2.5.4 Emergency Diesel Generator

1.0 Description

The emergency diesel generators (EDG) provide a standby source of Class 1E power to safety-related and non-safety-related loads during conditions that result in a loss of preferred power to emergency power supply system (EPSS) buses.

2.0 Arrangement

2.1 The functional arrangement of the EDG fuel oil system is as shown in Figure 2.5.4-1—Emergency Diesel Generator Fuel Oil System Functional Arrangement.

2.2 EDGs and their respective support systems are located as listed in Table 2.5.4-1—Emergency Diesel Generator Equipment Mechanical Design.

2.3 There are four independent EDGs.

3.0 Mechanical Design Features, Electrical and Seismic Classifications

3.1 Equipment listed in Table 2.5.4-1 as ASME Code Section III are designed and tested to ASME Code Section III.

3.2 Piping indicated in Figure 2.5.4-1 as ASME Code Section III is designed and tested in accordance with ASME Code Section III.

3.3 Supports for piping shown as ASME Section III on Figure 2.5.4-1 will be designed per ASME Section III.

3.4 Specifications exist for components listed as ASME Section III in Table 2.5.4-1.

3.5 Specifications exist for piping shown as ASME Section III on Figure 2.5.4-1.

3.6 Specifications exist for supports for piping shown as ASME Section III on Figure 2.5.4-1.

3.7 Equipment identified as Seismic Category I in Table 2.5.4-1 can withstand design basis seismic loads without loss of safety function.

3.8 Equipment listed as Class 1E in Table 2.5.4-2 are qualified as Seismic Category I and can withstand seismic design basis loads without loss of safety function.

3.9 Each EDG has a fuel oil storage tank.

3.10 Each EDG has a fuel oil day tank.

3.11 Each fuel oil transfer pump capacity is greater than EDG fuel oil consumption at the continuous rating.

3.12 Each EDG starting air system is capable of providing air to start the respective EDG without being recharged.

4.0 I&C Design Features, Alarms, Displays and Controls

4.1 Displays listed in Table 2.5.4-2 are retrievable in the main control room (MCR) and the remote shutdown station (RSS) as listed in Table 2.5.4-2.

4.2 EDG equipment controls are provided in the MCR and RSS as listed in Table 2.5.4-2.

5.0 Electrical Considerations

5.1 The EDG control power is provided by the EUPS system from the respective division.

5.2 Equipment loads listed as Class 1E in Table 2.5.4-2—Emergency Diesel Generator Electrical Equipment Design, are powered from the Class 1E power supplies listed in Table 2.5.4-2.

5.3 Each EDG is sized to provide power to the loads assigned in the respective division and loads connected through an alternate feed.

6.0 Inspection, Tests, Analyses and Acceptance Criteria

6.1 Table 2.5.4-3—Emergency Diesel Generator Inspections, Tests, Analyses, and Acceptance Criteria, provides the ITAAC for the EDGs.

Table 2.5.4-1—Emergency Diesel Generator Equipment Mechanical Design (2 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	ASME Code Section III	Function	Seismic Category
Emergency Diesel Generator	30XJA10	Division 1 Emergency Power Generating Building	N/A	Supply Emergency Power	I
Emergency Diesel Generator	30XJA20	Division 2 Emergency Power Generating Building	N/A	Supply Emergency Power	I
Emergency Diesel Generator	30XJA30	Division 3 Emergency Power Generating Building	N/A	Supply Emergency Power	I
Emergency Diesel Generator	30XJA40	Division 4 Emergency Power Generating Building	N/A	Supply Emergency Power	I
Fuel Oil Storage Tank	30JXN10BB001	Division 1 Emergency Power Generating Building	Yes	Storage Volume	I
Fuel Oil Storage Tank	30JXN20BB001	Division 2 Emergency Power Generating Building	Yes	Storage Volume	I
Fuel Oil Storage Tank	30JXN30BB001	Division 3 Emergency Power Generating Building	Yes	Storage Volume	I
Fuel Oil Storage Tank	30JXN40BB001	Division 4 Emergency Power Generating Building	Yes	Storage Volume	I
Fuel Oil Transfer Pump	30XJN10AP001A	Division 1 Emergency Power Generating Building	Yes	Run	I
Fuel Oil Transfer Pump	30XJN20AP001A	Division 2 Emergency Power Generating Building	Yes	Run	I
Fuel Oil Transfer Pump	30XJN30AP001A	Division 3 Emergency Power Generating Building	Yes	Run	I
Fuel Oil Transfer Pump	30XJN40AP001A	Division 4 Emergency Power Generating Building	Yes	Run	I
Fuel Oil Day Tank	30XJN10BB002	Division 1 Emergency Power Generating Building	Yes	Storage Volume	I

Table 2.5.4-1—Emergency Diesel Generator Equipment Mechanical Design (2 Sheets)

Equipment Description	Equipment Tag Number (1)	Equipment Location	ASME Code Section III	Function	Seismic Category
Fuel Oil Day Tank	30XJN20BB002	Division 2 Emergency Power Generating Building	Yes	Storage Volume	I
Fuel Oil Day Tank	30XJN30BB002	Division 3 Emergency Power Generating Building	Yes	Storage Volume	I
Fuel Oil Day Tank	30XJN40BB002	Division 4 Emergency Power Generating Building	Yes	Storage Volume	I
Starting Air Receiver	30XNX10BB001A	Division 1 Emergency Power Generating Building	Yes	Storage Volume	I
Starting Air Receiver	30XNX10BB001B	Division 1 Emergency Power Generating Building	Yes	Storage Volume	I
Starting Air Receiver	30XNX20BB001A	Division 2 Emergency Power Generating Building	Yes	Storage Volume	I
Starting Air Receiver	30XNX20BB001B	Division 2 Emergency Power Generating Building	Yes	Storage Volume	I
Starting Air Receiver	30XNX30BB001A	Division 3 Emergency Power Generating Building	Yes	Storage Volume	I
Starting Air Receiver	30XNX30BB001B	Division 3 Emergency Power Generating Building	Yes	Storage Volume	I
Starting Air Receiver	30XNX40BB001A	Division 4 Emergency Power Generating Building	Yes	Storage Volume	I
Starting Air Receiver	30XNX40BB001B	Division 4 Emergency Power Generating Building	Yes	Storage Volume	I

(1) Equipment tag numbers are provided for information only and are not part of the certified design.

Table 2.5.4-2—Emergency Diesel Generator Electrical Equipment Design (2 Sheets)

Equipment Description	Equipment Tag Number (1)	IEEE Class 1E	MCR / RSS Displays	MCR / RSS Controls
Emergency Diesel Generator	30XKA10AG	Yes	Generator voltage, current, frequency, power, reactive power. Engine running, not running / Generator voltage, current, frequency, power, reactive power. Engine running, not running	Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower
Emergency Diesel Generator	30XKA20AG	Yes	Generator voltage, current, frequency, power, reactive power. Engine running, not running / Generator voltage, current, frequency, power, reactive power. Engine running, not running	Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower
Emergency Diesel Generator	30XKA30AG	Yes	Generator voltage, current, frequency, power, reactive power. Engine running, not running / Generator voltage, current, frequency, power, reactive power. Engine running, not running	Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower
Emergency Diesel Generator	30XKA40AG	Yes	Generator voltage, current, frequency, power, reactive power. Engine running, not running / Generator voltage, current, frequency, power, reactive power. Engine running, not running	Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower
Fuel Oil Transfer Pump	30XJN10AP001 A	Division 1	On-Off / On-Off	Start-Stop / Start-Stop
Fuel Oil Transfer Pump	30XJN20AP001 A	Division 2	On-Off / On-Off	Start-Stop / Start-Stop

Table 2.5.4-2—Emergency Diesel Generator Electrical Equipment Design (2 Sheets)

Equipment Description	Equipment Tag Number (1)	IEEE Class 1E	MCR / RSS Displays	MCR / RSS Controls
Fuel Oil Transfer Pump	30XJN30AP001 A	Division 3	On-Off / On-Off	Start-Stop / Start-Stop
Fuel Oil Transfer Pump	30XJN40AP001 A	Division 4	On-Off / On-Off	Start-Stop / Start-Stop

(1) Equipment tag numbers are provided for information only and are not part of the certified design.

Table 2.5.4-3—Emergency Diesel Generator Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)

	Commitment	Inspection, Test or Analysis	Acceptance Criteria
2.1	The functional arrangement of the EDG fuel oil system is as shown in Figure 2.5.4-1.	An inspection will be performed.	The as-built EDG fuel oil system conforms to the functional arrangement as shown in Figure 2.5.4-1.
2.2	EDGs and their respective support systems are located as listed in Table 2.5.4-1.	An inspection will be performed.	EDGs listed in Table 2.5.4-1 and their respective support systems are located as listed in Table 2.5.4-1.
2.3	There are four independent EDGs.	An inspection will be performed.	There are four independent EDGs.
3.1	Equipment listed in Table 2.5.4-1 as ASME Code Section III is designed and tested to ASME Code Section III.	An inspection will be performed.	A report exists and concludes that the components listed as ASME Code Section III in Table 2.5.4-1 have been designed and tested in accordance ASME Code Section III requirements.

Table 2.5.4-3—Emergency Diesel Generator Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)

	Commitment	Inspection, Test or Analysis	Acceptance Criteria
3.2	Piping indicated in Figure 2.5.4-1 as ASME Code Section III is designed and tested in accordance with ASME Code Section III.	a. Analysis will be performed. b. An inspection will be performed.	a. ASME Code Section III stress reports exist and conclude that the as-designed piping identified as ASME Code Section III in Figure 2.5.4-1 meets ASME Code Section III design requirements. b. A report exists and concludes that the piping as indicated in Figure 2.5.4-1 as ASME Code Section III has been welded in accordance with ASME Code Section III welding requirements. A report exists and concludes that the piping as indicated in Figure 2.5.4-1 as ASME Code Section III has been hydrostatically tested in accordance with ASME Code Section III requirements.
3.3	Supports for piping shown as ASME Section III on figure 2.5.4-1 will be designed per ASME Section III.	An analysis will be performed.	a. Fatigue analysis has been performed for components listed as ASME Code Class I in Table 2.5.4-1. b. For components listed as ASME Code Class I in Table 2.5.4-1 operating modes where peak stresses are within 10% of allowable have been identified.

Table 2.5.4-3—Emergency Diesel Generator Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)

	Commitment	Inspection, Test or Analysis	Acceptance Criteria
3.4	Specifications exist for components listed as ASME Section III in Table 2.5.4-1.	An inspection will be performed.	Specifications exist for components listed as ASME Section III in Table 2.5.4-1.
3.5	Specifications exist for piping shown as ASME Section III on figure 2.5.4-1.	An inspection will be performed.	Specifications exist for piping identified as ASME Section III on Figure 2.5.4-1.
3.6	Specifications exist for supports for piping shown as ASME Section III on figure 2.5.4-1.	An inspection will be performed.	Specifications exist for supports for piping shown as ASME Section III on Figure 2.5.4-1.
3.7	Equipment identified as Seismic Category I in Table 2.5.4-1 can withstand a design basis seismic loads without loss of safety function.	Type tests, tests, analyses or a combination of tests and analyses will be performed.	A report exists and concludes that the equipment designated as Seismic Category I in Table 2.5.4-1 can withstand a design basis seismic loads without loss of safety function.
3.8	Equipment listed as Class 1E in Table 2.5.4-2 are qualified as Seismic Category I and can withstand seismic design basis loads without loss of safety function.	a. An inspection will be performed. b. Type testing, analysis, or a combination of type testing and analysis will be performed.	a. A report exists and concludes that the equipment designated as Class 1E in Table 2.5.4-2 is installed as designed. b. A report exists and concludes that the equipment listed as Class 1E in Table 2.5.4-2 can withstand seismic design basis loads without loss of safety function.
3.9	Each EDG has a fuel oil storage tank.	Inspections will be performed.	Each EDG fuel oil storage tank capacity is greater than the volume of fuel oil consumed by the EDG operating at the continuous rating for seven days.
3.10	Each EDG has a fuel oil day tank.	An inspection will be performed.	Each EDG fuel oil day tank capacity is greater than the volume of fuel oil consumed by the EDG operating at the continuous rating for two hours.

Table 2.5.4-3—Emergency Diesel Generator Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)

	Commitment	Inspection, Test or Analysis	Acceptance Criteria
3.11	Each fuel oil transfer pump capacity is greater than EDG fuel oil consumption at the continuous rating.	A test will be performed.	The capacity of each fuel oil transfer pump is greater than EDG fuel oil consumption at the continuous rating.
3.12	Each EDG starting air system is capable of providing air to start the respective EDG without being recharged.	A test will be performed.	Each EDG starts five consecutive times without recharging respective starting air receivers between EDG starts.
4.1	Displays listed in Table 2.5.4-2 are retrievable in the MCR and RSS as listed in Table 2.5.4-2.	An inspection will be performed.	Displays listed in Table 2.5.4-2 as being retrievable in the MCR can be retrieved in the MCR. Displays listed in Table 2.5.4-2 as being retrievable in the RSS can be retrieved in the RSS.
4.2	EDG equipment controls are provided in the MCR and RSS as listed in Table 2.5.4-2.	A test will be performed.	Controls listed in Table 2.5.4-2 as being in the MCR exist in the MCR. Controls listed in Table 2.5.4-2 as being in the RSS exist in the RSS.
5.1	The EDG control power is provided by the EUPS system from the respective division.	A test will be performed on each EDG system by providing a test signal in only one division.	The test signal exists in only the EDG system under test when a test signal is applied in each EDG system.
5.2	Equipment loads listed as Class 1E in Table 2.5.4-2 are powered from the Class 1E power supplies listed in Table 2.5.4-2.	A test will be performed on components designated as Class 1E in Table 2.5.4-2 by providing a test signal in each division.	The test signal provided in the division is present at the respective Class 1E component loads identified in Table 2.5.4-2.
5.3	Each EDG is sized to provide power to the loads assigned in the respective division and loads connected through an alternate feed.	A test will be performed.	Each EDG is capable of supplying the loads assigned in the respective division and loads connected through an alternate feed.