UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY and NORTH CAROLINA EASTERN MUNICIPAL POWER AGENCY	)	Docket Nos. 50-400 OL 50-401 OL
	)	
(Shearon Harris Nuclear Power Plant, Units 1 and 2)	)	

AFFIDAVIT OF ROLAND M. PARSONS

County of Wake	)	
	)	ss.
State of North Carolina	)	

ROLAND M. PARSONS, being duly sworn according to law, deposes and says as follows:

1. My name is Roland M. Parsons. My business address is P.O. Box 101, New Hill, North Carolina, 27562. I am employed by Carolina Power & Light Company ("CP&L") as Project General Manager for construction - Shearon Harris Nuclear Power Plant. In that position, my primary responsibility is construction of the plant. A civil engineer, I have worked on the construction

of nuclear power plants for over 17 years, and I have been at the Harris site since major construction activity was undertaken in 1976. A summary of my professional qualifications and experience is attached hereto as Exhibit "A".

2. I make this Affidavit in support of Applicants' Motion for Summary Disposition of Eddleman Contention 65. I have personal knowledge of the matters stated herein and believe them to be true and correct. I will first describe the containment building at the Harris plant, and its construction. I will then address the phenomenon of concrete honeycombing or voids, the subject of Eddleman Contention 65, and the extent to which it has occurred in the basemat, exterior walls and dome of the containment at Harris. Finally, I will explain why a soniscope examination of the concrete containment structure is unnecessary and unwarranted.

The Concrete Containment Structure

3. The concrete containment structure, which was designed by EBASCO (architect/engineer for the Harris plant), is fully described in section 3.8.1 of the Final Safety Analysis Report. It is a steel lined reinforced concrete structure in the form of a vertical right cylinder with a hemispherical dome and a flat base with a recess beneath the reactor vessel. The general arrangement of the structure is depicted in the attached Exhibit "B".

4. The cylindrical wall of the structure is 4 feet, 6 inches thick and measures 160 feet in height from the liner on the base to the springline of the dome. The dome is 2 feet, 6 inches thick, and the base mat consists of a 12-foot thick structural concrete slab and a metal liner. The base liner is covered with concrete, the top of which forms the floor of the containment.

5. The containment structure, base mat and walls provide pressure and temperature protection, biological shielding, and missile protection for the Nuclear Steam Supply System. The concrete walls protect the inner liner plate from internal pressures, external environmental effects and provide missile protection. The NRC Staff has concluded that the design of the concrete containment at Harris is acceptable and meets the recommendations of section 3.8.1 of the Standard Review Plan, and the relevant requirements of 10 C.F.R. § 50.55a and General Design Criteria 1, 2, 4, 16 and 50 of Appendix A to 10 C.F.R. Part 50. NUREG-1038, Safety Evaluation Report related to the operation of Shearon Harris Nuclear Power Plant, Units 1 and 2 (November 1983), at 3-29, 30.

Construction and Inspection Respon ilities

6. CP&L has overall responsibility and management control of the construction project at Harris. CP&L maintains on site an organization responsible for overall management of the

project including, among other things, planning and scheduling, quality assurance and quality control, construction inspection and construction engineering. Daniel Construction Company, under the direction and management of CP&L, has the responsibility for performing construction work in accordance with project plans, specifications, codes and license requirements.

7. The inspection function, as it relates to concrete placement of the containment structure, is the responsibility of CP&L and therefore is subject to complete supervision and review by CP&L through visual verification and/or documentation review, and through the use of CP&L inspectors. Civil Quality Assurance ("QA") inspectors are exclusively CP&L personnel, and Quality Control ("QC") and Construction inspectors include CP&L as well as Daniel personnel working under CP&L supervision.

8. Because of this management, supervision and inspection role of CP&L at the Harris project, it is my opinion that the performance of Daniel Construction Company on containment structure construction at other nuclear power plant sites does not apply to the situation at this project.

The Construction and Inspection Process

9. All concrete placements are closely controlled by methods prescribed in site work procedures, technical procedures and administrative procedures. These procedures were developed by engineers, using the architect/engineer's specifications, and relevant industry standards as guidance.

10. The control of concrete placed begins with the purchase and testing of concrete constituent materials. The batching process is also closely monitored, with each batch of concrete being accepted/rejected by a qualified QC Inspector to assure proper mix proportions and homogeneity of the mix. The concrete is further inspected at the placement by a qualified Construction Inspector who verifies the mix design identification number for each truck and follows all aspects of the placing operation including transporting, placing, consolidation and final finishing. In addition, a QA Inspector performs air content, slump, unit weight, and temperature tests in addition to molding compressive strength cylinders on a set frequency for each placement.

11. Measures are taken before a placement begins to prevent formation of honeycombs and voids. Construction Inspection personnel review design drawings to determine the difficulty of the placement. Placements which are determined to be difficult are brought to the attention of the Area Engineer who then selects an appropriate concrete mix design that will perform adequately under the given placement conditions, while still meeting design strength requirements. In some cases, a super plasticized concrete mix design is used when placement conditions require use of a highly workable mix to preclude formation of honeycombs or voids. In preparation for the placements at the top of the containment dome, plywood mock-up

forms were used in advance of the actual placement to test for honeycombing/void formation.

12. A preventative program is also used during the actual placements. Construction Inspection personnel constantly watch the placement to insure that adequate consolidation is being used to effect a dense and homogeneous concrete placement. Special attention is given to vibration of concrete around dense reinforcing steel areas to prevent honeycombing. Craft personnel are instructed as to the importance of adequate vibration. In addition to the use of pencil-type vibrators, vibratory rods were used in areas of congestion to facilitate consolidation. In the area around the equipment hatch (the largest containment penetration), plexiglass forms were employed so that the flow of concrete into congested areas could be observed visually.

13. After each placement is completed, a Post Placement Inspection is conducted by Construction Inspection personnel who examine the exposed concrete surfaces for honeycombing and voids. Honeycombing or voids found are chipped out until sound concrete is encountered in the entire area. The area is then repaired and cured with proper concrete temperature and moisture conditions maintained.

Concrete Placements and Tests

14. The placement of concrete for the base mat of the Unit 1 containment structure took place in July and August of 1978. Placement of the dome was completed in December, 1982. Post-placement compressive strength tests were performed in accordance with applicable ASTM (American Society for Testing and Materials) standards, and test results are as follows:

Location	Compressive Strength (Average) Actual (psi)	Design (psi)
Basemat	5812	4000
Exterior Wall	6065	5000
Dome	4910	4000
Dome	6112	5000

Actual strength exceeds design strength for containment concrete placements by an average of 27.9 percent.

15. Per the requirements in the Final Safety Analysis Report, concrete compression cylinders are required to be laboratory cured in accordance with ACI 214, "Recommended Practices for Evaluation of Compression Test Results of Field Concrete." In addition, the concrete mix must be proportioned for strength in accordance with ACI 211.1, "Recommended Practices for Selecting Proportions for Normal Weight Concrete." Compliance with ACI 211.1 assures that concrete strength is overdesigned to a sufficiert degree that any low strength batches will still fall in an acceptable range.

16. During discovery, Mr. Eddleman criticized the Harris procedure for curing concrete test cylinders as unrepresentative of site conditions. The primary reason that laboratory cylinders are used as opposed to field batches is that the laboratory provides a constant and repeatable temperature and humidity for evaluation of strength. Field cured cylinders are not constant with respect to either temperature or humidity. Concrete industry standards (ACI and ASTM) recognize the difference between laboratory and field curing of concrete cylinder specimens. Their recommended procedures and practices are developed to allow design and construction engineers the best available controls for proportioning, mixing, placing and curing of structural concrete. Contrary to Mr. Eddleman's position, these standards require laboratory cured specimens as control cylinders for strength evaluation criteria.

17. As I describe below, the placement of concrete for the base mat, exterior walls and dome of the Unit 1 containment structure did not result in any significant honeycombing problems. Neither, to my knowledge, did personnel of the NRC's Office of Inspection and Enforcement, some of whom actually observed placements, identify any significant items of noncompliance with respect to these placements.

18. Prior to plant operation, the concrete containment structure will be subjected to a structural proof test, with liner, concrete structures, all electrical and piping

penetrations, equipment hatch, and personnel locks in place. The internal test pressure will be increased from atmospheric pressure to 1.15 times the containment design pressure. This test is to confirm the adequacy of the structure with respect to quality of construction and material.

<u>Honeycombing/Voids</u>

19. Concrete must be proportioned and mixed as a relatively stiff material to assure good strength, durability and density of the hardened concrete. This requirement, on the other hand, inhibits its flow characteristics while in the unhardened state. The flow characteristics of the fresh concrete mixture are improved, however, when exposed to vibration (consolidation) during placement. In addition, a concrete mix with a super plasticizer added to the basic mix may be used when placement conditions require a highly workable mix. If adequate consolidation is not achieved, air pockets or voids are present in the hardened concrete. Current concrete industry procedures (pre-placement, placement, and post-placement) are written to preclude honeycombing/void formation problems with concrete placements. Further, current industry standards utilized for Harris concrete mixes and placement procedures optimize the desirable properties of fresh and hardened concrete. If honeycombing nevertheless occurs, visual inspection by qualified QC/Construction inspectors during the

inspection phases of concrete construction would identify any areas of honeycombing or voids.

20. Only one of the 106 concrete placements for the Unit 1 concrete containment structure base mat, exterior walls and dome was identified as having honeycombing or voids. The honeycombing occurred in a base mat placement of August 17, 1978, and following form removal was reported by a QC Inspector on a QC field report of September 13, 1978, and an Inspection Post-Placement Report of September 18, 1978. To determine the extent of the nonconformanc [illegible]d to facilitate repairs by providing satisfactory surface preparation, the area was chipped to sound concrete. Following the chipping operation, the excavated area was 6 feet in width, a maximum of 3.5 feet in height, and a maximum of 3 feet in depth.

21. A repair procedure was written by CP&L Construction Engineering, and approved by EBASCO, which designated repair methods employing a combination of replacement mortar and replacement concrete. An approved epoxy bonding medium was designated to assure proper bonding in all affected areas. In accordance with these and other applicable quality control and work procedures, the repair replacements were completed by October 9, 1978, and field reports written by the QC Inspector verified placement inspection and accepted the repairs.

Assessment

22. Placement of concrete for the Unit 1 concrete containment structure base mat, exterior walls and dome is complete. Unit 2 has been cancelled. The single instance of honeycombing identified was repaired in a manner which leaves the base mat at the repaired areas in a condition which is at least as good as the original design requirement. This is the result of: (1) using material for repair which equaled or exceeded the quality and strength requirements of the original design, and (2) utilizing procedures that provide for proper placement and bonding. No strength loss evaluation is required because the repair procedures were written by a CP&L discipline engineer and reviewed by the design engineer (EBASCO) to assure that the repaired area meets or exceeds original design requirements. The repair methods were written utilizing current concrete industry standards and procedures. Further, the replacement concrete and mortar used in the repair were tested during the repair placement, and subjected to pre-placement, placement, and post-placement inspections by qualified QC personnel.

23. I am confident that there are no other instances of significant honeycombing (i.e., capable of influencing the strength capabilities of the structure) in the base mat, exterior walls and dome of the concrete containment structure at

the Harris plant. First, the use of a small aggregate concrete mitigates the consequences of honeycombing by naturally resulting in smaller voids between the aggregate. Second, areas of concentration of reinforcing steel, where honeycombing is more likely to occur, were identified in the planning of the concrete placements, and special care was taken to maintain more accurate control of placing requirements and vibration of the concrete Third, any significant honeycombing would create a visible indication on the concrete surface. Because of the thorough inspection program implemented in association with these concrete placements, any such visual indication would have been observed by inspectors, as occurred in the one instance discussed earlier.

24. In addition, when Eddleman 65 postulates that honeycombing or voids in the concrete containment structure could provide a leakage path to the environment during releases of radiation inside containment, it ignores the fact that there is a steel liner on the inside surface of the containment that serves as a leak-tight membrane. Thus the containment is an essentially leak-tight barrier to prevent the uncontrolled release of radioactive effluents to the environment.

25. There is no basis for requiring a soniscope examination of the Harris concrete containment structure, as proposed by Eddleman Contention 65. Such an examination is not required by any industry code or standard, or NRC regulation or

guidance, and should not be undertaken in the absence of apparent significant concrete deficiencies. Here, where only one instance of honeycombing has been identified in concrete placements involving approximately 25,800 cubic yards of concrete with approximately 106,000 square feet of surface area, such a special investigation is unwarranted and would be a needless expenditure of funds and resources. In addition, it would be impractical to perform a soniscope examination of the base mat at this point in the construction process. Access is available only to the inside horizontal surface (ground elevation is 261 feet; see Exhibit B), the top of the mat has been covered with the steel liner plate and an additional five feet of concrete, and installed supports and structural steel seriously limit access even to that surface.

Roland M. Parsons

Roland M. Parsons

Subscribed and sworn to before me
this 17 day of January, 1984.

Deborah R. Harden

Notary Public

My Commission expires My Commission Expires 4-20-86.

Exhibit A

Roland M. Parsons

Project General Manager

I. Date of Birth: March 13, 1936

II. Education:

A. BS Degree in Civil Engineering from Fresno State College, 1959

III. Experience:

A. August, 1964 to November, 1966

1. U. S. Forest Service, Nevada City, California

a. Forest service representative on hydroelectric developments built on forest service land by others.

B. November, 1966 to September, 1973

1. Ebasco Services, Inc., Hartsville, South Carolina; and Jensen Beach, Florida

a. November, 1966 - Field Engineer on construction of H. B. Robinson Unit No. 2 (700 MW Westinghouse PWR nuclear power plant).

b. November, 1967 - Resident Engineer responsible for site engineering and quality control for construction of H. B. Robinson Unit 2.

c. April, 1971 - Senior Resident Engineer responsible for all site engineering for construction of St. Lucie Unit No. 1 (810 MW combustion engineering PWR nuclear power plant).

C. September, 1973 to May, 1974

1. Daniel Construction, Jenkinsville, South Carolina

a. Site Manager of Engineering responsible for all site engineering for construction of V. C. Summer Nuclear Power Plant.

D. June, 1974 to September, 1976

1. Ebasco Services, Elma, Washington

a. Senior Resident Engineer responsible for all site engineering on 1300 MW PWR nuclear power plant.

E. September 20, 1976 to Present

1. Carolina Power & Light Company

a. September 20, 1976 - Employed as Site Manager in the Nuclear Construction Section of the Power Plant Construction Department. Located at the Harris site, New Hill, N. C.

b. April 27, 1979 - Reclassified as Site Manager (Harris) in the Harris Site Management Section of the Power Plant Construction Department. Located at the Harris site, New Hill, N. C.

c. May 3, 1980 - Reclassified as Site Manager - Harris Plant Construction in the Harris Site Management Section of the Power Plant Construction Department. Located at the Harris site, New Hill, N. C.

d. January 31, 1981 - Reorganization - Site Manager - Harris Plant in the Harris Site Management Section of the Nuclear Plant Construction Department. Located at the Harris site, New Hill, N. C.

e. March 22, 1982 - Title changed to Project General Manager.

f. September 3, 1983 - Reorganization - Project General Manager - Nuclear Generation Group, Harris Nuclear Project Department, Harris Plant Construction Section. Located at the Harris site, New Hill, N. C.

IV. Societies, Memberships and Publications:

A. American Society of Civil Engineers

B. Registered Professional Engineer in North Carolina - No. 7634

C. Registered Professional Engineer in South Carolina - No. 3422

D. Registered Professional Engineer in California - No. 16379

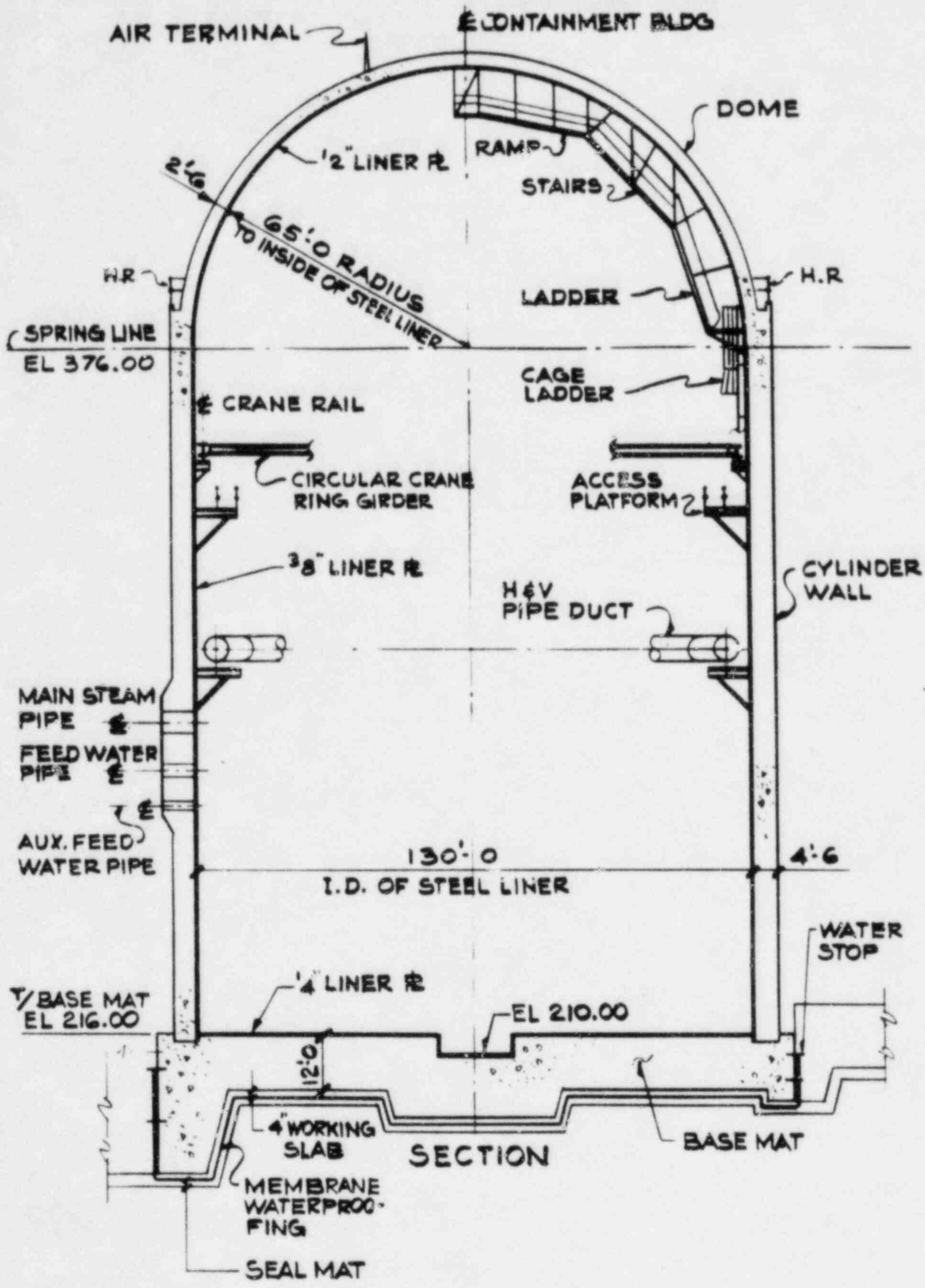
E. Registered Professional Engineer in Washington - No. 15111

F. Registered Professional Engineer in Florida - No. 16700

G. Publication: System For Control of Construction Quality; Proceedings of The American Society of Civil Engineers, Journal of The Construction Division, March, 1972.

H. Publication: System for Material Movement to Work Areas; Journal of The Construction Division, March, 1980.

I. Publication: Is Total CPM Really the Answer for Super Projects; Civil Engineering Magazine, November, 1983.



SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company FINAL SAFETY ANALYSIS REPORT	CONCRETE CONTAINMENT STRUCTURE – GENERAL ARRANGEMENT	FIGURE 3.8.1-1

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CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicants' Motion for Summary Disposition of Eddleman Contention 65," "Applicants' Statement of Material Facts as to Which There is No Genuine Issue to be Heard (Eddleman Contention 65)" and "Affidavit of Roland M. Parsons" were served this 18th day of January, 1984, by deposit in the U.S. mail, first class, postage prepaid, to the parties on the attached Service List.

Thomas A. Baxter

Thomas A. Baxter, P.C.

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