CERTIFIED BY:

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ACRS-2838
PDR 4/9/93

Date Issued: 9/10/92

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
COMBINED DHRS / ABWR SUBCOMMITTEE MEETING MINUTES: REVIEW OF ITAAC FOR SELECTED ABWR PLANT SYSTEMS
AUGUST 5, 1992
BETHESDA, MARYLAND

PURPOSE:

The purpose of the meeting was for the combined Subcommittee to review a selected set of ITAAC (Inspections, Tests, Analyses, and Acceptance Criteria) that support the GE Nuclear Energy (GE) ABWR design certification effort.

ATTENDEES:

Principal meeting attendees included:

ACRS
- D. Ward, Co-Chairman
- C. Michelson, Co-Chairman
- J. Carroll
- I. Catton
- W. Kerr
- T. Kress
- P. Shewmon
- C. Wylie

NRC
- T. Boyce, NRR
- M. Rubin, NRR
- G. Thomas, NRR

GE
- A. James
- J. Chambers
- C. Christensen

MEETING HIGHLIGHTS, AGREEMENTS, AND REQUESTS:

Remarks by Co-Chairman

Mr. Ward noted that the ACRS review of the ITAAC is being performed at the behest of the Commission as a result of a meeting between the ACRS and the Commissioners held in March, 1992. Formal Committee comment on the results of this review is expected by the Commission this month. Mr. Ward requested that the Members of the Combined Subcommittee provide him both some input for the ACRS's letter on this matter as well as advice on the content of the expected presentations before the Committee.

NRC Staff Presentation

Mr. T. Boyce (NRR) discussed the status of the program to develop the ITAAC for the GE ABWR. Prior to beginning his presentation, Mr. Ward asked Mr. Boyce to note the significant changes in the ITAAC program that have occurred since the ACRS's last review of this topic over one year ago (September, 1991 ACRS Meeting).

Key points noted by Mr. Boyce and the associated Subcommittee discussion are noted below:

program. Some inconsistencies have been noted between the ITAAC and the SSAR from which they are directly taken.

Mr. Michelson noted that indeed many inconsistencies exist between the SSAR and the ITAAC which he will discuss later. In light of the DAC concept now in use, Mr. Michelson also said that he believes the Committee should rescind its recommendation, made in its September, 1991 letter on ITAAC, that the ITAAC could be completed after the FDA issuance.

The relevant documentation associated with the development of ITAAC was noted (Figure 1).

- GE submitted the ABWR ITAAC in three Stages: Stage 1 - a set of nine pilot ITAAC, Stage 2 - a set of ITAAC that covered 40 plant systems, and Stage 3 - the complete ITAAC submittal. NRR review of the Stage 2 material will be addressed in the draft ABWR FSER to be issued later this month. Staff comments on the Stage 3 submittal will be provided via separate correspondence. For this meeting, the Stage 3 version of the ITAAC were provided to the Subcommittee and will be discussed today.

In response to Messrs. Michelson and Carroll, Mr. Boyce noted that other types of ITAAC, e.g. Interface and Generic, will be developed (Figure 2). Mr. Carroll indicated that he believes that the Committee should review a sampling of these other ITAAC, particularly the generic ITAAC, as part of the ACRS's overall scrutiny of this program.

Mr. Michelson questioned the staff concerning the need for the ITAAC to be completed, prior to FDA issuance. Mr. Boyce indicated that NRR will insist that the ABWR ITAAC will be completed before FDA issuance. In response to Mr. Ward, NRR noted that the staff is requesting that GE provide it the procedures associated with both pre- and post-operational testing for ABWR. GE is also being requested to develop a cross reference of SSAR issues to ITAAC. In response to another question from Mr. Michelson, Mr. Boyce indicated that the concept of "validation attributes" to support the ITAAC acceptance criteria has,for all intents and purposes,been abandoned.

GE Presentation

Mr. T. James (GE) began his presentation by providing comments in response to some of the above discussion points. He noted that the inconsistencies observed earlier between the SSAR and ITAAC result from the on-going iterative development process. He also said that validation attributes is a "dead issue" as far as GE is concerned and that the use of "COL" (combined operating license) ITAAC is opposed by the industry; instead, the relevant information should be part of the normal QA procedures. GE believes that DACs need to be completed bef re FDA issuance, but ITAAC do not. In response to Mr. Carroll, Mr. James said that he believes the FDA schedule (which calls for the FDA issuance in December, 1992) is "doable".

Details of the GE approach to use of the Tier 1 material including the ITAAC was described. GE is using a two-Tiered approach, with Tier 1 reserved for the top-level information, i.e. as a subset of the SAR. ITAAC are Tier 1 as well, and are used to verify that the ABWR design conforms with Tier 1 design. Mr. Ward asked if the COL ITAAC will be a Tier 1 document. Mr. James said that it will not, as it will be developed after the design certification stage, which is all Tier 1 material applies to. Figure 3 shows the elements included in Tier 1 material.

GE's approach to development of Tier 1 material is to structure it on a system-by-system approach. Systems are graded relevant to safety significance in order to determine if they should be included in Tier 1. Mr. Ward asked how the systems are graded. GE indicated that systems are ranked based on engineering judgment. The PRA was used as an aid to rank systems but Mr. James indicated that it was not relied on to any great extent for this task.

The format used for the ITAAC was noted (Figure 4). Regarding NRC's review of ITAAC, Mr. James indicated that there is a consensus, between GE and the staff, on the basic scope and content of ITAAC, but many details remain open.

The industry has reviewed the GE ABWR ITAAC under the auspices of a NUMARC Working Group. The main comments of the Working Group included: changes are needed to reflect the legal significance of Tier 1 material; acceptance criteria need to be more precise and unambiguous; the amount of Tier 1 material for non-safety systems needs to be reduced; and, the industry would like to eliminate generic ITAAC. In response to Mr. Ward, Mr. James said GE intends to meet with the staff later this month to discuss the above concerns.

GE presented the details of a selected set of ITAAC for the Subcommittee's review. The specific ITAAC reviewed is listed below, along with key points/questions noted by the Subcommittee during it discussion of same:

- Standby Liquid Control System - Figures 5-7 detail the specific content of this ITAAC. Extensive comment was provided on the associated text. The Subcommittee agreed that the scope and form of this ITAAC appears acceptable, but the content is in need of a lot of work. Mr. Ward questioned the lack of materials requirements. Dr. Shewmon indicated that GE has referenced the (ASME) Code Categories so he doesn't see a problem here.

There was discussion of the generic ITAAC. Mr. Boyce (NRR) indicated that NRR is not in agreement with the industry's desire to eliminate the generic ITAAC in their entirety. As a result of further discussion, Mr. Carroll suggested that the ACRS review, in detail, the generic ITAAC dealing with equipment qualification concerns.

● Residual Heat Removal System - The ITAAC for the RHR system is given in Figures 8-11. Overall, the Subcommittee felt that this ITAAC was well written and there appeared to be only a few minor problems.

● Control Building - Figures 12-13 delineate the ITAAC for the ABWR control building. The following discussion points were of note:

- Mr. Michelson inquired as to the design details for the steam tunnel cooling system. NRR said that they would be prepared to discuss this topic during a future subcommittee meeting.

- Messrs. Michelson and Carroll said that GE needs to include requirements in this ITAAC that will ensure that the drain systems are constructed to correspond with specific safety-grade Divisions. This will protect against common-mode loss of equipment, given an internal flooding event.

- Noting factual (numerical) errors in the ITAAC, Mr. Carroll warned GE to be sure to scrub the ITAAC document for such mistakes, prior to the Hearing process.

- GE noted that they are still wrestling with the problem of incorporating compliance with Industry Codes into the ITAAC, without direct reference to same.

- In response to Mr. Carroll, Mr. James said that the design certification documents will list all measurements in metric units. No British units will be included, not even in parentheses. As a result of further discussion, Mr. Michelson requested a copy of the U.S./metric Piping Code conversion Table that GE will be (is) using for design development work.

● Emergency Diesel Generator System - Details of this ITAAC are given on Figures 14-17. As a result of questions from

Messrs. Wylie and Michelson, GE was urged to verify the total time needed to get the EDG's up and running to accept loads, given a degraded voltage situation.

Subcommittee Caucus

Mr. Ward proposed to the Subcommittee that this matter be brought to the ACRS for review. Following the Subcommittee's concurrence, Mr. Ward provided direction to the NRC staff and GE regarding the content of their presentations to the Committee during its August, 1992 Meeting.

The meeting was adjourned at 3:10 pm.

FUTURE SUBCOMMITTEE ACTIONS ON THIS MATTER AND ITEMS FOR FOLLOW-UP

Future Subcommittee Actions:

The Subcommittee agreed that the Committee should continue its review of this matter by examination of the other forms of ITAAC for the ABWR (generic, interface, etc.). Specific details of the review (e.g. assignment of lead Subcommittee, meeting date(s), etc.) have yet to be established.

Follow-up Items:

1. Mr. Michelson requested a copy of the U.S./metric Piping Code conversion Table that GE will be (is) using for design development work.

2. As a result of questions from Messrs. Wylie and Michelson, GE was urged to verify the total time needed to get the EDG's up and running to accept loads, given a degraded voltage situation

3. Mr. Michelson inquired as to the design details for the steam tunnel cooling system. NRR said that they would be prepared to discuss this topic during a future subcommittee meeting.

BACKGROUND MATERIAL PROVIDED THE SUBCOMMITTEE FOR THIS MEETING

1. Staff Requirements Memorandum dated April 1, 1992, from Samuel J. Chilk, Secretary, for David A. Ward, ACRS, Subject: Periodic Meeting with the Advisory Committee on Reactor Safeguards on March 5, 1992.

2. Excerpts of Inspections, Tests, Analyses, and Acceptance Criteria from GE Nuclear Energy Report: "Tier 1 Design Certification Material for the GE ABWR," dated June 1992, as follows:

- Standby Liquid Control System (2.2.4)
- Residual Heat Removal System (2.4.1)
- Reactor Building Cooling Water System (2.11.3)
- Emergency Diesel Generator System (Standby ac Power Supply - 2.12.13)
- Control Building (2.15.12)

3. Report dated June 16, 1992, from David A. Ward, Chairman, ACRS, to Ivan Selin, Chairman, NRC, Subject: Interim Report on the Use of Design Acceptance Criteria in the Certification of the GE Nuclear Energy Advanced Boiling Water Reactor Design

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Additional details on this meeting can be obtained from a transcript of this meeting located in the NRC Public Document Room, 2120 L St. N.W., Washington, DC 20037. This transcript can also be purchased from Ann Riley & Assoc., Ltd., 1612 K. St. N.W., Washington, DC, (202) 293-3950

ITAAC FOR DESIGN CERTIFICATIONS
BACKGROUND

* REQUIREMENT FOR ITAAC IN 10 CFR 52.47(a)(1)(vi)
* SECY-91-178 DISCUSSED FORM AND CONTENT OF ITAAC
* SECY-91-210 DISCUSSED RELATIONSHIP OF FDA AND ITAAC
* SECY-92-053 DISCUSSED CONCEPT OF DAC
* SECY-92-196 DISCUSSED RAD PROTECTION AND PIPING DAC
* SECY-92-214 DISCUSSED CURRENT STATUS OF ITAAC
* SECY FOR I&C AND HFE (Human factors) DAC EXPECTED TO BE ISSUED THIS MONTH

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ITAAC FOR DESIGN CERTIFICATIONS

TYPES OF ITAAC

- "SYSTEMS ITAAC" FOR SYSTEMS OF DESIGN (~) 140 systems)
- "GENERIC ITAAC" FOR GENERIC CONCERNS ACROSS SYSTEMS CROSS REFERENCED TO SYSTEMS WHERE APPROPRIATE
- STAFF IS CONSIDERING "COL ITAAC" FOR LICENSEE PROCEDURAL REQUIREMENTS (E.G., TRAINING, ETC.) Combined OL
- "INTERFACE ITAAC" FOR SITE-SPECIFIC DESIGN (E.G., ULTIMATE HEAT SINK, ETC.)
- "DAC" FOR SELECTED AREAS OF THE DESIGN

CM Section 4 of Stage 3 Submittal

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ABWR DESIGN CERTIFICATION
8/5/92 ACRS SUBCOMMITTEE REVIEW

ELEMENTS INCLUDED IN TIER 1

ELEMENT	INTENT
DESIGN DESCRIPTION(S)	THE CERTIFIED DESIGN
INSPECTION, TESTS, ANALYSES AND ACCEPTANCE CRITERIA (ITAAC)	VERIFY THAT SPECIFIC FEATURES OF THE AS-BUILT FACILITY COMPLY WITH THE CERTIFIED DESIGN
DESIGN ACCEPTANCE CRITERIA (DAC)	AN ITAAC ON THE DESIGN PROCESS WHEN DESIGN DETAILS ARE (LEGITIMATELY) NOT AVAILABLE AT THE TIME OF DESIGN CERTIFICATION
INTERFACE ITAAC	VERIFY THAT SITE-SPECIFIC FEATURE(S) COMPLY WITH REQUIREMENTS OF THE CERTIFIED DESIGN
GENERIC ITAAC	VERIFY THAT GENERIC ASPECTS OF THE AS-BUILT FACILITY COMPLY WITH THE CERTIFIED DESIGN (E.G., EQ)

all DACs are ITAACs

FIG. 3

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(2)

ABWR DESIGN CERTIFICATION
8/5/92 ACRS SUBCOMMITTEE REVIEW

TYPICAL TIER 1 ENTRY
FOR AN ABWR SYSTEM

DESIGN DESCRIPTION (TYPICAL) ENTRY PER SYSTEM

1/2 - 5 PAGES OF TEXT

0 - 5 FIGURES, DIAGRAMS

INSPECTIONS, TESTS, ANALYSES AND ACCEPTANCE CRITERIA FOR EACH SYSTEM

TABULATION CONTAINING 2 - 20 ENTRIES

CERTIFIED DESIGN COMMITMENT	INSPECTIONS, TESTS, ANALYSES	ACCEPTANCE CRITERIA
DERIVED FROM THE SYSTEM DESCRIPTION	WHAT ACTION WILL BE TAKEN TO VERIFY THE CDC?	WHAT CONSTITUTES ACCEPTABLE RESULTS OF THE ACTION?

FIG 4

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Table 2.2.4: Standby Liquid Control System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The minimum average poison concentration in the reactor after operation of the SLC System shall be equal to or greater than 850 ppm. @ temp. (70°F)	1. Construction records, revisions and plant visual examinations will be undertaken to assess as-built parameters listed below for compatibility with SLC System design calculations. If necessary, an as-built SLC System analysis will be conducted to demonstrate that the acceptance criteria are met. **Critical Parameters:** a. Storage tank pumpable volume b. RPV water inventory at 70°F c. RHR shutdown cooling system water inventory at 70°F	It must be shown the SLC System can achieve a poison concentration of 850 ppm or greater, assuming a 25% dilution due to non-uniform mixing in the reactor and accounting for dilution in the RHR shutdown cooling systems. This concentration must be achieved under system design basis conditions. This requires that the SLC System meet the following values: a. Storage tank pumpable volume range 6100-6800 gal. b. RPV water inventory $\leq 1.00 \times 10^6$ lb c. RHR shutdown cooling system inventory $\leq 0.287 \times 10^6$ lb
2. A simplified system configuration is shown in Figure 2.2.4.	2. Inspections of installation records, together with plant walkdowns, will be conducted to confirm that the installed equipment is in compliance with the design configuration defined in Figure 2.2.4.	2. The system configuration is in accordance with Figure 2.2.4.

FIG. 5

Table 2.2.4: Standby Liquid Control System (Continued)

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3. The SLC System shall be capable of delivering 100 gpm of solution with both pumps operating against the elevated pressure conditions which can exist in the reactor during events involving SLC System initiation.	3. System preoperation tests will be conducted to demonstrate acceptable pump and system performance. These tests will involve establishing test conditions that simulate conditions which will exist during an SLC System design basis event. To demonstrate adequate Net Positive Suction Head (NPSH), delivery of rated flow will be confirmed by tests conducted at conditions of low level and maximum temperature in the storage tank, and the water will be injected from the storage tank to the RPV.	3. It must be shown that the SLC System can automatically inject 100 gpm (both pumps running) against a reactor pressure of 1250 psig with simulated ATWS conditions. It must also be shown that the SLC System pumps can pump the entire storage tank pumpable volume.
4. The system is designed to permit in-service functional testing of the SLC System.	4. Field tests will be conducted after system installation to confirm that in-service system testing can be performed.	4. Using normally installed controls, power supplies and other auxiliaries, the system has the capability to perform: a. Pump tests in a closed loop on the test tank. b. RPV injection tests using demineralized water from the test tank.
5. The pump, heater, valves and controls can be powered from the standby AC power supply as described in Section 2.2.4.	5. System tests will be conducted after installation to confirm that the electrical power supply configurations are in compliance with design commitments.	5. The installed equipment can be powered from the standby AC power supply.
6. SLC System components which are required for the injection of the neutron absorber into the reactor are classified Seismic Category I and qualified for appropriate environment for locations where installed.	6. See Generic Equipment Qualification verification activities (ITA).	6. See Generic Equipment Qualification Acceptance Criteria (AC).

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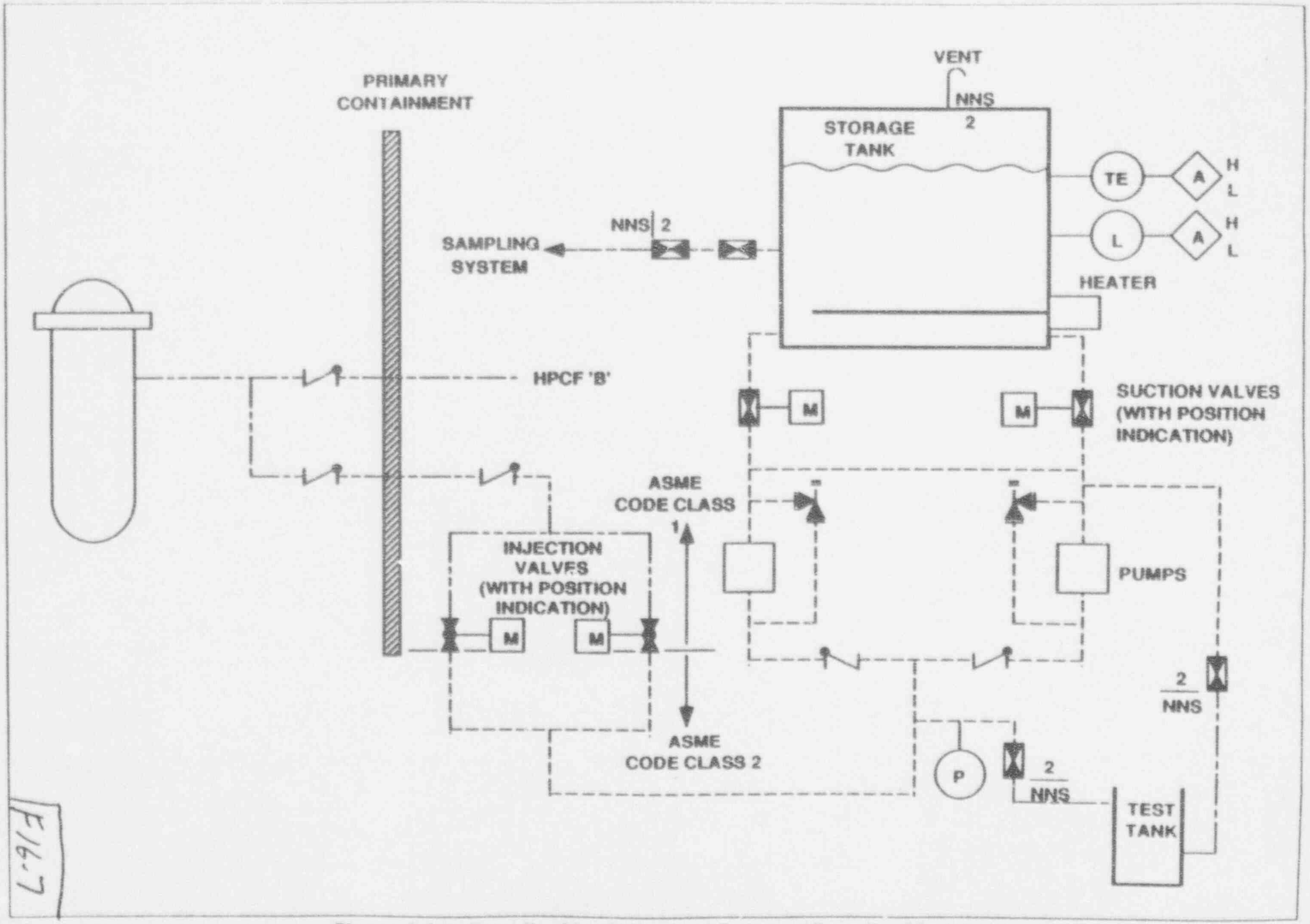

Figure 2.2.4 Standby Liquid Control System (Standby Mode)

Table 2.4.1: Residual Heat Removal System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The configuration of the RHR System is shown in Figures 2.4.1a, b and c, which are each mechanically and electrically separated from each other.	1. Inspections of the as-built RHR configuration shall be performed.	1. Actual RHR System configuration, for those components shown, conforms with Figures 2.4.1a, b and c and separation requirements.
2. The RHR System operates in the LPFL mode as part of the overall ECCS network.	2. The ECCS LOCA performance analysis for assuring core cooling shall be validated by RHR System functional testing, including demonstration that the LPFL mode (of each RHR loop) is capable of automatically initiating and operating in response to a LOCA signal.	2. RHR System actuation and operation is consistent with the ECCS performance analysis as follows: a. RHR Flow (each loop) .....≥ 4200 gpm (at 40 psid) b. Time to Rated Flow (each loop) .....≤ 36 sec
3. The RHR System operates in the suppression pool cooling mode to limit the long-term temperature and pressure of the containment under post-LOCA conditions.	3. The primary containment performance analysis for long-term peak pressure and temperature shall be validated by RHR System functional testing demonstrating the required flowrate through the heat exchanger and by inspection of vendor test data demonstrating the heat exchanger's effective heat removal capability. Automatic initiation in the suppression pool cooling mode will also be demonstrated.	3. RHR System automatically actuates in the suppression pool cooling mode as designed and RHR heat exchanger performance is consistent with the containment cooling system analysis as follows: a. Effective heat removal capability of each RHR Heat Exchanger (K coefficient) includes effects of RCW, RSW and UHS .....≥ 195 Btu/sec°F. b. Tube side flow of each RHR Heat Exchanger .....≥ 4200 gpm
4. A portion of the RHR System return flow (in loops B & C) can be diverted to the wetwell spray header.	4. RHR System functional tests shall be performed to demonstrate wetwell spray flow capability.	4. RHR loops B and C each separately are capable of providing wetwell spray flow consistent with the suppression pool bypass analysis as follows: a. Wetwell spray flow (each loop individually) ....≥ 500 gpm.

Table 2.4.1: Residual Heat Removal System (Continued)

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. The RHR System operates in the shutdown cooling mode to remove reactor core decay heat and bring the reactor to cold shutdown conditions.	5. RHR System functional tests shall be performed to demonstrate operation in the shutdown cooling mode of operation.	5. RHR System (each loop) is capable of taking suction from and discharging back to the reactor pressure vessel. [Heat exchanger heat removal capability in this mode is bounded by containment cooling requirements - ITAAC # 3]
6. The RHR System (loops B and C) operates in the augmented fuel pool cooling mode to supply supplemental or replacement cooling to the spent fuel storage pool under abnormal conditions.	6. RHR System functional tests shall be performed to demonstrate operation in the augmented fuel pool cooling mode of operation.	6. RHR System (loops B & C) is capable of taking suction from and discharging back to the normal fuel pool cooling system. [Required cooling capability in this mode bounded by containment cooling requirements - ITAAC #3]
7. The RHR System (loop C) provides an AC independent water addition function.	7. RHR System functional testing shall be performed to demonstrate operation in the AC independent water addition mode of operation.	7. Flow capability exists for directing water from the fire protection system to the RPV and drywell spray sparger, via the RHR System (loop C), without power being available from the essential AC distribution system. The valves are capable of being opened by manual hand wheels.
8. The RHR System operates when powered from both normal off-site and emergency on-site sources.	8. RHR System functional tests shall be performed to demonstrate operation when supplied by either normal off-site power or the emergency diesel generator(s).	8. RHR System is capable of operating when supplied by either power source.
9. If already operating in any other mode, the RHR System automatically reverts to the LPFL mode in response to a LOCA signal.	9. Using simulated inputs, logic and functional testing shall be performed to demonstrate the RHR System's ability to automatically revert to the LPFL mode from any other mode.	9. RHR logic functions to automatically reconfigure the system to the LPFL mode of operation in response to a LOCA signal.
10. Pressure isolation valves are provided to protect low pressure RHR piping from being subjected to excessively high reactor pressure.	10. Using simulated inputs, logic and functional testing shall be performed to demonstrate operation of automatic isolation and interlock functions of pressure isolation valves.	10. Automatic isolation and interlock features function upon receipt of input signals.

FIG. 9

Table 2.4.1: Residual He.. Removal System (Continued)

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
11. Each RHR loop operates automatically in a minimum flow mode to protect the pump from overheating.	11. Logic and functional testing shall be performed to demonstrate operation of the minimum flow mode for each loop (including extended minimum flow operational conditions).	11. RHR System logic functions automatically to assure a pump minimum flow path exists and no deleterious effects are observed during extended operation in the minimum flow mode.
12. The RHR System automatically isolates shutdown cooling suction valves to prevent draining of the reactor vessel.	12. Using simulated inputs, logic and valve functional testing shall be conducted to demonstrate operation of the shutdown cooling mode isolation function.	12. The shutdown cooling suction isolation valves automatically isolate on a low reactor water level signal.
13. RHR System valve interlocks prevent establishment of a drainage path from the reactor vessel to the suppression pool.	13. Using simulated inputs, logic and functional testing shall be conducted to demonstrate operation of interlocking between RPV suction valves and other RHR valves providing potential flow paths to the suppression pool.	13. RHR System valve interlock logic functions upon receipt of input signal.
14. The drywell spray inlet valves can only be opened if there exists high drywell pressure and the RPV injection valves are fully closed.	14. Using simulated inputs, logic and functional testing shall be conducted to demonstrate operation of drywell spray permissive logic.	14. RHR drywell spray permissive logic functions to prevent drywell spray inlet valves from opening in the absence of either a high drywell pressure signal or a signal indicating RHR RPV injection valve(s) not fully closed.
15. The RHR pumps are interlocked from starting without an open suction path.	15. Logic tests shall be conducted to demonstrate that the RHR pumps will not start without an open suction path being available.	15. An RHR pump start signal is not generated in the absence of indication of an open suction path.
16. The RHR System utilizes jockey pumps (1 in each loop) to keep the pump discharge lines filled.	16. Functional tests will be performed to demonstrate the ability of the jockey pump (in each loop) to keep its respective RHR pump discharge line full while in the standby mode.	16. Each jockey pump performs its keep fill function.

Table 2.4.1: Residual Heat Removal System (Continued)

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
17. The RHR System full flow test mode allows periodic demonstration of RHR capability during normal power operation.	17. Functional tests will be performed to demonstrate operation in the full flow test mode.	17. Each RHR subsystem demonstrates full flow functional capability while approximating actual vessel injection conditions during operation in the full flow test mode.
18. The RHR pumps have sufficient NPSH during postulated operating conditions.	18. Pump vendor records will be inspected and as-procured pump NPSH compared with design basis analysis assumptions. Actual system installation will be inspected, and appropriate measurements taken, to determine available pump NPSH.	18. Minimum pump NPSH available, as determined based on as-built conditions and the results of vendor tests and/or analyses, exceeds as-procured pump requirements and is consistent with design basis analyses requirements that includes saturated water conditions.
19. The RHR pumps have adequate head/flow characteristics.	19. Pump vendor test records and calculations will be inspected, and as-installed system flow testing conducted, to establish pump head/flow characteristics.	19. RHR pumps, in as-installed system configuration, demonstrate head/flow characteristics consistent with design basis analyses assumptions.
20. Control room indications are provided for RHR System parameters defined in Section 2.4.1.	20. Inspections will be performed to verify presence of control room indication for the RHR System (Section 2.4.1).	20. The instrumentation is present in the control room as defined in Section 2.4.1.

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Table 2.15.12: Control Building

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. Control building general arrangement is shown in Figures 2.15.12a through 2.15.12g.	1. Plant walk through* to check and verify requirements are met.	1. Per Figures 2.15.12a through 2.15.12g.
2. Design features are provided to protect against design basis internal and external floods.	2. Review construction records and perform visual inspections of the flood control features.	2. For external flooding: a. Exterior wall thickness below flood level greater than 0.6m. b. Water stop. c. Watertight door and piping penetrations below flood level. d. Waterproof coating on exterior walls. e. Foundations and walls of structures below grade are designed with water stops at expansion and construction joints. f. Roofs are designed to prevent pooling of large amounts of water. For internal flooding: a. Elevation differences and divisional separation of the mechanical functions from the remainder of the CB. b. Drainage system to divert water to assigned floor and location. c. Sills for doorways as needed to provide flood protection. d. Watertight doors installed below internal flood level. e. Wall thickness below internal flood level greater than 0.6m. f. Steam tunnel has no penetrations from the steam tunnel into the control building. Any high energy line or feedwater piping breaks inside the steam tunnel will vent out to the Turbine Building.

* Plant walk through is intended to include visual inspection of the as-built facility and (as-needed) dimensional measurements.

rating of door? need to qualified penetration?

FIG. 12

Table 2.15.12: Control Building (Continued)

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3. The Control Building is designed to have adequate radiation shielding to protect operating personnel during operation and following a LOCA.	3. Performed dimensional inspections of the Control Building walls, ceiling, floors, and other structural features.	3. The concrete thickness for the steam tunnel wall, floor and ceiling shall be greater than 1.6m. The steam tunnel interface structure and control building wall below the steam tunnel should have a combined thickness of 1.6m, i.e. in any line-of-sight from the control room, the total thickness of concrete between the observer and the steam lines must be 1.6m or greater.
4. The CB is designed to protect against design basis tornado and tornado missiles.	4. Review construction records and perform visual inspections and dimensional checks (as-needed) of the tornado protection features.	4. For tornado a. Roof and walls above grade designed greater than 0.5m. b. HVAC dampers designed for differential pressure > 1.46 psi. c. HVAC dampers have tornado missile barriers.
5. The CB is designed as a Seismic Category I structure and has major dimensions defined in the certified design.	5. Plant walk through to check and verify CB building major dimensions including column sizes and floor slab thickness. Review final design record for material properties site input data and analytical procedures and methodology for seismic analysis. Visual inspections of structures and review of as-built documentation will be conducted to assess compliance with the certified design commitments.	5. Structures have dimensions compatible with data in the certified design (Figures 2.15.12a through 2.15.12g).
6. The detail structural design will be based on ACI and AISC codes and will use site data for seismic events, floods, tornadoes winds and other loading conditions.	6. The control building design documentation will be reviewed.	6. Confirmation that the as-built design is in compliance with ACI and AISC requirements and is based on appropriate site design data.

Table 2.12.13: Emergency Diesel Generator System

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The three diesel generator trains are mechanically and electrically independent.	1. Tests and verification inspection will be conducted which will include independent and coincident operation of the three trains to demonstrate complete divisional separation.	1. Plant tests and verification inspection for physical location confirm proper independence of three diesel generator divisions.
2. All components essential to the operation of the diesel generators are Seismic Category I and qualified for the appropriate environment for locations where installed.	2. See Generic Equipment Qualification verification activities (ITA).	2. See Generic Equipment Qualification Acceptance Criteria (AC).
3. The three diesel generators are capable of supplying sufficient AC power to achieve safe shutdown of the plant and/or to mitigate the consequences of a LOCA in the event of a coincident loss of normal power (Figure 2.12.13.).	3a. Confirmatory inspection will be performed to assure the maximum design loads expected to occur for each division are within the ratings of the corresponding diesel generator.	3a. The maximum loads expected to occur for each division (according to nameplate ratings) shall not exceed 90% of the rated power output of the diesel generator.
	3b. Testing will be conducted by synchronizing each diesel generator to the plant offsite power system and increasing its output power level to its fully rated load condition.	3b. Each of the three units shall produce rated power output at ≥0.8 PF for a period of ≥24 hours (momentary transients excepted). Each unit will then experience full load rejection by tripping the load and verifying the unit does not trip.
4. Each diesel generator is rated at 6.9 kV, three phase, 60 Hz; and is capable of attaining rated frequency and voltage within 20 seconds after receipt of a start signal.	4. Perform a test of each diesel generator to confirm its ability to attain rated frequency and voltage.	4. Each diesel generator attains a voltage of 6.9 kV±10%, and a frequency of 60 Hz±2% within 20 seconds after application of a start signal.

Table 2.12.13: Emergency Diesel Generator System (Continued)

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
5. In the event of a loss of normal power, each diesel generator unit is capable of starting (both manually and automatically), accelerating, and supplying its loads in the proper sequence and timing specified in the plant design documents. It is also capable of recovery following trip and restart of its largest load.	5. The automatic and manual start sequences will be tested for each diesel generator unit.	5. Each of the three units starts from each automatic and remote manual signal, then accelerates and properly sequences its loads. Each local manual signal also starts the corresponding unit, but does not initiate load sequencing. The automatic load sequence begins at ≤20 seconds and ends ≤65 seconds. Following application of each load, the bus voltage will not drop more than 25% measured at the bus. Frequency shall be restored to within 2% of nominal, and voltage shall be restored to within 10% of nominal within 60% of each load-sequence time interval. In addition, the unit's largest motor load shall be tripped and restarted after the unit has completed its sequence, and the bus voltage shall recover to 6.9 kV±10% at 60±2% Hz within 10 seconds.
6. Each diesel generator unit is capable of manually starting without the need for external electrical power. The air receiver tanks have sufficient capacity for five starts without recharging.	6. Each unit will be tested and the air receiver tank capacities shall be analyzed to assure its black-start capability is functional.	6. Black-start capability is demonstrated following one successful manual start, acceleration, and bus energization for each of the three units without assist from any external electric power. Following black start, each unit's receiver tanks shall have sufficient air remaining for four more starts.
7. Interlocks to the LOCA and loss-of-power sensing circuits terminate parallel operation tests and cause the diesel generator to revert and reset to its automatic control system if either signal appears during a test.	7. Interlocks for the standby AC power system will be tested.	7. While in a parallel test mode, each unit will revert and reset to its automatic control system following individual application of a simulated LOCA signal and a simulated loss-of-power signal.

Table 2.12.13: Emergency Diesel Generator System (Continued)

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
8. Devices monitor the conditions of the diesel generators, and effect action in accordance with one of the following categories: (1) conditions to trip the diesel engine even under LOCA, (2) conditions to trip the diesel engine except under LOCA, (3) conditions to trip the generator breaker but not the diesel, and (4) conditions which are only annunciated.	8. Using simulated signals, protective interlocks and annunciations will be tested to assure they perform their functions, in accordance with the four categorical conditions described.	8. Successful circuit testing will be confirmed for the individual diesel generator protective sensors according to the following: <u>Category 1 Sensors:</u> Annunciations and diesel engine trip signals will be confirmed in combination with a simulated LOCA signal. <u>Category 2 Sensors:</u> Annunciations and diesel engine trip signals will be confirmed without a LOCA, but trips will be bypassed when a simulated LOCA signal is present. <u>Category 3 Sensors:</u> Annunciations and generator circuit breaker trip signals will be confirmed. <u>Category 4 Sensors:</u> Annunciation signals will be confirmed.
9. Each diesel has its own 7-day fuel storage tank, and its own 8-hour capacity day tank which is replenished by the storage tank.	9a. Visual inspection and calculation of capacities for each tank shall be performed.	9a. Tank inspections and calculations confirm proper capacities of the storage and day tanks. These shall be sufficient for full-load operation of each respective diesel generator for 7 days, and 8 hours, respectively.
	9b. The fuel transfer system shall be tested.	9b. Transfer system operation for each division will be confirmed by actuating both pumps from the day tank level sensors and observing proper flow into the day tanks.

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Table 2.12.13: Emergency Diesel Generator System (Continued)

Inspections, Tests, Analyses and Acceptance Criteria

Certified Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10. The manufacturer has conducted reliability testing on the units.	10. The manufacturer's test documents shall be visually inspected.	10. Visual inspection of manufacturer's test documents confirms the required reliability testing has been performed, and that the diesel generator has passed the test requirements.
11. Control indications are provided for D/G system parameters.	11. Inspections will be performed to verify presence of control room indication for the D/G system.	11. The designated instrumentation is present in the control room.