Luminant

Rafael Flores
Senior Vice President &
Chief Nuclear Officer
rafael.flores@luminant.com

Luminant Power
P O Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.5590
F 254.897.6652
C 817.559.0403

CP-201101008
Log # TXNB-11049

Ref. # 10 CFR 52

July 28, 2011

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555
ATTN: David B. Matthews, Director
Division of New Reactor Licensing

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 3 AND 4
DOCKET NUMBERS 52-034 AND 52-035
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION NO. 5716
(SECTION 2.5.4)

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein the response to Request for Additional Information (RAI) No. 5716 (CP RAI #223) for the Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4. The RAI addresses the ITAAC for concrete backfill under category I structures.

Should you have any questions regarding this response, please contact Don Woodlan (254-897-6887, Donald.Woodlan@luminant.com) or me.

There are no commitments in this letter.

I state under penalty of perjury that the foregoing is true and correct.

Executed on July 28, 2011.

Sincerely,

Luminant Generation Company LLC

RWBird for

Rafael Flores

Attachment: Response to Request for Additional Information No. 5716 (CP RAI #223)

D090
NRO

Electronic distribution w/attachment:

Rafael.Flores@luminant.com
mlucas3@luminant.com
jeff.simmons@energyfutureholdings.com
Bill.Moore@luminant.com
Brock.Degeyter@energyfutureholdings.com
rbird1@luminant.com
Allan.Koenig@luminant.com
Timothy.Clouser@luminant.com
Ronald.Carver@luminant.com
David.Volkening@luminant.com
Bruce.Turner@luminant.com
Eric.Evans@luminant.com
Robert.Reible@luminant.com
donald.woodlan@luminant.com
John.Conly@luminant.com
JCaldwell@luminant.com
David.Beshear@txu.com
Ashley.Monts@luminant.com
Fred.Madden@luminant.com
Dennis.Buschbaum@luminant.com
Carolyn.Cosentino@luminant.com
NuBuild Licensing files
sfrantz@morganlewis.com
jrund@morganlewis.com
tmatthews@morganlewis.com
regina.borsh@dom.com
diane.aitken@dom.com
askolhek@bechtel.com
yoshinori_fujiwara@mhi.co.jp
kano_saito@mhi.co.jp
shigemitsu_suzuki@mhi.co.jp
Luminant Records Management (.pdf files only)

shinji_kawanago@mnes-us.com
masanori_onozuka@mnes-us.com
ck_paulson@mnes-us.com
joseph_tapia@mnes-us.com
russell_bywater@mnes-us.com
william_mcconaghy@mnes-us.com
mutsumi_ishida@mnes-us.com
yukako_hill@mnes-us.com
nicholas_kellenberger@mnes-us.com
ryan_sprengel@mnes-us.com
al_freitag@mnes-us.com
masaya_hoshi@mnes-us.com
rjb@nei.org
kak@nei.org
michael.takacs@nrc.gov
cp34update@certrec.com
michael.johnson@nrc.gov
David.Matthews@nrc.gov
Balwant.Singal@nrc.gov
Hossein.Hamzehee@nrc.gov
Stephen.Monarque@nrc.gov
jeff.ciocco@nrc.gov
michael.willingham@nrc.gov
john.kramer@nrc.gov
Brian.Tindell@nrc.gov
Alicia.Williamson@nrc.gov
Elmo.Collins@nrc.gov
Loren.Plisco@nrc.com
Susan.Vrahoretis@nrc.gov
Frank.Akstulewicz@nrc.gov
ComanchePeakCOL.Resource@nrc.gov

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 5716 (CP RAI #223)

SRP SECTION: 02.05.04 - Stability of Subsurface Materials and Foundations

QUESTIONS for Geosciences and Geotechnical Engineering Branch 1 (RGS1)

DATE OF RAI ISSUE: 6/24/2011

QUESTION NO.: 02.05.04-25

10 CFR 100.23(d)(2) states that "sufficient geological, seismological, and geophysical data must be provided to clearly establish whether there is a potential for surface deformation." Furthermore, 10 CFR 100.23(d)(4) addresses siting factors for other design considerations, including "ground disruption."

During a public conference call with the NRC on September 23, 2010, the staff requested clarification from the applicant on the use of seismic Category I duct banks resting on soil backfill. In a letter to NRC dated October 21, 2010 (ML102980032), the applicant submitted supplemental information for the response to RAI 2.5.4-23 that stated that the duct banks are not seismic Category I and that concrete fill will be placed under all Category I structures. In order to clarify that all fill under seismic Category 1 structures must be concrete backfill, not soil backfill, the staff requests the applicant provide an ITAAC for the concrete backfill. The requested ITAAC should establish inspection and test methods for the concrete fill.

ANSWER:

The Luminant construction testing program, as described in FSAR Subsection 2.5.4.5.4 and incorporated in DCD Subsection 3.8.4.6.1.1, describes the inspection and test methods for the concrete fill beneath seismic category I structures. Luminant proposes the following ITAAC item to be incorporated in FSAR Part 10 Appendix A-3 to address NRC concerns that soil backfill might be used beneath seismic category I buildings and structures:

Concrete Fill/Backfill ITAAC Table

Design Commitment	Inspections, Tests, or Analyses	Acceptance Criteria
The R/B, PCCV, PS/Bs, PSFSVs, ESWPT and UHSRS are founded directly on bedrock or fill concrete.	Inspections will be performed of the fill placed beneath R/B, PCCV, PS/Bs, PSFSVs, ESWPT and UHSRS.	Bedrock or fill concrete, not soil, is used beneath the as-built foundation of the R/B, PCCV, PS/Bs, PSFSVs, ESWPT and UHSRS.

Discussion (Summary of information provided in FSAR and incorporated from DCD Tier 2)

The proposed ITAAC provides for the inspections to confirm that concrete backfill, not soil backfill, is placed below all seismic category I structures. Appropriate test methods for the concrete are already discussed in the FSAR. These test methods have been collected below for the convenience of the NRC reviewers. This is not new information; it is a consolidation and summary of information currently in the FSAR (including information incorporated by reference).

FSAR Subsection 2.5.4.5.4 (page 2.5-194) states that all "seismic category I and II buildings and structure are founded directly on solid limestone or fill concrete."

Subsection 2.5.4.5.4.1.2 (page 2.5-196) states that fill concrete under seismic category I and II buildings and structures

> ...has a design compressive strength of 3,000 psi that corresponds to a shear wave velocity of 6,400 ft/sec. The fill concrete mix design is required to be approved in advance to ensure it meets the minimum strength requirements. The fill concrete conforms to pertinent requirements of ACI 349 (Reference 2.5-440) and generally conforms to ASTM C94/C94M-07, "Standard Specification for Ready-Mixed Concrete (Reference 2.5-480)." Other ACI and ASTM standards applicable to the fill concrete are discussed in US-APWR DCD Subsection 3.8.4.6.1.1.

FSAR Subsection 3.7.1.3 (page 3.7-6) states:

> For CPNPP Units 3 and 4, all seismic category I and II buildings and structures, including the R/B-PCCV-containment internal structure on a common mat, the PS/Bs, UHSRS, ESWPT, PSFSVs, A/B, and T/B, are founded directly on solid limestone or on fill concrete which extends from the foundation bottom to the top of solid limestone at nominal elevation 782'. The fill concrete conforms to pertinent requirements of ACI-349 such as durability. Fill concrete is used as "dental" fill in any areas where additional removal of materials below the nominal top of limestone is required in order to reach competent limestone. With respect to horizontal extent, concrete fill matches the footprint of the foundation, except that the fill is permitted to extend beyond the foundation edges slightly to facilitate construction and placement of forms.

Summary of inspection and testing requirements contained in FSAR Subsections 2.5.4.5.4.1.2, 2.5.4.5.4.3, 2.5.4.5.4.5, and 2.5.4.5.4.6

- Subsection 2.5.4.5.4.1.2 specifies that:
  - A systematic quality control sampling and testing program is required to assure that the fill concrete and flowable fill material properties are in compliance with the design specifications (page 2.5-196).
  - Testing of fill concrete is performed by a qualified testing laboratory that has an established quality assurance program that conforms to NQA-1 requirements. The testing laboratory implements a concrete fill quality control program that includes all aspects of the fill concrete program from the qualification of materials to confirmatory strength testing. Field testing utilizes preapproved procedures that conform to ASTM C31/C31-08a, "Standard Practice for Making and Curing Concrete Test Specimens in the Field" (page 2.5-197).
  - Strength verification laboratory tests are performed to confirm that the compressive strength of the fill concrete is satisfactory. The tests are conducted using cylindrical test specimens molded during construction and conforms to ASTM C39/C39M-05e2, "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens." The specimens are taken from different batches of fill concrete. The strength of the fill concrete is considered

satisfactory if the average compressive strength from three cylinders molded at a location equals or exceeds the required strength and no individual strength test falls below the required value by more than 500 psi. If these acceptance criteria are not met, an evaluation of the acceptability of the fill concrete for its intended function is performed before acceptance (pages 2.5-197 to 2.5-198).

- The fill concrete testing results, non-conformance related to fill concrete, and QA audits of fill concrete activities will be reviewed and dispositioned to ensure that the fill concrete meets the specified strength requirement. These measures will ensure that the design properties of fill concrete are achieved during construction activities (page 2.5-198).

- Subsection 2.5.4.5.4.3 specifies that prior to placing engineered fill or concrete fill, the excavation bottoms or the ground surfaces to receive fill need to be observed, probed, tested, and approved by qualified personnel as part of the quality control measures (page 2.5-198).

- Subsection 2.5.4.5.4.5 specifies that continuous geotechnical engineering observation and inspection of all fill placement and compaction operations is required to certify and ensure that the fill is properly placed and compacted in accordance with the project plans and specifications (page 2.5-199).

- Subsection 2.5.4.5.4.6.1 specifies that the procedure for verification of foundation conditions consists of geologic mapping of the final exposed excavation surface prior to placement of foundation concrete or fill concrete. Geologic mapping of final exposed rock surfaces beneath Units 3 and 4 and any required extension to reach suitable rock material is periodically carried out at a scale of 1 in equals 5 ft. Areas where further detail is needed for documentation of significant features are also documented on the geologic map in order to ensure that all shale and unsuitable materials are removed and competent rock materials are exposed (page 2.5-200).

- Section 2.5.4.5.4.6.2 specifies that quality control of fill concrete placement below Units 3 and 4 foundation areas is required. Field observation is required to verify that appropriate mixes are used and that test specimens are collected for testing to verify that the required compressive strengths are met (page 2.5-201).

- Section 2.5.4.5.4.6.3 specifies that Geotechnical quality control includes continuous observations and monitoring of excavations during construction as well as geologic mapping by qualified and trained geotechnical personnel and geologists to verify that foundation quality materials are reached. Observations are required to be performed during 1) general excavation, to achieve mat foundation bearing elevations, 2) additional excavations below the design mat bearing elevations, and 3) cleanout of any defects in the rock foundation. The exposed excavation bottoms also need to be mapped by the project engineering geologist to record the conditions of the foundation prior to placement of reinforcing steel or fill concrete. Similar to Units 1 and 2 foundation excavations, extensometers are also needed during foundation excavation for Units 3 and 4 to monitor foundation deformation (page 2.5-201).

Summary of inspection and testing requirements contained in DCD Revision 3 Subsection 3.8.4.6.1.1 (from pages 3.8-67 to 3.8-68)

- A test age of 28 days is used for normal concrete. Batching and placement of concrete is performed in accordance with ACI 349, ACI 304R, and ASTM C 94.

- During construction, volume changes in mass concrete are controlled where necessary by applying measures and provisions outlined in ACI 207.2R and ACI 207.4R.

- Portland cement is used in the concrete conforms to ASTM C 150, Type II standards. The confirmation of the chemical composition of the cement properties is validated by certified copies of test reports showing the chemical composition of each Portland cement shipment.

- Aggregates used in the concrete conform to ASTM C 33. Aggregate and source acceptance is based on documented test results for each source and random sampling of shipments based on MIL-STD-1916.

- Water and ice used in the concrete conform to the requirements of ACI-349.

- Admixtures include an air entraining admixture, pozzolans, and a water reducing admixture. The admixtures, except the pozzolans, are stored in a liquid state.

- Admixtures and concrete mix conform to the following requirements:

Pozzolans	ASTM C 618
Sampling and Testing of Pozzolans	ASTM C 311
Air Entraining Admixtures	ASTM C 260
Water Reducing Admixtures	ASTM C 494
Concrete Mix	ACI 211.1,ASTM C 94
Concrete Mix Testing	ASTM C 172, ASTM C 192, ASTM C 39
Minimum Number of Strength Tests[1]	ACI 349, ASME NQA-2

Note 1: In lieu of frequency of compressive strength testing specified by Section 5.6.1.1 of ACI 349-97 or that specified by ASME NQA-2, the following is acceptable per RG 1.142, Regulatory Position 5.

- Samples for strength tests of concrete should be taken at least once per day for each class of concrete placed or at least once for each 100 cubic yards of concrete placed. When the standard deviation for 30 consecutive tests of a given class is less than 600 psi, the amount of concrete placed between tests may be increased by 50 cubic yards for each 100 psi the standard deviation is below 600 psi, except that the minimum testing rate should not be less than one test for each shift when the concrete is placed on more than one shift per day or not less than one test for each 200 cubic yards of concrete placed. The test frequency should revert to once for each 100 cubic yards placed if the data for any 30 consecutive tests indicate a higher standard deviation than the value controlling the decreased test frequency.

Impact on R-COLA

See attached marked-up FSAR Revision 2 pages 2.5-194, 2.5-196, 2.5-197, 2.5-198, 2.5-259, and Part 10 pages 30, 32, and 35.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

During construction of CPNPP Units 1 and 2, only small and localized seeps were reportedly observed in foundation excavations that extended to deeper levels (and lower elevations) than at CPNPP Units 3 and 4.

2.5.4.5.4 Backfill Material

Backfill is required between the foundation excavation sidewalls and lower structural walls of seismic category I and II facilities, the main power block structures, and the UHS. The volume of backfill is minimized by using steep or vertical excavation cuts.

No exclusions are placed on the use of limestone or sandstone derived from the mass grading to develop plant grade or foundation excavations. The total volume of excavation in the Units 3 and 4 power block and UHS areas greatly exceeds the volume of required backfill. Shale materials are not acceptable for backfill material in structural areas because of their fine-grained nature, high plasticity, and expansion potential. Testing of limestone and shale samples is discussed in Subsection 2.5.4.2. Dynamic properties assigned to engineered backfill are discussed in Subsection 2.5.4.7.4. The source of backfill to be used adjacent to category I structures will be the limestone and sandstone removed from the excavation and that there will be sufficient quantity of material from the excavation for that purpose. The acceptance criteria, test method, and frequency of verification for fill placement are provided for each fill application in Subsection 2.5.4.5.4.8. Continuous geotechnical engineering observation and inspection of all fill is required to certify and ensure that the fill is properly placed and compacted as discussed in Subsection 2.5.4.5.4.2.

Clean sand may be used as a select granular backfill material around the buried structure walls. A discussion of the materials for engineered fill is provided in Subsection 2.5.4.5.4.1.1. All ~~major~~ seismic category I and II buildings and structure are founded directly on solid limestone or fill concrete (Subsection 3.7.1.3). Recommendations for concrete fill under power block structure foundations are provided in Subsection 2.5.4.5.4.1.2. RCOL2_02.05.04-25

Concrete fill may be used as backfill to replace unsuitable rock removed below elevation 782 ft as part of foundation preparations. The concrete fill foundation details are shown on Figure 2.5.4-217.

2.5.4.5.4.1 Material Properties and Sources

2.5.4.5.4.1.1 Fill

All engineered fill materials need to contain no rocks or hard lumps greater than three inches in size, and require to have at least 80 percent of material smaller than 1/2 inch in size. No organic, perishable, spongy, or other improper material such as debris, bricks, cinders, metal, wood, etc. shall be present in the fill. Three types of engineered fill materials are used at the site.

- Consist of granular materials, well graded, with all material passing ½-inch sieve, and at least 95 percent retained on standard US Sieve No. 200 as determined in accordance with ASTM D422 (Reference 2.5-485). RCOL2_02.05.04-25

- Be placed under and equally along both sides of the pipe in uniform layers not exceeding 6 in (measured in loose state) to a height of at least the centerline of the pipe, or preferably to 12 in above the top of the pipe and compacted by hand, pneumatic tamper, or other approved means without damaging the pipe or the coatings.

- Be compacted to a relative compaction of 90 percent, except in the structural areas or within 12 in below the roadways and slabs, where 95 percent relative compaction governs (ASTM D1557) (Reference 2.5-484). RCOL2_02.05.04-25

- Above the pipe zone, general structural fill may be used with a similar degree of compaction as specified for the bedding materials.

Fill is derived from either off-site borrow areas or on-site cut areas and foundation excavations. The excavated materials from on-site areas require appropriate segregation, handling, and processing. Geotechnical testing is required for all fill materials to verify that their characteristics and properties meet the minimum requirements.

Representative samples from fill material are control tested for grain size, Atterberg Limits, Expansion Index, Modified Proctor, pH, sulfates, and chlorides. Where the type or the source of fill materials changes or is suspect, a new set of control tests like the ones indicated above is performed for the new or changed material.

2.5.4.5.4.1.2 Fill Concrete

Fill concrete and flowable fill mix designs are required to be approved in advance to ensure that they meet the minimum strength requirements. Continuous field observation is needed to verify that the appropriate mixes are used. A systematic quality control sampling and testing program is required to assure that the fill concrete and flowable fill material properties are in compliance with the design specifications.

The fill concrete has a design compressive strength of 3,000 psi that corresponds to a shear wave velocity of 6,400 ft/sec. The fill concrete mix design is required to be approved in advance to ensure it meets minimum strength requirements. The fill concrete conforms to pertinent requirements of ACI 349 (Reference 2.5-440) and generally conforms to ASTM C94/C94M-07, "Standard Specification for Ready-Mixed Concrete." (Reference 2.5-480). Other ACI and ASTM standards applicable to the fill concrete are discussed in US-APWR DCD Subsection 3.8.4.6.1.1. RCOL2_02.05.04-25

Safety-related fill concrete conforms to durability requirements given in Chapter 4 of ACI 349 (Reference 2.5-440). Durability of the fill concrete is assured by the site-specific mix design and by the particular site conditions at CPNPP. The site is located away from the ocean and salt water bodies such that the fill concrete is not exposed to seawater. As stated in Subsection 2.5.1.2.5.9, there are no expansive soils or reactive minerals of appreciable amounts at the site. Therefore, issues related to chemical attack by sulfate, salt attack, or acid attack do not pose concerns for the fill concrete. In addition, CPNPP is located in a relatively warm climate where concerns due to exposure to freeze-thaw action under moist conditions and detrimental effects due to the presence of ice removal agents are insignificant.

The foundation and fill concrete design at CPNPP are such that the issues contained in NRC Information Notice (IN) 97-11 (Reference 2.5-441) are not applicable to fill concrete. No mortar or concrete containing high amounts of calcium aluminate cement is used in foundation or fill concrete. The fill concrete mix design uses Type II Portland cement, consistent with US-APWR DCD Subsection 3.8.4.6.1.1, which is limited to a tricalcium aluminate content of 8% by ASTM C150 (Reference 2.5-482) and is classified by ASTM C150 as moderately resistant to sulfate attack. The maximum anticipated groundwater elevation is at elevation 760 ft, as stated in FSAR Subsection 2.4.1.2.5 and 2.5.4.1.7. This is well below the anticipated bottom of fill concrete. The fill concrete mix design uses fine aggregates, unlike porous concrete consisting only of coarse aggregates and cement. The plant structures are equipped with dampproofing coatings on the sides of below-grade walls and underground drains to collect underground water and channel it away from the structures. Perched water and precipitation run-off do have the potential to come in contact with the fill concrete. However, because of the low groundwater elevation, the use of non-porous fill concrete, and the low amounts of calcium aluminate present in the mix, erosion and leaching concerns and subsequent related effects discussed in IN 97-11 (Reference 2.5-441) are not an issue at CPNPP. Further, FSAR Subsection 3.8.4.7 requires that ground water chemistry be periodically monitored to assure that it remains nonaggressive with respect to concrete structures. DCD_02.05.04-25

A systematic quality control sampling and testing program ensures that material properties are in compliance with design specifications. Field inspections verify that the required mix is used and that test specimens are collected for testing.

Testing of fill concrete is performed by a qualified testing laboratory that has an established quality assurance program that conforms to NQA-1 requirements. The testing laboratory implements a concrete fill quality control program that includes all aspects of the fill concrete program from the qualification of materials to confirmatory strength testing. Field testing utilizes preapproved procedures that conform to ASTM C31/C31-08a, "Standard Practice for Making and Curing Concrete Test Specimens in the Field." (Reference 2.5-483). RCOL2_02.05.04-25

Strength verification laboratory tests are performed to confirm that the compressive strength of the fill concrete is satisfactory. The tests are conducted using cylindrical test specimens molded during construction and conforms to ASTM C39/C39M-05e2, "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens." (Reference 2.5-481) The specimens are taken from different batches of fill concrete. The strength of the fill concrete is considered satisfactory if the average compressive strength from three cylinders molded at a location equals or exceeds the required strength and no individual strength test falls below the required value by more than 500 psi. If these acceptance criteria are not met, an evaluation of the acceptability of the fill concrete for its intended function is performed before acceptance. RCOL2_02.05.04-25

The fill concrete testing results, non-conformance related to fill concrete, and QA audits of fill concrete activities will be reviewed and dispositioned to ensure that the fill concrete meets the specified strength requirement.

These measures will ensure that the design properties of fill concrete are achieved during construction activities.

2.5.4.5.4.2 Compaction Requirement

All engineered fill materials need to be compacted at a moisture content of ±2 percent of the optimum, and to a minimum relative compaction of 95 percent in the structural areas and 90 percent in non-structural areas. The maximum dry density and optimum moisture content is determined in accordance with ASTM D1557 (Reference 2.5-484). RCOL2_02.05.04-25

2.5.4.5.4.3 Clearing and Preparing Fill Areas

Prior to placing engineered fill or concrete fill, the excavation bottoms or the ground surfaces to receive fill need to be observed, probed, tested, and approved by qualified personnel as part of the quality control measures.

2.5.4.5.4.4 Placing, Spreading, and Compacting Fill Material

All fill materials need to be placed in horizontal layers not greater than eight inches in loose thickness. Each layer is required to be spread evenly and mixed thoroughly to obtain uniformity of material and moisture in each layer.

When the moisture content of the fill material is below that specified, water needs to be added until the moisture content is as specified. When the moisture content of the fill material is too high, the fill material needs to be aerated through blading, mixing, or other satisfactory methods until the moisture content is as specified.

After each fill layer has been placed, mixed, and spread evenly, it needs to be thoroughly compacted to the specified degree of compaction. Compaction needs to be accomplished by sheepsfoot rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compacting equipment. Equipment is required to be of such design and nature that it is able to compact the fill to the specified degree of compaction. Compaction should be continuous

2.5-475 Zachos, J. C., Quinn, T. M., Salamy, K. A. (1996) "High resolution (104 years) deep-sea foraminiferal stable isotope records of the Eocene-Oligocene climate transition". Paleoceanography, v.11, no.3, p.251-266.

2.5-476 Davis, D.M., Pennington, W., and Carlson, S., 1985, Historical seismicity of the state of Texas: a summary: Gulf Coast Association of Geological Societies Transactions, v. 35, p. 39-44.

2.5-477 Luza, K.V., and Lawson, J.E., 1993, Oklahoma Seismic Network: Washington, D.C., US Nuclear Regulatory Commission, NUREG/CR-6034, p. 33.

2.5-478 USGS, 2006, M5.8 Gulf of Mexico earthquake of 10 September 2006, U.S. Geological survey, Earthquake Summary MAP, p. 1: 4,500,000. Map released 9/18/2006.

2.5-479 Dewey, J.A., and J.A. Dellinger (2008). Location of Green Canyon (Offshore Souther Lousiana) Seismic Event of February 10, 2006, US Geological Survey Open-File Rept. 2008-1184.

2.5-480 ASTM International, ASTM C94, Standard Specification for Ready-Mixed Concrete. RCOL2_02.05.04-25

2.5-481 ASTM International, ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

2.5-482 ASTM International, ASTM C150, Standard Specification for Portland Cement.

2.5-483 ASTM International, ASTM C31/C31-08a, Standard Practice for Making and Curing Concrete Test Speciments in the Field.

2.5-484 ASTM International, ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

2.5-485 ASTM International, ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.

PART 10 - APPENDIX A.3

PLANT-SPECIFIC STRUCTURES

A.3.1 Design Description

The site-specific structures are comprised of the UHS related structures (UHSRS), ESW pipe tunnel (ESWPT) and power source fuel storage vault (PSFSV), which are seismic Category I structures. The seismic Category I structures are designed and constructed to withstand design-basis loads without loss of structural integrity. Design basis loads are:

- Normal plant operation (including dead loads, live loads, lateral earth pressure loads, equipment loads, hydrodynamic loads temperature and equipment vibration)
- External events (including rain, snow, flood, tornado, tornado generated missiles and safe shutdown earthquake)
- Internal events (including flood, pipe rupture, equipment failure, and equipment failure generated missiles).

Seismic category I buildings and structures, including the R/B-PCCV-containment internal structure on a common mat, the PS/Bs, UHSRS, ESWPT, PSFSVs are founded directly on solid limestone or on fill concrete. Fill concrete is used as 'dental' fill in any areas where additional removal of materials below the nominal top of limestone is required in order to reach competent limestone. RCOL2_02.05.04-25

A.3.1.1 UHSRS

The UHSRS consists of an UHS cooling tower enclosure, UHS ESW pump houses, and an UHS basin. These structures are described below.

UHS cooling tower enclosures - Each UHS basin has one cooling tower with two cells. Each cell is enclosed by reinforced concrete structures that house the equipment required to cool the water used by the ESWS. The reinforced concrete wall separates the two cell enclosures. A reinforced concrete wall, running eastwest, separates the cell enclosure portion of the basin from the rest of the UHS basin. Air intakes serving the cooling towers are configured to protect the safety-related substructures and components from tornado missiles.

UHS ESW pump house - The pump house is an integral part of the UHS basin supported by UHS basin exterior and interior walls. Each pump house contains one ESW pump and one UHS transfer pump with associated auxiliaries. The pump bay (lowest portion of the pump house required for the pump suction) is

6. Penetrations in the external walls of the UHSRS, ESWPT and PSFSV that are at or below design basis flood level are fitted with wate-tight seals to protect against external flooding.

7. Redundant safe shutdown components and associated electrical divisions of the UHSRS, ESWPT and PSFSV are separated by 3-hour rated fire barriers to preserve the capability to safely shutdown the plant following a fire.

8. Penetrations and openings through the fire barriers of the UHSRS, ESWPT and PSFSV are protected against fire.

9. The UHRS, ESWPT and PSFSV can withstand design-basis loads.

10. SSCs that require evaluation in the seismic fragilities task of a seismic margin analysis have high confidence of low probability of failure (HCLPF) values equal to or greater than the review level earthquake.

11. R/B, PCCV, PS/Bs, PSFSVs, ESWPT and UHSRS are founded directly on bedrock or fill concrete. RCOL2_02.05.04-25

A.3.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table A.3-1 describes the ITAAC for the UHS related structure (UHSRS), ESW pipe tunnel (ESWPT), and power source fuel storage vault (PSFSV).

Appendix A.3

Table A.3-1 (Sheet 3 of 3)
UHSRS, ESWPT and PSFSV Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10. SSCs that require evaluation in the seismic fragilities task of a seismic margin analysis have high confidence of low probability of failure (HCLPF) values equal to or greater than the review level earthquake.	10.a Analyses will be performed to verify that the SSCs requiring evaluation in the seismic fragilities task of a seismic margin assessment have HCLPF values equal to or greater than the review level earthquake.	10.a Reports exist and conclude that the SSCs evaluated in the seismic fragilities task of the seismic margin assessment have HCLPF values equal to or greater than the review level earthquake.
	10.b Inspection and analysis will be performed to verify that as-built SSCs requiring evaluation in the seismic fragilities task of a seismic margin assessment are bounded by conditions used in the seismic margin assessment.	10.b A report exists and concludes that the as-built SSCs requiring evaluation in the seismic fragilities task of a seismic margin assessment are bounded by the conditions used in the seismic margin assessment.
11. R/B, PCCV, PS/Bs, PSFSVs, ESWPT and UHSRS are founded directly on bedrock or fill concrete.	11. Inspections will be performed on the as-built foundation beneath R/B, PCCV, PS/Bs, PSFSVs, ESWPT and UHSRS.	11. Bedrock or fill concrete is used for the as-built foundation beneath R/B, PCCV, PS/Bs, PSFSVs, ESWPT and UHSRS.

RCOL2_02.05.04-25