PMVogtleCOLPEm Resource

From: Sweeney, Brian J. [X2SWEENE@southernco.com]
Sent: Thursday, October 15, 2009 5:43 PM
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Subject: SNC Letter ND-09-1578, Response to NRC Waterproof Membrane Questions
Attachments: ND-09-1578 Membrane Questions.pdf

Attached is SNC Letter ND-09-1578, dated October 15, 2009, regarding responses to NRC Region II Office questions on the waterproof membrane.

Brian Sweeney
Southern Nuclear
205-992-6692

Hearing Identifier: Vogtle_COL_Public
Email Number: 259

Mail Envelope Properties (6DF121ED0ABADC4F94CDD879C6424AB01EA07588)

Subject: SNC Letter ND-09-1578, Response to NRC Waterproof Membrane Questions
Sent Date: 10/15/2009 5:43:24 PM
Received Date: 10/15/2009 5:44:07 PM
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Files	**Size**	**Date & Time**
MESSAGE	197	10/15/2009 5:44:07 PM
ND-09-1578 Membrane Questions.pdf	884931	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
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SOUTHERN COMPANY

OCT 15 2009

Docket Nos.: 52-025
52-026

ND-09-1578

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Southern Nuclear Operating Company
Vogtle Electric Generating Plant Units 3 and 4
Response to Questions on the Waterproof Membrane

Ladies and Gentlemen:

During a U.S. Nuclear Regulatory Commission (NRC) visit to the Vogtle Electric Generating Plant Units 3 and 4 (VEGP 3 & 4) site on September 2, 2009, a Region II inspector requested clarification of certain aspects of the waterproof membrane that will be used on Nuclear Island (NI) foundations, as described in the Vogtle Early Site Permit Application. On September 8, 2009, the Region II office provided waterproof membrane questions to Southern Nuclear Operating Company (SNC) via email. SNC is hereby providing the answers to the questions in the enclosure to this letter.

If you have any questions regarding this letter, please contact Mr. J. T. Davis or Mr. B. W. Waites at (205) 992-7024 at (205) 992-7692.

Mr. J. A. (Buzz) Miller states he is an Executive Vice President of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

Joseph A. (Buzz) Miller

Sworn to and subscribed before me this 15th *day of* October, *2009*

Notary Public: Dana M. Williams

My commission expires: 12/29/2010

JAM/BJS/dmw

Enclosures:
1. Response to NRC Region II Questions on VEGP Units 3 & 4 Waterproof Membrane
2. BR Research Ballast Impact Test Document
3. Stirling Lloyd "Features and Benefits" Document

cc: Southern Nuclear Operating Company
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Mr. D. H. Jones, Site Vice President, Vogtle 3 & 4
Mr. M. K. Smith, Technical Support Director
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File AR.01.02.06

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Southern Nuclear Operating Company

ND-09-1578

Enclosure 1

Response to NRC Region II Questions

On

VEGP Units 3 & 4 Waterproof Membrane

Waterproof Membrane Questions From NRC Region II Office

NRC Question No. 1:

The product data sheet for the waterproofing membrane, Stirling Lloyd "integritank", states that the product is water proof with no leaks up to 6 meters or approximately 19.7 feet.

SNC Response:

The Sterling Lloyd product data sheet for "Integritank" shows that the system passes a waterproofing penetration test at 6 meters of head pressure. However, this does not denote the maximum hydrostatic pressure that the membrane can withstand. The referenced "Ballast Impact Test" (Enclosure 2) demonstrates that the membrane passes a waterproof penetration test at 5 bar (167 feet head of water) (after being subject to train loading with ballast load directly on the membrane). Stirling Lloyd's "Features and Benefits" document (Enclosure 3) reports the membrane's ability to resist "pressures equivalent to 170 meters head of water".

NRC Question No. 2:

Section 2.4 of the DCD [design control document] states that the "AP1000 is designed for a normal groundwater elevation up to plant elevation 98' and for flood level up to plant elevation 100'." Grade elevation is 100.' Therefore, the DCD requires the plant to be protected up to grade. The mudmat of the nuclear island is approximately 45' below grade requiring 45' of head "pressure" protection to meet DCD requirements. The product only provides 19.7' of head "pressure" protection. I understand that Vogtle is located such that ground water and flood levels are anticipated to be below the mudmat and that the sand or granular drain behind the MSE [mechanically stabilized earth] wall will provide a pressure reduction and that the hydraulic gradient will be reduced as water flows through any cracks in the MSE wall. My question is: Do you take credit for any of these systems that reduce pressure to meet the DCD requirements or is a deviation from the DCD required by having a product that does not protect against the full head applied with the assumptions made in the DCD?

SNC Response:

SNC does not intend to take credit for MSE wall drainage systems that reduce pressure to meet the DCD requirements. Also, SNC does not intend to pursue a deviation from the DCD requirement to protect against the full hydrostatic head applied from the mudmat up to final surface grade. Instead, SNC (through its EPC contractor) intends to pursue laboratory testing to confirm that the membrane meets waterproofing requirements described in the DCD.

NRC Question No. 3:

My other question I believe you are referencing is concerning the LWA. The LWA states in section 3.8.5.1.1 "Prior to procurement of the membrane material, a qualification program will be developed to demonstrate that the selected material will meet the waterproofing and friction requirements. This qualification program will address, as a minimum, the following: (1) chemical properties of the membrane material, (2) physical properties of the membrane material, (3)

surface finish requirements for the lower mudmat, and (4) installation procedures necessary to achieve the required properties and coefficients of friction."

This qualification program is in addition to the coefficient testing and will be used to develop application procedures. My question was have you developed this qualification program or know the details of these items?

SNC Response:

SNC has not yet finalized this program. SNC (through its EPC contractor) intends to procure a laboratory testing agency for assistance in developing the qualification program. Requirements for this program, as described in the DCD and LWA, are known at this time, but program specifics will not be finalized until after laboratory testing is complete.

NRC Question No. 4:

I also requested information about the shear strength of the product. The NRC's Safety Evaluation Report for Vogtle ESP/LWA Section 3.8.5.4.3 concluded "With respect to the shear strength of the waterproof membrane, the staff agrees with the applicant's statement that the waterproofing membrane, which possesses tensile strength of 1,700 psi, would likely possess shear strength greater than 25.1 psi. Nonetheless, the staff requires that a confirmatory testing for the shear strength of the waterproofing membrane be performed prior to the actual construction of the waterproofing membrane, or that the test is an item for ITAAC." Can you tell me if you plan to conduct a confirmatory shear test of the membrane and the details of the test?

SNC Response:

Membrane shear testing will be performed by the testing agency prior to procurement. The test procedure will either be consistent with ASTM D 732-02 (Standard Shear Strength of Plastics by Punch Tool) or as recommended by the testing agency and approved by SNC's EPC contractor.

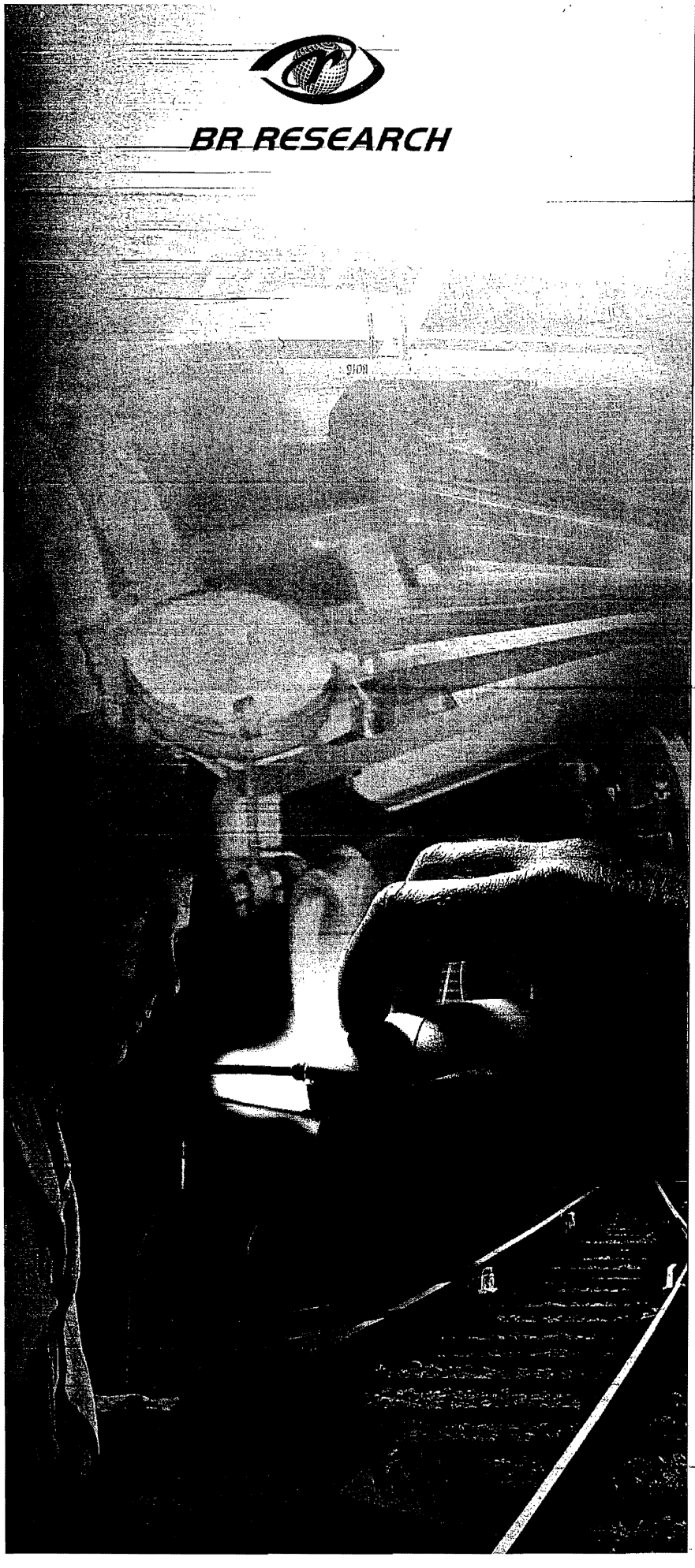
Southern Nuclear Operating Company

ND-09-1578

Enclosure 2

BR Research Ballast Impact Test Document

NOTE: The enclosed document consists of nine pages.


BR RESEARCH

TESTING OF A WATERPROOF MEMBRANE SYSTEM FOR STIRLING LLOYD

Author(s)

J Cahill

Approved By

B M Eickhoff
Manager, Traction & Rolling Stock

Customer

Stirling Lloyd

BR Research, PO Box 2,
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Report No
RR-TRS-96-011
RE-ISSUED
Date: AUGUST 1996

ADDENDUM

Report Title: Testing of Waterproof Membrane Systems for Stirling Lloyd

Report Number: RR-TRS-96-011

Author(s): J Cahill

This report was originally issued under BR Contract No: B0836 in December 1990. It has been re-issued in July 1996 at the requirement of Stirling Lloyd Polychem Limited in order to identify one of the materials tested by its trade name, the material was originally not identified to the test laboratory other than being coloured white, and was given the test lab ident L378/2. Stirling Lloyd have now identified this material as "Eliminator HM" and it is so referenced in this re-issuing of the report. There are no other changes to the report.

J Cahill
Structures Laboratory, BRR

SUMMARY

Report Title: Testing of Waterproof Membrane Systems for Stirling Lloyd

Report Number: RR-TRS-96-011

Author(s): J Cahill

The Structures Laboratory at BR Research has carried out comparative tests for Stirling Lloyd on two samples of waterproofing membrane for bridges. The tests were based on SNCF/SNCB specifications, and consist of fatigue loading through a ballast bed, followed by hydrostatic testing to detect leakage.

One sample passed the test successfully.

CONTENTS

STRUCTURES LABORATORY
REPORT BY TECHNICAL LETTER

TESTS ON ELIMINATOR MEMBRANE FOR STIRLING LLOYD

1.0 RESEARCH HAS CARRIED OUT

The Structures Laboratory at British Rail Research have carried out a series of tests for Stirling Lloyd on two samples of waterproofing membrane. The membrane is a system to provide a waterproof layer onto a concrete substrate, and in the Railway Engineering application is covered by, and loaded via, the ballast and the track system that it supports.

2.0 TASK REFERENCE

The work was carried out under BR contract number B0836 and under Laboratory BS5750 Task Reference SLT 9/90/0010.

3.0 TEST SPECIFICATION

The tests were based on SNCF/SNCB specification of which an unreferenced copy was provided by Stirling Lloyd. The testing machinery referred to in the text of this document suggests that specification for dynamic and hydrostatic tests is at least thirty years old. The test specification for dynamic and hydrostatic tests is given in Appendix 1. For these tests, the maximum dynamic force was increased from 125 kN, keeping the same specified minium dynamic force of 41 kN.

4.0 TEST SPECIMENS

Two tests specimens were provided by Stirling Lloyd. Both took the form of 36 inch by 24 inch by 2 inch thick concrete paving slab with the eliminator membrane system applied to one dimpled face. One tests specimen was coloured yellow and identified as "Eliminator S". The other was coloured white and is called "Eliminator HM", the two test specimens were given the test material reference L378/1 (coloured yellow), and L378/2 (coloured white).

5.0 TEST RIG

The work was carried out using a special test fixture in a 1000 kN Dartec servohydraulic testing machine.

The machine calibration reference is NAMAS Ref 0090 Serial No 01433 dated 12/6/90.

Each test specimen was grouted into a steel tray placed on the bed of the testing machine, using a sand-filled epoxy mortar. This was to ensure continuous support for the slab to avoid cracking. The grouting was done in situ in the testing machine,

The test fixture, based on the specification requirements, consisted of a steel tube, 595mm inside diameter with a wall thickness of 12mm. The tube was 400 mm long and machined true at each end.

The tube was provided with a bolted on lid with pressure tappings and a sealing gasket, for use

in the hydrostatic part of the test.

Figure 1 shows a general view of the test fixture in the testing machine .

6.0 TEST PROCEDURE

6.1 Repeated Loading Test

For the dynamic loading test on each specimen, the tube was placed centrally over the test specimen. It was then filled to a depth of 300mm with fresh granite ballast that had been graded to 25/50 size using a ballast sieve. The ballast was put on top of the membrane in 100mm layers and settled down by hand.

On top of the ballast was placed a 500m thick steel plate 300mm square.

The testing machine was then arranged to load onto this plate via a spherically mounted loading platten 250mm diameter.

The machine was then run dynamically in force feedback control, driven by a sinusoidal command signal at a frequency of 5 Hz. The maximum force was 185 kN, the minimum force was 41 kN. The test was run continuously for a total of 2 million cycles.

At the end of the test, the ballast was removed and the surface of the membrane cleaned off and examined.

6.2 Hydrostatic Test

Following the repeated loading test on each specimen, the specification required a hydrostatic leakage test (subject the provision that the membrane was not penetrated under repeated loading).

The hydrostatic test was carried out as follows:

The steel tube was sealed to the membrane using a silicone rubber mastic. The lid was sealed to the tube using a cork gasket and gasket cement. The tube was then filled with water. The water pressure was then raised to 5 Bar using a hand water pump. At the same time, the force applied by using the testing machine was gradually increased so as to ensure that the whole assembly was kept in contact with the membrane. When the required pressure level was reached, the whole assembly was sealed via and isolating tap. This ensured that any drop in pressure would be solely due to water leakage through the membrane. The pressure was measured using a calibrated pressure gauge, and also monitored in one test using a pressure transducer reading out to a chart recorder. The pressurisation was maintained on each test specimen for a period of 24 hours.

7.0 TEST RESULTS

7.1 Eliminator "S"(coloured yellow)

The repeated loading tests was uneventful. Loading proceeded continuously at a frequency of 5Hz for 2 million cycles of sinusoidal loading. Some initial settling of the ballast was noted, but the machine being in force control compensated for this.

When removing the ballast for examination, it was noted that fragmentation had occurred throughout the 300mm depth. About one third of the ballast was reduced in size about 20mm.

On examination, it was noted that the membrane surface had been damaged by the ballast, with two points in particular where tearing and apparent penetration had taken place, see Figure 2.

The specification states that a hydrostatic tests should be carried out if there is no sign of perforation In this case, a test was carried out for completeness and to gain testing experience.

The water pressure gradually decayed during the 24 hour tests from 5 Bar to 3.6 Bar, although there were no signs of external leakage on the edges of the concrete slab.

This result confirmed that the membrane was penetrated.

7.2 Eliminator HM (coloured white)

Repeated load testing was very similar to the first test, including the ballast fragmentation.

On examination of the membrane, it was noted that there were marks from the ballast, and there were three places where possible penetration had taken place, having the appearance of splits about 15mm long. There was no tearing of the surface as had been noted in the previous test.

The hydrostatic test confirmed that the membrane was intact, with no significant change in pressure over the 24 hour period.

8.0 CONCLUSIONS

Under the tests carried out, which were at a higher load than specified in the SNCF/SNCB document, the yellow-coloured "Eliminator S" failed the tests, whereas the white coloured "Eliminator HM" test specimen passed, although with some marking of the surface.

J Cahill
Structures Laboratory

BR RESEARCH

BR Research, PO Box 2, London Road, Derby, DE24 8YB, England Tel 01332 264908 Fax 01332 263178

Southern Nuclear Operating Company

ND-09-1578

Enclosure 3

Stirling Lloyd “Features and Benefits” Document

NOTE: The enclosed document consists of two pages.

stirling lloyd

THE TECHNOLOGY OF PROTECTION

FEATURES & BENEFITS

Integritank

SPRAY-APPLIED WATERPROOFING MEMBRANE SYSTEM

1. Proven Performance

Integritank is a very high performance waterproofing membrane based on the Eliminator system, both systems sharing the same base resins which have now been used on over 5, 000 structures worldwide without failure for over 25 years. Integritank has been fully tested and approved by certifying authorities for use as internal or external tanking.

2. Spray-Applied, Joint Free

Integritank is a spray-applied solvent-free acrylic resin based system. Formed in situ, the seamless membrane is free of the vulnerable joints which are recognized as areas of weakness in traditional preformed sheet systems. Similarly, complex detailing which often leads to failure of preformed sheet systems, presents no problem for a spray system.

3. High Adhesion – No Tracking

Integritank offers a very high bond to both concrete and steel substrates. For concrete we require a minimum tensile bond to concrete of 0.7 N/mm^2 with failure in the concrete. This level of adhesion is of vital importance to a waterproofing membrane, as should the system be punctured, this bond will prevent water coursing between membrane and substrate. Furthermore, high bond strength also adds to the system's durability, particularly when subjected to construction traffic.

4. Highly Weather-Tolerant

The acrylic resins used in Integritank do not react with moisture. This is particularly pertinent for work undertaken in high relative humidity and where application is likely to be undertaken during a rainy season. The only constraints in the use of Integritank are that the substrate be "surface dry" and above dew point. This ensures that moisture does not act as a physical barrier, interfering with the bond between membrane and substrate.

5. Two Coats, Color-Coded

Integritank is applied in two color-coded coats. Two coats are preferred by many engineers as they reduce the possibility of pinholes formed as a result of out-gassing from porous concrete substrates. Two coats also allow for better quality control during application, both for applicator and resident engineer. The pale pigmentation of the system's two coats was specifically chosen to highlight any potential flaws in the finished membrane, (darker colors would tend to conceal these). Pigment content is restricted to 5% and this gives the system translucence on initial application, enabling the applicator to discern and remedy areas of lesser thickness and also indicating areas to be "wet film gauged" by the engineer.

6. Long Life

The physical properties of Integritank have been specifically designed to cope with the rigorous requirements of both internal and external tanking. Integritank is made of acrylic resins which give it excellent UV and chemical resistance. Accelerated aging tests reveal no significant deterioration in physical properties and waterproofing ability over a simulated 50 year period, so unlike bituminous systems, Integritank will not embrittle, shrink or crack with age.

Integritank
SPRAY-APPLIED WATERPROOFING MEMBRANE SYSTEM

7. **Excellent Durability**

The durability of Integritank is superior to all traditional waterproofing membranes. Tests carried out by national railroad operators have shown that the unprotected system can be covered with ballast and withstand 40 ton axle loads without sustaining damage; the system can therefore be used without protection from backfill and does not need protection from site traffic.

8. **Outstanding Water Resistance**

Integritank demonstrates very low water absorption rates and had the lowest chloride transmission values of 47 waterproofing systems tested by the U.K.'s Transport and Road Research Laboratory (0.002% over a 12 month period of complete immersion).

9. **Dynamic Crack-Bridging**

At 120 mils, Integritank can bridge dynamic crack-opening of 125 mils at low temperatures (-4°F). (ASTM C836).

10. **High Water Pressure Resistance**

The system has successfully been tested to pressures equivalent to 170 meters head of water.

11. **Quality Application**

Application of Stirling Lloyd products may only be undertaken by fully trained, Authorized Contractors, who must comply with Stirling Lloyd's onsite Quality Assurance Plan.

12. **Quality Manufacture**

Integritank is manufactured under a ISO 9000-2 quality certified scheme.

13. **Rapid Installation**

Integritank is applied at rates typically of 10,000 ft^2 per day and the system cures and is fully trafficable within 1 hour. This fast application and cure gives the client the ability to accelerate his waterproofing program. This flexibility can prove vital in meeting critical dates in tight construction programs.