ArevaEPRDCPEm Resource

From: BRYAN Martin (EXTERNAL AREVA) [Martin.Bryan.ext@areva.com]
Sent: Tuesday, November 02, 2010 2:50 PM
To: Tesfaye, Getachew
Cc: Hearn, Peter; KOWALSKI David (AREVA); GARDNER Darrell (AREVA)
Subject: FW: DRAFT RESPONSES FOR FSAR Chapter 9 Weekly NRC Telecon
Attachments: Blank Bkgrd.gif; DRAFT RESPONSE RAI 345 Q.09.02.01-28(c).pdf

Importance: High

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Sent: Tuesday, November 02, 2010 12:52 PM
To: BRYAN Martin (External RS/NB)
Cc: BALLARD Bob (EP/PE); HUDDLESTON Stephen (EP/PE); HARTSELL Jody (EP/PE); GARDNER Darrell (RS/NB); MCINTYRE Brian (RS/NB); SLOAN Sandra (RS/NB)
Subject: DRAFT RESPONSES FOR FSAR Chapter 9 Weekly NRC Telecon
Importance: High

Marty:

Please transmit to Getachew Tesfaye the attached partial set of DRAFT responses to RAI 345 questions. This response will be discussed at today's (11/2/10) FSAR Chapter 9 Weekly Telecon/GoToMeeting with the NRC. It will also be available thru the GoToMeeting.

Attached are the following DRAFT response(s):

- Response to RAI 345 - Question 09.02.01-28(c) and supporting FSAR changes.

Note that this DRAFT response has not been through the final Licensing review/approval process; nor does it reflect technical editing.

Please call me if you have any questions. Thanks.

David J. Kowalski, P.E.
Principal Engineer
New Plants Regulatory Affairs

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Subject: FW: DRAFT RESPONSES FOR FSAR Chapter 9 Weekly NRC Telecon
Sent Date: 11/2/2010 2:49:56 PM
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DRAFT RESPONSE RAI 345 Q.09.02.01-28(c).pdf	938957	

Options
Priority: High
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Response to

Request for Additional Information No. 345

3/04/2010

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.02.01 - Station Service Water System
Application Section: 9.2.1

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

28(c) Updated
for NRC Call 11/02/10

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Question 09.02.01-28:

Follow-up to RAI 119, Question 9.2.1-04

The ESWS must be capable of removing heat from structures, systems and components (SSCs) important to safety during normal operating and accident conditions over the life of the plant in accordance with GDC 44 requirements. The ESWS description and P&ID were reviewed to assess the design adequacy of the ESWS for performing its heat removal functions. While the P&ID shows the ESWS components and identifies the boundaries between safety-related and non-safety-related parts of the system, some of the information is incomplete, inaccurate, or inconsistent. Consequently, the applicant needs to revise the FSAR to address the following considerations in this regard:

Part (a)- Pipe sizes are not shown on the P&ID, and the system description does not explain the criteria that were used in establishing the appropriate pipe sizes (such as limiting flow velocities).

Part (b)- The system description does not provide design details such as system operating temperatures, pressures, and flow rates for all operating modes and alignments.

Part (c)- The P&ID does not show where indications are displayed (e.g., local, remote panel, control room), and what instruments provide input to a process computer and/or have alarm and automatic actuation functions.

Part (d)- The P&ID does not show what the normal valve positions are, what valves are locked in position, and what valves have automatic functions; and these design features are not described.

Part (h)- The P&ID does not show specific set point for alarms, relief valves, vacuum breakers, air release valves, automatic functions such as filter backwash, etc., and the bases for these set points are not explained in the system description.

Based on the staff's review of response to RAI 119, Question 9.2.1-04 and an audit by the staff conducted on October 27, 2009, Parts a, b, c, d and h remain open and require further resolution and/or clarification by the applicant. The following description provides the results of the staff's evaluation of the applicant's initial response and justification for the remaining open items.

With regard to items a, b, c, d and h of RAI-response 9.2.1-04 above, the staff found that in general, the applicant stated that details would be developed later in the design process. The staff noted that the applicant provided some new information for parts (a) and (c) including: (1) criteria that will be used for determination of pipe sizes, and (2) a description of the normal functions for system valves. However, the requested details would be developed later in the design process. While the staff found the partial response to part (c) an improvement over the descriptions currently included in U.S.EPR FSAR Tier 2 Section 9.2.1, the applicant stated that the FSAR will not be updated as a result of this question. The applicant should include the requested information in the FSAR when the design is completed.

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The applicant should identify what the maximum return temperatures are coming out of the heat exchangers and going to the cooling tower.

The applicant should identify the continuation of the dedicated blowdown line from Figure 9.2.1-1, Sheet 4 of 4.

Response to Question 09.02.01-28:

Part (c)

Cooling tower basin water level and temperature, ESW pump discharge pressure, ESW cooling water supply temperature, debris filter differential pressure, valve position status (open/closed), and pump operating status (energized/de-energized) are provided in the MCR for operation of the system.

U.S. EPR FSAR Table 9.2.1-3 Alarm Summary will be revised to indicate which alarms will be provided in the MCR/RSS. The associated instruments provide input to a process computer and/or have alarm and automatic actuation functions. U.S. EPR FSAR Figure 9.2.1-1 will be revised to show which valves are monitored for valve position. U.S. EPR FSAR Section 9.2.1.7.1 will be revised to include valve position status and pump operating status as a monitored parameter.

The system automatic actions will be added to the U.S. EPR FSAR Section 9.2.1.7.

The information provided in RAI 345, Question 09.02.01-43 regarding the response of the ESWS return header isolation valves 30PED10/20/30/40 AA010 to a pump start/stop has been updated. The automatic open/close alignment for the ESWS return header isolation valves 30PED10/20/30/40 AA010 in response to a pump start/stop will be deleted from Section 9.2.1.7.

The ESW pump will trip on the following: high bearing temperature, high differential pressure across the debris filter, low pump discharge flow, high pump discharge pressure, and cooling tower basin water level below low level for safe pump operation.

ITAAC for pump operation in all modes is addressed in ITAAC 4.3. The scope and response of the ESWS starts with receipt of a signal from the PACS. For ITAAC for the PACS refer to Tier 1, Section 2.4.5.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.2.1, Table 9.2.1-3 and Figure 9.2.1-1 will be revised as described in the response and indicated on the enclosed markup.

ADDED for 11/02/10

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- Fluid flow from the CCWS and EDG HXs.
- Temperature of the ESWS and the dedicated ESWS pump discharge.
- Temperature at the outlet of the HXs.

9.2.1.7.2 System Alarms

- High temperature ESW and dedicated ESW.
- ESW and dedicated ESW pump abnormal.
- Low flow across the CCWS and dedicated CCWS HX.
- High ΔP across the CCWS, dedicated CCWS HX, and SAQ room cooler.
- Low temperature ESW.
- Table 9.2.1-3—Alarm Summary provides additional information.

9.2.1.8 References

1. ASME Boiler and Pressure Vessel Code, Section III: "Rules for Construction of Nuclear Facility Components," Class 3 Components, The American Society of Mechanical Engineers, 2004.
2. Generic Letter 89-13, NRC Letter to All Holders of Operating Licenses or Construction Permits for Nuclear Power Plants, "Service Water System Problems Affecting Safety-Related Equipment." U.S. Nuclear Regulatory Commission, July 18, 1989.

- MOV position status

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- Pump operating status (energized / de-energized)

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Table 9.2.1-3—Alarm Summary

Alarm Name	Division	Setpoint Name
CCW Hx differential pressure Hi	1/2/3/4	Max 1
CCW Hx Lo flow	1/2/3/4	Min 1
EDG coolers Lo flow	1/2/3/4	Min 1
SAQ room cooler differential pressure ESW side	1/2/3/4	Max 1
ESW temperature Hi	1/2/3/4	Max 1
ESW temperature Hi – Hi	1/2/3/4	Max 2
ESW temperature Low	1/2/3/4	Min 1
ESW debris filter differential pressure Hi	1/2/3/4	Max 1
ESW debris filter differential pressure Hi - Hi	1/2/3/4	Max 2
ESW pump abnormal	1/2/3/4	Min1 / Max 1
Dedicated CCW Hx differential pressure Hi	Dedicated	Max 1
Dedicated CCW Hx Lo flow	Dedicated	Min 1
Dedicated ESW temperature Hi	Dedicated	Max 1
Dedicated ESW temperature Hi - Hi	Dedicated	Max 2
Dedicated ESW pump abnormal	Dedicated	Min 1 / Max 1
Cooling tower basin water level Hi - Hi	1/2/3/4	Max 2
Cooling tower basin water level Hi	1/2/3/4	Max 1
Cooling tower basin water level Lo	1/2/3/4	Min 1
Cooling tower basin water level Lo - Lo	1/2/3/4	Min 2

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U.S. EPR FSAR Tier 2, Section 3.9 and Section 6.6 outline the inservice testing and inspection requirements. Refer to U.S. EPR FSAR Tier 2, Section 16.0, Surveillance Requirement (SR) 3.7.8 for surveillance requirements that verify continued operability of the ESWS.

Pursuant to the recommendations included in Generic Letter 89-13 (Reference 2), the design of safety-related portions of the ESWS considers the potential for capability and performance degradation and subsequent system failure due to siltation, erosion, corrosion, protective coating failure, and the presence of organisms that subject the system to microbiological influenced corrosion, as well as macro-fouling. A combination of design means, such as chemical treatment to reduce biological challenges; provisions to permit regular, periodic inspections, preventative maintenance, testing and performance trending; the use of best design practices for piping material selection and layout to minimize erosion and corrosion; and administrative controls in the form of operating, maintenance and emergency procedures, provide a level of assurance that the ESWS is able to perform its safety function when required.

Consistent with GL 89-13, design provisions of the ESWS accommodate performing the following:

- Identify and reduce the incidence of flow blockage problems caused from biofouling.
- Verify the heat transfer capability of safety-related heat exchangers connected to or cooled by the ESWS.
- Conduct routine inspection and maintenance activities of ESWS piping and components to provide assurance that corrosion, erosion, protective coating failure, silting, and biofouling cannot degrade the performance of safety-related systems supplied by ESW.

9.2.1.7 Instrumentation Requirements

Instrumentation is provided in order to control, monitor and maintain the safety-related and non-safety-related functions of the ESWS.

INSERT A

9.2.1.7.1 System Monitoring

The ESWS system is monitored for the following parameters:

- Fluid flow rate and pressure downstream of the ESWS pumps and the dedicated ESWS pump.
- Differential pressure at the ESWS and the dedicated ESWS debris filters, CCWS HXs, and Essential Service Water Pump Building Ventilation System (SAQ) room cooler.

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the mechanical equipment of the associated ESWS at full load operation with an additional margin of approximately 10 percent to the total head.

The pump motors are air cooled. To remove heat losses, an air recirculation system is installed for each division. In addition, anti-condensation heaters on the motors are switched on as soon as the pumps cease operation.

9.2.1.3.2 Dedicated Essential Service Water Pump

The 100 percent capacity dedicated ESW pump is normally in standby mode.

This non-safety-related pump is manually started only in response to certain postulated SA conditions; it is not credited for response to any DBA.

The required flow rate of the dedicated ESWS pump is defined by the heat to be removed from the dedicated CCWS HX. Design parameters are listed in Table 9.2.1-2. The pump is designed to fulfill the corresponding minimal required design mass flow rate under the following conditions:

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- Minimal water level.
- Fluctuations in the supplied electrical frequency.
- Increased pipe roughness due to aging and fouling.
- Fouled debris filter.
- Minimum water level in cooling tower basin considers minimum submergence requirements to prevent vortex effects, and net positive suction head to prevent cavitation of the dedicated ESWS pump.
- Maximum allowable water level differential across the coarse and fine screens.

The pump motor is air cooled. In addition, an anti-condensation heater on the motor is switched on as soon as the pump ceases operation.

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9.2.1.3.3 Debris Filters -Safety Divisions

The debris filters remove from the cooling water all debris particles that pass through coarse and fine screens and ~~from the cooling water that~~ would obstruct the system user HXs.

The debris filters are designed as an automatic backwash type. With increasing fouling, the differential pressure across the filter segments increases until reaching a preset operational point. The pressure relief backwash process of the filter is initiated by either the signal of the differential pressure measuring system, a timer after the start of the ESW pump or via a manual operator initiation.

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- ESWS pump recirculation isolation valves 30PEB10/20/30/40 AA002 (closed).
- ESWS pump discharge isolation valves 30PEB10/20/30/40 AA005 (open).
- ESWS return header tower isolation valves 30PED10/20/30/40 AA010 (open).
- ESWS emergency makeup water isolation valves 30PED10/20/30/40 AA021 (open).

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The following valves are automatically re-aligned in response to a pump start/stop:

- ESWS pump discharge isolation valves 30PEB10/20/30/40 AA005 (open/closed).
- ESWS return header isolation valves 30PED10/20/30/40 AA010 (open/closed).

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9.2.1.7.1 System Monitoring

The ESWS system is monitored for the following parameters:

- Fluid flow rate and pressure downstream of the ESWS pumps and the dedicated ESWS pump.
- Differential pressure at the ESWS and the dedicated ESWS debris filters, CCWS HXs, and Essential Service Water Pump Building Ventilation System (SAQ) room cooler.
- Fluid flow from the CCWS and EDG HXs.
- Temperature of the ESWS and the dedicated ESWS pump discharge.
- Temperature at the outlet of the CCWS and EDG HXs and pump room coolers.
- MOV position status.

UPDATED for 11/02/10

9.2.1.7.2 System Alarms

- High temperature ESW and dedicated ESW.
- ESW and dedicated ESW pump abnormal.
- Low flow across the CCWS and dedicated CCWS HX.
- High ΔP across the CCWS, dedicated CCWS HX, and SAQ room cooler.
- Low temperature ESW.
- Table —Table 9.2.1-3—Alarm Summary provides additional information.

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UPDATED for 11/02/10

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ESWS Safety Related I&C Functions

ESW Actuation from SIS

Upon receipt of a safety injection signal, the four ESWS trains are started to supply the CCWS heat exchangers, EDG heat exchangers and ESW pump room coolers.

For this function, the following ESW actuations are automatically initiated by the PS:

- The ESWS pumps 30PEB10/20/30/40 AP001 are started.
- The ESW pump discharge isolation valves 30PEB10/20/30/40 AA005 are opened.
- The ESWS cooling tower return isolation valves 30PED10/20/30/40 AA010 are opened, as required.
- UHS fans 30PED10/20/30/40 AN001 and 30PED10/20/30/40 AN002 are automatically operated at full speed.

Automatic ESW Actuation from CCWS

To ensure cooling of the safety related users of the NI cooling chain, the ESWS is automatically actuated when the associated CCWS train is started. The following actions occur:

- The ESW pump 30PEB10/20/30/40 AP001 is started. If one ESWS pump fails during normal operation, a switchover to the other ESWS train is carried out. This switchover is done automatically for the entire cooling train and is initiated by the CCWS Switchover sequence.
- The ESW pump discharge isolation valve 30PEB10/20/30/40 AA005 is opened.
- UHS fans 30PED10/20/30/40 AN001 and 30PED10/20/30/40 AN002 are started.

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Automatic ESW Actuation from LOOP

To ensure cooling of the safety related EDG (30XJA10/20/30/40), the ESWS is automatically actuated by a LOOP signal. The ESW system is started according to the EDG load sequence. The following actions occur:

- The ESW pump 30PEB10/20/30/40 AP001 is started.
- The ESW pump discharge isolation valve 30PEB10/20/30/40 AA005 is opened.
- UHS fans 30PED10/20/30/40 AN001 and 30PED10/20/30/40 AN002 are started.

Manual ESW Actuation

The ESWS pumps 30PEB10/20/30/40 AP001 and UHS cooling tower fans 30PED10/20/30/40 AN001 and 30PED10/20/30/40 AN002 can be started manually from the MCR and/or RSS and the ESWS pump discharge isolation valves 30PEB10/20/30/40 AA005 and ESWS cooling tower return isolation valves 30PED10/20/30/40 AA010 can be opened manually from the MCR and/or RSS to cool the plant to cold shutdown conditions following a DBA. This functionality is a backup to the automatic actuation.

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MCR / RSS	Division	Setpoint Name	Function
CCW HX differential pressure Hi	1/2/3/4	Max 1	Alarm alerts operator to high CCW HX DP
CCW HX Lo flow	1/2/3/4	Min 1	Alarm alerts operator to low CCW HX Flow
EDG coolers Lo flow	1/2/3/4	Min 1	Alarm alerts operator to low EDG HX Flow
CCW Hx Lo flow + EDG coolers Lo flow = Pump Discharge Flow	1/2/3/4	Min 1 Min 2	Min 1: Alarm (Pump discharge Flow low) Min 2: Alarm (Pump discharge Flow low-low) and Pump Trip
SAQ room cooler differential pressure ESW side	1/2/3/4	Max 1	Max 1: Alarm alerts operator of high DP
ESW debris filter differential pressure Hi UPDATED for 11/02/10	1/2/3/4	Max 4 Max 3 Max 2 Max 1	Max 4: Alarm and Pump Trip Max 3: Alarm alerts operator to filter trouble/DP too high –operator initiates division switchover Max 2: Auto-Start Strainer Motor (Backwash) Max 1: Status display in MCR
ESW pump abnormal (bearing temperature Hi)	1/2/3/4	Max 2 Max 1	Max 2: Alarm and Pump Trip Max 1: Alarm alerts operator to bearing trouble
ESW pump discharge pressure Hi/Lo	1/2/3/4	Max 2 Max 1 Min 1 Min 2	Max 2: Alarm and Pump Trip Max 1: Alarm alerts operator of high discharge pressure Min 1: Alarm (if Pump is Running) Min 2: Alarm alerts operator of Train Switchover Sequence (if Pump is Running)
Cooling tower basin temperature Hi-Hi	1/2/3/4	Max 2	Alarm and Part of the System Start Permissive (if below Max 2)
Cooling tower basin temperature Hi	1/2/3/4	Max 1	Alarm alerts operator to position cooling tower return isolation valve and/or adjust fan speed
Cooling tower temperature Lo	1/2/3/4	Min 1	Alarm alerts operator to position cooling tower return isolation valve and/or tower bypass valve and/or adjust fan speed
Cooling tower basin temperature Lo-Lo	1/2/3/4	Min 2	Alarm alerts the operator to manually place the affected ESW train into operation and/or adjust fan speed and/or direction
Cooling tower basin water level Hi-Hi	1/2/3/4	Max 2	Alarm alerts operator to remove basin inventory
Cooling tower basin water level Hi	1/2/3/4	Max 1	Auto-Close Normal Makeup Isolation Valve
Cooling tower basin water level Lo	1/2/3/4	Min 1	Auto-Open Normal Makeup Isolation Valve
Cooling tower basin water level Lo-Lo	1/2/3/4	Min 2	Alarm alerts operator to insufficient makeup
Cooling tower basin water level Lo–Lo-Lo	1/2/3/4	Min 3	Alarm and: -Part of the System Start Permissive (if >Min2) -Pump Start Permissive (if >Min2) for Emergency Makeup System
Cooling tower basin water level Lo–Lo–Lo-Lo	1/2/3/4	Min 4	Alarm and Pump Trip-Trouble with Emergency Makeup System
Cooling tower riser level	1/2/3/4	Min 1 Min 2	Alarm alerts operator to low water level in tower riser – Operator initiates refill actions Alarm alerts operator to leakages in the system - Operator to start ESW pump

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INSERT for RAI 345, Question 09.02.01-28 Part c Response

Add to Tier 2 Section 9.2.1.3.1

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The pumps will trip on high bearing temperature, high differential pressure across the debris filter, low pump discharge flow, high pump discharge pressure, and cooling tower basin water level below low level for safe pump operation.

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Figure 9.2.1-1—Essential Service Water System Piping & Instrumentation Diagram
Sheet 1 of 4

RAI 345
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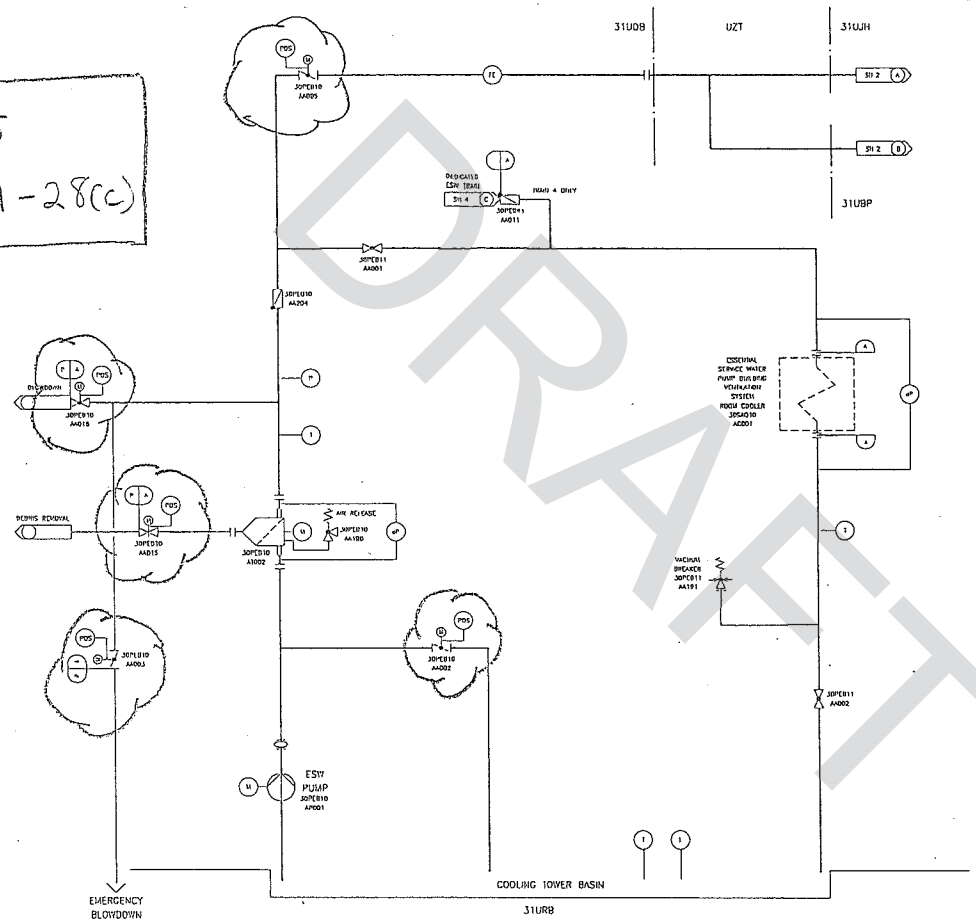

PEB - ESSENTIAL SERVICE WATER PIPING SYSTEM
SAD - ESSENTIAL SERVICE WATER PUMP BUILDING VENTILATION SYSTEM

31UBP - EMERGENCY POWER DISTRIBUTION BUILDING 1
31UJH - SAFEGUARD BUILDING MECHANICAL DIVISION 1
31UDB - ESSENTIAL SERVICE WATER PUMP, BUILDING 1
31URB - ESSENTIAL SERVICE WATER COOLING TOWER STRUCTURE, TUNNEL 1
UZT - OUTDOOR AREA

NOTES:
1. TRAIN 1 SHOWN IS REPRESENTATIVE OF TRAINS 2, 3 AND 4, WITH EXCEPTIONS AS NOTED

P	E	SSC
A	C	I
DESIGN AREA	SSC QUALITY GROUP	SSC SEISMIC CLASS

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PEB0172

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Figure 9.2.1-1—Essential Service Water System Piping & Instrumentation Diagram
Sheet 3 of 4

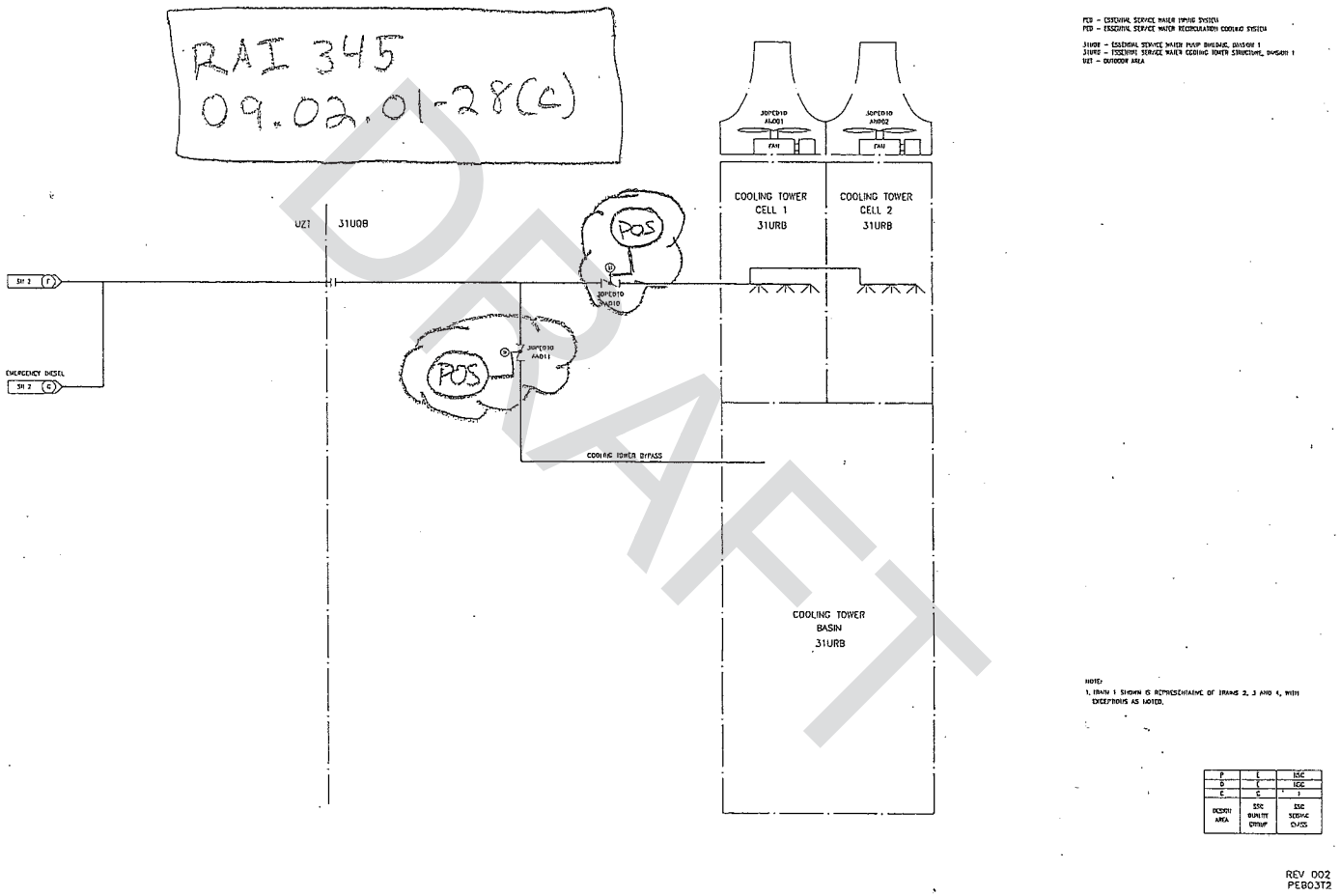
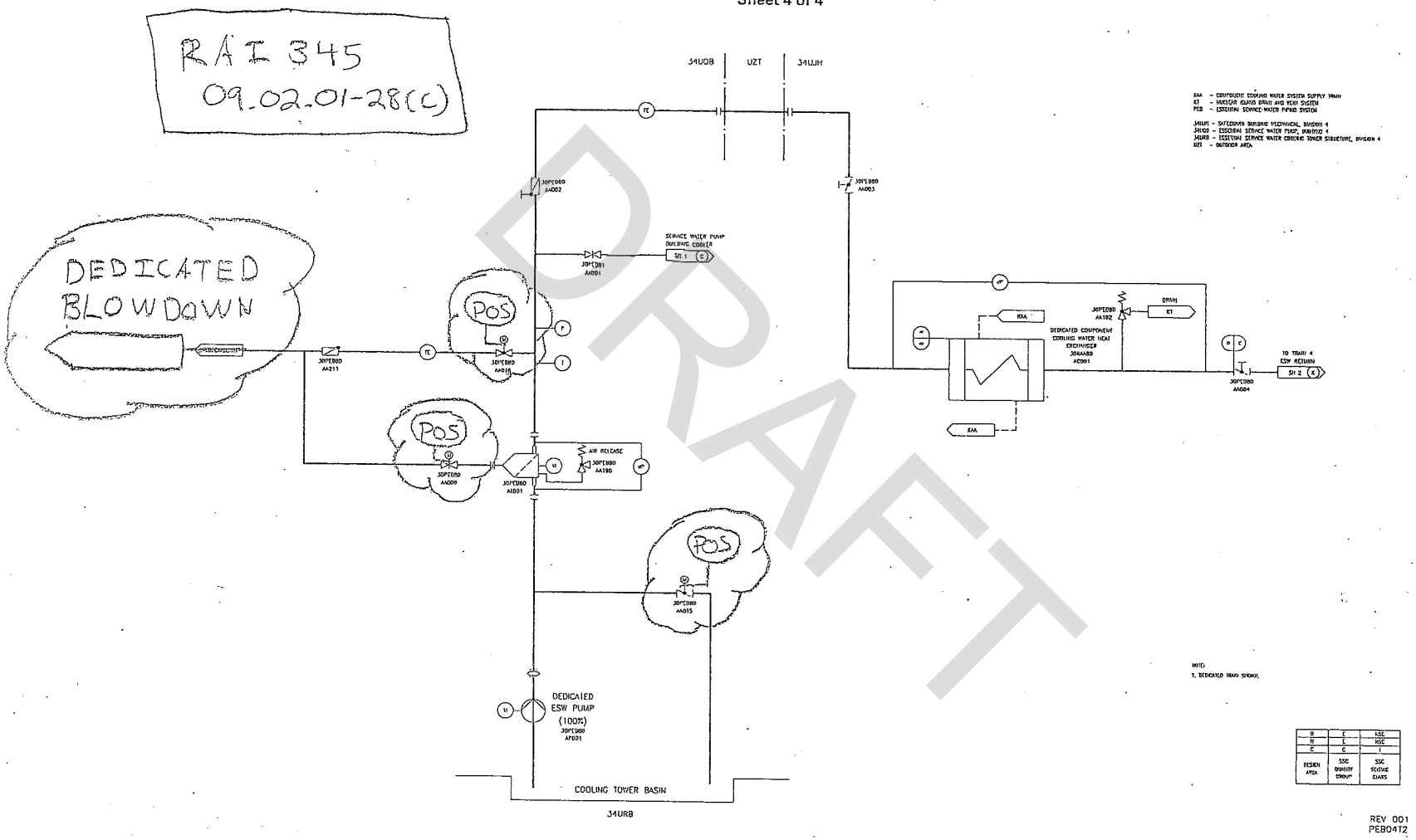
Figure 9.2.1-1—Essential Service Water System Piping & Instrumentation Diagram
Sheet 4 of 4