DAVIS-BESSE NUCLEAR POWER STATION
2000 USRO LICENSING EXAM

Justification for Post Examination Changes

Question 36

The original submittal and final question indicated choice 'b' as the correct answer. The examination outline cross-reference explanation referenced step 8.14 of DB-OP-02000 which clearly indicates choice 'c' as the correct answer. The answer was incorrectly transposed on to the question and answer key. The correct answer is choice 'c'. The answer of choice 'b' on the key is incorrect because reactor coolant pumps would not be running due to the loss of off-site power.

Question: 36

The following plant conditions exist:

- A steam generator tube rupture has occurred following a loss of off-site power.
- All systems performed as expected.
- The ruptured steam generator indicates 100 inches.

In accordance with DB-OP-02000, RPS, SFAS, SFRCS Trip, or SG Tube Rupture, what is the maximum cooldown rate allowed to reach the minimum RCS temperature to isolate the ruptured steam generator?

a. 50°F/hour to 500°F Thot

b. 100°F/hour to 520°F Thot

c. 50°F/hour to 520°F Thot

d. 100°F/hour to 500°F Thot

Answer:

b.

ACTIONS FOR SG TUBE RUPTURE

8.14 Begin an immediate cooldown and depressurization at 50°F/hr, using both SGs, if both can be steamed, to a T_h of 520°F and RCS pressure of 1000 PSIG,

AND

Perform the steps below as necessary. Plant conditions may require deviation from the order given.

CAUTION 8.14.1

- If RCS cooldown rate due to HPI flow is greater than 50°F/hr, steaming to establish a cooldown rate per Step 8.14.1 below will not be necessary until the cooldown rate is less than 50°F/hr.
- Both SGs should be steamed as necessary to prevent the SGs from becoming a heat source to the RCS or to prevent a SG High Level Trip. The TBVs should be used if available. Use the AVVs if the TBVs are not available.

8.14.1 Establish a 50°F/hr cooldown rate.

DETAILS

8.13.3.b (Continued)

3. Cycling of the PORV should be minimized to reduce the risk of the PORV failing open.

NOTE 8.13.4

SFAS actuation on High CTMT Pressure, High CTMT Radiation and from the Manual Actuation switches will function normally with the SFAS Low RCS Pressure trip blocked. To manually actuate SFAS in response to low RCS pressure, the operator may actuate all the necessary equipment for the required incident level, component by component, from each component control switch or manual actuation at the SFAS system level from the Manual Actuation switches.

8.13.4 When RCS pressure is less than 1800 PSIG and annunciator alarm SFAS RC PRESS <1800 PSIG BLK PERM (5-2-C) comes in, block all four SFAS channels. Ensure the SFAS RC PRESS < 1650 PSIG TRIP BLK (5-3-C) light comes on. If manual actuation of SFAS becomes necessary, refer to Table 2 for component status information.

8.13.5 PZR level should be recovered prior to starting RCS cooldown. It is acceptable to start the RCS cooldown as long as PZR level is on scale. PZR level indication will be erroneous when the PORV is open.

DAVIS-BESSE NUCLEAR POWER STATION
2000 USRO LICENSING EXAM

Justification for Post Examination Changes

Question 41

The original submittal had choice 'b' as the correct answer. During the exam review process, the answer was incorrectly changed to choice 'a'. After reviewing the fundamental training material associated with a wet reference leg level transmitter, choice 'b' is the correct answer. The answer choice 'a' on the key is not correct. (See attached pages 13 and 14 of General Physics Instrumentation Theory Manual.)

Question: 41

The following plant conditions exist:

- Reactor is at 100% power.
- Pressurizer level is 220 inches on the chart recorder.

The pressurizer level on the chart recorder has dropped to 70 inches indicated over 5 minutes.

Which one of the following statements is correct concerning the decrease in pressurizer level?

a. Pressurizer level reference leg pressure has decreased.

b. Pressurizer level sensing leg pressure has decreased.

c. Pressurizer level temperature compensation has failed low.

d. Pressurizer level temperature compensation has failed high.

Answer:

a.

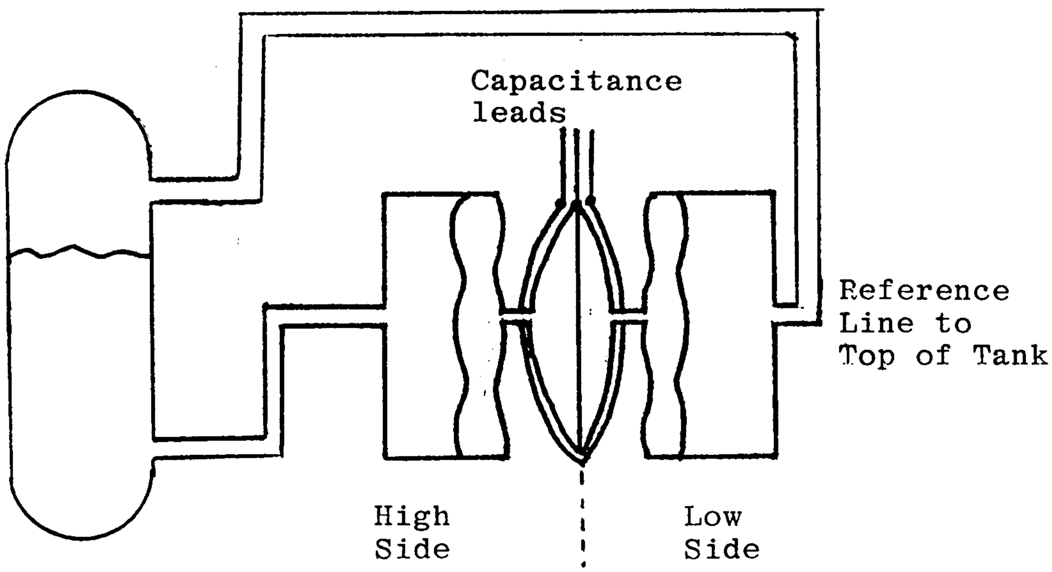

Figure 9

Pressurized Tank Level Measurement

On the low side will only be the pressure in the tank. The difference in pressure will be due to the static head of fluid and will be indicative of the level in the tank. For example: Assume a tank has an overpressure of 30 psig and a level of 11 feet of water. The pressure on the low side will be 30 psig and the pressure on the high side will by 30 psig plus the static head of the water which is approximately 3.1 psig from Table 1. Then:

Hi-Side		Low-Side		Δp
3.1 psi	-	30 psi	=	3.1 psi

3.1 psi is equivalent of 11 ft. of water fluid.

Operators are often required to determine the direction that indications will take if the sensor fails. The failure of the reference leg or line to the top of the tank will cause the diaphragm to collapse to the low side causing the ΔP to increase and indicate a full level in the tank.

If the line coming from the tank were to fail, the diaphragm would then collapse the high side causing the ΔP to increase in the other direction. Since the instrument will only sense ΔP to 0 the deflection beyond the 0 ΔP reference point will be neglected and the instrument will send a signal proportional to a 0 ΔP, which would indicate to the operator a 0 level in the tank.

In many cases, such as with pressurizer level, the signal generated by the ΔP must be compensated for by the temperature of the water. The temperature compensation is necessary because the water density as it is heated.

The temperature compensation acts to modify the signal from the ΔP to account for the loss of density. For example: the pounds force exerted by a level of water at 60°F is much greater than that generated by the same level at 500°F . That is, if we were to lose temperature compensation to the level instrument on the pressurizer while at power, the indicated level would fall and would indicate much less than the actual level.

FLOW MEASUREMENT

Measurement of the rate of fluid flow or the total quantity of flow is of considerable importance in the power plants. It is necessary to meter many different fluids such as water, steam, air, fuel oil and fuel gas. Depending on the fluid involved and the accuracy required, several methods of measurement are available. The type of flow meter used also depends on whether a continuous indication of flow rate is required or whether the total quantity of fluid passing through the meter during some time interval is required. In many instances, both of these requirements must be met. These two requirements permit dividing flow meters into two basic types known as rate meters and quantity meters.

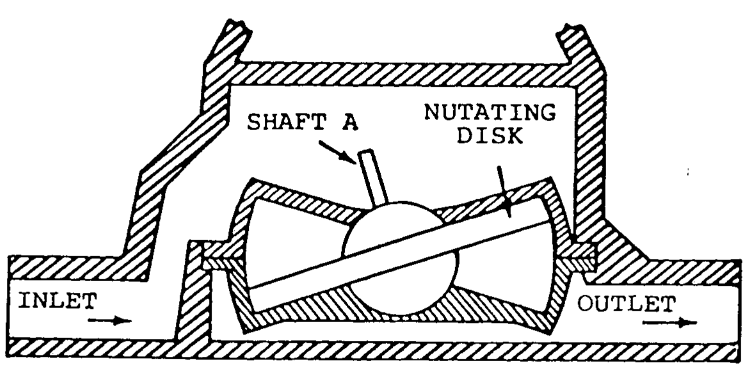

Figure 10

Nutating Disc Meter

DAVIS-BESSE NUCLEAR POWER STATION
2000 USRO LICENSING EXAM

Justification for Post Examination Changes

Question 60

The stem of the question fails to clearly tie the conditions of the stem to the question asked. If the stem of the question were to have stated 'Because the radiation elements are inoperable, which of the following are additional requirements that would have to be performed prior to starting the release?' then the only correct answer would be choice 'a'. As the question is currently stated, according to DB-OP-03012, Radioactive Liquid Batch Release, steps 2.1.4 and 4.1.8, choice 'a' and choice 'd' are both correct answers since condition 1, recirculating two tank volumes, is performed for all releases regardless of the status of RE 1878 A and B. (See attached pages 8, 9, 10, 11 and 15 of DB-OP-03011.)

Question: 60

A miscellaneous waste monitor tank release needs to be performed. RE 1878A and B have been declared inoperable.

Which of the following is required in order to perform the release?

1. Must recirc two tank volumes.
2. Must have two independent samples analyzed.
3. Must have two independent flow rate calculations
4. Must have two independent verifications of the discharge flowpath valving.
5. Must reprocess the monitor tank prior to release.

a. 2, 3, 4

b. 1, 3, 5

c. 3, 4, 5

d. 1, 2, 4

Answer:

a.

RADIOACTIVE LIQUID BATCH RELEASE

TABLE OF CONTENTS (Continued)

1.0 PURPOSE

This procedure shall be performed when batch releases of liquids containing radioactivity are required. The procedure will document the actions involved with the isolation, sampling, analysis, system lineup, instrumentation checks and release of radioactive liquid batch releases.

Completion of this procedure will fulfill the requirements of the Offsite Dose Calculations Manual.

2.0 LIMITS AND PRECAUTIONS

2.1 Administrative

2.1.1 All samples shall be handled as radioactive.

2.1.2 Radiation Protection restrictions shall be followed when performing required actions.

2.1.3 The requirements and actions of the Davis-Besse Nuclear Power Station Offsite Dose Calculation Manual (ODCM) shall be followed.

2.1.4 CWMT RELEASES INSTRUMENT OPERABILITY CHECKS - each channel for radioactive monitoring, liquid radwaste effluent line flow indicator and dilution flow to collection box flow string will be verified per specific surveillance test listed below.

a. RE 1770A or RE 1770B shall be operable with the following surveillance test requirements met:

- DB-SC-03200, Shift Channel Check of the Radiation Monitoring System
- DB-SC-03220, Quarterly Functional Test of RE 1770A, Clean Liquid Waste System Discharge Radiation Monitor
- DB-SC-03221, Quarterly Functional Test of RE 1770B, Clean Liquid Waste System Discharge Radiation Monitor
- DB-MI-03401, Channel Calibration of RE 1770A & B, RE 1878A & B, RE 4686 Liquid Process & RE 1822A Waste Gas System Outlet Radiation Monitors.

(Continued)

2.1.4.a (Continued)

If both radiation monitors are inoperable a release may occur if the following actions occur in accordance with the ODCM.

- Two independent samples are analyzed.
- Two independent verifications of the release rate calculations are performed.
- Two independent verifications of the discharge valving are performed.

NOTE 2.1.4.b

To help ensure that the release flowrate is maintained within limits, the release flowrate shall be calculated when approximately 1/3 and 2/3 of the tank has been released.

b. FI 1700A or FI 1700B (depending on the release rate), CWMT discharge to collection box shall be operable per:

- DB-MI-03423, Channel Functional Test of 69D-ISF 1700A Clean Waste Outlet 1.5" Flow
- DB-MI-03424, Channel Calibration of 69D-ISF 1700A Clean Waste Outlet 1.5" Flow
- DB-MI-03425, Channel Functional Test of 69D-ISF 1700B Clean Waste Outlet 3" Flow
- DB-MI-03426, Channel Calibration of 69D-ISF 1700B Clean Waste Outlet 3" Flow

The ODCM specifies if flow indication is inoperable then the release may proceed if the flowrate is estimated at least once per four hours. This flowrate may be based upon CWMT volume changes over a given time period (preferred method) or the use of the CWMT transfer pump curves.

(Continued)

2.1.4 (Continued)

c. F201, Collection Box Total Outlet Flow, which is total dilution flow, shall be operable per the following:

- DB-MI-03440 and DB-MI-03439, Channel Calibration and Functional Test of 20A-ISF 3611 Dilution Pump Discharge Flow

- DB-MI-03438 and DB-MI-03437, Channel Calibration and Functional Test of 20A-ISF 2799 Cooling Tower Makeup Pump Discharge to Collection Box Flow

- DB-MI-03436 and DB-MI-03435, Channel Calibration and Functional Test of 20A-ISF 2729 Service Water Outlet Flow to Collection Box

- DB-MI-03422, Channel Functional Test and Calibration of 41C-ISF 840 Cooling Tower Blowdown Flow

F201 is the summation of backup service water pump discharge, service water return to collection box, cooling tower makeup to collection box, and circulation water blowdown flows. The ODCM specifies if flow indication is inoperable then the release may proceed if the flowrate is estimated at lease once every four hours. This flowrate will be based upon known sources of flow to the collection box by using one or more of the following; flow computer points, flow indicators as applicable, pump curves as applicable, and verification of those sources valve lineups.

2.1.5 <u>MWMT OR DWDT RELEASES INSTRUMENT OPERABILITY CHECKS</u>- each channel for radioactive monitoring, liquid radwaste effluent line flow indicator and dilution flow to collection box flow string will be verified per specific surveillance test listed below.

a. RE 1878A or 1878B shall be operable with the following surveillance test requirements met:

- DB-SC-03200, Shift Channel Check of the Radiation Monitoring System

(Continued)

2.1.5.a (Continued)

- DB-SC-03222, Quarterly Functional Test of RE 1878A, Miscellaneous Liquid Waste System Discharge Radiation Monitor

- DB-SC-03223, Quarterly Functional Test of RE 1878B, Miscellaneous Liquid Waste System Discharge Radiation Monitor

- DB-MI-03401, Channel Calibration of RE 1770A & B, RE 1878A & B, RE 4686 LIQUID PROCESS & RE 1822A Waste Gas System Outlet Radiation Monitors.

If both radiation monitors are inoperable a release may occur if the following actions occur in accordance with the ODCM.

- Two independent samples are analyzed.

- Two independent verifications of the release rate calculations are performed.

- Two independent verifications of the discharge valving are performed.

NOTE 2.1.5.b

To help ensure that the release flowrate is maintained within limits, the release flowrate shall be calculated when approximately 1/3 and 2/3 of the tank has been released.

b. FI 1887A or FI 1887B (depending on the release rate), miscellaneous waste discharge to collection box shall be operable per:

- DB-MI-03431, Channel Functional Test of 71C-ISF 1887A Miscellaneous Waste Outlet 1.5" Flow

- DB-MI-03432, Channel Calibration of 71C-ISF 1887A Miscellaneous Waste Outlet 1.5" Flow

- DB-MI-03433, Channel Functional Test of 71C-ISF 1887B Miscellaneous Waste Outlet 3" Flow

(Continued)

2.1.5.b (Continued)

- DB-MI-03434, Channel Calibration of 71C-ISF 1887B Miscellaneous Waste Outlet 3" Flow

The ODCM specifies if flow indication is inoperable then the release may proceed if the flowrate is estimated at least once every four hours. This flow rate may be based upon tank volume changes over a given time period (preferred method) or the use of the tanks transfer pump curve.

c. F201, Collection Box Total Outlet Flow, which is total dilution flow, shall be operable in accordance with the following:

- DB-MI-03440 and DB-MI-03439, Channel Calibration and Functional Test of 20A-ISF 3611 Dilution Pump Discharge Flow
- DB-MI-03438 and DB-MI-03437, Channel Calibration and Functional Test of 20A-ISF 2799 Cooling Tower Makeup Pump Discharge to Collection Box Flow
- DB-MI-03436 and DB-MI-03435, Channel Calibration and Functional Test of 20A-ISF2729 Service Water Outlet Flow to Collection Box
- DB-MI-03422, Channel Functional Test and Calibration of 41C-ISF 840 Cooling Tower Blowdown Flow

F201 is the summation of backup service water pump discharge, service water return to collection box, cooling tower makeup to collection box, and circulation water blowdown. The ODCM specifies if flow indication is inoperable then the release may proceed if the flowrate is estimated at least once every four hours. This flowrate will be based upon known sources of flow to the collection box by using one or more of the following; flow computer points, flow indicators as applicable, pump curves as applicable, and verification of those sources valve lineups.

2.2 Equipment

2.2.1 Waste from the Miscellaneous Radwaste System shall NOT be transferred to the Clean Radwaste System.

4.1.5 (Continued)

______ d. Start the Miscellaneous Waste Monitor Tank Pump using HIS 1873, MISC WST MNTR TK PMP.

______ e. Adjust WM 136, MISCELLANEOUS WASTE MONITOR TANK 3" RECIRCULATION VALVE, as necessary, to obtain ~ 140 gpm as indicated on FI 2165, MWMT DISCHARGE FLOW INDICATOR.

______ f. Record the date/time recirculation was started in Item 1.b.

______ 4.1.6 Calculate the volume of liquid (gal.) in the MWMT by using curve CC 15.45 for T29 in DB-PF-06705, Tank Level Calibration Curves.

______ 4.1.7 Record the volume of liquid in the MWMT in Item 3.a.

______ 4.1.8 <u>WHEN</u> flow has stabilized as indicated on MWMT Transfer Pump Flow Indicator FI 2165,
<u>THEN</u> calculate the desired recirculation time for two turnovers using the following formula.

$$\text{Recirc Time} = \frac{(2) \text{ X (Gallons of Liquid in Tank)}}{\text{FI 2165 reading (gpm)}}$$

$$= \frac{(2) \text{ X (} \qquad\qquad\qquad \text{gallons)}}{\text{(} \qquad\qquad \text{gpm)}}$$

Recirc Time = ______________ Minutes

______ 4.1.9 Determine the date/time the MWMT recirculation will be completed.

______ 4.1.10 Record the date/time the minimum tank recirculation will be completed and ready for sampling in Item 1.c.

______ 4.1.11 <u>IF</u> the contents of the MWMT were processed through the Liquid Radwaste System,
<u>THEN</u> circle "YES" on Item 3.d,
<u>OTHERWISE</u> circle "NO" on Item 3.d.

NOTE 4.1.12

The pre-sample RE operability check conducted by the Shift Supervisor or Assistant Shift Supervisor may be performed by verifying RE status from the Status Board, Turnover Checklist or Unit Log. IF desired, THEN verification that the associated surveillance tests are current may also be utilized to determine operability. It is not necessary to verify surveillance tests at this time. IF the surveillance tests are verified at this time, THEN the tests should be re-verified prior to approving the release to ensure RE operability.

_______ 4.1.12 Perform a pre-sample RE operability check on RE 1878A and RE 1878B.

_______ 4.1.13 IF the pre-sample RE operability check determines at least one RE is operable, THEN complete Item 4.c by circling "SAT" AND record any inoperable REs in Item 5.a.

4.1.14 IF both RE 1878A and RE 1878B are inoperable, THEN complete the following:

- _______ Circle "UNSAT" in Item 4.c.
- _______ Record the required ODCM action statement on Item 5.a.
- _______ Mark Item 4.h AND 4.i N/A.

_______ 4.1.15 Deliver this procedure to Chemistry and inform them of required sample time (Item 1.c) and any required ODCM action statements recorded in Item 5.a.

Section 4.1 completed by ______________________________ Date __________