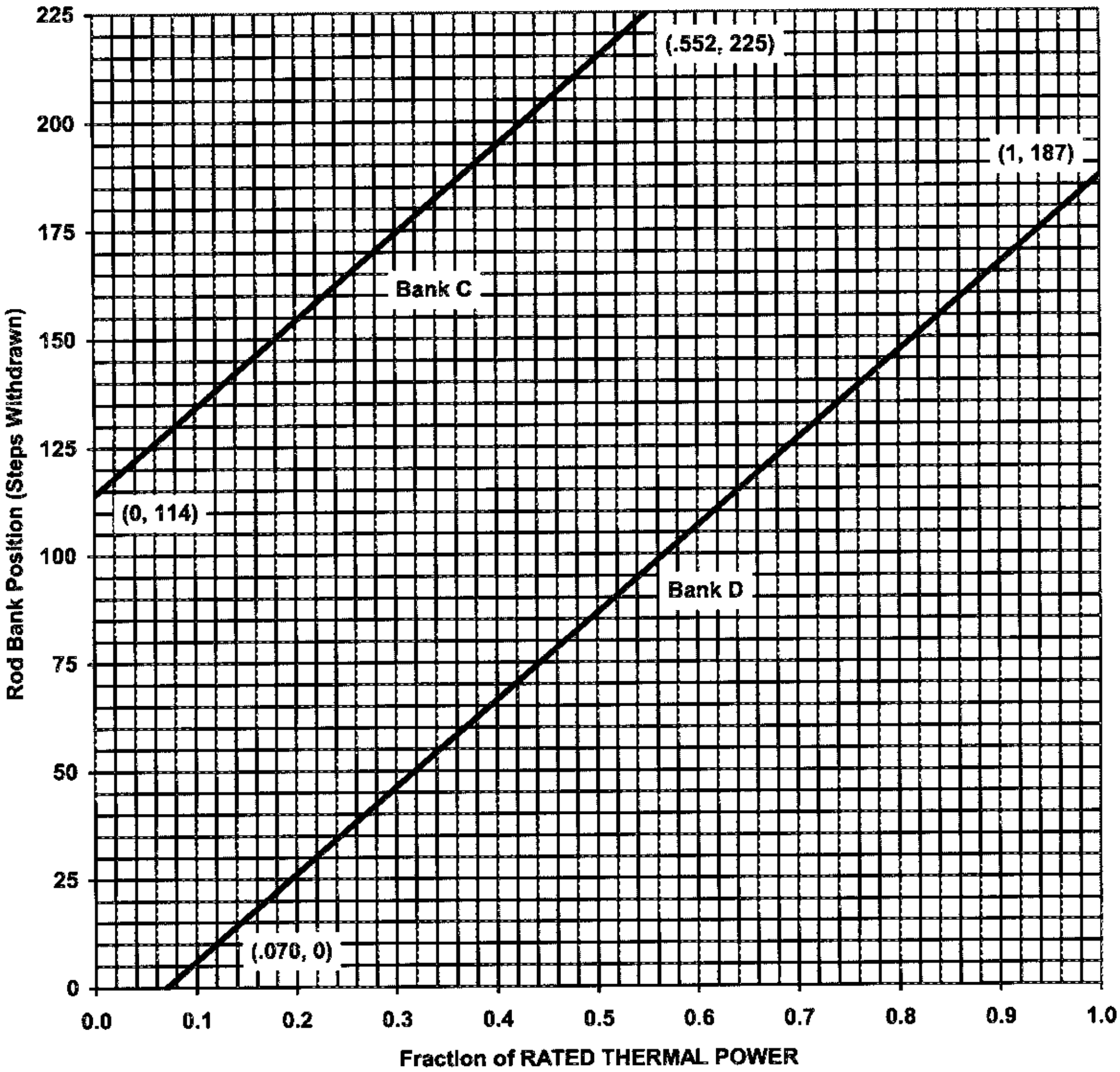
3.30 <u>WHEN</u> reactor power is in the power range, <u>THEN</u> compare reactor power indications and check for agreement. Continue monitoring and checking for agreement during the subsequent reactor power ascension. (IR 1-94-118)

- Average of RCS ΔTs
- Average of Power Range NIs
- AFW flow requirements (rough estimate of power level)
- Steam dump or S/G Atmospheric relief valve demand (rough estimate of power level)

3.30.1 <u>IF</u> any power disagreement greater than 2% is indicated, <u>THEN</u> resolve the discrepancy prior to power ascension.

3.31 Resetting the ROD CONTROL STARTUP RESET switch resets the following: Bank Overlap Unit, Master Cycler, Slave Cyclers, Pulse-to-analog converters, Urgent Failure Alarms, and Step Counters.

Fully Withdrawn – 225 to 231 steps, inclusive



Fully Withdrawn shall be the condition where control rods are at a position within the interval ≥ 225 and ≤ 231 steps withdrawn.

Note: The Rod Bank Insertion Limits are based on the control bank withdrawal sequence A, B, C, D and a control bank tip-to-tip distance of 128 steps.

LOCATION FE1

E1
CONT ROD BANK POSITION LO

SETPOINT: Variable; 10 Steps Greater than LO-LO Alarm Setpoint.
$Z_{LO} = Z_{LO\text{-}LO} + K_4$
Where K_4 = 10 Steps (6.25 inches)

ORIGIN: Rod Insertion Limit Computer

PROBABLE CAUSE

NOTE:
- **Zinc Addition System injection will result in a continuous RCS dilution of as much as 1.7 gph, which may result in a reduction in shutdown margin if compensated for by inward rod motion instead of boration.**
- **This annunciator has REFLASH capability.**

Reactor Coolant System Boric Acid Concentration too low for Reactor Power Level due to:
A. Plant Transient
B. Xenon Transient
C. Dilution of RCS

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. Check indications and determine that actual control bank rod position is at low insertion limit.
2. IF reactor coolant system dilution is in progress, THEN stop dilution.
3. IF a plant transient is in progress, THEN place the turbine load on "HOLD".
4. Refer to FNP-1-UOP-3.1, POWER OPERATIONS.
5. Borate the Control Bank "OUT" as necessary using the Boron Addition Nomographs. **{CMT 0008900}**
6. Refer to the Technical Specifications section on Reactivity Control.

References: A-177100, Sh. 291; U-260610; U266647 PLS Document; Technical Specifications DCP 93-1-8587; **{CMT 0008554, 0008887}**

LOCATION FE1

E1
CONT ROD BANK POSITION LO

SETPOINT: Variable; 10 Steps Greater than LO-LO Alarm Setpoint.
$Z_{LO} = Z_{LO\text{-}LO} + K_4$
Where K_4 = 10 Steps (6.25 inches)

ORIGIN: Rod Insertion Limit Computer

PROBABLE CAUSE

NOTE:
- **Zinc Addition System injection will result in a continuous RCS dilution of as much as 1.7 gph, which may result in a reduction in shutdown margin if compensated for by inward rod motion instead of boration.**
- **This annunciator has REFLASH capability.**

Reactor Coolant System Boric Acid Concentration too low for Reactor Power Level due to:
A. Plant Transient
B. Xenon Transient
C. Dilution of RCS

AUTOMATIC ACTION

NONE

OPERATOR ACTION

1. Check indications and determine that actual control bank rod position is at low insertion limit.
2. IF reactor coolant system dilution is in progress, THEN stop dilution.
3. IF a plant transient is in progress, THEN place the turbine load on "HOLD".
4. Refer to FNP-1-UOP-3.1, POWER OPERATIONS.
5. Borate the Control Bank "OUT" as necessary using the Boron Addition Nomographs. **{CMT 0008900}**
6. Refer to the Technical Specifications section on Reactivity Control.

References: A-177100, Sh. 291; U-260610; U266647 PLS Document; Technical Specifications DCP 93-1-8587; **{CMT 0008554, 0008887}**

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COLUMBIA, AL 36319

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Ron Aiello
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Atlanta Federal Center, Region II
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ATL A1

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XH QFEA

Question #20 flow path to prove the FE1 and 2 alarm structure

Start with drawing U169633 or drawing number 1. This shows the structure one line drawing for the FE1 and FE2 alarms as well as the inputs to the RIL computer.

The input for the alarms come from hi delta T (Ty-409) and from Tavg (TY-408). This is an OR input to TY409D and provides one side of the input to these alarms. With the unit at 100% power, this input would be either 100% from delta T or 573°F from Tavg. These equate to 100% power and give one input to ZB409D. The other side of the equation comes from the rod control system, specifically the P/A converter.

The drawings D-177882, D181727 and U176061 and 060 show the wiring diagrams that prove that U169633 is correct.
[In the bottom middle of U176061, TBP 11 and 10 comes from D181727 which in turn comes from D177882 which comes from the P/A converter (as proved by the TPNS number N1C1L007-N).]

The P/A converter is shown on tech manual drawing 6064D95 or drawing number 2. This is a wiring diagram of the P/A converter that shows the resets on the left hand side of the diagram shown and marked. The interface from Bank A, B, C, D provide up/down input to the P/A converter which causes the P/A converter to pulse up/down (count) and keep track of where the rods are. The right hand side of drawing 2 at location B2, C2, and D2 show four outputs that go to drawing number 1 into location G11, G8, G6 and G4, respectively. These feed the Lo and LO-Lo alarms.

Whenever the reactor power as determined by the Tavg or delta T correspond to an area on the graph, (from the PLS document and COLR that shows Rod Bank position vs. thermal power (that is below the lines indicated, then the alarm will come in. At 0% thermal power the low limit is C 114 and at 100% D 187.

In the question the reactor is tripped from a power level. One has to assume it is above C-114 since this would be normal for at power conditions. Since no other actions have taken place and since the step counters are at the at-power condition, one as to assume the P/A converter has not been reset locally. When the reactor trips, the step counters remain in the current position, as do the BOU and the P/A converter.

Since the P/A converter is greater than C114 and the reactor power is at 0%, FE1 and FE2 will not be alarm until the P/A converter is RESET. When ROS CONTROL STARTUP RESET SWITCH is taken to RESET, these alarms will now come into alarm. Why? Because power is at 0% and the rods are seen to be less than C114.

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FNP-2005-013-TRN

SOUTHERN COMPANY
Energy to Serve Your World℠

February 11, 2005

Mr. Ron Aiello
United States Nuclear Regulatory Commission
Sam Nunn Atlanta Federal Center
61 Forsyth Street SW, Suite 23T85
Atlanta, Georgia 30303-8931

Dear Mr. Aiello:

Enclosed in this package you will find documentation for question 20 from the recent 2005 NRC exam, as requested.

Hard copies of:

1. One explanation sheet
2. FNP-1-ARP-1.6, FE2
3. COLR PAGE 9 OF 12
4. pages from the P&L document page 41 and 42
5. Seven drawings

If you have any questions, please contact Gary Ohmstede at (334) 899-5156, extension 6111.

Sincerely,

Donna Christiansen
Ops Training Supervisor

Enclosure

GTO/DMC:gto

cc: File

LOCATION FE2

SETPOINT: Variable with Reactor Power as measured by ΔT and TAVG.

ORIGIN: Rod Insertion Limit Computer

E2
CONT ROD BANK POSITION LO-LO

PROBABLE CAUSE

NOTE:
- **Zinc Addition System injection will result in a continuous RCS dilution of as much as 1.7 gph, which may result in a reduction in shutdown margin if compensated for by inward rod motion instead of boration.**
- **This annunciator has REFLASH capability.**

1. Reactor Coolant System Boric Acid Concentration too low to ensure Reactor Protection under Accident conditions due to;
   A. Plant Transient
   B. Xenon Transient
   C. Dilution of RCS

AUTOMATIC ACTION

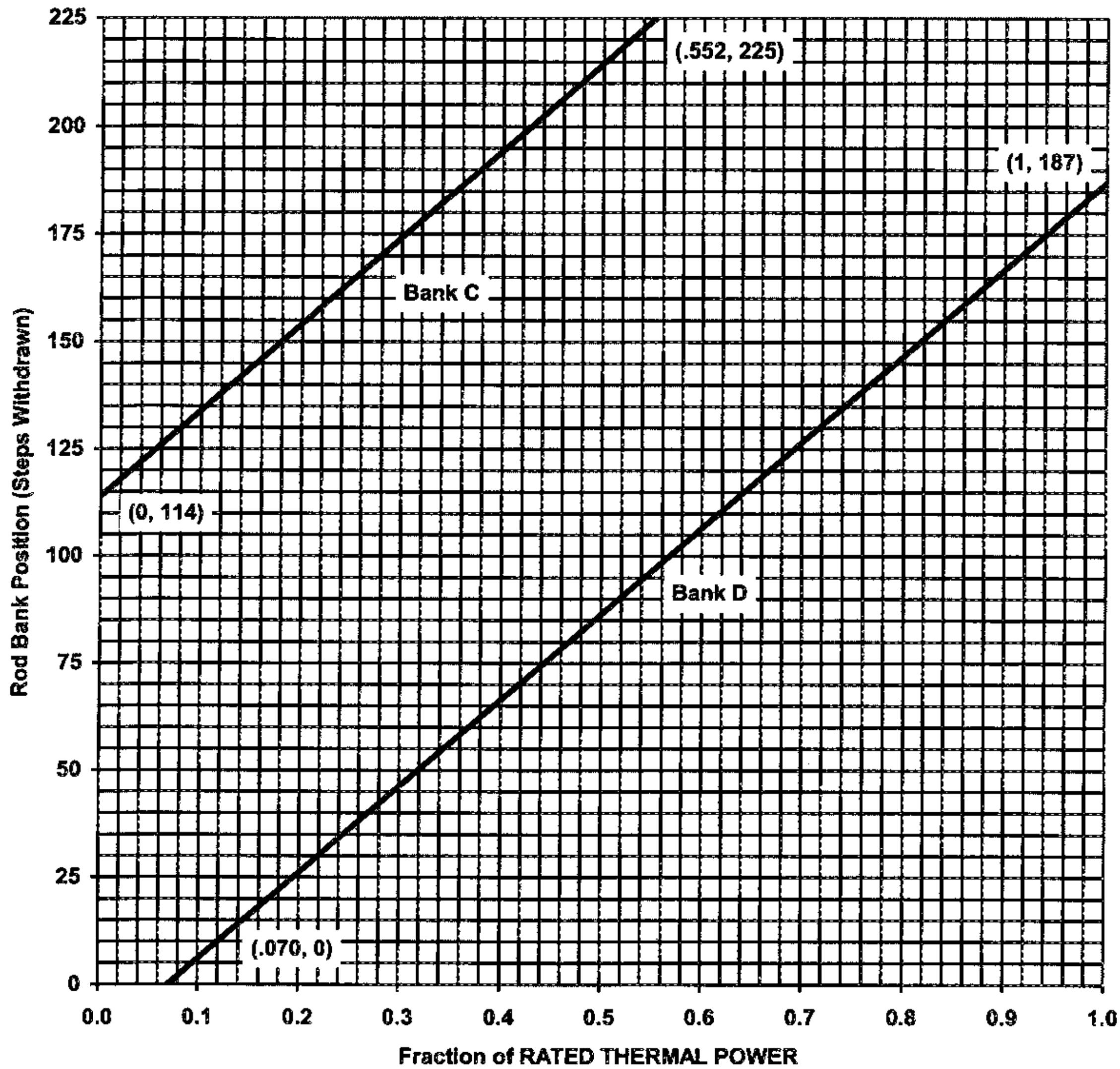
NONE

OPERATOR ACTION

1. Check indications and determine that actual control bank rod position is at the low-low insertion limit.
2. Emergency borate the reactor coolant system in accordance with FNP-1-AOP-27.0, EMERGENCY BORATION. **{cmt 0008555, 0008900}**
3. IF a plant transient is in progress, THEN place turbine load on "HOLD".
4. Refer to FNP-1-UOP-3.1, POWER OPERATIONS.
5. Refer to the Technical Specifications section on Reactivity Control.

References: A-177100, Sh. 292; U-260610; U266647 PLS Document; Technical Specifications; DCP 93-1-8587; **{CMT 0008887}**

Fully Withdrawn – 225 to 231 steps, inclusive



Fully Withdrawn shall be the condition where control rods are at a position within the interval ≥ 225 and ≤ 231 steps withdrawn.

Note: The Rod Bank Insertion Limits are based on the control bank withdrawal sequence A, B, C, D and a control bank tip-to-tip distance of 128 steps.

III. Alarms

1. Rodstops

Automatic and manual rod withdrawal block.

A. power range high flux level (C-2)

(NC-41L)
(NC-42L)
(NC-43L) 103% of full power
(NC-44L)

B. low turbine load cutout of automatic rod withdrawal (C-5)

(no alarm provided-permissive status light only)

(PB-446B) 15% of full power

C. Nuclear intermediate range high flux (C-1)

(NC-35E, NC-36E) Current equivalent to 20% full power

2. Insertion Limit Alarms

A. Lo-Lo alarm

(TY-409A, TY-409B, TY-409C, TY-409D)

See Drawing 1 for location of Cards TY-409A, B, C & D

(ZB-409A-2, ZB-409B-2, ZB-409C-2, ZB-409D-2)

$Z_{Lo\text{-}Lo} = K_1 T_{avg} + K_2 \Delta T + K_3$

Based on this calculation, RIL @ 0% Power (0 Delta T) would be Bank C @ 114.

Bank	K_2 (steps/%, T)	K_3 (steps)
C	2.010	114
D	2.010	-14

$K_1 = 0$

B. Low alarm

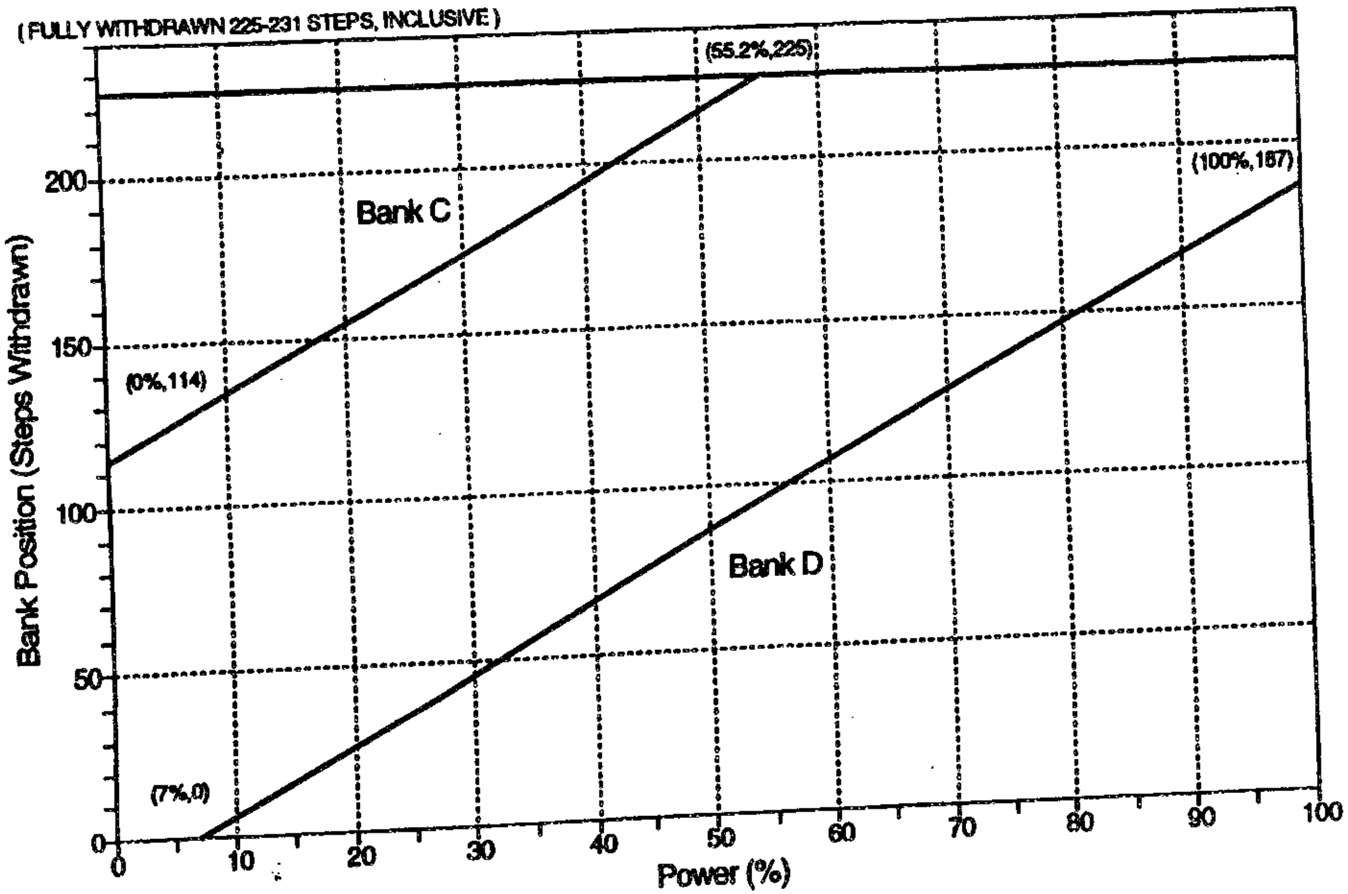
(ZB-409A-1, ZB-409B-1, ZB-409C-1, ZB-409D-1)

$Z_{Lo} = Z_{Lo\text{-}Lo} + K_4$

$K_4 = 10$ steps

Rev. A7

Control Bank Insertion Limits
Low-Low Alarm Setponts



055EA2.03 001/1/1/BLACKOUT/C/A 3.9/4.7/NEW/FA011005/RO/

Question 42:

There is a Station Blackout in progress for Unit 1. The 2C DG is being started for Unit 1 IAW ECP-0.0, Loss Of All A.C. Power. Which one of the following statements is correct that will ensure 2C DG is running properly with service water supplied after the start pushbutton is depressed?

A. • Check DJ06, Unit 1 2C DG output breaker, automatically closes.
• Close DG13, 1G 4160 V bus tie to 1J 4160 V bus.
• Manually start two service water pumps on B Train.

B. • Close DJ06, Unit 1 2C DG output breaker, manually from the EPB.
• Close DG13, 1G 4160 V bus tie to 1J 4160 V bus.
• Manually start two service water pumps on B Train.

C✓ • Check DJ06, Unit 1 2C DG output breaker, automatically closes.
• The LOSP sequencer will automatically run.
• All LOSP loads will automatically start.

D. • Close DJ06, Unit 1 2C DG output breaker, manually from the EPB.
• The LOSP sequencer will automatically run.
• All LOSP loads will automatically start.

A. Incorrect - DJ06 will auto close, however, DG13 will auto close and the SW pumps will auto start since there is no SI.

B. Incorrect - DJ06 will auto close, and the LOSP sequencer will run and start all loads.

C. Correct - **Check DJ06, Unit 1 2C DG output breaker, automatically closes, the LOSP sequencer will automatically run, and all LOSP loads will start.**
The Unit I output breaker **(DJ06-1) will close automatically when the 2C diesel is running at rated voltage and frequency, and it was manually started from the EPB in mode 1 with the USS in the Unit I position.** Also, an undervoltage condition must exist on the 1J bus, and the 1B diesel output breaker must be open.
Load shed of bus loads must be completed prior to closing the output breaker for any diesel generator. When the output breaker for the 2C DG is closed, then the LOSP sequencer on 4160V G *should run if no SI Signal is present*. This will load the 2C diesel from the G sequencer, in which case the operator needs to carefully monitor the loading on the diesel so that it will not exceed the continuous load rating of the diesel (2850 kW). If a safety injection signal is present, then the operator is reminded that neither the LOSP or the SI sequencer will run and the SI loads must be manually started.

D. Incorrect- DJ06 will auto close.

055EA2.03 Station Blackout- Ability to determine and interpret the following as they apply to a Station Blackout : actions necessary to restore power.

State the basis for all cautions, notes, and actions associated with ECP-0.0/0.1/02 (OPS52532A03)
Describe the sequence of major actions associated with ECP-0.0/0.1/02. (OPS52532A04)

POSITION:

In discussions with some of the individuals who picked "A" as the correct response, it was determined that an alternate way to analyze the question was to approach it in the procedural verification mode. This method is reinforced by the wording of the stem with the following items:

- The DG was being started IAW ECP-0.0, Loss Of All AC Power.
- Which one of the following statements is correct that will ensure 2C DG is running properly with service water supplied after the start pushbutton is depressed?

These applicants took the question to mean procedurally how the operator would verify that the 2C DG is running properly with service water. These actions were fresh their minds since one exam simulator scenario and an active JPM had them start the 2C DG in the SBO mode.

At FNP, the term VERIFY means to observe that an expected condition exists and take action to establish the condition if it does not exist. Each step in the ECP-0.0 has the word Verify at the beginning of the steps. The term ENSURE means to "To make sure or certain". We are asking the candidate to make sure or certain that the 2C DG is running properly with SW supplied IAW ECP-0.0. Then the distracters have the words check a breaker automatically closes or to close the breaker. If the candidate performed the actions as written in A and B, a success path is identified that is procedurally correct due to the terms ENSURE and VERIFY.

In reviewing the steps of ECP-0.0, you can find the actions in answers "A" and "B" as high level actions to be verified when starting 2C DG. The question uses the phrase "ensure 2C DG is running properly with service water supplied". A candidate who interprets the question as asking for what procedurally is required could pick either answer "A" or "B" as correct based on these options actually listing components that are required to be verified for the DG to be supplied with SW. Also, if viewed from this perspective, answer "C" would not be chosen based on it not listing the components detailed in the procedural steps.

Answer "C" was chosen as the correct response on the key because it is describes the system designed response to the 2C DG being started in the Station Backout (SBO) mode. Originally the question was written to ask with the conditions given what will be the required actions to make sure 2C DG is running properly with SW supplied. The answer as written is correct in that it defines what will happen when the start pushbutton is depressed. The operator will, in effect, have to do nothing.

Answer "D" contains parts based on procedural knowledge and system knowledge. If the actions were taken as in distracter B and the sequencer were to run as it will, then this would be a correct answer.

During the exam 2 candidates asked questions on this question as follows.

42 Dan	1138	Wanted to know if SI had occurred due to the LOSP. Ans: Use the info in the question.
David B.	1215	Does this affect Unit 2 also? U-2 power is needed to close DJ06. Ans: Answer the question as written.

intent and there was confusion among the candidates.

RECOMMENDATION:
Due to the the wording in the stem, any distracter could be picked and ensure that a success path to get SW supplied to the DG. Each candidate read the stem in a different light and depending on that viewpoint, was correct.
We submit based on these facts that all answers are correct and request this question be thrown out.

Hypothesis of why the exam team missed this on review.
The exam team validated this exam and 2 of the 3 validators missed this question. We rewrote the question and reviewed the question and missed the wording issues.

FARLEY NUCLEAR PLANT

SYSTEM OPERATING PROCEDURE

FNP-0-SOP-0.8

SAFETY RELATED

EMERGENCY RESPONSE PROCEDURE
USER'S GUIDE

PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	
Reference Use	
Information Use	ALL

Approved:

TODD YOUNGBLOOD
Operations Manager

Date Issued 8-12-03

GLOSSARY OF TERMS AND ACTIONS VERBS

Check	To note a parameter or condition and compare it with a specified requirement. No action to change the parameter or condition is implied.
	Example: Check reactor tripped
Close	To change the physical position of a device. Closing a valve prevents fluid flow. Closing a breaker allows current flow.
	Example: Close MSIVs for affected steam generators.
Compare	To examine two or more parameters to determine the similarities or differences among them.
	Example: Compare local valve position with control room indication.
Complete	To perform a specified action or task to a final end.
	Example: Complete RCS cooldown to required core exit temperatures.
Consult	To confer with or seek expert advice.
	Example: Consult TSC staff to determine long term plant status.
Continue	To maintain a course of action or to resume a course of action which has been interrupted. This implies a continuing action.
	Example: Continue efforts to restore off site power.
Control	To operate equipment to satisfy procedure requirements on process parameters. This implies a continuing action.
	Example: Control charging and letdown to stabilize pressurizer pressure.
Decrease	DO NOT USE
Deenergize	To remove electric power from.
	Example: Deenergize the accumulator discharge valves.

GLOSSARY OF TERMS AND ACTIONS VERBS

Trend	Do not use.
Trip	To manually actuate a semi-automatic feature. Generally directs manual action which causes a component to cease operation in a short time frame. **Example:** Trip the heater drain pumps.
Turn off	To remove power from. **Example:** Turn off pressurizer heaters.
Turn on	To supply power to. **Example:** Turn on pressurizer heaters.
Unlock	To unfasten a restricting device so that a component may be operated. **Example:** Unlock and close one isolation valve for any failed atmospheric relief.
Using	Directs operator to employ another procedure or portion of a procedure for guidance to perform a task. The referenced procedure does not become the controlling document. **Example:** Align 2C air compressor to Unit 1 using FNP-1-SOP-31.0, COMPRESSED AIR SYSTEM.
Vent	To permit a fluid under pressure to escape. **Example:** Vent the charging pump seals.
Verify	To observe that an expected condition exists and take action to establish the condition if it does not exist. **Example:** Verify all available AFW pumps running.

Step	Action/Expected Response	Response NOT Obtained

****

CAUTION: A running diesel generator will overheat if adequate SW flow is not provided within 3 minutes. Steps 5.3 through 5.7 must be performed immediately to verify adequate SW flow once a diesel generator has been started.

****

NOTE: Load shed of bus loads must be completed prior to closing the output breaker for any diesel generator.

Step	Action/Expected Response	Response NOT Obtained
5.2	Check 1-2A, 1C or 1B diesel generator running for Unit 1. • Check DIESEL SPEED indication - GREATER THAN 0 rpm. OR • Check FREQUENCY METER indication - GREATER THAN 58 Hz. OR • Check DIESEL AT SYN SPEED light - LIT.	5.2 Perform 2C DG SBO start as follows. 5.2.1 Verify 2C DG MODE SELECTOR switch in MODE 1. 5.2.2 Place 2C DG UNIT SELECTOR switch in UNIT 1. 5.2.3 WHEN load shed verified, THEN depress 2C DG DIESEL START pushbutton. 5.2.4 Verify 2C DG starts.

NOTE: The LOSP sequencer should run when output breaker closes, if no SI signal is present. If an SI signal is present, neither sequencer will run and SI loads must be started manually.

Step	Action/Expected Response	Response NOT Obtained
		5.2.5 Verify Unit 1 2C DG output breaker DJ06 closes. 5.2.6 Verify breaker DG13 closed. (1G 4160 V bus tie to 1J 4160 V BUS)

Step 5 continued on next page.

____Page Completed

Step	Action/Expected Response	Response NOT Obtained
		5.2.7 Verify breaker DG02 closed. (1G 4160 V bus tie to 1L 4160 V bus)
		5.2.8 <u>IF</u> 1G 4160V bus energized, <u>THEN</u> proceed to step 5.7.

NOTE:

- Starting 1-2A or 1B diesel generator should be attempted first.
- Any attempted start of a diesel generator which has automatically tripped should be performed locally in Mode 4.

Step	Action/Expected Response	Response NOT Obtained
		5.2.9 <u>WHEN</u> load shed verified, <u>THEN</u> start any diesel generator.
		5.2.9.1 Start diesel generator from EPB in Mode 2 using START pushbutton.
		<u>OR</u>
		5.2.9.2 Direct diesel operator to start diesel generator in MODE 4 using FNP-0-SOP-38.1, EMERGENCY STARTING OF A DIESEL GENERATOR.
		<u>OR</u>
		5.2.9.3 Direct diesel operator to perform a manual emergency start of 1-2A or 1B diesel generator using FNP-0-SOP-38.1, EMERGENCY STARTING OF A DIESEL GENERATOR.
		<u>OR</u>
		5.2.9.4 <u>IF</u> attempts to start a diesel generator fail, <u>THEN</u> proceed to step 5.9.

Step 5 continued on next page.

____Page Completed

Step	Action/Expected Response	Response NOT Obtained
	5.7 Verify adequate SW flow.	
	5.7.1 Verify two SW PUMPS in energized train - RUNNING. [] A Train (1A, 1B or 1C) [] B Train (1D, 1E or 1C)	
	5.7.2 <u>IF</u> A train energized, <u>THEN</u> verify SW TO/FROM DG BLDG - A HDR Q1P16V519/537 open.	
	5.7.3 <u>IF</u> B train energized, <u>THEN</u> verify SW TO/FROM DG BLDG - B HDR Q1P16V518/536 open.	

Step 5 continued on next page.

___Page Completed

subsequent steps. Each time a step energizes, a white lamp lights to indicate sequencer progress. A green lamp (LOSP MANUAL LOAD START) lights at the completion of the sixth step if all steps were energized. This lamp provides indication that all six steps received the proper signal and that additional loads may be started safely. A red lamp (LOSP INCOMPLETE SEQUENCE) lights at the completion of the sixth step if all steps did not energize, indicating that a malfunction has occurred. The lamps lock in and must be reset by depressing the lamp reset push button located beneath each light display.

At the completion of the sixth step, the sequencer signal feeds back to block the sequencer run signal. Blocking the run signal removes the close signal from the breakers on each step and returns the sequencer to a standby condition. This allows manual operation of all LOSP loads.

During an LOSP, bus 1J will normally be supplied emergency power from diesel generator 1B. With diesel generator 1B breaker (DG08-1) closed, the diesel generator 2C output breaker (DJ06-1) will be blocked from closing.

DG 2C Output Breaker (DJ06) Logic

Because the 2C diesel is the SBO diesel, its output breaker (Figure 20) controls are different from the emergency diesel breaker controls.

The Unit I output breaker (DJ06-1) will close automatically when the 2C diesel is running at rated voltage and frequency, and it was manually started from the EPB in mode 1 with the USS in the Unit I position. Also, an undervoltage condition must exist on the 1J bus, and the 1B diesel output breaker must be open.

The Unit II output breaker (DJ06-2) operates the same as the Unit I output breaker. To manually close DJ06-1 from the EPB, 2C diesel must be operating in mode 2. To start the diesel in mode 2, the USS must be in the TEST position.

B1J and B2J Sequencer Logic

Normally, an UV condition on 4160V bus 1J or 2J will generate a load shed signal. The load shed signal for the B1J sequencer will trip river water pumps 4 and 5. The load shed signal

immediately may result in restart of the diesel generator when the low speed relay de-energizes. If the diesel generator is supplying power to the emergency bus and does not have SW cooling being supplied to it, then the diesel generator must be rapidly shutdown. This rapid shutdown should prevent diesel engine failure, if the shutdown occurs within 3 minutes of diesel engine being started. The immediacy of these steps is to prevent a subsequent restart of the diesel generator after the DG Stop pushbutton has been depressed.

The LOSP sequencer may run when the output breaker is closed. The LOSP sequencer should run when output breaker closes, if no SI signal is present. If a SI signal is present, neither sequencer will run and SI loads must be started manually.

Caution. If both Unit 1 and Unit 2 B Train 4160V busses become de-energized, then make one attempt per unit to restore power to at least one unit's B Train 4160V bus by starting the designated B Train DG. If power cannot be restored using either 1B or 2B DGs, then immediately align and start the SBO DG to provide power to one unit's B Train 4160V bus.

Caution. When energizing any dead bus from a startup transformer, the SYNCH BYPASS switch must be held in the BYPASS position when closing the associated startup transformer output breaker. Closing the alternate output breaker from a startup transformer may cause safety related AC power to be cross-connected.

Recovery Actions

At this point in the procedure, all attempts to restore AC power to an emergency bus from any source (DGs or off-site) have failed. With no AC power available to any emergency bus, plant conditions will begin to deteriorate due to RCP seal leakage. Actions should now be initiated to minimize the deterioration of the plant conditions. Actions will be taken to prevent auto start of emergency loads, reduce DC loads, and isolate the RCP seals. Because of the changes made to various equipment and system lineups that are going to be completed in subsequent steps, the operator must proceed to an appropriate recovery procedure whenever AC power is restored.

When the point of the procedure has been reached when power to any bus cannot be restored, the step will direct the operator to proceed in the procedure to verify SW flow and a flowpath to the DGs available when power is restored to any emergency bus. The procedure will then direct the operator to perform the necessary actions to restore plant equipment to a "normal" configuration needed for recovery following a loss of all AC power.

Whenever a SI signal is present, the operator is directed to reset the SI signal so that SI equipment (i.e., pumps and valves) will not automatically actuate upon AC power restoration. This will permit manual loading of equipment as directed following restoration of power to the

If no emergency bus can be loaded on any DG for whatever reason (no excitation, breaker won't close, etc.), then the RNO column will direct the operator to attempt to load an emergency bus from an off-site power supply while continuing efforts to start one diesel generator.

If an emergency bus (4160V bus F or G) has been restored with electrical power from a DG, then the power supply should be sufficiently stable to accept automatic sequencing of loss of off-site power (LOSP) or SI loads on the emergency bus without detrimental effects. In this case, the operator will verify Service Water (SW) pumps are running with adequate SW flow to DGs being delivered and then will be directed to procedure and step in effect (EEP-0 in all likelihood).

A caution applies any time a diesel is started to help to ensure the running diesel is provided immediately with service water (SW) for cooling to protect it from overheating. If the DG cannot be provided with sufficient cooling water, then it should be secured until SW is available to be provided to the running DG.

Load shed of bus loads must be completed prior to closing the output breaker for any diesel generator. When the output breaker for the 2C DG is closed, then the LOSP sequencer on 4160V G should run if no SI Signal is present. This will load the 2C diesel from the G sequencer, in which case the operator needs to carefully monitor the loading on the diesel so that it will not exceed the continuous load rating of the diesel (2850 kW). If a safety injection signal is present, then the operator is reminded that neither the LOSP or the SI sequencer will run and the SI loads must be manually started.

Because of the increased capacity that is available from the big diesels (4075 kW versus 2850 kW), the operator should attempt to start one of them first. Also, the big diesels can be emergency started by one of two methods locally per SOP-38.1.

Any attempted start of a diesel generator that has automatically tripped should be performed locally in Mode 4. This note reminds the operator that if the local mode selector switch (located on the diesel local control panel) is placed in MODE 4 position, then the diesel cannot be controlled from the EPB. To return control to the operator in the control room, then the local control switch must be placed in the OFF position.

Failure to perform steps to shutdown a DG that is running without adequate SW immediately may result in restart of the diesel generator when the low speed relay de-energizes. If the diesel generator is supplying power to the emergency bus and does not have SW cooling being supplied to it, then the diesel generator must be rapidly shutdown. This rapid shutdown should

071K5.04 001/2/2/WASTE GAS/MEM 2.5/3.1/NEW/FA011005/RO/

Question 54:

The Shift Chemist has determined that oxygen concentration levels are 3.5% in the Waste Gas System. Which one of the following is required to be accomplished IAW SOP-51.0, Waste Gas System, to prevent an unsafe condition?

A. Dilute with nitrogen and transfer the smaller WGDT to #7 or #8 WGDT for further sampling.

B✓ Dilute with nitrogen and vent the WGDT to the plant vent stack per SOP-51.1, Waste Gas System Gas Decay Tank Release.

C. Place the waste gas compressor in service and dilute by combining the WGDT with another WGDT that has a lower oxygen concentration.

D. Transfer the smaller WGDT to #7 or #8 WGDT and vent the WGDT to the plant vent stack per SOP-51.1, Waste Gas System Gas Decay Tank Release.

Due to the question for KA 004K5.49 on this exam, this question was asked in the oxygen realm to prevent giving the answer or tips for that question. The words flammable and explosive mixture were avoided as well and the word hydrogen was avoided to keep from drawing the 2 questions together. The candidate will have to either take the unsafe condition at face value or know what the unsafe condition is. The operational implications of too high an oxygen level is to dilute and get rid of the WGDT contents to prevent a flammable mixture.

A. Incorrect - Diluting with nitrogen is correct but then the correct action is to get rid of it, not store it for future problems.

B. Correct - **Dilute with nitrogen and vent the WGDT to the plant vent stack per SOP-51.1, Waste Gas System Gas Decay Tank Release.**
This will bring the flammable concentration down and the get it out of the tank to prevent a future high O2 concentration. This is done to prevent a flammable mixture of O2 to H2 IAW SOP-51.

C. Incorrect - This is not a correct action but the candidate may believe this would dilute it and allow for a safer environment.

D. Incorrect - There is no need to transfer this from a smaller tank to the larger holding tanks for future disposal.

Reference:CFR: 41.5 / 45.7
TR 13.12.3, Waste Gas Monitoring Lesson plan
This technical requirement states that the concentration of oxygen in any portion of the gaseous radwaste treatment system shall be limited to < or equal to **2%** by volume whenever the hydrogen concentration in that portion of the gaseous radwaste treatment system exceeds 4% by volume and the hydrogen and oxygen monitors required by TR 13.12.1 are operable. If the hydrogen and oxygen monitors required by TR 13.12.1 are operable and the concentration of oxygen in the gaseous radwaste treatment system >2% by volume but < or equal to 4% by volume, then reduce oxygen concentration to within limits within 48 hours.

SOP-51.0 P&L
3.11 Gas decay tanks with O_2 levels greater than the required limits should be diluted with N_2 and purged to the plant vent in accordance with FNP-1-SOP-51.1, WASTE GAS SYSTEM GAS DECAY TANK RELEASE, until O_2 level is within limits.

071K5.04 Waste Gas Disposal - Knowledge of the operational implication of the following concepts as they apply to the Waste Gas Disposal System.
Relationship of hydrogen/oxygen concentrations to flammability.

Identify any special considerations such as safety hazards and plant condition changes that apply to the Waste Gas System (OPS52106B04).

QUESTIONS REPORT
for HLT-29 rebuttal Questions

POSITION:

The stem used the wording of "unsafe condition" as the driving force behind taking some action. Reviewing our procedures, 3.5% by itself does not constitute an unsafe condition.

Based on the TRM, section 13.12.3, this oxygen concentration would only be out of spec if hydrogen exceeded 4%. Since the hydrogen concentration is not given, one can assume that the TRM conditions are satisfied.

Chemistry typically provides recommendations as to the disposition of the contents of a WGDT based on H2 concentration, O2 concentration and curie content exceeding limits. Operations may also decide to make releases for operational concerns such as pressure, planned maintenance activities or planned future needs.

Since none of these items were apparent in the stem of the question, the candidates were left to draw their own conclusions and select a success path based on that conclusion.

The following procedural guidance exists on the disposition of waste gas in a WGDT:

A review of FNP-1/2-CCP-203.0, CHEMISTRY AND ENVIRONMENTAL GROUP CONSIDERATIONS DURING OPERATIONAL TRANSIENTS Section 5.18, does not provide for a mandatory release of a WGDT with the conditions given in the question. If hydrogen exceeds 4% and oxygen exceeds 1% then CCP-203 would mandate a release after dilution with nitrogen to below the TRM limit. The only statement in CCP-203 suggesting a release is contained in the subsection (Page 46, section E) describing the addition of nitrogen. It is worded as follows: "Generally, after the addition of nitrogen, it will be desired to release the contents of the WGDT." In practice the other factors of curie content, final tank pressure and final oxygen/hydrogen sample results may result in a decision to hold the tank for future use. This option is allowed by CCP-203.

STP-424, OXYGEN AND HYDROGEN DETERMINATION FOR THE WASTE GAS SYSTEM, provides instructions and actions to be taken on out of spec conditions for a Waste Gas Sample. For the given sample results, **no actions are required.**

SOP-51.0 gives the instructions for alignment of the waste gas system in various modes, Section 4.13 (Nitrogen Addition To Waste Gas System), Section 4.10 (Transferring Gas Between Gas Decay Tanks) or section 4.19 (Transferring Gas Between Gas Decay Tanks With The System Shutdown)

The question also asks the REQUIRED actions. Since no hydrogen limit is exceeded; no action is required for the stated conditions.

Answer A describes a valid alternative based on the following reasons:

1. The Oxygen concentration is out of spec for oxygen but the hydrogen concentration is not given. TRM 13.12.3 does not mandate a gas release as a required action for an out of spec oxygen concentration only. This is the only distracter that mentions the word sampling and implies past sampling has occurred because further sampling will be done.

2. Typically Operations will follow Chemistry recommendations as to the disposition of gas in out of spec tanks. Several factors are taken into consideration before making this type of recommendation including hydrogen and oxygen content in other tank (if a transfer is desired), curie content (if a release is desired), initial / final tank pressure (if dilution with nitrogen is desired) and other operational concerns.

Answer B is an option for the disposition of the contents of this tank although this would not be required by plant procedure.

Answer C describes a viable option for the disposition of a WGDT with high oxygen concentration. Since no limits are exceeded, a transfer to another WGDT and subsequent release is allowed.

Answer D could also describe a viable option for the disposition of a WGDT with high oxygen concentration. Since no limits are exceeded, a transfer to another WGDT and subsequent release is allowed.

RECOMMENDATIONS:
We contend that all responses could be selected as a correct answer based on the information given in the stem and the question be thrown out.

Hypothesis of why the exam team missed this on review.
This question was rewritten a number of times. One factor that came in to play was another question on this exam; KA 004K5.49.
This question was asked in the oxygen realm to prevent giving the answer or tips for that question. We did not put in 4% for hydrogen due to the possibililty of giving information to the candidate for that question.

004K5.49 Chemical and Volume Control
K5 Knowledge of the operational implications of the following concepts as they apply to the CVCS: K5.49 – Purpose and method of hydrogen removal from the RCS before opening system: explosion hazard, nitrogen purge

The words flammable and explosive mixture were avoided as well and the word hydrogen was avoided to keep from drawing the 2 questions together.

We made this an oxygen question but missed the mark by not giving any hydrogen concentrations. This would have been a good question to reassign the KA value, but we had already reassigned one KA dealing with liquid / gas waste issues.

13.12 Explosive Gas and Storage Tank Radioactivity Monitoring (EGSTRAM) Program

TR 13.12.3 Waste Gas Monitoring

TR 13.12.3 The concentration of oxygen in any portion of the gaseous radwaste treatment system shall be limited to:

A. ≤ 2% by volume whenever the hydrogen concentration in that portion of the gaseous radwaste treatment system exceeds 4% by volume and the hydrogen and oxygen monitors required by TR 13.12.1 are OPERABLE; or

B. ≤ 1% by volume whenever the hydrogen concentration in that portion of the gaseous radwaste treatment system exceeds 4% by volume and the hydrogen and oxygen monitors required by TR 13.12.1 are not OPERABLE.

APPLICABILITY: At all times.

ACTIONS

-----NOTE-----
TR 13.0.3 and TR 13.0.4 are not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Monitors in TR 13.12.1 OPERABLE <u>AND</u> Concentration of oxygen in the gaseous radwaste treatment system > 2% by volume but ≤ 4% by volume.	A.1 Reduce oxygen concentration to ≤ 2% by volume.	48 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Monitors in TR 13.12.1 not OPERABLE. AND Concentration of oxygen in the gaseous radwaste treatment system > 1% by volume but ≤ 4% by volume.	B.1 Analyze grab samples from the affected on-service waste decay tank during addition of waste gas.	4 hours
	AND	
	B.2 Reduce oxygen concentration to ≤ 1% by volume.	4 hours
C. Required Actions and associated Completion Times of Conditions A or B not met.	C.1 Suspend addition of waste gas to the system.	Immediately
D. Concentration of oxygen in the gaseous radwaste treatment system > 4% by volume.	D.1 Suspend all additions of waste gases to the system.	Immediately
	AND	
	D.2 Reduce oxygen concentration to ≤ 4%.	1 hour
	AND	
	D.3 Reduce oxygen concentration to within limit.	49 hours

TECHNICAL REQUIREMENT SURVEILLANCES

SURVEILLANCE		FREQUENCY
TRS 13.12.3.1	Verify concentration of hydrogen or oxygen in the gaseous radwaste treatment system to be less than the limit by monitoring the waste gases in the gaseous radwaste treatment system.	During addition of waste gases to the gaseous radwaste treatment system: by use of the hydrogen and/or oxygen monitors required by TR 13.12.1, when OPERABLE <u>OR</u> by analyzing grab samples from the affected waste decay tank at least once every 4 hours.

B 13.12 EXPLOSIVE GAS AND STORAGE TANK RADIOACTIVITY MONITORING (EGSTRAM) PROGRAM

BASES

TR 13.12.1 Waste Gas Monitoring Instrumentation

This instrumentation monitors (and controls) the concentrations of potentially explosive gas mixtures in the waste gas holdup system. The OPERABILITY and use of this instrumentation are consistent with the requirements of General Design Criteria 60 and 63 of Appendix A to 10 CFR Part 50.

TR 13.12.2 Liquid Holdup Tanks

Restricting the quantity of radioactive material contained in the specified tanks provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting concentrations would be less than the limits of 10 CFR Part 20, Appendix B, (to paragraphs 20.1001 -20.2401), Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an unrestricted area.

TR 13.12.3 Waste Gas Monitoring

This Technical Requirement is provided to ensure that the concentration of potentially explosive gas mixtures contained in the waste gas holdup system is maintained below the flammability limits of hydrogen and oxygen. During recombiner operation, an automatic control feature is included in the system to prevent the oxygen concentration from reaching these flammability limits. The automatic control feature includes isolation of the source of oxygen (the recombiner oxygen supply), to reduce the concentration below the flammability limit. When the recombiner is not operating and thus the recombiner oxygen supply is isolated, a grab sample can be taken to measure oxygen levels in the waste gas system. Maintaining the concentration of oxygen below the flammability limit when hydrogen is above 4% by volume provides assurance that the releases of radioactive materials will be controlled in conformance with the requirements of General Design Criterion 60 of Appendix A to 10 CFR Part 50.

TR 13.12.4 Gas Storage Tanks

Restricting the quantity of radioactivity contained in each gas storage tank provides assurance that in the event of an uncontrolled release of the tanks' contents, the resulting total body exposure to an individual at the nearest exclusion area boundary will not exceed 0.5 rem. This is consistent with Standard Review Plan 15.7.1, "Waste Gas System Failure".

UNIT 1

01/21/05 12:27:57

FNP-1-STP-424
January 27, 2003
Version 15.0

FARLEY NUCLEAR PLANT

SURVEILLANCE TEST PROCEDURE

FNP-1-STP-424

SAFETY RELATED

OXYGEN AND HYDROGEN DETERMINATION FOR THE WASTE GAS SYSTEM

PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	
Reference Use	**ALL**
Information Use	

Approved:

C.L. Buck
Technical Manager

Date Issued 01/29/03

OXYGEN AND HYDROGEN DETERMINATION FOR THE WASTE GAS SYSTEM

1.0 Purpose

This provides a means of determining the oxygen in the Waste Gas Inlet and Waste Gas Decay Tank.

2.0 Scope

2.1 This surveillance (Ref. 7.1) is required in all modes when adding waste gases to the waste gas system during the following conditions:

2.1.1 No recombiner oxygen analyzers are operable and addition of waste gas to the waste gas system is to continue TR 13.12.1, actions A and B.

2.1.2 No recombiner hydrogen analyzers are operable and addition of waste gas to the waste gas system is to continue TR 13.12.1, action C.

2.2 This surveillance (Ref. 7.2) is required in all modes, at all times, any time a waste gas decay tank is sampled for oxygen/hydrogen concentration whether the sample is routine scheduled sample, or a special sample requested for any reason. This surveillance applies on any waste gas decay tank, inservice OR in standby.

2.3 This procedure is not subject to the guidance in FNP-0-AP-52 pertaining to the release of repetitive tasks.

3.0 Acceptance Criteria

3.1 During recombiner operation, with less than the minimum number of oxygen monitors operable, the analysis for oxygen (O_2) in the affected on-service waste gas decay tank during the addition of waste gas shall verify oxygen in concentrations < 1 percent by volume once per 4 hours; otherwise, stop the addition of gas to the waste gas system.

At all times, with hydrogen and oxygen monitors required by TR 13.12.1 OPERABLE, the concentration of oxygen in any portion of the gaseous radwaste treatment system shall be limited to ≤ 2% by volume whenever the hydrogen concentration in that portion of the gaseous radwaste treatment system exceeds 4% by volume.

3.3 At all times, with hydrogen and oxygen monitors required by TR 13.12.1 NOT OPERABLE, the concentration of oxygen in any portion of the gaseous radwaste treatment system shall be limited to ≤ 1% by volume whenever the hydrogen concentration in that portion of gaseous radwaste treatment system exceeds 4% by volume. Verification shall be accomplished once per 4 hours; otherwise stop addition of gas to the waste gas system.

3.4 If applicable Acceptance Criteria are NOT met, go to section 4.0 for required actions.

These are not met due to hydrogen not high

4.0 Actions

4.1 With hydrogen and oxygen monitors required by TR 13.12.1 OPERABLE:

4.1.1 With the concentration of oxygen in the gaseous radwaste treatment system > 2% by volume but ≤ 4% by volume, REDUCE the concentration of oxygen to ≤ 2% by volume within 48 hours. If completion time not met, suspend addition of waste gas to the system.

4.1.2 With the concentration of oxygen in the gaseous radwaste treatment system > 4% by volume IMMEDIATELY suspend all additions of waste gases to the system AND reduce the concentration of oxygen to ≤ 4% within 1 hour AND ≤ 2% by volume within 49 hours.

4.2 With hydrogen and oxygen monitors required by TR 13.12.1 NOT OPERABLE:

4.2.1 With the concentration of oxygen in the gaseous radwaste treatment system > 1% by volume but ≤ 4% by volume, REDUCE the concentration of oxygen to ≤ 1% by volume within 4 hours. If completion time not met, suspend addition of waste gas to the system.

4.2.2 With the concentration of oxygen in the gaseous radwaste treatment system > 4% by volume, IMMEDIATELY suspend all additions of waste gases to the system AND reduce the concentration of oxygen to ≤ 4% within 1 hour AND ≤ 1% by volume within 49 hours.

5.0 References

5.1 FNP-1-CCP-653, Sampling the Waste Gas Decay Tanks (WGDT).

5.2 FNP-0-CCP-7, The Determination of Dissolved Hydrogen, Nitrogen and Oxygen.

5.3 FNP-1-CCP-203, Chemistry and Environmental Group Considerations During Operational Transients

6.0 Procedure

6.1 Obtain a Waste Gas Inlet sample by sampling the desired waste gas decay tank per FNP-1-CCP-653.

6.2 Determine the oxygen concentration in accordance with FNP-0-CCP-7.

6.3 Record the following in the appropriate spaces on the Surveillance Test Review Sheet:

6.3.1 Instrument I.D. Number of the gas chromatograph used.

6.3.2 Calibration Due Date of the gas chromatograph used.

6.4 Record the results on the Surveillance Test Review Sheet.

6.5 Record whether the Waste Gas Tank was Inservice (i.e. Gas being added to tank) or not in service (i.e., Tank being sampled for reason other than Gas addition to tank).

6.6 Indicate on the STRS which Acceptance Criteria is (are) applicable for this sample by checking appropriate box(es). Refer to FNP-1-CCP-203.

6.7 Notate in the "Comments" on the STRS area above "Performed by" why the tank was sampled and any actions taken due to the results (for example, "Tank sampled due to VCT burp. Operations requested to remove tank from service and not to add gas to this tank due to Oxygen level").

6.8 Document the date/time "Performed by" as the time 6.4 is performed.

7.0 Technical Specification Reference and Technical Requirements Manual Reference

7.1 5.5.12, TR 13.12.1

7.2 5.0, TR 13.12.3

FARLEY NUCLEAR PLANT
SURVEILLANCE TEST REVIEW SHEET

SURVEILLANCE TEST NUMBER	TECHNICAL SPECIFICATIONS REFERENCE and TECHNICAL REQUIREMENTS MANUAL REFERENCE
FNP-1-STP-424	5.5.12, 5.0, TR 13.12.1, TR 13.12.3

TITLE: Oxygen and Hydrogen Determination for the Waste Gas System
MODE (S) REQUIRING TEST: All modes (1) Recombiners inservice refer to TR 13.12.1 or (2) No recombiners inservice refer to TR 13.12.3B.

TEST RESULTS

WGDT #: ___________
Result: _____________ % Oxygen
_____________ % Hydrogen

[ ] Satisfactory [ ] Unsatisfactory

Deficiencies: ______________________

REFERENCES

	Rev.	Int.
1. FNP-1-CCP-653	_____	_____
2. FNP-0-CCP-7	_____	_____

Instrument I. D. No. ____________________
Calibration Due Date ____________________
WGDT STATUS: [ ] In Service (Gas being added)
[ ] Not In Service

Comments: ______________________

Corrective Action: ______________________

Performed by: ______________________

Date/Time: ______________ / ______

ACCEPTANCE CRITERIA

[ ] During recombiner operation with less than the minimum number of oxygen monitors operable, grab samples from affected on-service waste decay tank during addition of waste gas will be analyzed AND oxygen content will be verified as < 1% every 4 hours. (Procedure section 3.1)

[ ] At all times, with hydrogen and oxygen monitors required by TR 13.12.1 OPERABLE, the concentration of oxygen in any portion of the gaseous radwaste treatment system shall be limited to ≤ 2% by volume whenever the hydrogen concentration in that portion of the gaseous radwaste treatment system exceeds 4% by volume. (Procedure section 3.2)

[ ] At all times, with hydrogen and oxygen monitors required by TR 13.12.1 NOT OPERABLE. TR 13.12.3B requires the concentration of oxygen in any portion of the gaseous radwaste treatment system shall be limited to ≤ 1% by volume whenever the hydrogen concentration in that portion of the gaseous radwaste treatment system exceeds 4% by volume. Verification shall be accomplished once per 4 hours; otherwise stop addition of gas to the waste gas system. (Procedure section 3.3)

REVIEW - LEVEL II (or above)

Reviewed by: ______________________ Date: ____________

[ ] Procedure properly completed and satisfactory

[ ] Comments: ______________________

FINAL REVIEW - LEVEL II (or above)

Reviewed by: ______________________ Date: ____________

[ ] Procedure properly completed and satisfactory

[ ] Comments: ______________________

TRM SPECIFICATIONS

TR 13.12.1, Waste Gas Monitoring Instrumentation

This technical requirement requires that one hydrogen monitor and two oxygen monitors per recombiner are required during recombiner operations.

With one oxygen monitor for one or more recombiners inoperable immediately isolate the oxygen supply to the affected recombiner(s). If both oxygen monitors for one or more recombiners are inoperable then analyze grab samples from the affected on-service waste decay tank during addition of waste gas and verify oxygen concentration remains less than 1 percent within 4 hours. If the required hydrogen monitor for one or more recombiners is inoperable then analyze grab samples from the affected on-service waste decay tank during addition of waste gas and verify oxygen concentration remains less than 1 percent within 4 hours. If the above actions are not meet immediately suspend addition of waste gas to the system. A report must be prepared and submitted to the Commission if any oxygen or hydrogen monitor(s) for one or more recombiners is inoperable for more than 30 days.

During recombiner operation a channel check will be performed every 24 hours and Channel Operability Test (COT) will be performed every 31 days. A channel calibration shall be performed every 92 days.

TR 13.12.3, Waste Gas Monitoring

This technical requirement states that the concentration of oxygen in any portion of the gaseous radwaste treatment system shall be limited to **≤2%** by volume whenever the hydrogen concentration in that portion of the gaseous radwaste treatment system exceeds 4% by volume and the hydrogen and oxygen monitors required by TR 13.12.1 are operable. If the hydrogen and oxygen monitors required by TR 13.12.1 are operable and the concentration of oxygen in the gaseous radwaste treatment system >2% by volume but ≤4% by volume, then reduce oxygen concentration to within limits within 48 hours.

The concentration of oxygen in any portion of the gaseous radwaste treatment system shall be limited to **≤1%** by volume whenever the hydrogen concentration in that portion of the gaseous radwaste treatment system exceeds 4% by volume and the hydrogen and oxygen monitors required by TR 13.12.1 are NOT operable. If the hydrogen and oxygen monitors required by TR 13.12.1 are NOT operable and the concentration of oxygen in the gaseous radwaste treatment system >1% by volume but ≤4% by volume, then analyze grab samples from the affected on-service waste gas decay tank during addition of waste gas within 4 hours and reduce oxygen concentration to within limits within 4 hours.

If the concentration of oxygen in the gaseous radwaste treatment system >4% by volume then immediately suspend all additions of waste gas to the system, within one hour reduce oxygen concentration to ≤4%, and within 49 hours reduce oxygen concentration to within the limits specified above.

During the addition of waste gases to the gaseous radwaste treatment system, verify concentration of hydrogen or oxygen in the gaseous radwaste treatment system to be less than the limit by monitoring the waste gases in the gaseous radwaste treatment system by use of hydrogen and/or oxygen monitors required by TR 13.12.1, when OPERABLE, OR by analyzing grab samples from the affected waste decay tank at least once every 4 hours.

<u>TR 13.12.4, Gas Storage Tanks</u>

This requirement requires that the quantity of radioactivity contained in each gas storage tank be limited to ≤70,500 curies of noble gases (considered as Xe-133) at all times. If the quantity of radioactive material in any gas storage tank exceeds the limit then suspend all additions of radioactive material to the tank immediately and reduce the tank contents to within the limit within 48 hours. Once per seven days when radioactive materials have been added to the tank during the previous seven days verify the quantity of radioactive material contained in each gas storage tank to less than the limit. Also once per 24 hours when radioactive materials have been added to the tank during the previous 24 hours verify the quantity of radioactive material contained in each waste gas storage tank to be less than the limit, in the event of confirmed major fuel failure (>1%).

A. OPS DESIRES TO ADD WASTE GAS TO A WGDT

Prior to OPS adding waste gas to a WGDT verify that the WGDT to receive the gas is within the limits of TRM 13.12.3 (Oxygen $\leq$ 1% if Hydrogen > 4%) by reviewing previous data taken on that WGDT. Use of previous data and not sampling will be valid ONLY if gas has not been added or transferred to that WGDT since the last sample results were recorded. A good indication of this is to verify that the WGDT pressure has not changed since the last sample. Otherwise, the tank to receive the waste gas must be sampled and analyzed prior to the waste gas being added. **When the sample results for the tank that will receive the waste gas are obtained, the hydrogen and oxygen limits must be evaluated. Actions will depend on the sample results and should fall into one of these categories:**

1. If hydrogen is < 4%, the STP is satisfactory and no further evaluation for STP purposes is required. Based on the data available on the WGDT, the common sense approach for the addition of waste gas to this tank should be used. For example, if the WGDT contains high oxygen with low hydrogen, purging of high hydrogen gas into that tank could cause exceeding the TR 13.12.3 H_2 and O_2 limits in that tank. As soon as waste gas is added to the WGDT, establish the 1/4 HR (NO GRACE) sample frequency. If the addition of waste gas will last less than 4 Hrs., then only one additional sample will be required after the gas purge.

OR

2. **IF Hydrogen > 4% but Oxygen 1%, OPS may add waste gas to that WGDT. STP-424 may be signed off SAT. As soon as waste gas is added to the WGDT, establish the 1/4 HR (NO GRACE) sample frequency. If the addition of waste gas will last less than 4 Hrs, then only one additional sample will be required after the gas purge.** PROCEED TO SUBSECTION D TO EVALUATE SUBSEQUENT WGDT RESULTS

OR

3. IF Hydrogen is > 4% AND Oxygen is > 1%, notify the Shift Supervisor IMMEDIATELY. In addition, waste gas may NOT be added to this WGDT (which exceeds TR 13.12.3 H_2 and O_2 limits). STP-424 should be signed off UNSAT and corrective actions documented on the STRS. Initiate a Plant Condition Report. Subsequent samples will be required and each STP-424 STRS should be signed off UNSAT until the TR 13.12.3 limits (Oxygen < 1% OR Hydrogen < 4%) are satisfied. REQUEST THAT OPS SELECT ANOTHER WGDT OR REDUCE THE OXYGEN CONCENTRATION BY ADDING NITROGEN AND

WASTE GAS SYSTEM CONTINGENCIES

5.18 The method currently in use for both Units for the operation of Waste Gas System (WGS), is to keep hydrogen pressure on the VCT with the WGS shut down. In this mode, the hydrogen recombiners are not operated and the hydrogen and oxygen analyzers are not maintained in service nor calibrated. In this configuration, TRM requires that the WGS system must be monitored for oxygen concentration 1/4HRS while waste gas is being added to the Waste Gas Vent (or WGDT) TR 13.12.3.

TRS 13.12.3.B requires that at all times: The concentration of oxygen in any portion of the gaseous radwaste treatment system shall be limited to ≤ 1% by volume whenever the hydrogen concentration in that portion of the gaseous radwaste treatment system exceeds 4% by volume and the hydrogen and oxygen monitors required by TR 13.12.1 are not OPERABLE.

TRS 13.12.3.1 requires: Verify concentration of hydrogen or oxygen in the gaseous radwaste treatment system to be less than the limit by monitoring the waste gases in the gaseous radwaste treatment system.

Frequency: During addition of waste gases to the gaseous radwaste treatment system by analyzing grab samples from the affected WGDT at least once every 4 hours (when oxygen monitors required by TR 13.12.1 not operable)

These limits must be evaluated any time a WGDT is sampled and analyzed for hydrogen and oxygen.

The above conditions do NOT apply to STP-750 Waste Gas Decay Tank Curie Content. STP-750 is required weekly when radioactive material is added to a WGDT during the previous week or gas is transferred from one WGDT to another during the previous week.

The following subsections contain each (known) situation that should occur for sampling and evaluating WGDTs and follows through to a logical conclusion. Find the subsection that best describes the scenario and follow the logic until the appropriate conclusion(s) is reached for that scenario:

RELEASING THE WGDT. Proceed to subsection A if OPS desires to select another WGDT OR proceed to subsection E if OPS decides to add nitrogen and release this WGDT.

B. CHM OR ENV MUST DIRECT SAMPLE PURGE FROM A HIGH PRESSURE WGDT TO A LOW PRESSURE WGDT:

Purging a high pressure WGDT to a low pressure WGDT in order to obtain a sample from the high pressure WGDT is NOT considered adding Waste Gas to the low pressure WGDT per STP-424. **However, the TR 13.12.3 H_2 and O_2 limits must be evaluated and decisions must be made based on the sample results for this case as follows:**

1. IF historical data is available on the low pressure WGDT, the high pressure WGDT may be purged to it IF the TR 13.12.3 H_2 and O_2 limits will not be threatened in the low pressure WGDT. For example, if the low pressure WGDT contains high oxygen with low hydrogen, purging of high hydrogen gas into that tank could cause exceedance of TR 13.12.3 H_2 and O_2 limits in that tank. Also, the reverse situation would also be true, if the low pressure WGDT contains hydrogen with low oxygen, purging high oxygen gas into that tank could cause TR 13.12.3 H_2 and O_2 limits to be exceeded in that tank. If historical data is NOT available, the low pressure WGDT must be sampled prior to purging the high pressure WGDT. Since the high pressure WGDT must be purged to a low pressure tank, it would be BEST to find a low pressure WGDT which has both LOW hydrogen AND LOW Oxygen. This situation may not exist, therefore, judgement will have to be used to determine if the purge of an unknown gas source into the low pressure WGDT is advised. Discuss this situation with CHM Supervision and the Shift Supervisor.

2. If a sample is needed for the low pressure WGDT, the TR 13.12.3 Hydrogen and Oxygen limits must be evaluated. Actions will depend on the sample results and should fall into one of these categories:

   a. If $H_2 < 4\%$, the tank is satisfactory. STP-424 may be signed off SAT. Sample purge from the high pressure tank to the low pressure tank can proceed. However, as mentioned above, care should be taken to ensure the limits of TR 13.12.3 will not be threatened by the sample purge.

   b. If Hydrogen > 4% but Oxygen < 1%, sample purge from the high pressure tank to the low pressure tank can proceed. STP-424 may be signed off SAT.

c. IF Hydrogen is > 4% AND Oxygen is > 1%, notify the Shift Supervisor IMMEDIATELY. In addition, waste gas may NOT be added to this WGDT (which exceeds TR 13.12.3 H_2 and O_2 limits). STP-424 should be signed off UNSAT and corrective actions documented on the STRS. Initiate a Plant Condition Report. Subsequent samples will be required and each STP-424 STRS should be signed off UNSAT until the TR 13.12.3 limits (Oxygen < 1% OR Hydrogen < 4%) are satisfied. REQUEST THAT OPS SELECT ANOTHER WGDT.

3. As soon as waste gas is added to the WGDT, establish the 1/4 HR sample frequency. If the addition of waste gas will last less then 4 Hrs., then only one additional sample will be required after the gas purge. Obtain a follow-up sample on the WGDT receiving the sample purge once the purge is completed to ensure that no air was purged into the tank as a result of sampling and to verify that the resulting gas mixture in the receiving WGDT remains within limits. Evaluate these sample results as follows:

a. If Hydrogen is < 4%, the STP is satisfactory and no further evaluation for STP purposes is required.

b. If Hydrogen > 4% but Oxygen < 1%, no further evaluation for STP purposes is required. STP-424 may be signed off SAT.

c. IF Hydrogen is > 4% AND Oxygen is > 1%, notify the Shift Supervisor IMMEDIATELY. Waste gas may NOT be added to this WGDT (which exceeds TR 13.12.3 H_2 and O_2 limits). STP-424 should be signed off UNSAT and corrective actions documented on the STRS. Initiate a Plant Condition Report. Subsequent samples will be required and each STP-424 STRS should be signed off UNSAT until the TR 13.12.3 limits (Oxygen < 1% OR Hydrogen < 4%) are satisfied

C. OPS DESIRES TO TRANSFER GAS FROM ONE WGDT TO ANOTHER

OPS transferring gas from one WGDT to another is NOT considered adding Waste Gas to the receiving WGDT. **The TR 13.12.3 H_2 and O_2 limits must be evaluated and decisions must be made based on the sample results for this case as follows:**

1. If historical data is available on the one or both WGDTs the transfer of gas may proceed IF the TR 13.12.3 H2 and O2 limits will not be threatened in the receiving WGDT. For example, if the receiving WGDT contains high oxygen with low hydrogen, transferring high hydrogen gas into that tank could cause exceedance of TR 13.12.3 H2 and O2 limits in that tank. Also, the reverse situation would also be true, if the receiving WGDT contains hydrogen with low oxygen, transferring high oxygen gas into that tank could cause TR 13.12.3 H2 and O2 limits to be exceeded in that tank. If historical data is NOT available, the receiving WGDT must be sampled prior to transferring the other WGDT. If both hydrogen and oxygen concentrations are low, the result of the WGDT to be transferred to it do not have to be known. If this is NOT the case, the results of the WGDT to be transferred should be evaluated (by historical data or by sampling)

2. If a sample is needed for the receiving WGDT, the TR 13.12.3 Hydrogen and Oxygen limits must be evaluated. Actions will depend on the sample results and should fall into one of these categories:

   a. If $H_2 < 4\%$, the tank is satisfactory. STP-424 may be signed off SAT. OPS may transfer gas from one WGDT to the other. However, as mentioned above, care should be taken to ensure the limits of TR 13.12.3 will not be threatened by the sample purge.

   b. If Hydrogen > 4% but Oxygen < 1%, OPS may transfer gas from one WGDT to the other. STP-424 may be signed off SAT.

   c. IF Hydrogen is > 4% AND Oxygen is > 1%, notify the Shift Supervisor IMMEDIATELY. In addition, waste gas may NOT be added to this WGDT (which exceeds TR 13.12.3 H_2 and O_2 limits). STP-424 should be signed off UNSAT and corrective actions documented on the STRS. Initiate a Plant Condition Report. Subsequent samples will be required and each STP-424 STRS should be signed off UNSAT until the TR 13.12.3 limits (Oxygen < 1% OR Hydrogen < 4%) are satisfied. REQUEST THAT OPS SELECT ANOTHER WGDT.

3. Obtain a follow-up sample on the receiving WGDT once the transfer is completed to ensure that no air was purged into the tank as a results of transferring gas and to verify that the resulting gas mixture in the receiving WGDT remains within limits. Evaluate these sample results as follows:

   a. If Hydrogen is < 4%, the STP is satisfactory and no further evaluation for STP purposes is required.

   b. If Hydrogen > 4% but Oxygen < 1%, no further evaluation for STP purposes is required. STP-424 may be signed off SAT.

   c. IF Hydrogen is > 4% AND Oxygen is > 1%, notify the Shift Supervisor IMMEDIATELY. Waste gas may NOT be added to this WGDT (which exceeds TR 13.12.3 H_2 and O_2 limits). STP-424 should be signed off UNSAT and corrective actions documented on the STRS. Initiate a Plant Condition Report. Subsequent samples will be required and each STP-424 STRS should be signed off UNSAT until the TR 13.12.3 limits (Oxygen < 1% OR Hydrogen < 4%) are satisfied

D. OPS ACTIVELY ADDING WASTE GAS TO A WGDT APPLIES EVEN WHEN OPS PURGES FOR A SHORT DURATION AND CHEMISTRY SAMPLES AFTER THE PURGE (SUCH AS VCT BURPING): **Establish a once per four hour sampling frequency as required by Tech Specs and/or TRM.** IF the addition of waste gas will last less than 4 hrs., then only one additional sample will be required after the gas purge. **Actions will depend on the sample results and should fall into one of these categories:**

1. If Hydrogen is < 4%, the STP is satisfactory and no further evaluation for STP purposes is required. If Waste Gas addition continues after the sample was taken proceed again to subsection D for further evaluations.

OR

2. If Hydrogen > 4% but Oxygen < 1%, STP-424 may be signed off SAT. If Waste Gas addition continues after the sample was taken proceed again to subsection D for further evaluations.

OR

3. IF Hydrogen is > 4% AND Oxygen is > 1%, notify the Shift Supervisor IMMEDIATELY. Waste gas may NOT be added to this WGDT (which exceeds TR 13.12.3 H_2 and O_2 limits). STP-424 should be signed off UNSAT and corrective actions documented on the STRS. Initiate a Plant Condition Report. Subsequent samples will be required and each STP-424 STRS should be signed off UNSAT until the TR 13.12.3 limits (Oxygen < 1% OR Hydrogen < 4%) are satisfied. REQUEST THAT OPS SELECT ANOTHER WGDT OR REDUCE THE OXYGEN CONCENTRATION BY ADDING NITROGEN AND RELEASING THE WGDT. Proceed to subsection A if OPS desires to select another WGDT or proceed to subsection E if OPS decides to add nitrogen and release this WGDT.

E. OPS ADDING NITROGEN TO A WGDT

The addition of nitrogen from the bulk nitrogen supply or from a nitrogen cylinder is NOT considered addition of waste to the waste gas system. In fact, this will most likely be the method used to satisfy the LCO action if TR 13.12.3 H_2 and O_2 limits are found exceeded in a WGDT. Generally, after the addition of nitrogen, it will be desired to release the contents of the WGDT. ENV must perform STP-718 for each WGDT or bank of WGDTs released.

1. **If the addition of nitrogen is made as a result of LCO action, make all resources available to take immediate follow-up samples until the LCO action is satisfied for TR 13.12.3 H_2 and O_2 limits. Prior to releasing the WGDT, ENV should perform STP-718. A follow-up sample after release is NOT necessary as long as a sample was evaluated after the final nitrogen addition AND the WGDT pressure after release is greater than 0 psig.**

2. **If the addition of nitrogen is made for other than an LCO requirement (e.g. reducing hydrogen and oxygen concentrations in preparation for an outage or VCT burping), a sample may be taken for STP-424 concurrently with the release sample taken for STP-718, OR The sample for STP-424 may be taken AFTER the WGDT release is complete. IF, the WGDT pressure is NOT greater than 0 psig after the release, then a follow-up sample should be taken to ensure no air has entered the WGDT. The TR 13.12.3 H_2 and O_2 limits must be evaluated and STP-424 signed off. If the TR 13.12.3 H_2 and O_2 limits are found UNSAT, proceed to subsection D.3.**

F. OPS TRANSFERRING GAS FROM RCDT OR PRT TO ON SERVICE WGDT.

The addition of gas from the RCDT or PRT IS considered adding Waste Gas to a WGDT. Follow guidance in Part A to determine a suitable WGDT to purge into, then Part D to monitor the purge.

G. CHM SAMPLING RCDT OR PRT WITH SAMPLE PURGE ROUTED TO A WGDT

The addition of gas from the RCDT or PRT IS considered adding Waste Gas to a WGDT. Follow guidance in Part A to determine a suitable WGDT to purge into, then Part D to monitor the purge.

H. CALCULATION FOR ADDING NITROGEN TO A WGDT

To calculate the volume of nitrogen to add to a WGDT to reduce concentration of a gas to a desired concentration, convert the WGDT pressure in psig to psia and ratio the gas concentration to the target concentration. Subtract the calculated pressure in psia from the original pressure in psia to obtain psig of N_2 to add.

For example:

A WGDT has $H_2 = 5.30\%$; $O_2 = 2.40\%$ with a pressure of 47 psig. How much nitrogen must be added to reduce the O_2 to 2.0%?

47 psig + 14.7 = 61.7 psia

$$\frac{61.7 \text{ psia} \times 2.40\%}{2\%} = 74.0 \text{ psia}$$

74.0 psia - 61.7 psia = 12.3 psig increase

FARLEY NUCLEAR PLANT

SYSTEM OPERATING PROCEDURE

FNP-1-SOP-51.0

SAFETY RELATED

WASTE GAS SYSTEM

PROCEDURE USAGE REQUIREMENTS PER FNP-0-AP-6	SECTIONS
Continuous Use	ALL
Reference Use	
Information Use	

Approved:

RAY MARTIN
Operations Manager

Date Issued 10-22-04

FARLEY NUCLEAR PLANT
UNIT 1
SYSTEM OPERATING PROCEDURE SOP-51.0

WASTE GAS SYSTEM

1.0 Purpose

This procedure provides the Initial Conditions, Precautions and Limitations, and Instructions for the Operation of the waste gas system. Instructions are included in the following sections:

4.16 Shifting Gas Between Gas Decay Tanks With System In Operation

4.17 Alternate Method Of Venting The RCDT With The Waste Gas System Shutdown

4.18 Swapping Waste Gas Compressors While In Service

4.19 Transferring Gas Between Gas Decay Tanks With The System Shutdown

4.20 Waste Gas System Leak Check and Startup With The Recombiners Bypassed

4.21 Waste Gas System Shutdown With The Recombiners Bypassed

APPENDIX D WASTE GAS SYSTEM LEAK CHECK

APPENDIX 1 VENTING THE VCT FOR MAINTENANCE

2.0 <u>Initial Conditions</u>

2.1 The electrical distribution system is energized and aligned for normal operation per system check list FNP-1-SOP-36.0A, PLANT ELECTRICAL DISTRIBUTION LINE-UP, with exceptions noted.

2.2 The compressed air system is in service and aligned for normal operation per FNP-1-SOP-31.0, COMPRESSED AIR SYSTEM.

2.3 The component cooling water system is aligned per FNP-1-SOP-23.0, COMPONENT COOLING WATER SYSTEM, to supply water to the waste gas compressors and recombiners.

2.4 RMWST is in service per FNP-1-SOP-4.0, REACTOR MAKEUP WATER SYSTEM, to supply makeup water to the waste gas compressors.

2.5 The waste gas system valves are aligned per system check list FNP-1-SOP-51.0A with exceptions noted.

2.6 The Auxiliary building and radwaste area HVAC is aligned per FNP-1-SOP-58.0, AUXILIARY BUILDING HVAC SYSTEM, to provide ventilation for the waste gas areas.

2.7 Radiation monitors R-13 and R-14 are in service and aligned for normal operation per FNP-1-SOP-45.0, RADIATION MONITORING SYSTEM.

2.8 <u>IF</u> the catalytic hydrogen recombiners are to be operated, <u>THEN</u> training has been completed by the Training Group on the recombiners <u>PRIOR TO</u> any operation of the recombiners. (AI 2002200727)

3.0 Precautions and Limitations

3.1 Gas decay tanks 1 thru 6 will be alternated so that the accumulated gaseous activities (as indicated on R-13 WASTE GAS COMPR SUCT) are distributed among the tanks.

3.2 Minimize the use of #5 Gas Decay Tank to maintain low dose rates in the Waste Gas Decay Tank valve access compartment.

3.3 VCT purge pressure control valve, PCV-1092 (Q1G22V189), will not open unless at least one Waste Gas Compressor is running and no H_2 Recombiner trips are present. WHEN a gas compressor OR a recombiner trips, THEN ensure PCV-1092 (Q1G22V189) closes.

3.4 Ensure waste gas compressor separators are blowndown daily to prevent rust accumulation and ultimate seal failure.

3.5 WHEN valving in the CVCS RHT eductor, THEN the eductor isolation must be throttled to prevent exceeding the capacity of the operating waste gas compressor. The waste gas system must be aligned to the low pressure mode for this operation.

3.6 Gas decay tanks with 0_2 levels greater than the required limits should be diluted with N_2 and purged to the plant vent in accordance with FNP-1-SOP-51.1, WASTE GAS SYSTEM GAS DECAY TANK RELEASE, until 0_2 level is within limits.

3.7 The 0_2 concentration in the waste gas system should be limited to (refer to TR 13.12.3 if these values are exceeded):

- $\leq$ 2% by volume whenever H_2 concentration exceeds 4% by volume and the hydrogen and oxygen monitors required by TR 13.12.1 are OPERABLE;

OR

- $\leq$ 1% by volume whenever H_2 concentration exceeds 4% by volume and the hydrogen and oxygen monitors required by TR 13.12.1 are not OPERABLE.

3.8 With nitrogen in VCT and the shutdown gas decay tank not aligned to waste gas system, care should be taken to prevent over pressurizing the on-service tank.

3.9 WHEN waste gas system is receiving waste gas and a recombiner is not in service, THEN care should be taken to prevent over pressurizing the on-service tank.

3.10 IF nitrogen is isolated to the waste gas system, THEN ensure gas analyzers on non-operating recombiners are de-energized.

3.11 Two waste gas compressors may be required during CVCS RHT eductor operations.

3.12 IF purging is possible, THEN no portion of the waste gas system should be opened without first being purged with clean nitrogen gas.

3.13 IF any part of the Waste Gas System is opened, THEN either the open portion must have double valve isolation or the Waste Gas System must be shut down. (Ref: PER No. 88-004, IR 1-88-327.)

NOTE: The remaining Precautions and Limitations are in effect only if the recombiner will be or is in operation.

3.14 IF the recombiner trips on Hi temperature TS-1100, THEN RESET must be pushed to clear Hi temperature trip after Hi temperature condition is corrected.

3.15 The Recombiner will trip from the following:

3.15.1 Rise in feed gas hydrogen (9% at HARC-1104)

3.15.2 Low-low heater flow at recombiner skid (1800 SCFH at FI-1105)

3.15.3 High exit gas oxygen (60 ppm at OARC-1119) 2 min. time delay prior to unit tripping

3.15.4 High CR-1 reactor outlet temperature (950° at TCA-1114)

3.15.5 High temperature at oxygen addition point (350°F at TCA-1111)

3.15.6 High temperature at separator inlet (200°F at TCA-1116)

3.15.7 High O_2 concentration inlet gas (3.5% O_2 at OATC-1112)

3.16 Normally do NOT operate the recombiner with the oxygen concentration greater than 60 ppm on oxygen analyzer OAIC 1119A(B). During recombiner startup or oxygen breakthrough, approximately 10 minutes will be required for the OAIC 1119A(B) analyzer to stabilize. IF hydrogen concentration is greater than 6% on hydrogen analyzer HARC 1104A(B), THEN refer to steps 4.1.16.12 and 4.1.16.13.

3.17 Any significant change in the flow rate or pressure changes through the recombiners will cause the analyzers to be out of calibration. The Shift Support Supervisor must be notified to obtain I&C support for recalibration. Operator should ensure that flow and press remains constant.

3.18 IF waste gas processing system flow is interrupted AND flow can NOT be immediately restored, THEN the on service recombiner analyzers should be verified de-energized either automatically on low flow (<1800 SCFH) or manually.

3.19 Never leave recombiner unattended when abnormal H_2 or 0_2 concentrations exist.

3.20 Never place 0_2 supply valve controller in AUTO during severe transient recombiner operating conditions.

3.21 Recombiner catalyst bed temperature must never exceed 950°F. Decreasing 0_2 supply to recombiner will lower bed temperatures.

3.22 Range three (3) of HAIC-1118 controller, although not calibrated, may be used for indication purposes during high H_2 concentration conditions.

3.23 Operator may leave a recombiner unattended for no more than 30 minutes while manually recovering from a high H_2 condition providing conditions are stable enough to leave unattended.

3.24 The Recombiner oxygen pressure regulator should be set for 5-10 psi greater than skid pressure. Care should be exercised in adjusting O_2 regulator as it directly affects the control stability of the recombiner.

3.25 A minimum of 2 oxygen and 1 hydrogen channels should remain operable. IF only 1 oxygen channel is operable, THEN isolate oxygen supply to the recombiner. IF no oxygen channel is operable OR no hydrogen channel is operable AND waste gas is being added to the waste gas system, THEN grab samples of the on service decay tank must be taken every 4 hours to verify oxygen concentration is less than 1%. Refer to TR 13.12.1.

3.26 All adjustments on an operating recombiner should be minimal to prevent excessive transients. Enough time should be allotted between adjustments to allow system to respond properly.

3.27 DO NOT place FS-1105 analyzer flow trip bypass in bypass position unless each analyzer has the proper flow through it from the nitrogen purge supply.

3.28 De-energizing the AC Power to temperature recorder TR-1100A(B) and the analyzer recorder for OARC-1119A(B) and HARC-1104A(B), will result in the recorder program being erased when the battery back-up is depleted.

3.29 IF recombiner trips, THEN place oxygen flow control in MANUAL and CLOSE prior to resetting recombiner.

3.30 H2 concentration should never be allowed to exceed 9% in the waste gas system. IF this occurs, THEN isolate VCT purge and control O2 feed to recombiner in manual.

4.10 Transferring Gas Between Gas Decay Tanks

4.10.1 Have Chemistry Dept. sample appropriate gas decay tanks to ensure a compatible mixture exists.

4.10.2 Place the GDT from which gas is to be removed on service per section 4.3.

4.10.3 Bypass the recombiner as follows:

4.10.3.1 Verify recombiner shutdown per step 4.2.1 through 4.2.5.

4.10.3.2 Open Recombiner Bypass Valve 1-GWD-V-7855 (Q1G22V044).

4.10.3.3 Close Compressor Dischg to Recombiner iso 1-GWD-V-7856 (Q1G22V045).

4.10.3.4 Close Recombiner Dischg to GDT 1-GWD-V-7852 (Q1G22V041).

4.10.4 Using Table 9, determine the valve numbers required and perform the following:

TABLE 9

GDT	Bank	GDT Outlet Valve	GDT Inlet Valve	GDT Bank Inlet Valve	GDT Bank Outlet Valve
1	A	1-GWD-V-7823A (Q1G22V019A)	1-GWD-V-7820A (Q1G22V025A)	1-GWD-V-7818 (Q1G22V029)	1-GWD-V-7825 (Q1G22V017)
2	A	1-GWD-V-7823B (Q1G22V019B)	1-GWD-V-7820B (Q1G22V025B)	1-GWD-V-7818 (Q1G22V029)	1-GWD-V-7825 (Q1G22V017)
3	A	1-GWD-V-7823C (Q1G22V019C)	1-GWD-V-7820C (Q1G22V025C)	1-GWD-V-7818 (Q1G22V029)	1-GWD-V-7825 (Q1G22V017)
4	B	1-GWD-V-7833A (Q1G22V022A)	1-GWD-V-7830A (Q1G22V026A)	1-GWD-V-7828 (Q1G22V030)	1-GWD-V-7835 (Q1G22V020)
5	B	1-GWD-V-7833B (Q2G22V022B)	1-GWD-V-7830B (Q1G22V026B)	1-GWD-V-7828 (Q1G22V030)	1-GWD-V-7835 (Q1G22V020)
6	B	1-GWD-V-7833C (Q1G22V022C)	1-GWD-V-7830C (Q1G22V026C)	1-GWD-V-7828 (Q1G22V030)	1-GWD-V-7835 (Q1G22V020)
7	Shut Down	1-GWD-V-7886A (Q1G22V074A)	1-GWD-V-7883A (Q1G22V085A)	1-GWD-V-7881 (Q1G22V083)	1-GWD-V-7888 (Q1G22V076)
8	Shut Down	1-GWD-V-7886B (Q1G22V074B)	1-GWD-V-7883B (Q1G22V085B)	1-GWD-V-7881 (Q1G22V083)	1-GWD-V-7888 (Q1G22V076)

4.10.4.1 Open the GDT Bank inlet valve for the bank which includes the GDT where the gas is to be transferred.

4.10.4.2 Open the inlet valve for the GDT where the gas is to be transferred.

4.10.4.3 Close the inlet valve for the GDT from which the gas is to be removed.

4.10.4.4 IF transferring gas to another bank, THEN close the bank inlet valve for the bank from which the gas is being transferred.

4.10.5 Using the on service compressor, transfer as much gas as possible by holding the compressor handswitch in the RUN position.

4.10.6 WHEN as much gas as possible is transferred, THEN close the outlet valve on the tank from which the gas was transferred and close the inlet valve on the tank the gas was transferred to.

4.10.7 IF transferring gas to another bank, THEN close the bank outlet valve for the tank the gas was transferred from and close the bank inlet valve for the tank the gas was transferred to.

4.10.8 Notify the counting room of the waste gas transfer and have the transfer logged in the reactor operator log in the Control Room.

4.10.9 Startup the waste gas system per section 4.1 if required.

4.11 Purging A Waste Gas Compressor For Maintenance

CAUTION: Care should be taken to prevent sparks or excessive gaseous activity released to room due to the presence of hydrogen and radioactive gases.

NOTE:
- **This procedure requires I&C and HP presence for hook up and purge out.**
- **See Figure 1 for reference drawing.**

4.11.1 Shut down the Waste Gas System per section 4.2.

4.11.2 Isolate and tag the gas compressor to be purged.

4.11.3 Attach tygon hose to seal water strainer blowdown valve and route to floor drain.

4.13 Nitrogen Addition To Waste Gas System

NOTE: Shift Supervisor's permission required prior to nitrogen addition.

4.13.1 Nitrogen addition to waste gas decay tanks.

4.13.1.1 The waste gas system valves are aligned per system checklist FNP-1-SOP-51.0A with exceptions noted.

CAUTION: IF analyzer purge is aligned to plant nitrogen, THEN do not set regulator to < 30 psig.

4.13.1.2 Set N_2 to Gas Decay tanks pressure control valve 1-NG-PCV-7923 (N1G22V012) to the desired N_2 pressure.

4.13.1.3 Verify open N_2 to Gas Decay tanks isolation valve 1-NG-V-7922 (Q1G22V212).

4.13.1.4 Open N_2 supply to Gas Decay tanks valve 1-GWD-V-7844 (Q1G22V037).

4.13.1.5 Open the valve for the GDT desired per Table 10.

TABLE 10

GDT	BANK	N_2 - H_2 SUPPLY ISOLATION
1	A	1-GWD-V-7811A (Q1G22V035A)
2	A	1-GWD-V-7811A (Q1G22V035A)
3	A	1-GWD-V-7811A (Q1G22V035A)
4	B	1-GWD-V-7811B (Q1G22V035B)
5	B	1-GWD-V-7811B (Q1G22V035B)
6	B	1-GWD-V-7811B (Q1G22V035B)

CAUTION: Opening more than one GDT inlet valve in a bank will cross connect GDTs.

4.13.1.6 Open the valve for the GDT desired per Table 11.

TABLE 11

GDT	BANK	GDT INLET VALVE
1	A	1-GWD-V-7820A (Q1G22V025A)
2	A	1-GWD-V-7820B (Q1G22V025B)
3	A	1-GWD-V-7820C (Q1G22V025C)
4	B	1-GWD-V-7830A (Q1G22V026A)
5	B	1-GWD-V-7830B (Q1G22V026B)
6	B	1-GWD-V-7830C (Q1G22V026C)

4.13.1.7 WHEN GDT pressure reaches desired pressure, THEN close the valve for the GDT filled per Table 11.

4.13.1.8 Close N_2 supply to Gas Decay tanks valve 1-GWD-V-7844 (Q1G22V037).

4.13.1.9 Close the valve for the GDT filled per Table 10.

4.13.1.10 IF further N_2 addition is desired to other Waste Gas Decay tanks, THEN repeat steps 4.13.1.2 through 4.13.1.9.

4.13.1.11 Notify Control Room of GDT pressures.

4.13.2 Nitrogen Addition to Shutdown Tanks

4.13.2.1 The Waste Gas System valves are aligned per system checklist FNP-1-SOP-51.0A with exceptions noted.

CAUTION: IF analyzer purge is aligned to plant nitrogen, THEN do not set regulator to < 30 psig.

4.13.2.2 Set N_2 to Gas Decay tanks pressure control valve 1-NG-PCV-7923 (N1G22V012).

4.13.2.3 Verify open N_2 to Gas Decay tanks isolation valve 1-NG-V-7922 (Q1G22V212).

4.13.2.4 Open N_2 supply to Gas Decay tanks valve 1-GWD-V-7844 (Q1G22V037) to add N_2 to GDT.

CAUTION: Opening more than one GDT inlet valve in a bank will cross connect GDTs.

4.13.2.5 Open the valves for the GDT desired per Table 12.

TABLE 12

GDT	GDT INLET VALVE	N_2 - H_2 SUPPLY ISOLATION
7	1-GWD-V-7883A (Q1G22V085A)	1-GWD-V-7849 (Q1G22V040)
8	1-GWD-V-7883B (Q1G22V085B)	1-GWD-V-7849 (Q1G22V040)

4.13.2.6 WHEN GDT pressure reaches desired pressure, THEN close the valves for the GDT filled per Table 12.

4.13.2.7 Close N_2 supply to 1-GWD-V-7844 (Q1G22V037).

4.13.2.8 IF further N_2 addition is desired to other Waste Gas Decay shutdown tanks, THEN repeat steps 4.13.2.2 through 4.13.2.7.

4.13.2.9 Notify Control Room of GDT pressures.

4.14 Testing Recombiners For Blown Rupture Disk

4.14.1 Shutdown Recombiner A(B) by performing steps 4.2.1 through 4.2.5.

4.14.2 Check Recombiner A(B) inlet valve 1-GWD-V-7857A(B) (Q1G22V057A[B]) and outlet valve 1-GWD-V-7851A(B) (Q1G22V055A[B]) closed.

4.18 Swapping Gas Compressors While In Service

NOTE: When opening 1-CCW-V-045A(B), CCW from 1A(1B) WGC, FI-3085 will already be indicating 50 gpm for the operating compressor. This gauge's maximum indication is 90 gpm. 1-CCW-V-045A(B) (N1P17V045A[B]) must be adjusted until FI-3085 indicates slightly greater than 90 gpm.

4.18.1 Verify open the following valves on the compressor to be placed in service:

- 1-CCW-V-043A(B) (N1P17V043A[B]), CCW to 1A(1B) WGC
- 1-CCW-V-045A(B) (N1P17V045A[B]), CCW from 1A(1B) WGC
- 1-GWD-V-7909A(B) (Q1G22V063A [B]), RMW to 1A(1B) WGC
- 1-GWD-V-7907A(B) (Q1G22V061A [B]), 1A(1B) WGC suction
- 1-GWD-V-7910A(B) (Q1G22V064A[B]), 1A(1B) WGC discharge

4.18.2 Start the waste gas compressor being placed in service.

4.18.3 Stop the waste gas compressor being removed from service.

4.18.4 Close 1-CCW-V-045A(B) (N1P17V045A[B]), CCW from 1A(1B) WGC on the waste gas compressor being removed from service.

4.18.5 Adjust 1-CCW-V-045A(B) (N1P17V045A[B]), CCW from 1A(1B) WGC for the on service compressor until FI-3085 indicates 50 gpm.

4.19 Transferring Gas Between Gas Decay Tanks With The System Shutdown

4.19.1 Have Chemistry sample the appropriate gas decay tanks to ensure a compatible mixture exists.

4.19.2 Notify the counting room of the waste gas transfer.

CAUTION: The cooling waste discharge valve of the seal water heat exchanger for the compressor not in use must remain closed when the compressor is not in use.

4.19.3 Adjust water flow through 1A(1B) WGC seal water heat exchanger to 50 gpm on FI-3085 by adjusting the cooling water discharge valve N1P17V045A(B).

4.19.4 Using Table 14, determine the valve numbers required and perform the following steps.

TABLE 14

GDT	Bank	GDT Outlet Valve	GDT Inlet Valve	GDT Bank Inlet Valve	GDT Bank Outlet Valve
1	A	1-GWD-V-7823A (Q1G22V019A)	1-GWD-V-7820A (Q1G22V025A)	1-GWD-V-7818 (Q1G22V029)	1-GWD-V-7825 (Q1G22V017)
2	A	1-GWD-V-7823B (Q1G22V019B)	1-GWD-V-7820B (Q1G22V025B)	1-GWD-V-7818 (Q1G22V029)	1-GWD-V-7825 (Q1G22V017)
3	A	1-GWD-V-7823C (Q1G22V019C)	1-GWD-V-7820C (Q1G22V025C)	1-GWD-V-7818 (Q1G22V029)	1-GWD-V-7825 (Q1G22V017)
4	B	1-GWD-V-7833A (Q1G22V022A)	1-GWD-V-7830A (Q1G22V026A)	1-GWD-V-7828 (Q1G22V030)	1-GWD-V-7835 (Q1G22V020)
5	B	1-GWD-V-7833B (Q1G22V022B)	1-GWD-V-7830B (Q1G22V026B)	1-GWD-V-7828 (Q1G22V030)	1-GWD-V-7835 (Q1G22V020)
6	B	1-GWD-V-7833C (Q1G22V022C)	1-GWD-V-7830C (Q1G22V026C)	1-GWD-V-7828 (Q1G22V030)	1-GWD-V-7835 (Q1G22V020)
7	Shut Down	1-GWD-V-7886A (Q1G22V074A)	1-GWD-V-7883A (Q1G22V085A)	1-GWD-V-7881 (Q1G22V083)	1-GWD-V-7888 (Q1G22V076)
8	Shut Down	1-GWD-V-7886B (Q1G22V074B)	1-GWD-V-7883B (Q1G22V085B)	1-GWD-V-7881 (Q1G22V083)	1-GWD-V-7888 (Q1G22V076)

4.19.5 Open the GDT bank outlet valve for the bank from which the gas is to be transferred.

4.19.6 Open the Outlet Valve for the GDT from which the gas is to be transferred.

4.19.7 Close the Outlet Valve for the GDT where the gas is to be transferred.

4.19.8 IF transferring gas to another bank, THEN close the GDT Bank Outlet Valve for the bank where the gas is to be transferred.

4.19.9 Bypass the recombiner as follows:

4.19.9.1 Open Recombiner Bypass Valve 1-GWD-V-7855 (Q1G22V044).

4.19.9.2 Verify closed Compressor Disch to Recombiner Iso 1-GWD-V-7856 (Q1G22V045).

4.19.9.3 Verify closed Recombiner Dischg to GDT 1-GWD-V-7852 (Q1G22V041).

4.19.10 Open the GDT Bank Inlet Valve for the bank where the gas is to be transferred.

4.19.11 Open the Inlet Valve for the GDT where the gas is to be transferred.

4.19.12 Close the Inlet Valve for the GDT from which the gas is to be transferred.

4.19.13 IF transferring gas to another bank, THEN close the GDT Bank Inlet Valve for the bank from which the gas is being transferred.

4.19.14 Verify open GDTs outlet iso 1-GWD-V-7815 (Q1G22V015).

4.19.15 Transfer as much gas as possible by holding the A(B) compressor handswitch in the RUN position.

4.19.16 WHEN as much gas as possible has been transferred, THEN stop the compressor.

4.19.17 Close GDTs outlet iso 1-GWD-V-7815 (Q1G22V015).

4.19.18 Close the GDT Outlet Valve on the tank from which the gas was transferred.

4.19.19 Close the inlet valve for the GDT where the gas was transferred.

4.19.20 Close the GDT Bank Outlet Valve for the bank from which the gas was transferred.

4.19.21 Close the GDT Bank Inlet Valve for the Bank where the gas was transferred.

4.19.22 Close Recombiner Bypass Valve 1-GWD-V-7855 (Q1G22V044).

4.19.23 Close waste gas compressor A(B) cooling water discharge valve 1-CCW-V-045A(B) (N1P17V045A[B]).

4.19.24 Notify the Counting Room of the waste gas transfer AND have the transfer logged in the reactor operator log in the Control Room.

4.20 Waste Gas System Leak Check and Startup With The Recombiners Bypassed

CAUTION: **The cooling water discharge valve of the seal water heat exchanger for the compressor not in use must remain closed when the compressor is not in use.**

G2.3.2 001/3/3/ALARA/MEM 2.5/2.9/BANK/FA011005/RO/

Question 65:

A valve four feet inside a valve room is producing a 0.2 R/hr field at one feet (30 centimeters) from the valve.

Which one of the following identifies the proper posting requirement for this room?

A. CAUTION, RADIATION AREA

B✓ CAUTION, HIGH RADIATION AREA

C. DANGER, EXCLUSION AREA

D. GRAVE DANGER, VERY HIGH RADIATION AREA

A. Incorrect - this is 200 mr/hr and is too high for a radiation area.

B. Correct- **CAUTION, HIGH RADIATION AREA**

C. Incorrect - an exclusion area is > 1 rem/hr

D. Incorrect- not high enough for this designation

Reference:CFR: 43.4 / 45.10 OPS-30401A, Health Physics

POSTINGS	DOSE RATE (mrem/hr)	DISTANCE FROM SOURCE
Radiation Area	$\geq$ 5 but < 100	30 cm (12 inches)
High Radiation Area	$\geq$ 100	30 cm
Exclusion Area	$\geq$ 1000 or at HP Mgr's Direction	30 cm
Very High Radiation Area	$\geq$ 500 rads/hr	1 meter

Types of Postings
Several different types of radiological conditions may exist in the plant. High radiation levels and contaminated areas are some examples. Before entering any type of radiological area, you must meet the requirements of the RWP. The following are common types of postings that may be encountered in the plant, and what they mean:
• Radiation Controlled Area - this is an area with restricted access to make individuals knowledgeable of possible exposure to radiation and radioactive material.
• Radiation Area - This is an area with a dose rate greater than 5 mrem per hour, 30 cm (appox.12") from the source of radiation. It is posted with a 4-sided rectangle shaped sign.
• High Radiation Area (See Figure 13) - This is an area with a dose rate of greater than 100 mrem per hour, 30 cm (appox.12") from the source. This is posted with a triangle shaped (3 sided) sign.
• Exclusion Area (See Figure 14) - This is a special type of High Radiation Area where you could receive greater than one rem/hr at 30 cm (appox. 12"). The access to this area is normally locked due to the high dose rate. (This area is posted with an 8-sided sign that is the same shape as a traffic control stop sign.)
Very High Radiation Area (See Figure 15) - This is an area which has the words "GRAVE DANGER, VERY HIGH RADIATION AREA". This area has the potential of being greater than 500 rad (usually same as rem) per hour at 1 meter.
Very High Radiation Areas will be controlled similar to "Exclusion Areas", with additional measures taken to ensure that an individual is not able to gain unauthorized or inadvertent access to the area. This is posted with an 8-sided sign (shaped like traffic control stop sign).

G2.3.2 Radiation Control - Knowledge of facility ALARA program.

List four types of areas posted based on radiation levels and the radiation levels/distances that require them to be posted (OPS30401A22).

Describe the posting and entry requirements for a High Radiation Area. (GEN40103E-01)

Describe the posting and entry requirements for an Exclusion Area. (GEN40103E-02)

Describe the posting and entry requirements for a Very High Radiation Area. (GEN40103E-03)

Identify the following radiological areas and postings: (GEN40103D-01)
- Radiation Controlled Area (RCA)
- Radiation Area
- High Radiation Area (HRA)
- Exclusion Area
- Very High Radiation Area (VHRA)
- Airborne Radioactivity Area
- Radioactive Materials Area
- Radiologically Restricted Area (RRA)

HEALTH PHY-30401A22 #19

POSITION:

Upon review, one individual picked "A" as the correct response. We contend that both responses "A" and "B" are correct depending on factors that are not provided in the stem of the question. A review of plant and NRC Health Physics policies and Reg. Guides revealed the following:

- From the "Floor Walk down" checklist posted on the health physics home page - Minimize the size of each area posted to just the area affected. (e.g. If just 1 corner of a room is a High Radiation Area, only post that portion of the room as a HRA and not the entire room) This would justify "A" as the correct response for a larger room. Since the High Radiation Area (HRA) posting would only be required at a distance of 1.5 ft. from the source (boundary of 100 mrem/hr field, it would not necessarily require posting the entrance to the room as a HRA. In this question the entrance is four feet away.

- From Regulatory Guide 8.3.8, Control of Access to High and Very High Radiation Areas Section 2.5 – Controls (e.g., locked doors, access control, and **posting**) for high radiation areas may be established at locations beyond the immediate boundaries of high radiation areas to take advantage of natural or existing barriers. Smaller rooms, rooms that access is restricted due to other reasons (i.e. contamination levels) or rooms that has physical limitations that preclude posting the HRA at is smallest possible boundary are routinely posted at their entrance. Since this information was also not given in the stem, this could also lead one to pick response "B" as a conservative answer.

Practical experience as a System Operator where high radiation areas in larger rooms are posted closer to actual boundaries based on the radiation fields rather that the door to the room led one particular candidate to choose response "A" after ascertaining the dose at the entrance 4' away was <100 mrem an hour. This is consistent with the posting practices of the FNP Health Physics department. The facts are that the high rad area would be posted at approx. 1.5 feet from the source, and at the entrance the reading would be 12.5 mr/hr. This would not constitute a high rad area posting for the entire room.

This question asks for the posting of a certain valve room. Most valve rooms are very small in nature but at FNP, there are several extremely large valve rooms that may have more than one entrance. One in particular is the piping penetration room which has an extremely large number of valves and areas. In 1986, a committment to the NRC was written that speaks of this subject. If a room is large, and in an effort to reduce the size of the boundaries of high rad areas, only the area around the high rad area would be posted. For smaller rooms or cubicles, the entire cubicle would be posted as a high rad area.

Enclosed in the comments are two maps performed at FNP on 01/07/2005 and one from 01/18/2005 that shows this is how we do business at FNP.

RECOMMENDATION:

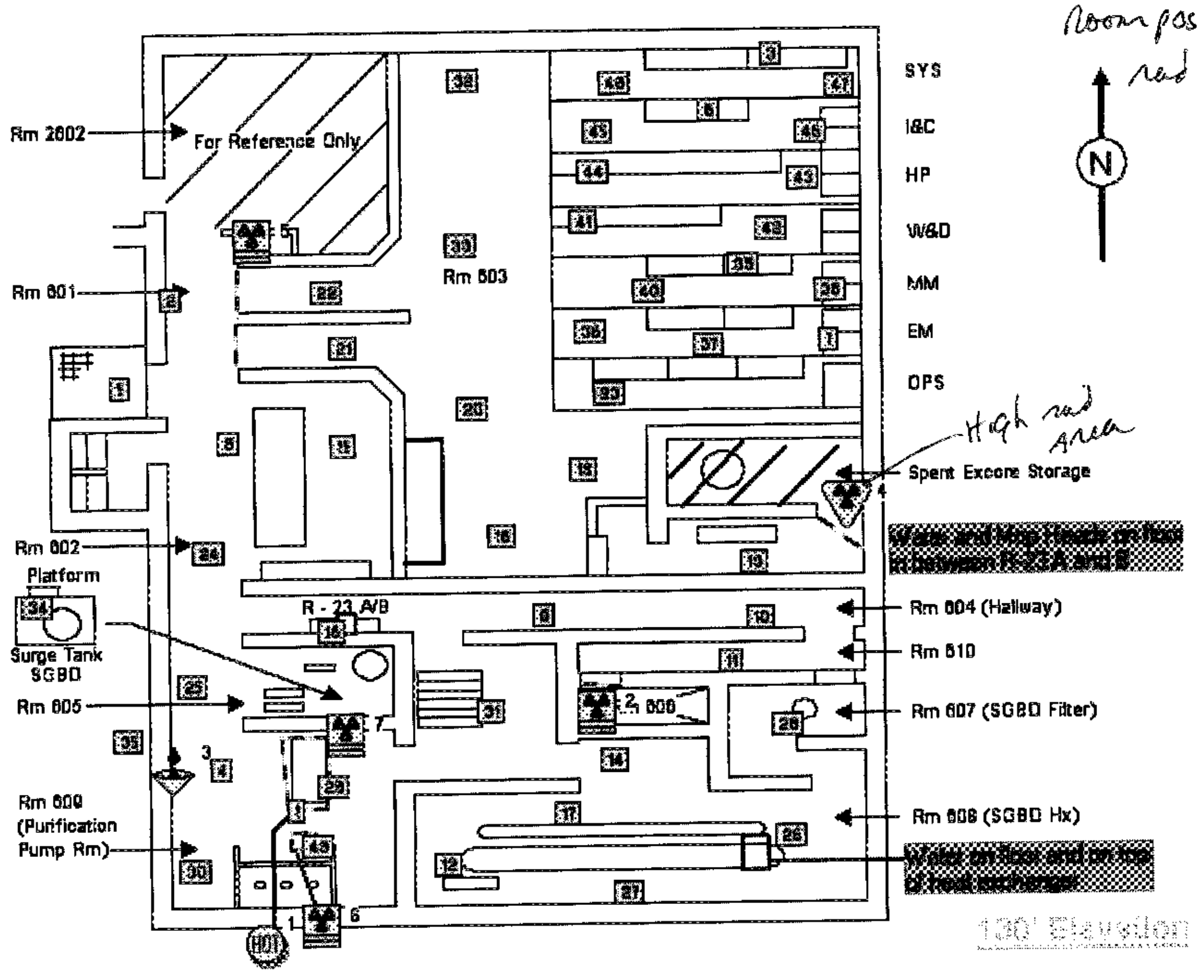
We submit based on these facts that both answers "A" and "B" are correct.

Hypothesis of why the exam team missed this on review.
During the validation process no one missed this question. The exam team did not effectively evaluate that a valve room could be large. We were wrong and missed the mark on this question.

Farley Radiological Information Survey # 14878   01/07/2005 01:16

U-1 A/B Friday 130 Ft. (1AB130)

Example of a smaller room posted as a High rad area



Status: Approved
Performed By: Willis, Julie M

Max Dose Rate: 282
Max Cntm: 573
Approved By: Styres, Don A   01/07/2005 02:33

Purpose: Routine Survey
Remarks: Monthly Routine Survey
Component: 130' U-1

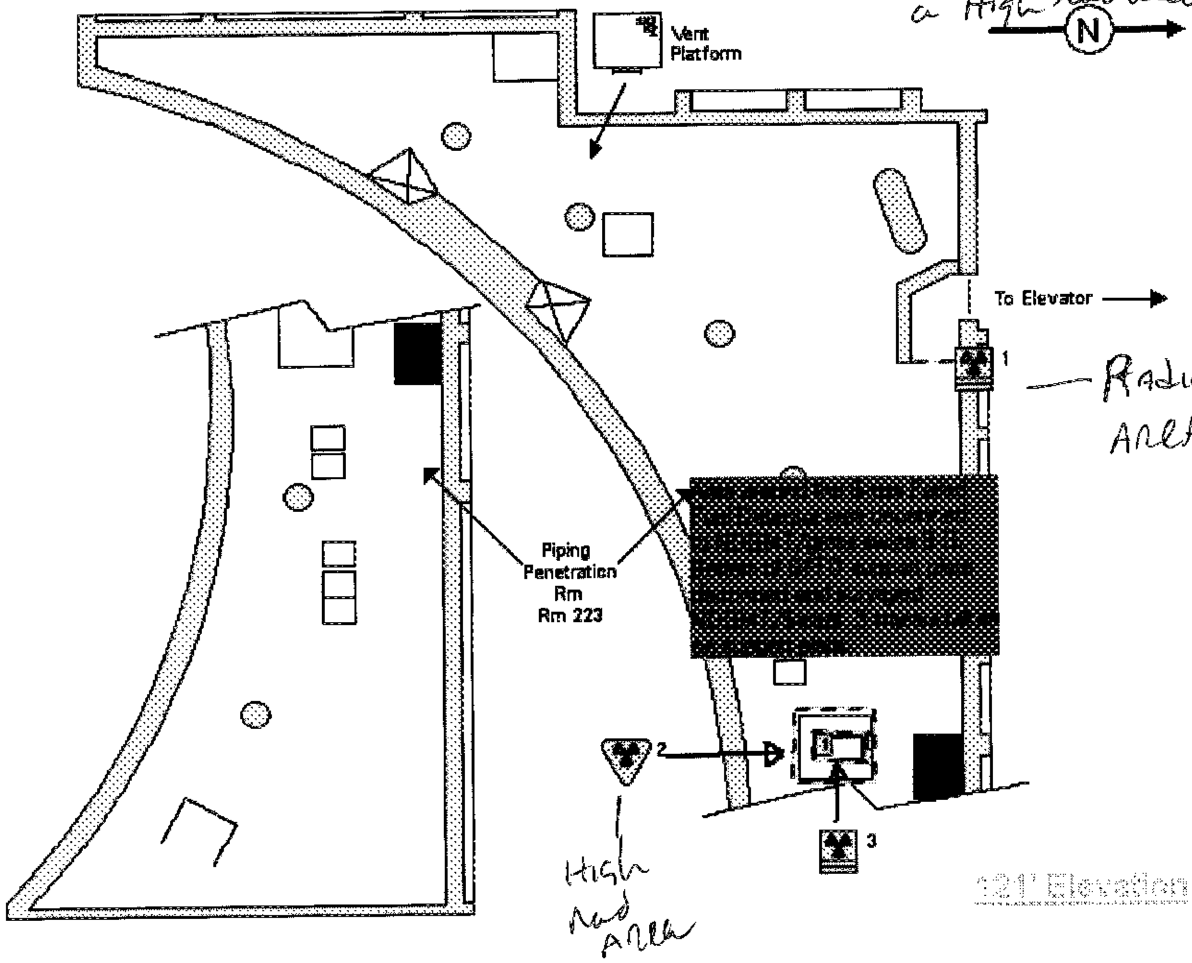
% Reactor Power: 100
Reactor Mode: 1
H2 Injection Level: 0
Void Level: 0
System Running: Yes
Survey Dose: 0

	ASR #s			RWP #s	
			05-0301		

Instrument	Description	Comment
GMT-152A	TELEPOLE	

U-1 A/B Tuesday 121ft (1AB121)

Example of a Room posted as a Radiation area with a High rad area in it.



Status:	Approved			**% Reactor Power:**	100
Performed By:	Pate, Mark H			**Reactor Mode:**	1
				H2 Injection Level:	0
Max Dose Rate:	N/A			**Void Level:**	0
Max Cntm:	NDGMT			**System Running:**	No
Approved By:	Roper, Wally H	01/18/2005 17:22		**Survey Dose:**	2

Purpose: Specific Survey
Remarks: Post Decon Survey and release of area.
Component: U-1 121' PPR

	ASR #s			RWP #s	
			05-0301	05-0801	

Instrument	Description	Comment
GMT-135	RM-20	

FLOOR WALKDOWNS

- **Ensure all posting ropes are TAUT**
- **Ensure all posting ropes are attached to stanchions, bracing or other appropriate point of attachment (i.e. not taped to walls), and that the rope is not frayed or otherwise showing signs of wear (e.g. faded, cracking, etc.).**
- **Ensure Contaminated Area signs have location of NEAREST frisker indicated on back of sign**
- **Ensure SOP are in place where needed, positioned to allow individual to safely undress, situated to minimize exposure to sources of radiation as much as possible, and neatly secured**
- **Stanchions should be positioned outside the contaminated area, only when there are physical restrictions on space should the stanchions be placed inside the contaminated area, but they must be at the outer perimeter of the contaminated area.**
- **Minimize the size of each area posted to just the area affected. (e.g. If just 1 corner of a room is a High Radiation Area, only post that portion of the room as a HRA and not the entire room; if the pump shaft area is contaminated, only post that area, not the entire pump skid or the entire pump room).**
- **Ensure laundry and trash receptacles are reasonably available at posted contaminated areas**
- **Ensure all openings on hoses, vent bottles, vacuums, NPUs, etc are covered, preferably with a bag or other similar device [tape covering openings can come loose or not fully cover the opening].**
- **Ensure hoses, cords, etc routed from clean areas to contaminated areas are secured to prevent cross contamination of clean areas. It is desirable to use tywraps, Velcro straps, or similar material as the first choice for securing and to use tape as the last choice for securing the items at the contamination boundary.**
- **Ensure no items are partially inside contaminated area boundaries.**
- **The use of various types of radiological tape should generally be used in some combination with ropes and stanchions. If an area is to be posted for less than 1 shift, it is generally acceptable to not require tape to be put down.**
- **Small areas (e.g. drains, small area on floor, etc.) may be identified as contaminated by just the use of the appropriate radiological tape.**

- Use signs that are clean and legible (not tape residue or taped over sections of the sign).
- Use signs indicating multiple conditions for posting when available (Example: if area is contaminated and is a radiation area use Radiation Area/Contaminated Area sign or Radiation Area Sign with an insert for Contaminated Area, versus 1 Radiation Sign + 1 Contaminated Area sign).
- Make sure we post, as appropriate, any "Sources of Radiation" areas, any "Low Dose Waiting Areas", and any "Hot Spot" areas.
- Ensure all containers are tagged as necessary
- Ensure information on Rad tags are accurate, complete, and legible, if the RAM tags are accurate and legible, there is no need to replace them; however, if they do not meet these criteria, they are to be replaced.
- Ensure most recent copies of surveys are neatly posted in work area and just inside the RCA entrance on the survey map boards (any updates to posted surveys should be made in red and updated in the survey notebook in the HP Office).
- Correct incidental housekeeping items
- Report housekeeping items that require other groups attention and/or support via the Housekeeping database or other appropriate means (follow-up on reported items for completion and inform HP FRM of items not corrected within 3-5 days)
- Submit MSR /DR for deficiencies (i.e. leaks, inoperable equipment, etc)
- Request FAC to install catch devices to contain leaks to reduce potential of spread of contamination
- Submit BULB request for any areas where bulbs are blown
- Report any needs for trash/laundry receptacles to FAC or any trash/laundry receptacles that need emptying
- Submit areas that can be potentially released as clean to FAC group
- Check to make sure there are no cloth covered chairs or stools inside any RCA. Remove any found or notify the HP Foreman if not able to remove (e.g. locked to some structure)

From Health Physics Web Page.

Regulatory Guide 8.38 - Control of Access to High and Very High Radiation Areas in Nuclear Power Plants

(Draft was issued as DG-8006)

June 1993

Availability Notice

Contents

A. INTRODUCTION

Section 20.1101, "Radiation Protection Programs," of 10 CFR Part 20, "Standards for Protection Against Radiation," requires licensees to develop and implement a radiation protection program appropriate to the scope of licensed activities and potential hazards. Section 20.2102 requires licensees to document these programs. An important aspect of a radiation protection program at nuclear power plants is the institution of a system of controls that includes procedures, training, audits, and physical barriers to protect workers against unplanned exposures in high and very high radiation areas. Specific requirements applicable to controlling access to high radiation areas are in 10 CFR 20.1601, and additional requirements to prevent unauthorized entry into very high radiation areas are in 10 CFR 20.1602. This regulatory guide describes methods acceptable to the NRC staff for implementing these requirements.

Underwater divers are being used more often for inspections and maintenance in reactor cavities and spent fuel pools. These underwater operations require careful planning, proper work methods, and specific procedures because of the potential for significant overexposures from irradiated fuel elements and irradiated reactor components and structures that act as high-level radiation sources.

Appendix A to this guide contains procedures for good operating practices for underwater divers that are recommended for licensees. These practices have evolved, in part, from instances in which proper controls were not in place or were not implemented. Appendix B summarizes past experiences with very high and potentially very high radiation areas so that historical, yet pertinent, information is readily accessible to users, especially to newer personnel.

Any information collection activities mentioned in this regulatory guide are contained as requirements in 10 CFR Part 20, which provides the regulatory basis for this guide. The information collection requirements in 10 CFR Part 20 have been approved by the Office of Management and Budget, Approval No. 3150-0014.

B. DISCUSSION

Requirements intended to prevent inadvertent, unwarranted, and potentially dangerous overexposures of individuals at facilities licensed by the NRC are provided in 10 CFR 20.1601 and 20.1602. A framework of graded radiation protection procedures is recommended in this guide to ensure that the controls for access to high and very high radiation areas at nuclear power plants are appropriate to the radiation hazard during both normal operations and abnormal operational occurrences.

Dose rates in areas of nuclear power plants accessible to individuals can vary over several orders of magnitude. High radiation areas, where personnel can receive doses in excess of the regulatory limits in a relatively short time, require special controls. Very high radiation areas require much stricter monitoring and controls since failure to adequately implement effective radiological controls can result in radiation doses that result in a significant health risk.

For the purpose of this guide, a *high radiation area* is defined as an area, accessible to individuals, in which radiation levels could result in an individual receiving a deep dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates. A *very high radiation area* means an area, accessible to individuals, in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in 1 hour at 1 meter from a radiation source or from any surface that the radiation penetrates. An *accessible area* is defined as one that can reasonably be occupied by a major portion of an individual's whole body, which is defined in 10 CFR 20.1003.

C. REGULATORY POSITION

1. PROGRAM ELEMENTS

Licensees are required by 10 CFR 20.1101 to develop and implement a radiation protection program appropriate to the potential radiation hazards in their facility. Because of the potential for overexposure in high and very high radiation areas, it is important that licensees have effective programs for controlling access to these areas. There have been instances of personnel inadvertently entering these areas because of inadequate controls on access.

The following elements should be included in the plant procedures and practices for access control to be sure that personnel are protected in high and very high radiation areas.

1.1 Management Control

Facility management has the responsibility for developing, implementing, and enforcing access control procedures for high and very high radiation areas.

1.2 Procedural Controls

1.2.1 Access control procedures for high and very high radiation areas should address at least the following areas:

1. Job planning,
2. Radiation protection coverage,
3. Survey techniques and frequencies,
4. Training of workers,
5. Prework briefing,
6. Frequency for updating radiation work permits (RWPs) or their equivalent, and

7. Placement of measuring and alarming dosimeters.

1.2.2 Administrative procedures should address the management oversight and specific control measures needed for entry into high and very high radiation areas. The procedures should include the process for gaining entry to these areas, such as the control and distribution of keys.

1.2.3 Procedures for activities that can greatly increase in-plant radiation levels (i.e., the withdrawal of in-core detectors, thimble tubes, or transversing in-core probes from the reactor) should provide for notification of personnel likely to authorize or have access to affected areas.

1.2.4 Procedures should provide for timely surveys to identify and post with precautionary notices the areas and systems that may become high or very high radiation areas, especially when in-plant changes (e.g., spent fuel transfer operations) could alter the ambient radiation levels.

1.2.5 Procedures should be provided to verify, at least on a weekly basis, that proper controls such as posting and barriers are in place for restricting access to high and very high radiation areas.

1.3 Training

The types of controls required for entry into high and very high radiation areas should be included in training for radiation workers (both initial and requalification training). Areas in the plant that are known to have the potential for becoming very high radiation areas should be specifically identified.

1.4 Communications

Good communication is essential among all departments concerned with entry into high and very high radiation areas to prevent excessive and unwarranted radiation exposures. This communication is especially important among personnel in known potential or existing very high radiation areas, such as reactor cavities, spent-fuel transfer areas, spent-fuel pools, and other reactor components and tanks. The access control program should include procedures and provisions for the use of equipment to ensure adequate communication. The group or department responsible for radiation protection should be notified prior to any entry into a very high radiation area.

1.5 Physical Controls

Physical barriers (such as chain-link fencing or fabricated walls) may be used to prevent unauthorized personnel access to high and very high radiation areas. Physical barriers surrounding high radiation areas should be sufficient to prevent inadvertent entry (e.g., a 2-meter [6-foot] fence, with worker training and signs or procedures to deter climbing, may be adequate for controlling access to a high radiation area). Physical barriers should, to the extent practicable, completely enclose very high radiation areas sufficient to thwart(1) undetected circumvention of the barrier (i.e., fencing around very high radiation areas should extend to the overhead and preclude anyone from climbing over the fencing). Entrances or access points to these areas should be controlled, as described in Regulatory Positions 2 through 4. Physical controls should be established that do not preclude personnel access to these areas when access is required to respond to emergencies.

Implicit in the definition of an entrance or access point to a high radiation area is that the opening (or portal) itself is accessible to personnel. Openings in physical barriers around a high radiation area are not required to be controlled as entrances if exceptional measures are needed to access them. Examples of areas that do not need to be controlled as entrances are the manway to a tank or vessel that has its cover bolted in place or an opening in a shield wall that is physically difficult to access without a ladder or mobile platform.

An acceptable method of excluding personnel from areas with dose rates greater than 1 mSv (100 mrem) in 1 hour is to provide a substantial physical barrier (e.g., chain-link fencing) that completely encloses the area and has no openings or portals. This type of control is commonly called cocooning. Since these areas are not accessible, the control of access and posting requirements in 10 CFR Part 20 for high and very high radiation areas do not apply. However, the requirements in 10 CFR Part 19 to instruct the worker on the radiological hazards in these areas are applicable.

Note: When an inaccessible portal to a high radiation area is made accessible (e.g., a manway cover is removed or scaffolding is erected) or when a portal is created in a physical barrier (i.e., a cocoon is breached), the applicable controls for a high or very high radiation area must be provided.

Controls must be established that prevent personnel from being locked in a high radiation area (10 CFR 20.1601(d)). For example, if chains and padlocks are used, the procedural controls must prevent the area from being locked with personnel in the area. If doors are self-locking, personnel must be able to open them from the inside without a key (10 CFR 20.1601(d)).

1.6 Shielding

Shielding may be used to make a high or very high radiation area, or a potentially very high radiation area, inaccessible. The following guidelines apply to shielding used for the purpose of controlling access.

1. The shielding should not be readily removable. Blankets, bricks, or other portable shielding that could be moved by hand would be readily removable; however, shielding requiring a hoist or crane to move would not be considered readily removable.

2. If the shielding is removable, it should be posted with a warning sign such as: "Warning, do not remove. Dangerous radiation levels may result."

3. If the shielding is removable, local radiation monitors with audible and visible alarms should be installed to warn personnel of the high exposure rates created by removal of the shielding.

2. HIGH RADIATION AREAS

2.1 Options for Access Control

Of the options for access control provided in 10 CFR 20.1601(a), the most widely used procedure at nuclear power plants is keeping high radiation areas locked. Although licensees have the option to control high radiation areas with the use of a control device to reduce radiation levels when an individual enters the area or the use of an alarm to alert the individual and the supervisor to an entry into a high radiation area, experience has shown that these options have limited practical application at nuclear power plants. In addition to the provisions of 10 CFR 20.160l(a), a nuclear power plant licensee may apply for Commission approval of alternative methods for control under 10 CFR 20.1601(c). See Regulatory Position 2.4 below.

2.2 Positive Access Control

Positive control over each individual entry is required by 10 CFR 20.1601(a)(3) when access is required to a high radiation area that is normally controlled by being locked. In a large facility such as a nuclear power plant, appropriate positive access controls can be instituted through the use of radiation work permits (RWPs) or an equivalent program. Such a system ensures appropriate supervision through specific procedures that establish requirements for control and delegate responsibility to qualified individuals. Procedures for establishing positive control over each entry should provide for:

1. Surveys that identify the radiation hazards in the area should be made and the results documented;

2. An appropriate level of supervision to determine that exposure of the individual to the hazards is warranted;

3. Communication of the nature and extent of the radiation hazards to each individual entering the area;

4. Protective measures (e.g., shielding, time limits, protective clothing, monitoring) to protect the individual from excessive or unnecessary radiation exposure; and

5. Permission for only authorized individuals to enter the high radiation area with all entries and exits documented.

2.3 Direct or Electronic Surveillance

Direct or electronic surveillance is identified in 10 CFR 20.1601(b) as a substitute for the controls required in 10 CFR 20.1601(a). The direct or electronic surveillance should have the following capabilities as a minimum.

1. Detect attempted unauthorized entry,
2. Warn individuals that their attempted entry is unauthorized, and
3. Alert the proper authority about an unauthorized entry so that action can be taken to correct the situation.

2.4 Alternative Methods for Access Control

The requirements in 10 CFR 20.1601(a) for access to high radiation areas may, in some instances, cause unnecessary restrictions on plant operations. According to 10 CFR 20.1601(c), licensees may apply to the Commission for approval to use alternative methods for control. The following method is acceptable to the NRC staff as an alternative to the requirements in 10 CFR 20.1601(a) for the control of access to high radiation areas.

Each high radiation area as defined in 10 CFR Part 20 should be barricaded[(2)] and conspicuously posted as a high radiation area, and entrance thereto should be controlled by requiring issuance of a radiation work permit (RWP) or equivalent. Individuals trained and qualified in radiation protection procedures (e.g., a health physics technician) or personnel continuously escorted by such individuals may be exempted from this RWP requirement while performing their assigned duties in high radiation areas where radiation doses could be received that are equal to or less than 0.01 Sv (1.0 rem) in 1 hour (measured at 30 centimeters from any source of radiation) provided they are otherwise following plant radiation protection procedures, or a general radiation protection RWP, for entry into such high radiation areas. Any individual or group of individuals permitted to enter such areas should be provided with or accompanied by one or more of the following:

- A radiation monitoring device that continuously indicates the radiation dose rate in the area,
- A radiation monitoring device that continuously integrates the radiation dose rate in the area and alarms when a preset integrated dose is received. Entry into such areas with this monitoring device may be made after the dose rates in the area have been determined and personnel have been made knowledgeable of them,
- An individual qualified in radiation protection procedures with a radiation dose rate monitoring device. This individual is responsible for providing positive radiation protection control over the activities within the area and should perform periodic radiation surveillance at the frequency specified in the radiation protection procedures or the applicable RWP.

In addition, areas that are accessible to personnel and that have radiation levels greater than 0.01 Sv (1.0 rem) (but less than 500 rads at 1 meter) in 1 hour at 30 cm from the radiation source, or from any surface penetrated by the radiation, should be provided with locked doors to prevent unauthorized entry, and the keys should be maintained under the administrative control of the shift supervisor on duty or health physics supervisor. Doors should remain locked except during periods of access by personnel under an approved RWP that specifies the dose rates in the immediate work areas and the maximum allowable stay time for individuals in that area. In lieu of a stay time specification on the RWP, direct or remote continuous surveillance (such as closed circuit TV cameras) may be made by personnel qualified in radiation protection procedures to provide positive exposure control over the activities being performed within the area.

Individual high radiation areas that are accessible to personnel, that could result in radiation doses greater than 0.01 Sv (1.0 rem) in 1 hour, and that are within large areas where no enclosure exists to enable locking and where no enclosure can be reasonably constructed around the individual area should be barricaded and conspicuously posted. A flashing light should be activated as a warning device whenever the dose rate in such an area exceeds or is expected to exceed 0.01 Sv (1.0 rem) in 1 hour at 30 cm from the radiation source or from any surface penetrated by the radiation.

2.5 Controls for High Radiation Areas (Control Points and Barriers)

Controls (e.g., locked doors, access control, and posting) for high radiation areas may be established at locations beyond the immediate boundaries of the high radiation areas to take advantage of natural or existing barriers. The use of one locked door, or one control point where positive control over personnel entry is exercised, to establish control over multiple high radiation areas is acceptable provided the following conditions are met:

1. The individual high radiation areas are barricaded and posted separately to identify the actual areas of concern,[(3)]
2. Control points are established sufficiently close to the high radiation areas that adequate supervision of access to the areas can be assured, and
3. The required protective measures and other requirements for entering the high radiation areas (e.g., dosimetry, monitoring) are enforced at the control point.[(4)]

2.6 Control of Keys

The shift supervisor or the radiation protection manager (or their respective designees) should administratively control the issuance of keys to personnel requiring access to high radiation areas and the return of the keys.

3. VERY HIGH RADIATION AREAS

Because of the potential danger of life-threatening overexposures to individuals, extremely tight control must be maintained over any entry to very high radiation areas. According to 10 CFR 20.1602, licensees must institute additional measures to ensure that an individual is not able to gain unauthorized or inadvertent access to very high radiation areas. To the extent possible, entry should be forbidden unless there is a sound operational or safety reason for entering. Special consideration should be given to areas that become very high radiation areas when the plant changes operational modes, such as shutdowns or startups.

3.1 Entrances

Entrances to very high radiation areas should be kept locked except during periods when access to the areas is required (see 10 CFR 20.1601(a)(3)). Posting of very high radiation areas is required by 10 CFR 20.1902.

Multiple very high radiation areas may be controlled with one locked entrance to take advantage of natural or existing barriers. For example, several very high radiation areas inside the containment, with the reactor at power, may be controlled by locking the containment access port. However, each very high radiation area within these areas should also be conspicuously posted and barricaded separately. Controls for personnel access to very high radiation areas should be established at the locked entrance.

Authorized entries to very high radiation areas may be monitored by continuous direct electronic surveillance. Unauthorized entries to very high radiation areas inside a PWR containment at power can be controlled by locking containment access. However, during authorized entry of the containment at power, electronic surveillance is an acceptable method to ensure that unauthorized entries do not occur into posted and barricaded very high radiation areas within the containment.

3.2 Control of Keys

The following procedures should govern the administrative control of keys to very high radiation areas.

1. Procedures should be established so that (1) there are stricter requirements for issuance of keys to very high radiation areas than keys to high radiation areas, and (2) the responsible operations and radiation protection supervisors are notified prior to personnel entry to very high or potentially very high radiation areas.

2. A key for access to a very high radiation area should unlock only that area. Master keys that unlock more than one area may be established for use during emergency situations provided their distribution is limited and they are not used for normal personnel access.

3.3 Radiation Work Permits

Entries to very high radiation areas should be controlled by issuance of a specific RWP or equivalent. General, standing, or blanket RWPs should not be used for controlling entries to very high radiation areas.

3.4 Radiation Protection Technician

A person entering a very high radiation area should be accompanied to the entryway to that area by a radiation protection technician who can determine the radiation exposure conditions at the time of entry and render assistance if necessary.

4. SPECIAL AREAS

Special hazards may arise in areas that usually are not very hazardous but have the potential to become very high radiation areas during certain normal plant operations. For example, a PWR reactor cavity sump can change from a radiation area to a very high radiation area as a result of withdrawal of the retractable incore detector thimble tubes (see Appendix B).

4.1 Administrative Procedures

Administrative procedures should be established to identify these "special" plant areas and ensure that appropriate control measures for potentially very high radiation areas are implemented prior to starting any operation that could create very high radiation areas.

4.2 Materials

Because of high radioactivity levels from activation and contamination, materials in the spent fuel pools, reactor vessel, and refueling cavities could create a very high radiation area when unshielded. These materials are normally covered with more than 10 feet of water and are inaccessible to personnel performing duties above the pool surface. Therefore, these pool areas do not have to be controlled as high or very high radiation areas solely because of the materials in them provided that:

1. Control measures are implemented to ensure that activated materials are not inadvertently raised above or brought near the surface of the pool water,
2. All drain line attachments, system interconnections, and valve lineups are properly reviewed to prevent accidental drainage of the water, and
3. Controls for preventing accidental water loss and drops in water levels that may create high and very high radiation areas are incorporated into plant procedures.

4.3 Procedures

Written procedures for any diving operations into pools, tanks, or cavities, or for access to plant components that contain or may contain highly radioactive materials, should be established to ensure proper radiological controls. Appendix A discusses some radiological considerations for conducting diving operations that should be incorporated into the plant procedures for diving operations.

4.4 Potential Very High Radiation Areas

Areas of the plant that are known to have a high potential for becoming very high radiation areas during certain operational occurrences should be controlled to provide for ready evacuation of the area. An example would be the upper drywell in a BWR if an activated fuel bundle is dropped during fuel handling.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide.

Except in those cases in which the applicant or licensee proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the methods described in this guide will be used in the evaluation of compliance with 10 CFR Part 20 on control of access to high and very high radiation areas in nuclear power plants.

Footnotes

1. Determined circumvention of a physical barrier, with wire cutters or other tools, cannot be prevented absolutely. Such instances should be addressed with appropriate disciplinary action.

2. A barricade can be a rope, ribbon, or other firmly secured, conspicuous obstacle that (by itself or used with physical barriers such as existing walls or hand railings) completely surrounds the area and obstructs inadvertent entry.

3. Relatively small areas with several discrete high radiation areas (i.e., near several valves or components) do not require separate barricades and posting for each if the whole room (or area) is considered a high radiation area.

4. Protective measures for access to an area not posted and barricaded as a high radiation area, but which is within a room or area controlled as a high radiation area, may be relaxed commensurate with the radiological hazards existing in the area.

Question 65

? Valve Room = Cubicle or larger room

Commitment

Commitment Number: 0006439 REV#: 002 Commitment Type: Ongoing Status: P

SD Number: 0001716 SD Section: SD Page: 0001 SD Rev#: 000

– procedures don't define room area. ? large area

SD Type: MEMO SD Date: 19860716

SD Title: GUIDANCE FOR POSTING RADIATION AREAS

Commitment Description:
"3. GUIDANCE: ITEMS (1) AND (2) ARE NOT MUTUALLY EXCLUSIVE. WHERE MUCH OF A LARGE AREA FALLS WITHIN THE DEFINITION OF A RADIATION AREA, BUT WHERE SAMLLER, DISCRETE AREAS WITHIN THAT AREA HAVE RADIATION LEVELS THAT ARE SUBSTANTIALLY ABOVE THE GENERAL AREA LEVELS, IT MAY BE APPROPRIATE AND MORE INFORMATIVE TO THE WORKERS TO:

A. POST, AS A RADIATION AREA, THE ENTRANCES TO THE VERY LARGE ROOM OR BUILDING.
B. DEFINE (AND ALERT WORKERS TO) DISCRETE, SMALLER AREAS OR ROOMS (WITHING THE LARGER, POSTED RADIATION AREA) IN WHICH THE RADIATION EXPOSURE RATES ARE SUBSTANTIALLY HIGHER THAN THE PREDOMINATE EXPOSURE RATES OF THE LARGER, POSTED AREA.

FNP PRACTICE: THIS GUIDANCE IS FOLLOWED. AN EXAMPLE OF THIS IS THE CONTAINMENT BUILDING POSTING FOR NORMAL ACCESS DURING OUTAGES. THE CONTAINMENT IS POSTED AS A HIGH RADIATION AREA ON THE BASIS THAT SUBSTANTIAL PORTIONS OF THE BUILDING MEET THE HIGH RADIATION AREA REQUIREMENTS. IN ADDITION, INDIVIDUAL HIGH RADIATION AREAS WITHIN THE BUILDING ARE POSTED SEPARATELY TO WARN WORKERS OF THE INCREASED DOSE RATE IN THESE AREAS."

Responsible Department: FNP-HP Units: 0 Legal Requirement: N

Plant System Codes:
NA NOT APPLICABLE

Keywords:

RAD	ALL	NA
FNP-HP	MEMO	ONGOING
UNIT1+2	Z-ID	DOSE
REQUIREMENT	HIGH	ACCESS
CONTAINMENT	RATE	EXPOSURE
BUILDING	ROOM	POST
LEVEL	AREA	RADIATION
GUIDANCE		

Action Type: FSAR Update Required?s: N

	Unit 1	Unit 2		Unit 1	Unit 2
Scheduled----> Comp date:			Mstone:		
Required-----> Comp date:			Mstone:		
Actual-------> Comp date:			Mstone:		

PCN Number:
**************** NO DATA ****************************

WLR Priority:
0 0 0 0 0 0 0 0 0 0

Date to Historical: Entry Date: 19870910

Superseded Commitment: Superseding Commitment:

Duplicated Commitment: Duplicating Commitment:

Higher Tier Document Name:

Lower Tier Document Name:

Related LC Numbers:
**************** NO DATA ****************************

Closing LC Numbers:

Required Periodic Report Type: Last Submittal:

Latest Verification Date: Individual:

MPA Number:
**************** NO DATA ****************************

Commitment Comments:

Procedures:
FNP-0-RCP -0000 .0000 05020400 000
FNP-0-RCP -0000 .0000 05020300 000
FNP-0-RCP -0000 .0000 05020200 000
FNP-0-RCP -0000 .0000 000

Miscellaneous:
**************** NO DATA ****************************

Drawing Number / Dwg-Sheet Number / Dwg-Sht-Revision Number
**************** NO DATA ****************************

FNP/Designer Management -----> Date:

Nuclear Support Management --> Date:

CTS Project Engineer --------> Date:

19860716 MEMO 84-082 GUIDANCE FOR POSTING RADIATION AREAS
Licensing Correspondence

LC #: 0001716 REV#: 009 LC Status: P Entry Date: 19870910

LC Type: MEMO LC Type Number: 84082

LC Date: 19860716 Units: 0 # of Commitments: 003

LC Title: GUIDANCE FOR POSTING RADIATION AREAS

NS File Number: IEN 84-82

Open or Closed: C Microfilm Location:

Parent LC Numbers:
0001704

Generated Commitments:
0006437 0006438 0006439

Keywords:

S-4,3,2	ALL	NA
MEMO	UNIT1+2	Z-ID
DOSE	HIGH	ACCESS
CONTAINMENT	RATE	EXPOSURE
LEVEL	RCA	CONTROL
POST	AUXILIARY	CRITERIA
BUILDING	ROOM	GUIDANCE
REQUIREMENT	10CFR20	POSTING
AREA	RADIATION	NOTICE
INFORMATION		

Plant System Codes:
NA NOT APPLICABLE

Daughter LC Numbers:
**************** NO DATA ****************************

LC Comments:
COMM. #6437,6438,6439

Approvals:
FNP Management --------------> Date:
Nuclear Support Management --> Date:
CTS Project Engineer --------> Date:

Commitment

Commitment Number: 0006437 REV#: 003 Commitment Type: Ongoing Status: P

SD Number: 0001716 SD Section: SD Page: 0001 SD Rev#: 000

SD Type: MEMO SD Date: 19860716

SD Title: GUIDANCE FOR POSTING RADIATION AREAS

Commitment Description:
"1. GUIDANCE: POSTING ONLY THE ENTRANCES TO A VERY LARGE ROOM OR BUILDING IS INAPPROPRIATE IF MOST OF THE AREA IS NOT A RADIATION AREA AND ONLY DISCRETE AREAS OR INDIVIDUAL ROOMS (CUBICLES) ACTUALLY MEET THE CRITERIA FOR A RADIATION AREA.

FNP PRACTICE: THIS GUIDANCE IS FOLLOWED. RADIATION AREAS IN AUXILARY BUILDING AND OTHER AREAS ARE POSTED SEPARATELY. IT IS NOT FNP PRACTICE TO POST LARGE AREAS AS RADIATION AREAS UNLESS CONDITIONS ACTUALLY REQUIRE THIS

Responsible Department: FNP-HP Units: 0 Legal Requirement: N

Plant System Codes:
NA NOT APPLICABLE

Keywords:

ALL	NA	FNP-HP
MEMO	ONGOING	UNIT1+2
Z-ID	AUXILIARY	CRITERIA
BUILDING	ROOM	AREA
RADIATION	POSTING	GUIDANCE

Action Type: FSAR Update Required?s: N

	Unit 1	Unit 2		Unit 1	Unit 2
Scheduled----> Comp date:			Mstone:		
Required-----> Comp date:			Mstone:		
Actual-------> Comp date:			Mstone:		

PCN Number:
**************** NO DATA ****************************

WLR Priority:
0 0 0 0 0 0 0 0 0 0

Date to Historical: Entry Date: 19870910

Superseded Commitment: Superseding Commitment:

Duplicated Commitment: Duplicating Commitment:

Higher Tier Document Name:

Lower Tier Document Name:

Related LC Numbers:
**************** NO DATA ****************************

Closing LC Numbers:

Required Periodic Report Type: Last Submittal:

Latest Verification Date: Individual:

MPA Number:
**************** NO DATA ****************************

Commitment Comments:

Procedures:
FNP-0-RCP -0000 .0000 05000000 000
FNP-0-RCP -0000 .0000 000

Miscellaneous:
**************** NO DATA ****************************

Drawing Number / Dwg-Sheet Number / Dwg-Sht-Revision Number
**************** NO DATA ****************************

FNP/Designer Management -----> Date:

Nuclear Support Management --> Date:

CTS Project Engineer --------> Date:

Commitment

Commitment Number: 0006438 REV#: 003 Commitment Type: Ongoing Status: P

SD Number: 0001716 SD Section: SD Page: 0001 SD Rev#: 000

SD Type: MEMO SD Date: 19860716

SD Title: GUIDANCE FOR POSTING RADIATION AREAS

Commitment Description:
"2. GUIDANCE: IF DISCRETE AREAS OR ROOMS WITHIN A LARGE AREA OR BUILDING CAN BE REASONABLY POSTED TO ALERT INDIVIDUALS TO RADIATION AREAS, THESE DISCRETE AREAS OR ROOMS SHOULD BE POSTED INDIVIDUALLY.

FNP PRACTICE: THIS GUIDANCE IS FOLLOWED. INDIVIDUAL AREAS WITHIN THE RADIATION CONTROLLED AREA ARE POSTED AS REQUIRED."

Responsible Department: FNP-HP Units: 0 Legal Requirement: N

Plant System Codes:
NA NOT APPLICABLE

Keywords:

ALL	NA	FNP-HP
MEMO	ONGOING	UNIT1+2
Z-ID	RCA	CONTROL
GUIDANCE	RADIATION	POST
BUILDING	ROOM	AREA

Action Type: FSAR Update Required?s: N

	Unit 1	Unit 2		Unit 1	Unit 2
Scheduled----> Comp date:			Mstone:		
Required-----> Comp date:			Mstone:		
Actual-------> Comp date:			Mstone:		

PCN Number:
**************** NO DATA ***************************

WLR Priority:
0 0 0 0 0 0 0 0 0 0

Date to Historical: Entry Date: 19870910

Superseded Commitment: Superseding Commitment:

Duplicated Commitment: Duplicating Commitment:

Higher Tier Document Name:

Lower Tier Document Name:

Related LC Numbers:

**************** NO DATA ****************************

Closing LC Numbers:

Required Periodic Report Type: Last Submittal:

Latest Verification Date: Individual:

MPA Number:
**************** NO DATA ****************************

Commitment Comments:

Procedures:
FNP-0-RCP -0000 .0000 05000000 000
FNP-0-RCP -0000 .0000 000

Miscellaneous:
**************** NO DATA ****************************

Drawing Number / Dwg-Sheet Number / Dwg-Sht-Revision Number
**************** NO DATA ****************************

FNP/Designer Management -----> Date:

Nuclear Support Management --> Date:

CTS Project Engineer --------> Date:

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§20.1902 Posting requirements.

(a) *Posting of radiation areas*. The licensee shall post each radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIATION AREA."

(b) *Posting of high radiation areas*. The licensee shall post each high radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, HIGH RADIATION AREA" or "DANGER, HIGH RADIATION AREA."

(c) *Posting of very high radiation areas*. The licensee shall post each very high radiation area with a conspicuous sign or signs bearing the radiation symbol and words "GRAVE DANGER, VERY HIGH RADIATION AREA."

(d) *Posting of airborne radioactivity areas*. The licensee shall post each airborne radioactivity area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, AIRBORNE RADIOACTIVITY AREA" or "DANGER, AIRBORNE RADIOACTIVITY AREA."

(e) *Posting of areas or rooms in which licensed material is used or stored*. The licensee shall post each area or room in which there is used or stored an amount of licensed material exceeding 10 times the quantity of such material specified in appendix C to part 20 with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL(S)" or "DANGER, RADIOACTIVE MATERIAL(S)."

[56 FR 23401, May 21, 1991, as amended at 60 FR 20185, Apr. 25, 1995]