Post Written Exam Facility Comments and NRC Resolution

Fitzpatrick Station 2012 Initial License Exam

Table of Contents

Comment and Resolution Summary

The licensee proposed changes to 3 written exam questions after the exam. Proposals and NRC resolution are summarized below:

Question #19

Entergy contends the Question #19 Key Answer should be changed from C to D.

The NRC agrees. The Key Answer is changed from C to D.

Question #27

Entergy contends there are two correct answers and proposes accepting the Question #27 Choice C as a 2nd correct answer in addition to Key Answer B.

The NRC disagrees. Key Answer B is correct. Distracter Choice C is NOT correct. The question answer remains as originally proposed.

Question #30

Entergy contends there are two correct answers and proposes accepting the Question #30 Choice C as a 2nd correct answer in addition to Key Answer A.

The NRC disagrees. Key Answer A is correct. The NRC does NOT agree that Distracter Choice C is also correct. The question answer remains as originally proposed.

Facility Post Written Exam Comments

In summary, we propose the following questions have TWO CORRECT ANSWERS:

Question	Basis	Number of Affected Applicants
27	Additional technical information	2 of 4
30	Additional system design information and procedural guidance	2 of 4

We propose the following question has ONLY ONE CORRECT ANSWER, but it is NOT THE ORIGINALLY APPROVED ANSWER:

Question	Basis	Number of Affected Applicants
19	Ambiguous language / inadequate stem focus	3 of 4

In accordance with ES-402, Section E.5, the following pages provide the analyses, justification for change, and our recommended disposition for each of these questions.

We present each of these questions in the following format:

Part 1 - The original question as approved by the NRC and administered to the applicants.

Part 2 - The justification for change, including an Analysis, Conclusions, and the Recommendation.

Part 3 - A copy of the reference documentation that supports the recommended change.

Question 19
Part 1 - Original Question

Examination Outline Cross-Reference:	Level	RO / SRO
	Tier #	1
	Group #	1
	K/A #	600000 AK 2.01
	Importance Rating	2.6 / 2.7

AK 2.01 Knowledge of the interrelations between PLANT FIRE ON SITE and the following:

Sensors / detectors and valves

Proposed Question:

A fire has ignited in the RWR Motor Generator Set room rendering it inaccessible to members of the Fire Brigade.

This area is supplied with _______(1)________ for fire suppression. The fire suppression system in this area can be actuated by _______(2)________.

	(1)	(2)
A.	CO_2	heat sensed in the area **only**
B.	CO_2	heat sensed in the area **or** manual pushbutton on the FPP
C.	water sprinklers	heat sensed in the area **or** manual pushbutton on the FPP
D.	water sprinklers	heat sensed in the area **only**

Proposed Answer:

C	water sprinklers	heat sensed in the area **or** manual pushbutton on the FPP

Explanation (Optional):

Per OP-33, the RWR MG set room is equipped with water sprinklers for fire suppression. Since the fire in the RWR MG set room has rendered the area inaccessible, manual hose stations and CO_2 fire extinguishers are not able to be used to suppress the fire manually. The water sprinkler system that supplies fire water to the RWR MG set room is a supervised preaction type assembly. This means that it takes two independent actions to occur prior to allowing fire water to flow into the area via the sprinkler head; the heat in the area must be high enough to open the fused sprinkler heads and the flow control valve must be opened by one of the following methods: temperature switch activation, local breakglass station pushbutton, ***pushbutton on the FPP***, or manual release lever at the flow control valve. Choice 'B' is plausible if the candidate does not recall that the Relay Room is the only area that requires manual initiation of CO_2. Choice 'D' is plausible if the candidate does not recall that fire suppression system for the RWR MG set room is designed as a preaction unit. Choice 'A' is plausible if the candidate does not recall that the area is protected by water sprinklers versus CO_2.

Technical Reference(s): TRM Section 3.7, SDLP-76, OP-33

Proposed references to be provided to applicants during examination: None

Learning Objective: SDLP-76: EO 1.05.a.8, EO 1.05.c.3.e, EO 1.06.e
Question Source: New

Question History: New

Question Cognitive Level: Memory or Fundamental Knowledge

10 CFR Part 55 Content: 10CFR55.41(7,8)

Comments:

Question 19
Part 2 - Justification

Analysis:

The stem conditions present a fire inside the Reactor Water Recirculation (RWR) Motor Generator Set room of sufficient magnitude to prevent Fire Brigade member access. This supports the presence of significant heat generation by the fire. The stem also narrows the question to the fire suppression system associated with the RWR Motor Generator Set room.

The fire suppression system for the RWR Motor Generator Set room is a water pre-action type system. This system consists of water pumps, piping, valves, and sprinkler heads. The system is divided into numerous zones. Each zone can be actuated independently of the others. Any of the following conditions will open a valve and direct pressurized water to the associated sprinkler heads:

- Detection of heat by temperature sensors
- Manual actuation of a local pushbutton
- Manual actuation of a remote pushbutton on a Fire Protection Panel (FPP)
- Manual actuation of a lever at the valve

For the system to be fully actuated and water to be applied to the fire zone, the sprinkler head must also be exposed to sufficient heat to melt a metal link that normally holds the sprinkler head closed.

The question requires the candidate to first complete the following sentence:

"This area is supplied with ___(1)___."

Choices C and D provide the correct answer of "water sprinklers" versus the incorrect answer in choices A and B of "CO_2".

The question requires the candidate to also complete the following sentence:

"The fire suppression system in this area can be actuated by ___(2)___."

Choice C completes the sentence with "...heat sensed in the area **or** manual pushbutton on the FPP". This is an incorrect response. Heat sensed in the area can actuate the system by a combination of melting the sprinkler head fusible link and satisfying the temperature sensor detection. The "or" statement implies the manual pusbutton on the FPP also is capable of actuating the system. However, the manual pushbutton will only allow the fire zone valve to open. Without heat in the area, the sprinkler head fusible link will not melt and system actuation will not be completed.

Choice D completes the sentence with "...heat sensed in the area **only**." This is a correct response. Heat sensed in the area can actuate the system by a combination of melting the sprinkler head fusible link and satisfying the temperature sensor detection with no other conditions.

Conclusion:

Choice D is correct. Choices A, B, and C are incorrect.

Recommendation:

Change the answer key to accept D as the correct answer instead of C.

Operations Approval: T. Peter [illegible] 4/2/12

Signature Date

Operations Training Approval: [illegible] Kelly 4/2/2012

Signature Date

Question 19
Part 3 - Reference Documentation

A. OP-33, Fire Protection Operating Procedure

B. DBD-076, Fire Protection Design Basis Document

BATTERY CHARGER FAIL (76P-4 only)

Contacts on the battery charger provide for a loss of DC output alarm when the engine is not running. Upon loss of DC output and after a 30 second time delay, the BATTERY CHARGER FAIL alarm light will come on at local control panel FPP-4 and the alarm bell will ring and the green fire pump TROUBLE alarm light will come on at panel FPP in the Control Room.

LOW FUEL LEVEL (76P-4 only)

The LOW FUEL LEVEL alarm provides indication of low fuel level in tank 76TK-14 (76P-4 Fuel Oil Tank). A low fuel level will cause the LOW FUEL LEVEL alarm light to come on at local control panel FPP-4 and the alarm bell will ring and the green fire pump TROUBLE alarm light will come on at panel FPP in the Control Room.

Fire Protection System piping includes three loops:

- West Outer Loop - Connects points in the yard surrounding the plant
- East Outer Loop - Supplies out-buildings
- Inner Loop - Connects points inside the plant

Eight manifolds located inside the plant buildings, which have forty-two main lines, supply water to locations inside the plant. These main lines supply water to the interior fire hose stations, sprinkler, air foam, and special hazard water spray systems. Each of the eight manifolds has an isolation valve so that each manifold can be isolated from the main system.

The Fire Protection Water System can also be used to supply the Residual Heat Removal Service Water System A pump discharge header by connecting a flexible hose between the two systems. This evolution shall only be performed in accordance with OP-13 when directed by the Emergency Operating Procedures.

The following locations are protected by the Fire Protection Water System:

DELUGE

Transformers

- 71T-1A
- 71T-1B
- 71T-2
- 71T-3
- 71T-4

MANUAL INITIATED WATER SPRAY

- Reactor Feed Pump Turbine Area North
- Reactor Feed Pump Turbine Area South
- Generator Hydrogen Seal Oil Area
- Standby Gas Treatment Filter Train A
- Standby Gas Treatment Filter Train B

AUTOMATIC WATER SPRAY

- RCIC Pump Area (after 2 minute time delay)
- HPCI Pump Area (after 2 minute time delay)

DRY PIPE SPRINKLERS

In areas protected by a dry pipe sprinkler system, each sprinkler head opens when the temperature reaches the actuation setpoint of the sprinkler head. The FCV is kept shut by the air pressure in the sprinkler header.

- Contract Services, craft area
- Building and Grounds
- Warehouse #2

WET PIPE SPRINKLERS

In areas protected by a wet pipe sprinkler system, each sprinkler head opens when the temperature reaches the actuation setpoint of the sprinkler head:

- Service and Administration Building
- Administration Building
  - Storeroom
  - Chemistry Lab
  - Locker Room
  - 286' elevation (partial)
  - 300' elevation (partial)
- Auxiliary Boiler Room
- Battery Room Corridor
- Diesel Fire Pump Rooms
- Baler Area and Laundry Room
- Restricted Area Zones 1R, 2R, and 3R
- Unrestricted Area Zones 1, 2E, 2W, 1B, and 2B
- Turbine Clean and Dirty Oil Storage Room
- Turbine Oil Storage Room
- Miscellaneous Oil and Grease Storage Room
- External Buildings
  - Warehouse
  - Security
  - Training center, general areas
  - Contract services office building
  - HU simulator area
- East/West Cable Tunnels (Zones 1S, 2S, 3S, 4S, 5S, and 6S)

Wet pipe sprinkler systems experience recurring pressure increases due to thermal expansion of a solid water system. Pressure monitoring to vent increased pressure is considered a cost effective method of pressure control as compared to automatic pressure control.

PRE-ACTION SPRINKLER

- Reactor Recirculation Motor Generator Set Room (supervised pre-action)
- Emergency Diesel Generator Rooms A, B, C, and D (supervised pre-action)
- Main Turbine Generator Bearing Boxes and Oil Piping
- Training Center (computer room and simulator)
- Warehouse #1, computer rm

AIR FOAM

Condenser Pit Area

The air foam system for the condenser pit area can be actuated remotely from panel FPP in the Control Room or from break-glass stations in the Turbine Building. The condenser pit air foam system will automatically actuate when heat detectors sense fire in the condenser pit area and after a 2 minute time delay expires. Foam concentrate is pumped from the foam tank by foam pump 76P-16 into a mixing nozzle downstream of a flow control valve. The flow control valve opens and water mixes with the foam concentrate. The foam discharges at system pressure into the condenser pit through floor and overhead spray deflectors. The foam layer will cover floating oil in the condenser pit area. The foam system will run for 5 minutes and then automatically shut down unless manually stopped first.

HPCI Pump Area

The air foam system for the HPCI pump area can only be manually actuated. The system can be manually actuated from two break-glass stations in the area or remotely from panel FPP in the Control Room. The foam concentrate tank (located in the East Crescent) has a diaphragm that is filled with foam concentrate. When the system is actuated, water pressurizes the outside of the diaphragm, forcing foam to the concentrate controller. The concentrate controller directs the water-foam mixture to the HPCI foam spray nozzles.

FIRE HYDRANTS

The yard area is protected by 23 fire hydrants.

FIRE HOSE STATIONS

Fire Hose Stations are located throughout the plant.

All equipment and installation is required to comply with the National Fire Protection Association (NFPA) Standards, which in this case is NFPA 15 "Water Spray Systems" (Ref. 6.9.2), the published standards of ASME and NEMA, and the Nuclear Energy Property Insurance Association (NEPIA), and all laws and regulations (Ref. 6.9.2). In addition, all equipment is required to be listed by the Underwriters' Laboratories, Inc. for fire protection use (Ref. 6.9.2).

3.5 PREACTION SPRINKLER SYSTEM FOR THE RECIRCULATION PUMPS MOTOR GENERATOR SETS ROOM

Normal Operating Functions

This system is normally in a standby ready-to-operate condition. The system shut-off valve (OS&Y gate valve type) is maintained in the open position. A position switch monitors the open condition of the valve. Any significant change from the fully open position will result in an alarm at the Main control Room FPP and loss of the visual open indication on the local system control panel. The abnormal state will continue until the valve is returned to its fully open position.

The system Flow Control Valve (FCV) is a pilot operated valve which is normally maintained in the closed position. The FCV valve is provided with control piping trim of small diameter which applies system water pressure to the intermediate (top) chamber of the FCV which maintains the valve closed. The trim piping includes a normally closed solenoid valve piped to drain, and a normally closed manual valve (emergency release) also piped to drain.

A local system control panel (Ref. 6.7.2.8 and 6.7.4.14) monitors the gate valve position switch and also the heat sensing fire detectors which are located at ceiling level in the protected area. A red indicator light on the panel illuminates only when the gate valve is in the full open position. The panel includes a red indicating light marked "Flow Control Valve Open," which is normally not illuminated. The panel also contains the relays, circuitry, and other components necessary to control the system and electrically supervise circuits. The panel includes an amber indicating light which is illuminated when the circuit monitoring the fire detectors is in the fully normal condition. There are twelve fire detectors of the rate-compensated fixed temperature type located at ceiling level (Ref. 6.7.3.7 and 6.7.3.8) and wired in a Class B system arrangement (Ref. 6.7.3.6 and 6.7.2.8). There are 92 sprinklers located near ceiling level throughout the protected area/room (Ref. 6.7.4.13). In this case, total room coverage is provided. The sprinklers are standard closed fusible type (Ref. 6.7.4.20 and 6.9.2).

The piping on the downstream side of the Flow Control Valve is monitored by a supervisory air system (Ref. 6.7.4.24 and 6.7.4.25). The motor driven air compressor (76C-12B) automatically cycles on and off to maintain the required air pressure. The function of the air supervision is to monitor the integrity of the sprinkler system piping. Loss of air pressure would be caused by damaged piping or any failure of a sprinkler and would be alarmed, by use of a pressure switch, at the local panel (visually with an amber light) and at the main control room FPP visually and audibly (Ref. 6.7.2.8 and 6.7.4.14).

Fire Condition Operating Functions

The function of the fire detector(s) is to rapidly detect a fire condition in the protected area. The detectors used on this system are of the rate compensated, fixed temperature (140°F) design and are self-resetting (Ref. 6.10.1 and 6.7.4.7). Actuation of any detector results in the automatic opening of the solenoid valve on the Flow Control Valve (FCV) trim, and the resulting exhausting of FCV trim water pressure through the solenoid valve to drain. This causes the FCV valve to open and pressurize all of the system piping downstream, and discharge of water through only those individual sprinklers that have opened (after reaching their fusible point). A water flow alarm pressure switch on the discharge side of the FCV actuates and sends alarms to the local system control panel and the Main Control Room FPP. The flow alarm at the local control panel is a visual red indicator labeled "FCV OPEN." The heat detector alarm at the local control panel is an audible fire bell only. The heat detector alarm and the water flow alarm at the main control room FPP are both audible and visual (Ref. 6.7.2.8 and 6.7.4.14).

The FCV valve can also be opened and the system operated by use of (a) a push button type switch on the FPP in the Main Control Room, or (b) a break glass type switch located at the southwest corner of the protected area, or (c) by use of the emergency manual release (quick opening valve) located on the FCV trim (Ref. 6.7.4.25, 6.7.4.24, 6.7.2.8 and 6.7.3.7).

The FCV valve trim includes a special valve called a PORV (pressure operated relief valve). Once the FCV is opened by any means (automatic or manual) and system water pressure is established downstream of the FCV, the same water pressure opens the PORV which will then continue to exhaust the pressure off the immediate (top) chamber of the FCV and maintain the FCV open, regardless of any other condition. Water flow (through the FCV and any open sprinklers) can then only be stopped by manually closing the system main shut-off valve located upstream of the FCV. (Ref. 8.13.7 and 6.7.4.25).

Fire protection/suppression is accomplished by the discharging water:

(a) cooling the equipment and burning combustibles

(b) cooling the hazardous liquid (hydraulic/lube oil)

(c) flushing the hazardous liquid to the floor drains.

Design Basis Requirements

This system was specified to be "a supervised pre-action sprinkler piping system consisting of automatic sprinklers with pressurized dry supply piping and an automatic flow control (pre-action) valve with shutoff valve" (Ref. 6.9.2). In addition, the AP-30 design specification (Rev. 0 dated 9-30-71 and including addendum up through Addendum #4 dated 3/1/72) also required the equipment and installation to comply with the latest edition of NFPA (National Fire Protection Association) Standards, which in this case was listed as NFPA 13 "Sprinkler Systems" (Ref 6.9.2).

Pipe sizing and automatic sprinkler placement for this system had no specific requirements in the design specification, Specification AP-30 (Ref. 6.9.2). Therefore, a review of NFPA 13 shows that "Power Plants" and "Electric Generating Stations" are classified as "Ordinary Hazard Occupancies" and are required to meet a specific "pipe schedule for ordinary hazard occupancies" (Ref. 6.10.3). This is an appropriate classification because the hazard and quantity of the MG Set drive fluid is not representative of an "extra hazard occupancy" classification. There are also specific ordinary hazard requirements (in NFPA Std. 13) for maximum allowable distance between sprinklers and between branch lines.

Piping and valve materials for this pre-action sprinkler system were specified to be Piping Specification Class 47 (galvanized ASTM-A53 steel piping-threaded connections) (Ref. 6.9.2). However, a SWEC teletype of 9/22/72) (Ref. 6.1.3) gave preliminary approval for use of Piping Specification Class 151 (modified with threaded connections - nongalvanized ASTM A106 steel piping), and a Davis-Ulmer Sprinkler Co. letter of 3-19-74 confirmed installation of Class 151, modified (Ref. 6.1.2).

The AP-30 Specification (Ref. 6.9.2) specified automatic sprinklers with "intermediate" temperature class. NFPA 13 defines "intermediate" temperature classification as 175 to 225□F. The contractor's material and test certification (Ref. 6.9.2) shows that 89 Viking 1/2" Model C sprinklers with 160°F temperature class, and 3 with 286°F temperature class were installed. The vendor design drawing (Ref. 6.7.4.13) contains no notes or references to indicate that the sprinklers are anything different than "ordinary" temperature class (135 to 170°F in Ref. 6.10.3). Analysis JAF-ANAL-FPS-01366 (ref. 6.4.4) confirmed that the temperature rating of the installed sprinklers are of the ordinary classification and has evaluated that no changes to the installed sprinklers are necessary. Ordinary temperature sprinklers are suitable for use where maximum ceiling temperatures are 100°F (Ref. 6.10.3).

The FCV valve is required to operate automatically by a signal when one or more open circuit rate-compensation type thermostat contacts close indicating a fire (Ref. 6.9.2). NFPA Std. 13 defines a pre-action system as "A system employing automatic sprinklers attached to a piping system containing air that may or may not be under pressure, with a supplemental heat responsive system of generally more sensitive characteristics than the automatic sprinklers themselves, installed in the same areas as the sprinklers. . . " (Ref. 6.10.3). The FCV valve is also required to operate manually (in addition to automatic) from the control room and from a location near the respective valve (Ref. 6.9.2). The FCV valve (76FCV-112) is sized to match the largest size piping (4 inch) in the system (Ref. 6.7.4.16, 6.10.1, and 6.10.3). The local control panel is required to be a drip tight NEMA Type 12 enclosure (Ref. 6.9.2).

All equipment for this system is required to comply with NFPA Standard No. 13, and be listed by the Underwriters' Laboratories, Inc. (Ref. 6.9.2). In addition, all equipment shall conform to the published standards of ASME and NEMA, and the Nuclear Energy Property Insurance Association (NEPIA), and all laws and regulations (Ref. 6.9.2).

3.6 WATER SPRAY SYSTEMS (2) FOR THE TURBINE DRIVE LUBE OIL HAZARDS ON THE REACTOR FEED PUMPS

Normal Operating Function

The normal operation of these systems is similar to the HPCI Water Spray System described in Subsection 3.2 with the following exceptions (Ref. 6.7.2.9, 6.7.3.13, 6.7.3.10, 6.7.3.26, 6.7.4.18, 6.7.4.19, 6.7.4.29, 6.7.4.22, and 6.7.4.23). Each system has two fire detectors (Ref. 6.7.4.22, 6.7.4.23, 6.7.3.10). These systems have manual actuation only, and therefore, any loss of continuity (break) of the normally closed detector circuit would result in a fire signal only (Ref. 6.7.2.9).

Fire Condition Operating Functions

The function of the fire detectors is to detect a fire condition at the hazard/protected equipment, which, in this case, is the lubricating oil hazard associated with the turbine drive. Each of these systems has two fire detectors of the rate compensated, fixed temperature (190°F), heat sensing design, and are self-resetting (Ref. 6.7.4.7, 6.7.4.22, and 6.7.4.23). Actuation of a detector (opening of normally closed contacts) because of a fire, or high heat, condition results in an audible alarm (bell) near the control panel and audible and visual alarms at the Fire Protection Panel (FPP) in the Main Control Room (Ref. 6.7.2.9).

The subject water spray systems can each be actuated manually from either (a) a push button type switch on the FPP in the Main Control room, or (b) a break glass type switch located near the entrance to the respective pump room. Operation of either of these switches will result in the opening of the solenoid valve on the respective Flow Control Valve (FCV) trim and the resulting exhausting of FCV trim water pressure through the solenoid valve to drain. This causes the respective FCV to open and pressurize all of the system piping downstream, and discharge of water through the open nozzles onto the hazard/protected equipment.

Fire protection/suppression is accomplished by the discharging water:

(a) cooling the equipment

(b) cooling the hazardous liquid (lube oil)

(c) flushing the hazardous liquid to the floor drains.

Question 27
Part 1 - Original Question

Examination Outline Cross-Reference:	Level	RO / SRO
	Tier #	1
	Group #	2
	K/A #	295012 AK3.01
	Importance Rating	3.5/3.6

Knowledge of the reasons for the following responses as they apply to HIGH DRYWELL TEMPERATURE: Increased drywell cooling.

Proposed Question:

The plant is operating at power when the following occurs:

- A small steam leak in the Drywell occurs
- DW pressure: 1.8 psig and rising slowly
- DW temp: 136°F and rising quickly

EOP-4 “Primary Containment Control” directs “**IF** drywell temperature cannot be restored and maintained below 135°F **THEN** Operate all available drywell cooling.”

This statement is attempting to preserve the integrity of which one of the following?

A. RHR Drywell Spray design capability

B. Primary Containment component qualification

C. RPV level instrumentation integrity

D. Hydrogen \ Oxygen sampling validity

Proposed Answer:

B Primary Containment component qualification

Explanation: . MIT-301.11E excerpts:

(EO-4.05) When it is determined that drywell temperature cannot be maintained below the maximum normal operating temperature (a conclusion that may be reached prior to drywell temperature actually reaching this value), DW/T has explicit instruction to place into operation all available methods by which drywell cooling can be effected.

(EO-4.05) If operation of all available drywell cooling is unable to terminate increasing drywell temperature before applicable **component qualification** or **structural design temperature limits** are reached, drywell sprays are initiated to effect the required drywell temperature reduction—status of governing plant conditions permitting.

The reference to Caution #1 warns of the effect of elevated drywell temperatures on RPV water level indication.

Spray operation effects a drywell pressure and temperature reduction through the combined effects of evaporative cooling and convective cooling.

(EO-4.03/4.05) If drywell temperature cannot be restored and maintained below applicable component qualification or structural design limits, emergency RPV depressurization is performed. This action minimizes any continuing direct energy release to the drywell through a primary system break and ensures that the SRVs are opened while still operable.

When the monitoring systems for hydrogen or oxygen become unavailable, the concentration of these gases must be determined by sample and analysis.
At the time this override is reached, it may not be possible to determine if the monitoring system is presently unavailable because of the time required to complete such prerequisites as sample path alignment and detector warm-up. However, the monitoring system should not be considered unavailable until ample opportunity has been taken for placing the system in service. During the time it takes to place the monitoring system in service, it may be learned that the system will not become available (e.g., due to equipment malfunction, etc.). In this case, it would be appropriate to initiate sample and analysis activities as directed by this override so that primary containment gas concentrations can be determined by alternate means. CA-01.02 is a backup means of sampling the primary containment atmosphere if the exosensors are unavailable. Sampling requires local access to sampling connections

A. incorrect: Drywell spray design is governed by the Drywell Spray Initiation Limit.
B. correct: see above
C. incorrect: RPV level instrumentation integrity is governed by RPV saturation temp limits
D. incorrect: H2\O2 sampling ability requires local access to sampling connections. Also validity is not dependent on DW temp.

Technical Reference(s): MIT-301.11E
Proposed references to be provided to applicants during examination: None

Learning Objective:	MIT-301.11E EO-4.05 SDLP-16A 1.07
Question Source:	New
Question History:	New
Question Cognitive Level:	Memory or Fundamental Knowledge
10 CFR Part 55 Content:	10CFR55.41(5)

Comments:

Question 27
Part 2 - Justification

Analysis:

The stem presents a step in EOP-4, Primary Containment Control, for initiating Drywell cooling to restore and maintain Drywell temperature below the normal operating upper limit of 135°F.

The question requires the candidate to choose the correct reason for this EOP step.

The station-specific EOP bases state the use of Drywell cooling is "to terminate increasing Drywell temperature before applicable component qualification or structural design temperature limits are reached". This supports choice B as correct.

The same step in EOP-4 references EOP-11, EOP and SAOG Graphs, Caution #1. This caution contains limitations on RPV water level instrumentation based on elevated Drywell temperature. The station-specific EOP bases state, "The reference to Caution #1 warns of the effect of elevated Drywell temperatures on RPV water level indication." The station lesson plan for RPV water level instrumentation provides further description of the negative effects of elevated Drywell temperature on RPV water level instrumentation. For example, as the RPV water level narrow range indicator reference legs heat up due to elevated Drywell temperature, the RPV level indication begins to read erroneously high. This is a non-conservative indication that has the potential to degrade the ability of Operators to monitor and control the plant. As such, it is an important part of the overall bases for control of Drywell temperature in EOP-4. This supports choice C as correct.

Conclusions:

Both choices B and C are correct.

Recommendation:

Change the answer key to accept both B and C as correct answers.

Operations Approval: _______________ / 3/12/12
Signature / Date

Operations Training Approval: _______________ / 3/12/12
Signature / Date

Question 27
Part 3 - Reference Documentation

A. EOP-4, Primary Containment Control

B. EOP-11, EOP and SAOG Graphs

C. MIT-301-11E, EOP-4 Lesson Plan

D. SDLP-02B, Reactor Vessel Level Instrumentation Lesson Plan

EOP-4 PRIMARY CONTAINMENT CONTROL

ENTRY CONDITIONS

Primary containment hydrogen above 3%	Drywell temperature above 135°F	Drywell pressure above 2.7 psig	Torus temperature above 95°F	Torus water level below 13.88 ft **OR** above 14.0 ft

While executing this procedure:

IF	THEN
PRIMARY CONTAINMENT FLOODING IS OR HAS BEEN REQUIRED	Exit the EOPs and enter the SAOGs.
DRYWELL SPRAY IS REQUIRED	Execute "Drywell Spray" concurrently with other sections of this procedure.
TORUS SPRAY IS REQUIRED	Execute "Torus Spray" concurrently with other sections of this procedure.

Section DW/T

Monitor and Control
DRYWELL TEMPERATURE

IF	THEN
Drywell temperature is or has been above 260°F	Isolate the cooling water supply to the drywell coolers, RWR pump and motor coolers and drywell equipment sump cooler (EP-12).

If required, enter AOP-39 and/or AOP-40 and execute them concurrently with this procedure.

Maintain drywell temperature below 135°F using available drywell cooling. ❶

IF	THEN
Drywell temperature cannot be restored and maintained below 135°F	Operate all available drywell cooling.

Section PC/P

Monitor and Control
PRIMARY CONTAINMENT PRESSURE

Maintain primary containment pressure below 2.7 psig using SBGT.

WAIT until primary containment pressure cannot be maintained below 2.7 psig.

BEFORE

Torus pressure reaches 15 psig (Torus spray)

Section T/T

Monitor and Control
TORUS TEMPERATURE

Maintain torus temperature below 95°F using availabl

IF	
Torus temperature cannot be maintained below 95°F	Operate all availa ➢ Use only RHR need to be ru LPCI mode to core cooling
'A' and 'C' RHRSW pumps cannot supply cooling water to the 'A' RHR Heat Exchanger	Enter EP-10 and c with this procedu

BEFORE

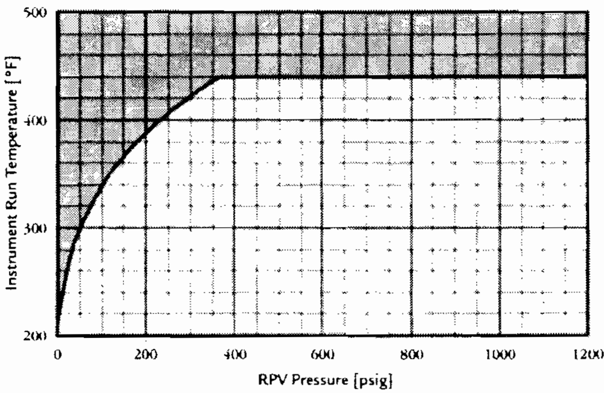
Torus temperature reaches the Boron Injection Initiation Temperature

EOP-11 EOP & SAOG GRAPHS

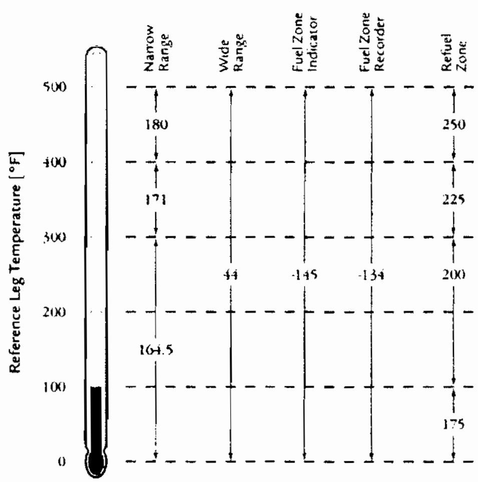
❶ RPV water level indications are affected by instrument run temperature and RPV pressure:

- If the temperature near any instrument run is above the RPV Saturation Temperature, the instrument may be unreliable due to boiling in the run
- An RPV water level instrument may be used to determine RPV water level only if the instrument reads above its Minimum Usable Indicating Level

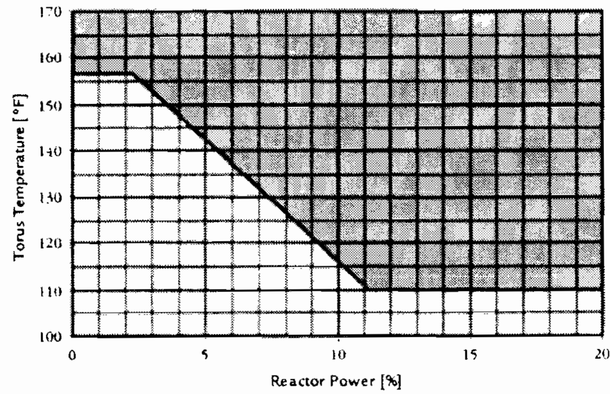
RPV Saturation Temperature

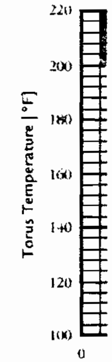


Minimum Usable Indicating Levels [in.]

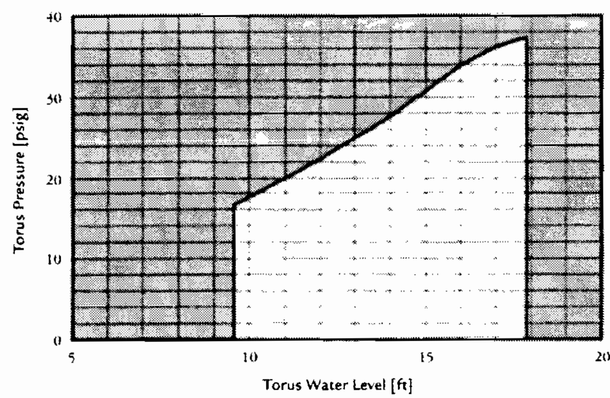


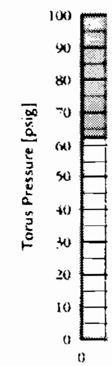
Boron Injection Initiation Temperature



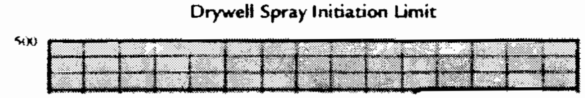


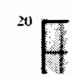
Pressure Suppression Pressure





Drywell Spray Initiation Limit





Monitor and Control
DRYWELL TEMPERATURE

IF	THEN
Drywell temperature is or has been above 260°F	Isolate the cooling water supply to the drywell coolers, RWR pump and motor coolers and drywell equipment sump cooler (EP-12).

If required, enter AOP-39 and/or AOP-40 and execute them concurrently with this procedure.

Maintain drywell temperature below 135°F using available drywell cooling. 1

IF	THEN
Drywell temperature cannot be restored and maintained below 135°F	Operate all available drywell cooling.

BEFORE

Drywell temperature reaches 309°F

(Drywell spray)

DRYWELL SPRAY IS REQUIRED.

Continue efforts to restore drywell temperature below 135°F

IF	THEN
Drywell temperature cannot be restored and maintained below 309°F	**EMERGENCY RPV DEPRESSURIZATION IS REQUIRED**, enter EOP-2, "RPV Control," and execute it concurrently with this procedure.

(EO-4.05) Action is taken to isolate the RBCLC supply to the drywell cooling loads in the event drywell temperature exceeds 260°F. Under LOCA conditions, if the RBCLC pumps tripped and subsequently restarted, the resultant water hammer could damage RBCLC piping inside the containment. This could lead to primary containment failure through the RBCLC penetrations.

(EO-4.05) DW/T can be a symptom of a loss of coolant or a steam line break inside the primary containment. Therefore, a step has been added to enter AOP-39 or AOP-40 concurrently. These AOPs contain further actions to mitigate the accident such as isolating the control room, relay room, and TSC ventilation systems.

(EO-4.05) The initial action taken to control drywell temperature employs the same method used during normal plant operations: monitoring its status and placing available drywell cooling in operation as required to maintain temperature within specified normal operating. DW/T thus provides a smooth transition from general plant procedures to emergency operating procedures, and assures that the normal method of drywell temperature control is attempted in advance of initiating more complex actions to terminate increasing drywell temperature.

As long as drywell temperature remains below normal operating limits no further operator action is required in this subsection of the procedure other than continuing to monitor and control drywell temperature using available drywell cooling.

As used in this step, "available" means that the pumps, fans, and support systems necessary to supply drywell cooling are capable of performing their identified function and can be placed in service to provide cooling. If a component cannot be operated due to plant conditions or physical restrictions, it is not considered "available."

The reference to Caution #1 warns of the effect of elevated drywell temperatures on RPV water level indication.

(EO-4.05) When it is determined that drywell temperature cannot be maintained below the maximum normal operating temperature (a conclusion that may be reached prior to drywell temperature actually reaching this value), DW/T has explicit instruction to place into operation all available methods by which drywell cooling can be effected.
As used in the previous step, "*available*" means that the pumps, fans, and support systems necessary to supply drywell cooling are capable of performing their identified function and can be placed in service to provide cooling. If a component cannot be operated due to plant conditions or physical restrictions, it is not considered "available". All available drywell cooling is defined in EP-1 as operating three of the four fans per drywell cooling assembly.

(EO-4.05) If operation of all available drywell cooling is unable to terminate increasing drywell temperature before applicable component qualification or structural design temperature limits are reached, drywell sprays are initiated to effect the required drywell temperature reduction—status of governing plant conditions permitting.
Spray operation effects a drywell pressure and temperature reduction through the combined effects of evaporative cooling and convective cooling.

Monitor and Control
DRYWELL TEMPERATURE

IF	THEN
Drywell temperature is or has been above 260 °F	Isolate the cooling water supply to the drywell coolers, RWR pump and motor coolers and drywell equipment sump cooler (EP-12).

If required, enter AOP-39 and/or AOP-40 and execute them concurrently with this procedure.

Maintain drywell temperature below 135° F using available drywell cooling. 1

IF	THEN
Drywell temperature cannot be restored and maintained below 135°F	Operate all available drywell cooling.

BEFORE

Drywell temperature reaches 309°F (Drywell spray)

DRYWELL SPRAY IS REQUIRED.

Continue efforts to restore drywell temperature below 135°F

IF	THEN
Drywell temperature cannot be restored and maintained below 309°F	**EMERGENCY RPV DEPRESSURIZATION IS REQUIRED**, enter EOP-2, "RPV Control," and execute it concurrently with this procedure.

(EO-4.03/4.05) If drywell temperature cannot be restored and maintained below applicable component qualification or structural design limits, emergency RPV depressurization is performed. This action minimizes any continuing direct energy release to the drywell through a primary system break and ensures that the SRVs are opened while still operable.

Consistent with the definition of "*restore*", emergency RPV depressurization is not required until it has been determined that drywell sprays, which were initiated in an earlier step, are ineffective in reducing drywell temperature. It is not expected that either containment integrity or SRV operability will be immediately challenged when the respective temperature limit is reached. Thus, if drywell temperature is already above 309°F when these steps are reached, drywell sprays, if available, may still be used in preference to emergency RPV depressurization. If sprays are effective in reducing drywell temperature, emergency RPV depressurization need not be performed. However, extended operation above 309°F is not permitted.

The determination that drywell temperature can not be restored and maintained below the limit may be made when, before, or after the temperature limit is reached.

Entering EOP-2 RPV Control assures that, if possible, the reactor is scrammed and shutdown by control rod insertion before RPV depressurization is initiated. Entry into EOP-2 RPV Control must be explicitly stated because conditions requiring entry into EOP-4 Primary Containment Control do not necessarily require entry into EOP-2 RPV Control. Therefore, a scram may not have yet been initiated. Directing that EOP-2 RPV Control be entered, rather than explicitly stating here "Initiate a reactor scram," coordinates actions currently being executed if EOP-2 RPV Control has already been entered. (Note: EOP-2 RPV Control requires initiating a reactor scram only if one has not previously been initiated.) In addition, entry into EOP-2 RPV Control must be made because it is through EOP-2 that the transfer to Emergency RPV Depressurization is effected.

Content/Skills	Activities/Notes/Objectives
3. Instrument Racks	
a. 25-5 R.B. 300' West	EO 1.05.a.4 EO 1.11.c.1
b. 25-6 R.B. 300' North	
c. 25-51 R.B. 272' West	
d. 25-52 R.B. 272' East	
4. Wide Range Instruments	EO 1.05.c.2 EO 1.11.a.2
a. See Table V, Instruments for functions and locations.	Figure 02B-8 Cold Reference Leg Design Instrumentation
b. The triple low water level in Tech Spec is ≥18", however the initiation setpoint was set at 59.5".	
1) This was done because during a LOCA, the DW temperature increases sufficiently to possibly cause a 40" inaccuracy in reactor level.	
2) With the removal of the temperature compensated instrument columns and the minimizing of the reference leg vertical drop within the DW, it is no longer possible, during a LOCA, to cause a 40" inaccuracy.	
3) The triple low setpoint was not adjusted downward and conservatively not reset to ensure ECCS initiates in enough time to ensure post accident cooling can be accomplished and 10 CFR 100 guidelines are not exceeded.	
c. Calibrated for 20 Btu/lbm subcooling below the narrow range variable tap and no RWR flow.	EO 1.08.b
1) The 20 Btu/lbm subcooling is accounted for because the specific volume of water depends on its temperature.	
2) The subcooled water introduces ≈ 1.8% density increase in the indicated reactor water level at 1000 psig.	
3) This would result in a higher level indication on the wide range instrument of ≈ 3".	

b. Narrow and Refuel Water Level Instruments

1) During high DW temperature conditions when the reactor remains pressurized, these level instruments will sense/indicate a water level higher than actual.

2) This results since the X dimension is > Y dimension for these instruments.

3) The pressure reduction due to the density change in the reference leg is greater than that for the variable leg, causing indicated level to be higher than actual.

c. Fuel Zone Water Level Instruments

Figure 02B Fuel Zone Range Water Level Instrumentation

1) Under these conditions, these level instruments will sense/indicate a water level lower than actual.

2) This results since the Z dimension > X dimension for these instruments.

3) The pressure reduction due to the density change in the variable leg is greater than that for the reference leg, causing indicated level to be lower than actual.

d. Wide Range Water Level Instruments

Figure 02B-12 Wide Range Water Level Instrumentation

1) Under these conditions, these level instruments will sense/indicate a water level equal to actual level.

2) This results because the X and Z dimensions are nearly equal (within one foot difference). The pressure reduction due to the density change in the reference leg is compensated for by a corresponding reduction in variable leg density, causing indicated level to be equal to actual level.

Question 30
Part 1 - Original Question

Examination Outline Cross-Reference:	Level	RO / SRO
	Tier #	2
	Group #	1
	K/A #	206000 G 2.4.6
	Importance Rating	3.7 / 4.7

2.4.6 Knowledge of EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)

Proposed Question:

The Plant was operating at 45% when a complete loss of Instrument Air occurred.

The reactor has successfully scrammed and the following conditions exist:

- Operators are performing actions per EOP-2 “RPV Control”.
- RPV Water Level is 145 inches and lowing slowly.
- RPV Pressure is 590 psig and lowering slowly.

Which of the following systems should be used to restore and maintain RPV water level between 177 and 222.5 inches?

A. HPCI

B. LPCI

C. Condensate

D. Feedwater

Proposed Answer:

A. HPCI

Explanation (Optional):

Based on the conditions provided in the question stem, since there has been a complete loss of Instrument Air, the Outboard MSIVs drift shut, therefore Feedwater system is not available for injection. Although RPV pressure is less than the discharge head of the Condensate Booster pumps, the loss of Instrument Air causes the Condensate and Condensate Booster Pump minimum flow valves to fail open; this results in any Condensate flow to be diverted to the Main Condenser and not the RPV. Additionally, RPV pressure is still greater than the LPCI injection permissive pressure of 450 psig. Therefore, the only system listed that is available for injection to restore level is HPCI and would have to be manually started since RPV level is above its auto start value.

Technical Reference(s): EOP-2, MIT-301.11C, AOP-12 (Loss of Instrument Air)

Proposed references to be provided to applicants during examination: None

Learning Objective: MIT-301.11C, EO 1.07
Question Source: New

Question History: New

Question Cognitive Level: Comprehension or Analysis

10 CFR Part 55 Content: 10CFR55.41

Comments:

Question 30
Part 2 - Justification

The question begins with the Plant at 45% power.

At 45% power, only two trains of Condensate are in service (Condensate Pump and Condensate Booster Pump 'A' & 'B'). The 'C' train is secured.

The flow path for RPV injection is as follows:

1. Water from the Main Condenser Hotwell is supplied to the two Condensate Pumps (33P-8A and 33P-8B).

2. The common (single) Condensate Minimum Flow Valve, 33FCV-133, is shut.

3. The discharge from the Condensate Pumps is then supplied to the suction of the Condensate Booster Pumps (33P-9A and 33P-9B).

4. Two Condensate Booster Pumps can provide a design flow of 12,100 gpm.

5. Each Condensate Booster pump is equipped with its own Minimum Flow Valve (33FCV-132A, B and C). These valves are shut also.

6. The Condensate Booster Pump discharge is then supplied to the Reactor Feed Water Pumps 34P-1A and 34P-1B. (Only one of these pumps will be running to maintain RPV water level in the normal band).

7. The Minimum Flow Valve, 34FCV-135A or B for the running Feed Water Pump will be closed. The other Min Flow Valve will be open.

When the loss of Instrument Air occurs, in addition to a Reactor scram and the running Feed Water pump trip (* see additional description), the following takes place:

1. The Minimum Flow Valves for the above mentioned pumps open.

2. This creates a flow path of Condensate water to the Main Condenser Hotwell.

3. The common Condensate Pump Minimum Flow Valve, 33FCV-133, will pass 2500 gpm to the Main Condenser Hotwell.

4. The Condensate Booster Pumps Minimum Flow Valves, 33FCV-132A, B and C, will pass 1100 gpm each (3300 gpm total).

5. The Feed Water Minimum Flow Valves, 34FCV-135A and B will pass 1000 gpm each (2000 gpm total)

This sequence of events results in the following:

- 2500 gpm to the Main Condenser Hotwell via 33FCV-133.
- 3300 gpm to the Main Condenser Hotwell via 33FCV-132A and 132B.
- 2000 gpm to the Main Condenser Hotwell via 34FCV-135A and 135B.
- Total flow of Condensate to the Main Condenser Hotwell of 7800 gpm.

The two running trains of Condensate are designed to provide 12,100 gpm of injection to the RPV.

Therefore, 12,100 gpm is available for RPV injection, minus 7800 gpm diverted from the open Minimum Flow Valves, results in 4300 gpm of Condensate being injected into the RPV.

With no Reactor Coolant System (RCS) leakage stated in the question stem, there are no other loss terms for this condition and RPV level can be restored to the normal band of 177-222.5 inches.

* Additional information concerning Feed water pump trip:

The Reactor Feed water pumps trip on low Main Condenser vacuum of 20" Hg (SDLP-33 and OP-2A).

Main Condenser vacuum degrades quickly due to 38AOV-113A and B (Vac A(B) SJAE Off-Gas Line Press Hi Trip Suction Isolation) closing and a loss of Main Steam supply to the Steam Jet Air Ejectors (29PCV-107 closing). This results in blanketing of Main Condenser tubes by non-condensables (SDLP-33, FM-38A).

Additionally, the Air Admission Valves (36AOV-128A1, (A2), (B1), (B2), open (AOP-12, SDLP-39), degrading the Circulating Water heat removal ability.

Conclusions:

Both choices A and C are correct.

Recommendation:

Change the answer key to accept both A and C as correct answers.

Operations Approval:	[signature] / Signature	3/12/12 / Date
Operations Training Approval:	[signature] / Signature	3/12/12 / Date

Question 30
Part 3 - Reference Documentation

A. DBD-034, Condensate / Feedwater / Feedwater Control Design Bases Document

B. EOP-2, RPV Control

C. AOP-12, Loss of Instrument Air

D. SDLP-39, Instrument, Breathing, Service Air

E. SDLP-33, Feed and Condensate Systems

F. OP-2A, Feedwater System

G. SDLP-38, Condenser Air Removal, Gland Seal/Gland Exhaust System

H. FM-38A, Vacuum Priming and Air Removal

I. JAF Plant-Referenced Simulator

Document No. DBD-034

ENTERGY NUCLEAR NORTHEAST

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

DESIGN BASIS DOCUMENT

FOR THE

CONDENSATE/FEEDWATER AND FEEDWATER CONTROL SYSTEMS

006/033/034

	Print/Sign/Date		Print/Sign/Date
Prepared by:	R. Casella / R. Casella 2/23/11	ENN DBD Owner	Rick Casella
Reviewed by:	G. Foster / Guy Foster 2-23-2011	ENN Prog. Engr.	Guy Foster
Approved by:	[signature] 2/24/11	ENN Mgr. Design Eng.	Vince Bacanskas

3.1.3.3 Design Basis Requirements

- Each condensate booster pump shall be designed to have a flow rate of 8,066 gpm with all three pumps running or 12,100 gpm with two pumps running. This flow rate is 1/3 or 1/2 of total design flow of 24,200 gpm (VWO + 10%) during pre-power uprate (Ref. 6.6.49 and Mech. Calc. 34-12, Subsection 7.1.28).
- Each condensate booster pump requires a minimum flow of 1000 gpm at 3580 rpm. This is the minimum flow that the pumps at this speed can be operated. The minimum recirculation flow is to protect the condensate booster pump during startup (Ref. 6.8.4.2).
- Each condensate booster pump requires a minimum NPSH of 58 ft. The basis for this is that this is the minimum suction head required at the inlet of the impeller to prevent the liquid from boiling under the reduced pressure and cavitation at 8066 gpm during pre-power uprate (Ref. 6.8.4.2).
- Each condensate booster pump shall be designed to provide a developed head of 1100 ft. This is the head required to deliver the required flow rate of 8066 gpm during pre-power uprate (Ref. 6.6.49, 6.8.4.2).
- Each condensate booster pump requires an electrical protection and an alarm in the control room of any adverse condition (Ref. 6.8.2.4).

3.1.4 Condensate Transfer Pumps (33P-13A, B)

3.1.4.1 Normal Operating Functions

Each condensate transfer pump, sized for full capacity, is required to supply condensate to core spray flush, RHR flush, reactor building; radioactive waste system precoat filters and pump seals, backwash water for reactor cleanup and fuel pool filter demineralizers and condensate demineralizer regeneration.

3.1.4.2 Accident Mitigating Functions

None

3.1.4.3 Design Basis Requirements

- Each condensate transfer pump shall be designed to have a flow rate of 600 gpm at 3500 rpm. The basis for this flow rate is that the pump should be sized at full capacity during power (Ref. 6.6.7).
- Each condensate transfer pump requires a minimum NPSH of 17 ft. This is the minimum suction head required to prevent liquid from boiling under the reduced pressure and cavitation during pre-power uprate (Ref. 6.8.4.4).

3.4.2 RFP Discharge Stop Valve (34MOV-100A, B)

3.4.2.1 Normal Operating Functions

These valves are required to stop the discharge flow from the RFP to the reactor during low power operation and startup. The minimum recirculation flow of 1000 gpm for each RFP will pass through valves 34FCV-135A, B and return to the main condensers. Low flow control valve 34FCV-137 will be used to bypass the valves and control the reactor level. These valves are always fully open except during low power operation and startup. These valves can be manually operated by the operator in the control room by control switches 1-FWSA01 and 1-FWSB01 for A and B valves, respectively. Valve status lights are also provided in the control room (Ref. 6.8.2.8).

EC # 3945

34MOV-100A has had a hole drilled in the downstream disc of the flexible wedge to allow pressure relief for the valve neck (bonnet cavity) to preclude pressure locking of the valve which could prevent the valve from opening on demand.

EC # 6877

34MOV-100B has had a hole drilled in the downstream disc of the flexible wedge to allow pressure relief for the valve neck (bonnet cavity) to preclude pressure locking of the valve which could prevent the valve from opening on demand.

3.4.2.2 Accident Mitigating Functions

None

3.4.2.3 Design Basis Requirements

- Each RFP discharge stop valve shall have a flow rate of 5,468,256 lb/hr. This is based on feedwater flow at VWO during pre-power uprate (Ref. 6.8.1.1). For power uprate, feedwater flow is calculated to be 5,682,547 lb/hr at VWO (Ref. 6.8.1.22).
- Each RFP discharge stop valve shall be a gate valve with motor operators for use in isolation (Ref. 6.4.11).
- Each RFP discharge stop valve fails in the "as is" position. The valve motor operators will not move if the electrical power is lost.
- Each RFP discharge stop valve has an open and closure time of 82 seconds. This is from the manufacturers standards (Ref. 6.4.11).
- Each RFP discharge stop valve shall have a maximum pressure drop when open, of 22 equivalent ft. of pipe (Ref. 6.8.4.16 and Subsection 7.1.27).

3.4.3 Feedwater Bypass Valves to Condensers (34MOV-101A, B)

- Each valve shall have a maximum pressure drop, when open, of 27 equivalent ft of piping (Ref. 6.4.18, 6.8.4.16 and Subsection 7.2.3 of this DBD).

3.4.10 6 In. Automatic Minimum Flow Recirculation Valves for Booster Pumps (33FCV-132A, B, C, 33SOV-132A, B, C, 33FS-132A, B, C)

3.4.10.1 Normal Operating Functions

These valves are used to recirculate flow when a booster pump is running at less than 1000 gpm. When the booster pump is running and the flow through it is greater than 1000 gpm, the recirculating valve is closed. Condensate booster pumps 33P-9A,B,C and flow switches 33FS-132A,B,C actuate on low flow to de-energize solenoid valves 33SOV-132A,B,C and open recirculation valves 33FCV-132A,B,C, respectively. There is no provision for manual open-close operation of these valves. Valve status indicating lights are provided in the control room (Ref. 6.8.2.5).

3.4.10.2 Accident Mitigating Functions

None

3.4.10.3 Design Basis Requirements

- Each valve shall have a design flow rate of 1100 gpm and a normal flow rate of 1000 gpm during startup. This is based on the minimum booster pump recirculation flow requirement (Ref. 6.4.13).
- Each valve shall be a globe type valve with a diaphragm operator to minimize leakage and provide fast operation (Ref. 6.4.13).
- Each valve shall have a minimum flow coefficient (Cv) of 115 based on a flow rate of 1000 gpm and a pressure drop of 75 psi (Ref. 6.4.13). The specified maximum pressure drop is 790 psi (Ref. 6.4.13).
- Each valve shall fail in the "open" position. The valve fails open on a loss of power or air supply.

3.4.11 Automatic Minimum Flow Valve Through Recombiners (33FCV-131, 33FE-131, 33FT-131, 33FIC-131, 33E/P-131)

3.4.11.1 Normal Operating Functions

This control valve is used to regulate the flow in the condensate line to maintain a constant flow through the condensers including SJAE, SOE and the recombiner's condensers. The valve is activated by flow controller 33FIC-131, which receives its signal from a flow element and transmitter (33FE-131 and 33FT-131) in the discharge line from the recombiner's condenser (Ref. 6.8.2.12).

3.4.11.2 Accident Mitigating Functions

None

3.4.11.3 Design Basis Requirements

- This valve shall have a maximum flow rate of 24,200 gpm during power, the maximum design flow at VWO + 10% (pre-power uprate) (Mech Calc. 34-12, Subsection 7.1.28).
- This valve shall be a butterfly with a diaphragm operator type valve. This is for the throttling consideration.
- This valve shall fail in the "open" position. This valve fails open on a loss of air supply.
- This valve shall have a minimum flow coefficient (Cv) of 11,000. This is required based on a flow rate of 24,200 gpm and a pressure drop of 5 psi (Ref. 6.4.13). The specified pressure drop range is 5 to 15 psi (Ref. 6.4.13).

3.4.12 Automatic Minimum Flow Recirculation Valve for Condensate Pumps (33FCV-133, 33SOV-133, 33FS-133A, B, C)

3.4.12.1 Normal Operating Functions

This valve is used for minimum recirculation for the condensate pumps and the Steam Packing Exhaust Condenser's protection. If any condensate pump is operating and the flow through the condensate booster pump is less than 2900 gpm, 33FCV-133 is open, passing water directly back to the condenser hotwell. There is no provision for manual open/close operation of this valve from the control room. However, valve status indicating lights are provided (Ref. 6.8.2.6).

3.4.12.2 Accident Mitigating Functions

None

3.4.12.3 Design Basis Requirements

- This valve shall have a minimum flow rate of 2500 gpm. This is the minimum flow through the most limiting component in the condensate system, the Steam Packing Exhaust Condenser (6.6.56, 8.1.64).
- This valve shall have a minimum flow coefficient of 94. This is based on a flow rate of 1250 gpm and a pressure drop of 200 psi (Ref. 6.4.13). The specified maximum pressure drop is 235 psi (Ref. 6.4.13).
- This valve shall be a globe modulating type valve. This is for throttling consideration.

- This valve shall fail in the "open" position. The valve fails open on a loss of power or air supply.

3.4.13 Feedwater Line Drywell Check Valves (34FWS-28A, B)

3.4.13.1 Normal Operating Functions

None

3.4.13.2 Accident Mitigating Function

These valves are check valves located inside containment upstream of the reactor vessel and are used for containment isolation during accident conditions. These valves are part of RCPB inside containment. There is one valve per train.

In the case of pipe rupture outside containment, these valves prevent reverse flow from the reactor vessel to the point where the rupture occurred.

3.4.13.3 Design Basis Requirements

- These valves shall be 18 in. check valves, the same diameters as the line (Ref. 6.4.12).
- These valves shall have a maximum pressure drop of 70 equivalent ft of piping (Ref. 6.4.12, 6.8.14.16).

3.4.14 Main Condensers 33C-10A, B Hotwell Normal Makeup Valve (33LCV-103)

3.4.14.1 Normal Operating Functions

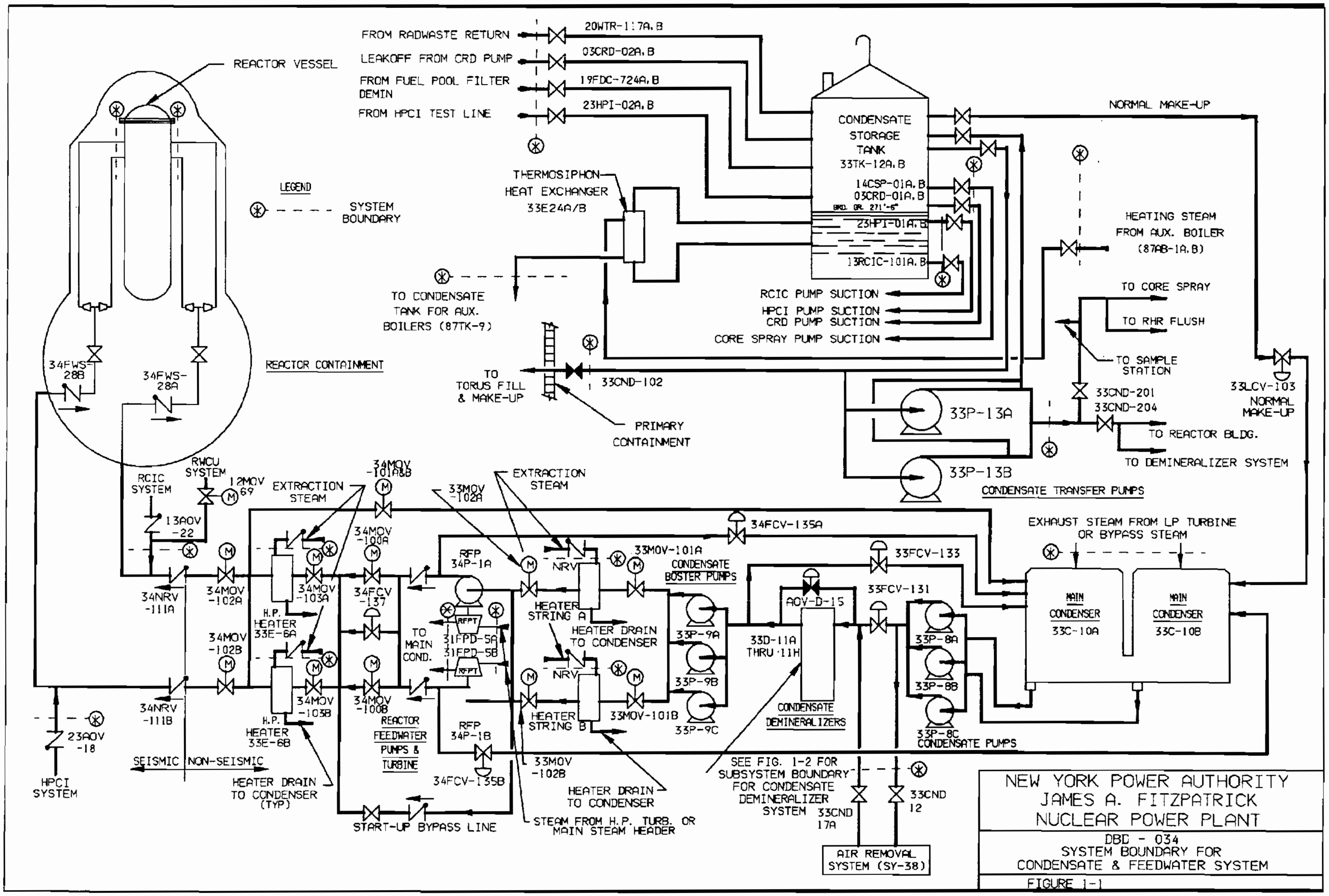
This control valve is used to maintain a normal level in the condenser's hotwell. The valve is controlled by level controller 33 LIC-103, which receives its signal from level transmitter 33LT-103 in the condenser's hotwell. As the water level increases above the normal setpoint, the control valve closes, and makeup water flow from the condensate storage tanks ceases.

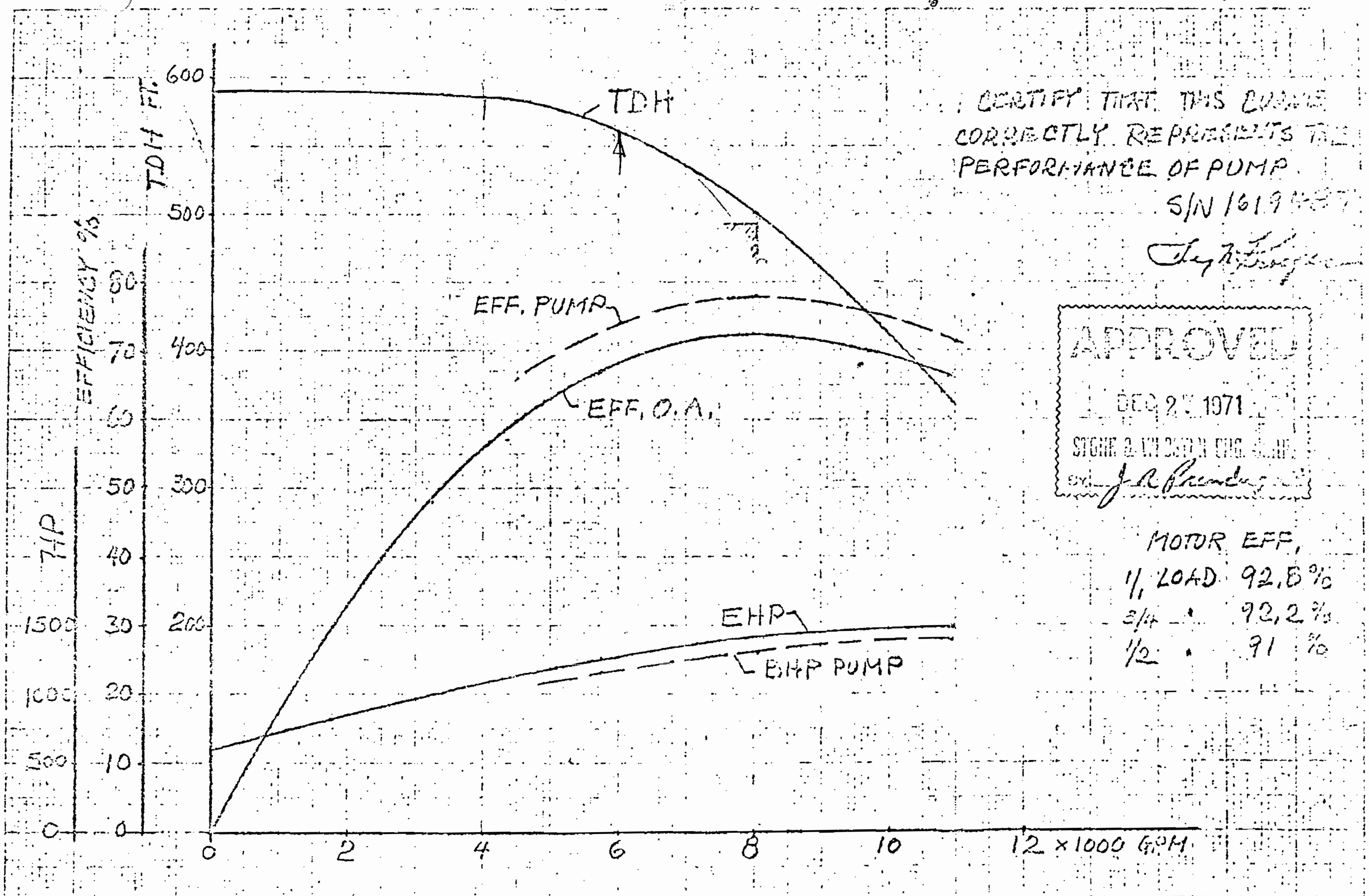
3.4.14.2 Accident Mitigating Functions

None

3.4.14.3 Design Basis Requirements

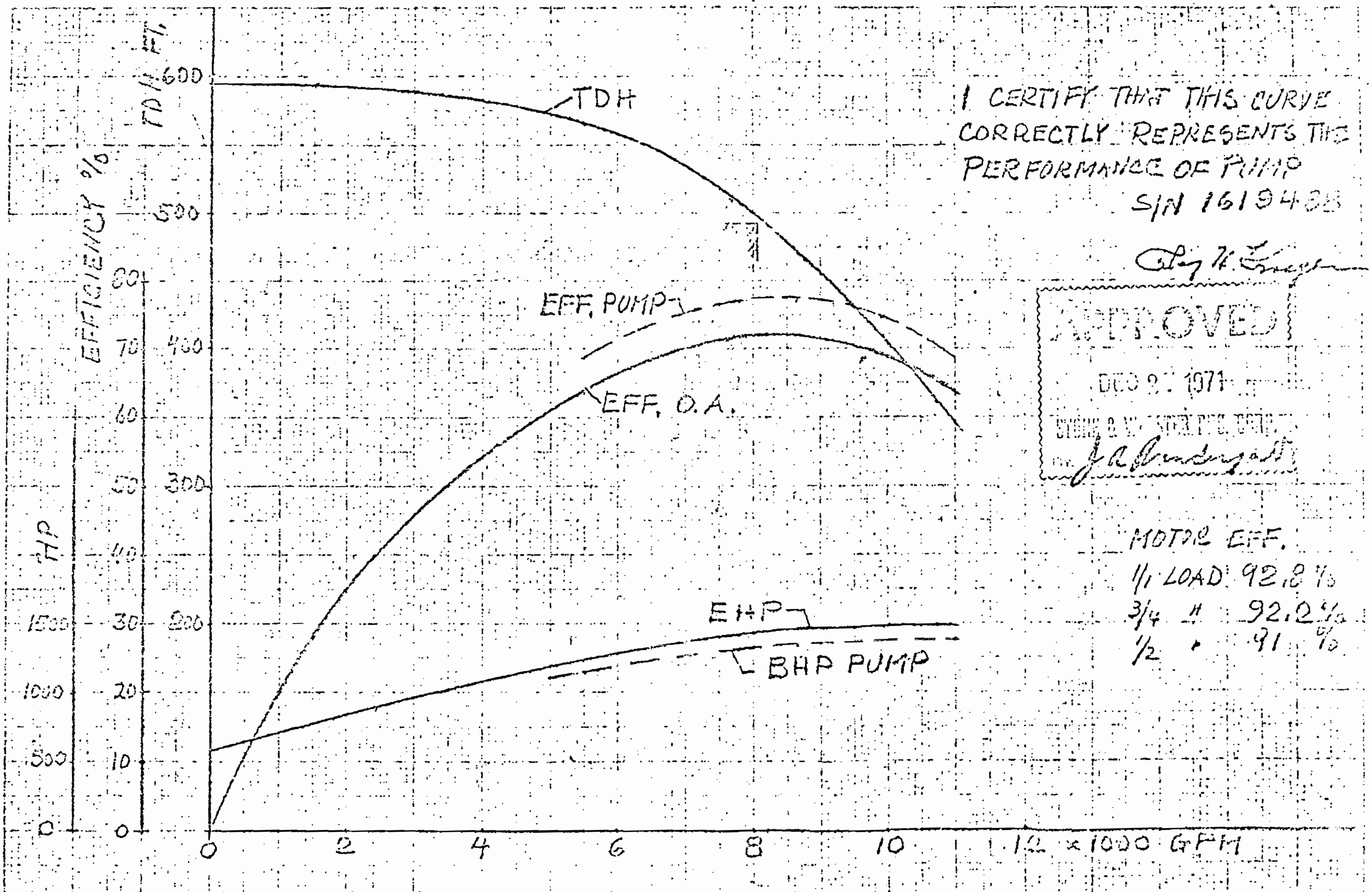
- This valve shall have a normal flow rate of 250 gpm. This is a required makeup flow to the condenser hotwell in order to maintain a sufficient hotwell holding capacity (Ref. 6.4.13, 6.6.3).
- This valve shall have a minimum flow coefficient of 112. This is based on a flow rate of 250 gpm and a pressure drop of 5 psi (Ref. 6.4.13).


FROM RADWASTE RETURN
20WTR-117A, B
LEAKOFF FROM CRD PUMP
03CRD-02A, B
FROM FUEL POOL FILTER DEMIN
19FDC-724A, B
FROM HPCI TEST LINE
23HPI-02A, B
REACTOR VESSEL
CONDENSATE STORAGE TANK 33TK-12A, B
14CSP-01A, B
03CRD-01A, B
23HPI-01A, B
13RCIC-101A, B
NORMAL MAKE-UP
LEGEND
SYSTEM BOUNDARY
THERMOSIPHON HEAT EXCHANGER 33E24A/B
HEATING STEAM FROM AUX. BOILER (87AB-1A, B)
TO CONDENSATE TANK FOR AUX. BOILERS (87TK-9)
RCIC PUMP SUCTION
HPCI PUMP SUCTION
CRD PUMP SUCTION
CORE SPRAY PUMP SUCTION
TO CORE SPRAY
TO RHR FLUSH
TO SAMPLE STATION
34FWS-28B
34FWS-28A
REACTOR CONTAINMENT
TO TORUS FILL & MAKE-UP
33CND-102
PRIMARY CONTAINMENT
33CND-201
33CND-204
33LCV-103 NORMAL MAKE-UP
33P-13A
33P-13B
TO REACTOR BLDG.
TO DEMINERALIZER SYSTEM
CONDENSATE TRANSFER PUMPS
RCIC SYSTEM
RWCU SYSTEM
12MOV 69
13AOV -22
EXTRACTION STEAM
34MOV -101A&B
33MOV -102A
34FCV-135A
EXHAUST STEAM FROM LP TURBINE OR BYPASS STEAM
34MOV -100A
RFP 34P-1A
33MOV-101A
CONDENSATE BOSTER PUMPS
33FCV-133
34NRV -111A
34MOV -102A
H.P. HEATER 33E-6A
34MOV -103A
34FCV -137
TO MAIN COND.
31FPD-5A
31FPD-5B
NRV
HEATER STRING A
HEATER DRAIN TO CONDENSER
AOV-D-15
33FCV-131
33P-9A
33P-9B
33P-9C
33D-11A THRU 11H
33P-8A
33P-8B
33P-8C
MAIN CONDENSER 33C-10A
MAIN CONDENSER 33C-10B
34MOV -102B
H.P. HEATER 33E-6B
34MOV -103B
34MOV -100B
REACTOR FEEDWATER PUMPS & TURBINE
34NRV -111B
23AOV -18
HPCI SYSTEM
SEISMIC
NON-SEISMIC
HEATER STRING B
33MOV-101B
CONDENSATE DEMINERALIZERS
CONDENSATE PUMPS
RFP 34P-1B
34FCV-135B
33MOV -102B
HEATER DRAIN TO CONDENSER (TYP)
START-UP BYPASS LINE
HEATER DRAIN TO CONDENSER
STEAM FROM H.P. TURB. OR MAIN STEAM HEADER
SEE FIG. 1-2 FOR SUBSYSTEM BOUNDARY FOR CONDENSATE DEMINERALIZER SYSTEM
33CND 17A
33CND 12
AIR REMOVAL SYSTEM (SY-38)
NEW YORK POWER AUTHORITY
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
DBD - 034
SYSTEM BOUNDARY FOR CONDENSATE & FEEDWATER SYSTEM
FIGURE 1-1



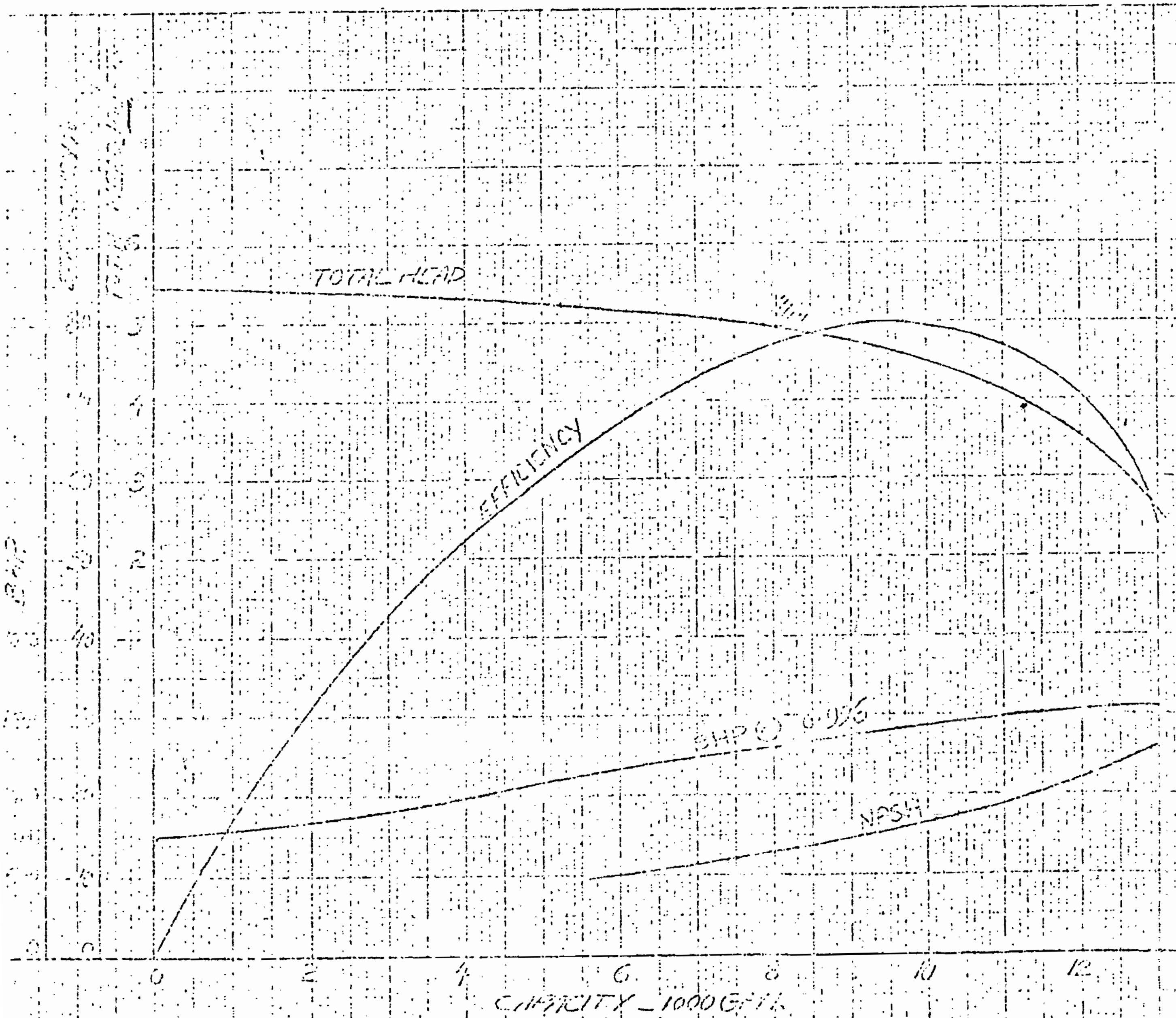
HOW TESTED: CAPACITY VENTURY DRIVER EL. MOTOR SPEED 894 RPM DRIVE DIRECT

TEST CURVE	WORTHINGTON CORPORATION NEW YORK					P-453085	
	12-20-71	33	QEAC	VERTICAL	1619487	880	
APPROVED	DATE	SIZE	TYPE	STYLE	MACHINE	RPM	



HOW TESTED: CAPACITY. VENTURI DRIVER EL. MOTOR SPEED 894 DRIVE DIRECT

TEST CURVE		WORTHINGTON CORPORATION			NEW YORK		P-453035	
[illegible]	12-20-71	33	QEAC	VERTICAL	1619488	880		[illegible]
	DATE	SIZE	TYPE	STYLE	MACHINE	RPM		



This pump is guaranteed to deliver 8000 G. P. M.

405 Feet total head

880 R. P. M.

77.5 % Efficiency

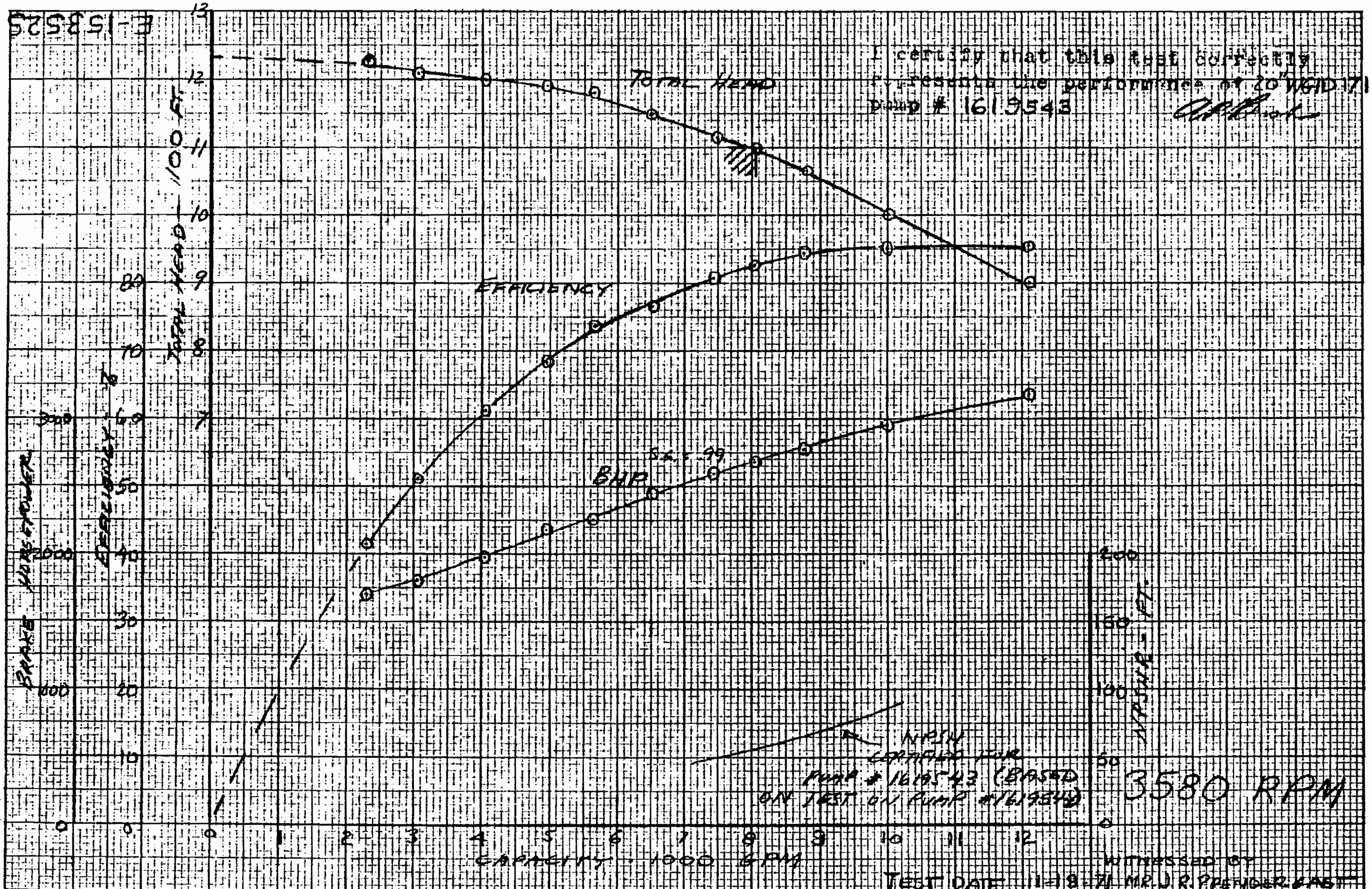
Pumping Temp.

.992 Sp. Gr.

This curve shows the expected heads and efficiencies at other capacities, but this additional data is only approximate and is not guaranteed.

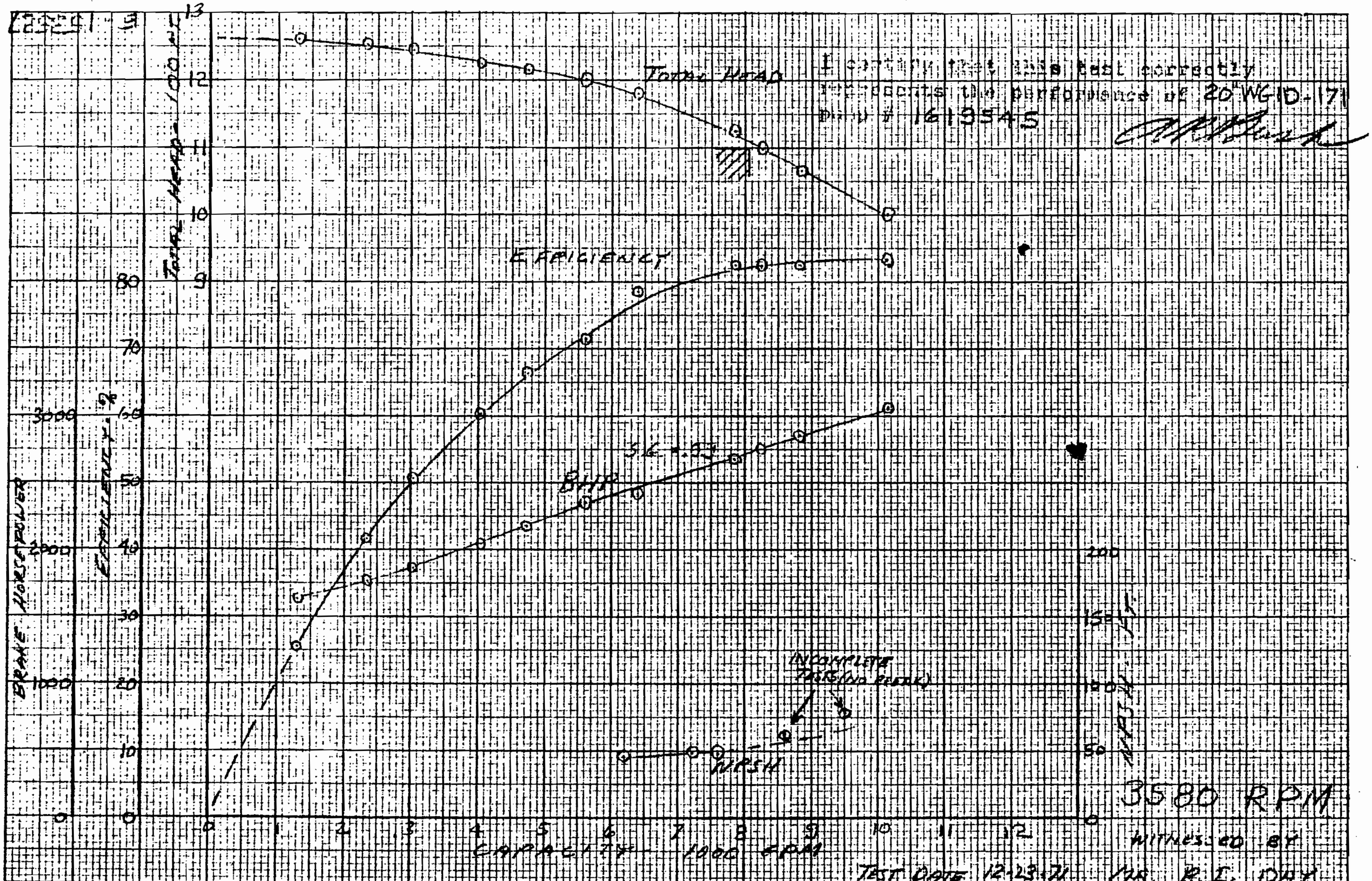
*Approximate driver speed. To be revised as necessary to match rated speed of driver.

ITEM No. 33-P-8	SERVICE Condensate Pump 33-P-8	WORTHINGTON CORPORATION SIZE AND TYPE 33QEAC-3 Vertical Turbine Type pump	DATE 3-5-81 E-208299
INQUIRY No.			
DRAWN BY W.C.W.			



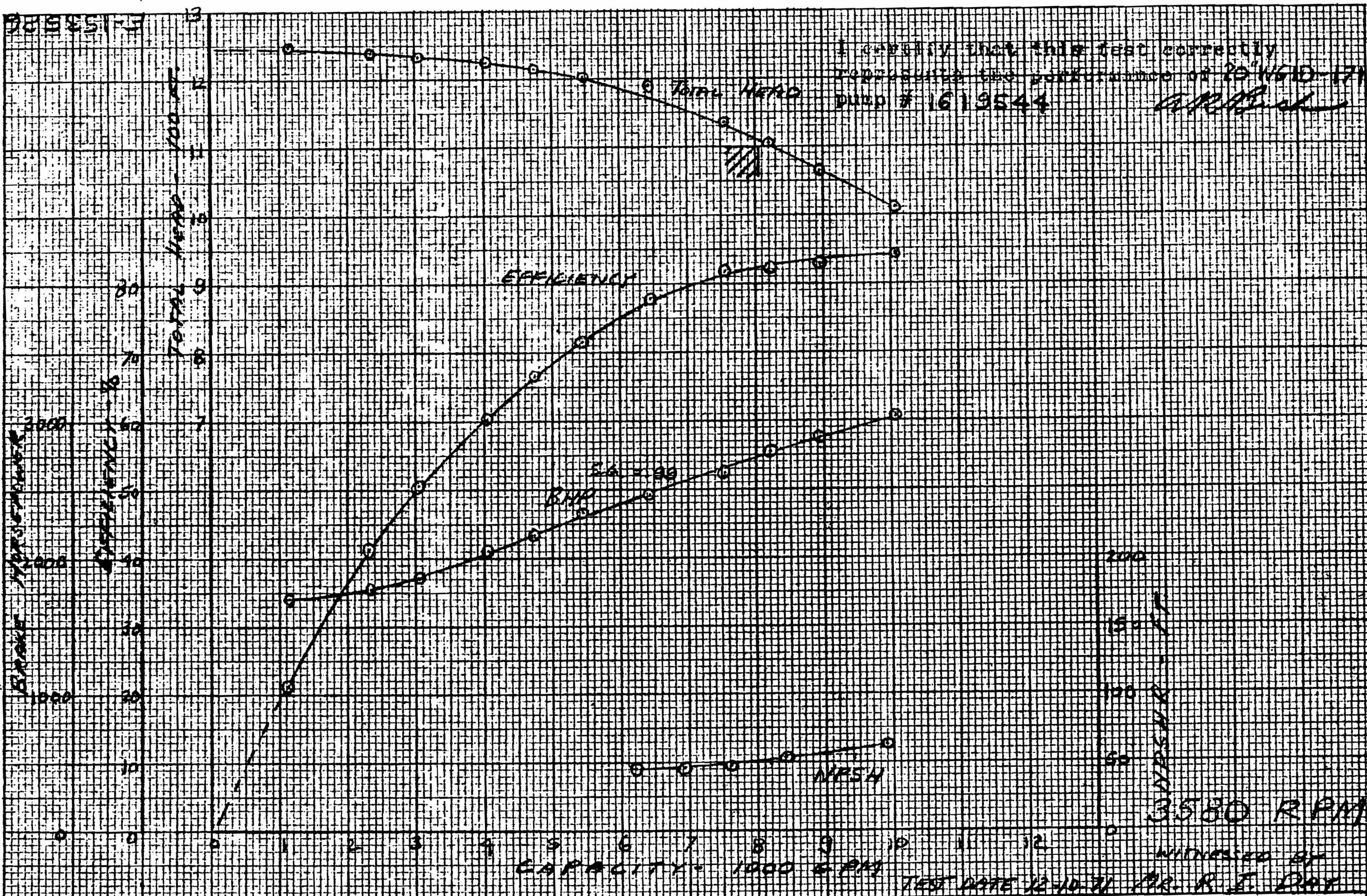
Q No. ORDER No. P. 453033 APPR.	**WORTHINGTON CORPORATION** MOUNTAINSIDE, N. J. U. S. A. SUBJECT 20" WGID-171 COND. BOOSTER PUMP S.N. 1619543	DATE 12-8-71 E-153525

W1013 A1167M20



Q No. ______ ORDER No. P-453033 APPR. [signature]	**WORTHINGTON CORPORATION** MOUNTAINSIDE, NEW JERSEY, U.S.A. SUBJECT 20" WG1D-171 CONDENSATE BOOSTER PUMP # 1619545	DATE 12-29-71 E-153527

W1013 A1167M20



Q No.	**WORTHINGTON CORPORATION**	DATE 12-20-71
ORDER No. P-453033	MOUNTAINSIDE, NEW JERSEY, U.S.A.	E-153526
APPR. [signature]	SUBJECT 20" WGID-171 CONDENSATE BOOSTER PUMP #1619544	

W1013 A1167M20

Monitor and control
RPV WATER LEVEL 1

IF	THEN
Primary containment water level and torus pressure cannot be maintained below the Primary Containment Pressure Limit **AND** Adequate core cooling can be assured	Terminate injection into the RPV from sources external to the primary containment.
RPV water level cannot be determined	Exit this procedure and enter EOP-7, "RPV Flooding" at "Shutdown Flooding."

Restore and maintain RPV water level between 177 in. and 222.5 in. using one or more Group 1 Water Level Control Systems.

IF	THEN
RPV water level cannot be restored and maintained above 177 in.	Maintain RPV water level above 0 in. (TAF). One or more Group 2 Water Level Control Systems may be used to augment RPV water level control.
The ADS timer initiates	Override ADS.
RPV water level cannot be restored and maintained above 0 in. (TAF)	Exit "Section RPV/L" of this procedure and enter "Alternate RPV Level Control."

Group 1 Water Level Control Systems

Assigned Water Level Band:

- Condensate / Feedwater
- CRD
- HPCI
  - ❑ Align suction to the CST, if available.
  - ❑ Defeat the high area temperature isolation and high torus water level suction transfer if necessary (EP-2).
- RCIC
  - ❑ Align suction to the CST, if available.
  - ❑ Defeat the low RPV pressure and high area temperature isolations if necessary (EP-2).
- LPCI
  - ❑ Inject through the heat exchangers as soon as possible.
- CS

SUBSEQUENT ACTIONS (cont)

OVERRIDES		
1.	⇓EXPG.2.1 **IF** *any of the following occur:* 1. All circulating water pumps are tripped 2. RPV level approaches 270 inches	**THEN** ensure closed MSIVs.
2.	**IF** both recirc pumps are tripped,	**THEN** minimize RPV bottom head cooldown per Attachment 6.
WARNING		
1.	A loss of all circulating water pumps could cause rupture disc actuation on the low pressure turbine and a subsequent release of radioactive steam to the Turbine Building.	
NOTES		
1.	Subsections E.1 through E.3 should be performed concurrently	

E.2 **RPV Water Level Control**

E.2.1 Control RPV water level **BETWEEN** 177 and 222.5 inches any of the following methods:(see table 1)

- Adjust feedwater level control auto-setpoint
- Take manual control of reactor feed pump(s) and place FDWTR STARTUP VLV (34FCV-137) in service
- Shut down or trip one reactor feed pump.
- Operate RCIC per Section D of OP-19
- Operate HPCI per Section D of OP-15
- Condensate booster pumps if RPV pressure is **BELOW** booster pump discharge pressure

TABLE 1 - Pump Discharge Pressures

PUMP	DISCH PRESSURE (PSIG)
Feedwater Pumps 34P-1A, B	1213 (max)
HPCI 23P-1	150 - 1195
RCIC 13P-1	150 - 1195
Condensate Booster Pumps 33P-9A, B, C	700 (max)
Condensate Pumps 33P-8A, B, C	255 (max)

AOP-12
LOSS OF INSTRUMENT AIR
REVISION 26

APPROVED BY: Chris Miller (signature) — RESPONSIBLE PROCEDURE OWNER — DATE: 3-28-07

EFFECTIVE DATE: 4-16-7

A. **ENTRY CONDITIONS**

Loss of instrument air

B. **SYMPTOMS**

- One or more of the following EPIC low air header pressure alarm(s):

EPIC POINT	SENSID	SETPOINT
EPIC-A-1539	39PT-101	102 psig
EPIC-A-1540	39PT-102	100 psig
EPIC-D-679	39PS-114	85 psig

- One or more of the following annunciators alarm:
  - 09-6-1-31 SERV AIR HDR PRESS LO (95 psig)
  - 09-6-2-39 SERV AIR HDR ISOL VLV CLOSED (95 psig)
  - 09-6-2-38 BREATHING AIR HDR PRESS LO (85 psig)
  - 09-6-2-40 BREATHING AIR HDR ISOL VLV CLOSED (85 psig)
  - 09-5-1-54 SCRAM AIR HDR PRESS HI OR LO (65 psig)
- Various annunciators and alarms which indicate air compressor malfunction.

C. **AUTOMATIC ACTIONS**

NOTE: Fail safe positions for important pneumatic valves are listed on Attachment 1.

- As air pressure trends downward, the following occurs:
  - Air compressors (39AC-2A, 2B or 2C):
    - 1st Standby compressor starts at 107 psig
    - 2nd Standby compressor starts at 104 psig
  - SAS Header Auto Isolation Valve 39FCV-110 closes at 95 psig.
  - BAS Header Auto Isolation Valve 39AOV-111 closes at 85 psig.
- Depending on the severity of the loss of air or the source of the problem, the following could occur:
  - Control rods drift inward.
  - Air operated valves fail as-is or in fail safe position.
  - Valves drift from expected position due to vibration or system pressure.
  - Outboard MSIVs drift closed (accumulators could delay closure for up to 30 minutes).
  - 01-107AOV-100 (off gas disch to stack) fails open.
  - Waterbox air admission valves fail open.
  - CRD Flow Control Valves 03FCV-19A and 03FCV-19B fail closed.
  - RWCU Blowdown Valve 12FCV-55 fails closed.
  - Building ventilation dampers fail closed.
- If drywell pneumatic header is lined up to instrument air, the following could occur:
  - Inboard MSIVs drift closed.
  - Drywell cooler dampers fail closed.
  - Loss of actuating air to SRVs.

D. **EXIT CONDITIONS**

- Cause of air loss has been corrected or isolated

AND

- Instrument, service and breathing air systems are restored to normal

Entergy | ENTERGY NUCLEAR | LESSON PLAN

TRAINING PROGRAM:

BWR Technology

***LESSON PLAN TITLE:**

Instrument, Breathing, Service Air

***COURSE NUMBER:**

SDLP-39 **Revision 14**

APPROXIMATE TIME REQUIRED: 14 Hours

PREREQUISITES: None

SUPPORTING LESSONS: None

☐ New Material ☒ Minor Revision ☐ Major Revision ☐ Cancellation

REASON FOR REVISION:
Corrected typos, added scripted questions

REVIEW / APPROVAL (Print Name): ☐ Electronic Approval (TEAR # ______________)

Prepared By:	L. Greene (signature)	Preparer	2/9/09 Date
Reviewed By:	L. Oxsen Revision 11	Technical Reviewer (e.g., SME, line management)	5/4/04 Date
Instructional Adequacy Determined By:	L. Oxsen Revision 11	Qualified Instructor	5/4/04 Date
Approved By:	Mike Freihofer Revision 11	**Discipline Training Superintendent	5/5/04 Date
Approval Date:		*Date	

**Indicates that the LP has been reviewed by the Training Superintendent for inclusion of Management Expectations and items referenced on TQF-201-DD06, "Training Material Checklist"

FLEET PROGRAM CONCURRENCE: ☒ Not Applicable

ANO		**NP**	
BRP		**PLP**	
CNS		**PNPS**	
GGNS		**RBS**	
HQN		**VY**	
IPEC		**W3**	
JAF			

* Indexing Information
Class Code: __________

Lesson Content	Instructor Notes
4. Main Steam System:	
a. Loss of air to outboard MSIV's will cause them to drift close.	EO 1.09.b
b. The inboard MSIV's drift close if being supplied by instrument air, they are unaffected if supplied by the nitrogen supply system. Accumulators will delay the closure of each valve.	
5. Off-gas system - discharge isolation valve, 01-107AOV-100 fails open. AOP-12 describes alternate isolation method.	EO 1.09.c
6. Condenser air removal system - waterbox air admission valves, 36AOV-128A1(A2)(B1)(B2) fail open, resulting in a loss of condenser vacuum.	EO 1.09.d Q: How does the failing open of the Air Admission valves affect condenser vacuum?
7. RHR System - loss of air to:	EO 1.09.e
a. Heat exchanger steam pressure control valves, 10PCV-69A(B) which fail shut	NOTE – RHR steam condensing mode has been retired.
b. Heat exchanger level control valves, 10LCV-71A(B) which fail shut	
8. Reactor water cleanup system - loss of air to blowdown flow control valve, 12FCV-55 fails closed.	EO 1.09.f
9. Building ventilation systems - loss of air to valves, instrumentation and dampers. Ventilation dampers fail shut on a loss of air.	EO 1.09.h
10. ADS-SRV's:	EO 1.09.g
a. Normally supplied by nitrogen (CAD), but may be supplied by Air (IAS) when plant is shutdown and containment is not inerted.	
b. In this condition loss of air will prevent ADS or manual actuation, however, SRV's have accumulators which may delay failure.	

Entergy **ENTERGY NUCLEAR** **LESSON PLAN**

***TRAINING MATERIAL NUMBER:**

SDLP-33 Rev 20

***TRAINING MATERIAL TITLE:**

Feed and Condensate Systems

☒ Lesson Plan ☐ Qualification Card / Familiarization Guide ☐ Lab Guide ☐ Simulator Guide

☐ CBT Course ☐ Electronic Document/Form ☐ Graded Approach to Training ☐ Other ________

☐ New Material ☒ Minor Revision ☐ Major Revision ☐ Cancellation

Lesson Plan/Material Superseded: SDLP-33 Rev. 19

REASON FOR REVISION (include reason for site specific exception date as necessary):
TEAR 2011-963 – Remove information related to RFP shaft grounding devices as they are no longer installed. Does not affect any objectives.

REVIEW / APPROVAL: ☐ Electronic Approval (TEAR 2011-963)

Prepared By:	F. Catella [signature] **Preparer	10/5/2011 Date
*Reviewed By:	Mike Freihofer (Rev. 19) **Technical Reviewer (e.g., SME, line management)	3/17/2011 Date
*Instructional Adequacy Determined By:	Garrette Weiss (Rev. 19) **Instructional Technologist or Qualified Instructor	3/17/2011 Date
Approved By:	T. Peter [signature] Discipline Training Superintendent or Fleet Training Manager	10/5/11 Date

*Technical review, instructional adequacy, and fleet review N/A for electronic document or form. Instructional adequacy review is not required for graded approach to training topics.
**Indicates that the training material has been reviewed for inclusion of items referenced on TQF-201-DD06, Training Material Checklist as appropriate.

FLEET PROGRAM REVIEW POINT OF CONTACT: ☒ Not Applicable

	Name or N/A	Exception Date		Name or N/A	Exception Date
ANO			**NP**		
BRP			**PLP**		
CNS			**PNPS**		
GGNS			**RBS**		
HQN			**VY**		
IPEC			**W3**		
JAF					

Indexing Information

Class Code: ________

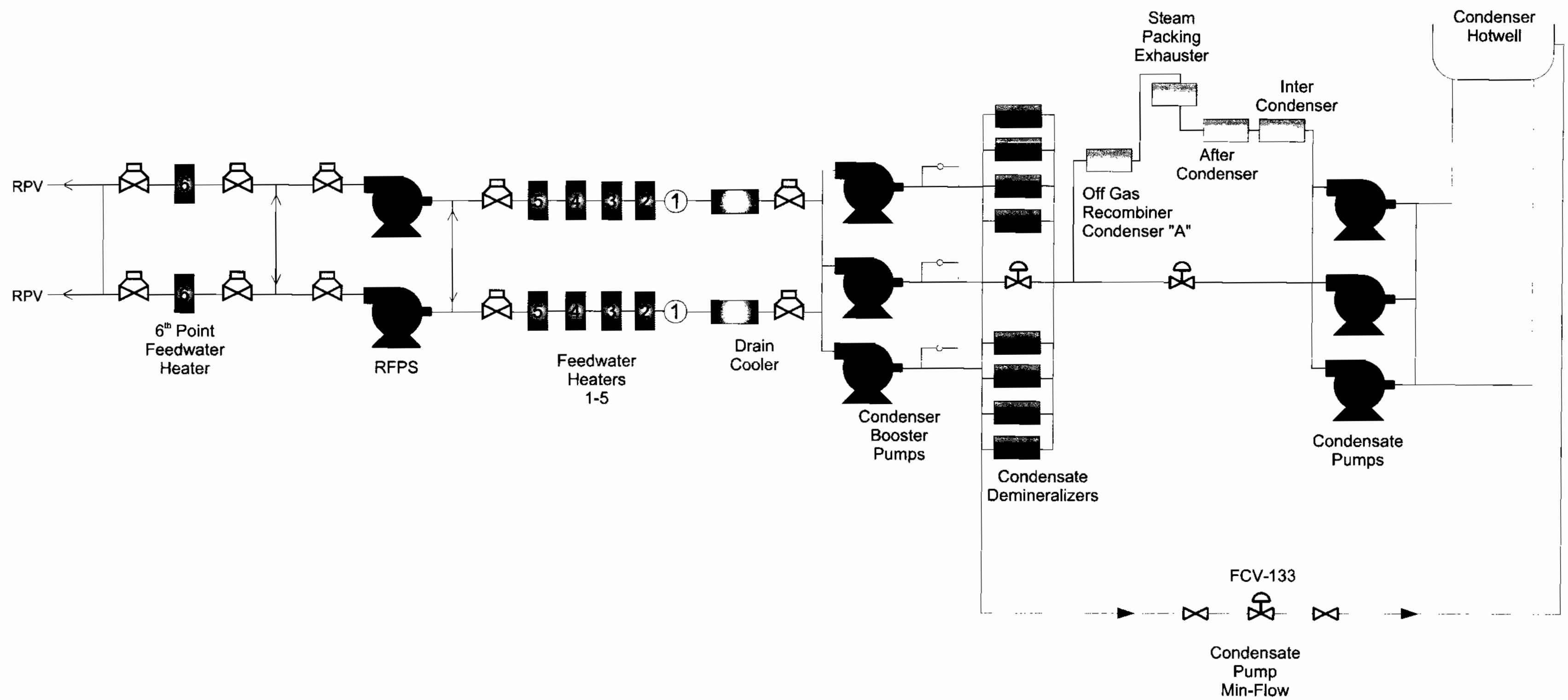
END OF DOCUMENT

Lesson Content	Instructor Notes
(1) Oil pressure is 8 psig, <u>AND</u> (2) Booster pump suction pressure is > 30 psig.	
2) Trip	EO 1.08.b
a) Undervoltage <u>OR</u> overcurrent	
b) Low suction pressure (25 psig)	
c) Low oil pressure (3 psig)	
d. Reactor Feed Pump Trips - Closure of Stop & Control Valves	EO 1.05.c.3.a Figure 33-43 RFPT Simplified Trip System
1) Rx Water Level High >222.5 inches	
2) Low RFP Suction Pressure <100 psig when hydraulic coupling is engaged	
3) Low Bearing Oil Pressure < 4 psig	
4) High Thrust Bearing Wear ≥ 40 psig	
5) Hi-Hi Vibration a) RFP 'A' Hi-Hi Vibration >5 mils	JAF OE- due to balancing shots incorrectly added – Plant shutdown was forced to adjust the balance of the RFPs.
b) RFP 'B' Hi-HI Vibration >5 mils (31VD-1B/2B)	SCR-T1-02-0025 and 0027
6) Low Condenser Vacuum <20" Hg 7) Exhaust Valve Not Full Open	Due to higher vibration on RFP 'B', when only one RFP is desired to be operated, RFP 'A' is preferred.
8) Manual (Local & Remote)	
9) Overspeed = 110% rated	Figure 33-33 Condensate & Feed Systems (14)
a) 5445- 5555 RPM	Q: What conditions will trip a RFP? A: Hi RPV Lvl; Low suct press; low brg oil press; Hi Thrust Brg wear; Hi-Hi vib; Lo vac; Exh Vlv closed; Manual (Local & remote); Overspeed

Lesson Content	Instructor Notes
b. Flow of TBCLC to the RFP Lube Oil Coolers is automatically controlled based on the lube oil temperature.	
12. Connections to Feedwater Inlet Piping	EO 1.09.c
a. Downstream of the FW Non-Return Valve (NRV), the RWCU System & RCIC systems inject into the 'A' feed line.	
b. Downstream of the FW Non-Return Valve, the HPCI System injects into the 'B' feed line.	
13. DC Power	EO 1.10.c
a. If DC power to the RFP trip circuit is lost the auto, remote manual trip & remote reset is lost.	
14. Reactor Power	EO 1.09.g
a. A reduction of FW flow will reduce subcooling & RX power.	
b. A total loss of FW will cause a RX scram on low level.	
c. An increase in FW flow will cause RX power to increase & will cause a reduction in MCPR.	
15. AC power	EO 1.10.b,c
a. Components are powered from 4160, 600 & 120 VAC sources, as listed in Table III.	
16. Condenser Air Removal	EO 1.10.e
a. A failure of air removal could result in blanketing of condenser tubes by non-condensables, thus lowering vacuum, ultimately causing a RFPT trip on low vacuum.	
17. Turbine Building Equipment Drain System	
a. A failure of RFP Seals could cause a over-load of 20LCV-958.	
b. Combined RFP seal drain flow is limited to 192 gpm due to flow limitations of 20LCV-958.	
c. Flow rate in excess of this limit will require removal of the RFW pump from service to facilitate replacement of the degraded throttle bushing.	

TABLE I
ANNUNCIATORS

ANNUNCIATOR NUMBER	CONDITION	SETPOINT/PURPOSE/ACTION
09-6-4-1 (8)	RFPT A(B) Vac Lo	23" Hg by 31PNS-LS13A(B) 1. Vacuum Alarm Only 2. Trip Impending a. Main Turb 22.5 " HG b. RFPT Trip 20 " HG c. Bypass Valve Closure 8" HG d. MSIV Closure 8" HG (Mode switch NOT in Run & TSV closed –Bypassed) e. If >29 % Power (1st Stage Press) If MSIV close in Run or Turb Trip = RX SCRAM. 2. Enter AOP-1, AOP-2, AOP-31, AOP-42 as applicable.
09-6-4-2 (9)	RFPT A(B) Trip	Emergency Trip Device 1. Low VAC < 20" HG 2. High Rx Water Lvl > 222.5" 3. Thrust Brg Wear ≥ 40 psig 4. Hi Vibration >5 mils 5. Low Oil Pressure < 4 psig 6. Low Suct Press < 100 psig With hydraulic coupling engaged 7. Exhaust Valve Not Fully Opened 8. Overspeed (5445-5555 RPM) 9. Manual Trip Partial or Complete loss of FW: 1. RWR Runback to 44% if < 196.5" RPV Lvl 2. RWR Runback to 30% if < 20% FW flow 3. Rx scram if < 177" RPV Lvl



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PROJECT
Condensate & Feed Systems

DWG # **S33-008.cdr**

SDLP 33

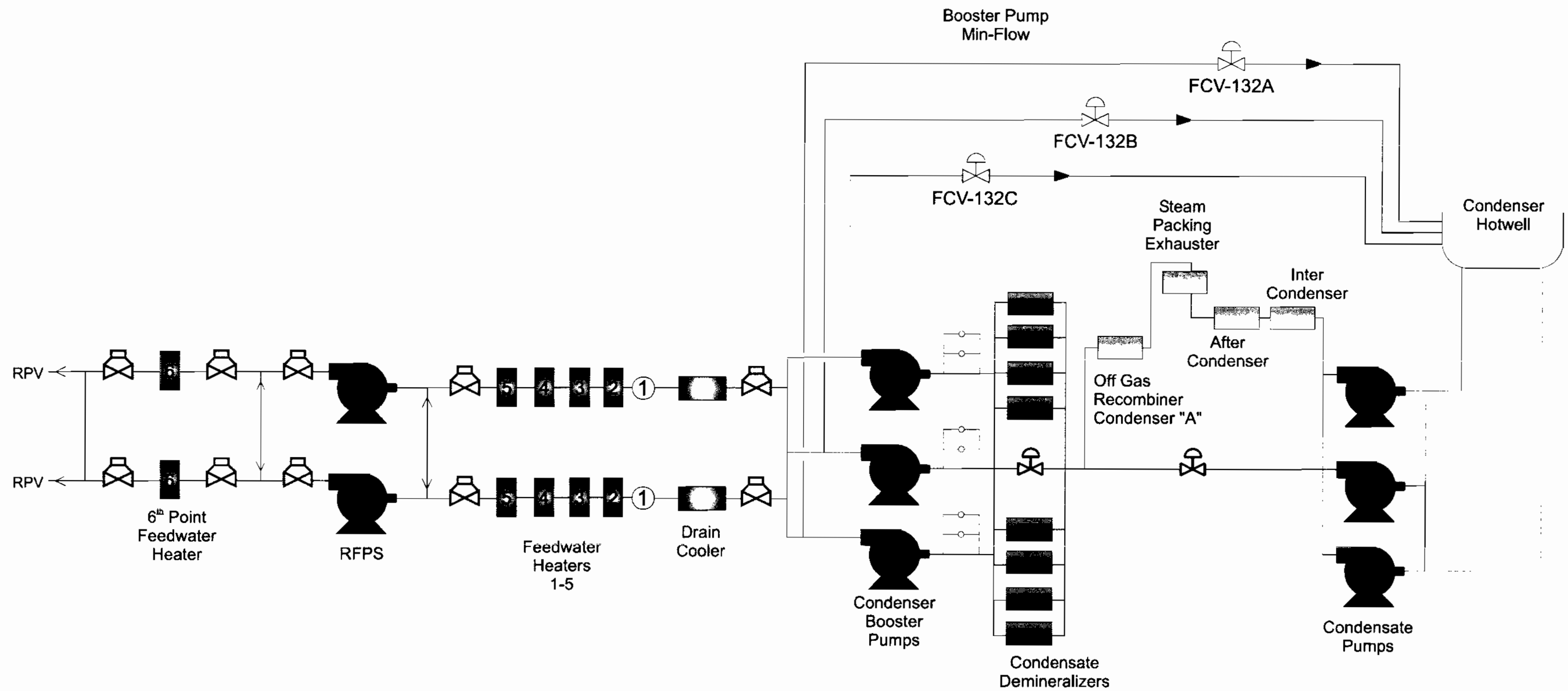
CAD DATE **Jan. 1997**

PAGE 1 OF 1

FIGURE 13

REV DATE / No: 10/09/98 Rev. 01

DRAFTER *J. Paquette*



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PROJECT
Condensate & Feed Systems

DWG # S33-009.cdr

SDLP 33

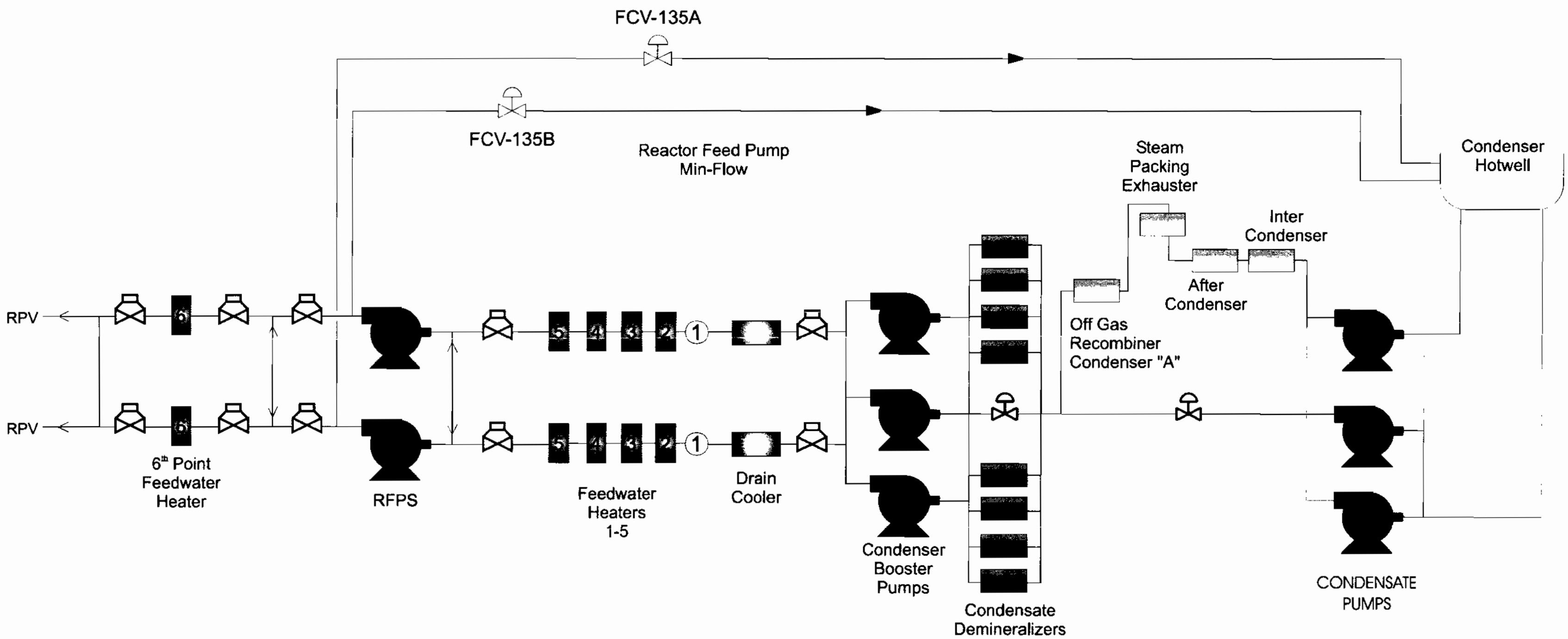
CAD DATE Dec. 1997

PAGE 1 OF 1

FIGURE 15

REV DATE / No. 10/17/98 Rev. 01

DRAFTER J. Paquette



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PROJECT
Condensate & Feed Systems

DWG # S33-011.cdr

SDLP 33

CAD DATE Dec. 1997

PAGE 1 OF 1

FIGURE 27

REV. DATE / No 10/17/98 Rev. 01

DRAFTER J. Paquette

ENTERGY NUCLEAR OPERATIONS, INC.
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
OPERATING PROCEDURE

FEEDWATER SYSTEM
OP-2A
REVISION 68

APPROVED BY: ______________________ DATE: 2/29/12
RESPONSIBLE PROCEDURE OWNER

EFFECTIVE DATE: 3-12-12

FIRST ISSUE ☐ FULL REVISION ☐ LIMITED REVISION ☒

CONTINUOUS USE	QUALITY RELATED
TECHNICAL	

Protective Devices

The protective devices that cause the stop and control valves to close are as follows:

- Emergency (overspeed) governor (5445 to 5555 rpm)
- Local manual trip lever
- Low main condenser vacuum trip (less than 20 inches Hg vacuum)
- The following solenoid trip and associated devices:
  - Turbine exhaust valve not full open
  - Thrust bearing wear trip device (greater than 40 psig)
  - Turbine bearing oil pressure low (less than 4 psig)
  - Remote trip pushbutton (Control Room panel 09-6)
  - Reactor feed pump suction pressure low when hydraulic coupling is engaged (less than 100 psig)
  - Reactor feed pump turbine shaft vibration high (greater than or equal to 5 mils)
  - RPV high water level (greater than 222.5 inches)

Entergy

ENTERGY NUCLEAR

LESSON PLAN

*TRAINING MATERIAL NUMBER:

SDLP-38	Rev. 14

*TRAINING MATERIAL TITLE:

Condenser Air Removal, Gland Seal/Gland Exhaust System

APPROXIMATE TIME REQUIRED: 4.0 Hours

PREREQUISITES: None

SUPPORTING LESSONS: None

[ ] New Material [X] Minor Revision [ ] Major Revision [ ] Cancellation

REASON FOR REVISION:
TEAR-JAF-2011-360: Added clarifying information regarding the typical plant values for nominal steam seal header pressure.

REVIEW / APPROVAL (Print Name): [ ] Electronic Approval (TEAR # ____________)

Prepared By:	Matthew Emrich Matthew Emrich Preparer	6/6/11 Date
Reviewed By:	Lee Oxsen Revision 12 Technical Reviewer (e.g., SME, line management)	9/17/10 Date
Instructional Adequacy Determined By:	Garrette Weiss Revision 12 Instructional Technologist or Qualified Instructor	9/22/10 Date
Approved By:	Jim Burton Revision 12 **Discipline Training Superintendent or Fleet Training Manager	10/20/10 Date
Approval Date:	10/20/10 *Date	

**Indicates that the LP has been reviewed by the Training Superintendent for inclusion of Management Expectations and items referenced on TQF-201-DD06, "Training Material Checklist"

FLEET PROGRAM REVIEW/COMMENT: [X] Not Applicable

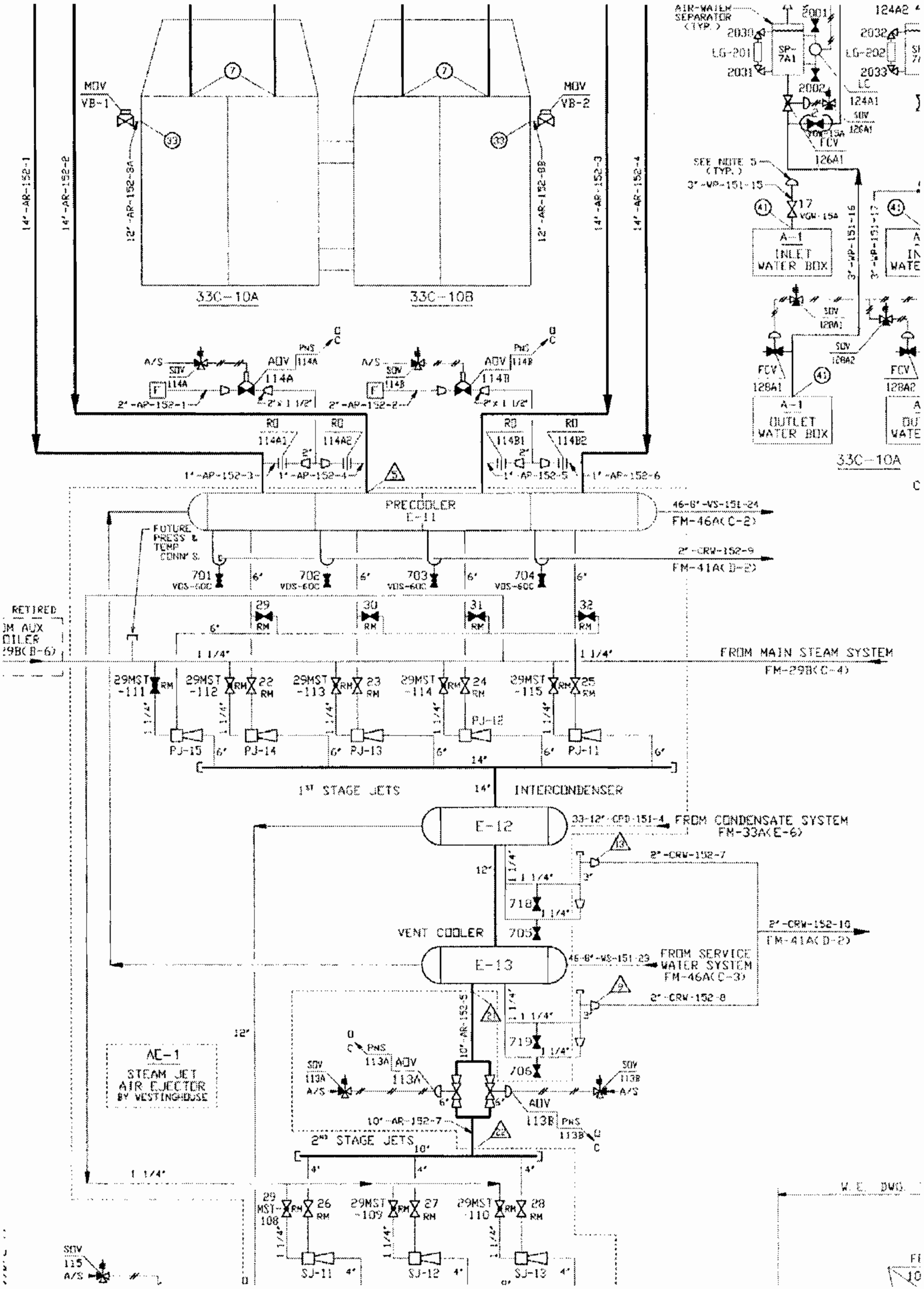
	Name or N/A	Exception Date		Name or N/A	Exception Date
ANO			**NP**		
BRP			**PLP**		
CNS			**PNPS**		
GGNS			**RBS**		
HQN			**VY**		
IPEC			**W3**		
JAF					

* Indexing Information
Class Code: ________

Lesson Content	Instructor Notes
8) Off-Gas Air Purge Valve AOV-115	EO 1.05.b.7 ESK-6KG
a) Opens automatically when both condenser isolation valves AOV-113A(B) are closed and no high temp/press exists in the holdup volume. (Relays reset)	
b) Closes automatically after 90 minutes.	
c) After H2 has been purged from Off-Gas System, AOV-113A & B may be reopened.	
9) Condenser Vacuum Breakers 38MOV-VB-1(2)	EO 1.05.a.8 ESK-11AB
a) Located each end of Main Condenser	EO 1.11.c.9
b) Opened from Control Room 9-7 panel	
c) Logic is "SEALED IN" for full open or full closed.	
10) Air Ejector Steam Supply	EO 1.05.a.9 EO 1.06.b
a) 29PCV-107 Nuclear steam supply from main steam lines.	**NOTE:** Aux Boiler Steam Piping to Air Ejector capped off.
b) Pressure regulated to 165-220 psig via 29PIC-107 when "NUC STM" is selected on transmitter rack 08-1 on T.B. el. 292'.	
c) Air is supplied to 29PCV-107 from 29PIC-107 via 29SOV- 107 when SOV-107 is de-energized.	EO 1.05.b.8 (ENERGIZED TO CLOSE)
d) Closing 38AOV-113 A and B will energize 29SOV-107, closing 29PCV-107.	Why is this a good idea? What would happen if 29SOV107 did not close automatically? FM-38A Steam would backfeed into the Main Condenser since the discharge path is isolated.

TABLE V
AOV FAIL POSITIONS

VALVE NUMBER	VALVE NAME	AIR LOSS FAILS	POWER LOSS FAILS
38AOV-111	Vac Cndsr Air Removal Pump Suct Isol Valve	CLOSED	CLOSED
38AOV-112	Vac Cndsr Air Removal Pump Disch to Off-Gas Isol	CLOSED	CLOSED
38AOV-113A(B)	Vac A(B) SJAE Off-Gas Line Press Hi Trip Suct Isol	CLOSED	CLOSED
38AOV-114A(B)	Vac A(B) Air Ejector Purge Isol	CLOSED	CLOSED
38AOV-115	Vac SJAE Off-Gas Purge Isol	CLOSED	CLOSED
38AOV-22	Vac Off-Gas Drip Pot Outlet to Cndsr Isol	CLOSED	CLOSED



33C-10A
33C-10B
MOV VB-1
MOV VB-2
14"-AR-152-1
14"-AR-152-2
14"-AR-152-3
14"-AR-152-4
12"-AR-152-8A
12"-AR-152-8B
AIR-WATER SEPARATOR (TYP.)
SEE NOTE 5 (TYP.)
3"-WP-151-15
A-1 INLET WATER BOX
A-1 OUTLET WATER BOX
FCV 128A1
FCV 128A2
3"-WP-151-16
3"-WP-151-17
ADV 114A
ADV 114B
RO 114A1
RO 114A2
RO 114B1
RO 114B2
2"-AP-152-1
2"-AP-152-2
1"-AP-152-3
1"-AP-152-4
1"-AP-152-5
1"-AP-152-6
PRECOOLER E-11
46-6"-WS-151-24
FM-46A(C-2)
2"-CRW-152-9
FM-41A(D-2)
FUTURE PRESS & TEMP CONN'S.
RETIRED
FROM MAIN STEAM SYSTEM
FM-29B(C-4)
PJ-15
PJ-14
PJ-13
PJ-12
PJ-11
1ST STAGE JETS
INTERCONDENSER
E-12
33-12"-CPD-151-4 FROM CONDENSATE SYSTEM
FM-33A(E-6)
2"-CRW-152-7
2"-CRW-152-10
FM-41A(D-2)
VENT COOLER
E-13
46-6"-WS-151-23 FROM SERVICE WATER SYSTEM
FM-46A(C-3)
2"-CRW-152-8
10"-AR-152-5
10"-AR-152-7
ADV 113A
ADV 113B
AE-1 STEAM JET AIR EJECTOR BY WESTINGHOUSE
2ND STAGE JETS
SJ-11
SJ-12
SJ-13
W. E. DWG.

NRC Post Written Exam Comment Resolution

Question #19

Entergy contends the Question #19 Key Answer should be changed from C to D.

The NRC agrees. The Key Answer is changed from C to D.

The Recirculation (RWR) System Motor Generator (MG) Set room fire detection contains a pre-action sprinkler system for fire protection. The sprinkler piping is normally dry and two actions are required to actuate the system to extinguish a fire. One or more of the sprinkler head fusible links must melt to allow water to pass through the sprinkler head. Most of the sprinklers in this room are of the 160°F melt temperature class, with a few of the 286°F melt class. The piping must also be pressurized from the fire header by the opening of the sprinkler system's associated Flow Control Valve FCV). Any one of 12 fire temperature detectors in the affected zone sensing a temperature in excess of 140°F will cause the FCV to open automatically. The FCV will also open upon operator demand through actuation of a pushbutton on a panel in the Main Control Room.

The question stem provides information that a fire exists in the RWR MG Set room which has rendered the room inaccessible to members of the Fire Brigade. However, the stem does not indicate the temperature of sprinkler heads in the room or whether any fusible links have melted. Applicants are cautioned when answering a question to not make assumptions regarding conditions that are not specified in the question unless they occur as a consequence of other conditions that are stated in the question. In this case, applicants cannot assume fusible links have already melted. The room could be inaccessible as a result of toxic gas or smoke from a fire in the room.

Although the stem mentions a fire in the area, it lacks information concerning room temperature. The second fill-in-the-blank statement identifies what, by design, can cause suppression actuation. Regarding this statement, the original Key Answer C is not correct. Suppression can be actuated by heat sensed in the area. However, suppression cannot be actuated by manual pushbutton action alone.

Choice D is a correct answer. Fire suppression can be actuated by heat sensed in the area only, meaning that heat sensed in the area, by itself, can actuate suppression.

The NRC agrees with the facility that original Key Answer C is not correct and that Choice D is the correct answer.

Question #27

Entergy contends there are two correct answers and proposes accepting the Question #27 Choice C as a 2nd correct answer in addition to Key Answer B.

The NRC disagrees. Key Answer B is correct. Distracter Choice C is not correct. The question answer remains as originally proposed.

The question provides applicants with the wording of an EOP-4 step that directs operation of all available drywell cooling if drywell temperature cannot be restored and maintained below 135°F. It then essentially asks the applicant to fill-in-the-blank, that this EOP "statement is attempting to preserve the integrity of [blank]."

Original Key Answer B identifies that the EOP statement is attempting to preserve the integrity of Primary Containment component qualification. MIT-301.11E, "EOP-4 Primary Containment Control", Revision 10, explains that all available drywell cooling, defined as 3 of the 4 fans per drywell cooling assembly, are used to terminate increasing drywell temperature before "applicable component qualification or structural design temperature limits are reached". It further explains that drywell sprays are initiated in the DW/T leg if all available drywell cooling is unable to terminate the temperature rise before applicable component qualification or structural design temperature limits are reached. The EOP threshold for this drywell spray initiation is 309°F.

EOP-4 directs drywell spray prior to 309°F and emergency depressurization if temperature cannot be restored and maintained below 309°F. MIT-301.11E indicates the limiting components driving these action requirements are containment integrity and SRV operability and that, while containment integrity or SRV operability are not expected to be immediately challenged when temperature reaches 309°F, extended operation above this temperature is not permitted.

SDLP-16A, Primary and Secondary Containment System Description Lesson Plan, states the design temperature of the drywell is 309°F. The bases for TS 3.6.1.5, "Drywell Air Temperature" explains that exceeding the design temperature of 309°F "may result in the degradation of the primary containment structure under accident loads." It also states "equipment inside primary containment required to mitigate the effects of a DBA is designed to operate and be capable of operating under environmental conditions expected for the spectrum of break sizes." These statements confirm the EOP is attempting to preserve the integrity of the primary containment and not the RPV level instrumentation.

The facility justifies their contention that Choice C is a second correct answer by the existence of a caution in the EOP related to temperature effects on the RPV level instrumentation. However, EOP owner's guide explains that cautions identify potential adverse consequences of plant conditions or actions in the EPGs, but they do not specify operator actions or limit the applicability of EOP actions.

From the EOP Owner's Guide:

> "Cautions identify potential adverse consequences of certain plant conditions or actions

specified in the EPGs. Cautions do not specify operator actions or limit the applicability of specified actions."

"Caution #1 defines conditions under which RPV water level indications may be unreliable or must be considered invalid due to the effects of RPV pressure and primary and secondary containment temperatures."

"Note that the purpose of Caution #1 is not to correct for instrument inaccuracies due to variances from calibration conditions. Rather it defines conditions under which neither the displayed value nor the indicated trend of RPV water level can be relied upon."

Caution #1 is basically telling the operator that besides the actions that need to be taken in primary containment control to mitigate the rising drywell temperature, the operator also needs to evaluate the reliability of the RPV level indications to properly execute the RPV control EOP. The wording of Caution #1 permits continued use of a level instrument, avoiding premature transfers to RPV flooding.

The caution, which informs the operator of the need to evaluate reactor water level instrumentation because the instruments may be unreliable at elevated drywell temperature, does not constitute a basis for initiating additional Drywell cooling. The caution is not directing any operator actions and therefore the actions to provide additional cooling are not tied to the caution.

Additionally, although the narrow range instruments react to increasing drywell temperature by causing indicated level to be higher than actual, the wide range level instrument indicates a water level equal to actual and the fuel zone instrument indicates a water level that is lower than actual. In the post exam comment it was mentioned that narrow range is a non-conservative indication, however there was no mention that the other ranges were not affected in the same way.

The NRC disagrees with the facility's position on Question #27. Key Answer B is the only correct answer.

Question #30

Entergy contends there are two correct answers and proposes accepting the Question #30 Choice C as a 2nd correct answer in addition to Key Answer A.

The NRC disagrees. Key Answer A is correct. The NRC does NOT agree that Distracter Choice C is also correct. The question answer remains as originally proposed.

The stem of the question indicates that the reactor has scrammed from 45% power following a complete loss of instrument air. RPV pressure is lowering slowly at 590 psig and RPV level is also lowering slowly. The question asks the applicant to select the system (HPCI, LPCI, Condensate, or Feedwater) that should be used to restore and maintain RPV water level between 177 and 222.5 inches.

The HPCI system (Key Answer A) remains available following a loss of instrument air and can be used to restore level. Therefore Key Answer A is correct.

The facility proposes accepting Distracter Choice C, “Condensate” as a second correct answer based on condensate system availability to inject water with the given stem conditions.

The justification in the facility’s post exam comments provides an explanation of why there would be a flowpath and sufficient flow using the condensate booster pumps (CBP). Further, AOP-1 “Reactor Scram” directs control of RPV water level between 177 and 222.5 inches using any of a number of listed methods, including CBPs if RPV pressure is below CBP discharge pressure. The AOP step references a table in the AOP, which lists the maximum CBP discharge pressure as 700 psig. The question stem states RPV pressure is 590 psig, a pressure well below the listed maximum discharge pressure of the CBPs.

But the loss of instrument air causes the minimum flow valves in the condensate and feedwater systems listed below to fail open, which will divert potential injection flow back to the condenser.

- Condensate Minimum Flow Valve, 33FCV-133
- Condensate Booster Pump Minimum Flow Valves, 33FCV-132A, B, C
- Feedwater Pump Minimum Flow Valves, 34FCV-135A, B

The diverted flow, assumed to be 7800 gpm based on values given in design documentation, is below the flow capacity of the plant pump configuration, at approximately 32% of the system’s 24,200 gpm design flow rate. With a substantial portion of condensate flow diverted to the condenser, it is not clear whether the head developed by the running pumps would be sufficient to overcome system head losses such that water would flow to the RPV. The NRC asked for additional thermohydraulic analysis to support the facility’s justification for a second correct answer. However, Entergy was not able to supply any additional information.

Given the lack of information relating to this post-exam comment, the NRC is not able to conclude that condensate would be able to restore and maintain RPV level.

Therefore, the NRC does NOT agree that Distracter Choice C is also correct. Key Answer A is the only correct answer to Question #30. The question answer remains as originally proposed.