ArevaEPRDCPEm Resource

From: WELLS Russell D (AREVA NP INC) [Russell.Wells@areva.com]
Sent: Friday, March 27, 2009 5:41 PM
To: Getachew Tesfaye
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 145, FSAR Ch 9, Supplement 1
Attachments: RAI 145 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided responses to 4 of the 10 questions of RAI No. 145 on January 9, 2009. The attached file, "RAI 145 Supplement 1 Response US EPR DC.pdf" provides technically correct and complete responses to the remaining 6 questions, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 145 Questions 09.05.08-1, 09.05.08-2, 09.05.08-6, 09.05.08-9 and 09.05.08-10.

The following table indicates the respective pages in the response document, "RAI 145 Supplement 1 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 145 — 09.05.08-1	2	3
RAI 145 — 09.05.08-2	4	4
RAI 145 — 09.05.08-3	5	5
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RAI 145 — 09.05.08-10	8	8

This concludes the formal AREVA NP response to RAI 145, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

(Russ Wells on behalf of)
Ronda Pederson
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
New Plants Deployment
AREVA NP, Inc.
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From: Pederson Ronda M (AREVA NP INC)
Sent: Friday, January 09, 2009 4:59 PM
To: 'Getachew Tesfaye'
Cc: DELANO Karen V (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); KOWALSKI David J (AREVA NP INC);

VAN NOY Mark (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 145 (1648), FSARCh. 9

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 145 Response US EPR DC.pdf" provides technically correct and complete responses to 4 of the 10 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 145 Questions 09.05.08-4, 09.05.08-5, 09.05.08-7 and 09.05.08-8.

The following table indicates the respective pages in the response document, "RAI 145 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

Question #	Start Page	End Page
RAI 145 — 09.05.08-1	2	2
RAI 145 — 09.05.08-2	3	3
RAI 145 — 09.05.08-3	4	4
RAI 145 — 09.05.08-4	5	5
RAI 145 — 09.05.08-5	6	6
RAI 145 — 09.05.08-6	7	7
RAI 145 — 09.05.08-7	8	8
RAI 145 — 09.05.08-8	9	10
RAI 145 — 09.05.08-9	11	11
RAI 145 — 09.05.08-10	12	12

A complete answer is not provided for 6 of the 10 questions. The schedule for a technically correct and complete response to these questions is provided below.

Question #	Response Date
RAI 145 — 09.05.08-1	March 27, 2009
RAI 145 — 09.05.08-2	March 27, 2009
RAI 145 — 09.05.08-3	March 27, 2009
RAI 145 — 09.05.08-6	March 27, 2009
RAI 145 — 09.05.08-9	March 27, 2009
RAI 145 — 09.05.08-10	March 27, 2009

Sincerely,

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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Tuesday, November 25, 2008 7:46 AM
To: ZZ-DL-A-USEPR-DL
Cc: Gerard Purciarello; Stephen Campbell; John Segala; Peter Hearn; Joseph Colaccino; John Rycyna
Subject: U.S. EPR Design Certification Application RAI No. 145 (1648), FSARCh. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on November 17, 2008, and on November 24, 2008, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs, excluding the time period of **December 20, 2008 thru January 1, 2009, to account for the holiday season** as discussed with AREVA NP Inc. For any RAIs that cannot be answered **within 45 days**, it is expected that a date for receipt of this information will be provided to the staff within the 45-day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 348

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Reply Requested: No
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Response to

Request for Additional Information No. 145, Supplement 1

11/25/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.05.08 - Emergency Diesel Engine Combustion Air Intake and Exhaust System
Application Section: 9.5.8

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

Question 09.05.08-1:

FSAR Tier 2, Figure 9.5.8-1, "Emergency Diesel Generator Air Intake and Exhaust System," shows the safety-related (Quality Group C) exhaust stack and vent and the non safety related (Quality Group D) exhaust silencer and vent. The applicant has not shown a concise location of the interface between Quality Group D and Quality Group C on Figure 9.5.8-1.

a. The applicant needs to clearly define the interface. If the interface is inside the Emergency Power Generator Building (EPGB), verify that a safe shutdown earthquake (SSE) will not cause any portion of the Quality Group D piping to break inside the EPGB.

b. Explain whether any portion of the safety-related (Quality Group C) exhaust stack and vent is outside the EPGB. If any portion is outside the EPGB, explain meeting the requirements of GDC 2 for that portion.

c. Show the boundary of the EPGB to outside.

The FSAR should be changed to reflect this information.

Response to Question 09.05.08-1:

a. The interface between the safety-related and non-safety-related structures, systems and components (SSC) of the diesel generator air intake and exhaust system (DGAIES) is at the penetration of the exterior wall of the emergency power generating building (EPGB). U.S. EPR FSAR Tier 2, Figure 9.5.8-1—Emergency Diesel Generator Air Intake and Exhaust System will be revised to show the interface boundary.

   Non-safety-related SSC located inside the DGAIES are classified as Quality Class D Seismic Category II and are designed so that they will not degrade the operability of Seismic I SSC during a design basis accident event.

b. All safety-related (Quality Group C) SSC of the DGAIES are located inside the EPGB. The safety-related exhaust duct exits the diesel hall ceiling through a penetration to an EPGB room at elevation 51 ft, 6 inches. The room provides a missile protected flow path for the exhaust gas to the atmosphere. The non-safety-related DGAIES exhaust path exits the diesel hall at a different penetration, passes through the emissions control equipment, and then passes through a different portion of the EPGB on its way to the non-safety-related exhaust vent. Although the non-safety-related DGAIES exhaust path may be damaged by an event postulated by GDC 2, such damage would not prevent the safety-related DGAIES exhaust path from functioning and would allow continued operation of the emergency diesel generators (see U.S. EPR FSAR Tier 2, Figure 9.5.8-1—Emergency Diesel Generator Air Intake and Exhaust System that will be revised in the response to Part a of Question 09.05.08-1). Note also that the safety-related DGAIES intake air also enters the EPGB thru a separate missile protected room at elevation 51 ft, 6 inches on the opposite side of the building.

c. The interface boundary of the safety-related DGAIES SSC to the outside is shown on U.S. EPR FSAR Tier 2, Figure 9.5.8-1—Emergency Diesel Generator Air Intake and Exhaust System that will be revised in the response to Part a of Question 09.05.08-1.

   The response to RAI 145, Question 09.05.08-8, included a new U.S. EPR FSAR Tier 1, Figure 2.5.4-3—Emergency Diesel Generator Air Intake and Exhaust System. The corresponding U.S. EPR FSAR Tier 2, Figure 9.5.8-1—Emergency Diesel Generator Air

Intake and Exhaust System was also included in that response to support the introduction of the new Tier 1 figure.

U.S. EPR FSAR Tier 2, Figure 9.5.8-1—Emergency Diesel Generator Air Intake and Exhaust System will be revised as part of the response to Questions 09.05.08-1 and 09.05.08-2. The changes incorporated in this revision to Figure 9.5.8-1 do not impact the new Tier 1 figure submitted in the response to RAI 145, Question 09.05.08-8.

FSAR Impact:

U.S. EPR FSAR Tier 2, Figure 9.5.8-1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.08-2:

FSAR Section, "9.5.8.2.2, "Component Description," states that the diesel generator air intake and exhaust system (DGAIES) has exhaust emission equipment to control exhaust emissions. The exhaust emission equipment is not shown on Figure 9.5.8-1, "Emergency Diesel Generator Air Intake and Exhaust System." The applicant needs to designate the Quality Group and seismic class and show the component on Figure 9.5.8-1 to meet the guidelines of SRP Section 9.5.8.

Response to Question 09.05.08-2:

The diesel generator air intake and exhaust system (DGAIES) is equipped with exhaust emissions control equipment for NO_X and preventative maintenance (PM) as required to meet emissions regulations for emergency diesel generators with a displacement of over 30 liters per cylinder. The emissions equipment is positioned downstream of the safety-related exhaust bypass stack and is located outside the Emergency Power Generating Building (EPGB). The emissions equipment is non-safety related and Non-Seismic and is assigned a quality group classification of Quality Group E. The silencer downstream of the emissions control equipment is located inside the EPGB; it is classified as Seismic Design Category II and is assigned a safety classification of Supplemented Grade (NS-AQ) and a quality group classification of Quality Group D. The exhaust emissions control equipment will be added to U.S. EPR FSAR Tier 2, Figure 9.5.8-1—Emergency Diesel Generator Air Intake and Exhaust System.

In addition to the preceding changes on the DGAIES exhaust path, several other changes to the DGAIES will be included on U.S. EPR FSAR Tier 2, Figure 9.5.8-1—Emergency Diesel Generator Air Intake and Exhaust System. An air heater, used to allow operation during extreme cold weather, will be added to the intake system. Clarification will also be added to show the intercooler high- and low-temperature cooling loops. The portions of the DGAIES that are part of the engine assembly are Seismic Category I but are beyond the ASME Section III boundary; therefore, the quality group classification for these SSC is Quality Group E.

The above changes will be reflected on U.S. EPR FSAR Tier 2, Figure 9.5.8-1—Emergency Diesel Generator Air Intake and Exhaust System that will be revised as part of the response to Question 09.05.08-1.

In addition U.S. EPR FSAR Tier 2, Table 3.2.2-1—Classification Summary, Section 9.5.8 and Section 9.5.8.2.1 will be revised to incorporate the preceding changes.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 3.2.2-1, Figure 9.5.8-1, Section 9.5.8 and Section 9.5.8.2.1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.08-3:

Regulatory Guide 1.29, “Seismic Design Classification,” states that those portions of structures, systems, and components (SSCs) of which continued function is not required but of which failure could reduce the functioning of the Class 1E electrical systems, including the auxiliary systems for the onsite electric power supplies, to an unacceptable safety level should be designed and constructed so the safe shutdown earthquake (SSE) would not cause such failure.

Although the applicant stated that each DGAIES is protected from the effects of natural phenomena, including earthquakes, it is not clear whether the DGAIES is protected from nearby non seismic SSC during an SSE. Explain the effects of non seismic SSCs that are nearby upon the safety related SSCs in the DGSAS during an SSE.

The FSAR should be changed to reflect this information.

Response to Question 09.05.08-3:

The seismic design classification of the non-safety-related equipment or structures that are located in the vicinity of the diesel generator air intake and exhaust system (DGAIES) is provided in U.S. EPR FSAR Tier 2, Table 3.2.2-1 and is consistent with the guidance provided in SRP 3.2.1 (see the response to RAI 71, Questions 03.02.01-1, for further details of the methodology for classifying SSC). The impact of the failure of non-safety-related equipment or structures not designed to Seismic Category I criteria on safety-related, Seismic Category I components of the DGAIES is reflected in the classification summary table in U.S. EPR Tier 2, Table 3.2.2-1. Designation of a particular non-safety-related component as Seismic Category II (as stated in RG 1.29, Regulatory Position C.2) is dependent on the potential failure modes and consequences of that component, the proximity of Seismic Category I/safety-related components, and the vulnerability of those components to the consequences of the failure mode of the particular non-safety-related component in question.

Non-seismic lines and associated equipment are routed, to the extent possible, outside of safety-related structures and areas to avoid potentially adverse interactions. In the event that this routing is not possible and non-seismic lines must be routed in safety-related areas, the non-seismic items are evaluated for seismic interactions (refer to U.S. EPR Tier 2, Section 3.7.3.8).

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 09.05.08-6:

FSAR Section 9.5.8.6, “Instrumentation Requirements,” states that monitoring the exhaust gas temperature is a safety-related function. Note 2 on Figure 9.5.8-1, “Emergency Diesel Generator Air Intake and Exhaust System,” indicates that temperature sensors are non safety-related. Explain the use of non safety related instrumentation for a safety related function.

The FSAR should be changed.

Response to Question 09.05.08-6:

Note 2 on U.S. EPR FSAR Tier 2, Figure 9.5.8-1—Emergency Diesel Generator Air Intake and Exhaust System is correct. The second set of instrumentation and control functions listed in U.S. EPR FSAR Tier 2, Section 9.5.8.6 will be revised to correctly state:

> “The instrumentation and control for the DGAIES is designed to provide the following non-safety-related functions:”

This change is consistent with the format used in other U.S. EPR FSAR sections that describe safety-related and non-safety-related functions of instrumentation and controls in emergency diesel generator (EDG) auxiliary systems.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.8.6 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.08-9:

FSAR Section 9.5.8.6, “Instrument Requirements,” lists two sets of safety-related instrument and control functions. One set designates the monitoring of the EDG exhaust gas backpressure and the operation of the rupture disk as a safety-related instrument and control feature. The other set designates the monitoring of differential pressure of the air filters, operation of the intake air shutoff dampers, and monitoring diesel engine exhaust gas temperature as safety-related functions. Yet the temperature sensors on Figure 9.5.8-1, “Emergency Diesel Generator Air Intake and Exhaust System,” are designated non safety-related. FSAR Section 9.5.8.6 states the operation of the air intake damper is designated non safety-related. Safety related functions should be in Tier 1. This information is apparently inconsistent. The applicant needs to clarify the safety-related and non safety-related classifications of the instrument and control features.

The FSAR Tier 1 and Tier 2 should be changed to reflect this information.

Response to Question 09.05.08-9:

In the Response to Question 09.05.08-6 the second set of instrumentation and control functions listed in U.S. EPR FSAR Tier 2, Section 9.5.8.6 will be revised to state:

> “The instrumentation and control for the DGAIES is designed to provide the following non-safety-related functions:”

The Response to Question 09.05.08-6 addresses Question 09.05.08-9.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.8.6 will be revised as described in the response to Question 09.05.08-6 and indicated on the enclosed markup.

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Question 09.05.08-10:

Lube Oil Interconnection Clarification

FSAR Tier 2 Figure 9.5.8-1, “Emergency Diesel Generator Air Intake and Exhaust System,” shows interconnections between DGAIES and the EDG lubrication system. The purpose of this connection is not apparent and is not discussed in Tier 2 Section 9.5.8. Provide the purpose of this interconnection and the location in the FSAR of the discussion of its purpose.

Response to Question 09.05.08-10:

The emergency diesel generator air intake and exhaust system (DGAIES) supplies compressed combustion air to the ejector of the crankcase ventilation system. The air flow through the ejector creates a vacuum that removes combustible vapors from the engine crankcase.

The crankcase vacuum function is described in U.S. EPR FSAR Tier 2, Section 9.5.7.2.1 and shown on Figure 9.5.7-1—Emergency Diesel Generator Lubricating Oil System.

U.S. EPR FSAR Tier 2, Section 9.5.8.2.1 will be revised to reflect this information.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.8.2.1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

Table 3.2.2-1—Classification Summary
Sheet 123 of 179

KKS System or Component Code	~~System or Component~~ SSC Description	Safety Classification (Note 15)	Quality Group Classification	Seismic Category (Note 16)	10 CFR 50 Appendix B Program	Location (Note 17)	Comments/ Commercial Code
30XJA10/20/30/40 AV100	Diesel Engine (Excluding Engine-Driven Cooling, Lubrication, and Fuel Pumps) 09.05.08-2	S	~~C~~N/A	I	Yes	UBP	~~IEEE 387~~
30XJA10/20/30/40 AP100	Engine Governor	S	~~C~~N/A	I	Yes	UBP	
30XJR10/20/30/40	Exhaust Emissions Equipment and Pipe	NS	E	NSC	No	UBP	ANSI/ASME B31.1 (6)
30XJR10/20/30/40	Exhaust Silencer and Exhaust Stack	NS-AQ	D	II	Yes	UBP	ANSI/ASME B31.1(6)
30XJR10/20/30/40	Exhaust System, Bypass Valve and Duct	S	C	I	Yes	UBP	ASME Class 3(3)
30XJN10/20/30/40	Fuel Oil System	S	C	I	Yes	UBP	ASME Class 3(3)
30XJG10/20/30/40	Jacket Water Standby Heater Circuit	~~NS~~NS-AQ	~~E~~D	~~NSC~~II	No	UBP	ANSI/ASME B31.1(6)
30XJV10/20/30/40	Lube Oil Keepwarm/ Prelube Circuit	~~NS~~NS-AQ	~~E~~D	~~NSC~~II	No	UBP	ANSI/ASME B31.1(6)
30XJV10/20/30/40	Lube Oil System	S	C	I	Yes	UBP	ASME Class 3(3)
30XJA10/20/30/40 AN100A/B	Turbochargers	S	~~C~~N/A	I	Yes	UBP	

9.5.8 Diesel Generator Air Intake and Exhaust System

The diesel generator air intake and exhaust system (DGAIES) provides the diesel engine with combustion air from the outside. The combustion air passes through a filter, ~~and~~ silencer, and heater before being compressed by a turbocharger and cooled by the coolant system before entering the individual cylinders for combustion.

09.05.08-2

The exhaust gas system collects the exhaust gas from the individual cylinders and conveys them via the engine-mounted turbocharger, emissions equipment, and an exhaust gas silencer to the outside.

9.5.8.1 Design Basis

The design of the system and EPGB establishes that the arrangement and location of the combustion air intake and exhaust gas discharge are such that dilution and contamination of the intake air will not prevent operation of the EDG at rated power output or cause engine shutdown as a consequence of any metrological or accident condition.

Each EDG set has a separate, independent diesel engine combustion air and exhaust gas system, as shown in Figure 9.5.8-1—Emergency Diesel Generator Air Intake and Exhaust System.

- The safety-related portions of the DGAIES are designed in accordance with Seismic Category I. Safety-related systems are required to function following a DBA, and are required to achieve and maintain a safe shutdown condition.
- Safety functions can be performed, assuming a single active component failure coincident with the LOOP (GDC 17).
- None of the safety-related components of the DGAIES are shared with any other division or unit (GDC 5).
- Each DGAIES is protected from the effects of natural phenomena, such as earthquakes, tornadoes, hurricanes, floods, and external missiles GDC 2). Each system remains functional after an SSE and performs its intended functions following a postulated hazard, such as fire, internal missiles, or pipe break. Failure of one division DGAIES will not affect the function of more than one DGAIES (GDC 3 and 4).
- Safety functions can be performed, assuming a single active component failure coincident with the LOOP due to the four100 percent design structure of the EDGs (GDC 44).
- Active components of each of the DGAIES sub-systems of the EDGs can be tested during plant operation. The DGAIES uses design and fabrication codes consistent with the quality group classification assigned by RG 1.26 and seismic category

assigned by RG 1.29. Power and control functions are designed in accordance with RG 1.32.

- The DGAIES is designed to provide combustion air under all operating conditions.

The DGAIES is only operational when providing combustion air to the diesel engine and removing the exhaust gasses from the engine. The emission control function of the DGAIES is a non-safety function.

9.5.8.2 System Description

The diesel engine combustion air system provides the necessary combustion air for the diesel engine, and the exhaust gas system provides a path for exhaust products of combustion from the EDGs to the environment under all operating conditions.

9.5.8.2.1 General Description

The combustion air for the diesel engine is taken directly from outside the EPGB via an air duct located on the upper floor level (i.e., elevation +51 ft, 6 in) of the building inside the missile protection area. The air passes through a filter, ~~silencer, and~~ inlet damper, silencer and heater before entering the diesel engine turbocharger.

09.05.08-2

The turbocharger is operated by the kinetic energy of the exhaust gas and compresses the combustion air, which then passes through an intercooler before entering the individual cylinders. Compressed combustion air is supplied to the ejector of the crankcase ventilation system. The air flow through the ejector creates a vacuum that removes combustible vapors from the engine crankcase. The crankcase vacuum function is described in Section 9.5.7.2.1 and shown on Figure 9.5.7-1.

09.05.08-10

The intercooler is a heat exchanger, supplied with DGCWS to cool the intake air that has been heated by compression.

The cooled compressed air forces more air into each cylinder during the intake portion of the combustion cycle, increasing the horsepower of the engine. The compressed air is required for the EDG to meet its rated output.

The exhaust gas system, which consists of pipes, emission control equipment, and an exhaust gas silencer, is insulated to reduce radiated heat in the EPGB to an acceptable level.

The layout of the main components (i.e., piping, filters, and valves) provides the space required to permit inspection, cleaning, maintenance, and repair of the system

9.5.8.6 Instrument Requirements

The EDG control system monitors the diesel generator support system. Alarms essential for the availability of the system are transmitted to the MCR. The air filters are monitored for differential pressure and the temperature of the exhaust gas is monitored. Indicators and alarms are listed in Table 9.5.8-1.

The instrumentation and control for the DGAIES is designed to provide the following safety-related function:

- Monitoring the EDG exhaust gas system backpressure – The exhaust gas system backpressure is monitored to make sure that an undesirable pressure is not attained that would affect the operability of the diesel engine. When a high-high setpoint is reached, the bypass valve is actuated. The rupture disk is the actuator used to perform this function.

The instrumentation and control for the DGAIES is designed to provide the following non-safety-related functions:

09.05.08-6 and 09.05.08-9

- Monitoring of diesel engine combustion air system – The air filters are monitored for fouling by differential pressure measurement.
- Intake air shutoff dampers – The intake air supply is equipped with shutoff dampers that are actuated in the event of an emergency shutdown or overspeed trip. The dampers are actuated by the automated safety actuation system. The dampers have no safety-related function.
- Monitoring of diesel engine exhaust gas system – The temperature of the exhaust gas is monitored.

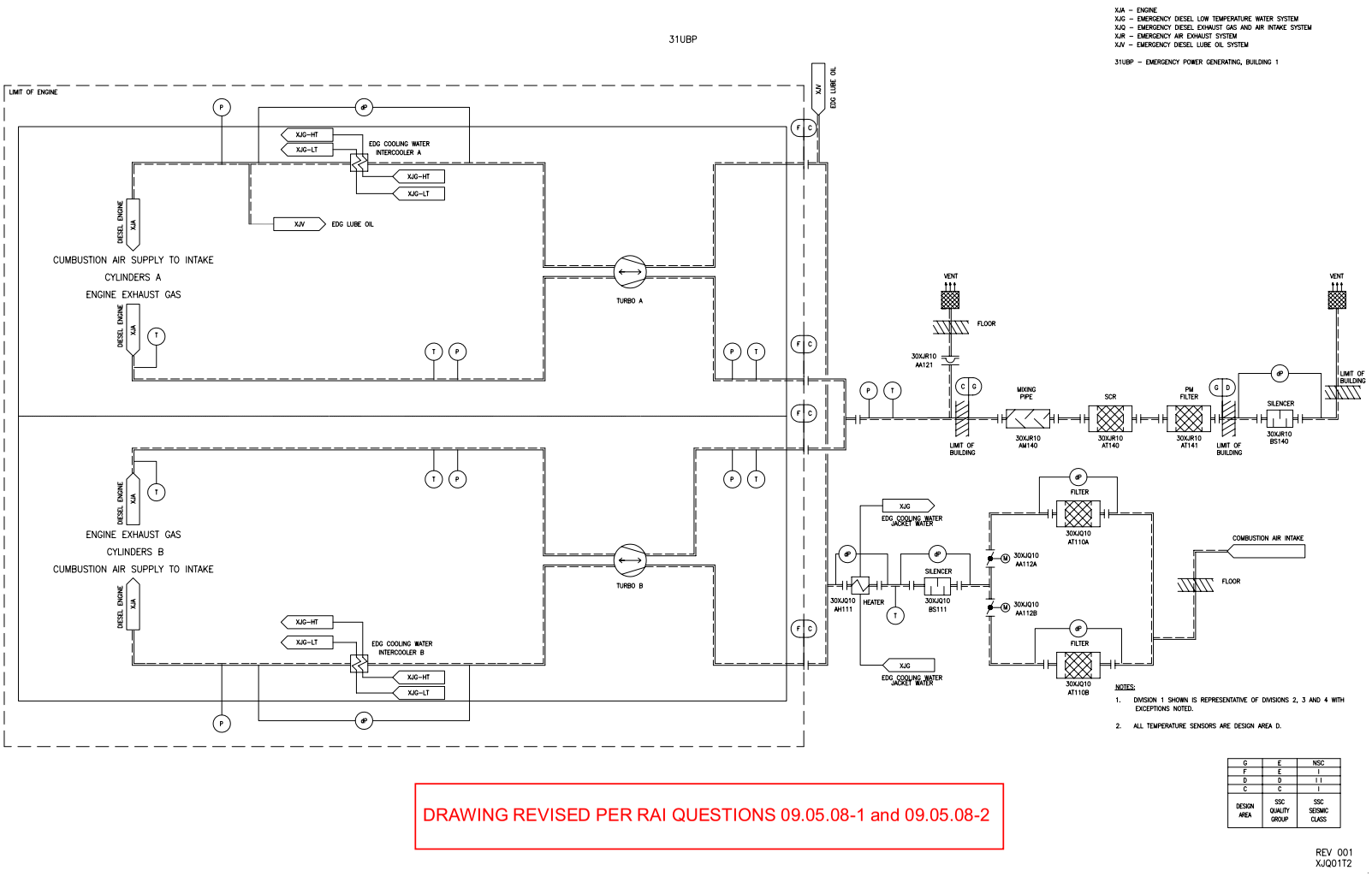
9.5.8.7 References

1. ~~ASME Boiler and Pressure Vessel Code, Section XI, "Rules for construction of Nuclear Power Plant Components," 2004 – No Addenda.~~

1. NUREG/CR-0660, "Enhancement of Onsite Emergency Diesel Generator Reliability," University of Dayton Research Institute for the U.S. NRC; UDR-TR-79-07; February 1979.

2. ~~ANSI/ANS-59.51 "Fuel Oil Systems for Safety-Related Emergency Diesel Generator," American National Standards Institute, 1997~~.

Figure 9.5.8-1—Emergency Diesel Generator Air Intake and Exhaust System



DRAWING REVISED PER RAI QUESTIONS 09.05.08-1 and 09.05.08-2

Next File