

**FINAL AS-ADMINISTERED WALKTHROUGH JPMS**

**FOR THE DUANE ARNOLD EXAMINATION**

**THE WEEK OF APRIL 9, 2001**

# **DUANE ARNOLD ENERGY CENTER**

## **JOB PERFORMANCE MEASURE**

**NUMBER: 201001-06**

**TASK NUMBER: 10.01**

**TITLE: Startup CRD under Normal Conditions**

**Rev. 1**

DEVELOPED BY:	<u>Michael Luthi</u> Instructor	<u>3/20/2001</u> Date
VALIDATED BY:	<u>[Signature]</u> SME/Instructor	<u>3/30/01</u> Date
REVIEWED BY:	<u>David Hansen</u> Plant Reviewer	<u>3-30-2001</u> Date
APPROVED BY:	<u>SR Muller for</u> Training Supervisor-Operations	<u>4/2/01</u> Date

# DUANE ARNOLD ENERGY CENTER

## JOB PERFORMANCE MEASURE

<b>JPM No.</b> 201001-06	<b>JPM Description:</b> Startup CRD under Normal Conditions		
<b>Task No.</b> 10.01	<b>Task Description:</b> Startup CRD under Normal Conditions		
<b>K/A Reference:</b> A201 3.2/3.3 <b>201001</b>			
APPLICABLE METHOD OF TESTING: RO/SRO			
Simulate Performance		Actual Performance X	
Simulator X	In-Plant	Control Room	
Time for Completion: 10 minutes			

# JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

## NOTE

All steps of this checklist should be performed upon initial validation. Prior to JPM usage, revalidate JPM using steps 7 through 10.

JPM No. 201001-06 JPM Title Startup CRD under Normal Conditions

- ☒ 1. Task description and number, JPM description and number are identified
- ☒ 2. Task elements identified and K/A references are included
- ☒ 3. Performance location specified
  - a. in-plant
  - b. control room
  - c. simulator
- ☒ 4. Initial conditions and cues identified
  - a. setup, required materials, and procedure
  - b. malfunctions and instructor actions
  - c. initiating and terminating cues
- ☒ 5. Task standards identified and verified by SME review
- ☒ 6. Critical tasks/steps identified meet criteria and identified with a "C"
- ☒ 7. Verify JPM steps fit the most current procedures  
Procedure Rev. 46 Date 1/12/01
- ☒ 8. Pilot test JPM
  - a. verify cues both verbal and visual are free of conflict
  - b. ensure performance time is accurate
- 9. If the JPM cannot be performed as written with proper responses, then revise the JPM
- 10. When JPM is revalidated, SME/Instructor signs and dates JPM

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date



**SIMULATOR SETUP:**

Reset to any power IC.

Verify that "B" CRD pump is running.

**EVENT TRIGGERS**

None

**MALFUNCTIONS:**

Time	Malfunction No.	Malfunction Title	ET	Delay	F. Sev.	Ramp	I. Sev.
0	RD11B	B CRD pump trip	N/A	0	N/A	0	N/A

**OVERRIDES:**

None

**REMOTE FUNCTIONS:**

Time	Remote Function No.	Remote Function Title	Value	Ramp
As req				

**INSTRUCTOR ACTIONS:**

1. Reset to any at power IC that has "B" CRD pump running.
2. Insert malfunction to trip "B" CRD pump.
3. Read initial conditions and initiating cues to the operator.

**TASK STANDARDS:**

1. V-17-08 closed to ½ turn open.
2. FC-1814 shifted to MANUAL and adjusted to 0 gpm.
3. 1P209A started.
4. V-17-08 slowly opened.
5. FC-1814 returned to AUTO.

**REQUIRED MATERIALS:**

OI-255

**GENERAL REFERENCES:**

OI-255 Rev. 46, 1/12/2001

**Read to the operator the following information:**

**INITIAL CONDITIONS:**

1. Annunciator 1C05A, A-7, "B" CRD PUMP 1P-209B TRIP OR MOTOR OVERLOAD has just alarmed.
2. GEMAC Reference Leg Backfill has been isolated for three days.
3. You are the 1C05 operator.

**INITIATING CUES:**

As the Shift Supervisor, I direct you to respond to annunciator 1C05A, A-7.

**This task is not time critical.**

**Inform the evaluator when you have completed the task.**

## PERFORMANCE INFORMATION

### NOTE:

Critical steps are denoted with a "C". Failure to meet the standard for this step constitutes failure.

Time Start \_\_\_\_\_

PERFORMANCE STEP: Critical:	Determine the cause of CRD 1P-209B trip. 1. Monitor alarm 1C05A, B-7 "B" CRD PUMP 1P-209B LO SUCT PRESSURE. 2. Send an Operator to Bus 1A4 to check targets on breaker 1A410. 3. Monitor computer points W092 and W093 for any bearing temperature > 180°F.
STANDARD:	Monitor 1C05A, B-7 An operator sent to 1A4 to check for targets Monitor computer points W092 and W093
COMMENTS: Simulator driver will respond as all in plant contacts (NSPEOs sent to 1A4 and NSPEO for start of "A" CRD Pump).  Simulator Driver to report that "B" CRD Pump tripped on instantaneous overcurrent.	

PERFORMANCE STEP: Critical:	If due to CAUSES 1.1 through 1.5, (caused by 1.2) start CRD Pump 1P209A, per OI-255.
STANDARD:	Determines that 1P-209A is directed to be started.
COMMENTS: The following are the steps in OI-255 for start up of the standby CRD pump.	

PERFORMANCE STEP: Critical:	Verify the GEMAC Reactor Level Instruments Reference Legs Backfill system is isolated.
STANDARD:	GEMAC reference leg backfill system verified to be isolated.
COMMENTS: Given as part of the initial conditions.	

PERFORMANCE STEP: Critical:	Verify adequate oil level in CRD pump 1P209A motor and speed changer.
STANDARD:	NSPEO sent to verify adequate oil.
COMMENTS:	

PERFORMANCE STEP: Critical: C	Close 1P209A Pump Discharge Isolation V-17-08 to approximately ½ open.
STANDARD:	NSPEO directed to throttle V-17-08 to ½ turn open.
COMMENTS:	

PERFORMANCE STEP: Critical: C	Adjust CRD SYSTEM FLOW CONTROL FC-1814 to 0 gpm in MANUAL.
STANDARD:	CRD flow controller FC-1814 taken to MANUAL and adjusted to 0 gpm.
COMMENTS:	

PERFORMANCE STEP: Critical: C	Start CRD Pump 1P-209A by momentarily placing handswitch HS-1807A on Panel 1C05 in the START position.
STANDARD:	1P209A started.
COMMENTS:	

PERFORMANCE STEP: Critical: C	Slowly open Discharge Isolation V-17-08.
STANDARD:	NSPEO directed to slowly open V-17-08.
COMMENTS:	

PERFORMANCE STEP: Critical:	Vent CRD Discharge Filters 1F-201A and B.
STANDARD:	NSPEO directed to vent the CRD pump discharge filters.
COMMENTS:	

PERFORMANCE STEP: Critical:	At Panel 1C05, verify charging header pressurized > 1200 psig on PI-1816A CHARGING WATER PRESSURE.
STANDARD:	Charging header verified to be pressurized > 1200 psig.
COMMENTS:	

PERFORMANCE STEP: Critical:	Slowly raise CRD System flow to 40 gpm with FC-1814 CRD SYSTEM FLOW CONTROL in MANUAL Adjust DRIVE WATER $\Delta$ P MO-1830, using HS-1830, at Panel 1C05 to maintain 260 psid.
STANDARD:	CRD System flow raised to 40 gpm, MO-1830 adjusted to maintain 260 psid
COMMENTS:	

PERFORMANCE STEP: Critical: C	At Panel 1C05, when FC-1814 is properly controlling flow, then shift to AUTO.
STANDARD:	FC-1814 shifted to AUTO.
COMMENTS:	

PERFORMANCE STEP: Critical:	At Panel 1C05, verify INLET TO CRD RETURN LINE MO-1833 is fully open.
STANDARD:	MO-1833 verified fully open.
COMMENTS:	

Time Stop \_\_\_\_\_

**TERMINATING CUES:** 1P-209A has been started per OI-255.

## VERIFICATION OF COMPLETION

JPM No.: 201001-06 JPM Description: Startup CRD under Normal Conditions

Operator: \_\_\_\_\_ Evaluator: \_\_\_\_\_

Licensee: ☐ RO ☐ SRO ☐ SRO Cert  
☐ STA ☐ NSPEO

Result: ☐ SATISFACTORY ☐ UNSATISFACTORY

**COMMENTS/FEEDBACK:** (Note any trainee discrepancies or misperformed steps.)

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Evaluator's Signature

                      
Date

**NOTE**

As the HCU accumulators charge, the individual alarm lights on the FULL CORE DISPLAY on Panel 1C05 should extinguish.

- New Step*
- (3) At Panel 1C05, verify charging header pressurized >1200 psig on PI-1816A CHARGING WATER PRESSURE. \_\_\_\_\_
  - (4) At Panel 1C05, slowly adjust DRIVE WATER  $\Delta$ P CONTROL MO-1830 and CRD SYSTEM FLOW CONTROL FC-1814 to obtain approximately 260 psid on PDI-1825A DRIVE WATER  $\Delta$ P and 40 gpm on FI-1814 CRD SYSTEM FLOW. \_\_\_\_\_
  - (5) At Panel 1C05, when FC-1814 is properly controlling flow, then shift to AUTO. \_\_\_\_\_
  - (6) At Panel 1C05, verify that INLET TO CRD RETURN LINE MO-1833 (HS-1833), is fully open. \_\_\_\_\_
  - (7) Start up the GEMAC Reactor Vessel Level Instruments Reference Legs Backfill System per OI-880, Section J-1. \_\_\_\_\_

### 3.3 STARTUP OF THE CRD SYSTEM UNDER EOP CONDITIONS

- (1) To start a second CRD pump, if one CRD pump is running, start the second CRD pump per the following:

**CAUTION**

If CRD PUMP 1P-209B[A] becomes airbound (indicated by motor current dropping to approximately 9 amps with no local flow noise) then immediately stop the pump to prevent damage and vent CRD suction piping, suction filters, and pump casing.

- (a) Start Standby CRD PUMP 1P-209B[A] by momentarily placing handswitch HS-1807B[A] on Panel 1C05 in the START position. \_\_\_\_\_
- (b) If possible, verify adequate oil level in standby CRD PUMP 1P-209B[A]. \_\_\_\_\_



### 3.2 STARTUP OF A CRD PUMP

#### CAUTION

1. If CRD Pump 1P-209A[B] becomes airbound (indicated by motor current dropping to approximately 9 amps with no local flow noise) then immediately stop the pump to prevent damage and vent CRD suction piping, suction filters and pump casing.

(1) Place CRD Pump 1P-209A[B] in service as follows:

- (a) Verify the GEMAC Reactor Level Instruments Reference legs Backfill system is isolated per OI-880, Section J-1. \_\_\_\_\_
- (b) Verify adequate oil level in CRD Pump 1P-209A[B] motor and speed changer. \_\_\_\_\_
- (c) Close 1P-209A[B] Pump Discharge Isolation V-17-8[10] to approximately 1/2 turn open. \_\_\_\_\_
- (d) Adjust CRD SYSTEM FLOW CONTROL FC-1814 to 0 gpm in MANUAL. \_\_\_\_\_
- (e) Start CRD PUMP 1P-209A[B] by momentarily placing handswitch HS-1807A[B] on Panel 1C05 in the START position. \_\_\_\_\_

#### CAUTION

Do not exceed 33 amps motor current when opening Discharge Valve V-17-8[10].

- (f) Slowly open Discharge Isolation V-17-8[10] to pressurize downstream piping and to prevent CRD pump from tripping on low suction pressure. \_\_\_\_\_
- (2) Vent CRD Discharge Filters 1F-201A and B, using Vent Valves V-17-15 and V-17-17 for 1F-201A and valves V-17-18 and V-17-20 for 1F-201B. \_\_\_\_\_

# **DUANE ARNOLD ENERGY CENTER**

## **JOB PERFORMANCE MEASURE**

**NUMBER: 259001-11**

**TASK NUMBER: 45.03**

**TITLE: RESTART OF A REACTOR FEED PUMP FOLLOWING A  
REACTOR SCRAM**

**Rev. 1**

DEVELOPED BY:	<u>Michael Fisher</u> Instructor	<u>3/23/2001</u> Date
VALIDATED BY:	<u>[Signature]</u> SME/Instructor	<u>3/30/01</u> Date
REVIEWED BY:	<u>Paul Hansen</u> Plant Reviewer	<u>3-30-2001</u> Date
APPROVED BY:	<u>[Signature]</u> Training Supervisor-Operations	<u>4/2/01</u> Date

# DUANE ARNOLD ENERGY CENTER

## JOB PERFORMANCE MEASURE

<b>JPM No.</b> 259001-11	<b>JPM Description:</b> Restart of a Reactor Feed Pump following a Reactor Scram.		
<b>Task No.</b> 45.03	<b>Task Description:</b> Restart of a Reactor Feed Pump following a Reactor Scram.		
<b>K/A Reference:</b> A4.02 (3.9/3.7) <b>259001</b>			
APPLICABLE METHOD OF TESTING: RO/SRO			
Simulate Performance		Actual Performance X	
Simulator X	In-Plant	Control Room	
Time for Completion: 10 minutes			

# JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

## NOTE

All steps of this checklist should be performed upon initial validation. Prior to JPM usage, revalidate JPM using steps 7 through 10.

JPM No. 259001-11 JPM Title Restart of a Reactor Feed Pump following a Reactor Scram

- ☒ 1. Task description and number, JPM description and number are identified
- ☒ 2. Task elements identified and K/A references are included
- ☒ 3. Performance location specified
  - a. in-plant
  - b. control room
  - c. simulator
- ☒ 4. Initial conditions and cues identified
  - a. setup, required materials, and procedure
  - b. malfunctions and instructor actions
  - c. initiating and terminating cues
- ☒ 5. Task standards identified and verified by SME review
- ☒ 6. Critical tasks/steps identified meet criteria and identified with a "C"
- ☒ 7. Verify JPM steps fit the most current procedures  
Procedure Rev. 52 Date 2/23/01
- ☒ 8. Pilot test JPM
  - a. verify cues both verbal and visual are free of conflict
  - b. ensure performance time is accurate
- 9. If the JPM cannot be performed as written with proper responses, then revise the JPM
- 10. When JPM is revalidated, SME/Instructor signs and dates JPM

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

**SIMULATOR SETUP:**

**EVENT TRIGGERS**

None

**MALFUNCTIONS:**

None

**OVERRIDES:**

None

**REMOTE FUNCTIONS:**

None

### **INSTRUCTOR ACTIONS:**

1. Reset to IC-14.
2. Start "B" Well Water pump and secure "D" Well Water pump.
3. Insert a manual scram.
4. Ensure that reactor water level exceeds 211", and then lower reactor water level to less than 200".
5. Perform appropriate steps of IPOI 5, with the exception of leaving both Condensate pumps running.
6. Hang a Warning Tag on the S/U FRV
7. Place HC-1579 and HC-1621 in MANUAL. Place the Master feed Reg valve controller in MANUAL and close both feed reg valves.
8. Read initial conditions and initiating cues to the operator.

### **TASK STANDARDS:**

1. Verify that the aux lube oil pumps are running.
2. Verify that the high reactor water level trips are reset.
3. Start "B" RFP.

### **REQUIRED MATERIALS:**

OI-644

### **GENERAL REFERENCES:**

OI-644

**Read to the operator the following information:**

**INITIAL CONDITIONS:**

1. A reactor scram has occurred.
2. IPOI 5 has been entered and Immediate actions have been taken.
3. EOP 1 has been entered.
4. The OSS has directed level be maintained between 170" and 211".
5. Both feedwater pumps tripped when reactor water level exceeded 211".
6. The S/U Feed Reg Valve is tagged out for maintenance.
7. The scram occurred four (4) minutes ago.
8. You are the 1C05 operator.

**INITIATING CUES:**

As the OSS, I direct you to restart the "B" Reactor Feed Pump.

**This task is not time critical.**

**Inform the evaluator when you have completed the task.**

## PERFORMANCE INFORMATION

### NOTE:

Critical steps are denoted with a "C". Failure to meet the standard for this step constitutes failure.

Time Start \_\_\_\_\_

PERFORMANCE STEP: Critical:	Verify HC-1579 and HC-1621 A and B FEED REG VALVE AUTO/MAN TRANSFER, in MANUAL and both FRVs closed.
STANDARD:	HC-1579 and HC-1621 verified to be in MANUAL and both FRVs verified to be closed.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify only one Condensate pump running.
STANDARD:	The operator will secure either "A" Condensate pump using HS-1401 or B Condensate pump using HS-1411.
COMMENTS: The operator may choose to secure either of the Condensate pumps.	

PERFORMANCE STEP: Critical: C	Verify 1P-2A and 1P2B, RFP AUX LUBE OIL PUMPS, are running.
STANDARD:	The operator will verify that 1P2A and 1P2B are running or will start the pumps as necessary.
COMMENTS:	

PERFORMANCE STEP: Critical: C	Verify RFP/MN TURB HI LEVEL CH.A, B, C trips are RESET at 1C05.
STANDARD:	The operator will reset the RFP/MN HI LEVEL trips by pushing in the reset pushbuttons.
COMMENTS:	



PERFORMANCE STEP: Critical:	Verify CV-1611 "B" REACTOR FEED PUMP 1P1B RECIRC valve is CLOSED.
STANDARD:	The operator will verify that CV-1611 is closed.
COMMENTS:	

PERFORMANCE STEP: Critical:	Slowly throttle open MO-1708 CONDENSATE DEMIN BYPASS valve.
STANDARD:	The operator will slowly throttle open the Condensate Demin Bypass valve using HS-1708 as necessary to maintain adequate RFP suction pressure.
COMMENTS:	

PERFORMANCE STEP: Critical: C	Start "B" Reactor Feed Pump 1P-1B.
STANDARD:	The operator will start the "B" Reactor Feed Pump using HS-1616.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify FIC-1611 establishes and maintains a recirc flow of at least 2800 gpm.
STANDARD:	The operator will verify that a recirc flow of at least 2800 gpm exists.
COMMENTS:	

PERFORMANCE STEP: Critical:	Stop "B" RFP AUX LUBE OIL PUMP 1P2B by placing handswitch HS-1648 to STOP and then to AUTO.
STANDARD:	The operator will stop "B" RFP Aux Lube Oil pump and return the handswitch to AUTO.
COMMENTS:	

PERFORMANCE STEP: Critical: <i>C MS #18101</i>	Manually control Reactor Water Level using the B Feed Reg Valve, CV-1621, until the FRV can be transferred to AUTO per the appropriate section of this OI.
STANDARD:	The operator will manually control reactor water level with CV-1621.
COMMENTS: Cue: Restore reactor water level to 170" to 211".	

Time Stop \_\_\_\_\_

**TERMINATING CUES:** "B" RFP running and the operator controlling level

## VERIFICATION OF COMPLETION

JPM No.: 259001-11 JPM Description: Rapid Restart of "B" RFP  
Following a Reactor Scram.

Operator: \_\_\_\_\_ Evaluator: \_\_\_\_\_

Licensee: ☐ RO ☐ SRO ☐ SRO Cert  
☐ STA ☐ NSPEO

Result: ☐ SATISFACTORY ☐ UNSATISFACTORY

**COMMENTS/FEEDBACK:** (Note any trainee discrepancies or misperformed steps.)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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Evaluator's Signature

Date \_\_\_\_\_

# **DUANE ARNOLD ENERGY CENTER**

## **JOB PERFORMANCE MEASURE**

**NUMBER: 239001-02**

**TASK NUMBER: 95.15**

**TITLE: Install EOP Defeat 5 to depressurize the reactor**

**Rev. 1**

DEVELOPED BY:

Michael Fisher  
Instructor

3/23/2001  
Date

VALIDATED BY:

[Signature]  
SME/Instructor

3/29/01  
Date

REVIEWED BY:

David Hansen  
Plant Reviewer

3/30/01  
Date

APPROVED BY:

[Signature]  
Training Supervisor-Operations

4/2/01  
Date

# **DUANE ARNOLD ENERGY CENTER**

## **JOB PERFORMANCE MEASURE**

<b>JPM No. 239001-02</b>	<b>JPM Description:</b> Install EOP Defeat 5 to depressurize the reactor.		
<b>Task No. 95.15</b>	<b>Task Description:</b> Perform the required actions of the MSIV and Main Steam Line Drain Total Isolation Defeat.		
<b>K/A Reference:</b> <b>239001</b>	A4.02 3.2/3.2		
<b>APPLICABLE METHOD OF TESTING:</b>			
Simulate Performance		Actual Performance      X	
Simulator      X	In-Plant		Control Room
Time for Completion: 10 minutes			

# JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

## NOTE

All steps of this checklist should be performed upon initial validation. Prior to JPM usage, revalidate JPM using steps 7 through 10.

JPM No. 239001-02 JPM Title Install EOP Defeat 5 to depressurize the reactor.

- ✓ 1. Task description and number, JPM description and number are identified
- ✓ 2. Task elements identified and K/A references are included
- ✓ 3. Performance location specified
  - a. in-plant
  - b. control room
  - c. simulator
- ✓ 4. Initial conditions and cues identified
  - a. setup, required materials, and procedure
  - b. malfunctions and instructor actions
  - c. initiating and terminating cues
- ✓ 5. Task standards identified and verified by SME review
- ✓ 6. Critical tasks/steps identified meet criteria and identified with a "C"
- ✓ 7. Verify JPM steps fit the most current procedures  
Procedure Rev. 2 Date 9/21/00
- ✓ 8. Pilot test JPM
  - a. verify cues both verbal and visual are free of conflict
  - b. ensure performance time is accurate
- 9. If the JPM cannot be performed as written with proper responses, then revise the JPM
- 10. When JPM is revalidated, SME/Instructor signs and dates JPM

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

**SIMULATOR SETUP:****EVENT TRIGGERS**

None

**MALFUNCTIONS:**

Time	Malfunction No.	Malfunction Title	ET	Delay	F. Sev.	Ramp	I. Sev.
0	AD01D	PSV-4403 leak	N/A	0	7%	0	0
0	SW24	WW load blockage	N/A	0	100%	0	0

**OVERRIDES:**

Time	Override Tag	Override Description	ET	Delay	Value.	Ramp
0	AD HS-4400		N/A	0	CLOSE	0
0	AD HS-4401		N/A	0	CLOSE	0
0	AD HS-4402		N/A	0	CLOSE	0
0	AD HS-4405		N/A	0	CLOSE	0
0	AD HS-4406		N/A	0	CLOSE	0
0	AD HS-4407		N/A	0	CLOSE	0

**REMOTE FUNCTIONS:**

None

### **INSTRUCTOR ACTIONS:**

1. Insert malfunctions and overrides.
2. Override ADS logic.
3. Place ADS handswitches in the OPEN position.
4. Allow 850 psig in RUN to cause a Group 1, then place the Mode Switch in the SHUTDOWN position.
5. Read initial conditions and initiating cues to the operator.

### **TASK STANDARDS:**

1. HS-4427A placed in OVERRIDE position
2. HS-4427B placed in OVERRIDE position
3. HS-4427C placed in OVERRIDE position
4. HS-4427D placed in OVERRIDE position
5. All MSIV handswitches taken to CLOSE and PCIS reset
6. MO-1043 is OPEN
7. CV-1064 is OPEN
8. MO-4424 is OPEN
9. MO-4423 is OPEN

### **REQUIRED MATERIALS:**

EOP Defeat 5

### **GENERAL REFERENCES:**

EOP Defeat 5, Rev. 1, 2/16/1999



**Read to the operator the following information:**

**INITIAL CONDITIONS:**

1. The reactor scrammed due to a safety relief valve failing open.
2. The Mode Switch was NOT taken out of RUN prior to 850 psig.
3. DW temperature is 280 degrees F.
4. Emergency Depressurization has been directed.
5. All SRVs have failed.
6. You are the BOP operator.

**INITIATING CUES:**

The OSS directs you to perform the required actions of EOP Defeat 5 in order to depressurize the RPV with the Main Steam Line Drains.

**This task is not time critical.**

**Inform the evaluator when you have completed the task.**

## PERFORMANCE INFORMATION

### NOTE:

Critical steps are denoted with a "C". Failure to meet the standard for this step constitutes failure.

Time Start \_\_\_\_\_

**NOTE: The first four steps may be performed in any order.**

PERFORMANCE STEP: Critical: C	At Panel 1C15, place GROUP 1 CHANNEL A1 ALL SIGNALS OVERRIDE keylock switch HS-4427A in OVERRIDE and confirm amber light is ON.
STANDARD:	HS-4427A taken to OVERRIDE and the amber light is confirmed ON.
COMMENTS:	

PERFORMANCE STEP: Critical: C	At Panel 1C15, place GROUP 1 CHANNEL A2 ALL SIGNALS OVERRIDE keylock switch HS-4427C in OVERRIDE and confirm amber light is ON.
STANDARD:	HS-4427C taken to OVERRIDE and the amber light is confirmed ON.
COMMENTS:	

PERFORMANCE STEP: Critical: C	At Panel 1C17, place GROUP 1 CHANNEL B1 ALL SIGNALS OVERRIDE keylock switch HS-4427B in OVERRIDE and confirm amber light is ON.
STANDARD:	HS-4427B taken to OVERRIDE and the amber light is confirmed ON.
COMMENTS:	

<b>PERFORMANCE STEP:</b> Critical: C	At Panel 1C17, place GROUP 1 CHANNEL B2 ALL SIGNALS OVERRIDE keylock switch HS-4427D in OVERRIDE and confirm amber light is ON.
<b>STANDARD:</b>	HS-4427D taken to OVERRIDE and the amber light is confirmed ON.
<b>COMMENTS:</b>	

<b>PERFORMANCE STEP:</b> Critical: C	Verify all MSIV handswitches are in CLOSE position.
<b>STANDARD:</b>	All MSIV handswitches are in the CLOSE position.
<b>COMMENTS:</b>	

<b>PERFORMANCE STEP:</b> Critical: C	Reset Group 1 using DIV 1 RESET and DIV 2 RESET pushbuttons on 1C05.
<b>STANDARD:</b>	PCIS is reset using the DIV 1 and DIV 2 pushbuttons.
<b>COMMENTS:</b>	

<b>PERFORMANCE STEP:</b> Critical: C	At 1C04, open MO-1043 MSL HEADER DRAINS BYPASS valve.
<b>STANDARD:</b>	MO-1043 is open.
<b>COMMENTS:</b>	

<b>PERFORMANCE STEP:</b> Critical:	At 1C04, verify CLOSED, MO-1044 MSL DRAIN ORIFICE BYPASS valve.
<b>STANDARD:</b>	MO-1044 is verified CLOSED.
<b>COMMENTS:</b>	

<b>PERFORMANCE STEP:</b> Critical: C	At 1C04, open CV-1064 MSL HEADER DRAIN valve by placing HS-1064 in OPEN position.
<b>STANDARD:</b>	CV-1064 is OPEN.
<b>COMMENTS:</b>	

PERFORMANCE STEP: Critical: C	At 1C04, open MO-4424 OUTBD MAIN STM LINE DRAIN ISOL valve by placing handswitch HS-4424 in OPEN position.
STANDARD:	MO-4424 is OPEN.
COMMENTS:	

PERFORMANCE STEP: Critical: C	At 1C03, open MO-4423 INBD MAIN STM LINE DRAIN ISOL valve by placing handswitch HS-4423 in OPEN position.
STANDARD:	MO-4423 is OPEN.
COMMENTS:	

PERFORMANCE STEP: Critical:	At 1C04, open MO-1044 MSL DRAIN ORIFICE BYPASS as necessary to vent the RPV.
STANDARD:	MO-1044 is opened.
COMMENTS:	CUE: If asked if opening MO-1044 is necessary, direct the operator to open MO-1044.

Time Stop \_\_\_\_\_

**TERMINATING CUES:** All 4 Override switches taken to OVERRIDE and MSL Drain valves are open.

## VERIFICATION OF COMPLETION

JPM No.: 239001-02 JPM Description: Install EOP Defeat 5 to depressurize the reactor.

Operator: \_\_\_\_\_ Evaluator: \_\_\_\_\_

Licensee: ☐ RO ☐ SRO ☐ SRO Cert  
☐ STA ☐ NSPEO

Result: ☐ SATISFACTORY ☐ UNSATISFACTORY

**COMMENTS/FEEDBACK:** (Note any trainee discrepancies or misperformed steps.)

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. A small, dark smudge or mark is present near the center of the page, slightly to the right of the middle. The paper appears to be from a notebook or a standard sheet of stationery.

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**Evaluator's Signature**

Date \_\_\_\_\_

# DUANE ARNOLD ENERGY CENTER

## JOB PERFORMANCE MEASURE

NUMBER: 217000-16

TASK NUMBER: 3.04

TITLE: Perform Required Actions for Manual Startup of RCIC System  
to Establish a Cooldown

Rev. 1

DEVELOPED BY:

Michael Fisher  
Instructor

3/23/2001  
Date

VALIDATED BY:

Paul Hansen  
SME/Instructor

3-30-01  
Date

REVIEWED BY:

Paul L. Suber  
Plant Reviewer

3-30-01  
Date

APPROVED BY:

J.R. Muller  
Training Supervisor-Operations

4/2/01  
Date

# **DUANE ARNOLD ENERGY CENTER**

## **JOB PERFORMANCE MEASURE**

<b>JPM No.</b> 217000-16	<b>JPM Description:</b> Perform required actions for manual startup of RCIC system to Establish a Cooldown.		
<b>Task No.</b> 3.04	<b>Task Description:</b> Perform a Manual Startup using the Flow Indicating Controller.		
<b>K/A Reference:</b> A4.04 (3.6/3.6) 217000			
<b>APPLICABLE METHOD OF TESTING:</b> SRO/RO			
<b>Simulate Performance</b>		<b>Actual Performance</b> X	
<b>Simulator</b> X	<b>In-Plant</b>		<b>Control Room</b>
<b>Time for Completion:</b> 10 minutes			

## JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

### NOTE

All steps of this checklist should be performed upon initial validation. Prior to JPM usage, revalidate JPM using steps 7 through 10.

JPM No. 217000-16 JPM Title Perform required actions for manual startup of RCIC system to Establish a Cooldown

- ☒ 1. Task description and number, JPM description and number are identified
- ☒ 2. Task elements identified and K/A references are included
- ☒ 3. Performance location specified
  - in-plant
  - control room
  - simulator
- ☒ 4. Initial conditions and cues identified
  - setup, required materials, and procedure
  - malfunctions and instructor actions
  - initiating and terminating cues
- ☒ 5. Task standards identified and verified by SME review
- ☒ 6. Critical tasks/steps identified meet criteria and identified with a "C"
- ☒ 7. Verify JPM steps fit the most current procedures  
Procedure Rev. 40 Date 2/27/01
- ☒ 8. Pilot test JPM
  - verify cues both verbal and visual are free of conflict
  - ensure performance time is accurate
- 9. If the JPM cannot be performed as written with proper responses, then revise the JPM
- ☐ 10. When JPM is revalidated, SME/Instructor signs and dates JPM

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date



**SIMULATOR SETUP:** Reset to IC 5.

**EVENT TRIGGERS:**

None

**MALFUNCTIONS:**

None

**OVERRIDES:**

None

**REMOTE FUNCTIONS:**

None

**INSTRUCTOR ACTIONS:**

1. Insert a manual reactor scram.
2. After scram, take appropriate IPOI 5 actions. Insure reactor water level remains <211 inches by tripping both feed pumps prior to 180 inches.
3. Reset scram.
4. Start RHR loop A and B in Torus Cooling per OI 149.
5. Place HPCI Aux Oil Pump handswitch in PTL and tag.
6. Read initial conditions and initiating cues to the operator.

**TASK STANDARDS:**

1. MO-2316 is open. (Redundant Shutoff)
2. MO-2515 is open. (Test Bypass)
3. HS-2415 placed in start. (Vacuum Pump)
4. HS-2426 placed in open. (Lube Oil Cooler Supply)
5. HS-2404 placed in the OPEN position. (Steam Supply)

**REQUIRED MATERIALS:**

OI 150

**GENERAL REFERENCES:**

OI 150

**Read to the operator the following information:**

**INITIAL CONDITIONS:**

1. A plant shutdown due to HPCI being inoperable is in progress.
2. RHR loops "A" and "B" are in torus cooling.
3. NSPEO is in RCIC Room awaiting RCIC startup.
4. You are the ANSOE.

**INITIATING CUES:**

The OSS directs you to startup RCIC, in the CST to CST mode, using the flow indicating controller to establish a cooldown not to exceed 80°F/hr per OI-150.

**This task is not time critical.**

**Inform the evaluator when you have completed the task.**

## PERFORMANCE INFORMATION

### NOTE:

Critical steps are denoted with a "C". Failure to meet the standard for this step constitutes failure.

Time Start \_\_\_\_\_

PERFORMANCE STEP: Critical:	Start A and B ESW PUMPS 1P-99A and B per OI-454 on Panel 1C06.
STANDARD:	A and B ESW Pumps started.
COMMENTS: This step is N/A per the simulator setup and initial conditions.	

PERFORMANCE STEP: Critical:	Verify RHR System started in Torus Cooling Mode per OI-149.
STANDARD:	RHR System verified in Torus Cooling Mode.
COMMENTS: This step is N/A per the simulator setup and initial conditions.	

PERFORMANCE STEP: Critical:	Start 1V-AC-15A and B RCIC ROOM CLG UNITS at 1C23.
STANDARD:	1V-AC-15A and B started.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify RCIC pump and turbine have adequate lubricant level by observing the local lubricant level indicators.
STANDARD:	NSPEO contacted to ensure lubricant level is satisfactory.
COMMENTS: When contacted as the NSPEO and asked about lubricant level report that RCIC pump and turbine have adequate lubricant.	

PERFORMANCE STEP: Critical:	Verify one train of Standby Gas Treatment System is operable per OI-170.
STANDARD:	Observe SBGT lineup to verify one train is operable.
COMMENTS:	

PERFORMANCE STEP: Critical: C	Open the REDUNDANT SHUTOFF valve MO-2316 on 1C03.
STANDARD:	MO-2316 is open.
COMMENTS:	

PERFORMANCE STEP: Critical: C	Open TEST BYPASS valve MO-2515 to 44-46% as indicated on RCIC TEST BYP MO-2515 position ZI 2515.
STANDARD:	MO-2515 is open.
COMMENTS:	
NOTE: Opening MO-2515 is the critical portion of this step, NOT the percentage open.	

PERFORMANCE STEP: Critical:	Verify MO-2511 PUMP DISCHARGE valve is open.
STANDARD:	MO-2511 is verified open.
COMMENTS:	
NOTE: MO-2511 is normally open.	

PERFORMANCE STEP: Critical: C	Start 1P-227 VACUUM PUMP by placing handswitch HS-2415 on Panel 1C04 in the START position.
STANDARD:	HS-2415 placed in start and vacuum pump start observed.
COMMENTS:	

PERFORMANCE STEP: Critical: C	Open MO-2426 LUBE OIL COOLER SUPPLY by placing HS-2426 in the OPEN position momentarily and observing proper valve position indication.
STANDARD:	HS-2426 placed in open and proper lube oil cooler supply valve indication is observed.
COMMENTS:	

PERFORMANCE STEP: Critical:	If time permits, ensure unnecessary/unauthorized personnel are clear of the RCIC Room.
STANDARD:	NSPEO contacted to ensure unnecessary personnel are clear of RCIC Room.
COMMENTS: When contacted as the NSPEO, report all personnel are clear of the RCIC Room.	

PERFORMANCE STEP: Critical: C	Open MO-2404 TURBINE STEAM SUPPLY by placing the handswitch in the OPEN position momentarily and observing proper valve position indication and that RCIC turbine speed, pump discharge pressure, and RCIC flow indicators indicate increases.
STANDARD:	HS-2404 placed in the OPEN position and proper valve indication, turbine speed, pump discharge pressure and flow increase is observed.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify that the following drain valves automatically close: CV-2410      RCIC STEAM LINE ISOLATION CV-2411      RCIC STEAM LINE ISOLATION CV-2436      CLOSED RADWASTE DISCH ISOL
STANDARD:	CV-2410, CV-2411, and CV-2436 verified CLOSED.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify that MO-2510 MIN FLOW BYPASS opens when RCIC flow is less than 80 gpm with pump discharge pressure greater than 125 psig.
STANDARD:	MO-2510 verified to be open when system flow is < 80 gpm and system pressure is > 125 psig.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify HV-2406 TURBINE CONTROL VALVE Governor Valve is throttling to control turbine speed.
STANDARD:	HV-2406 is verified to be throttling.
COMMENTS:	

PERFORMANCE STEP: Critical:	Throttle MO-2515 to achieve desired discharge pressure.
STANDARD:	Operator throttles MO-2515 as desired.
COMMENTS:	

<b>PERFORMANCE STEP:</b> Critical:	Verify MO-2510 MIN FLOW BYPASS valve closes as RCIC flow raises above 80 gpm.
<b>STANDARD:</b>	MO-2510 is verified closed when greater than 80 gpm..
<b>COMMENTS:</b>	

<b>PERFORMANCE STEP:</b> Critical:	Adjust FIC-2509 FLOW CONTROL until desired flow is achieved; do not throttle RCIC turbine speed below the minimum of 2000 rpm.
<b>STANDARD:</b>	FIC-2509 is throttled as necessary.
<b>COMMENTS:</b>	

Time Stop \_\_\_\_\_

**TERMINATING CUES:** RCIC is operating in CST to CST mode.

## VERIFICATION OF COMPLETION

JPM No.: 217000-16 JPM Description: Perform required actions for manual startup of RCIC system to establish a cooldown.

Operator: \_\_\_\_\_ Evaluator: \_\_\_\_\_

Licensee: ☐ RO ☐ SRO ☐ SRO Cert  
☐ STA ☐ NSPEO

Result: ☐ SATISFACTORY ☐ UNSATISFACTORY

**COMMENTS/FEEDBACK:** (Note any trainee discrepancies or misperformed steps.)

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Evaluator's Signature

\_\_\_\_\_  
Date



# DUANE ARNOLD ENERGY CENTER

## JOB PERFORMANCE MEASURE

NUMBER 295003-03

RO TASK NUMBER: 15.05

**TITLE: Perform the Required Actions to Re-Energize a De-Energized Essential  
4160V Bus from the Standby Transformer**

Rev. 3

DEVELOPED BY:	<u>Michael Fisher</u>	<u>3/23/2001</u>
	Instructor	Date
VALIDATED BY:	<u>[Signature]</u>	<u>3/30/01</u>
	SME/Instructor	Date
REVIEWED BY:	<u>David Hansen</u>	<u>3/30/2001</u>
	Plant Reviewer	Date
APPROVED BY:	<u>[Signature]</u>	<u>4/12/01</u>
	Training Supervisor-Operations	Date

# DUANE ARNOLD ENERGY CENTER

## JOB PERFORMANCE MEASURE

<b>JPM No.</b> 295003-03	<b>JPM Description:</b> Perform the required actions to re-energize a de-energized essential 4160 V bus from the Standby transformer.		
<b>Task No.</b> RO 15.05	<b>Task Description:</b> Re-energize a dead 4160 V bus from the Standby transformer.		
<b>K/A Reference:</b> AA1.01 (3.7/3.8)			
<b>295003</b>			
<b>APPLICABLE METHOD OF TESTING:</b>			
Simulate Performance		Actual Performance X	
Simulator X	In-Plant	Control Room	
Time for Completion: 10 Minutes			

## JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

### NOTE

All steps of this checklist should be performed upon initial validation. Prior to JPM usage, revalidate JPM using steps 7 through 10.

JPM No. 295003-03 JPM Title Re-energize a dead 4160V essential bus from the standby transformer.

- ☒ 1. Task description and number, JPM description and number are identified
- ☒ 2. Task elements identified and K/A references are included
- ☒ 3. Performance location specified
  - in-plant
  - control room
  - simulator
- ☒ 4. Initial conditions and cues identified
  - setup, required materials, and procedure
  - malfunctions and instructor actions
  - initiating and terminating cues
- ☒ 5. Task standards identified and verified by SME review
- ☒ 6. Critical tasks/steps identified meet criteria and identified with a "C"
- ☒ 7. Verify JPM steps fit the most current procedures  
Procedure Rev. 28 Date 7/18/00
- ☒ 8. Pilot test JPM
  - verify cues both verbal and visual are free of conflict
  - ensure performance time is accurate
- 9. If the JPM cannot be performed as written with proper responses, then revise the JPM
- 10. When JPM is revalidated, SME/Instructor signs and dates JPM

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

JPM 295003-03  
Rev. 3

**SIMULATOR SETUP:**

Any shutdown IC that has 1A3 powered from the Startup Transformer. Place the "A" SBDG handswitch in PTL, and place a warning tag on the handswitch.

**EVENT TRIGGERS:** None

**MALFUNCTIONS:**

Time	Malfunction No.	Malfunction Title	ET	Delay	F. Sev.	Ramp	I. Sev.
0	ED01B	Loss of "J" Breaker	0	0	N/A	N/A	N/A
0	ED01C	Loss of "K" Breaker	0	0	N/A	N/A	N/A
0	ED07C	1A3 failure to auto transfer	0	0	N/A	N/A	N/A

**OVERRIDES:** None

**REMOTE FUNCTIONS:** None

**INSTRUCTOR ACTIONS:**

1. Note any discrepancies in the comments section for any misperformed steps.
2. Read initial conditions and initiating cues to the operator.
3. Place the A SBDG handswitch in the PTL position, and put a warning tag on the handswitch.
4. Instructor may choose to manually trip the "J" and "K" breakers, but Malfunction ED07C must be inserted first.

**TASK STANDARDS:**

1. Bus 1A3 Manual Transfer Switch in MANUAL.
2. Insert the handle in the standby transformer to BUS 1A3 SYNC switch and place it in the ON position.
3. 4KV BREAKER 1A301 STANDBY TRANSFORMER TO BUS 1A3 closed.

**REQUIRED MATERIALS:**

AOP 301

**GENERAL REFERENCES:**

AOP 301

**Read to the operator the following information:**

**INITIAL CONDITIONS:**

1. The DAEC was shutdown to repair a large lube oil leak on the "A" SBDG, which is being tagged out for repair.
2. The "A" SBDG handswitch is in PTL.
3. The electric plant was in a normal shutdown plant lineup, with the Startup transformer supplying power to the Essential and Non-Essential 4KV busses.
4. The "J" and "K" breakers have tripped open, causing a loss of STARTUP Transformer.
5. AOP 301 (Loss of Essential Electrical Power ) has been entered, and completed through Restoration of Power to Essential 4160V Buses, Step one.
6. You are the BOP operator.

**INITIATING CUES:**

The OSS directs you to re-energize Bus 1A3 from the STANDBY transformer IAW AOP 301.

**This task is NOT time critical.**

**Inform the evaluator when you have completed the task.**

## PERFORMANCE INFORMATION

### NOTE:

Critical steps are denoted with a "C". Failure to meet the standard for this step constitutes failure.

Time Start \_\_\_\_\_

PERFORMANCE STEP: Critical:	Consult with Electrical Maintenance.
STANDARD:	Electrical Maintenance contacted.
COMMENTS: If asked, Electrical Maintenance has been contacted.	

PERFORMANCE STEP: Critical:	Verify no 1A3 Bus Lockout condition exists (1C08A, A5 reset)
STANDARD:	Annunciator 1C08A, A5 verified reset.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify no STANDBY Transformer Lockout condition exists (1C08A, A11 is reset).
STANDARD:	1C08A, A11 is verified reset
COMMENTS:	

PERFORMANCE STEP: Critical: C	Place the Bus 1A3 Transfer Switch to MANUAL
STANDARD:	Bus 1A3 Transfer Switch taken to manual
COMMENTS: Student should observe annunciator 1C08A, D7 (4KV Bus Auto Transfer Inop) come in.	

PERFORMANCE STEP: Critical: C	Insert the synch switch handle in the SYNCHRONIZE switch for 4KV BREAKER 1A301 STANDBY TRANSFORMER TO BUS 1A3 and place it to the ON position.
STANDARD:	Handle inserted and 1A3 Synch switch turned ON.
COMMENTS:	

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PERFORMANCE STEP: Critical:	If necessary, reset the degraded voltage condition by pushing the degrade voltage reset pushbutton for 1A3
STANDARD:	1A3 degraded voltage push-button reset, if necessary.
COMMENTS: The student may push the reset button, even if the amber light is OFF.	

PERFORMANCE STEP: Critical: C	Reenergize bus 1A3 by taking the 4KV BREAKER 1A301 handswitch momentarily to CLOSE
STANDARD:	1A301 Handswitch taken to CLOSE
COMMENTS: Student should observe red breaker closed light come on, 1A3 bus voltage white lights come ON, or other indications that 1A3 is reenergized.	

PERFORMANCE STEP: Critical:	Place 1A3 SYNCHRONIZE switch for 4KV BREAKER 1A301 STANDBY TRANSFORMER TO BUS 1A3 in the OFF position and remove the handle.
STANDARD:	1A3 SYNCHRONIZE switch turned OFF, and switch removed.
COMMENTS: If the student continues to step 3 of the restoration section (follow up actions), inform him that these will be completed later.	

Time Stop \_\_\_\_\_

**TERMINATING CUES:** When the student informs you that 1A3 is powered from the Standby Transformer, inform him the JPM is completed.



## VERIFICATION OF COMPLETION

JPM No.: 295003-03 JPM Description: Re-energize a dead 4160V essential bus from the standby transformer.

Operator: \_\_\_\_\_ Evaluator: \_\_\_\_\_

Licensee: ☐ RO ☐ SRO ☐ SRO Cert  
☐ STA ☐ NSPEO

Result: ☐ SATISFACTORY ☐ UNSATISFACTORY

**COMMENTS/FEEDBACK:** (Note any trainee discrepancies or misperformed steps.)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

**Evaluator's Signature**

Date \_\_\_\_\_

# **DUANE ARNOLD ENERGY CENTER**

## **JOB PERFORMANCE MEASURE**

**NUMBER: 215005-02**

**TASK NUMBER: 99.12**

**TITLE: Restoration of a Flow Unit  
Respond to APRM Upscale and Remove a Flow Unit from Service  
Alternate Path**

**Rev. 2**

DEVELOPED BY:

Michael Fisher  
Instructor

3/23/2001  
Date

VALIDATED BY:

[Signature]  
SME/Instructor

3/29/01  
Date

REVIEWED BY:

Dee D Hansen  
Plant Reviewer

3/30/2001  
Date

APPROVED BY:

J.R. Muller for  
Training Supervisor-Operations

4/2/01  
Date

## DUANE ARNOLD ENERGY CENTER

### JOB PERFORMANCE MEASURE

<b>JPM No.</b> 215005-02	<b>JPM Description:</b> Restoration of a Flow Unit/Respond to APRM Upscale and Remove a Flow Unit from Service Alternate Path		
<b>Task No.</b> 99.12	<b>Task Description:</b> Respond to APRM Upscale.		
<b>K/A Reference:</b> 215005	A4.03 (3.2/3.3)		
<b>APPLICABLE METHOD OF TESTING:</b> RO/SRO			
<b>Simulate Performance</b>		<b>Actual Performance</b> X	
<b>Simulator</b> X	<b>In-Plant</b>		<b>Control Room</b>
<b>Time for Completion:</b> 20 minutes			

## JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

### NOTE

All steps of this checklist should be performed upon initial validation. Prior to JPM usage, revalidate JPM using steps 7 through 10.

JPM No. 215005-02 JPM Title Restoration of a Flow Unit/Respond to APRM Upscale and Remove a Flow Unit from Service. (Alternate Path)

- ☒ 1. Task description and number, JPM description and number are identified
- ☒ 2. Task elements identified and K/A references are included
- ☒ 3. Performance location specified
  - a. in-plant
  - b. control room
  - c. simulator
- ☒ 4. Initial conditions and cues identified
  - a. setup, required materials, and procedure
  - b. malfunctions and instructor actions
  - c. initiating and terminating cues
- ☒ 5. Task standards identified and verified by SME review
- ☒ 6. Critical tasks/steps identified meet criteria and identified with a "C"
- ☒ 7. Verify JPM steps fit the most current procedures  
Procedure Rev. 23 Date 3/20/2001
- ☒ 8. Pilot test JPM
  - a. verify cues both verbal and visual are free of conflict
  - b. ensure performance time is accurate
- 9. If the JPM cannot be performed as written with proper responses, then revise the JPM
- 10. When JPM is revalidated, SME/Instructor signs and dates JPM

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

**SIMULATOR SETUP**Reset to any full power IC.

**EVENT TRIGGERS**

Trigger Number	Trigger File Name	Trigger Logic Statement	Trigger Word Description
1	N/A	ZDINMC51FUBYP(1) .le. 0	Flow Unit Rod Block Bypass switch in Normal

**MALFUNCTIONS:**

Time	Malfunction No.	Malfunction Title	ET	Delay	F. Sev.	Ramp	I. Sev.
0	NM11A	A APRM Flow Unit Inop	1	10	0	0	N/A

**OVERRIDES:**

None

**REMOTE FUNCTIONS:**

None

**INSTRUCTOR ACTIONS:**

1. At 1C05, bypass "A" APRM Flow Unit.
2. Place "A" APRM Flow Unit Mode Switch in the ZERO position.
3. Read initial conditions and initiating cues to the operator.

**TASK STANDARDS:**

1. Flow Unit Mode Switch (S1) placed in the OPERATE position.
2. "A" Flow Unit removed from BYPASS and BYPASS indicating light is verified OFF.
3. "A" Flow Unit is determined to be the cause of the half scram and rod block.
4. FLOW UNIT ROD BLOCK BYPASS switch taken to "A".
5. At 1C-37, MODE switch for the "A" flow unit taken to a position other than OPERATE or STANDBY.

**REQUIRED MATERIALS:**

OI-878.4  
ARP 1C05A

**GENERAL REFERENCES:**

ARP 1C05A  
OI-878.4 Rev. 22

**Read to the operator the following information:**

**INITIAL CONDITIONS:**

1. You are the BOP Operator.
2. "A" APRM Flow Unit failed and was removed from service.
3. I&C Technicians have repaired and calibrated "A" APRM Flow Unit.
4. The tagout has been cleared and verified.

**INITIATING CUES:**

As the OSS, I direct you to restore the "A" APRM Flow Unit to service per OI-878.4.

**This task is not time critical.**

**Inform the evaluator when you have completed the task.**

## PERFORMANCE INFORMATION

### NOTE:

Critical steps are denoted with a "C". Failure to meet the standard for this step constitutes failure.

Time Start \_\_\_\_\_

PERFORMANCE STEP: Critical: C	At 1C37, place the mode switch (S1) to OPERATE.
STANDARD:	Mode Switch (S1) placed in the OPERATE position.
COMMENTS:	

PERFORMANCE STEP: Critical:	Depress RESET and confirm INOP, COMPAR, TEST and UPSCALE lights are off.
STANDARD:	INOP, COMPAR, TEST and UPSCALE lights confirmed off.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify test switch (S2) in sum ZERO.
STANDARD:	Switch S2 verified in the sum ZERO position.
COMMENTS:	

PERFORMANCE STEP: Critical:	Confirm Flow Unit PERCENT FLOW meter indicates flow consistent with plant conditions.
STANDARD:	Flow Unit PERCENT FLOW meter confirmed to be consistent with plant conditions.
COMMENTS:	Candidate may check other Flow Units or check power at the front panel.



PERFORMANCE STEP: Critical: C	At 1C05, remove Flow Unit from BYPASS using bypass switch Flow Unit Rod Block HS-C51B-S7 and verify BYPASS indicating light is OFF.
STANDARD:	"A" Flow Unit removed from BYPASS and BYPASS indicating light is verified OFF.
COMMENTS: Note: Ten seconds after the switch is taken out of BYPASS, "A" Flow Unit will fail.	

PERFORMANCE STEP: Critical: C	Determine that the "A" Flow Unit is the cause of the half scram and rod block.
STANDARD:	"A" Flow Unit is determined to be the cause of the half scram and rod block.
COMMENTS:  The student will respond to ARP 1C05A, E-2, APRM FLOW UNIT UPSCALE INOP OR COMPARE ERROR.  When informed of the failure of "A" Flow Unit, and when asked about bypassing the flow unit, as the OSS direct the student to bypass the "A" Flow Unit. If asked, direct the student to return the Flow Unit mode switch to ZERO.	

PERFORMANCE STEP: Critical: C	Place the FLOW UNIT ROD BLOCK BYPASS switch in the position for the malfunctioning flow unit with permission from the OSS .
STANDARD:	FLOW UNIT ROD BLOCK BYPASS switch taken to "A".
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify that the alarm and rod withdrawal block conditions clear.
STANDARD:	Verify that 1C05A, E-2 clears and Identify that the ROD BLOCK annunciator DOES NOT clear.
COMMENTS: The APRM upscale condition prevents the reset of the Rod Block annunciator. (This discrepancy is the source of a JPM follow-up question).  As necessary, Role Play SS/SM: State that the problem will be investigated at a later time direct the operator to continue.	

PERFORMANCE STEP: Critical: C	If the malfunctioning flow unit is producing an APRM rod block and scram condition by reducing APRM flow biased setpoints, perform the following in addition to bypassing the affected flow limit rod block: Place the MODE switch for the affected flow unit in a position other than OPERATE or STANDBY.
STANDARD:	At 1C-37, MODE switch for the "A" flow unit taken to a position other than OPERATE or STANDBY.
COMMENTS: Cue: If asked for tagout, inform the student that another operator will write and hang the tag. You are to continue with the actions of the ARP.	

PERFORMANCE STEP: Critical:	While at 1C37, Operator may depress the reset pushbuttons for the Flow Unit COMPAR and/or APRM UPSCALE alarm lights. (Not procedurally required)
STANDARD:	Operator may depress the reset pushbuttons for the Flow Unit COMPAR and/or APRM UPSCALE alarm lights.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify that the alarm and rod withdrawal block conditions clear.
STANDARD:	Verify 1C05A C-2 (APRM Upscale) and 1C05B, A-6 (Rod Block) annunciators reset.
COMMENTS:	

PERFORMANCE STEP: Critical:	Reset the 1/2 Scram per OI 358 (RPS).
STANDARD:	Turn the REACTOR SCRAM RESET switch C71A-S5 first to one side then to the other.
COMMENTS: This step becomes Critical if operator causes a Reactor Scram during its performance.	

PERFORMANCE STEP: Critical:	Verify the SCRAM GROUP indication lights are on.
STANDARD:	SCRAM GROUP indication lights verified on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify the "A" RPS AUTO SCRAM (1C05A, A-2) annunciator is reset.
STANDARD:	Annunciator 1C05A, A-2 confirmed reset.
COMMENTS:	

Time Stop \_\_\_\_\_

**TERMINATING CUES:**

1999

111



This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is a small, dark, rectangular mark or smudge near the center of the page, slightly above the middle line. The paper appears to be part of a notebook or a set of loose-leaf papers.

Date \_\_\_\_\_

# **DUANE ARNOLD ENERGY CENTER**

## **JOB PERFORMANCE MEASURE**

**NUMBER: 261000-08**

**RO Task Number: 7.05**

**TITLE: MANUAL INITIATION OF SBT WITH TEST PUSHBUTTONS  
Alternate Path**


**Rev. 0**

DEVELOPED BY:

  
Instructor

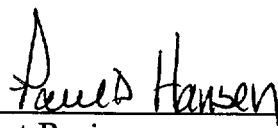
3/21/01  
Date

VALIDATED BY:

  
SME/Instructor


3/21/01  
Date

REVIEWED BY:

  
Plant Reviewer

4-3-2001  
Date

APPROVED BY:

  
Training Supervisor-Operations

4/3/01  
Date

# DUANE ARNOLD ENERGY CENTER

## JOB PERFORMANCE MEASURE

<b>JPM No.</b> 261000-08	<b>JPM Description:</b> Manual Initiation of SBT With Test Pushbuttons (Alternate Path).		
<b>Task No.</b> 7.05	<b>Task Description:</b> (SBT) Perform Manual Initiation with Test Pushbuttons.		
<b>K/A Reference:</b> 261000	A3.01 3.2/3.3 A3.02 3.2/3.1 A3.03 3.0/2.9	A4.03 3.0/3.0	
<b>APPLICABLE METHOD OF TESTING:</b> SRO/RO			
<b>Simulate Performance</b>		<b>Actual Performance</b> X	
<b>Simulator</b> X	<b>In-Plant</b>	<b>Control Room</b>	
<b>Time for Completion:</b> 20 minutes			

## JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

\*\*\*

### NOTE

All steps of this checklist should be performed upon initial validation. Prior to JPM usage, revalidate JPM using steps 7 through 10.

\*\*\*

JPM #: 261000-08

JPM Description: Manual Initiation of SSGT With Test Pushbuttons (Alternate Path).

- ☒ 1. Task description and number, JPM description and number are identified
- ☒ 2. Task elements identified and K/A references are included
- ☒ 3. Performance location specified
  - in-plant
  - control room
  - simulator
- ☒ 4. Initial conditions and cues identified
  - setup, required materials, and procedure
  - malfunctions and instructor actions
  - initiating and terminating cues
- ☒ 5. Task standards identified and verified by SME review
- ☒ 6. Critical tasks/steps identified meet criteria and identified with a "C"
- ☒ 7. Verify JPM steps fit the most current procedures  
Procedure Rev. 36 Date 9/19/00
- ☒ 8. Pilot test JPM
  - verify cues both verbal and visual are free of conflict
  - ensure performance time is accurate
- 9. If the JPM cannot be performed as written with proper responses, then revise the JPM
- 10. When JPM is revalidated, SME/Instructor signs and dates JPM

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

**SIMULATOR SETUP:** Any at-power IC with the Group 3 Isolations reset.

**EVENT TRIGGERS:**

None

**MALFUNCTIONS:**

Time	Malfunction No.	Malfunction Title	ET	Delay	F. Sev.	Ramp	I. Sev.
≈30 seconds after the A SBTG is started.*	PC07A	A SBTG Fan 1V-EF-15A Trip	n/a	0	n/a	n/a	n/a
≈30 seconds after the B SBTG is started.*	PC07B	A SBTG Fan 1V-EF-15B Trip	n/a	0	n/a	n/a	n/a

\*Trip whichever fan is started first. SBTG Fan operation can be monitored on screen PC3

**OVERRIDES:**

Time	Override No.	Override Title	ET	Delay	Value
SETUP	ZAOHVDP17638	RB to Outside ΔP	n/a	0	0.55 (0.27"wg)
SETUP	HVHS7604U	AV-7604U	n/a	0	CLOSED

**REMOTE FUNCTIONS:**

NONE



### **INSTRUCTOR ACTIONS:**

1. Verify that there are NO other simulator activities in progress that will cause annunciator horns to activate.
2. Install a WARNING TAG on AV-7604U warning of a broken air line.
3. Reset to any at-power IC without a Group 3 isolation signal present.
4. Place simulator in run.
5. Read initial conditions and initiating cues to the operator.
6. Simulator Driver or other evaluators:
  - DO NOT acknowledge SGBT 1C24 TROUBLE annunciator 1C07A, B-11.
  - Insert Malfunction PC07A or PC07B ≈30 seconds after the first SGBT train is started.

### **TASK STANDARDS:**

1. PB-5831A/B depressed to start SGBT.
2. PB-5831B/A depressed to start alternate train of SGBT.

### **REQUIRED MATERIALS:**

OI-573, Section 6.1

OI 170 Section 5.2, 4.0, & 8.3

ARP 1C24A/B (A-4)

### **GENERAL REFERENCES:**

OI-573, Rev 57

OI 170, Rev. 36

**Read to the operator the following information:**

**INITIAL CONDITIONS:**

1. You are the BOP operator.
2. AV-7604U, REFUEL POOL TO SBTGT INLET VALVE, has a broken air line and is inoperable.
3. A partial loss of Well Water has occurred.
4. Drywell pressure is 1.2 psig and rising slowly.
5. The OSS has directed the 1C03 operator to vent the Drywell.

**INITIATING CUES:**

The OSS directs you to start a Standby Gas Treatment train per OI-170 in support of Drywell venting.

**This task is not time critical.**

**Inform the evaluator when you have completed the task.**

## PERFORMANCE INFORMATION

\* \* \*

### NOTE:

Critical steps are denoted with a "C". Failure to meet the standard for this step constitutes failure.

\* \* \*

Time Start \_\_\_\_\_

PERFORMANCE STEP: Critical: C	Start A/B SBT TRAIN by depressing pushbutton PB-5831A/B on Panel 1C24A/B.
STANDARD:	PB-5831A or B depressed to start one train of SBT.
COMMENTS: Simulator Driver or other evaluators:  DO NOT acknowledge SBT 1C24 TROUBLE annunciator 1C07A, B-11.  Simulator Driver: Approximately ~30 seconds after a SBT train is started, Insert Malfunction PC07A or PC07B for whichever SBT train is started first.	

### NOTE:

The following verification steps become Not Applicable (N/A) if operator identifies the LOW FLOW condition and begins to respond accordingly.

PERFORMANCE STEP: Critical:	Verify applicable SBT System AUTOMATIC actions per section 4.0 except the ISOLATION LOCKOUT RELAY.
STANDARD:	Verification performed.
COMMENTS:	

PERFORMANCE STEP: Critical:	Acknowledge SBT 1C24 TROUBLE, 1C07A, B-11, annunciator.
STANDARD:	The operator acknowledges SBT 1C24 TROUBLE annunciator 1C07A, B-11.
COMMENTS: NOTE: A front-panel operator would normally acknowledge this annunciator. The candidate may elect to wait to acknowledge this annunciator until he returns to the front panel area.  Simulator Driver or other evaluator acting as a front panel operator: DO NOT ACKNOWLEDGE THIS ANNUNCIATOR.	

PERFORMANCE STEP: Critical:	Acknowledge A (B) SBTG RUNNING 1C24A[B], A-2, annunciator.
STANDARD:	The operator acknowledges A (B) SBTG RUNNING annunciator 1C24A [B], A-2.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify Cooldown/Outside Air Valve AV-5801A[B] indicates closed
STANDARD:	The operator verifies that the Cooldown/Outside Air Valve AV-5801A[B] GREEN closed light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify Intake Valve AV-5825A[B] is open.
STANDARD:	The operator verifies that the Intake Valve AV-5825A[B] RED open light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Confirm the Constant Heater EC-5805A[B] indicates on when air flow is greater than 2400 scfm.
STANDARD:	The operator verifies that the Constant Heater EC-5805A[B] RED on light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Confirm the Variable Heater $\Delta T$ Controller DTIC-5805A[B] is operating properly by observing the desired temperature rise (approx. 16 degrees $\Delta T$ ) as controlled on 1C24A[B] (subtract TI- 5805A[B] from TI-5833A[B]).
STANDARD:	The operator verifies that there is a temperature difference between TI-5805A[B] and TI-5833A[B]. NOTE: There is a time delay before the variable heaters can establish the 16 degrees- $\Delta T$ .
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify Fan Inlet Valve AV-5815A[B] is open.
STANDARD:	The operator verifies that the Fan Inlet Valve AV-5815A[B] RED open light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify Exhaust fans 1V-EF-15A[B] is running.
STANDARD:	The operator verifies that the Exhaust Fan 1V-EF-15A[B] RED running light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify Discharge Valve AV-5817A[B] is open.
STANDARD:	The operator verifies that Discharge Valve AV-5817A[B] RED open light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify air flow less than or equal to 4000 cfm on FIC-5828A[B].
STANDARD:	The operator verifies air flow less than or equal to 4000CFM on FIC-5828A[B].
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify Rx Bldg. to outside air $\Delta P$ is greater than or equal to .25" H <sub>2</sub> O on DPI-4638.
STANDARD:	The operator verifies that Rx Bldg. to outside air $\Delta P$ is greater than or equal to .25" H <sub>2</sub> O on DPI-4638.
COMMENTS:	

PERFORMANCE STEP: Critical:	For the OG stack exhaust fan 1V-EF-18A[B], verify that one fan is running and that the other fan hand switch is in AUTO.
STANDARD:	The operator verifies that one OG stack exhaust fan 1V-EF-18A[B] RED running light is on and that the other fan's handswitch is in AUTO.
COMMENTS:	

PERFORMANCE STEP: Critical:	At Panel 1C23A[B], verify that AV-7602A[B] Inlet Valve is open.
STANDARD:	Associated Inlet Valve AV-7602A will still be closed.
COMMENTS:  Inlet Valves AV-7602A/B open when Lockout relay trips. This step would not be applicable per Step 5.2 (2).	

PERFORMANCE STEP: Critical:	As desired to establish air flow greater than 2400 scfm and less than 4000 scfm, open REFUEL POOL TO SBTG INLET VLV AV-7604U.
STANDARD:	N/A, AV-7604U is inoperable.
COMMENTS:	

PERFORMANCE STEP: Critical:	Record start time in the SBTG run log.
STANDARD:	The operator logs the SBTG start times.
COMMENTS:  CUE: The log entry has been made.	

**NOTE:**

End of verification steps for initially started SBTG train.

PERFORMANCE STEP: Critical:	Respond to annunciator 1C24A/B (A-4) "A/B" SBTG LO FLOW.
STANDARD:	Low Flow condition identified on initially started train.
COMMENTS:	

PERFORMANCE STEP: Critical:	ARP (3.3) If train "A/B" Exhaust fan 1V-EF-15A/B has stopped, send an operator to breaker 1B3454/1B4445 and reset if needed.
STANDARD:	Operator sent to breaker 1B3454/1B4445.
COMMENTS: Evaluator of Simulator Driver, Role Play in-plant operator as necessary. CUE: Breaker and/or overload will not reset.	

PERFORMANCE STEP: Critical: C	(Low Flow ARP Step 3.4) If low flow condition cannot be corrected and SBTG is required, place "B/A" SBTG in service per OI-170....
STANDARD:	PB-5831B/A depressed to start alternate train of SBTG.
COMMENTS: Simulator Driver or other evaluators: DO NOT acknowledge SBTG 1C24 TROUBLE annunciator 1C07A, B-11.	

PERFORMANCE STEP: Critical:	Verify applicable SBTG System AUTOMATIC actions per section 4.0 except the ISOLATION LOCKOUT RELAY.
STANDARD:	Verification performed.
COMMENTS:	

PERFORMANCE STEP: Critical:	Acknowledge SBTG 1C24 TROUBLE, 1C07A, B-11, annunciator.
STANDARD:	The operator acknowledges SBTG 1C24 TROUBLE annunciator 1C07A, B-11.
COMMENTS: NOTE: A front-panel operator would normally acknowledge this annunciator. The candidate may elect to wait to acknowledge this annunciator until he returns to the front panel area. Simulator Driver or other evaluator acting as a front panel operator: DO NOT ACKNOWLEDGE THIS ANNUNCIATOR.	

PERFORMANCE STEP: Critical:	Acknowledge A (B) SBTG RUNNING 1C24A[B], A-2, annunciator.
STANDARD:	The operator acknowledges A (B) SBTG RUNNING annunciator 1C24A [B], A-2.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify Cooldown/Outside Air Valve AV-5801A[B] indicates closed
STANDARD:	The operator verifies that the Cooldown/Outside Air Valve AV-5801A[B] GREEN closed light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify Intake Valve AV-5825A[B] is open.
STANDARD:	The operator verifies that the Intake Valve AV-5825A[B] RED open light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Confirm the Constant Heater EC-5805A[B] indicates on when air flow is greater than 2400 scfm.
STANDARD:	The operator verifies that the Constant Heater EC-5805A[B] RED on light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Confirm the Variable Heater $\Delta T$ Controller DTIC-5805A[B] is operating properly by observing the desired temperature rise (approx. 16 degrees $\Delta T$ ) as controlled on 1C24A[B] (subtract TI- 5805A[B] from TI-5833A[B]).
STANDARD:	The operator verifies that there is a temperature difference between TI-5805A[B] and TI-5833A[B]. NOTE: There is a time delay before the variable heaters can establish the 16 degrees- $\Delta T$ .
COMMENTS:	



PERFORMANCE STEP: Critical:	Verify Fan Inlet Valve AV-5815A[B] is open.
STANDARD:	The operator verifies that the Fan Inlet Valve AV-5815A[B] RED open light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify Exhaust fans 1V-EF-15A[B] is running.
STANDARD:	The operator verifies that the Exhaust Fan 1V-EF-15A[B] RED running light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify Discharge Valve AV-5817A[B] is open.
STANDARD:	The operator verifies that Discharge Valve AV-5817A[B] RED open light is on.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify air flow less than or equal to 4000 cfm on FIC-5828A[B].
STANDARD:	The operator verifies air flow less than or equal to 4000CFM on FIC-5828A[B].
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify Rx Bldg. to outside air $\Delta P$ is greater than or equal to .25" H <sub>2</sub> O on DPI-4638.
STANDARD:	The operator verifies that Rx Bldg. to outside air $\Delta P$ is greater than or equal to .25" H <sub>2</sub> O on DPI-4638.
COMMENTS:	

PERFORMANCE STEP: Critical:	For the OG stack exhaust fan 1V-EF-18A[B], verify that one fan is running and that the other fan hand switch is in AUTO.
STANDARD:	The operator verifies that one OG stack exhaust fan 1V-EF-18A[B] RED running light is on and that the other fan's handswitch is in AUTO.
COMMENTS:	

PERFORMANCE STEP: Critical:	At Panel 1C23A[B], verify that AV-7602A[B] Inlet Valve is open.
STANDARD:	Associated Inlet Valve AV-7602A will still be closed.
COMMENTS:  Inlet Valves AV-7602A/B open when Lockout relay trips. This step would not be applicable per Step 5.2 (2).	

PERFORMANCE STEP: Critical:	Record start time in the SBTG run log.
STANDARD:	The operator logs the SBTG start times.
COMMENTS:  CUE: The log entry has been made.	

PERFORMANCE STEP: Critical:	As desired to establish air flow greater than 2400 scfm and less than 4000 scfm, open REFUEL POOL TO SBTG INLET VLV AV-7604U.
STANDARD:	N/A, AV-7604U is inoperable.
COMMENTS:	

PERFORMANCE STEP: Critical:	(Low Flow ARP Step 3.4) <i>If low flow condition cannot be corrected and SBTG is required, place "B/A" SBTG in service per OI-170 and secure Train A/B per OI-170.</i>
STANDARD:	OI-170 Section 8.3 used to restore Initially started train.
COMMENTS: This is part of a combined step from the ARP and measures candidate's procedure adherence abilities. Section 8.0 has three sections for securing SBTG, 8.3 is the correct section for shutdown after Pushbutton start.	

PERFORMANCE STEP: Critical:	At panel 1C24A/B, place A[B] SBTG MODE SELECT HS-5814A[B] in the MAN position.
STANDARD:	HS-5814A[B] placed in the MAN position.
COMMENTS: Note: A Mode Switch key must be obtained in order to operate this switch.	

PERFORMANCE STEP: Critical:	Acknowledge the A[B] SBTG IN MANUAL MODE 1C24A/B (C-4) annunciator which automatically resets the A[B] SBTG RUNNING annunciator.
STANDARD:	1C24A/B (C-4) acknowledged.
COMMENTS:	

PERFORMANCE STEP: Critical:	Return the A[B] SBTG MODE SELECT switch HS-5814A[B] to the AUTO position.
STANDARD:	HS-5814A[B] placed in the AUTO position.
COMMENTS:	

PERFORMANCE STEP: Critical:	Reset the A[B] SBTG IN MANUAL MODE 1C24A/B (C-4) annunciator.
STANDARD:	1C24A/B (C-4) acknowledged.
COMMENTS:	

PERFORMANCE STEP: Critical:	Complete OI-170A6 (Attachment 6) SGBT Control panel Lineup, in order to restore the proper Standby/Readiness handswitch position with the exception of the OG STACH EXH FAN 1V-EF-18A[B]. Leave the fan's associated handswitches HS-7600A[B] in the AUTO position and verify only one fan is running.
STANDARD:	OI-170 Attachment 6 performed.
COMMENTS: CUE: The Standby Readiness lineup is not necessary because the (A or B) SGBT train is inoperable.	

PERFORMANCE STEP: Critical:	Reset the A[B] SGBT PANEL 1C24 TROUBLE (1C07A, B-11) annunciator.
STANDARD:	(1C07A, B-11) reset.
COMMENTS:	

PERFORMANCE STEP: Critical:	Record the stop time in the SGBT run log.
STANDARD:	Step is Not Applicable unless operator has logged the start time before the fan tripped.
COMMENTS: CUE: The log entry has been made.	

Time Stop \_\_\_\_\_

**TERMINATING CUES:** None

**JPM Description: Manual Initiation of SBGT With Test Pushbuttons (Alternate Path).**

Evaluator: \_\_\_\_\_

□ STA

☐ UNSATISFACTORY

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Date \_\_\_\_\_

# ***DUANE ARNOLD ENERGY CENTER***

## **JOB PERFORMANCE MEASURE**

**NUMBER 202002-05**

**Task Number: 12.02**

**DESCRIPTION: Take Local Control of the MG Set Scoop Tube**

**Rev. 1**

DEVELOPED BY:

*Michael Fisher*  
Instructor

*3/23/2001*  
Date

VALIDATED BY:

*[Signature]*  
SME/Instructor

*3/29/01*  
Date

REVIEWED BY:

*Paul Hansen*  
Plant Reviewer

*3-30-2001*  
Date

APPROVED BY:

*JR Huller*  
Training Supervisor-Operations

*4/2/01*  
Date

## DUANE ARNOLD ENERGY CENTER

### JOB PERFORMANCE MEASURE

<b>JPM No.</b> 202002-05	<b>JPM Description:</b> Take local control of the MG set scoop tube		
<b>Task No.</b> 12.02	<b>Task Description:</b> Adjust speed controls from MG set room.		
<b>K/A Reference:</b> 2.1.30 (3.9/3.4) 202002			
APPLICABLE METHOD OF TESTING: SRO/RO			
Simulate Performance		X	Actual Performance
Simulator	In-Plant	X	Control Room
Time for Completion: 10 minutes			

# JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

\*\*\*

## NOTE

All steps of this checklist should be performed upon initial validation. Prior to JPM usage, revalidate JPM using steps 7 through 10.

\*\*\*

JPM# 202002-05 JPM Title Take local control of the MG set scoop tube

- ☒ 1. Task description, name, and number identified
- ☒ 2. Task elements identified and K/A references are included
- ☒ 3. Performance location specified
  - in-plant
  - control room
  - simulator
- ☒ 4. Initial conditions and cues identified
  - setup, required materials, and procedure
  - malfunctions and instructor actions
  - initiating and terminating cues
- ☒ 5. Task standards identified and verified by SME review
- ☒ 6. Critical tasks/steps identified denoted with a "C"
- ☒ 7. Verify JPM steps fit the most current procedures
  - Procedure Rev. 66 Date 3/20/01
- ☒ 8. Pilot test JPM
  - verify cues both verbal and visual are free of conflict
  - ensure performance time is accurate
- 9. If the JPM cannot be performed as written with proper responses, then revise the JPM
- 10. When JPM is revalidated, SME/Instructor signs and dates JPM

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date



**SIMULATOR SETUP: NA**

**MALFUNCTIONS: NA**

**INSTRUCTOR ACTIONS:**

1. Verify that hearing protection equipment is available and used.
2. Note any discrepancies in the comments section for any misperformed steps.
3. Read initial conditions and initiating cues to the operator.

**TASK STANDARDS:**

1. The scoop tube positioner cover is opened.
2. The circuit breaker for the scoop tube positioner brake is open (OFF) (simulated).
3. The hand crank is installed on the motor drive shaft (simulated).
4. Hand crank rotated to increase MG set speed 1% (simulated).

**REQUIRED MATERIALS:**

Hand crank  
OI 264

**GENERAL REFERENCES:**

OI 264, Rev. 65

**Read to the operator the following information:**

**INITIAL CONDITIONS:**

1. The plant is operating at 90% power.
2. The "A" MG Scoop tube automatically locked when the speed control signal to the "A" recirc MG set was lost.
3. The annunciator "A" RECIRC MG SCOOP TUBE LOCK (1C04A, C-5) has alarmed.
4. You are the ANSOE and have been sent to the Reactor Building to adjust Recirc Pump speed.

**INITIATING CUES:**

The OSS directs you to take local control of the "A" recirc MG set scoop tube and coordinate with the control room operator to match recirc MG set speeds. This task is not time critical.

**Inform the evaluator when you have completed the task.**

## PERFORMANCE INFORMATION

\*\*\*

### NOTE:

Critical steps are denoted with a "C". Failure to meet the standard for this step constitutes failure.

\*\*\*

Time Start \_\_\_\_\_

PERFORMANCE STEP: Critical:	Establish communications with the control room.
STANDARD:	Two-way communication with the control room is simulated established via the page, sound-powered phone, or radio.
COMMENTS:	

PERFORMANCE STEP: Critical: C	Open the hinged cover on the scoop tube positioner.
STANDARD:	Operator opens the cover for the scoop tube positioner.
COMMENTS:	

PERFORMANCE STEP: Critical: C	Open the circuit breaker for the scoop tube positioner brake.
STANDARD:	The circuit breaker for the scoop tube positioner brake is simulated open (OFF).
COMMENTS:	
Cue: When the operator indicates the proper position for the breaker, inform the operator that the breaker is off.	

PERFORMANCE STEP: Critical:	Verify that the "A" RECIRC MG SCOOP TUBE LOCK (1C04A, C-5) annunciator alarms.
STANDARD:	Simulate communicating with the control room to check status of the alarm.
COMMENTS:	
Note: Annunciator 1C04A C-5 is in alarming state due to initial conditions.	

PERFORMANCE STEP: Critical: C	Install the hand crank on the motor drive shaft extension (small wheel).
STANDARD:	The hand crank is simulated installed on the motor drive shaft extension (small wheel).
COMMENTS:	

PERFORMANCE STEP: Critical:	Screw in the two red thumbscrews on top of the motor drive.
STANDARD:	Two red thumbscrews on top of motor drive are simulated screwed in.
COMMENTS:	
Note: This eases brake tension to allow easier operation of crank.	
Cue: NSOE directs operator to manually raise A recirc MG set speed 1% (about 3/4 turn).	

PERFORMANCE STEP: Critical: C	Rotate hand crank in the "speed increase" direction.
STANDARD:	Operator simulates rotating hand crank approximately 3/4 of a turn in "increase" direction (counter clockwise).
COMMENTS:	
Cue: When operator has simulated turning the handwheel as directed, direct operator as NSOE to stop raising A recirc MG set speed.	
Cue: Inform operator that he is relieved of manual control of the A recirc MG set by a second licensed operator.	

Time Stop \_\_\_\_\_

**TERMINATING CUES:** Operator simulates rotating hand crank to increase MG speed 1%.

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

**OPERATING INSTRUCTION**  
**OI 264**  
**REACTOR RECIRCULATION SYSTEM**

Effective Date: **MAR 20 2001**

**TECHNICAL REVIEW**

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**PROCEDURE APPROVAL**

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## **1.0 PURPOSE**

To provide detailed instructions to the plant operating personnel for proper operation of the Reactor Recirculation System.

## **2.0 PRECAUTIONS AND LIMITATIONS**

- (1) Do not run the MG Set loaded unless lube oil temperature leaving the heat exchanger is above 80°F.
- (2) Repeated pump starts shall be avoided as this can overheat and damage the motor windings. From ambient temperature, the motor can be started and brought to speed two times in succession. With the windings above ambient temperature, the motor can be started and brought to speed once. Additional attempts to start the motor shall be separated by at least 45 minutes to allow the motor windings to cool. This applies to the MG set drive motor and the Recirc pump motor.
- (3) The reactor recirc pumps shall not be operated outside 20 to 102.5% rated pump speed when using manual speed controllers. The maximum pump speed is 1710 rpm as read at 1C-466. At this speed, the control signal (digital voltmeters) will be greater than 50.0 millivolts.
- (4) The reactor recirc pump shall not be operated in a condition where:
  - (a) Either pump cavitates (indicated by excessive vibration and sudden drop in pump discharge pressure and flow).
  - (b) The jet pumps cavitate (indicated by excessive noise on the jet pump dP indicators).
- (5) Do not operate recirc pumps more than 10 minutes without RBCCW cooling water to the pump seals.

- (6) Minipurge to a reactor recirculation pump may be isolated to support maintenance and recirculation pump startup from SLO under the following restrictions:
- (a) If the reactor recirculation pump is running, monitor lower seal cavity temperatures on TE4600J and TE4600V (points 9 and 21 on TRS4600). If lower seal cavity temperatures exceed 185 F OR the expected duration of minipurge being out of service exceeds 24 hours, notify the System Engineer to evaluate the affect on reactor seal pump degradation.
  - (b) If in SLO and the recirculation pump is not running, monitor lower seal cavity temperatures on TE4600J and TE4600V (points 9 and 21 on TRS4600). If lower seal cavity temperatures exceed 185 F, restore minipurge, UNLESS, as determined by the Shift Manager/Shift Supervisor, minipurge must remain secured to restore or maintain idle recirculation loop pump suction temperatures within specifications for idle recirculation pump restart. If lower seal cavity temperatures exceed 185 F OR the expected duration of the minipurge being out of service exceeds 24 hours, notify the System Engineer to evaluate the affect on reactor seal pump degradation.
- (7) Prior to isolating a recirc pump with suction, discharge and discharge bypass valves all closed, secure Mini-Purge flow to the affected pump.
- (8) Open the discharge valve as soon as possible after starting a recirc pump to prevent damage to the pump hydrostatic thrust bearing.
- (9) At rated temperature and low reactor power (less than 2%), avoid single loop operation, even at minimum speed. If single loop operation is necessary for short periods of time, monitor jet pump flow to ensure cavitation does not occur.
- (10) Plant operation in natural circulation mode is not permitted. If operation in natural circulation mode occurs, the reactor shall be manually scrammed and the mode switch placed in shutdown. (T.S.)
- (11) Differential temperature between reactor dome saturation temperature and vessel bottom drain temperature shall be maintained less than 145°F prior to starting a reactor recirc pump, and an idle recirc pump shall not be started unless the temperatures of the coolant in the idle loop and operating loop are within 50°F of each other. (T.S.).

- (12) Reactor recirc pump suction, discharge and discharge bypass valves are not equipped with bonnet overpressure protection. These valves (MO-4601, MO-4602, MO-4627, MO-4628, MO-4629 and MO-4630) should not be closed unless isolation of the pump is required. Ensure they are opened prior to/during plant heatup.
- (13) To minimize/prevent excessive jet pump vibration following single pump operation, the discharge valve of the lower speed pump may not be opened unless the speed of the faster pump is less than 50% of rated.
- (14) The recirc pump shall not be operated with the pump discharge valve closed, except when starting up or shutting down a pump. Since LPCI loop selection logic uses pump dP to detect a running pump, the LPCI loop selection logic will mistakenly assume normal two-pump operation exists even though one of the pump discharge valves is closed.
- (a) Pump speed shall not exceed 20% of rated while the discharge valve is closed.
  - (b) The pump suction and discharge valves shall not be used to throttle flow.
- (15) To enhance the capability of the LPCI loop selection logic to detect recirc loop breaks, the following operating limits shall be maintained during steady-state conditions with both recirc pumps operating. Transient periods of pump startup, testing, one loop restart or adjustments are excepted. However, the duration of these transients shall be minimized.
- (a) For core power levels of 80% of rated and above, the speed of the faster pump shall not exceed 122% of the speed of the slower pump. (See Appendix 1.) (T.S.)
  - (b) For core power levels below 80% rated, the speed of the faster pump shall not exceed 135% of the speed of the slower pump. (See Appendix 1.) (T.S.)
  - (c) If a recirc pump trip occurs during two pump operation, the tripped pump shall be allowed to coast through the shaded region of Appendix 1.
- (16) A recirc pump shall not be started while the reactor is in natural circulation flow and two or more control rods are withdrawn and the reactor mode switch is in STARTUP or RUN. (T.S.)

- (17) If recirc pump operation is required while the core is partially or fully defueled, adequate horizontal support shall be provided for in-core instrumentation tubes to prevent excessive vibration. This support shall consist of blade guides or fuel bundles on at least two corners.
- (18) Operating the MG set with fluid drive oil outlet temperatures of 155°F for short periods of time is acceptable if there are no bearing temperatures above their alarm setpoints. The fluid drive oil cooler outlet temperature should be reduced to and maintained less than 140°F. The MG set may be operated for prolonged periods of time at 140°F. The amount of heat rejected by the MG set Fluid coupler will go up until it reaches a maximum amount at approximately 70% speed. By raising speed when operating above 70%, the fluid drive oil cooler outlet temperature may lower.
- (19) The loss of 1D1313 or 1D2313 will disable that ATWS-RPT/ ARI trip system and the manual ATWS trip capability. Comply with T.S. for loss of one or both RPT trip systems and with the technical requirements manual for ARI instrumentation.
- (20) Recirc pump(s) shall not be operated above minimum speed when operating in parallel with RHR in Shutdown Cooling mode.

### **3.0 STARTUP OF THE REACTOR RECIRCULATION SYSTEM**

#### **3.1 STARTUP OF THE MG SET LUBE OIL SYSTEM**

##### **NOTE**

Start up the MG Set Lube Oil System well in advance of starting Recirc Pumps to allow warmup to normal operating temperature.

- (1) Complete the Recirculation System Electrical Lineup OI 264A1  
(Attachment 1). \_\_\_\_\_
- (2) Complete the "A" Recirculation System Valve Lineup and Checklist  
OI 264A2 (Attachment 2 & 3). \_\_\_\_\_
- (3) Complete the "B" Recirculation System Valve Lineup and Checklist  
OI 264A4 (Attachment 4 & 5). \_\_\_\_\_

- (4) Verify OI 880 Instrument Lineups have been completed. \_\_\_\_\_
- (5) Verify that the following systems are operational or able to support operation of the Reactor Recirculation System: \_\_\_\_\_

- GSW, OI 411
- RBCCW, OI 414
- Instrument and Service Air, OI 518.1

**NOTE**

GSW Inlet Valves V11-33[34] may be warning tagged per ACP 1410.5 to maintain lube oil temperature > 80°F.

- (6) As necessary, initiate cooling water flow to Recirc Pump MG Set Lube Oil Cooler 1E-221A[B] by opening GSW Inlet Valve V-11-33[34]. \_\_\_\_\_
- (7) Verify that the oil level in the MG set fluid coupler reservoir sight glass is visible. \_\_\_\_\_
- (8) Verify temperature indicating controller TIC-4765[4766] is set to maintain outlet lube oil temperature at 115°F. \_\_\_\_\_
- (9) Verify operability of M/G Set Emerg DC Lube Oil Pump 1P-204A[B] as follows:
- (a) Momentarily start the M/G Set Emerg DC Lube Oil Pump by turning on supply breaker 1D4202[1D4201]. \_\_\_\_\_
- (b) Secure the M/G Set Emerg DC Lube Oil Pump by turning off 1D4202[1D4201]. \_\_\_\_\_

**NOTE**

MG SET LUBE OIL PUMPS 1P-202[203]A, B and C are interlocked to prevent three pump operation. The standby pump will automatically start on lube oil pressure of 30 psig with the associated MG Set running, when less than two lube oil pumps are running.

- (10) Start two of the three MG SET LUBE OIL PUMPS with the associated handswitches on Panel 1C04: \_\_\_\_\_

<u>Pump</u>	<u>Hand Switch</u>	<u>Name</u>
1P-202[203]A	HS-4665A[B]	MG SET LUBE OIL PUMP 1P-202A[1P-203A]
1P-202[203]B	HS-4666A[B]	MG SET LUBE OIL PUMP 1P-202B[1P-203B]
1P-202[203]C	HS-4667A[B]	MG SET LUBE OIL PUMP 1P-202C[1P-203C]

- (11) Verify M/G Set Emerg DC Lube Oil Pump 1P204A[1P204B] Supply Breakers 1D4202[1D4201] turned on. \_\_\_\_\_
- (12) Verify that the handswitch for the Standby MG SET LUBE OIL PUMP is positioned in AUTO to provide a permissive for automatic starting. \_\_\_\_\_
- (13) Verify annunciator "A"["B"] RECIRC MG FLUID DRIVE OIL LO PRESSURE (1C04A, D-3[D-9]) reset. \_\_\_\_\_
- (14) Verify that the MG Set Lube Oil System pressure 30-50 psig on Lube Oil Manifold Pressure Indicator PI-4672A[B]. \_\_\_\_\_
- (15) Verify normal oil level in all MG Set A[B] motor and generator bearings and that there is flow through each sight glass in the bearing oil return lines. \_\_\_\_\_

**NOTE**

During initial startup, the plates on Auto Klean Filter 1F-210A[B] should be rotated several times during the first three hours of operation. Also, rotate the plates on the set of three in-series oil filters frequently.

- (16) If necessary, warm the MG Set Lube Oil System as follows:
- (a) Verify that "A"["B"] RECIRC MG SCOOP TUBE LOCK (1C04A, C-5 [1C04B, C-2]) annunciator is reset. \_\_\_\_\_
- (b) Place the field breaker in the test position at the local control panel. \_\_\_\_\_
- (c) Verify A[B] MG SET SPEED CONTROL SIC-9245A[B] set at minimum demand. \_\_\_\_\_

- (d) Start MG Set A[B] by placing the RECIRC MG SET MOTOR BREAKER 1A-104[1A-204] handswitch at panel 1C04, in the START position. \_\_\_\_\_
- (e) When the "A"["B"] RECIRC MG FLUID DRIVE OIL LO TEMP (1C04A, C-3[9]) annunciator resets, stop MG Set A[B] by placing A[B] RECIRC MG SET MOTOR BREAKER 1A-104[1A-204] handswitch at Panel 1C04 in the STOP position. \_\_\_\_\_
- (f) Return the A[B] GENERATOR FIELD BREAKER to the NORMAL position. \_\_\_\_\_

### 3.2 STARTUP OF RECIRC PUMP MINI-PURGE

- (1) Verify that A[B] RECIRC PUMP SUCTION MO-4601[4602] or A[B] RECIRC PUMP DISCH BYP MO-4629[4630] is open. \_\_\_\_\_
- (2) Verify the CRD Hydraulic System in operation per OI 255 with Recirc Pump Mini-Purge Supply Header Isolation V-17-23 OPEN. \_\_\_\_\_
- (3) Verify open A[B] PUMP MINI PURGE ISOL CV-1804A[B] to supply seal purge flow to Pump 1P-201A[B]. \_\_\_\_\_

#### **NOTE**

Any time combined Mini-Purge flow (both loops) is raised above 5 gpm, the 8 hour average thermal power shall be limited to  $\leq 1657.5 \text{ Mw}_{\text{th}}$  and Reactor Engineering shall be contacted.

- (4) Regulate flow through FCV-1804A and B to between 2 and 4 gpm as indicated on FI-1804A and B. \_\_\_\_\_

### 3.3 STARTUP OF A[B] MG SET AND RECIRC PUMP

#### **CAUTION**

A recirc pump shall not be started while the reactor is in natural circulation flow and the Reactor Mode Switch is in STARTUP or RUN. (T.S.)

- (1) If starting a Recirc Pump with shutdown cooling in service, perform this procedure in conjunction with OI 149, section 16.2. \_\_\_\_\_

#### **NOTE**

GSW Inlet Valves V11-33[34] may be warning tagged per ACP 1410.5 to maintain lube oil temperature > 80°F prior to M/G Set START.

- (2) Verify that the A[B] MG Set Lube Oil System is in operation per Section 3.1 and that lube oil temperature is above 80°F. \_\_\_\_\_
- (3) Ensure proper Recirc MG Set Room fan operation by verifying the following:
- (a) At 1C-149, in the Recirc MG Set Room Intake Airlock, that 1V-SF-12[1V-SF-11], the Recirc Pump MG Set Room Supply Fan for the MG Set to be started has its respective handswitch HS-6534A[B] in AUTO or START. \_\_\_\_\_
  - (b) The associated fan discharge damper opens when fan starts. \_\_\_\_\_
- (4) Verify that mini-purge is in operation per Section 3.2. \_\_\_\_\_
- (5) Verify that 1P-201A[B] RECIRC PUMP mechanical seals have been vented per Section 10.2 or 10.3 if: \_\_\_\_\_
- (a) Reactor pressure dropped below 300 psig.
  - (b) Maintenance was performed on the seals OR
  - (c) Seal cavities were drained.



(6) Verify the following annunciators reset:

- "A"["B"] RECIRC GENERATOR LOCKOUT (1C04A, A-1[7])
- "A"["B"] RECIRC MG CONTROL POWER TRANSFER INITIATED (1C04A, B-1[7])
- "A"["B"] RECIRC GENERATOR AUX LOCKOUT RELAY TRIP (1C04A, C-1[7])
- "A"["B"] RECIRC MG FLUID DRIVE OIL LO TEMP (1C04A, C-3[9])
- "A"["B"] RECIRC PUMP MOTOR OIL HI/LO LEVEL (1C04A, C-4[B, C-1])
- "A"["B"] RECIRC MG SCOOP TUBE LOCK (1C04A, C-5[B, C-2])
- "A"["B"] RECIRC MG SPEED CONTROLLER OR LOSS OF FEEDBACK FAILURE  
(1C04A, D-1[7])

(7) Verify the following:

- (a) A[B] MG SET SPEED CONTROL SIC-9245A[B] is set at minimum demand.
- (b) MO-4601[4602] A[B] RECIRC PUMP SUCTION and MO-4629[4630] A[B] RECIRC PUMP DISCH BYP valves OPEN.
- (c) Reactor water level above 186 inches as indicated on available 1C05 indications.
- (d) Verify closed RPT circuit breakers 1A501[502] on Panel 1C15 and 1A601[602] on Panel 1C17.

**NOTE**

Prior to taking the RPV bottom head drain temperatures per STP 3.4.9-03 verify that RWCU is in-service.

(8) Record temperatures at the following points per STP 3.4.9-03, Recirc Pump Start Temperature Recording:

- (a) Recirc Pump Suction Temperatures
- (b) Reactor Vessel Dome Saturation Temperatures
- (c) Reactor Vessel Bottom Head Drain Temperature

**NOTE**

In order to minimize changes in the pump start temperatures, be prepared to start the MG set immediately after the associated recirc pump discharge valve reaches full closed.

- (9) Close MO-4627[4628] A[B] RECIRC PUMP DISCHARGE with the handswitch at Panel 1C04.

**NOTE**

During an MG Set start sequence, the Generator will ramp to about 80% speed immediately as shown on A[B] MG set speed controller SIC-9245A[B] P-% SPEED INDICATOR. The MG Set A[B] Field Breaker will automatically close 6 seconds after the MG Set start. When the field breaker closes, the generator speed will drop rapidly to approximately 40% speed and settle out at 20% speed.

During the pump start, annunciator "A" ["B"] RECIRC PUMP MOTOR HI VIBRATION (1C04A B-4, [1C04B B-1]) may be received. This is an expected alarm and should clear as the Recirc pump speed goes up.

During an A [B] MG set start or reset from a deviation lockup condition, annunciator (1C08A C-8, [1C08A B-8]) inverter overload alarm may be received.

- (10) START MG Set A[B] by momentarily placing A[B] RECIRC MG SET MOTOR BREAKER 1A104[1A204] handswitch on Panel 1C04 to the START position.
- (11) Open A[B] RECIRC PUMP DISCHARGE MO-4627[4628] with handswitch HS-4627[4628] at Panel 1C04.

**NOTE**

If pump venting is not necessary, proceed to step 17.

**CAUTION**

A[B] RECIRC PUMP DISCHARGE MO-4627[4628] is not equipped with bonnet overpressure protection. Ensure MO-4627[4628] does not remain closed during plant heatup.

(12) After 5 minutes of operation perform the following:

(a) Close A[B] RECIRC PUMP DISCHARGE MO-4627[4628] with handswitch HS-4627[4628] at Panel 1C04. \_\_\_\_\_

(b) Stop MG SET A[B] with the A[B] RECIRC MG SET MOTOR BREAKER 1A-104[1A-204] handswitch on Panel 1C04. \_\_\_\_\_

(13) Verify A[B] Recirc MG Scoop Tube Lock (1C04A, C-5[1C04B, C-2]) is reset. \_\_\_\_\_

(14) Vent Recirc Pump A[B] per Section 10.2 or 10.3. \_\_\_\_\_

(15) Record temperatures at the following points per STP 3.4.9-03, Recirc Pump Start Temperature Recording: \_\_\_\_\_

(a) Recirc Pump Suction Temperatures

(b) Reactor Vessel Dome Saturation Temperatures

(c) Reactor Vessel Bottom Head Drain Temperature

(16) Start MG Set A[B] by momentarily placing A[B] RECIRC MG SET MOTOR BREAKER 1A-104[1A-204] hand switch on Panel 1C04 in the START position. \_\_\_\_\_

(17) Open A[B] RECIRC PUMP DISCHARGE MO-4627[4628] with handswitch HS-4627[4628] on Panel 1C04. \_\_\_\_\_

(18) Perform the applicable surveillances for jet pump operability. \_\_\_\_\_

## **4.0 NORMAL OPERATION OF THE RX RECIRCULATION SYSTEM**

### **4.1 NORMAL OPERATION INFORMATION**

(1) During normal operation, the operator should rotate Auto Clean Filter 1F-210A[B] handles daily. \_\_\_\_\_

- (2) The following parameters are normal at 100% rated flow. Any significant variations shall be investigated.

<u>Parameter</u>	<u>Indicator</u>	<u>Value</u>
Recirc Pump Disch. Flow	FI-4634A[B]/FR-4635	28,000 gpm
Reactor Jet Pump Total Flow	PDR/FR-4528 (Computer Point B012)	49.0 mlb/hr
Recirc Pump dP	PDI-4623[4624]	155 psid
Recirc Pump Motor Current	II-9237A[B]	380 amps
Recirc Pump Motor Voltage	EI-9235A[B]	3.85 KV
Recirc Pump Motor Power	JI-9232[9233]	2.5 MW
Recirc Pump Suction Temp.	TR-4603	520°F
Recirc Pump No. 1[2] Seal Pressure	PI-4607[4608]	1000[500] psig
	PI-4611[4612]	1000[500] psig
Recirc Loop A[B] Flow	FI-4523[4526]	23 million lb/hr.
Inst. Jet Pump 9[1] Flow	FI-4517[4518]	2.9 million lb/hr.
Inst. Jet Pump 13[5] Flow	FI-4519[4520]	2.9 million lb/hr.
MG Set A[B] Drive Motor Current	II-9233[9234]	490 amps
MG Set Lube Oil Cooling Water Inlet Temp.	TIC-4765[4766]	60-95°F
MG Set Bearing Oil Pressure	Local	15-20 psig
MG Set Fluid Drive Bearing Oil pressure	Local	30-50 psig
MG Set Lube Oil HX Outlet Temp.	TI-4668A[B]	110-130°F
Mini-Purge Flow	FI-1804A[B]	2 to 4 gpm

- (3) During operation, periodically monitor and log the following parameters:

<u>Component</u>	<u>Location</u>	<u>Low</u>	<u>Norm</u>	<u>High</u>
MG INPUT END OUTBOARD JOURNAL BEARING TEMP	TI-4670A[B]	110	115	160
MG INPUT END INBOARD JOURNAL BEARING TEMP	TI-4671A[B]	110	115	160
MG BEARING OIL MANIFOLD PRESSURE	TI-4672A[B]	30	42	50
MG OUTPUT END INBOARD JOURNAL BEARING TEMP	TI-4673A[B]	110	115	160
MG OUTPUT END OUTBOARD JOURNAL BEARING TEMP	TI-4674A[B]	110	115	160
MG LUBE OIL INLET TEMPERATURE	TI-4677A[B]	110	115	130
"B" RECIRC PUMP ΔP	PDIS-4626A,B,C,D	-	>10	-
"A" RECIRC PUMP ΔP	PDIS-4625A,B,C,D	-	>10	-

## 4.2 MANUAL OPERATION USING RECIRC PUMP SPEED CONTROLLERS

- (1) When above 20% feedwater flow, as indicated on FI-1581 (RX FEEDWATER FLOW) A FEEDLINE and FI-1626 (RX FEEDWATER FLOW) B FEEDLINE at Panel 1C05, reset the 45% Runback Speed Limiter by depressing the A[B] 45% RUNBACK SPEED LIMITER RESET pushbutton at Panel 1C04. \_\_\_\_\_
- (2) Observe that "A"["B"] RECIRC MG 20% OR 45% FLOW LIMITER IN EFFECT (1C04A, D-2[8]) annunciator resets. \_\_\_\_\_

### **NOTE**

Normal power changes should be made at an overall rate not to exceed 1% of rated power/minute and with incremental changes not to exceed 5%. The following indications shall be monitored for proper response during power changes:

- a. Recirc discharge flow on FI-4634A[B], FR-4635
- b. Reactor Jet Pump Total core Flow (red pen) on PDR/FR-4528 REACTOR JET PUMP TOTAL FLOW & REACTOR CORE PLATE  $\Delta P$  recorder
- c. Total steam flow
- d. Total feed flow
- e. APRM power
- f. Generator output

### **CAUTION**

For core power levels  $\geq 80\%$  rated, the speed of the faster recirc pump shall not exceed 122% of the speed of the slower pump. For core power levels  $< 80\%$  rated, the speed of the faster recirc pump shall not exceed 135% of the speed of the slower pump. (T.S.)

- (3) Adjust recirc pump speed as necessary to maintain desired power levels: \_\_\_\_\_

- (a) To raise recirc flow, set the digital display to the S-PERCENT SPEED DEMAND variable by pressing the display switch, then rotate the A[B] MG SET SPEED CONTROL SIC-9245A[B] knobs on Panel 1C04 clockwise in small equal increments. \_\_\_\_\_

(b) To lower recirc flow, set the digital display to the S-PERCENT SPEED DEMAND variable by pressing the display switch, then rotate the A[B] MG SET SPEED CONTROL SIC-9245A[B] knobs on Panel 1C04 counter-clockwise in small equal increments.

(4) Keep loop flows balanced by comparing the Recirc Pump discharge flow on FI-4634A vs. FI-4634B or Pen 1 vs. Pen 2 on FR-4635.

### 4.3 ALTERNATING STANDBY MG SET LUBE OIL PUMPS

(1) If maintenance has been performed on the standby MG SET LUBE OIL PUMP, verify the associated circuit breaker racked in and closed and the associated suction and discharge valves open as follows:

<u>Standby Pump</u>	<u>Circuit Breaker</u>	<u>Suction Valve</u>	<u>Discharge Valve</u>
1P-202[203]A	1B5407[5408]	V-16-3[93]	V-16-1[91]
1P-202[203]B	1B6402[6403]	V-16-6[96]	V-16-4[94]
1P-202[203]C	1B5419[6401]	V-16-9[99]	V-16-7[97]

#### CAUTION

Amber "START INHBTD" light above MG SET LUBE OIL PUMP handswitch indicates the restart lockout relay is energized. The pump will not start until the relay is reset by cycling the handswitch to STOP position.

(2) At Panel 1C04, place and hold the standby MG SET LUBE OIL PUMP hand switch in the START position.

<u>MG Set Lube Oil Pump</u>	<u>Hand Switch</u>
1P-202[203]A	HS-4665A[B]
1P-202[203]B	HS-4666A[B]
1P-202[203]C	HS-4667A[B]

(3) At Panel 1C04, place the handswitch for the MG SET LUBE OIL PUMP to be placed in standby to the STOP position.

(4) Verify that the standby MG SET LUBE OIL PUMP starts.

(5) Release the handswitch for the standby MG SET LUBE OIL PUMP.

- (6) Place the stopped MG SET LUBE OIL PUMP in standby by placing its handswitch to the AUTO position. \_\_\_\_\_

## **5.0 SHUTDOWN OF THE REACTOR RECIRCULATION SYSTEM**

### **5.1 SHUTDOWN OF A[B] MG SET AND RECIRC PUMP**

#### **NOTE**

Upon securing A[B] MG set, annunciator 1C04A,D-1[D-7] A[B] Recirc MG Set Speed Controller or Loss of Feedback Failure may occur with subsequent scoop tube lockup. This is an expected response as a result of the generator field undervoltage relay setpoints.

- (1) Reduce operating Recirc MG Set speed(s) to minimum per Sections 4.2 or 8.0. \_\_\_\_\_
- (2) Control reactor water level in the lower portion of the green band on available 1C05 indications (indicated level will go up when a recirc pump is tripped). \_\_\_\_\_
- (3) Secure the operating recirc pump(s) one at a time as follows:
- (a) Verify open MO-4629[4630] A[B] RECIRC PUMP DISCHARGE BYP valve. \_\_\_\_\_
  - (b) Close MO-4627[4628] A[B] RECIRC PUMP DISCHARGE valve. \_\_\_\_\_
  - (c) Stop A[B] MG Set by momentarily placing A[B] RECIRC MG SET MOTOR BREAKER 1A104[1A204] handswitch in the STOP position. \_\_\_\_\_
  - (d) After 5 minutes, reopen MO-4627[4628] A[B] RECIRC PUMP DISCHARGE valve (unless the pump is to be isolated or the loop is to be used for shutdown cooling). \_\_\_\_\_
- (4) Stabilize reactor water level. \_\_\_\_\_

### **NOTE**

Mini-purge can only be secured if:

- a. RBCCW to recirc pump seal cooling is in service, or
- b. The pump suction temperature is less than 250°F, or
- c. The pump needs to be isolated, or
- d. As allowed by the limitations of Precaution and Limitation #6.

- (5) If desired, close A[B] PUMP MINI PURGE ISOL valve CV-1804A[B]. \_\_\_\_\_

### **CAUTION**

Reactor recirc pump suction, discharge and discharge bypass valves are not equipped with bonnet overpressure protection. These valves (MO-4601, MO-4602, MO-4627, MO-4628, MO-4629 or MO-4630) shall not be closed unless isolation of the pump is required, and shall not remain closed during plant heatup.

- (6) If an idle recirc pump needs to be isolated:

- (a) Verify closed A[B] PUMP MINI PURGE ISOL CV-1804A[B]. \_\_\_\_\_
- (b) Verify closed A[B] RECIRC PUMP DISCHARGE MO-4627[4628]. \_\_\_\_\_
- (c) Close A[B] RECIRC PUMP DISCH BYP MO-4629[4630]. \_\_\_\_\_
- (d) Close A[B] RECIRC PUMP SUCTION MO-4601[4602]. \_\_\_\_\_

- (7) If desired, shut down the A[B] MG Set Lube Oil System per Section 5.2 after A[B] MG Set has coasted to a full stop. \_\_\_\_\_



## 5.2 SHUTDOWN OF MG SET LUBE OIL SYSTEM

### CAUTION

Do not secure the MG Set Lube Oil System until the MG Set has coasted to a complete stop.

- (1) Place in STOP the handswitch on Panel 1C04 for the standby MG SET LUBE OIL PUMP:

<u>Pump</u>	<u>Hand Switch</u>	<u>Name</u>
1P-202[203]A	HS-4665A[B]	MG SET LUBE OIL PUMP 1P-202A[1P-203A]
1P-202[203]B	HS-4666A[B]	MG SET LUBE OIL PUMP 1P-202B[1P-203B]
1P-202[203]C	HS-4667A[B]	MG SET LUBE OIL PUMP 1P-202C[1P-203C]

- (2) Secure the M/G SET EMERG DC LUBE OIL PUMP, 1P-204A[B] by turning off breaker 1D4202[4201].
- (3) Place the hand switches for the operating MG SET LUBE OIL PUMPS in STOP at Panel 1C04.

## 6.0 OPERATION OF THE REACTOR WATER SAMPLE VALVES

### NOTE

Reactor water should be continuously monitored by the Crack Arrest Verification Sample System from cold startup until cold shutdown. Hydrogen and oxygen concentrations should also be monitored whenever the Hydrogen Water Chemistry System is in operation. This requires that the reactor water sample valves CV-4639 and CV-4640 remain open.

### CAUTION

Technical Requirements Manual requires continuously recording the conductivity of the reactor coolant. If RWCU is isolated, contact Chemistry to verify that the coolant is being monitored.

- (1) Notify the plant chemist that reactor water is being lined up to the CAVs analyzer.

- (2) Open CV-4639 and CV-4640 INBD and OUTBD LOOP SAMPLE ISOL valves using handswitches HS-4639 and HS-4640 at Panel 1C04. \_\_\_\_\_
- (3) Verify OPEN, V-16-111 Recirc HWC Sample Line Isolation (located outside the RWCU Pump Room). \_\_\_\_\_
- (4) Line up the CAVs analyzer per OI 563. \_\_\_\_\_
- (5) Line up the HWC hydrogen and oxygen analyzers per OI 563. \_\_\_\_\_
- (6) Notify the plant chemist if reactor water conductivity monitoring is being shifted from the RWCU System to the Reactor Recirc System. \_\_\_\_\_
- (7) Verify OPEN, V-16-109 Recirc Sample Point SX-4640 Isolation (located outside the RWCU Pump Room). \_\_\_\_\_
- (8) Verify all of the following before closing CV-4639 and CV-4640: \_\_\_\_\_
  - (a) Conductivity monitoring shifted to the RWCU System.
  - (b) Hydrogen and oxygen analyzers shutdown per OI 563.
  - (c) CAVs analyzer shutdown.
- (9) If all the conditions of Step (8) are met, close INBD and OUTBD LOOP SAMPLE ISOL CV-4639 and CV-4640 valves, by using switches HS-4639 and HS-4640 on Panel 1C04. \_\_\_\_\_

## **7.0 SINGLE LOOP OPERATION**

### **7.1 TWO-LOOP TO SINGLE LOOP TRANSFER**

#### **CAUTION**

The reactor is considered to be unstable if at least one APRM exhibits undamped oscillations greater than normal. At any time the reactor becomes unstable, the reactor shall be manually scrammed. {C001}

**NOTE**

To maintain the idle loop "hot" while in single loop operation, the speed of the pump left running should be greater than 50% and the idle loop discharge and discharge bypass valves open.

**NOTE**

Performance of the following steps may cause Recirculation Pump Speed mismatch to exceed the limits of Tech. Specs..

- (1) Reduce the speed of both recirc pumps to a desired speed (preferably between 50% and 60%) by adjusting A and B MG SET SPEED CONTROL SIC-9245A[B].

**NOTE**

Performance of the following step may cause jet pump flow mismatch to exceed the limits in Tech Spec.

**CAUTION**

To prevent a 20% runback ensure that total feedwater flow is maintained greater than approximately 1.4Mlb/hr (20%) when adjusting speeds on the inservice recirc pump.

- (2) Continue reducing the speed of the recirc pump to be taken out of service until the pump speed is at minimum.

**CAUTION**

If reactor level drops to 186" with only one feedwater pump operating, a 45% recirc pump runback will be initiated.

- (3) Control reactor water level in the lower portion of the green band on available 1C05 indications (indicated level will go up when the recirc pump is tripped).

(4) For the loop to be taken out of service:

(a) Verify open MO-4629[4630] A[B] RECIRC PUMP DISCHARGE BYP valve. \_\_\_\_\_

(b) Close MO-4627[4628] A[B] RECIRC PUMP DISCHARGE valve. \_\_\_\_\_

(c) Stop A[B] MG Set by momentarily placing A[B] RECIRC MG SET MOTOR BREAKER 1A104[1A204] handswitch in the STOP position. \_\_\_\_\_

(d) After 5 minutes, reopen MO-4627[4628] A[B] RECIRC PUMP DISCHARGE valve (unless pump needs to be isolated). \_\_\_\_\_

(5) Stabilize reactor water level. \_\_\_\_\_

**NOTE**

Mini-purge can only be secured if:

- a) RBCCW to recirc pump seal cooling is in service, or
- b) The pump suction temperature is less than 250°F, or
- c) The pump needs to be isolated, or
- d) As allowed by the limitations of Precaution and Limitation #6.

**NOTE**

Seal cavity high temperature alarms are possible on the idle recirc pump if mini-purge is secured.

(6) If desired to limit cooldown of the idle loop, close A[B] PUMP MINI PURGE ISOL valve CV-1804A[B]. \_\_\_\_\_

(7) Verify at 1C-149, in the Recirc. MG Set Room Intake Airlock, that 1V-SF-12[1V-SF-11], the Recirc Pump MG Set Room Supply Fan for the MG Set to remain running has its respective handswitch HS-6534A[B] in AUTO or START. \_\_\_\_\_

## CAUTION

Reactor recirc pump suction, discharge and discharge bypass valves are not equipped with bonnet overpressure protection. These valves (MO-4601, MO-4602, MO-4627, MO-4628, MO-4629 or MO-4630) should not be closed unless isolation of the pump is required. Ensure they do not remain closed during plant heatup.

## NOTE

Tagging out of the idle recirc pump can be performed at any time as desired by the OSS/OSM.

- (8) If Maintenance requires the Recirc MG set field breaker 1G-201A[B] / FBKR racked out, then via the Temp Mod process, install jumper between terminals A-7 and A-8 at 1C112A[B] prior to racking out breaker in order to maintain proper core flow indication. \_\_\_\_\_
- (9) If the idle recirc pump needs to be isolated:
- (a) Verify closed A[B] PUMP MINI PURGE ISOL CV-1804A[B]. \_\_\_\_\_
  - (b) Verify closed A[B] RECIRC PUMP DISCHARGE MO-4627[4628]. \_\_\_\_\_
  - (c) Close A[B] RECIRC PUMP DISCH BYP MO-4629[4630]. \_\_\_\_\_
  - (d) Close A[B] RECIRC PUMP SUCTION MO-4601[4602]. \_\_\_\_\_
- (10) Perform STP 3.4.1-02, Single Loop Operation surveillance. \_\_\_\_\_
- (11) Perform STP 3.4.2-03, Daily Jet Pump Operability Single Loop Operation Surveillance. \_\_\_\_\_
- (12) If desired, shut down the A[B] MG Set Lube Oil System per Section 5.2 after A[B] MG Set has coasted to a full stop. \_\_\_\_\_
- (13) Adjust the running recirc pump speed as desired. \_\_\_\_\_
- (14) Proceed to Section 7.2 for Continued Single Loop Operation. \_\_\_\_\_

## 7.2 CONTINUED SINGLE LOOP OPERATION

### NOTE

To maintain the idle loop "hot" while in single loop operation, the speed of the pump left running should be greater than 50% and the idle loop discharge and discharge bypass valves open.

### **CAUTION**

The reactor is considered to be unstable if at least one APRM exhibits undamped oscillations greater than normal. At any time the reactor becomes unstable, the reactor shall be manually scrammed. {C001}

- (1) Verify that the idle recirc pump has been shutdown per Section 7.1, Two Loop to Single Loop Transfer, or per applicable annunciator response procedure for "A"["B"] RECIRC MG DRIVE MOTOR TRIP OR OVERLOAD (1C04A, A-4 or 1C04B, A-1). \_\_\_\_\_
- (2) Verify at 1C-149, in the Recirc. MG Set Room Intake Airlock, that 1V-SF-12[1V-SF-11], the Recirc Pump MG Set Room Supply Fan for the MG Set to remain running has its respective handswitch HS-6534A[B] in AUTO or START. \_\_\_\_\_
- (3) Perform STP 3.4.1-02, Single Loop Operation, surveillance as follows: \_\_\_\_\_
  - (a) Upon entering SLO from power,
  - (b) Once every 24 hours while in SLO.
- (4) If entry into the exclusion or buffer region of the power to flow map is made, refer to AOP 255.2 for guidance on exiting the region and evaluating the Solomon Stability Evaluation Report. \_\_\_\_\_

### NOTE

During power changes, monitor and maintain APRM GAFs 3.5% greater than actual core power until STP 3.3.1.1-33, Calibration of APRMs for Single Loop Operation surveillance is performed.

- (5) If single-loop operations are expected to continue for an extended period, initiate STP 3.3.1.1-33, Calibration of APRMs for Single Loop Operation surveillance within 72 hours of entering single-loop operation.

### 7.3 SINGLE LOOP TO TWO-LOOP TRANSFER

- (1) Verify started or start up idle MG Set A[B] Lube Oil System per Section 3.1.
- (2) Verify lube oil temperature greater than or equal to 80°F.
- (3) Verify Recirc MG set field breaker 1G201A[B] / FBKR is racked in and remove temporary jumper installed between terminals A-7 and A-8 at 1C112A[B] if installed.
- (4) Verify started or start up Recirc Pump A[B] Mini-Purge per Section 3.2.
- (5) Verify RPT circuit breakers 1A501[502] and 1A601[602] closed.
- (6) Verify at 1C-149, in the Recirc. MG Set Room Intake Airlock, that 1V-SF-12[1V-SF-11], the Recirc Pump MG Set Room Supply Fan for the MG Set to be started has its respective handswitch HS-6534A[B] in AUTO or START.
- (7) Verify A[B] MG SET SPEED CONTROL SIC-9245A[B] is set at minimum speed demand.
- (8) Verify the following annunciators reset:
- ["B"] RECIRC GENERATOR LOCKOUT (1C04A, A-1[7])
  - ["B"] RECIRC MG CONTROL POWER TRANSFER INITIATED (1C04A, B-1[7])
  - ["B"] RECIRC GENERATOR AUX LOCKOUT RELAY TRIP (1C04A, C-1[7])
  - ["B"] RECIRC MG FLUID DRIVE OIL LO TEMP (1C04A, C-3[9])
  - ["B"] RECIRC PUMP MOTOR OIL HI/LO LEVEL (1C04A, C-4[B, C-1])
  - ["B"] RECIRC MG SCOOP TUBE LOCK (1C04A, C-5[B, C-2])
  - ["B"] RECIRC MG SPEED CONTROLLER OR LOSS OF FEED BACK FAILURE (1C04A, D-1[7])

- (9) Verify that MO-4601[4602] A[B] RECIRC PUMP SUCTION and MO-4629[4630] A[B] RECIRC PUMP DISCH BYP are OPEN. \_\_\_\_\_
- (10) Determine the  $\Delta T$  between the Recirc Pump suction temperatures per STP 3.4.9-03, Recirc Pump Start Temperature Recording. \_\_\_\_\_
- (11) If loop temperatures are not within 50°F, then:
- (a) Place running loop speed at approximately 50%. \_\_\_\_\_
  - (b) Verify open MO-4627[4628] A[B] RECIRC PUMP DISCHARGE (for the non-running pump). \_\_\_\_\_

### CAUTION

Past experience shows that the heatup of the idle recirc loop is controllable up to approximately 300°F. Beyond 300°F, heatup may go up significantly.

- (c) Raise speed of running pump slowly to raise idle loop temperature to within 50°F of operating loop temperature. \_\_\_\_\_
- (12) Adjust LC-4577 on Panel 1C05 to raise reactor water level to the upper portion of the green band on available 1C05 indications. \_\_\_\_\_

### NOTE

As recirc speed approaches 50%, flow in the idle loop may be insufficient to keep the loop warm. Therefore, the amount of time spent at less than 50% speed should be minimized.

### CAUTION

To prevent a 20% runback, ensure that total feedwater flow is maintained greater than approximately 1.4Mlb/hr (20%) when adjusting speeds on the inservice recirc pump.

- (13) Reduce speed of operating A[B] Recirc Pump to below 50% with A[B] MG SET SPEED CONTROL SIC-9245A[B] at Panel 1C04. \_\_\_\_\_



**NOTE**

Prior to taking RPV Bottom Head Drain Temperatures per STP 3.4.9-03, verify that RWCU is in service.

- (14) Record the following temperatures per STP 3.4.9-03, Recirc Pump Start Temperature Recording: \_\_\_\_\_

- Reactor Dome temperature
- Bottom Head Drain temperature
- Operating Recirc Loop temperature
- Idle Recirc Loop temperature

**NOTE**

In order to minimize changes in the pump start temperatures, be prepared to start the MG set immediately after the associated RECIRC PUMP DISCHARGE valve reaches full closed.

Indicated reactor level will lower upon the start of a recirc pump due to the suction on the Downcomer Annulus region. If operating with only one feedwater pump, a 45% recirc pump runback will be initiated if reactor level drops to 186".

During an MG Set start sequence, the generator will ramp to about 80% speed immediately as shown on A[B] MG set speed controller SIC-9245A[B] PERCENT SPEED indicator. The A[B] MG Set Field Breaker will automatically close 6 seconds after the MG Set start. When the field breaker closes, the generator speed will drop rapidly to approximately 40% speed and settle out at 20% speed.

**CAUTION**

MO-4627[4628] A[B] RECIRC PUMP DISCHARGE valve is not equipped with bonnet overpressure protection. Ensure MO-4627[4628] does not remain closed during plant heatup.

- (15) Close MO-4627[4628] A[B] RECIRC PUMP DISCHARGE valve with HS-4627[4628] on Panel 1C04. \_\_\_\_\_
- (16) Start up idle A[B] MG Set and A[B] Recirc Pump momentarily by placing A[B] RECIRC MG SET MOTOR BREAKER 1A104[1A204] handswitch in the START position. \_\_\_\_\_

(17) Open MO-4627[4628] A[B] RECIRC PUMP DISCHARGE valve with HS-4627[4628] at Panel 1C04.

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(18) After reactor level stabilizes, adjust LC-4577 on Panel 1C05 as necessary to restore level to the middle of the green band using available 1C05 indications.

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**CAUTION**

Total core flow should be maintained constant while balancing recirc loop flows to prevent abnormal core power distributions.

(19) Balance recirc loop flow by slowly and simultaneously lowering speed of the operating pump and raising speed on the on-coming pump using the respective A[B] MG SET SPEED CONTROL SIC-9245A[B].

---

(20) Perform STP 3.4.2-01, Daily Jet Pump Operability Test within 4 hrs. of Recirc. Pump start.

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(21) When recirc flows are balanced and reactor power has stabilized, restore APRM GAFs to normal by performing STP 3.4.1-01, APRM Gain Adjust Calibration OR recalibrate APRMs per STP 3.3.1.1-32, Calibration of APRMs.

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(22) If APRMs were recalibrated per STP 3.3.1.1-32 Calibration of APRMs then perform STP 3.4.1-01, APRM Gain Adjust Calibration when Recirc flows are balanced and Reactor Power has stabilized.

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## **8.0 MANUAL OPERATION OF MG SET AND RECIRC PUMP FROM THE MG SET ROOM**

### **CAUTION**

Since operation of the scoop tube affects reactor reactivity, this operation shall only be performed by a licensed operator.

- (1) Establish communications between the Control Room and operator at the scoop tube positioner in the Motor Generator Room. \_\_\_\_\_
- (2) Open the hinged cover on the Scoop Tube positioner. \_\_\_\_\_
- (3) Place the scoop tube positioner BRAKE circuit breaker to OFF. \_\_\_\_\_
- (4) Verify "A"["B"] RECIRC MG SCOOP TUBE LOCK  
(1C04A, C-5[1C04B, C-2]) annunciator activated. \_\_\_\_\_
- (5) Install the hand crank on the motor drive shaft extension (small wheel). \_\_\_\_\_

### **CAUTION**

Maintain a firm grip on the hand crank to prevent the fluid drive load from driving through the control drive.

- (6) Screw in the two red thumbscrews on top of the motor drive to release enough brake tension to allow manual turning of the hand crank. \_\_\_\_\_

### **NOTE**

Three-fourths turn of the hand crank corresponds to approximately 1% MG Set speed change.

- (7) Rotate the hand crank clockwise to lower speed or counterclockwise to raise speed as directed by control room personnel. \_\_\_\_\_
- (8) Screw out the two red thumbscrews on top of the motor drive to restore full brake tension. \_\_\_\_\_

## **9.0 SHIFTING RECIRC MG CONTROL FROM THE MG SET ROOM TO THE CONTROL ROOM**

- (1) Remove the hand crank from the motor drive shaft extension. \_\_\_\_\_
- (2) Verify the two red thumbscrews on top of the motor drive have been screwed out to restore brake tension. \_\_\_\_\_
- (3) Place the scoop tube positioner BRAKE circuit breaker to ON. \_\_\_\_\_
- (4) Close the hinged cover on the Scoop Tube positioner. \_\_\_\_\_
- (5) Reset the scoop tube lockout per Section 11.0. \_\_\_\_\_

## **10.0 RECIRC PUMP SEAL MAINTENANCE SUPPORT OPERATIONS**

### **10.1 DRAINING RECIRC PUMP 1P-201A[B]**

#### **NOTE**

This procedure addresses draining of a recirc loop between the pump suction and discharge valves.

- (1) Verify reactor coolant temperature less than 212°F. \_\_\_\_\_
- (2) Shut down A[B] MG Set and Recirc Pump per Section 5.1. \_\_\_\_\_
- (3) Verify closed A[B] PUMP MINI PURGE ISOL CV-1804A [B]. \_\_\_\_\_
- (4) Shut down the MG Set Lube Oil System per Section 5.2. \_\_\_\_\_
- (5) Verify the A[B] MG SET DRIVE MOTOR CIRCUIT BREAKER 1A104[204] is open and racked-out. \_\_\_\_\_
- (6) Close MO-4601[4602] A[B] RECIRC PUMP SUCTION by placing HS-4601[4602] on Panel 1C04 to the CLOSE position. \_\_\_\_\_
- (7) Close MO-4629[4630] A[B] RECIRC PUMP DISCH BYP by placing HS-4629[4630] on Panel 1C04 to the CLOSE position. \_\_\_\_\_

(8) Verify MO-4627[4628] A[B] RECIRC PUMP DISCHARGE closed at Panel 1C04.

(9) If required, manually seat the following valves to minimize leakage in accordance with IPOI 7, Special Operations:

<u>Valve</u>	<u>Description</u>
MO-4601[4602]	A[B] RECIRC PUMP SUCTION
MO-4629[4630]	A[B] RECIRC PUMP DISCH BYP
MO-4627[4628]	A[B] RECIRC PUMP DISCHARGE

(10) Verify that the Drywell Equipment and Floor Drain Sumps are operable per OI 920, Radwaste Sump System.

(11) Ensure drainage rate does not exceed sump pump capacity.

(12) Slowly open 1P-201A[B] Suction Drain Inboard and Outboard Isolations V-16-30[48] and V-16-85[49].

(13) When drain flow has essentially stopped, open 1P-201A[B] #1 Seal Cavity Vent Inboard and Outboard Isolations V-16-50[52] and V-16-51[53].

## **10.2 VENTING RECIRC PUMP MECHANICAL SEALS WITH THE DRYWELL ACCESSIBLE**

(1) Verify that RBCCW is in operation per OI 414 and if RBCCW has been secured, vent upper cooling water return line through the upper cooling water return line vent valves, V-16-0148[132].

(2) Verify A[B] Recirc Pump Mini-Purge in operation per Section 3.2.

(3) Remove the pipe cap downstream of Vent Valve V-16-51[53].

(4) Vent No. 1 seal cavity and Mini-Purge piping through V-16-50[52] and V-16-51[53].

(5) When all air is vented, close V-16-51[53].

**NOTE**

If not already activated, Step (6) will activate the "A"["B"] RECIRC PUMP SEAL STAGING HI/LO FLOW (1C04A, A-5[1C04B, A-2]) annunciator.

- (6) Close Mini-Purge Supply Valve V-17-84[80]. \_\_\_\_\_
- (7) Vent No. 1 seal cavity through V-16-51[53]. \_\_\_\_\_
- (8) When all air has been vented, close V-16-50[52] and V-16-51[53]. \_\_\_\_\_
- (9) Replace the pipe cap downstream of vent valve V-16-51[53]. \_\_\_\_\_
- (10) Open Mini-Purge Isolation Valve V-17-84[80]. \_\_\_\_\_
- (11) If activated by Step (6) , observe that the "A"["B"] RECIRC PUMP SEAL STAGING HI/LO FLOW (1C04A, A-5[1C04B, A-2]) annunciator resets. \_\_\_\_\_

**10.3 VENTING RECIRC PUMP MECHANICAL SEALS WITH THE DRYWELL INACCESSIBLE**

- (1) Verify A[B] Recirc Pump Mini-Purge in operation per Section 3.2. \_\_\_\_\_

**NOTE**

Due to the length of piping involved, the following steps may require an appreciable amount of time to complete.

- (2) Remove the pipe cap downstream of the drain valve for PT4607-V-71[PT4608-V-87] at Panel 1C57[58]. \_\_\_\_\_
- (3) Vent No. 1 seal cavity and Mini-Purge piping at 1C57[58] through PT4607-V-71 [PT4608-V-87]. Throttle flow as necessary to avoid isolation of XfV-4607[4608]. \_\_\_\_\_
- (4) Close Pressure Transmitter PT-4607[4608] Drain Valve PT4607-V-71[PT4608-V-87]. \_\_\_\_\_

**NOTE**

If not already activated, Step (5) will activate the "A"["B"] RECIRC PUMP SEAL STAGING HI/LO FLOW (1C04A, A-5[1C04B, A-2]) annunciator.

- (5) Close A[B] PUMP MINI PURGE ISOL CV-1804A[B] from Panel 1C04. \_\_\_\_\_
- (6) Vent No. 1 seal cavity at 1C57[58] through PT4607-V-71[PT4608-V-87].  
Throttle flow as necessary to avoid isolation of XFV-4607[4608]. \_\_\_\_\_
- (7) Close the drain valve for PT4607-V-71[PT4608-V-87] at 1C57[58]. \_\_\_\_\_
- (8) Replace the drain line pipe cap for PT4607-V-71[PT4608-V-87]. \_\_\_\_\_
- (9) Open A[B] PUMP MINI PURGE ISOL CV-1804A[B] from Panel 1C04. \_\_\_\_\_
- (10) If activated by Step (5), observe that the "A"["B"] RECIRC PUMP SEAL STAGING HI/LO FLOW (1C04A, A-5[1C04B, A-2]) annunciator resets. \_\_\_\_\_
- (11) At 1C57[58], remove the pipe cap downstream of PT4611-V-70 [PT4612-V-86] on the instrument line to PT-4611[4612]. \_\_\_\_\_
- (12) Vent No. 2 seal cavity through PT4611-V-70[PT4612-V-86]. Throttle flow as necessary to avoid isolation of XFV-4611[4612]. \_\_\_\_\_
- (13) Close PT4611-V-70[PT4612-V-86]. \_\_\_\_\_
- (14) Replace the pipe cap downstream of PT4611-V-70[PT4612-V-86]. \_\_\_\_\_
- (15) Verify 2 to 4 gpm Mini-Purge flow at FCV-1804A[B]. \_\_\_\_\_

## **11.0 SCOOP TUBE LOCKOUT OPERATIONS**

### **11.1 LOCKING THE RECIRC MG SET SCOOP TUBES**

#### **NOTE**

Operation with Scoop Tubes locked for one or both recirculation pumps will prevent the proper function of the protective runbacks.

- (1) If time allows:
  - (a) Record the values of "Percent Speed" (P), "Percent Speed Demand" (S) and "Percent Output" (X) from the Recirc MG Set Speed Controller SIC9245A[B] and millivolts on A[B] Recirc Speed Control output signal for the scoop tube to be locked. \_\_\_\_\_
- (2) Take A[B] Scoop Tube Control Handswitch B31A-S3A[S3B] to the "Locked" position. \_\_\_\_\_
- (3) Verify the amber light above A[B] Scoop Tube Control Handswitch B31A-S3A[S3B] is lit. \_\_\_\_\_
- (4) Verify "A"["B"] RECIRC MG SCOOP TUBE LOCK (1C04A, C-5[1C04B, C-2]) annunciator activated.. \_\_\_\_\_
- (5) Allow A[B] Scoop Tube Control Handswitch B31A-S3A[S3B] to spring return to "Norm". \_\_\_\_\_
- (6) Monitor Rx power, level and recirc flows and verify Reactor Recirc pump flows have stabilized. \_\_\_\_\_



## 11.2 RESETTING SCOOP TUBE LOCKOUT

### CAUTION

If Recirc MG speed becomes unstable during this procedure, immediately relock scoop tube by momentarily placing the A[B] SCOOP TUBE CONTROL hand switch on Panel 1C04 to the LOCKED position.

### NOTE

Any parameter (P, S, V or X) may be selected for digital display; however, controller adjustments using the control knob can only be made when Percent Speed Demand (S) is selected.

During a reset from a scoop tube lockout / deviation lockup condition, annunciator (1C08A C-8, [1C08A B-8]) inverter overload alarm may be received.

- (1) If A[B] Recirc MG is running with either a 20% or 45% Runback in effect, then perform ARP 1C04A, D-2 [D-8] prior to resetting the Scoop Tube Lockout.

- (2) If A[B] Recirc MG Set is running, reset the Scoop Tube Lockout as follows:

### NOTE

Concerning Percent Output (X):

- Percent Output (X) will integrate in the raise direction when  $(S) > (P)$  and in the lower direction when  $(S) < (P)$ .
- Only when (X) is at the approximate value of (S) will Deviation Meter SI-9247A[B] approach 0 (null).
- The rate of change of (X) will depend on the magnitude of the difference between (S) and (P). A 0.2 to 0.4 difference is adequate as the Deviation Meter begins to respond.

- (a) Start with Deviation Meter SI-9247A[B] indicating to the positive side of 0. If necessary, adjust Percent Speed Demand (S) to a value greater than Percent Speed (P) until a positive deviation is achieved.
- (b) Adjust Percent Speed Demand (S) to a value less than Percent Speed (P).

(c) Monitor the Percent Output (X) on the digital display. Confirm that the value of (X) is lowering. \_\_\_\_\_

(d) When the indicator on the Deviation Meter starts to respond, verify that it is moving slowly. If the deviation indicator is moving too rapidly, return to step (a) above and use a smaller difference between (S) and (P). \_\_\_\_\_

(e) When the indication on the Deviation Meter approaches 0, match or minimize the difference between (S) and (P) to slow the rate of change in Percent Output (X). \_\_\_\_\_

**NOTE**

If the percent output (X) is greater than percent speed (P) when the scoop tube is reset, a deviation lock-up may occur.

(f) When the indication on the Deviation Meter is at 0, reset the scoop tube by momentarily placing A[B] SCOOP TUBE CONTROL handswitch B31A-S3A[B] on Panel 1C04 in the RESET position. \_\_\_\_\_

(g) Confirm that the amber SCOOP TUBE LOCKED LIGHT is out. \_\_\_\_\_

(h) Confirm that the "A"["B"] RECIRC MG SCOOP TUBE LOCK, 1C04A, C-5 [1C04B, C-2] annunciator resets. \_\_\_\_\_

(i) Verify that the Recirc pump speed is stable by observing the following parameters: \_\_\_\_\_

- Percent Speed Demand (S)
- Percent Speed (P)
- Recirc pump discharge flow
- Total core flow
- Core pressure drop
- APRM readings

(j) Verify that Percent Speed Demand (S) is selected for digital display. \_\_\_\_\_

(3) If A[B] RECIRC MG is secured:

(a) Verify that the following annunciators are reset: \_\_\_\_\_

"A"["B"] RECIRC GENERATOR LOCKOUT (1C04A, A-1[7])

"A"["B"] RECIRC MG FLUID DRIVE OIL HI TEMP (1C04A, B-3[9])

"A"["B"] RECIRC GENERATOR AUX LOCKOUT RELAY TRIP (1C04A, C-1[7])

"A"["B"] RECIRC MG SPEED CONTROLLER OR LOSS OF FEED BACK FAILURE  
(1C04A, D-1[7])

"A"["B"] RECIRC MG FLUID DRIVE OIL LO PRESSURE (1C04A, D-3[9])

(b) Momentarily place the A[B] SCOOP TUBE CONTROL hand switch on  
Panel 1C04 to the RESET position. \_\_\_\_\_

(c) Confirm amber SCOOP TUBE LOCKED Light out. \_\_\_\_\_

(d) Observe that the "A"["B"] RECIRC MG SCOOP TUBE LOCK  
(1C04A, C-5 [1C04B, C-2]) annunciator resets. \_\_\_\_\_

(e) Proceed to Section 3.3 when ready to restart MG Set A[B]. \_\_\_\_\_

## **12.0 RECIRC PUMP OPERATION ABOVE 20% SPEED WITH PLANT SHUTDOWN**

### **CAUTION**

Do not operate recirc pumps unless all the vessel internals are adequately supported. Proper support consists of fuel assemblies or blade guides on all sides of the nuclear instruments (SRM, IRM, and LPRM/TIP assemblies).

Recirc pump speeds should be limited to 80% to ensure that the core volumetric flow does not exceed 100%.

During two pump operation above 20% speed, if one pump trips, immediately trip or runback the running pump to minimum speed in order to avoid cavitation.

Do not exceed a core plate D/P of 25 PSID.

(1) Verify all the reactor internals are fully supported. \_\_\_\_\_

- (2) Start the A and B Recirc pumps per section 3.3. When operating recirc above 20% it is preferred to operate both loops, however, one pump can be operated by itself, but NPSH/ cavitation limits will occur at a lower pump speed.
- (3) Install the following jumpers in 1C-18 per the Temp. Mod. process. These jumpers will remove the 20% total feedwater flow input requirement from the 20% recirc runback circuitry. The recirc discharge valve not full open 20% runback will remain in effect.
- (a) In 1C-18, install jumper from AA-56 to AA-63.
- (b) In 1C-18, install jumper from AA-69 to AA-75.
- (4) Activate special log "RECIRC LOG FOR > 20% SPEED IN SHUTDOWN" on the Process Computer per OI 831.4 or monitor the computer points shown on the following note.

**NOTE**

Special Log "RECIRC" should include the following data points:

<u>Point ID</u>	<u>Description</u>	
B012	REACTOR TOTAL CORE FLOW	M#/H
B013	REACTOR CORE PRESS-DIFF	DPSI
B019	RECIRC PUMP MTR A POWER	MW
B020	RECIRC PUMP MTR B POWER	MW
B026	RECIRC LOOP A1 DRV FLOW	M#/H
B027	RECIRC LOOP A2 DRV FLOW	M#/H
B028	RECIRC LOOP B1 DRV FLOW	M#/H
B029	RECIRC LOOP B2 DRV FLOW	M#/H
B038	RECIRC A WIDE RANGE TEMP	DEGF
B039	RECIRC A WIDE RANGE TEMP	DEGF
B061	RCT JET PMPS 9-16 FLOW A	M#/H
B062	RCT JET PMPS 1-8 FLOW B	M#/H

**NOTE**

**NPSH**

Insufficient NPSH in either the Recirc Pumps or the Jet Pumps will cause cavitation.

- Reduce speed if cavitation noise occurs.
- Reduce speed if excessive vibrations occur.
- Reduce speed if a proportional raise in recirc pump flow does not occur along with pump speed raising.
- Reduce speed if an excessive raising in jet pump flow noise occurs.

In general, the maximum allowed speed is 5% speed below the point where cavitation was observed.

**NOTE**

**BLADE GUIDE LIFT**

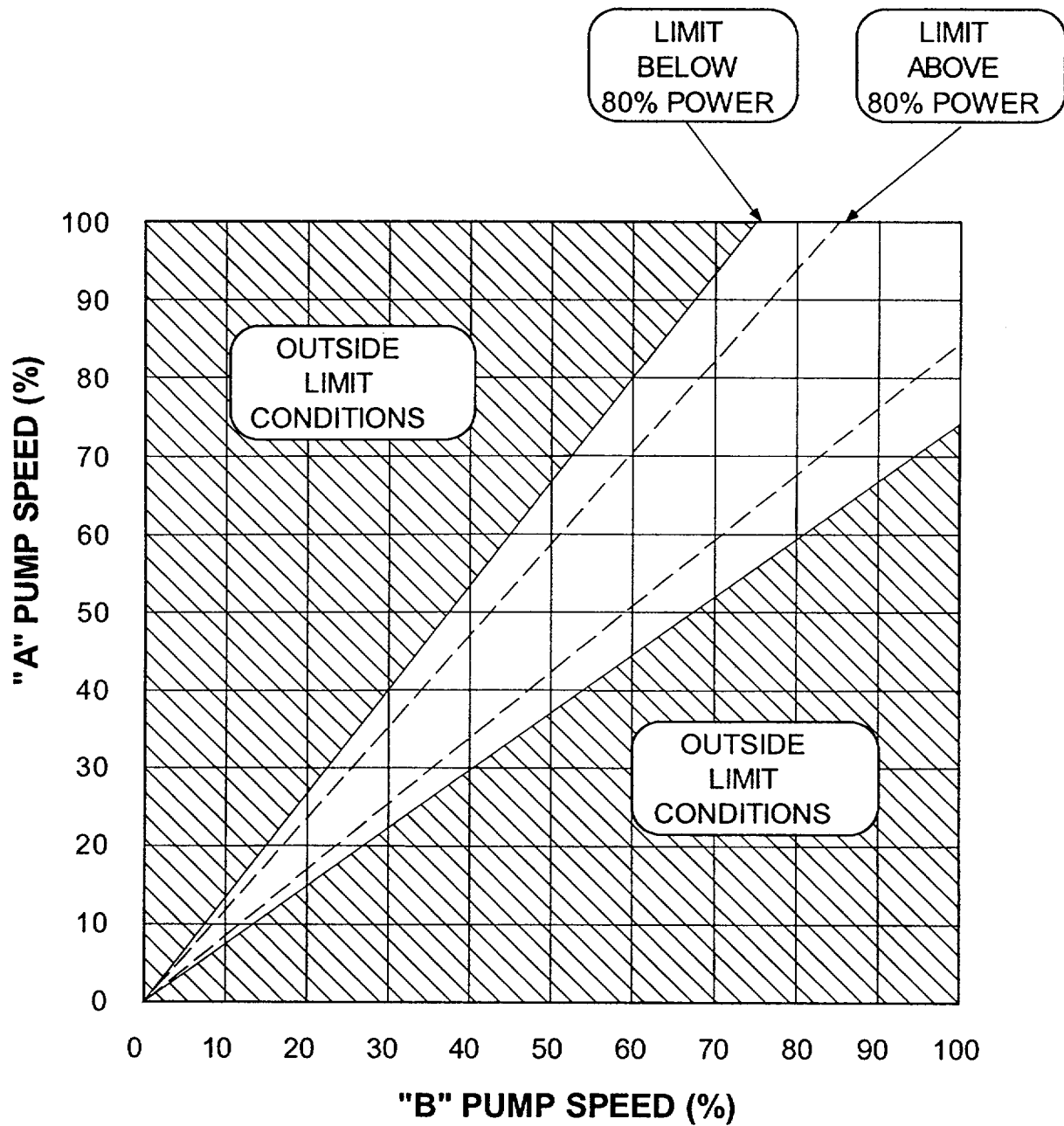
Blade Guides will lift if the core plate D/P is high enough. This condition is indicated by a relatively higher noise level of the core plate D/P, jet pump total developed head (PDI-4567) and single tap jet pump instruments (all of these are connected to the lower plenum pressure tap). The maximum speed is inversely proportional to the number of blade guides installed. The higher the number of blade guides the lower the speed at which lift will occur.

- (5) Raise recirc pump speeds slowly and symmetrically, keeping loop flows as balanced as possible, to obtain the desired heatup rate. Do not exceed a mismatch in pump speeds > 10%. \_\_\_\_\_
- (6) Monitor Core Flow, Core Plate D/P on 1C-05; Recirc Pump Flows, Recirc Pump D/P and Jet Pump Flows on 1C-04; and individual jet pump flows and total jet pump developed head at 1C-38 for signs of cavitation. \_\_\_\_\_
- (7) When operation above 20% speed is no longer desired, reduce recirc pump speeds to minimum. \_\_\_\_\_
- (8) Deactivate the special log initiated earlier. \_\_\_\_\_
- (9) Remove jumpers installed to defeat the 20% feedwater flow interlock. \_\_\_\_\_

### **13.0 REFERENCES**

- (1) DAEC Technical Specifications
- (2) Updated Final Safety Analysis Report, Duane Arnold Energy Center, Section 5.4
- (3) Operating Instructions: OI-255, OI-414, OI-518.1, OI-831
- (4) STPs 3.4.9-03, 3.4.1-01, 3.4.1-02, 3.4.2-03, 3.3.1.1-32, 3.3.1.1-33
- (5) Reactor Recirculation System, P and ID No. 7884-M-116
- (6) Control Rod Drive Hydraulic System, Sheet 1, P and ID No. 7884-M-117
- (7) Elementary Diagram, Reactor Recirculation Pump and MG Set, Bechtel VPCR No. 7884-APED-B31-16, Sheets 1 through 9
- (8) Reactor Control Systems, Bechtel VPCR No. 7884-E-120, Sheets 2, 2A, 3, 3A, 4, 5, 5A, 6, 7, 7A, 8 and 9
- (9) Reactor Recirculation System, GEK No. 16641
- (10) DCPs 1320, 1366, 1408, 1449, 1450, 1451, 1547, 1548
- (11) MM-134, MM-133
- (12) Commitment AI 8152 per DAEC Letter DAEC-88-0778
- (13) Commitment 860361 per GE SIL 409/406
- (14) T.S. Amendment #183, 193, 203, 215, 216, 223
- (15) DAEC Commitment 920202
- (16) EMA A11232, EMA A31937
- (17) Commitment Control Item 930161
- (18) GE Memo REK 95-10, from R.E. Kingston to R.A. Browning, 6-2-95, "Transmittal of Additional Transient Analysis Domains Results"
- (19) AR 961109.01, AR 12029, AR 17803
- (20) NG-96-2319, Dated 10-29-96, "Criteria For Detection of Reactor Instability".
- (21) DDC 3323 , DDC 3634, DDC 4018
- (22) {C001} AR97-0051.23, Agency Commitment C
- (23) EMA A32678
- (24) AR 21543

# **APPENDIX 1** **RECIRC PUMP SPEED MISMATCH OPERATING LIMITS**



**DUANE ARNOLD ENERGY CENTER**

**JOB PERFORMANCE MEASURE**

**NUMBER 264000-08**

**Task Number: NSPEO 26.05**

**TITLE: Return the SBDG to a Standby Readiness Condition  
(Alternate Path = Starting Diesel Air Compressor)**

**Rev. 3**

DEVELOPED BY:	<u>Michael Fisher</u>	<u>3/23/2001</u>
	Instructor	Date
VALIDATED BY:	<u>[Signature]</u>	<u>3/30/01</u>
	SME/Instructor	Date
REVIEWED BY:	<u>Paul Hansen</u>	<u>3.30.2001</u>
	Plant Reviewer	Date
APPROVED BY:	<u>[Signature]</u>	<u>4/2/01</u>
	Training Supervisor-Operations	Date



# DUANE ARNOLD ENERGY CENTER

## JOB PERFORMANCE MEASURE

<b>JPM No.</b> 264000-08	<b>JPM Description:</b> Return the SBDG to a standby readiness condition. (Alternate path = starting diesel air compressor.)		
<b>Task No.</b> NSPEO 26.05	<b>Task Description:</b> Assist with diesel generator operability test.		
<b>K/A Reference:</b> 264000	2.1.30 (3.9/3.4)		
APPLICABLE METHOD OF TESTING: SRO/RO			
Simulate Performance	X	Actual Performance	
Simulator	In-Plant	X	Control Room
Time for Completion: 15 minutes			

## JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

### NOTE

All steps of this checklist should be performed upon initial validation. Prior to JPM usage, revalidate JPM using steps 7 through 10.

JPM No. 264000-08 JPM Title Return the SBDG to a standby readiness condition. (Alternate parth = starting diesel air compressor)

- ☒ 1. Task description and number, JPM description and number are identified
- ☒ 2. Task elements identified and K/A references are included
- ☒ 3. Performance location specified
  - in-plant
  - control room
  - simulator
- ☒ 4. Initial conditions and cues identified
  - setup, required materials, and procedure
  - malfunctions and instructor actions
  - initiating and terminating cues
- ☒ 5. Task standards identified and verified by SME review
- ☒ 6. Critical tasks/steps identified meet criteria and identified with a "C"
- ☒ 7. Verify JPM steps fit the most current procedures
  - Procedure Rev. SD Date 2/23/01
- ☒ 8. Pilot test JPM
  - verify cues both verbal and visual are free of conflict
  - ensure performance time is accurate
- 9. If the JPM cannot be performed as written with proper responses, then revise the JPM
- 10. When JPM is revalidated, SME/Instructor signs and dates JPM

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

JPM 264000-08  
Rev. 3

**SIMULATOR SETUP:** N/A

**EVENT TRIGGERS:** None

**MALFUNCTIONS:** None

**OVERRIDES:** None

**REMOTE FUNCTIONS:** None

**INSTRUCTOR ACTIONS:**

1. Note any discrepancies in the comments section for any misperformed steps.
2. Read initial conditions and initiating cues to the operator.

**TASK STANDARDS:**

1. Overspeed trip lever tripped (simulated).
2. Close V-32-0109 (simulated).
3. Override SV-3262B and admit starting air to 1G-21 (simulated).
4. Open then close V-32-110 (simulated).
5. Open V-32-0109 (simulated).
6. Reset overspeed trip lever (simulated).
7. Reset alarms on 1C92 (simulated).
8. Reset alarms on 1C94 (simulated).
9. Start diesel air compressor (simulated).

**REQUIRED MATERIALS:**

OI 324  
ARP 1C94

**GENERAL REFERENCES:**

OI 324, Rev. 50  
ARP 1C94, C-2, Rev. 7

JPM 264000-08  
Rev. 3

**Read to the operator the following information:**

**INITIAL CONDITIONS:**

1. 1G-21 SBDG was shutdown 45 minutes ago following an auto start due to a lightning strike at DAEC.
2. You are an additional Licensed Operator assigned to the Work Control Center.

**INITIATING CUES:**

The OSS directs you to return 1G-21 to the standby readiness condition IAW OI 324 in the SBDG room.

**This task is not time critical.**

**Inform the evaluator when you have completed the task.**

## PERFORMANCE INFORMATION

### NOTE:

Critical steps are denoted with a "C". Failure to meet the standard for this step constitutes failure.

Time Start \_\_\_\_\_

PERFORMANCE STEP: Critical:	Place the droop switch HS-3234B, on panel 1C-94 in the UNIT position.
STANDARD:	Operator simulates placing droop switch on Panel 1C-94 in UNIT position.
COMMENTS:	
NOTE: No action should be required since the SBDG auto started and droop switch was not repositioned.	

PERFORMANCE STEP: Critical:	Secure ESW pump 1P-99B.
STANDARD:	Operator simulates requesting the control room to secure "B" ESW pump 1P-99B.
COMMENTS:	
Cue: Acknowledge request from operator and report back when complete.	

PERFORMANCE STEP: Critical:	At 1A411, verify Diesel Generator Lockout relay 186-DG2 is reset.
STANDARD:	Operator verifies Diesel Generator Lockout relay 186-DG2 is reset.
COMMENTS:	
Cue: Inform operator that the lockout relay has been verified to be reset.	

PERFORMANCE STEP: Critical:	Adjust the Woodward governor.
STANDARD:	Operator simulates placing droop setting at 0. Fuel control at "Max" and speed control at "18.25".
COMMENTS:	
NOTE: This step is not required since the SBDG was not slow started. The operator may verify the correct settings.	

PERFORMANCE STEP: Critical: C	Operator trips injection pump control racks by depressing the emergency stop pushbutton (overspeed trip) at the engine.
STANDARD:	Operator simulates depressing the emergency stop pushbutton (overspeed trip).
COMMENTS:  Cue: Inform the operator that he hears a "clunk" as the fuel racks move forward (towards generator end) when the emergency stop pushbutton was depressed.	

PERFORMANCE STEP: Critical: C	Confirm annunciator 1C-94 A-1 ENGINE OVERSPEED has annunciated.
STANDARD:	Operator verifies annunciator alarming.
COMMENTS:  Cue: Inform the operator that annunciator 1C94, A-1, engine overspeed annunciator is flashing.	

PERFORMANCE STEP: Critical: C	Close the air isolation to oil booster tanks valve V-32-0109.
STANDARD:	Operator closing the air isolation to oil booster tanks valve V-32-0109.
COMMENTS:  Cue: Inform the operator that the valve handle is perpendicular to the air line.	

PERFORMANCE STEP: Critical: C	Using the manual override of the normal air start solenoid SV-3262B, admit starting air to "B" diesel generator 1G-21 for 1 to 3 seconds.
STANDARD:	Operator simulates overriding SV-3262B, admitting starting air to "B" diesel generator 1G-21 for 1 to 3 seconds.
COMMENTS: Note: The candidate will have to climb under the grating.  Cue: Inform the operator 1G-21 has rotated one revolution after they simulate overriding the solenoid.	

PERFORMANCE STEP: Critical: C	Vent air on the line to the bearing oil boosters by opening and closing the "B" SBDG air start header vent V-32-110, close vent valve.
STANDARD:	Operator simulates venting air on the line to the bearing oil boosters by opening and closing the "B" SBDG air start header vent V-32-110.
COMMENTS: Cue: Inform the candidate that he hears air venting.  Cue: Inform operator that a health physics person has surveyed the tools prior to bringing them into the diesel generator room.	

PERFORMANCE STEP: Critical: C	Open the air isolation to oil booster tanks valve V-32-0109.
STANDARD:	Operator simulates opening the air isolation to oil booster tanks valve V-32-0109.
COMMENTS:  Cue: Inform the operator that the valve handle is in line with the air line.	

PERFORMANCE STEP: Critical: C	Reset the overspeed trip using the reset lever as follows:  1. Take the reset lever to the reset position, i.e., opposite of generator end (feel the latch drop in place, hear a click).  2. Slowly take the reset lever to the reset position to verify the latch is holding the plunger.
STANDARD:	Operator simulates resetting the overspeed trip using the reset lever as follows:  1. Take the reset lever to the reset position, i.e., opposite of generator end (feel the latch drop in place, hear a click).  2. Slowly take the reset lever to the reset position to verify the latch is holding the plunger.
COMMENTS:  Cue: Inform the operator that the Overspeed Trip lever is reset.	

PERFORMANCE STEP: Critical: C	Depress alarm reset pushbutton HS-3253B, on 1C-92.
STANDARD:	Operator simulates depressing alarm reset pushbutton on 1C-92.
COMMENTS:  Cue: Alarm pushbutton moves in.	

PERFORMANCE STEP: Critical:	Confirm engine overspeed annunciator is reset at 1C94 A-1.
STANDARD:	Operator confirms engine overspeed annunciator is reset at 1C94 A-1.
COMMENTS:  Cue: Inform the operator the engine overspeed annunciator 1C94, A-1, is flashing slowly, if asked about other annunciators inform the operator C-2 and D-4 are flashing fast.	

PERFORMANCE STEP: Critical:	Verify diesel oil storage tank 1T-35 level on LIS-3201 greater than 36,317 gallons.
STANDARD:	Operator verifies diesel oil storage tank 1T-35 level on LIS-3201 greater than 36,217 gallons.
COMMENTS:  Cue: Inform the operator that the Aux Operator will check the level on their rounds.	

PERFORMANCE STEP: Critical: C	Reset all annunciator alarms on 1C94.
STANDARD:	Operator simulates resetting all annunciator alarms on 1C94.
COMMENTS:  <u>Instructor will point to each annunciator window.</u> Cue: Inform the operator that annunciator window C-2 did not reset.	

PERFORMANCE STEP: Critical:	Operator goes to 1C92 to verify air pressures.
STANDARD:	Operator confirms the low pressure for the 1K-10D diesel air compressor.
COMMENTS:  Cue: Inform the operator that PI-3253B (AC air comp) indicates as you see it and PI-3256B (diesel air comp) indicates 175 psig.	

PERFORMANCE STEP: Critical:	Operator notifies the control room of the low air pressure and the affected system.
STANDARD:	Operator simulates using a radio or goes to a page system and notifies the control room of the low pressure.
COMMENTS:  Note: Acknowledge communications as the control room operator.	



PERFORMANCE STEP: Critical: C	Operator starts 1K-10D
STANDARD:	a) Ensuring clutch is disengaged. b) Depress and hold down TATTLETALE BUTTON. Press down START SWITCH and release when engine starts. c) When engine is running, release TATTLETALE BUTTON. d) Engage clutch to start compressor.
COMMENTS: This start procedure is found in section 3.0, "Placing the SBDG in STBY/Readiness Condition", and in the ARP.  Cue: When the START SWITCH has been simulated released, inform the operator that the diesel air compressor has started and is running OK.	

PERFORMANCE STEP: Critical:	The operator verifies that 1K10D trips at ≈225 to 240 psig.
STANDARD:	The operator simulates observing PI-3256B pressure increasing and verifies that 1K-10D trips.
COMMENTS:  Cue: Inform the operator that PI-3256B pressure is increasing and that a 20 minute time lapse has occurred and the air compressor tripped at 232 psig.	

PERFORMANCE STEP: Critical:	Complete the SBDG standby/readiness checklist, Attachment 10. Notify OSS of out of spec.
STANDARD:	Operator completes the SBDG standby/readiness checklist, Attachment 10. Notify OSS of out of spec.
COMMENTS:  Cue: Inform the operator that the Aux Operator has completed the attachment.	

Time Stop \_\_\_\_\_

**TERMINATING CUES:** 'B' SBDG 1G-21 is in standby readiness condition and 1K-10D is shutdown.

## VERIFICATION OF COMPLETION

JPM No.: 264000-08 JPM Description: Return the SBDG to a standby readiness condition. (Alternate path = starting diesel air compressor)

Operator: \_\_\_\_\_ Evaluator: \_\_\_\_\_

Licensee: ☐ RO ☐ SRO ☐ SRO Cert  
☐ STA ☐ NSPEO

Result: ☐ SATISFACTORY ☐ UNSATISFACTORY

**COMMENTS/FEEDBACK:** (Note any trainee discrepancies or misperformed steps.)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

**Evaluator's Signature**

Date \_\_\_\_\_

JPM 264000-08  
Rev. 3

# OPERATING INSTRUCTION

OI 324

## STANDBY DIESEL GENERATOR SYSTEM

Effective Date: FEB 23 2001

### TECHNICAL REVIEW

Prepared by: Patricia Vandenberg Date: 01/10/01

Validated by: Thomas V. Robinson Date: 1-19-01  
Operations

Verified by: [Signature] Date: 2/19/01  
System Engineer

Reviewed by: McMurry Fox Date: 2/21/2001  
Operations Committee

### PROCEDURE APPROVAL

I am responsible for the technical content of this procedure.

Approved by  
Procedure Owner: WS Run Date: 1-20-01  
Operations

Approved by: [Signature] Date: 2/21/01  
Plant Manager, Nuclear

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## **1.0 PURPOSE**

To provide detailed instructions to the plant operating personnel for proper operation of the Standby Diesel Generator (SBDG) System.

## **2.0 PRECAUTIONS AND LIMITATIONS**

- (1) Operation of the Prelube Pump without performing an engine start will cause oil to collect in the over-piston area. If oil is left in the over-piston area for a significant amount of time (12 to 24 hours) it will drain past the rings and, depending on crankshaft position, could fill the combustion chamber and hydraulically lock the engine on a start signal. Rotating (barring) the engine manually or with air per Section 7.2 will clear the oil from the over-piston area. If the engine is rotated with air longer than noted in Section 7.2 the engine driven lube oil pump will refill the upper lube oil header requiring a second barring evolution.
- (2) If standby lube oil temperature falls below 105°F and the standby lube oil pump 1G031/LOP (1G021/LOP) is running oil will be supplied to the upper lube oil header and fill the over-piston area. Then engine must be barred over one revolution every 15 minutes until lube oil temperature is greater than 125°F. (NG-94-2492, AR 21697)
- (3) If the diesel starts automatically on a LOOP or LOCA, all automatic shutdowns become inoperative except engine overspeed and generator lockout for as long as the automatic start initiation signal is present.
- (4) To stop the diesel with an automatic start signal present, place A[B] DIESEL GENERATOR 1G-31[21] CONTROL handswitch at 1C08 in PULL-TO-LOCK after receiving annunciator (1C08A, A-10 [1C08B, A-3]) "A"["B"] DIESEL GEN 1G-31[21] RUNNING. {C001}
- (5) If the diesel is placed in PULL-TO-LOCK when required to be operable, enter the appropriate Limiting Condition for Operation per Tech. Specs.

- (6) Loss of (or low) jacket coolant flow can cause erroneous jacket coolant temperature readings due to no flow past the temperature sensors. This can result in a loss of automatic temperature protection.
- (7) High crankcase pressure indicates the possible existence of an explosive gas mixture. The diesel should not be run in this condition unless an emergency exists. If operation is necessary with high crankcase pressure, the operator should take additional precautions to protect himself from injury due to possible crankcase explosion. Before performing maintenance on a diesel that has been shut down due to high crankcase pressure, ensure that the diesel has thoroughly cooled.
- (8) A time delay relay prohibits restarting of the electric lube oil pump for 10 minutes after the generator has been shut down. This delay allows the lube oil to drain from the upper crank line to prevent overfilling.
- (9) Diesel engine exhaust temperature shall not exceed 1100°F.
- (10) Exhaust temperature variation between cylinders shall not exceed 250°F at full load. Excessive exhaust differential temperatures indicates an instrumentation or engine-operation malfunction. If excessive differential temperatures are noted, a detailed inspection shall be performed to determine and correct the malfunction. A differential temperature of greater than 250°F has been identified between cylinders #6 and #7 of 1G-31. This condition has been determined not to affect 1G-31 operability. (NG-93-4271)
- (11) Prior to performing maintenance on the diesel engine, ensure that the starting air system is isolated.
- (12) The reactor shall not be made critical unless two diesel generators are operable and there is a minimum of 36,317 gal ( $\geq 10'-1/4"$ ) of diesel fuel in the diesel fuel oil tank. (NG-91-2655)
- (13) A diesel generator is operable as long as one of the three air start receivers is pressurized to  $> 75$  psig. However, per T.S. 3.8.3 if none of the three receivers is pressurized to  $\geq 150$  psig, then 48 hours is allowed to pressurize at least one receiver to  $\geq 150$  psig or the Diesel Generator must be declared inoperable.

- (14) In standby readiness conditions, the Standby Diesel Generators (SBDGs) shall be declared inoperable due to low lube oil or jacket coolant temperatures at the alarm limits. The low lube oil temperature alarm is 105°F and the low jacket coolant temperature is 90°F. (Reference NG-91-0472)
- (15) Avoid prolonged periods of operation at less than 25% load to avoid buildup of incomplete combustion products in the exhaust lines (engine souping), with the possibility of fire upon return to full load.
- (16) Turbocharger inlet temperature should not exceed 1200°F.
- (17) Any time a Diesel Generator is operated loaded for operability, it should be run a minimum of two hours at normal full load prior to shutdown to allow generator stator winding temperatures to stabilize at full load temperature. (NG-94-2492)
- (18) Trip the Diesel Generator output breaker prior to tripping the diesel engine, to prevent motorizing the diesel if paralleled with another source.
- (19) Exercise extreme caution when placing additional loads on an essential bus whose only supply is the SBDG.
- (20) Stop one RHR Pump before starting a second RHR Service Water on an essential bus whose only supply is the SBDG.
- (21) For normal operation of the SBDG, use 0.9 pf nomograph. For surveillance test, use the 0.8 pf nomograph.
- (22) Do not operate the Fuel Oil Transfer Pumps (1P-44A/B) with diesel fuel oil level in 1T-35 less than 3'9" without OSS permission. If 1P-44A or B are operated under these conditions, either pump motor amps or discharge pressure should be monitored for signs of cavitation.
- (23) During a fast transfer of the essential buses, a diesel start may occur if the bus is not heavily loaded.



(24) The following precautions should be taken when transferring diesel fuel from the Aux. Boiler Room to the "B" Diesel Generator Day Tank Room through the wall penetration:

- (a) Install fire pillows in wall penetration with transfer hose. Reference ACP 1412.4
- (b) During the transfer process, the transfer hose and connections should be checked frequently (at least hourly) to assure that fuel leaks have not developed which could result in fuel pooling in either room.

### **3.0 PLACING THE SBDG SYSTEM IN STANDBY/READINESS CONDITION**

#### **NOTE**

The instructions of this procedure refer to components of the 1G-31 Standby Diesel Generator (SBDG) System with components of the 1G-21 SBDG System shown in brackets.

Both Standby Diesel Generators shall be operable before the reactor is made critical. The standby generators are placed in a Standby/Readiness Condition before reactor startup and remain in the Standby Mode during normal plant operation.

- (1) Verify that the Emergency Service Water System is OPERABLE. \_\_\_\_\_
- (2) Verify that Diesel Oil Storage Tank 1T-35 contains at least 36,317 gallons ( $\geq 10'-1/4"$ ) of fuel oil as indicated on local level Indicator LIS-3201. \_\_\_\_\_
- (3) Verify the Condensate and Demin. Water System is operational. \_\_\_\_\_
- (4) Verify that SBDG 1G-31 [1G-21] room ventilation is lined up in accordance with OI 733. \_\_\_\_\_
- (5) Complete the SBDG System Electrical Lineup for 1G-31 - OI 324A1 (Attachment 1), [1G-21 - OI 324A2 (Attachment 2)]. \_\_\_\_\_
- (6) Complete the SBDG System Valve Lineup and Checklist for 1G-31 - OI 324A3 (Attachments 3 & 5) [1G-21 - OI 324A4 (Attachments 4 & 6)]. \_\_\_\_\_

- (7) Complete the SBDG System Control Panel Lineup for 1G-31 – OI 324A7 (Attachment 7) [1G-21 - OI 324A8 (Attachment 8)].
- (8) Verify that 1G-31 [1G-21] crankcase oil level is between ADD and 4" above the full mark on the dip stick.
- (9) Verify that the Auto Lube Oil Makeup Tank 1T-114A[B] level is normal by observing that the LUBE OIL MAKEUP TANK LEVEL LO-LO and LUBE OIL MAKEUP TANK LO LEVEL annunciators are reset on Panel 1C93 [1C94].
- (10) Verify that Fuel Oil Day Tank 1T-37A[B] level is normal by observing that LIS-3207 [LIS-3209] indicates greater than or equal to 50 in. of fuel oil.
- (11) Verify that Jacket Water Expansion Tank 1T-113A[B] level is between 1/4 and 3/4 as indicated on LG-3239A[B].
- (12) Verify that 1G-31 [1G-21] governor oil level is between the two scribed marks on the local gauge glass.
- (13) Verify that the oil level on Starting Air Compressor 1K-10A[B] (motor-driven) is between the two marks on the local dip stick.
- (14) Verify the following for the diesel-driven Starting Air Compressor 1K-10C[D]:
- (a) Diesel engine lube oil level between the F and L marks on the local dip stick.
  - (b) Compressor lube oil is between the two marks on the local dip stick.
  - (c) Fuel tank is topped off.
  - (d) Starting air pressure (diesel-driven) is 180-240 psig as indicated on PI-3256A[B] on Panel 1C91[1C92]. If not, start the Diesel-Driven Starting Air Compressor 1K-10C[D] as follows:
    - 1. Ensure clutch is disengaged.

**NOTE**

Engine will not start with clutch engaged.

2. Depress and hold down tattletale button. Press down start switch and release when engine starts. \_\_\_\_\_
3. When engine is running, release tattletale button. \_\_\_\_\_
4. Engage clutch to start air compressor. \_\_\_\_\_
5. Observe that compressor 1K010C[1K010D] trips at approximately 225-240 psig. \_\_\_\_\_
- (15) Start the 1G-31 [1G-21] Day Tank Room Exhaust Fan 1V-EF-61 [1V-EF-63] by placing the local handswitch timer HS-7028 [HS-7029] to 60 min. to exhaust the Day Tank Room of fuel and lube oil vapors. \_\_\_\_\_
- (16) Verify that starting air pressure (electric motor-driven) for 1G-31 [1G-21] is 200-230 psig by observing PI-3253A[B] on Panel 1C91 [1C92]. \_\_\_\_\_
- (17) Observe that lube oil temperature stabilizes at 120-140°F as indicated on local Temperature Indicator TI-3278A[B] near the lube oil circulating pump. \_\_\_\_\_
- (18) Observe that cooling water temperature stabilizes at 100-120°F as indicated on the JACKET COOLANT TEMPERATURE TI-3258A[B] meter on Panel 1C91 [1C92]. \_\_\_\_\_
- (19) Verify that the Lube Oil Circulating Pump and Coolant Circulation Pump are both running. \_\_\_\_\_
- (20) Verify that the generator bearing oil level is at the scribe mark on the sight glass. \_\_\_\_\_
- (21) Check that the Air Intake Filter is in place and not excessively dirty. \_\_\_\_\_
- (22) On Diesel Engine, verify Overspeed Trip is RESET. \_\_\_\_\_

- (23) On Panel 1C93 [1C94], verify that the annunciators are functional by pressing the ANNUNCIATOR TEST pushbutton. Reset the annunciators by pressing the ANNUNCIATOR SILENCE pushbutton. \_\_\_\_\_
- (24) Verify that all Standby Diesel Generator System 1G-31 [1G-21] annunciators are reset on Panel 1C08A[B]. \_\_\_\_\_
- (25) Verify A[B] DIESEL GENERATOR 1G-31[21] CONTROL handswitch HS-3231A[B] on Panel 1C08 in the AUTO position. \_\_\_\_\_
- (26) Verify that A[B] DIESEL GENERATOR 1G-31[1G-21] STOP RELAY RESET light on Panel 1C08 is ON. If it is not ON, reset alarms on Panel 1C91 [1C92] by depressing the ALARM RESET pushbutton HS-3253A[B] on Panel 1C91 [1C92]. After about one minute, observe that the A[B] DIESEL GENERATOR 1G-31[1G-21] STOP RELAY RESET light is ON. \_\_\_\_\_
- (27) Verify STP 3.8.1-04, 3.8.1-05, or 3.8.1-06 has been completed to ensure operability of A[B] DIESEL GENERATOR 1G-31[1G-21]. \_\_\_\_\_

#### **4.0 AUTOMATIC STARTUP OF THE SBDG SYSTEM**

- (1) Immediately following an automatic start, perform the following on Panel 1C08:
- (a) Adjust A[B] DIESEL GENERATOR 1G-31[1G-21] VOLTAGE ADJUST control to maintain A[B] DIESEL GENERATOR 1G-31[1G-21] VOLTS meter at approximately 4160 volts. \_\_\_\_\_
- (b) Adjust A[B] DIESEL GENERATOR 1G-31[1G-21] SPEED ADJUST control to maintain A[B] DIESEL GENERATOR 1G-31[1G-21] FREQUENCY meter at 60 hertz. \_\_\_\_\_

##### **NOTE**

Frequency and voltage may both vary as loads are automatically started.

### **CAUTION**

Only one supply breaker to a 4160V essential bus should be closed at any time except when transferring power sources or periodically testing the standby diesel generators.

Under normal conditions, do not exceed 2850 KW at 0.9 power factor on either diesel generator.

- (2) Verify that DIESEL GEN RM VENT 1V-SF-20 [1V-SF-21] fan is running by observing that its red indicating light on Panel 1C23 is ON. \_\_\_\_\_
- (3) Verify that EMERG SERV WATER PUMP 1P-99A[B] is running per OI 454. \_\_\_\_\_
- (4) As soon as plant conditions permit after automatic startup, complete the SBDG Operating Checklist OI 324A9 (Attachment 9). For prolonged operation, repeat the SBDG Operating Checklist OI 324A9 (Attachment 9) every 4 hours. \_\_\_\_\_

## **5.0 MANUAL STARTUP AND LOADING OF THE SBDG SYSTEM**

### **5.1 SLOW MANUAL STARTUP OF THE SBDG SYSTEM**

- (1) Start Emergency Service Water Pump 1P-99A[B] per OI 454. \_\_\_\_\_
- (2) If starting the standby diesel generator(s) from the Control Room on Panel 1C08:

### **CAUTION**

Operation of the Prelube Pump without performing an engine start will cause oil to collect in the over-piston area. (Ref. P&L #1)

- (a) Set Prelube Timer KS-3238A[B] to 2.0 minutes. \_\_\_\_\_

### **NOTE**

Placing the Woodward Governor SPEED knob to "0" renders the associated Diesel Generator INOPERABLE. Ensure the requirements of DAEC Technical Specifications 3.8.1 or 3.8.2 are met.

- (b) In the A[B] DIESEL GENERATOR 1G-31[1G-21] Room on the Woodward Governor, rotate the SPEED knob counterclockwise to "0". \_\_\_\_\_

- (c) Start the A[B] DIESEL GENERATOR 1G-31[1G-21] PRELUBE pump by depressing HS-3238A[B].

**NOTE**

Field flashing shall be IMMEDIATELY de-energized after Diesel Generator start by depressing the Exciter Voltage Shutdown pushbutton on Panel 1C93[1C94].

- (d) After the Prelube Pump has been running for 1 minute, place A[B] DIESEL GENERATOR 1G-31[1G-21] CONTROL handswitch HS-3231A[B] momentarily in the START position, then return it to the AUTO position. The Prelube Pump will stop after engine start.
- (e) In the SBDG 1G-31[1G-21] Room at Panel 1C93[1C94], IMMEDIATELY after Diesel Generator start, depress and hold Exciter Voltage Shutdown pushbutton until diesel generator speed is greater than 250 rpm (this will ensure that the voltage regulator de-energizes).

**NOTE**

Step (2)(f) will activate the "A" ["B"] DIESEL GEN 1G-31 [1G-21] RUNNING (1C08A, A-10 [1C08B, A-3]) annunciator.

- (f) After 2 minutes, rotate the SPEED knob on the Woodward Governor clockwise to raise Diesel Generator speed to between 900 and 940 rpm at a rate of approximately 300 rpm/minute.
- (g) When the Diesel Generator is between 900 and 940 rpm, at Panel 1C93[1C94] flash the field by depressing the Exciter Reset pushbutton.
- (h) At the Woodward Governor, rotate the SPEED knob clockwise to "17.7" ["18.25"].
- (i) Verify 1V-SF-20 [1V-SF-21] Diesel Generator Supply Fan is running. If not, start the fan by placing HS-7000A[7000B] on Panel 1C23, or HS-7003A[B] on Panel 1C151[1C152] to the START position and allow it to spring return to AUTO.

- (3) If starting the standby diesel generator(s) from the Diesel Generator Room:

### **CAUTION**

Operation of the Prelube Pump without performing an engine start will cause oil to collect in the over-piston area. (Ref. P&L #1)

### **NOTE**

Placing the Woodward Governor SPEED knob to "0" renders the associated Diesel Generator INOPERABLE. Ensure the requirements of DAEC Technical Specifications 3.8.1 or 3.8.2 are met.

- (a) In the A[B] Diesel Generator 1G-31[1G-21] Room on the Woodward Governor, rotate the SPEED knob counterclockwise to "0": \_\_\_\_\_
- (b) Start the Prelube Pump by holding HS-3247A[B] on Panel 1C91[1C92] in the MAN position. Time the Prelube Pump run for 1 minute. \_\_\_\_\_

### **NOTE**

Field flashing shall be IMMEDIATELY de-energized after Diesel Generator start by depressing the Exciter Voltage Shutdown pushbutton on Panel 1C93[1C94].

Placing the Engine Mode Selector Switch HS-3232A[B] in START will override the PULL-TO-LOCK position of the Panel 1C08 Control Switch.

- (c) On Panel 1C93[1C94], place the ENGINE MODE SEL SW HS-3232A[B] momentarily in the START position, then return it to the AUTO position. \_\_\_\_\_
- (d) In the SBDG 1G-31[1G-21] Room at Panel 1C93[1C94], IMMEDIATELY after Diesel Generator start, depress and hold Exciter Voltage Shutdown pushbutton until diesel generator speed is greater than 250 rpm (this will ensure that the voltage regulator de-energizes). \_\_\_\_\_
- (e) Return handswitch HS-3247A(B) to the remote position on Panel 1C91 (1C92). \_\_\_\_\_

**NOTE**

The following step will activate the "A"[B] DIESEL GEN 1G-31 [1G-21] RUNNING (1C08A, A-10 [1C08B, A-3]) annunciator.

- (f) After 2 minutes, rotate the SPEED knob on the Woodward Governor clockwise to raise Diesel Generator speed to between 900 and 940 rpm at a rate of approximately 300 rpm/minute. \_\_\_\_\_
- (g) When the Diesel Generator is between 900 and 940 rpm, at Panel 1C93[1C94] flash the field by depressing the Exciter Reset pushbutton. \_\_\_\_\_
- (h) At the Woodward Governor, rotate the SPEED knob clockwise to "17.7" ["18.25"]. \_\_\_\_\_
- (i) Verify 1V-SF-20 [1V-SF-21] Diesel Generator Supply Fan is running. If not, start the fan by placing ~~75~~ 7003A[B] on Panel 1C151 [1C152] to the START position and allow it to spring return to auto. \_\_\_\_\_
- (4) Immediately after starting the diesel, perform the following on Panel 1C08:
  - (a) Adjust A[B] DIESEL GENERATOR 1G-31[1G-21] VOLTAGE ADJUST control to maintain A[B] DIESEL GENERATOR 1G-31[1G-21] VOLTS meter at approximately 4160 volts. \_\_\_\_\_
  - (b) Adjust A[B] DIESEL GENERATOR 1G-31[1G-21] SPEED ADJUST control to maintain A[B] DIESEL GENERATOR 1G-31[1G-21] FREQUENCY meter at approximately 60 hertz. \_\_\_\_\_
- (5) Refer to Section 5.3, Paralleling the SBDG System, to 1A3[1A4]. \_\_\_\_\_

## **5.2 FAST MANUAL STARTUP OF THE SBDG SYSTEM**

- (1) Start Emergency Service Water Pump 1P-99A[B] per OI 454. \_\_\_\_\_



### **NOTE**

Step (2) or (3) below will activate the "A"["B"] DIESEL GEN 1G-31[1G-21] RUNNING (1C08A, A-10 [1C08B, A-3]) annunciator.

- (2) If starting the standby diesel generator(s) from the Control Room on Panel 1C08:

### **CAUTION**

Operation of the Prelube Pump without performing an engine start will cause oil to collect in the over-piston area. (Ref. P&L #1)

- (a) Set Prelube Timer KS-3238A[B] to 2.0 minutes. \_\_\_\_\_
  - (b) Start the A[B] DIESEL GENERATOR 1G-31[1G-21] PRELUBE pump by depressing HS-3238A[B]. \_\_\_\_\_
  - (c) After the Prelube Pump has been running for 1 minute, place A[B] DIESEL GENERATOR 1G-31[1G-21] CONTROL handswitch HS-3231A[B] momentarily in the START position, and then return it to the AUTO position. The Prelube Pump will stop after engine start. \_\_\_\_\_
  - (d) Verify 1V-SF-20 [1V-SF-21] Diesel Generator Supply Fan is running. If not, start the fan by placing HS-7000A[HS-7000B] on Panel 1C23, or HS-7003A[B] on Panel 1C151 [1C152] to the START position and allow it to spring return to AUTO. \_\_\_\_\_
- (3) If starting the standby diesel generator(s) from the Diesel Generator Room:

### **CAUTION**

Operation of the Prelube Pump without performing an engine start will cause oil to collect in the over-piston area. (Ref. P&L #1)

- (a) Start the PRELUBE PUMP by holding HS-3247A[B] on Panel 1C91 [1C92] in the MAN position. Time the Prelube Pump run for 1 minute. \_\_\_\_\_

**NOTE**

Placing the Engine Mode Selector Switch HS-3232A[B] in START will override the PULL-TO-LOCK position of the Panel 1C08 Control Switch.

- (b) On Panel 1C93 [1C94], place the ENGINE MODE SEL SW HS-3232A[B] momentarily in the START position, then return it to the AUTO position. \_\_\_\_\_
- (c) Return handswitch HS-3247A(B) to the remote position on Panel 1C91 (1C92). \_\_\_\_\_
- (d) Verify 1V-SF-20(1V-SF-21) Diesel Generator Supply Fan, starts. If not, start the fan by placing HS-7003A[B] on Panel 1C151 [1C152] in the START position and allow it to spring return to AUTO. \_\_\_\_\_
- (4) Immediately after starting the diesel, perform the following on Panel 1C08:
  - (a) Adjust A[B] DIESEL GENERATOR 1G-31[1G-21] VOLTAGE ADJUST control to maintain A[B] DIESEL GENERATOR 1G-31[1G-21] VOLTS meter at approximately 4160 volts. \_\_\_\_\_
  - (b) Adjust A[B] DIESEL GENERATOR 1G-31[1G-21] SPEED ADJUST control to maintain A[B] DIESEL GENERATOR 1G-31[1G-21] FREQUENCY meter at approximately 60 hertz. \_\_\_\_\_
- (5) Refer to Section 5.3, Paralleling the SBDG System to 1A3[1A4]. \_\_\_\_\_

### 5.3 PARALLELING THE SBDG SYSTEM TO ESSENTIAL BUS 1A3[4]

- (1) Verify SBDG 1G31[1G21] started per Section 5.1 or 5.2. \_\_\_\_\_

**NOTE**

The following step will activate the "A"["B"] DIESEL GEN PANEL 1C-93[94] TROUBLE (1C08A, C-11[B, C-2]) annunciator.

Placing the GOVENOR MODE SWITCH(DROOP SWITCH) to PARALLEL renders the associated Diesel Generator INOPERABLE. Ensure the requirements of DAEC Technical Specifications 3.8.1 or 3.8.2 are met.

- (2) Place the GOVERNOR MODE SWITCH (DROOP) HS-3234A[B] on Panel 1C93[94] in the PARALLEL position.

**NOTE**

The following step will activate the 4KV BUS AUTO-TRANSFER INOP (1C08A, D-7) annunciator.

Placing the BUS 1A3[4] Transfer mode selector switch to MANUAL renders the Transfer function INOPERABLE, refer to DAEC Technical Specifications 3.8.1 or 3.8.2. Condition A, one offsite circuit inoperable.

- (3) Place the BUS 1A3[4] TRANSFER breaker mode selector switch in MANUAL.
- (4) Insert the handle in the SYNCHRONIZE switch for 4KV BREAKER 1A311[411] A[B] DIESEL GENERATOR 1G-31[1G-21], and place it in the ON position.
- (5) Using the A[B] DIESEL GENERATOR 1G-31[1G-21] VOLTAGE ADJUST knob, raise INCOMING VOLTS SYNCHRONIZE to slightly more than RUNNING VOLTS SYNCHRONIZE.
- (6) Using the A[B] DIESEL GENERATOR 1G-31[1G-21] SPEED ADJUST, adjust diesel generator speed to a slow, clockwise synchroscope rotation.
- (7) When the synchroscope is at the 12 o'clock position, momentarily place the control switch for 4KV BREAKER 1A311[411] A[B] DIESEL GENERATOR 1G-31[1G-21] in the CLOSE position. Observe that the red (breaker closed) and white (closing spring charged) indicating lights are ON.

**CAUTION**

Do not exceed the following diesel generator ratings:

Continuous rating - 2,850 KW

2,000 hour rating - 3,000 KW

300 hour rating - 3,250 KW

**NOTE**

If time permits, warm the Diesel Generator for five minutes at 250-300 KW.

- (8) Use A[B] DIESEL GENERATOR 1G-31[1G-21] SPEED ADJUST to load A[B] DIESEL GENERATOR 1G-31[1G-21], observing 1G-31[1G-21] K/W Meters at 1C08. \_\_\_\_\_
- (9) Place the SYNCHRONIZE switch for 4KV BREAKER 1A311[411] A[B] DIESEL GENERATOR 1G-31[1G-21] in the OFF position, and remove the handle. \_\_\_\_\_
- (10) Place handswitch 1A3[1A4] BUS TRANSFER in AUTO. \_\_\_\_\_
- (11) Use the A[B] DIESEL GENERATOR 1G-31[1G-21] VOLTAGE ADJUST to maintain 0.9 power factor per Appendix 1. \_\_\_\_\_
- (12) Complete the SBDG Operating Checklist OI 324A9 (Attachment 9). For prolonged operation, repeat the checklist every 4 hours. \_\_\_\_\_

**5.4 REENERGIZING DEAD ESSENTIAL BUS 1A3[1A4] FROM SBDG 1G31[1G21]**

- (1) Verify no 1A3[1A4] Bus Lockout condition exists by annunciators 1C08A, A-5 and 1C08B, A-6 alarms are clear. \_\_\_\_\_
- (2) At 1C93 [1C94], verify the GOVERNOR MODE SWITCH (DROOP) HS-3234A[B] in the UNIT position. \_\_\_\_\_

**NOTE**

If SBDG handswitch was in PULL-TO-LOCK, return HS-3231A[B] to AUTO and wait until the Stop Relay Reset White Light is on.

- (3) Verify SBDG 1G31[1G21] running or start SBDG 1G31[1G21] by one of the following methods:
- (a) At 1C08, place A[B] Diesel Generator 1G31[1G21] control handswitch HS3231A[B] momentarily to START, and then return to AUTO.
  - OR
  - (b) At 1C93[1C94], place ENGINE MODE SEL SW HS-3232A[B] momentarily to START, then return to AUTO.
- (4) Place the 1A3[1A4] Bus Transfer Switch to Manual.
- (5) Insert the handle in the SYNCHRONIZE switch for 4KV BREAKER 1A311[1A411] A[B] DIESEL GENERATOR 1G31[1G21], and place it in the ON position at 1C08.

### CAUTION

Do not exceed the following diesel generator ratings:

Continuous rating - 2,850 KW

2,000 hour rating - 3,000 KW

300 hour rating - 3,250 KW

If a 2# Drywell pressure or 64" Reactor Pressure Vessel water level signal exists, the RHR and Core Spray pumps will automatically sequence onto Bus 1A3[1A4] once power is restored, take extra caution on DIESEL GENERATOR loading when this occurs.

If only SBDG 1G31[21] is supplying power to Bus 1A3[1A4], then only 1 RHRSW can be run when 2 RHR pumps are running.

- (6) Reenergize Bus 1A3[1A4] by taking the 4KV BREAKER 1A311[1A411] A[B] DIESEL GENERATOR 1G31[1G21] handswitch momentarily to CLOSE.
- (7) Adjust A[B] DIESEL GENERATOR 1G31[1G21] SPEED ADJUST control to maintain A[B] DIESEL GENERATOR 1G31[1G21] FREQUENCY meter at approximately 60 Hertz at Panel 1C08.

- (8) Adjust A[B] DIESEL GENERATOR 1G31[1G21] VOLTAGE ADJUST control to maintain A[B] DIESEL GENERATOR 1G31[1G21] VOLTS at approximately 4160 volts. \_\_\_\_\_
- (9) Place the SYNCHRONIZE switch for 4KV BREAKER 1A311[1A411] A[B] DIESEL GENERATOR 1G31[1G21] in the OFF position, and remove the handle at Panel 1C08. \_\_\_\_\_
- (10) Verify that A[B] ESW PUMP 1P099A[B] is running. If not, start A[B] ESW PUMP 1P099A[B] at Panel 1C06 by taking handswitch HS4927A[HS4928A] to START and allow it to spring return to AUTO or locally in Essential Switchgear Room 1A3[1A4] at 1B3214[1B4207] push HS4927B[HS4928B] in to START. \_\_\_\_\_
- (11) Verify that 1V-SF-20 [1V-SF-21] Diesel Generator Supply Fan is running. If not, start the fan by placing HS7000A[HS7000B] on Panel 1C23, or HS7003A[HS7003B] on Panel 1C151[1C152] to the START position and allow it to spring return to AUTO. \_\_\_\_\_
- (12) Reference OI 304.2 section 6.2 REENERGIZING 4160V ESSENTIAL BUS 1A3[1A4]. \_\_\_\_\_
- (13) Complete the SBDG Operating Checklist OI 324A9 (Attachment 9). For Prolonged operation, repeat the checklist every 4 hours. \_\_\_\_\_

## **6.0 NORMAL OPERATION OF THE SBDG SYSTEM**

- (1) Once per shift, verify the following on Panel 1C08:
- (a) B DIESEL GENERATOR 1G-21 Control Switch in the AUTO position. \_\_\_\_\_
  - (b) B DIESEL GENERATOR 1G-21 Breaker Control Switch in the AUTO position. \_\_\_\_\_
  - (c) A DIESEL GENERATOR 1G-31 Control Switch in the AUTO position. \_\_\_\_\_
  - (d) A DIESEL GENERATOR 1G-31 Breaker Control Switch in the AUTO position. \_\_\_\_\_

- (2) Once per shift, verify the overspeed trip reset on SBDGs 1G-31 and 1G-21 as follows:

- (a) Slowly take the reset lever to the reset position to verify that the latch is holding the plunger (e.g., the reset lever moves freely, significant force increase near the end of movement), then release the reset lever.

- (3) During normal operation (STANDBY / READINESS lineup), periodically monitor and log the following parameters:

<u>Component</u>	<u>Location</u>	<u>Low</u>	<u>Norm</u>	<u>High</u>
LUBE OIL TEMPERATURE (°F)	TI-3278A[B]	120	-	140
STARTING AIR PRESSURE (PSI) (ELECTRIC AIR COMPRESSOR)	PI-3253A[B]	200	220	230
STARTING AIR PRESSURE (PSI) (DIESEL AIR COMPRESSOR)	PI-3256A[B]	180	230	240
JACKET COOLANT TEMPERATURE	TI-3258A[B]	100	-	120
JACKET COOLANT EXPANSION TANK LEVEL	LG-3239A[B]	1/4	1/2	3/4
1T-37A[B] FUEL OIL TANK LEVEL (INCHES)	LIS-3207[3209]	50		
DIESEL GENERATOR FUEL OIL TANK LEVEL (FEET)	LIS-3201	10'7"		11'

- (4) Once per day, blow moisture out of air receivers.

## **7.0 SHUTDOWN OF RUNNING SBDG TO STANDBY/READINESS CONDITION**

### **7.1 SHUTDOWN OF SBDG**

- (1) If the SBDG to be shut down is not loaded, proceed to Step (10).
- (2) If the SBDG started automatically (UNIT OPERATION) and energized the essential bus, then transfer essential bus 1A3[4] to either the Startup or Standby Transformer per OI 304.2, Section 7.0.

**NOTE**

If the SBDG has been operating at 1500 KW or less, no cooldown is necessary prior to shutdown.

- (3) If the SBDG is in PARALLEL OPERATION, then reduce the load on the Diesel Generator to 1500-1600 KW by using the DIESEL GENERATOR 1G-31[21] SPEED ADJUST CONTROL.
- (4) Adjust A[B] DIESEL GENERATOR 1G-31[1G-21] VOLTAGE ADJUST to maintain 0.9 power factor per Appendix 1.
- (5) Operate at 1500-1600 KW for 10 minutes to allow for cooldown.

**NOTE**

The following step will activate the 4KV BUS AUTO TRANSFER INOP (1C08A, D-7) annunciator.

Placing the BUS 1A3[4] Transfer mode selector switch to MANUAL renders the Transfer function INOPERABLE, refer to DAEC Technical Specifications 3.8.1 or 3.8.2 Condition A, one offsite circuit inoperable.

- (6) Place the BUS 1A3[4] TRANSFER breaker mode selector switch in MANUAL.
- (7) Reduce the load on the Diesel Generator to 50 KW by using the DIESEL GENERATOR 1G-31[1G-21] SPEED ADJUST CONTROL.

**CAUTION**

The Diesel Generator may overspeed and trip after tripping the output breaker.

- (8) Place the control switch for 4KV BREAKER 1A311[411] A[B] DIESEL GENERATOR 1G-31[1G-21] in the TRIP position. Observe that the green (breaker tripped) and the white (closing spring charged) indicating lights are ON.



**NOTE**

The Transfer function of the associated Essential Bus may be considered OPERABLE when the BUS 1A3[4] Transfer mode selector switch is returned to AUTO. Refer to T.S. 3.8.1, 3.8.2.

- (9) Place the BUS 1A3[4] TRANSFER breaker mode selector switch in the AUTO position. \_\_\_\_\_
- (10) At 1C08, confirm annunciator 4KV BUS AUTO TRANSFER INOP (1C08A, D-7) is reset. \_\_\_\_\_
- (11) Place the A[B] GOVERNOR MODE SWITCH (DROOP) HS-3234A[B] at 1C93[1C94] in UNIT. \_\_\_\_\_
- (12) At 1C08, perform the following:
  - (a) Set A[B] Diesel Generator frequency to approximately 60 Hz using handswitch A[B] Diesel Generator 1G31[1G21] speed adjust. \_\_\_\_\_
  - (b) Set A[B] Diesel Generator voltage to approximately 4160 VAC using handswitch A[B] Diesel Generator 1G31 [1G21] voltage adjust. \_\_\_\_\_
- (13) Stop A[B] DIESEL GENERATOR 1G-31[1G-21] by performing either of the following:
  - (a) Place A[B] DIESEL GENERATOR 1G-31[1G-21] CONTROL handswitch HS-3231A[B] on Panel 1C08 in the STOP position, hold for 5 to 10 sec., and then return to AUTO. \_\_\_\_\_

**NOTE**

The following step will activate the A[B] DIESEL GEN 1G-31[1G-21] AUTO START INHIBITED (1C08A, D-10 [1C08B, D-3]) annunciator.

- (b) If an initiation signal is present, then place HS-3231A[B] in the PULL-TO-LOCK position on 1C08. \_\_\_\_\_

**NOTE**

The following step will not stop the Diesel Engine if it has automatically started due to a LOOP or LOCA.

- (c) Place the ENGINE MODE SEL SW HS-3232A[B] on Panel 1C93 [1C94] (using the selector key) in the LOCKOUT AND STOP position, hold for 5 to 10 seconds, and then return to AUTO.

## **7.2 RETURNING SBDG TO STANDBY/READINESS CONDITION**

- (1) Place the GOVERNOR MODE SWITCH (DROOP) HS-3234A[B] on Panel 1C93[94] in the UNIT position.

**NOTE**

A time delay relay prohibits restarting of the lube oil recirculation pump for ten (10) minutes to allow lube oil to drain from the upper crankline of the diesel generator thus preventing overfilling.

- (2) If the Emergency Service Water pumps are not required to support other plant operations, stop them in accordance with OI 454.
- (3) At Diesel Gen Output Bkr 1A311 [1A411], verify Diesel Gen Lockout Relay 186-DG1 [DG2] is RESET.
- (4) If a slow manual start of the diesel generator was performed, adjust the Woodward Governor for automatic operation as follows:
- (a) Droop Setting at 0
  - (b) Fuel Control at MAX
  - (c) Speed Control at "17.7" ["18.25"]

**NOTE**

Rotate the engine per Steps (5) through (8) below (to remove oil from cylinders) only after the diesel engine has been shut down greater than 30 minutes but less than 4 hours.

Depressing the Emergency Stop Pushbutton (Overspeed Trip) renders the associated Diesel Generator INOPERABLE. Ensure the requirements of DAEC Tech. Specs. 3.8.1 or 3.8.2 are met.

- (5) Trip injection pump control racks by depressing the Emergency Stop Pushbutton (overspeed trip) at the engine. \_\_\_\_\_
- (6) At Panel 1C93[1C94], confirm annunciator ENGINE OVERSPEED (1C93[94], A-1) is activated. \_\_\_\_\_
- (7) Close the Air Isolation to Oil Booster Tanks Valve V32-0112[0109]. This is located on the northwest end of the engine near inspection cover 13. \_\_\_\_\_

**NOTE**

More than one revolution may cause the oil to pump back to the upper crank and could cause a hydraulic lock condition on restart. (Ref. P&L #1)

- (8) Using the manual override of the normal air start solenoid SV-3261B [SV-3262B], admit starting air to A[B] DIESEL GENERATOR 1G-31[1G-21] for 1 to 3 seconds (sufficient to cause one full revolution of the engine crankshaft). \_\_\_\_\_
- (9) Vent air on the line to the bearing oil boosters by opening the A[B] SBDG Air Start Header Vent V-32-111[110]. This valve is located on the northwest end of the engine near inspection cover 13. Close vent valve after venting. \_\_\_\_\_
- (10) Open the Air Isolation to Oil Booster Tanks Valve V-32-112[109]. \_\_\_\_\_

- (11) Reset the overspeed trip using the reset lever (located near the Emergency Trip Pushbutton) as follows: {C002}
- (a) Take the reset lever to the reset position (e.g., feel the latch drop in place, hear a click), then release the reset lever.
  - (b) Slowly take the reset lever to the reset position to verify that the latch is holding the plunger (e.g., the reset lever moves freely, significant force increase near the end of movement), then release the reset lever.
- (12) In order to clear the Shutdown Relay Signal, depress the ALARM RESET pushbutton HS-3253A[B] on Panel 1C-91[92].
- (13) At Panel 1C93[1C94], confirm annunciator ENGINE OVERSPEED (1C93[94], A-1) is reset.
- (14) Verify Diesel Oil Storage Tank 1T-35 level on LIS-3201 greater than 36,317 gallons ( $\geq 10'-1/4"$ ).
- (15) Reset the annunciator alarms on 1C93[94] (GENERATOR UNDERVOLTAGE OR SINGLE PHASING (1C93[94], D-4) will not clear).
- (16) Complete the SBDG Standby/Readiness Checklist, OI 324A10 (Attachment 10). Notify OSS of out-of-spec. readings.

## **8.0 MANUALLY FILLING DIESEL GENERATOR DAY TANKS**

### **NOTE**

When a diesel is running continuously, if required, the diesel oil transfer pumps may be run continuously because the day tank(s), when full, overflow back to the diesel oil storage tank.

## **8.1 MANUALLY FILLING SBDG DAY TANK 1T-37A[B] WITH ITS ASSOCIATED DIESEL OIL TRANSFER PUMP 1P-44A[B]**

- (1) Start DIESEL OIL TRANSFER PUMP 1P-44A[B] by performing either of the following:

- (a) Place A[B] DIESEL OIL TRANSFER PUMP 1P-44A[B] handswitch HS-3201 [HS-3202] on Panel 1C08 to START and verify the associated red (running) light on Panel 1C08 ON.
- (b) Place local handswitch HS-3203 [HS-3204] on Panel 1C91 [1C92] to START and return it to the STOP position.

- (2) When the desired level is reached in Diesel Generator Day Tank 1T-37A[B], stop A[B] DIESEL OIL TRANSFER PUMP 1P-44A[B] by performing either of the following:

- (a) Place A[B] DIESEL OIL TRANSFER PUMP 1P-44A[B] handswitch HS-3201 [HS-3202] on Panel 1C08 to the STOP position and return it to the AUTO position. Verify A[B] DIESEL OIL TRANSFER PUMP 1P-44A[B] STOPPED by observing associated green indicating light ON.
- (b) The A[B] DIESEL OIL TRANSFER PUMP 1P-44A[B] automatically stops when the day tank high level is reached.

- (3) Verify that Diesel Oil Storage Tank 1T-35 contains at least 10 ft. 1/4 inches (36,317 gal) of fuel oil as indicated on local level Indicator LIS-3201.

## 8.2 MANUALLY FILLING SBDG DAY TANK 1T-37A[B] WITH ITS ALTERNATE DIESEL OIL TRANSFER PUMP 1P-44B[A]

(1) Place the following local valves in the indicated position:

(a) For filling 1T-37A with 1P-44B:

<u>Valve No.</u>	<u>Position</u>
V-32-11	CLOSED
V-32-6	OPEN
V-32-12	OPEN
V-32-7	CLOSED
V-32-13	OPEN
V-32-8	OPEN

(b) For filling 1T-37B with 1P-44A:

<u>Valve No.</u>	<u>Position</u>
V-32-11	OPEN
V-32-6	CLOSED
V-32-12	CLOSED
V-32-7	OPEN
V-32-13	OPEN
V-32-8	OPEN

(2) Verify local valves V-32-80 and V-32-81 CLOSED and V-32-90 and V-32-93 LOCKED CLOSED.

(3) Start B[A] DIESEL OIL TRANSFER PUMP 1P-44B[A] by performing either of the following:

(a) Place B[A] DIESEL OIL TRANSFER PUMP 1P-44B[A] handswitch HS-3202 [HS-3201] on Panel 1C08 to START and verifying the red (running) light on Panel 1C08 ON.

(b) Place local handswitch HS-3204 [HS-3203] on Panel 1C92 [1C91] to START and return it to the STOP position.

- (4) When the desired level is reached in Diesel Generator Day Tank 1T-37A[B], stop B[A] DIESEL OIL TRANSFER PUMP 1P-44B[A] by placing B[A] DIESEL OIL TRANSFER PUMP 1P-44B[A] handswitch HS-3202 [HS-3201] on Panel 1C08 to the STOP position and return it to the AUTO position. Verify DIESEL OIL TRANSFER PUMP 1P-44B[A] stopped by observing associated green indicating light ON.

- (5) Place the following local valves in the indicated position:

<u>Valve No.</u>	<u>Position</u>
V-32-11	LOCKED OPEN
V-32-12	LOCKED OPEN
V-32-13	LOCKED CLOSED
V-32-8	LOCKED CLOSED
V-32-6	LOCKED OPEN
V-32-7	LOCKED OPEN

- (6) Verify that DIESEL OIL STORAGE TANK 1T-35 contains at least 10 ft. 1/4 inches (36,317 gallons) of fuel oil as indicated on local level indicator LIS-3201.

## **9.0 FILLING DIESEL GENERATOR FUEL OIL STORAGE TANK 1T-35**

### **9.1 FILLING DIESEL GENERATOR FUEL OIL STORAGE TANK 1T-35 FROM AUX BOILER FUEL OIL STORAGE TANK 1T-34**

#### **CAUTION**

The following precautions should be taken when transferring diesel fuel from the Aux. Boiler Room to the "B" Diesel Generator Day Tank Room through the wall penetration:

- (a) Install fire pillows in wall penetration with transfer hose. Reference ACP 1412.4.
- (b) During the transfer process, the transfer hose and connections should be checked frequently (at least hourly) to assure that fuel leaks have not developed which could result in fuel pooling in either room.

- (1) Connect the flexible hose between V-82-103 and V-32-80. The hose should be passed through the capped hole in the wall between the Aux. Boiler Room and the "B" Diesel Day Tank Room.

**NOTE**

Do not exceed 11' in 1T-35.

- (2) When the hose is connected, open V-82-103, and V-32-80.
- (3) Locally start Transfer Pump 1P-42A (V-82-72 and V-82-70 shall be open) or Transfer Pump 1P-42B (V-82-66, V-82-68, V-82-69, and V-82-73 shall be open).
- (4) When Diesel Oil Storage Tank 1T-35 has been filled to the desired level, stop Transfer Pump(s) 1P-42A [1P-42B].

**NOTE**

Since some oil will spill out of the hose when the connections are broken, be prepared to collect it.

- (5) Close V-82-103. Break the hose connection at V-82-103 and drain any residual fuel in the flexible hose back into Diesel Oil Storage Tank 1T-35 through V-32-80.
- (6) Close V-32-80. Break the hose connection at V-32-80 and store the hose.
- (7) Replace the cap on the hole between the Aux. Boiler Room and the "B" Diesel Day Tank Room.

**9.2 FILLING DIESEL GENERATOR FUEL OIL STORAGE TANK 1T-35 UPON NEW FUEL OIL RECEIPT**

**NOTE**

Maintain tank level > 36,317 gallons ( $\geq 10'-1/4"$ ). (NG-91-2655)



- (1) Prior to tanker truck entering fuel oil containment area, lift grating, insert plug into drain opening, and tighten wing nut to expand plug. If the plug cannot be inserted due to ice or debris, contact the Hazardous Waste Emergency Coordinator before transferring fuel. \_\_\_\_\_
- (2) Unlock and remove the bulk loading filter from the storage box located in the yard on 1T-34. \_\_\_\_\_
- (3) Verify that a bag filter is installed in the bulk loading filter. \_\_\_\_\_
- (4) Set the bulk loading filter into the 1T-35 filler connection. \_\_\_\_\_
- (5) Position driver warning sign in front of tanker truck so as to be visible when entering truck and from truck cab. \_\_\_\_\_
- (6) Request that the tanker operator pump the new fuel oil through the filter into the tank. \_\_\_\_\_

**NOTE**

Do not exceed 11' in 1T-35.

- (7) Attach the tanker hose to the camlock fitting on the bulk loading filter and fill 1T-35. \_\_\_\_\_

**NOTE**

Since some oil will spill out of the hose when the connections are broken, be prepared to collect it.

- (8) Disconnect the tanker hose from the bulk loading filter. \_\_\_\_\_
- (9) The remaining tanker fuel will be emptied into 1T-34 (OI 727). \_\_\_\_\_
- (10) When the fuel oil receipt is complete, remove the bag filter and install a new filter. \_\_\_\_\_

**NOTE**

New filters may be obtained from the Warehouse (Part Number 112769-4).  
Contact Radwaste for disposal of used filters.

(11) Return the bulk loading filter to the storage box and lock it. \_\_\_\_\_

(12) Remove drive through containment drain plug and take away warning sign. \_\_\_\_\_

**10.0 RECIRCULATION OF DIESEL FUEL OIL FROM DIESEL OIL  
STORAGE TANK 1T-35 TO DIESEL GENERATOR DAY TANKS  
1T-37A[B]**

(1) When directed by the OSS, operate 1P-44A and B DIESEL OIL  
TRANSFER PUMPS to recirculate diesel fuel oil from Diesel Oil Storage  
Tank 1T-35 to Diesel Generator Day Tanks 1T-37A and B as follows:

(a) Start 1P-44A and B DIESEL OIL TRANSFER PUMPS by placing  
handswitches HS-3201 and HS-3202 to START at Panel 1C08. \_\_\_\_\_

(b) Recirculate diesel fuel oil for 24 hours. \_\_\_\_\_

(c) Secure 1P-44A and B DIESEL FUEL OIL TRANSFER PUMPS by  
placing handswitches HS-3201 and HS-3202 to STOP at Panel 1C08. \_\_\_\_\_

## **11.0 CROSS-CONNECTING AIR RECEIVERS 1T-117A[B] AND 1T-116A[B]**

### **NOTE**

The diesel generator is operable when one of the two air start systems is operable. A properly charged air receiver, with intact piping to the diesel generator and the associated compressor operable, can be considered as an operable air start system.

With 1K-10A[B] electric air compressor or 1K-10C[D] diesel-driven air compressor inoperable, all three air receivers may be kept charged using the following steps.

- (1) Cross-tie 1T-117A[B] to 1T-116A[B] by connecting a Chicago hose at drain connection valves V-32-33 [V-32-35] and V-32-41 [V-32-37]. Use a three-way connector at one of the connections to provide a means to depressurize the Chicago hose. \_\_\_\_\_
- (2) Open V-32-33 [V-32-35] and V-32-41 [V-32-37] to equalize pressure between 1T-117A[B] and 1T-116A[B]. \_\_\_\_\_
- (3) If air receiver pressure drops to 200 psig, verify 1K-10A[B] electric air compressor starts if operable or start 1K-10C[D] diesel-driven air compressor. \_\_\_\_\_
- (4) Verify 1K-10A[B] stops when pressure reaches 230 psig or 1K-10C[D] stops when pressure reaches 240 psig. \_\_\_\_\_
- (5) Close V-32-41 [V-32-37] and V-32-33 [V-32-35]. \_\_\_\_\_
- (6) Depressurize the Chicago hose using the three-way connector. Disconnect and store the Chicago hose. \_\_\_\_\_

## **12.0 CHARGING THE DIESEL AIR COMPRESSOR STARTING BATTERIES 1D73[1D71]**

### **NOTE**

The DIESEL AIR COMPRESSORS 1K10C[D] have alternators which will normally maintain a full charge on starting batteries 1D73[1D71]. In the event that there is a fault with this system or a new battery is installed, the back-up Battery Charger 1D74[1D72] can be used to restore the charge on the battery.

(1) Verify the following on Battery Charger 1D74[1D72]:

(a) DC output breaker is OFF. \_\_\_\_\_

(b) AC input breaker is OFF. \_\_\_\_\_

(2) Plug in 1D74[1D72] in local electrical receptacle. \_\_\_\_\_

(3) Connect charger cables to Starting Battery 1D73[1D71]. \_\_\_\_\_

(4) Perform the following at Battery Charger 1D74[1D72]:

(a) Set timer for 4 hours. \_\_\_\_\_

### **CAUTION**

Close DC breaker prior to energizing charger.

(b) Turn DC output breaker to ON. The DC VOLTS meter should read battery voltage. \_\_\_\_\_

(c) Turn AC input breaker to ON. The DC AMPS meter will show charger current flow. \_\_\_\_\_

**NOTE**  
As the battery charges, the DC VOLTS meter indication should gradually increase to approximately 14 VDC.

- (5) After the timer has timed out or the DC VOLTS meter indication has stabilized at approximately 14 VDC, secure the battery charge by performing the following at Battery Charger 1D74[1D72]:
  - (a) Return timer to FLOAT position. \_\_\_\_\_
  - (b) Turn AC input breaker to OFF. \_\_\_\_\_
  - (c) Turn DC output breaker to OFF. \_\_\_\_\_
- (6) Disconnect charger cables from 1D73[1D71]. \_\_\_\_\_
- (7) Unplug 1D74[1D72] from local electrical receptacle. \_\_\_\_\_

### **13.0 REFERENCES**

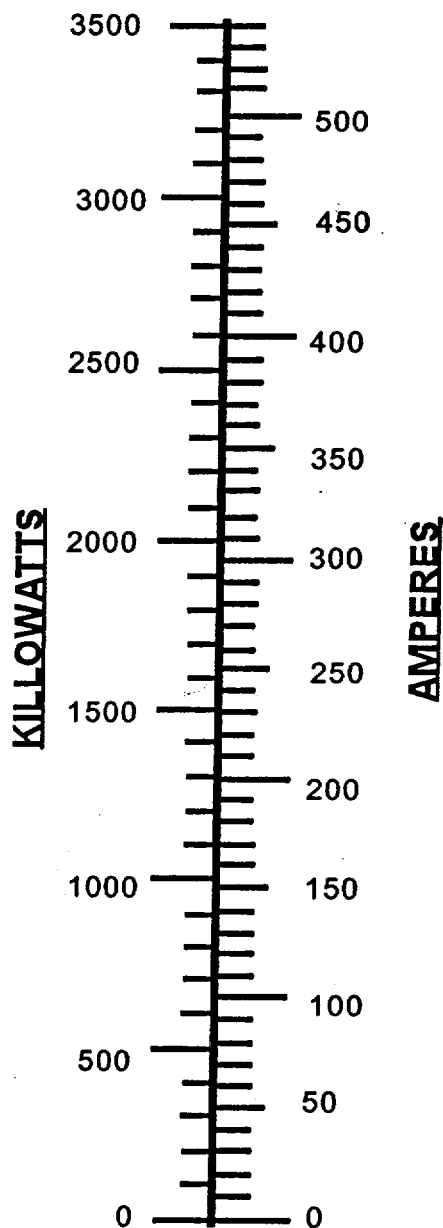
- (1) Technical Specifications, Duane Arnold Energy Center.
- (2) Updated Final Safety Analysis Report, Duane Arnold Energy Center, Chapter 8
- (3) OIs 304.2, 454, 537
- (4) Bechtel Requisition No. 7884-M15
- (5) Fairbanks Morse Technical Manual, Bechtel VPCR No. 7884-M-15-73-2
- (6) P and ID No. M-132, M-160, M-182
- (7) Air Coolant System Schematic, Colt Industries Drawing No. 11867225, Bechtel VPCR No. 7884-M15-001
- (8) Fuel Oil System Schematic, Colt Industries Drawing No. 11867228, Bechtel VPCR No. 7884-M15-002

- (9) Lube Oil System Schematic, Colt Industries Drawing No. 11867227, Bechtel VPCR No. 7884-M15-003
- (10) Jacket Coolant Schematic, Colt Industries Drawing No. 11867226, Bechtel VPCR no. 7884-M15-004
- (11) Starting Air System Schematic, Colt Industries Drawing No. 11867229, Bechtel VPCR No. 7884-M15-005
- (12) Model D325 Compressor with 5 HP Motor, Burgess-Manning Drawing No. DM3251766, Bechtel VPCR No. 7884-M15-25-3
- (13) Model D325 Compressor with Lister Petter Diesel Engine, Burgess-Manning Drawing No. DM3251955, Bechtel VPCR No. 7884-M15-26-7
- (14) Fuel Oil Transfer Pump, Bechtel VPCR No. 7884-M15-102-1
- (15) Diesel Engine Control, Colt Industries Drawing No. 11867221, Sheet 1, Bechtel VPCR No. 7884-M15-6, Sheets 1, 2, and 3
- (16) (Misc.), Colt Industries Drawing No. 11867221, Sheet 4, Bechtel VPCR No. 7884-M15-6(4)-6
- (17) 3-line Schematic Diagrams, Colt Industries Drawing No. 0170474, Bechtel VPCR Nos. 7884-M-15-15(1)-6, -15(2)-6, -15(3)-9, and -15(4)-5
- (18) Schematic Meter and Relay Diagram, 4160V System Essential Swgr. 1A3 and 1A4, Bechtel Drawing No. 7884-E-23
- (19) Schematic Diagram, Annunciators Cabinets 1C08A and C, Bechtel VPCR No. 7884-E-36
- (20) Schematic Diagram, Annunciators Cabinets 1C08B, Bechtel VPCR No. 7884-E-37
- (21) 4160V and 480V System Control and Protection, Bechtel VPCR No. 884-E-104
- (22) Standby Diesel Generator and Auxiliary Control, Bechtel VPCR No. 7884-E-106, Sheets 1, 2, 3, 4, 5, and 6

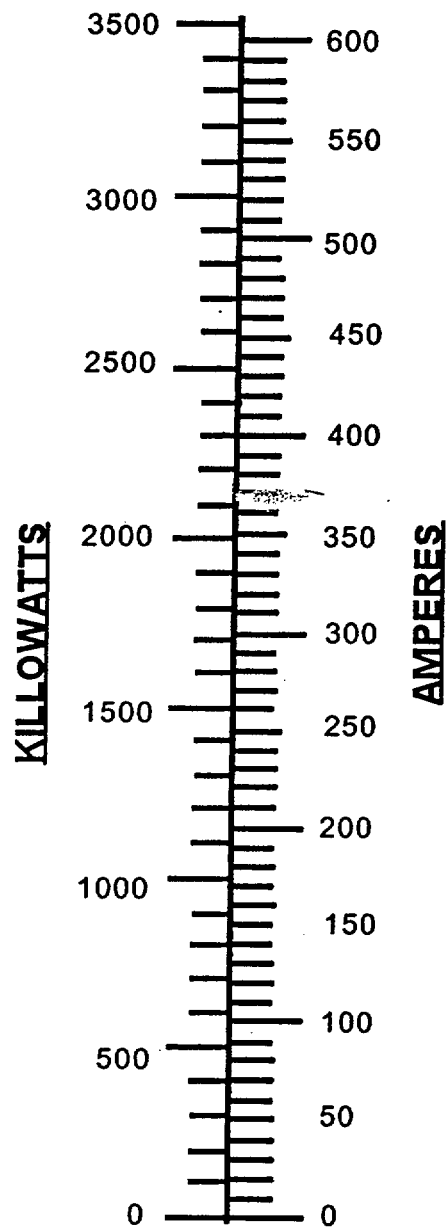
- (23) Schematic and Connection Diagram, Diesel Generator Panels 1C117 and 1C93, Bechtel  
VPCR No. 7884-E-79
- (24) Schematic and Connection Diagram, Diesel Generator Panels 1C118 and 1C94, Bechtel  
VPCR No. 7884-E-80
- (25) Heating and Ventilating Systems, Bechtel VPCR No. 7884-E-113, Sheets 52 and 53
- (26) DCPs 1149, 1298, 1332, 1407
- (27) MMs 95, 137, 278
- (28) NG-85-3356, Commitment A15022, NG-89-1460, NG-91-0472, Commitment A90372,  
NG-91-2655
- (29) Colt Recommendations
- (30) EMA 089414G, A20087, A40832
- (31) DAEC Vender Manual L216DE, Diesel Compressor Engines
- (32) {C001} CTS 198811250105
- (33) {C002} LER 93-04
- (34) AR 98-0600
- (35) AR 21697

# **APPENDIX 1** **KILOWATT-AMPERE-POWER FACTOR AT 4160 VOLTS**

## **0.9 POWER FACTOR**



## **0.8 POWER FACTOR**





# ***DUANE ARNOLD ENERGY CENTER***

## **JOB PERFORMANCE MEASURE**

**NUMBER: 286000-03**

**TASK NUMBER: NSPEO 9.08**

**TITLE: Manually Initiate Cable spreading Room CO<sub>2</sub> (Alternate Path)**

**Rev. 3**

DEVELOPED BY: *Michael Fisher* *3/23/2001*  
Instructor Date

VALIDATED BY: *[Signature]* *3/29/01*  
SME/Instructor Date

REVIEWED BY: *Paul D Hansen* *3-30-2001*  
Plant Reviewer Date

APPROVED BY: *[Signature]* *4/2/01*  
Training Supervisor-Operations Date

# **DUANE ARNOLD ENERGY CENTER**

## **JOB PERFORMANCE MEASURE**

<b>JPM No.</b> 286000-03	<b>JPM Description:</b> Manually initiate cable spreading room CO <sub>2</sub>		
<b>Task No.</b> NSPEO 9.08	<b>Task Description:</b> Initiate cable spreading room CO <sub>2</sub> using alternate initiation method per OI 513, Section 5.3.2		
<b>K/A Reference:</b> 286000	A3.04 (3.2/3.3) 2.1.30		
<b>APPLICABLE METHOD OF TESTING:</b>			
Simulate Performance	X	Actual Performance	
Simulator	In-Plant	X	Control Room
Time for Completion: 20 minutes			

# JOB PERFORMANCE MEASURE VALIDATION CHECKLIST

## NOTE

All steps of this checklist should be performed upon initial validation. Prior to JPM usage, revalidate JPM using steps 7 through 10.

JPM No. 286000-03 JPM Title Manually initiate cable spreading room CO<sub>2</sub>

- ☒ 1. Task description and number, JPM description and number are identified
- ☒ 2. Task elements identified and K/A references are included
- ☒ 3. Performance location specified
  - a. in-plant
  - b. control room
  - c. simulator
- ☒ 4. Initial conditions and cues identified
  - a. setup, required materials, and procedure
  - b. malfunctions and instructor actions
  - c. initiating and terminating cues
- ☒ 5. Task standards identified and verified by SME review
- ☒ 6. Critical tasks/steps identified meet criteria and identified with a "C"
- ☒ 7. Verify JPM steps fit the most current procedures  
Procedure Rev. 506 Date 2/6/01
- ☒ 8. Pilot test JPM
  - a. verify cues both verbal and visual are free of conflict
  - b. ensure performance time is accurate
- 9. If the JPM cannot be performed as written with proper responses, then revise the JPM
- 10. When JPM is revalidated, SME/Instructor signs and dates JPM

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

\_\_\_\_\_  
SME/Instructor

\_\_\_\_\_  
Date

**SIMULATOR SETUP:**

None

**EVENT TRIGGERS**

Trigger Number	Trigger File Name	Trigger Logic Statement	Trigger Word Description

**MALFUNCTIONS:**

Time	Malfunction No.	Malfunction Title	ET	Delay	F. Sev.	Ramp	I. Sev.

**OVERRIDES:**

Time	Override Tag	Override Description	ET	Delay	Value.	Ramp

**REMOTE FUNCTIONS:**

Time	Remote Function No.	Remote Function Title	Value	Ramp

### **INSTRUCTOR ACTIONS:**

1. Inform OSS of performance of in-plant JPM.
2. Read initial conditions and initiating cues to the operator.

### **TASK STANDARDS:**

1. Operator proceeds with alternate initiation method.
2. Place pilot control valve handle in the open position.
3. Proceed to master pilot valve control box at the Cardox unit and break the glass
4. Open the pilot valve for 210 seconds.
5. Verify on 1C26 in the Control Room that the CABLE SPREADING ROOM SUPPLY 1V-AC-32 and EXHAUST 1V-EF-33 FANS have auto tripped by observing green lights OFF.
6. Close the master pilot control valve.

### **REQUIRED MATERIALS:**

OI 513

### **GENERAL REFERENCES:**

OI 513, Sections 5.3, 7.4, and 8.4

**Read to the operator the following information:**

**INITIAL CONDITIONS:**

1. The plant is operating at 100% power.
2. 1C40 annunciator F-6 (CARDOX PRE-INITIATION ALARM) was received and acknowledged. A report of smoke was received from the second floor admin bldg. After approximately 1 minute annunciator 1C40 G-6 (CARDOX INITIATED) had still NOT been received.
3. You are the Auxiliary Operator.

**INITIATING CUES:**

The OSS directs you to manually initiate Cable Spreading Room CO<sub>2</sub> using the normal initiation method.

**This task is not time critical.**

**Inform the evaluator when you have completed the task.**

## PERFORMANCE INFORMATION

### NOTE:

Critical steps are denoted with a "C". Failure to meet the standard for this step constitutes failure.

Time Start \_\_\_\_\_

PERFORMANCE STEP: Critical:	At the Cable Spreading Room South door, pull out the locking pin and depress the green START push-button.
STANDARD:	START push-button depressed.
COMMENTS:	

PERFORMANCE STEP: Critical:	Verify the local horn sounds at Panel 1C179.
STANDARD:	Operator listens for horn sounding.
COMMENTS:	Inform operator that no horn sound is heard. If asked after 24 second time delay has expired inform operator that no audible sound of CO <sub>2</sub> discharge is heard. If asked about red light at 1C179 inform operator it is OFF.

PERFORMANCE STEP: Critical:	Verify on Panel 1C26 in the control room that the CABLE SPREADING ROOM SUPPLY FAN 1V-AC-32 and CABLE SPREADING ROOM EXH FAN 1V-EF-33 have Auto tripped by observing the green OFF lights turn on.
STANDARD:	Operator attempts to verify Green OFF lights are ON.
COMMENTS:	Operator goes to 1C26 or calls control room to verify 1V-AC-32 and 1V-EF-33 have auto tripped. Inform operator that CABLE SPREADING ROOM SUPPLY and EXHAUST FANS are still running. Green lights are OFF.(Red running lights are ON).

PERFORMANCE STEP: Critical:	Verify discharge using audible indication at Cable Spreading Room access or CO <sub>2</sub> tank pressure and level decrease.
STANDARD:	Discharge verified by audible indications or tank pressure and level decrease.
COMMENTS: Cue: If asked, there is no audible indication of CO <sub>2</sub> discharge.	

PERFORMANCE STEP: Critical:	Secure the Cardox System per Section 7.4 and tag it out per Section 8.4.
STANDARD:	The Cardox is secured and tagged out.
COMMENTS: If asked, another operator will make out the tagout and secure the Cardox System.	

PERFORMANCE STEP: Critical: C	If no discharge occurs proceed to alternate initiation method.
STANDARD:	Operator proceeds with alternate initiation method.
COMMENTS:	

PERFORMANCE STEP: Critical: C	At North Cable Spreading Room door break glass on the pilot box and place pilot control valve handle in the OPEN position.
STANDARD:	Pilot Control Valve handle placed in the OPEN position.
COMMENTS:	

PERFORMANCE STEP: Critical:	Acknowledge local alarm horn and red actuation light (CARDOX SYSTEM ACTUATION) on Panel 1C179.
STANDARD:	Determine horn and light are off.
COMMENTS	
Inform operator that the horn and light are off.	



PERFORMANCE STEP: Critical: C	Proceed to the Master Pilot Valve Controller at the CARDOX unit. Break the glass. Inform the control room that you are about to initiate Cardox.
STANDARD:	Locates Master Pilot Valve Controller.
COMMENTS:  Role play as control room and acknowledge that Cardox is about to be initiated.	

PERFORMANCE STEP: Critical: C	Open the pilot control valve for 210 seconds.
STANDARD:	Operator opens pilot control valve and has an awareness of how long it has been open.
COMMENTS:  If the operator informs you he is waiting for 210 seconds to expire, inform him time is complete and he may continue to the next step.	

PERFORMANCE STEP: Critical:	Verify CO <sub>2</sub> discharge by observing CO <sub>2</sub> tank indicators.
STANDARD:	Observes tank level and pressure gauges, or listens for flow noise to verify discharge of Cardox.
COMMENTS:  Cue: When asked, the Cardox tank level and pressure are decreasing, sound of Cardox flow is heard.	

PERFORMANCE STEP: Critical: C	Verify on Panel 1C26 in the control room that the CABLE SPREADING ROOM SUPPLY 1V-AC-32 and EXHAUST 1V-EF-33 FANS have auto tripped.
STANDARD:	Operator goes to 1C26 or calls Control Room to verify fans have tripped.
COMMENTS:  Cue: Inform operator that green lights are lit for the Cable Spreading Room Supply and Exhaust Fans. (1V-AC-32 and 1V-EF-33 have TRIPPED)  Cue: If the operator states that he/she will wait for 210 seconds, inform the operator that the pilot control valve has been open for 210 seconds. Otherwise wait for that period of time.	

PERFORMANCE STEP: Critical: C	Close the Pilot Control Valve.
STANDARD:	Operator closes pilot control valve.
COMMENTS	

<b>PERFORMANCE STEP:</b> Critical:	Notify control room that the manual initiation process for the Cardox System is complete.
<b>STANDARD:</b>	Calls control room to report completion of manual initiation.
<b>COMMENTS:</b>  Role play as control room and acknowledge completion of manual Cardox initiation.	

<b>PERFORMANCE STEP:</b> Critical:	Close the pilot control valve located by the North Cable Spreading Room door.
<b>STANDARD:</b>	Closes pilot control valve at North Cable Spreading Room door.
<b>COMMENTS</b>  Once the operator states that he will go to the cable spreading room and close the valve, inform him that the Operations Department Manager (back on the Admin Bldg. 2 <sup>nd</sup> floor) will close it. (This allows you to start the next JPM from here.)	

<b>PERFORMANCE STEP:</b> Critical:	Secure the Cardox System per Section 7.4 and tag it out per Section 8.4.
<b>STANDARD:</b>	Operator proceeds to Section 7.4 to secure the Cardox System.
<b>COMMENTS:</b>  Cue: Inform operator that the Aux Operator will secure the Cardox System, per Section 7.4 of OI-513 and that the control room is writing the tagout.	

Time Stop \_\_\_\_\_

**TERMINATING CUES:** Cardox System has been manually initiated per OI 513 Section 5.3. Inform trainee that the Aux Operator will secure the Cardox System per Section 7.4 and the control room is writing the tagout per Section 8.4

## VERIFICATION OF COMPLETION

JPM No.: 286000-03

**JPM Description:** Manually initiate cable spreading room CO<sub>2</sub>

Operator: \_\_\_\_\_

**Evaluator:** \_\_\_\_\_

**Licensee:**

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RO



**SRO**

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**SRO Cert**

STA



NSPEO

Result:

**SATISFACTORY**

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UNSATISFACTORY

**COMMENTS/FEEDBACK:** (Note any trainee discrepancies or misperformed steps.)

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**Evaluator's Signature**

Date \_\_\_\_\_

# OPERATING INSTRUCTION

OI 513

## FIRE PROTECTION

Effective Date: FEB 06 2001

### TECHNICAL REVIEW

Prepared by: Patricia Vandervoort Date: 01/10/01

Validated by: Scott D. Pehr Date: 1-15-01  
Operations

Verified by: Ray D. Schultz Date: 1/31/01  
System Engineer

Reviewed by: D. Barton Date: 2-01-01  
Operations Committee

### PROCEDURE APPROVAL

I am responsible for the technical content of this procedure.

Approved by  
Procedure Owner: David Manheim Date: 1-15-01  
Operations

Approved by: Rob Anderson Date: 2/1/01  
Plant Manager, Nuclear

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## **1.0 PURPOSE**

To provide detailed instructions to the plant operating personnel for proper operation of the Fire Protection System.

## **2.0 PRECAUTIONS AND LIMITATIONS**

- (1) Fire detection instrumentation for each fire detection zone shall be operable whenever safety related equipment in the fire detection zone is required to be operable.  
(Fire Plan Section 12)
- (2) The fire suppression system shall be operable with the river water supply system operable and two fire pumps with automatic initiation logic operable.  
(Fire Plan Section 12)
- (3) The deluge and sprinkler system shall be operable whenever safety related equipment in the deluge and sprinkler protected area is required to be operable. (Fire Plan Section 12)
- (4) The carbon dioxide flooding system (CARDOX) shall be operable with a minimum level of 80% and a minimum pressure of 275 psig in the storage tank. (Fire Plan Section 12)
- (5) Fire hose stations protecting safety related equipment shall be operable whenever the safety related equipment is required to be operable. (Fire Plan Section 12)
- (6) Personnel in the Cable Spreading Room have 24 seconds to evacuate the Cable Spreading Room following alarm. Inlet ventilation to the Cable Spreading Room will then be isolated and the room will be flooded with carbon dioxide. The outlet isolation damper will remain open for 4 minutes to prevent pressurization of the Cable Spreading Room, and to vent displaced air.
- (7) When starting up the Fire Protection System from a depressurized condition, isolation of all deluge and sprinkler systems will be necessary to preclude inadvertent actuation.
- (8) Activation of the Cooling Tower Deluge System automatically shuts off the associated tower fans. The fans auto-start upon system restoration; the affected fan handswitches on Panel 1C06 need to be placed in the OFF position in order to protect plant personnel and equipment.

- (9) When refrigeration is lost to the Cardox System, the Cardox System high pressure alarm will be received. If the pressure does not reach 357 psig, the bleeder valve is operating correctly. It is expected that the loss of carbon dioxide will not become critical for approximately 24 hours. The local alarm bell from the storage tank has been removed by EMA A16769.
- (10) Any time the diesel driven fire pump is run at greater than minimum flow, the engine is required to be run at minimum flow for 15 minutes to allow for adequate cooldown of the diesel engine prior to shutdown.
- (11) The Exciter CO<sub>2</sub> Fire Suppression System shall be isolated and tagged out prior to purge of the main generator. This ensures that CO<sub>2</sub> gas is supplied to the generator via the Cardox vaporizer vice liquid CO<sub>2</sub> via the exciter CO<sub>2</sub> supply path. This also prevents generator purge CO<sub>2</sub> from reaching the exciter housing.
- (12) Personnel who may be in the main generator exciter housing have 15 seconds to evacuate following initiation of the CO<sub>2</sub> Fire Suppression System. After this period, the vent exhaust damper will close and the area will be flooded with CO<sub>2</sub>. Entries into the exciter housing without the exciter CO<sub>2</sub> system being tagged out shall be limited to short term inspections and minor maintenance only and requires two people, (one to remain outside the exciter housing). The exciter CO<sub>2</sub> system shall be tagged out whenever the exciter housing is entered for maintenance or the exciter housing doors are left open.
- (13) The main turbine shall be tripped within two minutes following activation of the Exciter CO<sub>2</sub> Fire Suppression System. Otherwise, possible damage to the exciter may occur.
- (14) Cardox Tank leaks, vents and CO<sub>2</sub> used for generator purge will not smell of wintergreen.

**NOTE**

There are wintergreen odorizers installed in the piping runs to the Cable Spreading Rooms and the Generator Exciter Housing. When the Cardox System is discharged to these areas, the odorizers will rupture and the discharged CO<sub>2</sub> will smell of wintergreen.

- (15) Do not use the timer disable switch in 1C179 to terminate a Cardox discharge. This disable switch will freeze the timer in its current state and can result in a total discharge of the Cardox Tank if the timer freezes during a discharge sequence.



- (16) The Cardox System is designed to extinguish a fire in one discharge. The system has the capacity for two discharges but will normally only discharge one time.
- (17) Following a discharge of the Cardox System, allow the CO<sub>2</sub> to "soak" for 10 to 15 minutes before ventilating the Cable Spreading Room or the Exciter Housing.
- (18) Use of the fire pumps, except for fire system operation, maintenance and testing, shall require Shift Manager approval.

### **3.0 PLACING THE FIRE PROTECTION SYSTEM IN STANDBY/READINESS CONDITION**

#### **3.1 INITIAL CONDITIONS FOR STANDBY/READINESS**

#### **CAUTION**

Control circuits for DIESEL FIRE PUMP 1P-49, ELECTRIC FIRE PUMP 1P-48, and JOCKEY PUMP 1P-47 shall not be energized until the fire protection system has been filled and vented.

- (1) Complete the Fire Protection System Electrical Lineup OI 513A1  
(Attachment 1). \_\_\_\_\_
- (2) Complete the Fire Protection System Valve Lineup OI 513A2  
(Attachment 2). \_\_\_\_\_
- (3) Verify the General Service Water System is in operation per OI 411. \_\_\_\_\_
- (4) Verify the Well Water System is in operation per OI 408. \_\_\_\_\_
- (5) Verify compressed nitrogen cylinders are connected to the pneumatic line release deluge valves, located in the east and west cooling tower valve houses, and are regulated to 30 psig. \_\_\_\_\_
- (6) Verify electro-pneumatic line release deluge valves for the Control Building Standby Filter Units and Standby Gas Treatment charcoal filter beds are placed in the Standby/Readiness condition by depressing the RESET buttons on Control Room Panels 1C26A[B] and 1C24A[B], as necessary. \_\_\_\_\_

- (7) Verify that Circulating Water Pump Pit water level is above 13.0 feet as indicated by LI-4212 at computer point A-F092 in the Control Room. \_\_\_\_\_
- (8) Verify all switches inside the Fire Indicating Unit (FIU) cabinets are in the UP position and all zone alarm indications are reset. \_\_\_\_\_
- (a) Control Room (FIUs 1 and 2) \_\_\_\_\_
- (b) Pump House (FIU 3) \_\_\_\_\_
- (c) Intake Structure (FIU 4) \_\_\_\_\_

**NOTE**

**Fire Detection Panel Locations:**

Panel	Location
1C395	RB, 786, F-6
1C386	RW, 757, B-7

- (9) Verify proper operation of the fire detection Panels 1C395 and 1C386 by completing the following steps:
- (a) Unlock and open Panel 1C395 [1C386] and associated battery box. \_\_\_\_\_
- (b) Place the battery disconnect switch to the ON position. \_\_\_\_\_
- (c) Place the key operated ON/OFF switch located in the main panel in the ON position. \_\_\_\_\_
- (d) Close and lock the panel door for Panel 1C395 [1C386] and associated battery box. \_\_\_\_\_
- (e) Verify the key operated ALARM SILENCE switch is in the NON-SILENCED position. \_\_\_\_\_
- (f) Verify the following panel lights are illuminated: \_\_\_\_\_

SYSTEM NORMAL

(g) Verify the following panel lights are extinguished: \_\_\_\_\_

Panel 1C395  
BATTERY VOLTAGE LOW  
BATTERY TROUBLE  
AUDIBLE ALARM TROUBLE  
Fire Zones 3A and 3B  
PREALARM  
ALARM  
DETECTOR TROUBLE  
SOLENOID TROUBLE  
SOLENOID ENERGIZED

Panel 1C386  
BATTERY VOLTAGE LOW  
BATTERY TROUBLE  
AUDIBLE ALARM TROUBLE  
Fire Zone 13A  
PREALARM  
ALARM  
DETECTOR TROUBLE

(h) Depress the RESET pushbutton for Panel 1C395 to reset Deluge System #18 solenoid valve SV-3364. \_\_\_\_\_

### 3.2 FILL AND VENT OF THE FIRE PROTECTION SYSTEMS

#### **CAUTION**

Verify that GSW flow and pressure is adequate for additional load. If necessary, start an additional GSW Pump per OI 411.

- (1) Open V-46-10, GSW Supply/Fire Protection Cross-Connect Isolation, in the Pump House to provide a source of fill water to the Fire Main System. \_\_\_\_\_
- (2) Vent the Fire Protection System along the fire protection system ring header using yard hydrants as required. \_\_\_\_\_
  - (a) Resetting/Placing Cooling tower deluge system in Standby/Readiness condition. \_\_\_\_\_

### 3.3 RESETTING/PLACING COOLING TOWER DELUGE SYSTEM IN STANDBY/READINESS CONDITION

#### **CAUTION**

Ensure N<sup>2</sup> system for deluge system is in service (pressurized 40-45 psig) prior to restoring deluge system.

(1) Complete the following procedure for each of the deluge systems:

(a) Verify each Deluge System Main Isolation Valve (total of 12; 6 in "A" Tower Valve House, 6 in "B" Tower Valve House) is closed. \_\_\_\_\_

(b) Close the Deluge Priming Valve. \_\_\_\_\_

(c) Open the main drain valve and allow the system to drain. \_\_\_\_\_

(d) Depress the push rod of the Ball Drip Valve to ensure the valve is open and the Deluge Valve is drained. \_\_\_\_\_

(e) Remove the Deluge Valve cover by taking off the eight hex nuts. \_\_\_\_\_

(f) Inspect the clapper valve for freedom of movement. \_\_\_\_\_

#### **CAUTION**

Do not apply grease or oil to a stuck clapper mechanism.

(g) Raise the clapper and engage the clapper latch to the left to allow the clapper to be resealed. \_\_\_\_\_

(h) Release the clapper latch so that it rests on top of the clapper. \_\_\_\_\_

(i) Open the Deluge Priming Valve and allow pressure to build inside the diaphragm chamber. \_\_\_\_\_

(j) Reinstall the Deluge Valve cover with the eight nuts. \_\_\_\_\_

(k) Shut the main drain Isolation Valve. \_\_\_\_\_

## CAUTION

Water discharge from the main drain is indicative of an improperly reset deluge valve.

- (l) Slowly open the main deluge station isolation valve. If leakage is detected, repeat Steps 3.3(1)(a) through 3.3(1)(k). \_\_\_\_\_
- (m) If leakage is not detected from the ball drip valve, completely open the main isolation valve. \_\_\_\_\_

## NOTE

The following step will cause annunciator (1C40, G-1[G-2]) "A"["B"] COOLING TOWER DELUGE NO. 16[17] N<sub>2</sub> PRESSURE HI/LO OR SUPPLY VALVE NOT FULL OPEN to alarm during interval reset button is depressed.

- (n) If "A"["B"] COOLING TOWER 1E-69A[B] FIRE (1C40, F-1[F-2]) annunciator is alarming, depress reset button on 1B7-8[1B8-4]. \_\_\_\_\_

### 3.4 RESETTING/PLACING DELUGE STATIONS 1 THROUGH 15, 18, 24 AND 25 IN STANDBY/READINESS CONDITION

- (1) Placing Deluge Stations 1 through 15, 18, 24 and 25 in Standby Readiness Condition. Complete the following procedure for each deluge station: \_\_\_\_\_
  - (a) Verify the Deluge Shutoff Valve is closed. \_\_\_\_\_
  - (b) Open Deluge System Drain and allow the system to drain. \_\_\_\_\_
  - (c) Depress the Deluge Drip Test Check Valve to ensure the valve is open and the Deluge Valve is drained. \_\_\_\_\_
  - (d) For Deluge Station 18 only depress the SYSTEM RESET pushbutton at Panel 1C-395 to reset SV-3364. \_\_\_\_\_
  - (e) For Pneumatic Release Deluges #5 and 10 through 15 verify the Instrument Air Supply Pressure Gauge is reading between 30 and 60 psig. \_\_\_\_\_

(f) Open the Priming Line Isolation until the local Priming Line Pressure Indicator indicates fire main pressure has been achieved in the priming line. \_\_\_\_\_

(g) Close the Deluge System Drain Valve. \_\_\_\_\_

(h) Slowly open and seal the Deluge System Shutoff Valve. \_\_\_\_\_

(i) Close the Priming Line Isolation. \_\_\_\_\_

### 3.5 PLACING JOCKEY PUMP 1P-47 IN AUTOMATIC

(1) At MCC 1B13 place Breaker 1B1311 in the ON position. \_\_\_\_\_

(2) Open V-33-153, 1T-253 Well Water Supply Isolation and verify that V-33-145, 1T-253 Well Water Supply Auto Level Control functions to establish and maintain tank level. \_\_\_\_\_

(3) Start 1P-47, JOCKEY PUMP, by placing local hand switch HS-3302 at Panel 1C114 in the AUTO position. \_\_\_\_\_

#### **NOTE**

The JOCKEY PUMP will cycle on and off between 120 psig and 130 psig.

(4) Open V-33-162, Jockey Pump 1P-47 Discharge Isolation, and observe that fire main system pressure increases to 120 psig on local indicator PI-3302A. \_\_\_\_\_

(5) Close V-46-10, GSW Supply/Fire Protection Cross-Connect Isolation if previously opened. \_\_\_\_\_

### 3.6 PLACING ELECTRIC FIRE PUMP 1P-48 IN STANDBY/READINESS CONDITION

(1) At Panel 1C115 verify isolation switch is in the open position. \_\_\_\_\_

(2) At Panel 1C115 verify local circuit breaker (disconnecting means) is OFF. \_\_\_\_\_

- (3) In the 1A1 Switchgear, rack in and close 1B0106, (1P48 Electric Fire Pump and Panel 1C115 Power Supply). \_\_\_\_\_
- (4) Verify Annunciator 1C40, I-5 (Electric Fire Pump 1P48 tripped) Reset. \_\_\_\_\_
- (5) At 1P48 verify proper upper and lower motor bearing oil levels by observing oil level between minimum and maximum on each sightglass. \_\_\_\_\_
- (6) At Panel 1C115 place the local isolation switch in the ON position. \_\_\_\_\_

**NOTE**

Fire Header Pressure must be > 95 psig to ensure Electric Fire Pump will not auto start upon release of stop pushbutton.

- (7) At Panel 1C115, depress and hold HS3301C (1P48 Electric Fire Pump manual stop pushbutton) then turn local circuit breaker (disconnecting means) on. \_\_\_\_\_
- (8) At Panel 1C115 release HS3301C. \_\_\_\_\_
- (9) Verify Annunciator 1C40, I-6 (Electric Fire Pump 1P48 Power Failure) reset. \_\_\_\_\_
- (10) At Panel 1C115 verify the white power available light is ON. \_\_\_\_\_
- (11) Electric Fire Pump, 1P48 is now in standby/readiness condition. \_\_\_\_\_

### **3.7 PLACING DIESEL-DRIVEN FIRE PUMP 1P-49 IN STANDBY/READINESS CONDITION**

- (1) Place breaker 1L50 CKT 07 in the ON position. \_\_\_\_\_
- (2) Verify that the 1P-49 battery racks, both trains A and B are charged by observing the blue lights ON at Panel 1C116. \_\_\_\_\_
- (3) Verify that the Fuel Oil Day Tank 1T-89 has at least 140 gallons of fuel oil (equivalent to an eight hour supply at full load) as indicated by LIS-3303 in the day tank room. \_\_\_\_\_

- (4) Place switch HS-3300A at Panel 1C116 in the AUTO position. The Diesel Fire Pump is now in the readiness condition and will automatically start and run to maintain fire main pressure above 85 psig.

**NOTE**

DIESEL FIRE PUMP 1P-49 SELECTOR SWITCH NOT IN AUTO (1C40, J-3) may be reset.

- (5) Verify a green light is ON at Panel 1C116, indicating HS-3300A is in AUTO, and adequate voltage is available in the battery racks.

**3.8 PLACING CARDOX CO<sub>2</sub> FIRE SUPPRESSION SYSTEMS IN  
STANDBY/READINESS CONDITION**

**NOTE**

The Cardox tank supplies CO<sub>2</sub> to Cable Spreading Room (CO<sub>2</sub> System #1) and main generator exciter (CO<sub>2</sub> System #2) fire suppression systems. The cable spreading room CO<sub>2</sub> system is automatically initiated if heat is detected in the room. The exciter CO<sub>2</sub> system is manually operated as directed by Annunciator Response Procedure (1C40A, F-3).

**CAUTION**

The Cable Spreading Room CO<sub>2</sub> Fire Suppression System shall be operable at all times. If not operable, comply with Limiting Conditions For Operation in Fire Plan Section 12.

The Exciter CO<sub>2</sub> Fire Suppression System should be operable whenever the main generator is in operation.

- (1) Verify that Cardox CO<sub>2</sub> System Valves are positioned per OI 513A3 (Attachment 3).
- (2) Place the Cardox Battery Disconnect Switch (1D93 48V Battery 9507) in the ON position at 1D95 in the PBX room.



**NOTE**

Steps (3) through (8) are performed locally at the Cardox Storage Tank.

- (3) Place the Cardox Battery Charger Disconnect Switch in the ON position. \_\_\_\_\_
- (4) Verify that the Cardox tank has a minimum level of 80% full as indicated by LIS-8505 on the east side of the tank. \_\_\_\_\_
- (5) If level in the Cardox tank is low, fill the Cardox tank per Section 8.3. \_\_\_\_\_

**NOTE**

The Cardox system refrigeration compressor shall remain in operation whenever liquid CO<sub>2</sub> is present in the tank. Shutdown of the compressor shall not be performed unless the tank is empty.

- (6) Verify that the CO<sub>2</sub> refrigeration compressor is in operation, cycling ON and OFF to maintain tank pressure between 285-320 psig as indicated on PI-8505. \_\_\_\_\_
- (7) Verify that emergency release handswitches on Pilot Valve Cabinets SV-8521 and SV-8523 are in the closed position. \_\_\_\_\_
- (8) At the vaporizer control panel, verify that mechanical release operator on V-85-17 cabinet is in the closed position. \_\_\_\_\_
- (9) At the north cable spreading room door, verify that the emergency release handswitch on Alternate Pilot Valve Cabinet SV-8522 is in the closed position. \_\_\_\_\_
- (10) At the southwest corner of the turbine operating deck, inside Panel 1C463, perform the following:
- (a) Verify all alarm and trouble lights are off and the panel displays the word "SAFE". \_\_\_\_\_
- (b) Confirm the Exciter Vent Exhaust Damper has reopened. \_\_\_\_\_

- (c) Place HS 8523B Exciter Damper Position Switch in the OVERRIDE (OPEN) position. \_\_\_\_\_

- (11) Verify that the following annunciators are reset: \_\_\_\_\_

(1C40, F-6) CARDOX PRE-INITIATION ALARM  
(1C40, G-6) CARDOX INITIATED  
(1C40, H-6) CARDOX POWER FAILURE OR CO<sub>2</sub> TANK TROUBLE  
(1C40A, F-2) MAIN TURB/GEN OR EXCITER 1C464 OR 1C463 TROUBLE  
(1C40A, F-3) MAIN GEN EXCITER SMOKE DETECTOR OR EXCITER  
CARDOX SYS INITIATED  
(1C40A, F-4) MAIN GEN EXCITER VENT DAMPER NOT FULLY OPEN

#### **4.0 AUTOMATIC STARTUP/INITIATION OF THE FIRE PROTECTION SYSTEM**

##### **NOTE**

Follow the Duane Arnold Energy Center Fire Plan and AOP 913, Fire for fire fighting procedures.

- (1) If the ELECTRIC FIRE PUMP 1P-48 automatically starts when system pressure drops to less than 95 psig, acknowledge ELECTRIC FIRE PUMP 1P-48 RUNNING (1C40, J-5). \_\_\_\_\_

##### **NOTE**

Pump 1P-48 will run until secured manually.

- (2) If the DIESEL FIRE PUMP 1P-49 automatically starts when system pressure drops to less than 85 psig:
- (a) Acknowledge DIESEL FIRE PUMP 1P-49 RUNNING (1C40, J-1) annunciator. \_\_\_\_\_
- (b) Verify proper lube oil pressure, 30-79 psig as indicated by PI-3303 on the side of the diesel. \_\_\_\_\_
- (c) Verify proper water jacket temperature, 165-185°F, as indicated by TI-3300 on the side of the diesel. \_\_\_\_\_

(d) Verify proper engine speed, approximately 2100 rpm, as indicated by a local rpm gauge on the side of the diesel. \_\_\_\_\_

(e) Verify cooling water strainer pressure drop is less than 20 psid by comparing pressure indicators PI-3345 and PI-3346 (strainer inlet and outlet pressures) in the diesel room. \_\_\_\_\_

**NOTE**

Pump 1P-49 will run until secured manually.

(3) If the CO<sub>2</sub> flood of the Cable Spreading Room automatically initiates:

(a) Acknowledge annunciator CARDOX INITIATED (1C40, G-6). \_\_\_\_\_

**Perform ARP 1C40, G-6 immediately.**

(b) Ensure that personnel in the Cable Spreading Room are alerted to evacuate the room. \_\_\_\_\_

(c) Verify on Panel 1C26 in the Control Room that the CABLE SPREADING ROOM SUPPLY FAN 1V-AC-32 and CABLE SPREADING ROOM EXH FAN 1V-EF-33 have auto-tripped by observing the green OFF lights turned ON. \_\_\_\_\_

(d) Acknowledge the local audible alarm and red activation light (CARDOX SYSTEM ACTUATION) outside the Cable Spreading Room on Panel 1C179. \_\_\_\_\_

(e) Secure the Cardox System per Section 7.4 and tag it out per Section 8.4. \_\_\_\_\_

**NOTE**

Activation of a Cooling Tower Deluge System automatically shuts off the two associated cooling tower fans. "A"["B"] COOLING TOWER 1E-69A[B] FAN TROUBLE (1C06A, A-5[6]) annunciator will also be activated.

(4) If a Deluge, Preaction or Sprinkler system auto-initiation occurs, acknowledge the system alarm on Panel 1C40 or 1C40A and respond per applicable Annunciator Response Procedure. \_\_\_\_\_

## **5.0 MANUAL STARTUP/INITIATION OF THE FIRE PROTECTION SYSTEM**

### **5.1 MANUAL STARTUP OF DIESEL FIRE PUMP 1P-49**

(1) Manually initiate the Diesel Fire Pump 1P-49 by any one of the following four methods:

- (a) Depress pushbutton HS-3300B DIESEL FIRE PUMP 1P-49 on Panel 1C40 in the Control Room. \_\_\_\_\_
- (b) In the Diesel Fire Pump Room, open the door to Panel 1C116 and turn switch HS-3300A from AUTO to either MAN A or MAN B (for Battery Rack A[B], respectively), and then depress the START pushbutton. \_\_\_\_\_
- (c) Turn Control Switch HS-3300A from AUTO to TEST on Panel 1C116. \_\_\_\_\_

#### **NOTE**

The following steps are performed if the Diesel Engine Control Panel 1C116 fails to operate. At least one set of batteries shall be charged and usable to crank the engine.

(d) Emergency Local Manual Startup of Diesel Fire Pump 1P-49:

- 1. Override the electric fuel solenoid control by turning the knurled knob on top of the fuel pump assembly fully in a clockwise direction. \_\_\_\_\_
- 2. Engage the starter by raising the manual start lever on either one of the two manually operated starting contactors. \_\_\_\_\_
- 3. Disengage the starter after diesel engine start by releasing the previously operated starting contactor. \_\_\_\_\_

(2) Acknowledge annunciator DIESEL FIRE PUMP 1P-49 RUNNING (1C40, J-1). \_\_\_\_\_

(3) Verify proper Diesel Fire Pump operation by:

- (a) Observing proper lube oil pressure, 30-79 psig as indicated by PI-3303 on the side of the diesel. \_\_\_\_\_

- (b) Observing proper water jacket temperature, 165-185°F, as indicated by TI-3300 on the side of the diesel. \_\_\_\_\_
- (c) Observing proper engine speed, 2175 ± 100 rpm, as indicated by a local rpm gauge on the side of the diesel. \_\_\_\_\_
- (d) Observing cooling water strainer pressure drop is less than 40 psid by comparing pressure indicators PI-3345 and PI-3346 (strainer inlet and outlet pressures) in the Diesel Fire Pump Room. \_\_\_\_\_

## **5.2 MANUAL STARTUP OF ELECTRIC FIRE PUMP 1P-48**

- (1) Manually initiate ELECTRIC FIRE PUMP 1P-48 by any one of the following methods:
  - (a) Depressing pushbutton HS-3301D ELECTRIC FIRE PUMP 1P-48 on Panel 1C40 in the Control Room. \_\_\_\_\_
  - (b) Depressing START pushbutton HS-3301B on Panel 1C115 in the Pump House. \_\_\_\_\_
  - (c) Push in the manual EMERGENCY START control handle (motor starter control) on Panel 1C115 and engage the manual latch to hold the control handle. \_\_\_\_\_
- (2) Acknowledge annunciator ELECTRIC FIRE PUMP 1P-48 RUNNING (1C40, J-5). \_\_\_\_\_

## 5.3 MANUAL INITIATION OF THE CABLE SPREADING ROOM CO<sub>2</sub> FLOOD SYSTEM

### 5.3.1 NORMAL INITIATION METHOD

#### CAUTION

Personnel will have 24 seconds after receiving the audible alarm to evacuate the Cable Spreading Room before CO<sub>2</sub> flood occurs.

The operator should use any method of CO<sub>2</sub> injection available during an emergency condition by selecting steps in this section or Section 5.3.2. Manual initiation per Section 5.3.2 will not provide a 24 second delay. Ensure all personnel are out of the Cable Spreading Room before operating either pilot selector valve.

#### NOTE

The following step will initiate:

- CARDOX INITIATED annunciator (1C40, G-6)
- Local Cardox horn at panel 1C179
- Cable Spreading Room Supply and Exhaust Fans trip
- 24 second time delay
- 200 second CO<sub>2</sub> discharge

(1) Manually initiate the CO<sub>2</sub> flood system at the Cable Spreading Room, South access door as follows:

- (a) Pull out the locking pin, and depress the green START button. \_\_\_\_\_
- (b) Verify the local horn sounds at panel 1C179. \_\_\_\_\_
- (c) Verify on Panel 1C26 in the Control Room that the CABLE SPREADING ROOM SUPPLY FAN 1C-AC-32 and CABLE SPREADING ROOM EXH FAN 1V-EF-33 have auto-tripped by observing the green OFF lights turn ON. \_\_\_\_\_

**NOTE**

If discharge occurs, the timer motor (in 1C179) should stop, after 5 to 6 minutes. If timer motor does not stop (fire detection signal or manual actuation signal still sealed in), a second 5 to 6 minute CO<sub>2</sub> discharge sequence will be initiated.

- (d) Verify discharge using audible indication at Cable Spreading Room access or CO<sub>2</sub> tank pressure and level decrease. \_\_\_\_\_
- (e) Secure the Cardox System per Section 7.4 and tag it out per Section 8.4. \_\_\_\_\_
- (f) If no discharge occurs, proceed to an alternate initiation method. \_\_\_\_\_

**5.3.2 ALTERNATE INITIATION METHOD**

**CAUTION**

Placing both pilot control valve handles in the open position overrides the timed discharge sequence. The valve handle of at least one pilot control valve shall be returned to the closed position after 3 1/2 minutes to avoid expending the entire CO<sub>2</sub> storage tank on a single discharge.

**NOTE**

If Cardox has lost power, Step (1.A.1) may be successful in initiating Cardox. If Step (1.A.1) fails to discharge Cardox, both pilot valves need to be opened at the same time to initiate Cardox.

- (1) Manually initiate the CO<sub>2</sub> Flood System via the pilot valves as follows:
  - (a) Proceed to the North Cable Spreading Room door and break the glass cover on the Pilot box. \_\_\_\_\_
    - 1. Place the pilot control valve handle in the OPEN position. \_\_\_\_\_
    - 2. Acknowledge the local audible alarm and red actuation light (CARDOX SYSTEM ACTUATION) outside the Cable Spreading Room on Panel 1C179. \_\_\_\_\_

- (b) Proceed to the Master Pilot Valve Controller at the Cardox Unit, break the glass. Notify the Control Room that you are about to initiate Cardox.

**NOTE**

The following step will initiate:

- CO<sub>2</sub> to the Cable Spreading Room
- Local Cardox horn
- Cable Spreading Room Supply and Exhaust Fans trip

1. Open the pilot control valve for 210 seconds.
  2. Verify CO<sub>2</sub> discharge using CO<sub>2</sub> tank indicators.
  3. Verify on Panel 1C26 in the Control Room that the CABLE SPREADING ROOM SUPPLY 1C-AC-32 and EXHAUST 1V-EF-33 FANS have auto-tripped by observing the green OFF lights turn ON.
  4. Close the pilot control valve.
  5. Notify the Control Room that the manual initiation process for the Cardox System is complete.
- (c) Close the pilot control valve located by the North Cable Spreading Room door.
- (d) Secure the Cardox System per Section 7.4 and tag it out per Section 8.4.



## 5.4 MANUAL INITIATION OF THE EXCITER CO<sub>2</sub> FIRE SUPPRESSION SYSTEM

### **NOTE**

The main generator exciter fire suppression system is manually initiated. Four smoke detectors are installed on the exciter vent exhaust duct. These smoke detectors provide alarm and trouble lights on Control Room 1C40B Fire Panel. If two or more smoke detectors alarm, control room annunciator (1C40A, F-3) MAIN GEN EXCITER SMOKE DETECTOR OR EXCITER CARDOX SYS INITIATED will be activated to warn plant operators that a fire may exist on the exciter. Plant operators shall inspect the main generator exciter and make a determination on whether to initiate the CO<sub>2</sub> fire suppression system.

### **CAUTION**

Personnel have 15 seconds after actuating the fire suppression system to evacuate the exciter housing before CO<sub>2</sub> injection occurs.

When cooling/ventilation to the exciter is secured, the turbine shall be tripped within two minutes. Otherwise, damage to the exciter may occur.

- (1) If a fire in the main generator exciter has been confirmed, and the plant operator has determined manual initiation of exciter CO<sub>2</sub> is required, then perform Steps (2) through (8).
- (2) Initiate the exciter CO<sub>2</sub> fire suppression system using the pushbutton release stations located on the south end and southwest corner of the turbine operating deck and immediately place HS-8523B Exciter Damper Position Switch inside Panel 1C463 in the NORMAL position. CO<sub>2</sub> will be emitted to the exciter for about two minutes and then automatically be secured.

### **NOTE**

The system discharge timer is automatically bypassed when the emergency releases are used. The operator will be required to manually close the emergency release, if used, after approximately two minutes. Otherwise, the Cardox CO<sub>2</sub> Storage Tank will be emptied and depressurized.

- (3) If the pushbutton release stations are inaccessible, the exciter fire suppression system can be initiated using Exciter Fire Suppression Emerg-Manual Pilot Valve V-85-17 at the Cardox tank or by using the mechanical release on the pilot cabinet located above the Cardox tank. \_\_\_\_\_
- (4) Activate DAEC Fire Brigade by sounding Site Fire Alarm and making an announcement over the plant paging system. \_\_\_\_\_
- (5) Trip the main turbine, if not previously performed. \_\_\_\_\_
- (6) Refer to EPIP, Section 1.1 for EAL classification, if applicable. \_\_\_\_\_

### **NOTE**

If the fire is not suppressed by a single CO<sub>2</sub> release, operators can reinitiate the system using either of the methods noted in Steps (2) or (3).

### **CAUTION**

Following a discharge of the Cardox System, allow the CO<sub>2</sub> to "soak" for 10 to 15 minutes before ventilating the Exciter Housing

- (7) After ensuring that the exciter fire is suppressed, reset the Exciter Cardox Fire Suppression System by performing the following actions inside 1C463:
  - (a) On the keypad, press the red "RESET" key. \_\_\_\_\_
  - (b) To reopen the Exciter Vent Exhaust Damper, momentarily toggle the "PE RESET" switch to the up position and then restore it to its original position. \_\_\_\_\_

(c) Verify all alarm and trouble lights are off and the panel displays the word "SAFE". \_\_\_\_\_

(d) Place HS8523B Exciter Damper Position Switch in the OVERRIDE (OPEN) position. \_\_\_\_\_

## **6.0 NORMAL OPERATION OF THE FIRE PROTECTION SYSTEM**

### **NOTE**

During normal operation, the Fire Protection System is in the Standby/Readiness Condition per Section 3.3 with JOCKEY PUMP 1P-47 cycling ON and OFF to maintain system water pressure between 120 psig and 130 psig on local pressure indicator PI-3302.

(1) During operation, periodically monitor and log the following parameters: \_\_\_\_\_

<u>Component</u>	<u>Location</u>	<u>Low</u>	<u>Norm</u>	<u>High</u>
Diesel Fire Pump Fuel Oil Tank Level	LIS-4247	140		260
Cardox Level (PERCENT)	LIS-8505	80	95	100
Cardox Pressure	PI-8505	285		320

(2) The CO<sub>2</sub> Storage Tank should be in service with the following parameters: \_\_\_\_\_

<u>Parameter</u>	<u>Indication</u>	<u>Range</u>
Refrigerant Compressor Pressure	PI-8505	285-320 psig
Liquid CO <sub>2</sub> Level	LIS-8505	>80%

(3) The Smoke and Fire Detection System should be energized and operating properly as indicated by the following:

(a) White power available lights on Panel 1C40 (annunciator power and ZIU power) and on both FIUs 1 and 2 are ON in the Control Room. \_\_\_\_\_

- (b) At 1C40B Fire Alarm panel in the Control Room Back Panel Area verify the following:

Power available LED on is ON, with display stating

"1C40B FIRE SYSTEM NORMAL"

The ALARM, AUDIBLE SILENCE, SUPERVISORY, TROUBLE, and PARTIAL SYSTEM DISABLE LED's are OFF and the internal audible is off.

- (c) Green CARDOX SYSTEM NORMAL light on Panel 1C179 outside the cable spreading room is ON.

- (d) White power available light on FIU No. 3 is ON in the Pumphouse.

- (4) The 1P-49 lube oil and jacket water heaters and 1P49 room HVAC should be in operation whenever the pump is not running as indicated by the following:

- (a) Pump room HVAC (1VAH052, 1VEC050) is available as required for outside weather conditions.

**NOTE**

Room ventilation is backup to the block heater.

- (b) The lower diesel casing is warm to the touch.

- (5) Fire Detection Panels 1C395 and 1C397 should be operating properly as indicated by the SYSTEM NORMAL light ON.

**NOTE**

Pressure reading can vary from 110 to 155 psig due to system operation. Do not attempt to adjust pressure with a fire pump in operation or water flow in the system.

## **7.0 SHUTDOWN OF THE FIRE PROTECTION SYSTEM**

### **7.1 ELECTRIC FIRE PUMP 1P-48 SHUTDOWN**

- (1) Verify the EMERGENCY START handle is disengaged, and then depress the STOP pushbutton HS-3301C on Panel 1C115. \_\_\_\_\_
- (2) Reset annunciator ELECTRIC FIRE PUMP 1P-48 RUNNING (1C40, J-5). \_\_\_\_\_
- (3) If desired, return the pump to standby readiness per Section 3.6. \_\_\_\_\_

### **7.2 DIESEL-DRIVEN FIRE PUMP 1P-49 SHUTDOWN**

- (1) If the diesel driven fire pump was run at greater than minimum flow, run the engine at minimum flow for 15 minutes to allow for adequate cooldown of the diesel prior to diesel shutdown. \_\_\_\_\_
- (2) Place switch HS-3300A in the OFF position on Panel 1C116. \_\_\_\_\_

#### **NOTE**

The following step is only performed if the diesel engine was started via the emergency start method given in Step 5.1.

- (3) Shutdown Following an Emergency Diesel Fire Pump Start \_\_\_\_\_
  - (a) Turn the knurled knob located on top of the fuel pump assembly fully in the counter-clockwise direction. \_\_\_\_\_

#### **NOTE**

The engine will continue to run following Step (4) until fuel oil in the supply line between the shutoff valve and the engine is consumed.

- (4) If the engine should fail to stop following Steps (1) or (2), pull the fuel oil shutoff remote handle located on the wall outside the diesel fire pump fuel tank room. \_\_\_\_\_
- (5) Acknowledge annunciator DIESEL FIRE PUMP 1P-49 SELECTOR SWITCH NOT IN AUTO (1C40, J-3). \_\_\_\_\_

(6) Reset annunciator DIESEL FIRE PUMP 1P-49 RUNNING (1C40, J-1). \_\_\_\_\_

(7) If desired, return the Diesel Driven Pump to standby readiness per  
Section 3.7. \_\_\_\_\_

### 7.3 JOCKEY PUMP 1P-47 SHUTDOWN

#### **CAUTION**

The ELECTRIC FIRE PUMP and DIESEL FIRE PUMP will automatically start on loss of system pressure following shutdown of the jockey pump unless the pumps are inhibited from auto starting.

(1) Close V-33-162, 1P-47 Discharge Isolation. \_\_\_\_\_

(2) Place control switch HS-3302 at Panel 1C114 in the OFF position. \_\_\_\_\_

### 7.4 CARDOX SHUTDOWN AFTER INITIATION

(1) To ensure that the Cardox System does not discharge a second time,  
"close V-85-08 and V-85-09. \_\_\_\_\_

(2) Allow Cardox to "soak" in the discharge area for 10 to 15 minutes before  
ventilating the area. \_\_\_\_\_

(3) If a second Cardox discharge is required: \_\_\_\_\_

(a) Open V-85-08, V-85-09. \_\_\_\_\_

(b) At 1C179, verify timer disable switch is in NORMAL. \_\_\_\_\_

(c) Manually initiate Cardox per Section 5.3. \_\_\_\_\_

(4) If a second discharge is not required, tagout Cardox per Section 8.4. \_\_\_\_\_

## **8.0 INFREQUENT PROCEDURES**

### **8.1 PRESSURIZATION OF THE FIRE PROTECTION SYSTEM WITH WELL WATER**

#### **NOTE**

The Well Water System is the recommended source of fire main water when the circulating water pit is drained for maintenance. If the circulating water pit is not drained, the GSW System should be used to pressurize the plant fire main per OI 411.

- (1) Verify closed the Well Water cross-tie backflow preventer vent and drain valves V-33-167 and V-33-168 at the southwest yard area. \_\_\_\_\_
- (2) Open the Well Water cross-tie upstream and downstream isolations V-33-113 and V-33-112 at the southwest yard area. \_\_\_\_\_

#### **CAUTION**

The Fire Protection System is now supplied by the Well Water System. IF the Electric and Diesel driven fire pumps are to be isolated to perform circ pit drain-down, compensatory measures must be taken for the following inoperable equipment: Sprinkler system #21, Sprinkler system #7, Hose stations #46, and #47. Comply with DAEC Fire Plan Section 12.1.B.3 and 12.1.B.4, 12.1.C and ACP 1412.4.

- (3) Pressurization of the Fire Protection System may be secured when the circ. water pit has been filled and the fire pumps have been returned to standby/readiness by closing V-33-112 and V-33-113, and opening V-33-167 and V-33-168 (vent and drain) in the southwest yard area. \_\_\_\_\_

## 8.2 PRESSURIZATION OF THE FIRE WATER SYSTEM WITH OFFSITE FIRE DEPARTMENT PUMPER

### NOTE

The purpose of this procedure is to provide guidance to operations and fire brigade personnel in the connection of a fire department pumper to the connections available at the pump house. This procedure would be used when other sources of water are not available to provide a means of pressurizing the fire main system.

### 8.2.1 PREFERRED METHOD (GREATER FLOWS ATTAINABLE AT CT PROVIDED WATER IS AVAILABLE)

### NOTE

This method of pressurizing the fire main system will NOT provide the same capacity of flow as the normal methods of water supply. Under ideal conditions of the circulation water pit level near normal and a pumper in good condition, a maximum flow of 600-700 gpm may be possible. If the circ water pit is low, the flow will be decreased with the possibility of not being able to pump water from the pit due to the lift capability of the fire pumper.

### **CAUTION**

**DO NOT** put Pumper suction hoses in south end of CT basin while Circ Pumps are **RUNNING**.

- (1) Locate the fire department pumper as close as needed to the over flow outlet at either CT. \_\_\_\_\_
- (2) Using the 4.5" hard suction hose, route the hose through the fill material in the CT and allow the hose to enter the water of the CT basin. \_\_\_\_\_
- (3) Assist the fire department personnel in attaching the 4.5" hose to the fire department pumper intake. \_\_\_\_\_
- (4) Using 2.5" hose, attach 2 separate hoses from the fire department pumper discharge to the nearest fire hydrant. \_\_\_\_\_



- (5) Open the fire hydrant to the full open position to pressurize the fire main system.

### **CAUTION**

The fire department pump operator should establish a minimum flow line to allow for pump cooling if the fire department pumper is being used only to pressurize the fire main system without water flow.

### **NOTE**

The amount of water and pressure available will be dependent on the water level of the circ pit, the condition and size of the pumper and other variables. Optimum condition may allow 600-700 gpm at 150#.

## **8.2.2 ALTERNATE METHOD (CONNECTION AT PUMP HOUSE TO CIRC WATER PIT)**

### **NOTE**

This method of pressurizing the fire main system will NOT provide the same capacity of flow as the normal methods of water supply. Under ideal conditions of the circulation water pit level near normal and a pumper in good condition, a maximum flow of 600-700 gpm as possible. If the circ water pit is low, the flow will be decreased with the possibility of not being able to pump water from the pit due to the lift capability of the fire pumper.

- (1) Locate the fire department pumper as close as possible to the Fire Dept. Pumper **INTAKE** (Wall Hydrant) and Fire Dept. Pumper **DISCHARGE** (Stand Pipe) located on the east side of the pump house.
- (2) Attach a 10 ft length of 2.5" hard suction hose to each of the fire department intake connections on the east wall of the pump house labeled: Fire Dept. Pumper **INTAKE** (Wall Hydrant).
- (3) Install a 4.5" to 2.5" adapter to the intake port of the fire department pumper.

(4) Install a 2.5" Siamese to the adapter installed at the intake port of the pumper.

(5) Hook a 2.5" hard suction hose to each side of the Siamese.

**NOTE**

Four 50 ft sections of 2.5" fire hose will be needed to connect the pumper discharge to the fire main.

(6) Connect two 50 ft lengths of hose together and route the hose from the 2.5" pumper discharge (Siamese connection on the pumper) to the 2.5" hose connection located on the east side of the pump house labeled: Fire Dept. Pumper **DISCHARGE** (Stand pipe).

(7) Route the second set of hoses in a similar manner.

(8) The fire department pumper operator may then follow the normal pump operation procedures to begin to supply water to the fire main system.

### 8.3 FILLING CARDOX CO<sub>2</sub> STORAGE TANK

(1) Connect CO<sub>2</sub> vendor supplied hoses to the CO<sub>2</sub> charging and equalizing connections located outside the turbine building adjacent to the CARDOX unit.

**NOTE**

QC Receiving is required to review Certification prior to CO<sub>2</sub> transfer. Call QC Receiving at 7596 prior to opening fill valve V-85-11.

(2) Open valves V-85-11, V-85-7, and V-85-28 (inside the Cardox covered area) to connect the CARDOX tank to the vendor CO<sub>2</sub> supply.

(3) Open valves V-85-10 and V-85-29 (inside CARDOX covered area) to equalize CARDOX unit with vendor supply tanker.

(4) Refill CARDOX tank to at least the 90% level as indicated on local indicator LIS-8505.

- (5) Close V-85-28 and V-85-29 to isolate the CARDOX tank from the vendor CO<sub>2</sub> supply. \_\_\_\_\_
- (6) After vendor has vented hoses, liquid line and equalizing line, shut V-85-7, V-85-10 and V-85-11. \_\_\_\_\_
- (7) Disconnect CO<sub>2</sub> vendor supplied hoses at the CO<sub>2</sub> charging and equalizing connections located outside the turbine building adjacent to the CARDOX unit. \_\_\_\_\_

## **8.4 CABLE SPREADING ROOM CO<sub>2</sub> SYSTEM TAGOUT INSTRUCTIONS**

### **8.4.1 TAGOUT OF THE CABLE SPREADING ROOM CO<sub>2</sub> SYSTEM**

#### **NOTE**

The Cable Spreading Room CO<sub>2</sub> System tagout is performed whenever personnel entry into the Cable Spreading Room is required.

- (1) Verify the fire suppression water system is operable with standpipe pressure greater than 95 psig on Control Room Fire Hose Station HS-38, supply pressure indicator PI-3373. \_\_\_\_\_
- (2) Verify V-33-57, Turbine Building Fire Hose Station Supply Post Indicator, is open and hang a Warning Tag on it. \_\_\_\_\_
- (3) Visually inspect Hose Station #35 and Hose Station #36 for operability by insuring all equipment is available. \_\_\_\_\_
- (4) Route Cardox Fire Protection Impairment Request (FPIR) through Security but do not start Fire Watch rounds in the Cable Spreading Room. \_\_\_\_\_

#### **NOTE**

The following steps will activate CARDOX POWER FAILURE OR CO<sub>2</sub> TANK TROUBLE (1C40, H-6).

- (5) Unlock Cardox Panel 1C179 and complete the following steps: \_\_\_\_\_

- (a) Place NORMAL-DISABLE handswitch in "DISABLE" position and verify 1C40 annunciator CARDOX POWER FAILURE OR CO<sub>2</sub> TANK TROUBLE (1C40, H-6) is received. \_\_\_\_\_
- (b) Attach a hold card to the hand switch. \_\_\_\_\_
- (c) Relock Panel 1C179. \_\_\_\_\_
- (6) Close V-85-8 and lock in the closed position. \_\_\_\_\_
- (7) Verify closed valve V-85-9. \_\_\_\_\_
- (8) Verify V-85-8 is seated by performing the following:
  - (a) Open V-85-12 and bleed off pressure downstream of V-85-8. (This may take several minutes). Then, close V-85-12. \_\_\_\_\_
  - (b) If V-85-8 is not seated, cycle V-85-8 open, then closed. Repeat Step (8)(a). \_\_\_\_\_
- (9) Hang hold cards on V-85-8 and V-85-9. \_\_\_\_\_
- (10) Notify Security to perform the following steps:
  - (a) Enable the card reader for the 2nd Floor Administration Building Northwest Cable Spreading Room door #407. \_\_\_\_\_
  - (b) Commence Cable Spreading Room Fire Watch rounds. \_\_\_\_\_

#### 8.4.2 RESTORATION OF THE CABLE SPREADING ROOM CO<sub>2</sub> SYSTEM

**NOTE**

The following steps are not completed until the Hold Card release for the Cardox System has been signed.

- (1) Notify Security to perform the following steps:
  - (a) Verify all personnel have exited the cable spreading room. \_\_\_\_\_

- (b) Disable the card reader for the 2nd Floor Administration Building Northwest Cable Spreading Room door #407. \_\_\_\_\_
- (c) Secure the fire watch rounds in the Cable Spreading Room. \_\_\_\_\_
- (2) Obtain confirmation Security has completed step 8.4.2 (1). \_\_\_\_\_
- (3) Open V-85-8 and lock in the open position. \_\_\_\_\_
- (4) Place the NORMAL-DISABLE handswitch in the "NORMAL" position.  
Relock Panel 1C179. \_\_\_\_\_
- (5) Verify that Control Room annunciator CARDOX POWER FAILURE OR  
CO<sub>2</sub> TANK TROUBLE (1C40, H-6) has reset. \_\_\_\_\_

## 8.5 EXCITER CO<sub>2</sub> SYSTEM TAGOUT INSTRUCTIONS

### NOTE

Entries into the exciter housing without the exciter CO<sub>2</sub> system being tagged out shall be limited to short term inspections and minor maintenance only and requires two people, (one to remain outside the exciter housing). The exciter CO<sub>2</sub> system shall be tagged out whenever the exciter housing is entered for maintenance or the exciter housing doors are left open.

Performing Step (1) will activate the MAIN TURB/GEN OR EXCITER 1C464 OR 1C463 TROUBLE (1C40A, F-2) annunciator.

- (1) Open Exciter CO<sub>2</sub> System Control Panel 1C-463 and place the blue  
SOLENOID DISABLE (System Disable) micro-switch in the OFF position. \_\_\_\_\_
- (2) Attach a Hold Card for the switch on Panel 1C-463. \_\_\_\_\_
- (3) Close the cover door on Panel 1C-463. \_\_\_\_\_
- (4) At the Cardox tank, close and lock V-85-14, Exciter Fire Suppression  
System CO<sub>2</sub> Tank Shutoff Valve, in the closed position. \_\_\_\_\_
- (5) Close and lock V-85-16, Vapor Pilot Line Isolation, in the closed position. \_\_\_\_\_

(6) Behind the Hydrogen Seal Oil Unit, close V-85-18, Exciter Fire Suppression System CO<sub>2</sub> Injection Isolation. \_\_\_\_\_

(7) Hang Hold Cards on valves V-85-14, V-85-16 and V-85-18. \_\_\_\_\_

**NOTE**

Steps (8) through (17) are completed only after maintenance/ testing has been completed and it is desired to restore the system to operation.

(8) Clear Hold Cards on valves V-85-14, V-85-16 and V-85-18. \_\_\_\_\_

(9) Clear Hold Cards on the blue System Disable Switch at Panel 1C-463. \_\_\_\_\_

(10) Open valve V-85-18. \_\_\_\_\_

(11) Open valves V-85-14 and V-85-16 and lock in the open position. \_\_\_\_\_

(12) Place the blue System Disable Switch inside Panel 1C-463 in the ON position. \_\_\_\_\_

(13) Inside 1C463, reset the Exciter CO<sub>2</sub> System by pressing the red RESET key on the keypad. \_\_\_\_\_

(14) Verify that exciter vent exhaust damper D-85-01 is open. If not, open the Exciter Vent Exhaust Damper by momentarily toggling the "PE RESET" switch, inside 1C463, to the up position and then restore it to its original position. \_\_\_\_\_

(15) Inside 1C463, verify all alarm and trouble lights are off and the panel displays the word "SAFE". \_\_\_\_\_

(16) Inside 1C463, place HS8523B Exciter Damper Position Switch in the OVERRIDE (OPEN) position. \_\_\_\_\_

(17) Verify that the following annunciators are reset: \_\_\_\_\_

- (1C40A, F-2) MAIN TURB/GEN OR EXCITER 1C464 OR 1C463 TROUBLE
- (1C40A, F-3) MAIN GEN EXCITER SMOKE DETECTOR OR EXCITER CARDOX  
SYS INITIATED
- (1C40A, F-4) MAIN GEN EXCITER VENT DAMPER NOT FULLY OPEN

- (18) If necessary to verify operability of system after maintenance, perform STP-NS13C008.

## 8.6 1C40B FIRE ALARM SYSTEM OPERATION

### NOTE

A FPIR is required if any "FIRE" or "TROUBLE" Alarm cannot be reset within one hour.

The 1C40B Device ID as displayed will not show the 2 letter prefixes as follows:

FD = Fire Detector

HS = Manual Pull Station

FK = Relay

Example FD001-001 will be displayed as 001-001

- (1) When an alarm is detected:

- (a) The ALARM and AUDIBLE SILENCE LED's will be flashing, the system buzzer will be activated, and the display will alternate thru the following 3 messages:

Message 1	[Device ID] [custom message] [event #] [device type]	in ALR
Message 2	[Device ID] [custom message] [event #] [time/date]	in ALR
Message 3	ALARMS =001 TROUBLES=000	SUPERVISORY=000 SECURITY=000

### NOTE

The printer will print an alarm message similar to the following:

ALARM [Device ID] 11:59:59 Dec 31, 2000  
[event #] [custom message], [device type]

**NOTE**

If there is more than 1 alarm the operator can page thru the alarm by pressing the Display NEXT pushbutton.

- (b) Acknowledge the alarm by depressing the ALARM ACK pushbutton.  
The system will acknowledge the alarm displayed, and then display the next unacknowledged alarm, if any.

**NOTE**

The printer will print an alarm acknowledgement message similar to the following:

ACK ALARM [Device ID] 11:59:59 Dec 31, 2000  
[event #] [custom message], [device type]

- (c) Continue acknowledging the alarms until the system displays the following message:

ALL ALARMS ACKNOWLEDGED

- (d) The ALARM LED will change from flashing to a solid glow.
- (e) If there are no supervisories, or troubles the internal audible alarm goes silent; if any of these conditions exist, the internal audible alarm will pulse.
- (f) Press AUD SIL after all alarms are acknowledged: the system will display the following::

AUDIBLES SILENCED



**NOTE**

Pushing the AUD SIL pushbutton again after the AUDIBLES SILENCED is displayed reactivates all alarms and the buzzer.

(2) When a trouble is detected:

(a) The TROUBLE LED will be flashing, the buzzer will be sounding and the display will alternate thru the following 3 messages:

Message 1	[Device ID]	[custom message]	
	[event #]	[Trouble type]	in TBL
Message 2	[Device ID]	[Device type]	
	[event #]	[time/date]	in TBL
Message 3	ALARMS =000		SUPERVISORY=000
	TROUBLES=001		SECURITY=000

**NOTE**

The printer will print an Trouble message similar to the following:

Trouble In [Device ID] 11:59:59 Dec 31, 2000  
[event #] [custom message], [Trouble Type], [device type]

(b) Acknowledge the Trouble alarm by depressing the TRBL ACK pushbutton. The system will acknowledge the Trouble displayed, and then display the next unacknowledged Trouble, if any.

**NOTE**

The printer will print an Trouble acknowledgement message similar to the following:

ACK Trouble [Device ID] 11:59:59 Dec 31, 2000  
[event #] [custom message], [Trouble Type], [device type]

- (c) Continue acknowledging Troubles until the system displays the following message:

ALL TROUBLES ACKNOWLEDGED.

- (d) The TROUBLE LED will change from flashing to a solid glow and the internal audible alarm goes silent.

(3) Soft Reset of the system

- (a) When the cause of the alarms, or troubles, have been corrected the system may be reset.

**NOTE**

A FPIR is required if any "FIRE" or "TROUBLE" Alarm cannot be reset within one hour.

- (b) Depress the RESET pushbutton. The display will respond with the following message:

System Reset

- (c) The system then returns to normal and the display shows the following:

11:59:59 Dec 31, 2000  
[custom system message]

SYSTEM  
NORMAL

## 8.7 FLUSHING DIESEL FIRE PUMP 1P-49 GEAR HEAD OIL COOLER WYE STRAINER YS-3338

- (1) If not already running, manually start Diesel Fire Pump 1P-49 per Section 5.1
- (2) Remove pipe cap downstream of YS-3338 Drain Flush Isolation V-33-630.
- (3) Connect temporary drain hose.

## CAUTION

If there is oil or glycol on top of the drain plug, contact the Environmental Department.

- (4) Remove drain plug from floor drain and insert temporary drain hose into floor drain. \_\_\_\_\_
- (5) Open YS-3338 Drain/Flush Isolation V-33-630 for 30 to 60 seconds to flush YS-3338. \_\_\_\_\_
- (6) Close V-33-630. \_\_\_\_\_
- (7) Remove temporary drain hose from floor drain. \_\_\_\_\_
- (8) Reinstall drain plug into floor drain. \_\_\_\_\_
- (9) Unlock and open Fire Pump Test Return Line Isolation V-33-31. \_\_\_\_\_
- (10) Adjust Fire Pump Test Return Line Throttle V-33-156 to obtain a flowrate of  $\geq 2500$  gpm as indicated on Fire Pump Test Return Line Flow FI-3300. \_\_\_\_\_
- (11) Close Fire Pump Test Return Line Throttle V-33-156. \_\_\_\_\_
- (12) Close and lock Fire Pump Test Return Line Isolation V-33-31. \_\_\_\_\_
- (13) Allow Diesel Fire Pump 1P-49 to run for 15 minutes at minimum flow to cooldown. \_\_\_\_\_
- (14) Disconnect temporary drain hose. \_\_\_\_\_
- (15) Reinstall pipe cap downstream of YS-3338 Drain/Flush Isolation V-33-630. \_\_\_\_\_
- (16) Secure Diesel Fire Pump 1P-49 per Section 7.2. \_\_\_\_\_

## **9.0 REFERENCES**

- (1) Updated Final Safety Analysis Report, Duane Arnold Energy Center, Section 9.5.1
- (2) OI 730, Control Building HVAC System
- (3) OI 170, Standby Gas Treatment System
- (4) Duane Arnold Energy Center Fire Plan
- (5) Operation and Instruction Manual Model A888-M452 Control Unit Bechtel Document 11186-293-E-008470-30(1)
- (6) Operation and Instruction Manual Model A888-M453 Control Unit Bechtel Document 11186-293-E-008470-33(1)
- (7) Operation and Instruction Manual Model A888-M454 Control Unit Bechtel Document 11186-293-E-008470-31(1)
- (8) Operation and Instruction Manual Model A888-M455 Control Unit Bechtel Document 11186-293-E-008470-32(1)
- (9) Instruction Manual AN-3100 Visual Annunciator, Rochester Instrument, Bechtel Document 11186-293-P72-3-2
- (10) Instructions, Grinnell Multimeter Valve, BECH VPCR No. 7884-M-104B-6-1
- (11) Owner's Manual, Viking Deluge System, BECH VPCR No. 7884-M104B-13-1
- (12) Owner's Manual, Viking Wet Pipe Sprinkler System, National Fire Sprinkler, Drawing No., BECH VPCR No. 7884-M104B-12-1
- (13) P and ID, Fire Protection, BECH 7884-M-133
- (14) Fire Protection Plans at EL 716'9" and 734'0", BECH 7884-M-373
- (15) Fire Protection Plans at ELEV 757'6", BECH 7884-M-374
- (16) Fire Protection Plans at ELEV 780', 786', and 800'4", BECH 7884-M-375
- (17) Fire Protection Plans at ELEVS 812' and 833'6", BECH 7884-M-376
- (18) Fire Protection Plans at EL 855'0", BECH 7884-M-377
- (19) Fire Protection Plans, Radwaste, Control, Office and Shop Buildings, BECH 7884-M-378
- (20) Cardox System, BECH 7884-M-185
- (21) Schematic Diagram, Annunciators 1C40, BECH 7884-E-38

- (22) Cable Spreading RM AC Unit 1V-AC-32 Control, BECH 7884-E-113, SH 19
- (23) Cable Spreading RM EXH FAN 1V-EV-33 Control, BECH 7884-E113, SH 20
- (24) Cardox DWG No. FL-17671, SH 5, PNL 1C179 Wiring Diagram
- (25) Schematic and Connector Diagram, Fire Protection System, BECH 7884-E-81
- (26) Basic Wiring Diagram, Cooling Tower Deluge System, National Fire Sprinkler Co., BECH VPCR No. 7884-M104B-1-2
- (27) Single Line Diagram, Fire Protection - Smoke Detection, BECH 788-SK-M-605
- (28) Schematic Meter and Relay Diagram, 480V Load Center System, BECH 7884-E-24
- (29) Fire Hazard Analysis, Drawing No. BECH-FHA-1
- (30) Fire Hazard Analysis, Drawing Nos. BECH-FHA-M-1 through 13, 15, and 17 through 20
- (31) DCPs 1122, 1221, 1231, 1279, 1284, 1312, 1315, 1316, 1330, 1366, 1378, 1428, 1521, 1527, 1549, ECP-1585
- (32) EDCP-1488, HPCI/RCIC Deluge Sensor Modification
- (33) MMs 154, 164, 198, 277, 279
- (34) STPs NS-13C008, NS13A003
- (35) Chemetron Micro IEV Control Panel 1C463 Installation and Operating Manual
- (36) NG-92-0101
- (37) A12794 (Temp Mod)
- (38) Tech Spec Amendment 190
- (39) EMA A17255G, A16769, A27397, A21268G, A38490, A38491, A41753
- (40) Operating Order 92-156
- (41) DDC's 1538, 2410, 2615, 2791, 2909, 3279, 3435, 3664
- (42) PMP 91
- (43) MO12-052
- (44) MO12-053
- (45) SE-99-042
- (46) ECP 1619

## APPENDIX 1

### FIRE PROTECTION EQUIPMENT - COVERAGE AND LOCATIONS

Type	Plant Location or Equipment
Deluge Sys. 1	RCIC Room (Hydraulic Release) 716'9"
Deluge Sys. 2	HPCI Room (Hydraulic Release) 747'0"
Deluge Sys. 3	Reactor Feed Pump 1P-1B (Hydraulic Release) 734'0"
Deluge Sys. 4	Reactor Feed Pump 1P-1A (Hydraulic Release) 734'0"
Deluge Sys. 5	Standby Transformer (Pneumatic Release) 757'6"
Deluge Sys. 6	Hydrogen Seal Oil Unit (Hydraulic Release) 757'6"
Deluge Sys. 7	Turbine LO Reservoir (Hydraulic Release) 757'6"
Deluge Sys. 8	MG Set LO Coolers and Pumps 1G-201B (Hydraulic Release) 786'0"
Deluge Sys. 9	MG Set LO Coolers and Pumps 1G-201A (Hydraulic Release) 786'0"
Deluge Sys. 10	Startup Transformer (Pneumatic Release) 757'6"
Deluge Sys. 11	Auxiliary Transformer (Pneumatic Release) 757'6"
Deluge Sys. 12	Main Transformer 1X1A (Pneumatic Release) 757'6"
Deluge Sys. 13	Main Transformer 1X1B (Pneumatic Release) 757'6"
Deluge Sys. 14	Main Transformer 1X1D (Pneumatic Release) 757'6"
Deluge Sys. 15	Main Transformer 1X1C (Pneumatic Release) 757'6"
Deluge Sys. 16	West Cooling Tower 1E-69A (Nitrogen Release)
Deluge Sys. 17	East Cooling Tower 1E-69B (Nitrogen Release)
Deluge Sys. 18	Reactor Building Hatch Area 786'0"
Deluge Sys. 19	Standby Gas Treatment System Train A Charcoal Bed Filter (Pneumatic Release) 786'0"
Deluge Sys. 20	Standby Gas Treatment System Train B Charcoal Bed Filter (Pneumatic Release)
Deluge Sys. 21	Control Building Air Conditioning Train A Charcoal Bed Filter (Pneumatic Release) 800'4"
Deluge Sys. 22	Control Building Air Conditioning Train B Charcoal Bed Filter (Pneumatic Release) 800'4"
Deluge Sys. 23	TSC Emergency Air Filtration Charcoal Bed Filter (Manual Release)
Deluge Sys. 24	LLRPSF DAW Storage Area (Manual Release) 757'6"
Deluge Sys. 25	LLRPSF Resin Storage Area (Manual Release) 757'6"

## APPENDIX 1

### FIRE PROTECTION EQUIPMENT - COVERAGE AND LOCATIONS

(Continued)

Type	Plant Location or Equipment
Sprinkler Sys. 1	Clean and Dirty LO Storage Area 716'9"
Sprinkler Sys. 4	Area Under Turbine Building Operating Floor 757'6"
Sprinkler Sys. 5	Plant Heating Boiler 757'6"
Sprinkler Sys. 6	Radwaste Baler Area 757'6"
Sprinkler Sys. 7	Pump House Diesel Oil Room 761'0"
Sprinkler Sys. 8	Railroad Airlock 757'6"
Sprinkler Sys. 9	Turbine Bldg. RR and Aux. Equip. Area 757'
Sprinkler Sys. 10	Reactor Bldg. Scaffolding Storage Area
Sprinkler Sys. 11	Reactor Bldg. HVAC Chiller Area 812'
Sprinkler Sys. 12	Control Bldg. HVAC Equipment Room 807'
Sprinkler Sys. 13	LLRPSF Drum Processing / HIC Storage
Sprinkler Sys. 14	LLRPSF Processing Area
Sprinkler Sys. 15	LLRPSF Storage Area
Sprinkler Sys. 16	Condenser Bay 734'
Sprinkler Sys. 18	East Warehouse
Sprinkler Sys. 19	West Warehouse
Sprinkler Sys. 21	Sprinkler System # 21, Pumphouse Elevation 747'-6"
Preaction Sys. 1	Turbine Generator Bearings and Turbine Underskirt Preaction Sprinkler Systems, Deluge Valve 757'6", Electrical Release from 1C-464 TB780'
Preaction Sys. 2	Diesel Generator 1G-31 (Division I), Turbine Bldg. 757'6", Pneumatic Release
Preaction Sys. 3	Diesel Generator 1G-21 (Division II), Turbine Bldg. 757'6", Pneumatic Release

## APPENDIX 1

### FIRE PROTECTION EQUIPMENT - COVERAGE AND LOCATIONS

(Continued)

Type	Plant Location or Equipment
Hose Station 1	Turbine Building - Column M-4 734'0"
Hose Station 2	Turbine Building - Column Q-6 734'0"
Hose Station 3	Turbine Building - Column L-7.05 734'0"
Hose Station 4	Turbine Building - Column P-10 734'0"
Hose Station 5	Turbine Building - Column Q-10 734'0"
Hose Station 6	Turbine Building - Column K-12 734'0"
Hose Station 7	Auxiliary Bay - Column N-13 734'0"
Hose Station 8	Turbine Building - Column M-5 757'6"
Hose Station 9	Turbine Building - Column Q-6 757'6"
Hose Station 10	Turbine Building - Column K-7 757'6"
Hose Station 11	Turbine Building - Column Q-9.8 757'6"
Hose Station 12	Turbine Building - Column K-12 757'6"
Hose Station 13	Turbine Building - Column M-14 757'6"
Hose Station 14	Turbine Building - Column M-4 780'0"
Hose Station 15	Turbine Building - Column Q-6 780'0"
Hose Station 16	Turbine Building - Column K-7 780'0"
Hose Station 17	Turbine Building - Column Q-10 780'0"
Hose Station 18	Turbine Building - Column K-11 780'0"
Hose Station 19	Turbine Building - Column Q-13 780'0"
Hose Station 20	Turbine Building - Column L-14 780'0"
Hose Station 21	Reactor Building - Column F-5.2 757'6"
Hose Station 22	Reactor Building - Column E-9.1 757'6"
Hose Station 23	Reactor Building - Column H-11.1 757'6"
Hose Station 24	Control Building - Battery Room Col. H14 757'6"
Hose Station 25	Reactor Building - Column H-5.2 786'0"
Hose Station 26	Reactor Building - Column E-7.1 786'0"
Hose Station 27	Reactor Building - Column G-10.1 786'0"
Hose Station 28	Reactor Building - Column H-7.1 812'0"
Hose Station 29	Reactor Building - Column F-10.1 812'0"
Hose Station 30	Radwaste Building - Column C-7.1 757'6"
Hose Station 31	Radwaste Building - Column C-9.1 772'6"
Hose Station 32	Radwaste Building - Column B-7.1 786'0"
Hose Station 33	Offgas Building 757'6"
Hose Station 34	Machine Shop 757'6"
Hose Station 35	Control Building - Column F-14 772'6"
Hose Station 36	Admin. Building - Column F-11.5 772'
Hose Station 37	Admin. Building - Column Ec-13.7 786'
Hose Station 38	Control Room - Column FC-11.2 786'
Hose Station 39	Turbine Building - Column K-12.9 757'6"
Hose Station 40	Reactor Building - Column J-5.2 747'



## APPENDIX 1

### FIRE PROTECTION EQUIPMENT - COVERAGE AND LOCATIONS

(Continued)

Type	Plant Location or Equipment
Hose Station 41	Reactor Building - Column E-5.6 812'
Hose Station 42	Reactor Building - Column E-5.6 833'6"
Hose Station 43	Reactor Building - Column E-5.2 855'
Hose Station 44	Reactor Building - Column F-10.1 833'6"
Hose Station 45	Reactor Building - Column E-10.1 855'
Hose Station 46	Pump House - Column A-2 757'
Hose Station 47	Pump House - Column D-12 761'
Hose Station 48	Railroad Airlock Column - D-3.9 756'
Hose Station 49	LLRPSF - Column JJ-2.5 757'6"
Hose Station 50*	LLRPSF - Column AA-1.1 757'6"
Hose Station 51*	LLRPSF - Column BB-1 774'2"
Hose Station 52	LLRPSF - Column FF-6 757'6"
Hose Station 53*	LLRPSF - Column AA-6 757'6"
Hose Station 54	LLRPSF - Column AA-7 757'6"
Hose Station 55	LLRPSF - Column AA-9 757'6"
Hose Station 56*	LLRPSF - Column BB-5 774'2"
Hose Station 57	LLRPSF - Column AA-6 774'2"
Hose Station 58	LLRPSF - Column AA-9 798'0"
Hose Station 59	East Warehouse - South Area
Hose Station 60	East Warehouse - Center
Hose Station 61	East Warehouse - North Area
Hose Station 62*	Training Center, North End Corridor 107
Hose Station 63*	Training Center, East End Corridor 213
Hose Station 64*	Training Center, West End Corridor 107
Hose Station 65*	Training Center, South End Corridor 217
Hose Station 66*	Data Acquisition Center Corridor DAC - 130
Hose Station 67*	Data Acquisition Center Corridor DAC - 129
Hose Station 68*	Data Acquisition Center Corridor DAC - 211
Hose Station 69*	Data Acquisition Center Corridor DAC - 222
Hose Station 70*	Technical Support Center 757'
Hose Station 71	West Warehouse North Area - Center (North)
Hose Station 72	West Warehouse North Area - Center (South)
Hose Station 73	West Warehouse South Area - Outside Rod Storage
Hose Station 74	West Warehouse South Area - Outside Tool Room
Hose Station 75	West Warehouse South Area - East Wall
Hose Station 76	Admin. Building, Stairwell Outside Hot Lab
*In Hose Cabinet	

## APPENDIX 1

### FIRE PROTECTION EQUIPMENT - COVERAGE AND LOCATIONS

(Continued)

Type	Plant Location or Equipment
Yard Hydrant Hose Station #1	East of Main XFMR
Yard Hydrant Hose Station #2	Southeast Side of Turbine Building
Yard Hydrant Hose Station #3	South of CSTs
Yard Hydrant Hose Station #4	South Side of Radwaste Storage Facility
Yard Hydrant Hose Station #5	Southwest Side of Radwaste Storage Facility
Yard Hydrant Hose Station #6	South End of Construction Support Center
Yard Hydrant Hose Station #7	East of Startup XFMR
Yard Hydrant Hose Station #8	West of Security Building
Yard Hydrant Hose Station #9	Northeast Side of East Warehouse
Yard Hydrant Hose Station #10	South Side Cooling Tower 1E-69A
Yard Hydrant Hose Station #11	West Side Cooling Tower 1E-69A
Yard Hydrant Hose Station #12	North Side Cooling Tower 1E-69A
Yard Hydrant Hose Station #13	East Side Cooling Tower 1E-69A
Yard Hydrant Hose Station #14	West Side Cooling Tower 1E-69B
Yard Hydrant Hose Station #15	South Side Cooling Tower 1E-69B
Yard Hydrant Hose Station #16	East Side Cooling Tower 1E-69B
Yard Hydrant Hose Station #17	North Side Cooling Tower 1E-69B
Yard Hydrant Hose Station #18	East of Construction Support Center
Yard Hydrant Hose Station #19	North of LLRPSF
Yard Hydrant Hose Station #20	Northwest of LLRPSF
Yard Hydrant Hose Station #21	Southwest of Training Center
Yard Hydrant Hose Station #22	West of Training Center
Yard Hydrant Hose Station #23	West of Training Center
Yard Hydrant Hose Station #24	Remote Hydrogen Storage Facility

**APPENDIX 2**  
**1C40B SYSTEM DEVICES**  
**CONTROL ROOM**

<u>Device Code</u>	<u>Device Type</u>	<u>Device Location</u>
001-001	Photo-Elect DET	CONT RM FRAME 12 DET 1
001-002	Photo-Elect DET	CONT RM FRAME 12 DET 2
001-003	Photo-Elect DET	CONT RM FRAME 12 DET 3
001-004	Photo-Elect DET	CONT RM FRAME 12 DET 4
001-005	Photo-Elect DET	CONT RM FRAME 12 DET 5
001-006	Photo-Elect DET	CONT RM FRAME 12 DET 6
001-007	Photo-Elect DET	CONT RM FRAME 12 DET 7
001-008	Photo-Elect DET	CONT RM FRAME 12 DET 8
001-009	Photo-Elect DET	CONT RM FRAME 12 DET 9
001-010	Photo-Elect DET	CONT RM FRAME 13 DET 10
001-011	Photo-Elect DET	CONT RM FRAME 13 DET 11
001-012	Photo-Elect DET	CONT RM FRAME 13 DET 12
001-013	Photo-Elect DET	CONT RM FRAME 13 DET 13
001-014	Photo-Elect DET	CONT RM FRAME 13 DET 14
001-015	Photo-Elect DET	CONT RM FRAME 13 DET 15
001-016	Photo-Elect DET	CONT RM FRAME 13 DET 16
001-017	Photo-Elect DET	CONT RM FRAME 13 DET 17
001-018	Photo-Elect DET	CONT RM FRAME 13 DET 18
001-019	Photo-Elect DET	CONT RM FRAME 13.5 DET 19
001-020	Photo-Elect DET	CONT RM FRAME 13.5 DET 20
001-021	Photo-Elect DET	OUTSIDE INTAKE H&V DUCT DET
001-026	Photo-Elect DET	SPDS PANEL 1C401 DET
001-027	Photo-Elect DET	SPDS PANEL 1C402 DET
001-028	Photo-Elect DET	CONT RM FRAME 13.5 DET 21
001-029	Photo-Elect DET	CONT RM FRAME 13.5 DET 22

001-020 Detector is in the Computer Room above the ceiling tiles.

**APPENDIX 2**  
**1C40B SYSTEM DEVICES**  
**AIR COMPRESSOR BUILDING**

<u>Device Code</u>	<u>Device Type</u>	<u>Device Location</u>
001-022	Thermal DET	AIR COMPR BLDG NE DET
001-023	Thermal DET	AIR COMPR BLDG NW DET
001-024	Thermal DET	AIR COMPR BLDG SE DET
001-025	Thermal DET	AIR COMPR BLDG SW DET

**LLRPSF**

<u>Device Code</u>	<u>Device Type</u>	<u>Device Location</u>
001-032	Photo-Elect DET	LLRPSF DET TELEPHONE RM 851
001-033	Photo-Elect DET	LLRPSF DET FOREMAN OFF RM 852
001-034	Manual Pull Station	PULL STATION OUTSIDE LLRPSF RM 852
001-035	Photo-Elect DET	LLRPSF DET CORR RM 850
001-036	Photo-Elect DET	LLRPSF DET CORR RM 850
001-037	Photo-Elect DET	LLRPSF DET CRANE CONT RM 845
001-038	Photo-Elect DET	LLRPSF DET TEMP AREA RM 855
001-039	Photo-Elect DET	LLRPSF DET DIMEN AREA RM 856
001-040	Photo-Elect DET	LLRPSF DET RW BREAK RM 844
001-041	Photo-Elect DET	LLRPSF DET RW BREAK RM 844
001-042	Photo-Elect DET	LLRPSF DET MET LAB RM 857
001-043	Photo-Elect DET	LLRPSF DET MET LAB RM 857
001-044	Photo-Elect DET	LLRPSF DET MET LAB RM 857
001-045	Photo-Elect DET	LLRPSF DET TORQUE/HP RM 858
001-046	Photo-Elect DET	LLRPSF DET STAGING AREA RM 854
001-047	Photo-Elect DET	LLRPSF DET MET LAB SUPV OFF RM 853
001-048	Photo-Elect DET	LLRPSF DUCT DET RM 854
001-049	Photo-Elect DET	LLRPSF DET CORR RM 859
001-050	Photo-Elect DET	LLRPSF DET CORR RM 859

## APPENDIX 2

### 1C40B SYSTEM DEVICES

#### LLRPSF

Device Code	Device Type	Device Location
002-002	Relay	LLRPSF HVAC TRIP, 1C434
002-003	Relay	LLRPSF HVAC PURGE, 1C434
002-004	Relay	LLRPSF HVAC TRIP, 1C436
002-005	Relay	LLRPSF HVAC PURGE, 1C436
002-006	Relay	LLRPSF HVAC TRIP, 1C435
002-007	Relay	LLRPSF HVAC PURGE, 1C437
002-008	Relay	LLRPSF HVAC PURGE, 1C437
002-009	Relay	LLRPSF HVAC TRIP, 1C437
002-010	Thermal DET	LLRPSF DET ELEC EQPT RM 862
002-011	Photo-Elect DET	LLRPSF DUCT DET RM 862
002-012	Thermal DET	LLRPSF DET ELEC EQPT RM 862
002-013	Photo-Elect DET	LLRPSF DUCT DET RM 862
002-014	Thermal DET	LLRPSF DET ELEC EQPT RM 862
002-015	Thermal DET	LLRPSF DET ELEC EQPT RM 862
002-016	Thermal DET	LLRPSF DET ELEC EQPT RM 862
002-017	Photo-Elect DET	LLRPSF DUCT DET RM 862
002-018	Photo-Elect DET	LLRPSF DUCT DET RM 862
002-019	Thermal DET	LLRPSF DET ELEC EQPT RM 862
002-020	Photo-Elect DET	LLRPSF DUCT DET RM 862
002-021	Photo-Elect DET	LLRPSF DET STORAGE RM 861
002-022	Manual Pull Station	PULL STATION LLRPSF CORR RM 863
002-023	Photo-Elect DET	LLRPSF DET SOUTH CORR RM 863
002-025	Relay	LLRPSF SPRK #14 TRIP, PS3362
002-026	Relay	LLRPSF SPRK #13 FLOW, FS3364
002-032	Relay	LLRPSF RESIN STOR DELUGE 25 TRIP PS3360
002-034	Relay	LLRPSF DAW STOR DELUGE 24 TRIP PS3361
002-036	* Photo-Elect DET	LLRPSF DUCT DET DAW STOR
002-037	* Photo-Elect DET	LLRPSF DUCT DET DAW STOR
002-038	* Photo-Elect DET	LLRPSF DUCT DET DAW STOR
002-039	* Photo-Elect DET	LLRPSF DUCT DET DAW STOR
002-040	** Photo-Elect DET	LLRPSF DUCT DET RESIN STOR
002-041	** Photo-Elect DET	LLRPSF DUCT DET RESIN STOR
002-042	** Photo-Elect DET	LLRPSF DUCT DET RESIN STOR
002-043	** Photo-Elect DET	LLRPSF DUCT DET RESIN STOR
002-045	Relay	LLRPSF SPRK #15 TRIP, PS3363
002-046	Photo-Elect DET	LLRPSF DET 1 1T088 TANK RM 802
002-047	Photo-Elect DET	LLRPSF DET 2 1T088 TANK RM 802

\* These areas are protected by Deluge System #24. This deluge is manually initiated only, contact the Radwaste Operator.

\*\* These areas are protected by Deluge System #25. This deluge is manually initiated only, contact the Radwaste Operator.

## APPENDIX 2

### 1C40B SYSTEM DEVICES

#### CONTROL BUILDING BATTERY ROOM CORRIDOR

Device Code	Device Type	Device Location
003-001	Photo-Elect DET	BAT CORR ZONE 10A DET
003-016	Photo-Elect DET	BAT CORR ZONE 10A DET
003-029	Photo-Elect DET	BAT CORR ZONE 10A DET
003-030	Photo-Elect DET	BAT CORR ZONE 10A DET

#### DATA ACQUISITION CENTER

Device Code	Device Type	Device Location
003-002	Photo-Elect DET	DAC102 1FL SOUTH EXIT DET
003-003	Photo-Elect DET	DAC105 1FL WEST EQPT RM DET
003-004	Photo-Elect DET	DAC103 1FL SW CORR DET
003-005	Manual Pull Station	PULL STATION DAC103 1FL SW CORR
003-006	Photo-Elect DET	DAC109 1FL SW OFFICE AREA DET
003-007	Photo-Elect DET	DAC109 1FL SW OFFICE AREA DET
003-008	Photo-Elect DET	DAC110 1FL SW OFFICE DET
003-009	Photo-Elect DET	DAC111 1FL SW COMP RM DET
003-010	Photo-Elect DET	DAC112 1FL SW OFFICE DET
003-011	Photo-Elect DET	DAC113 1FL SW WOMEN'S RM DET
003-012	Photo-Elect DET	DAC114 1FL SW MEN'S RM DET
003-013	Photo-Elect DET	DAC106 1FL SW STOR RM DET
003-014	Photo-Elect DET	DAC107 1FL SW JAN CLOSET DET
003-015	Photo-Elect DET	DAC103 1FL SW CORR DET
003-017	Photo-Elect DET	DAC105 1FL WEST OFFICE AREA DET
003-018	Photo-Elect DET	DAC115 1FL WEST EXIT DET
003-019	Photo-Elect DET	DAC130 1FL WEST EXIT DET
003-020	Manual Pull Station	PULL STATION DAC130 1FL WEST EXIT
003-021	Photo-Elect DET	DAC130 1FL MID CORR DET
003-022	Photo-Elect DET	DAC121 1FL NW GE RM DET
003-023	Photo-Elect DET	DAC120 1FL NW CONF RM DET
003-024	Photo-Elect DET	DAC117 1FL NW OFFICE DET
003-025	Photo-Elect DET	DAC119 1FL NW OFFICE DET
003-026	Photo-Elect DET	DAC119 1FL NW OFFICE DET
003-027	Photo-Elect DET	DAC118 1FL SUPV OFFICE DET
003-028	Photo-Elect DET	DAC117 1FL NW OFFICE DET

## APPENDIX 2

### 1C40B SYSTEM DEVICES

#### CONTROL BUILDING / SECURITY BUILDING/ADMIN BUILDING

Device Code	Device Type	Device Location
003-031	* Photo-Elect DET	CB HVAC 1V-RF-30B DET 1
003-032	* Photo-Elect DET	CB HVAC 1V-AC-30A/B DET 2
003-033	* Photo-Elect DET	CB HVAC 1V-AC-30B DET 3
003-034	* Photo-Elect DET	CB HVAC 1V-AC-30A DET 4
003-035	* Photo-Elect DET	CB HVAC 1V-EF-33 DET 5
003-036	* Photo-Elect DET	CB HVAC 1V-HP-30B DET 6
003-037	* Photo-Elect DET	CB HVAC HALL-WEST DET 7
003-038	* Photo-Elect DET	CB HVAC AIR INTAKE DET 8
003-039	* Photo-Elect DET	CB 1V-SFU-30B DET 9
003-040	* Photo-Elect DET	CB 1V-SFU-30A DET 10
003-041	Photo-Elect DET	SEC BLD BAT RM 207 DET
003-042	Photo-Elect DET	SEC BLDG UPS RM 206 DET
003-043	Photo-Elect DET	CAS COMP RM SUB FL DET
003-044	Photo-Elect DET	SEC SUPV OFFICE SUB FL DET
003-045	Photo-Elect DET	CAS RM WEST SIDE SUB FL DET
003-046	Photo-Elect DET	CAS RM NE SIDE SUB FL DET
003-047	Photo-Elect DET	CAS RM SOUTH SIDE SUB FLOOR DET
003-048	Photo-Elect DET	SAS EXTERIOR CABLE CHASE DET
003-049	Photo-Elect DET	CLOSET WEST SIDE OF SAS RM DET
003-050	Photo-Elect DET	SAS RM SE SIDE SUB FL DET
003-051	Photo-Elect DET	SAS RM WEST SIDE SUB FL DET
003-052	Photo-Elect DET	SAS RM NORTH SIDE SUB FL DET

- \* These areas are protected by Sprinkler System #12. This sprinkler is manually initiated only. Send an Operator to Control Building HVAC Room (Elevation 800'4") to evaluate the situation. V-33-220 must be opened. (TB 757', Feed Reg Valve area).

## APPENDIX 2

### 1C40B SYSTEM DEVICES

### DATA ACQUISITION CENTER

Device Code	Device Type	Device Location
004-002	Photo-Elect DET	DAC131 1FL SE MACH RM DET
004-003	Photo-Elect DET	DAC133 1FL SE OFFICE DET
004-004	Photo-Elect DET	DAC133 1FL SE OFFICE DET
004-005	Photo-Elect DET	DAC133 1FL SE OFFICE DET
004-006	Photo-Elect DET	DAC133 1FL SE OFFICE DET
004-007	Photo-Elect DET	DAC132 1FL SE MACH RM DET
004-008	Photo-Elect DET	DAC136 1FL SE SUPV ROOM DET
004-009	Photo-Elect DET	DAC135 1FL SE SUPV OFFICE DET
004-010	Photo-Elect DET	DAC137 1FL NE OFFICE DET
004-011	Photo-Elect DET	DAC137 1FL NE OFFICE DET
004-012	Photo-Elect DET	DAC130 1FL MID CORR DET
004-013	Photo-Elect DET	DAC130 1FL MID CORR DET
004-014	Photo-Elect DET	DAC119 1FL NW OFFICE DET
004-015	Photo-Elect DET	DAC127 1FL NE MEN'S RM DET
004-016	Photo-Elect DET	DAC128 1FL NE WOMEN'S RM DET
004-017	Photo-Elect DET	DAC129 1FL NE CORR DET
004-018	Photo-Elect DET	DAC137 1FL NE OFFICE DET
004-019	Photo-Elect DET	DAC137 1FL NE OFFICE DET
004-020	Photo-Elect DET	DAC138 1FL NE SUPV OFFICE DET
004-021	Photo-Elect DET	DAC137 1FL NE OFFICE DET
004-022	Photo-Elect DET	DAC139 1FL NE CONF RM DET
004-023	Manual Pull Station	PULL STATION DAC129 1FL NE CORR
004-024	Photo-Elect DET	DAC125 1FL NE NORTH ENTRY DET
004-025	Photo-Elect DET	DAC126 1FL NE COPY RM DET
004-026	Photo-Elect DET	DAC119 1FL NW OFFICE DET
004-027	Photo-Elect DET	DAC122 1FL NW SUPV OFFICE DET
004-028	Photo-Elect DET	DAC123 1FL NW CONF RM DET

### TURBINE BUILDING

Device Code	Device Type	Device Location
004-031	Photo-Elect DET	MAIN GEN EXCITER DUCT DET
004-032	Photo-Elect DET	MAIN GEN EXCITER DUCT DET
004-033	Photo-Elect DET	MAIN GEN EXCITER DUCT DET
004-034	Photo-Elect DET	MAIN GEN EXCITER DUCT DET



# **APPENDIX 2** **1C40B SYSTEM DEVICES** **DATA ACQUISITION CENTER**

Device Code	Device Type	Device Location
005-001	Photo-Elect DET	DAC208 2FL SUPV OFFICE DET
005-002	Photo-Elect DET	DAC202 2FL SOUTH EXIT DET
005-003	Photo-Elect DET	DAC203 2FL SW CORR DET
005-004	Manual Pull Station	PULL STATION DAC203 2FL SW CORR
005-005	Photo-Elect DET	DAC204 2FL SW I&C SHOP DET
005-006	Photo-Elect DET	DAC205 2FL SW I&C LAB DET
005-007	Photo-Elect DET	DAC206 2FL SW I&C LIB DET
005-008	Photo-Elect DET	DAC207 2FL SW I&C CAL SHOP DET
005-009	Photo-Elect DET	DAC209 2FL SW NRC OFFICE DET
005-010	Photo-Elect DET	DAC204 2FL SW I&C SHOP DET
005-011	Photo-Elect DET	DAC204 2FL SW I&C SHOP DET
005-012	Photo-Elect DET	DAC203 2FL SW CORR DET
005-013	Manual Pull Station	PULL STATION DAC203 2FL SW CORR
005-014	Photo-Elect DET	DAC211 2FL MID CORR DET
005-015	Photo-Elect DET	DAC211 2FL MID CORR DET
005-016	Photo-Elect DET	DAC210 2FL SW NRC OFFICE DET
005-017	Photo-Elect DET	DAC211 2FL MID CORR DET
005-018	Photo-Elect DET	DAC216 2FL MID CONF RM DET
005-019	Photo-Elect DET	DAC216 2FL MID CONF RM DET
005-020	Photo-Elect DET	DAC214 2FL NW CONF RM DET
005-021	Photo-Elect DET	DAC212 2FL NW OFFICE DET
005-022	Photo-Elect DET	DAC203 2FL WEST STAIRWAY DET
005-023	Photo-Elect DET	DAC212 2FL NW OFFICE DET
005-024	Photo-Elect DET	DAC212 2FL NW OFFICE DET
005-025	Photo-Elect DET	DAC212 2FL NW OFFICE DET
005-026	Photo-Elect DET	DAC215 2FL NW SUPV OFFICE DET
005-027	Photo-Elect DET	DAC212 2FL NW OFFICE DET
005-028	Photo-Elect DET	DAC213 2FL NW SUPV OFFICE DET
005-029	Photo-Elect DET	DAC217 2FL NW CONF RM DET

## **TURBINE BUILDING**

Device Code	Device Type	Device Location
005-031	Photo-Elect DET	NON-ESS SWGR RM 1A1 DET
005-032	Photo-Elect DET	NON-ESS SWGR RM 1A1 DET
005-033	Photo-Elect DET	NON-ESS SWGR RM 1A1 DET
005-034	Photo-Elect DET	NON-ESS SWGR RM 1A2 DET
005-035	Photo-Elect DET	NON-ESS SWGR RM 1A2 DET
005-036	Photo-Elect DET	NON-ESS SWGR RM 1A2 DET

**APPENDIX 2**  
**1C40B SYSTEM DEVICES**  
**DATA ACQUISITION CENTER**

Device Code	Device Type	Device Location
006-002	Relay	DAC226 2FL SE HALON PNL TRBL
006-003	Relay	DAC226 2FL SE HALON SYS INJCT
006-004	Photo-Elect DET	DAC225 2FL SE BLDG AIR INTAKE DUCT DET
006-005	Photo-Elect DET	DAC225 2FL SE MACH RM DET
006-006	Photo-Elect DET	DAC228 2FL SE COMP AREA DET
006-007	Photo-Elect DET	DAC228 2FL SE COMP AREA DET
006-008	Photo-Elect DET	DAC228 2FL SE COMP AREA DET
006-009	Photo-Elect DET	DAC229 2FL SE COMP AREA DET
006-010	Photo-Elect DET	DAC 2FL SE CORR DET
006-011	Photo-Elect DET	DAC224 2FL SE STOR RM DET
006-012	Photo-Elect DET	DAC223 2FL SE JAN CLST DET
006-013	Photo-Elect DET	DAC 2FL MID CORR DET
006-014	Photo-Elect DET	DAC230 2FL NE OFFICE DET
006-015	Photo-Elect DET	DAC230 2FL NE OFFICE DET
006-016	Photo-Elect DET	DAC230 2FL NE OFFICE DET
006-017	Photo-Elect DET	DAC230 2FL NE OFFICE DET
006-018	Photo-Elect DET	DAC222 2FL NE CORR DET
006-019	Photo-Elect DET	DAC221 2FL NE WOMEN'S RM DET
006-020	Photo-Elect DET	DAC220 2FL NE MEN'S RM DET
006-021	Photo-Elect DET	DAC217 2FL CONF RM DET
006-022	Photo-Elect DET	DAC219 2FL NE VENDING RM DET
006-023	Photo-Elect DET	DAC124 2FL NORTH STAIRWAY DET
006-024	Manual Pull Station	PULL STATION DAC222 2FL NE CORR
006-025	Photo-Elect DET	DAC230 2FL NE OFFICE DET
006-026	Photo-Elect DET	DAC231 2FL NE CONF RM DET
006-027	Photo-Elect DET	DAC230 2FL NE OFFICE DET
006-028	Photo-Elect DET	DAC232 2FL NE SUPV OFFICE DET
006-029	Photo-Elect DET	DAC218 2FL NE CORR DET

**ADMIN BUILDING CHEM LAB**

Device Code	Device Type	Device Location
006-031	Photo-Elect DET	CHEM LAB NORTH DET
006-032	Photo-Elect DET	CHEM LAB SE DET
006-033	Photo-Elect DET	CHEM LAB UTILITY RM DET
006-034	Photo-Elect DET	CHEM LAB POST ACC SAMPLE RM DET
006-035	Photo-Elect DET	CHEM LAB SW DET
006-036	Photo-Elect DET	CHEM LAB GAMMA SPEC DET
006-037	Photo-Elect DET	CHEM LAB COUNT RM DET

## APPENDIX 3

### FIRE ZONE INDICATING UNITS

#### ZIU-2 Zones (Outside Cable Spreading Room)

- 1
- 2
- 3
- 4

#### Detector Locations

##### Cable Spreading Room

- Det. Zone 5 (NW)
- Det. Zone 6 (NE)
- Det. Zone 7 (SW)
- Det. Zone 8 (SE)

#### ZIU-3 Zones (Outside Radwaste Control Room)

- 1

#### Detector Locations

##### Radwaste Control Room

- Det. Zone 9

#### ZIU-4 Zones (In Hallway Outside Battery Rooms)

- 1
- 2
- 3
- 4

#### Detector Locations

- 250V Battery Room
- Det. Zone 13 (Middle)
- 125V Battery Room
- Det. Zone 14 (West)
- 1A4 Switchgear Room
- Det. Zone 15 (West)
- 1A3 Switchgear Room
- Det. Zone 16 (East)

#### ZIU-5 Zones (In Hallway Outside Battery Rooms)

- 1

#### Detector Locations

- 125V Battery Room
- Det. Zone 17 (East)

#### ZIU-6 Zones (Next to Diesel Generator Room Door)

- 1
- 2

#### Detector Locations

- A Diesel Gen. Room
- Det. Zone 21 (East)
- B Diesel Gen. Room
- Det. Zone 22 (West)

# APPENDIX 3

## FIRE ZONE INDICATING UNITS

(Continued)

### ZIU-7 Zones (Control Room Panels)

1

### Detector Locations

#### Det. Zone 25

1C14	1C35 E	1C03 E
1C04 W	1C04 E	1C05 W
1C05 C	1C05 E	1C06 N
1C07 S	1C07 N	1C08 N
1C09 S	1C26 S	1C23 S
1C25 S	1C24 S	1C34
1C29 N	1C22	1C20

2

#### Det. Zone 26

1C16	1C15 W	1C15 C
1C15 E	1C10 E	1C21 E
1C13	1C37 E	1C37
1C37	1C36	1C36
1C36 W	1C27	1C28
1C19	1C30	1C41
1C45	1C32	1C43

3

#### Det. Zone 27

1C35 W	1C03 W	1C06 S
1C08 S	1C09 N	1C31 N
1C31 S	1C47	1C26 N
1C23 N	1C23 C	1C25 N
1C24 N	1C29 S	1C49 S
1C49 C	1C49 N	

4

#### Det. Zone 28

1C38	1C44	1C33 W
1C33 E	1C42	1C39
1C17 W	1C17 C	1C17 E
1C18 W	1C18 E	1C11
1C10 W	1C02	1C21 W
1C21 C	1C37	1C37 W
1C36 E		

### ZIU-8 Zones (Computer Room)

1

### Detector Locations

#### Det. Zone 29

### APPENDIX 3

#### FIRE ZONE INDICATING UNITS

(Continued)

##### ZIU-9 Zones

##### Detector Locations

1	(Refuel Floor 855' 0")	Det. Zone 33 1 - 16
2	(4th Floor 833'6")	Det. Zone 34 1 - 21
3	(3rd Floor 812' 0")	Det. Zone 35 1 - 6 East Wall 7-13 and 22 Stairs and N Wall 19 - 21 15,16,17,18 and 24 (Hatch) 14 and 23 Elevator  Jungle Room 1 - 7 Exhaust Fan Room 8 - 12

##### ZIU-10 Zones

##### Detector Locations

1	(1st Floor 757'6" North)	Det. Zone 37 1 - 6 CRD Room 7-12 HCU Area 16 Stairs/Airlock 17-22 N. Open Area 23-24 Torus Area 25-26 RHR Valve Rm.
2	(1st Floor 757'6" South)	Det. Zone 38 1 - 23
3	(2nd Floor 786'0" North)	Det. Zone 39 1 - 23
4	(2nd Floor 786'0" South)	Det. Zone 40

##### ZIU-11 Zones

##### Detector Locations

1	(NE Corner Room)	Det. Zone 41 1 and 2
2	(NW Corner Room)	Det. Zone 42 1 - 4
3	(SE Corner Room)	Det. Zone 43 1 - 4
4	(SW Corner Room)	Det. Zone 44 1 and 2

### APPENDIX 3

#### FIRE ZONE INDICATING UNITS

(Continued)

##### ZIU-12 Zones

##### Detector Locations

2 (Intake Structure)

Det. Zone 50

1S and 2N Ground Level  
3N and 4S Upper Level

3 (Pump House)

Det. Zone 45  
1-4

5N and 6S Pump House Basement  
7 Sub-Basement

##### ZIU-14 Zones (Turbine Bldg 734'-0")

##### Detector Locations

1

Det. Zone 53  
1 - 14