



TECHNICAL REPORT

NUMBER

759

TITLE

Elcometer Adhesion Tests
Nutec Concrete Coating Repair Systems

11S/1201/11S/1201

11S/1201/11/1201

FOR

Preparation for: Comanche Peak Nuclear Plant
Glen Rose, Texas

CUSTOMER

Submitted by: Jerry Arnold *[Signature]*

Accepted by:

Approved:

Date: 4/19/84

SOUTHERN IMPERIAL COATINGS CORPORATION, INC.

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PDR FOIA
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PDR

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Introduction: Following the installation of the 11S/1201 concrete coating system, it sometimes becomes necessary to repair damaged areas or fill holidays in the original system. Also separate applications sometimes result in overlap of the newly applied coatings to adjacent, aged systems. The result is the application of Nutec 11S or 11 over previously applied and cured 1201 topcoat. The purpose of this adhesion test is to demonstrate the validity of this practice.

Procedures: Concrete blocks, measuring 2x4x2" were coated with the following systems:

- A] Nutec 11S (10 mils)
Nutec 1201 (3 mils)
Nutec 11S (10 mils)
Nutec 1201 (3 mils)
- B] Nutec 11S (35 mils)
Nutec 1201 (16 mils)
Nutec 11S (35 mils)
Nutec 1201 (16 mils)
- C] Nutec 11S (10 mils)
Nutec 1201 (3 mils)
Nutec 11 (3 mils)
Nutec 1201 (3 mils)
- D] Nutec 11S (35 mils)
Nutec 1201 (16 mils)
Nutec 11 (20 mils)
Nutec 1201 (16 mils)

The dry film thicknesses applied were selected to envelope the thickness range actually applied at nuclear jobsites. For application and curing details refer to the attached panel preparation sheets.

Six adhesion tests were conducted on each system (two tests per concrete block) using an Elcometer adhesion tester.

Results:

The attached laboratory result sheet outlines the individual results. Below are the resultant averages:

System	Ave. PSI	Mode of Failure
11S (10mils)/1201 (3mils)/11S (10mils)/1201 (3mils)	313	100% Concrete
11S (35mils)/1201 (16mils)/11S (35mils)/1201 (16mils)	337	75% Concrete 25% 11S(1st Co)
11S (10mils)/1201 (3mils)/11 (3mils)/1201 (3mils)	325	85% Concrete 7% 11S 8% Glue
11S (35mils)/1201 (16 mils)/11 (20mils)/1201 (16 mils)	313	85% Concrete 15% 11S

Conclusions: All pulls exhibited concrete failure and surpassed the minimum 200 PSI values required by ANSI N5.12.

ELCOMETER ADHESION

Work Order 1 0125
Glue Type 2 035

ON 2X2X4 CONCRETE
Dolly #1 = Side "B"
#2 = Side "A"

Date 4-17-84

PANEL NO. SIZE	SYSTEM	DFT	DOLLY NO.	PSI	TYPE & POSITION OF FAILURE*							
					11		11S		CONCRETE		GLUE	
					%CO	%AD	%CO	%AD	%CO	%AD	%CO	%A
6151	11S/12 10/3 MILS MILS		1	260					100			
			2	230					100			
6152	①		1	450					100			
			2	290					100			
6153			1	410					100			
			2	240					100			
6154	11S/11 35/1 MILS MILS		1	390					100			
			2	380	40				60			
6155	②		1	260	30				70			
			2	450	40				60			
6156			1	320	20				80			
			2	220	20				80			
6157	11S/11 10/10 MILS MILS		1	410					100			
			2	290					50		50	
6158	③		1	230	20				80			
			2	450					100			
6159			1	210	20				80			
			2	360					100			
6160	11S/11 35/20 MILS MILS		1	460	30				70			
			2	280	30				70			
6161	④		1	370					100			
			2	230					100			
6162			1	320					100			
			2	220	30				70			

*CO = Cohesion

AD = Adhesion

ELCOMETER ADHESION

Work Order ARO125
Glue Type DURO ES

Date 4-17-84

[illegible]

*CG = Cohesion

AD = Adhesion

SPRAY OUT & TESTING INSTRUCTIONS

AR0125

PAGE 1 OF 3		ORIGINATOR		Elcometer Addressing		AT # R0090							
PANEL	PANEL # OR BLOCK	SIZE OR SIDE	S P	COATING DETAILS				REMARKS	TEST CODE				
				CODE	BATCH B	BATCH C	D F T			W F T	T E M	R H	DATE / TIME
6151		2x1x2		11S			10	11.4	69	86	11/28/41		
				1201			3	5.6	68	62	11/4/41		
				11S			10	11.4	69	67	11/7/41		
				1201			3	5.6	74	74	11/16/41		
6152		✓					✓						
							✓						
							✓						
							✓						
							✓						
							✓						
6154		2x4x2		11S			35	31.8					
				1201			16	30.4					
				11S			35	31.8					
				1201			16	30.4					
6155		✓					✓						
							✓						
							✓						

SPRAY OUT & TESTING INSTRUCTIONS

AR0125

PAGE 2 OF 3

ORIGINATOR

AT # R0090

PANEL			COATING DETAILS									REMARKS	TEST CODE
PAN # OR BLOCK	SIZE OR SIDE	S P	CODE	BATCH B	BATCH C	D F T	W F T	T E M	R H	DATE/ TIME	D F T		
6156	✓					✓							
						✓							
						✓							
						✓							
6157	2x4x2		11S			10	144						
			1201			3	5.6						
			11			3	3.8						
			1201			3	5.6						
6158	✓					✓							
						✓							
						✓							
						✓							
6159	✓					✓							
						✓							
						✓							
						✓							
6160	2x4x2		11S			35	31.8						
			1201			16	29.6						
			11			20	15.1						
			1201			16	29.6						

AR0125

ORIGINATOR

AT #: R0090

[illegible]

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 11S/Nutec 1201/Nutec 11S/Nutec 1201
2. TYPE SUBSTRATE: Concrete
3. SURFACE PREPARATION (Describe): All surfaces lightly wirebrushed to remove efflorescence and/or laitance, followed by a 80 PSI compressed air blow down.
4. PRODUCT DATA: SAMPLE NO. (s) : 6151, 6152, 6153
5. DATE AND TIME CURING COMPOUNDED OR PRIMER APPLIED: N/A

<u>COAT</u>	<u>PRODUCT</u>	<u>PRODUCT CODES</u>	<u>BATCH #</u>	<u>APPLICATION METHOD</u>	<u>CONDITIONS R/H(*F) XR.II.</u>	<u>THICKNESS (ins.)</u>	<u>TIME & DATE APPLIED</u>
1	Nutec	11S	4286/4287/4288	Squeegee	69/86	12.3	4/2/84
2	Nutec	1201	4284/4285	Spray	68/62	3.7	4/5/84
3	Nutec	11S	4286/4287/4288	Squeegee	69/67	12.1	4/7/84
4	Nutec	1201	4284/4285	Spray	74/74	3.5	4/9/84

CURING CONDITIONS: AMBIENT TEMP. 60 - 100 °F REL. HUMIDITY 40 - 80 % MINIMUM CURE 8 DAYS

TEST PROCEDURE: Elcometer Adhesion

TEST PERFORMED BY: Imperial

*DATE SUBMITTED: 4-17-84

APPROVED BY: Arnold E. Arnold

REPORT NUMBER 759

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 11S/Nutec 1201/Nutec 11S/Nutec 1201
2. TYPE SUBSTRATE: Concrete
3. SURFACE PREPARATION (Describe): All surfaces lightly wirebrushed to remove efflorescence and/or laitance, followed by a 80 PSI compressed air blow down.
4. PRODUCT DATA: SAMPLE NO. (s) : 6154, 6155, 6156
5. DATE AND TIME CURING COMPOUNDED OR PRIMER APPLIED: N/A

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/H(*F) XR.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	Nutec	11S	4286/4287/4288	Squeegee	69/86	37.5	4/2/84
2	Nutec	1201	4284/4285	Spray	68/62	4.3	4/5/84
3	Nutec	11S	4286/4287/4288	Squeegee	69/67	11.2	4/7/84
4	Nutec	1201	4284/4285	Spray	74/74	3.5	4/9/84

CURING CONDITIONS: AMBIENT TEMP. 60 - 100 *F REL. HUMIDITY 40 - 80 % MINIMUM CURE 8 DAYS

TEST PROCEDURE: Elcometer Adhesion

TEST PERFORMED BY: Imperial *DATE SUBMITTED: 4/17/84

APPROVED BY: Spald E. Arnold REPORT NUMBER 759

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 11S/Nutec 1201/Nutec 11/Nutec 1201
2. TYPE SUBSTRATE: Concrete
3. SURFACE PREPARATION (Describe): All surfaces lightly wirebrushed to remove efflorescence and/or
laitance, followed by a 80 PSI compressed air blow down.
4. PRODUCT DATA: SAMPLE NO. (s) : 6157, 6158, 6159
5. DATE AND TIME CURING COMPOUNDED OR PRIMER APPLIED: N/A

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/H(*F) X R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	Nutec	11S	4286/4287/4288	Squeegee	69/86	12.2	4/2/84
2	Nutec	1201	4284/4285	Spray	68/62	4.3	4/5/84
3	Nutec	11	4290/4292/4293	Squeegee	69/67	4.5	4/7/84
4	Nutec	1201	4284/4285	Spray	74/74	3.5	4/9/84

CURING CONDITIONS: AMBIENT TEMP. 60 - 100 °F REL. HUMIDITY 40 - 80 % MINIMUM CURE 8 DAYS

TEST PROCEDURE: Elcometer Adhesion

TEST PERFORMED BY: Imperial *DATE SUBMITTED: 4/17/84

APPROVED BY: *Frank E. Arnold* REPORT NUMBER 759

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 115/Nutec 1201/ Nutec 11/ Nutec 1201
2. TYPE SUBSTRATE: Concrete
3. SURFACE PREPARATION (Describe): All surfaces lightly wire brushed to remove efflorescence and/or laitance, followed by a 80 PSI compressed air blow down.
4. PRODUCT DATA: SAMPLE NO. (s) : 6160, 6161, 6162
5. DATE AND TIME CURING COMPOUNDED OR PRIMER APPLIED: N/A

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/H(*F) X R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	Nutec	115	4286/4287/4288	Squeegee	69/86	36.0	4/2/84
2	Nutec	1201	4284/4285	Spray	68/62	17.4	4/5/84
3	Nutec	11	4290/4292/4293	Squeegee	69/67	21.9	4/7/84
4	Nutec	1201	4284/4285	Spray	74/74	16.8	4/9/84

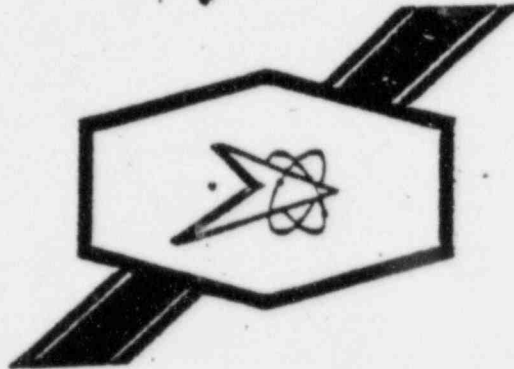
CURING CONDITIONS: AMBIENT TEMP. 60 - 100 °F REL. HUMIDITY 40 - 80 % MINIMUM CURE 8 DAYS

TEST PROCEDURE: Elcometer Adhesion

TEST PERFORMED BY: Imperial *DATE SUBMITTED: 4/17/84

APPROVED BY: *John E. Ames* REPORT NUMBER 759

Imperial



TECHNICAL REPORT

NUMBER

553-81

TITLE

TEST PROGRAM TO EVALUATE DBA PERFORMANCE
OF OVERLAP COATING SYSTEMS (CARBOLINE/IMPERIAL)
FOR BEAVER VALLEY UNIT 2

FOR

GENERAL USE

CUSTOMER

STONE AND WEBSTER

Submitted by: GERALD E. ARNOLD

Approved: ROBERT R. TAYLOR

Date: DECEMBER 24, 1981

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85110-50-331

TEST PROGRAM TO EVALUATE DBA PERFORMANCE
OF OVERLAP COATING SYSTEMS (CARBOLINE/IMPERIAL)
FOR BEAVER VALLEY UNIT 2

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SCOPE:

The purpose of this test was to evaluate the DBA performance of Carbolina/Imperial mixed systems for use at Beaver Valley 2 Nuclear Plant. Systems to be tested are:

- A) CZ-11/191
- B) CZ-11/191/1201
- C) CZ-11/1201
- D) CZ-11/1201/191
- E) CZ-11/11S/11/1201

BACKGROUND:

The above systems are possible overlap combinations at Beaver Valley especially on steel imbeds. Most steel imbeds at the project are already coated with Carbolina's CZ-11 primer or CZ-11 topcoat with #191. When the adjacent concrete is coated with Imperial's 11S/11/1201 system, some of the coated imbeds are overlapped.

The test specimens were prepared under the direction of Stone and Webster by painters at the Beaver Valley Project. The coated specimens were then submitted to Imperial. Imperial coordinated the testing activities at ORNL. The work was authorized by Stone and Webster's Purchase Order # E24476.

SUMMARY OF RESULTS:

All test specimens were irradiated to 2.66×10^7 rads and then DBA tested with maximum temperature and pressure parameters of 340°F and 70 PSIG respectively. All panels performed in accordance with the acceptance criteria of ANSI N101.2.

PROCEDURE:

The test specimens were fabricated and coated at the Beaver Valley Nuclear Plant in Shippingport, Pa. Section 2 of this report contains the Stone and Webster procedure for test specimen preparation. The specific panel preparation data can be found in Section 3. It describes the coating application performed by Stuart Painting under the surveillance of Stone and Webster Quality Control. The coated specimens were allowed to cure and then were shipped to Imperial coatings. Coordination of the testing activities was performed by Imperial through its contract with ORNL. Authorization of this testing program was made by Stone and Webster per Purchase Order #E24476.

Test Program To Evaluate DBA Performance Of
Overlap Coating Systems (Carboline/Imperial)
For Beaver Valley Unit 2
Page 2

The test specimens were submitted to Oak Ridge National Laboratories where they were exposed to a cumulative radiation dose of 2.66×10^7 rads and then DBA tested. The test was designed to be subjected to maximum temperature and pressure of 280°F and 45 PSIG respectively. However, during the test a sudden surge in these parameters resulted in a maximum temperature of 340°F and a maximum pressure of 70 PSIG. The temperature/pressure spike lasted for only 1.5 minutes. The initial 28 hours of the DBA tested were performed in the autoclave. The remaining 11 days were conducted in a constant temperature chamber at 130°F and 100% RH.

RESULTS:

The test results, Section 5, describe the condition of the panels following irradiation then again at the end of DBA testing.

CONCLUSIONS:

The tested systems met the acceptance criteria of ANSI N5.12 (radiation tolerance) and ANSI N101.2 (DBA testing). Two defects (unacceptable per ANSI) were noted on panels 4-1-4-2, and 4-3-4-4, along the coating overlap area where the repair coating was tied into the previously applied system. Some minor separation was occurring at this interface prior to submittal of the panels to ORNL. This separation can be attributed to the taping method used to apply the repair coating and the length of time the tape was allowed to remain on the panels. When the specimens were received by Imperial, the tape was still intact along the edges of the 3, 4 and 4A series. The taping resulted in high millages along the tape line, solvent entrapment, and exposed repair primer. Some of the repair system began to peel back a short distance from the tape line when the tape was removed. As a consequence of these observations, the minor defects noted on panels 4-1-4-2 and 4-3-4-4, should be ignored, especially since the remaining four panels 4-5-4-6, 4-1A-4-2A, 4-3A-4-4A and 4-5A-4-6A, exhibited no defects.

Manufacturers: ImperialNew Orleans, Louisiana

Analytical Chemistry Division

Oak Ridge National Laboratory

Date: October 29, 1981SYSTEM IDENTIFICATIONx Steel panelConcrete block

CZ-11/1201/191

CZ-11/1201

DBA TEST

ORNL Master Analytical Manual Method No. 2 0922.

ORNL Log Book No. A9675, A10-8-1.Sample No.DBA phaseTest results

3-1-3-2

spray*

Front: Coatings intact, no defects after one day. Blisters, #6 few, at coating interphase and weld area at end of test.

Rear: Coatings intact no defects after one day. Blisters, #6 few, at coating interphase and weld area at end of test.

3-3-3-4

spray*

Front: Coatings intact, no defects after one day. Blisters, #6 few, at weld area at end of test.

Rear: Coatings intact, no defects after one day. Blisters, #6 few, insert area at end of test.

3-5-3-6

spray*

Front: Coatings intact, no defects after one day. Blisters, #4 few, weld area and coating interphase at end of test.

Rear: Coatings intact, no defects all areas.

*Irradiated.

Evaluated

Paul L. Apple

Approved

L. T. G. Lin

SUMMARY OF RESULTS

Panel No.	System	DRA Results
1/1	CZ-11/1201	No Defects
1/2	CZ-11/1201	No Defects
1/3	CZ-11/1201	No Defects
2/1	CZ-11/11S/11/1201	#8M
2/2	CZ-11/11S/11/1201	#8M
2/3	CZ-11/11S/11/1201	#8M
3-1-3-2	CZ-11/1201, CZ-11/1201/191	#6 at coating interphase and weld are
3-3-3-4	CZ-11/1201, CZ-11/1201/191	#6F weld area
3-5-3-6	CZ-11/1201, CZ-11/1201/191	#4F weld area (front only)
4-1-4-2	CZ-11/191, CZ-11/191/1201	Minor separation at coating interphas
4-3-4-4	CZ-11/191, CZ-11/191/1201	One large blister on 4-3
4-5-4-6	CZ-11/191, CZ-11/191/1201	No Defects
4-1A-4-2A	CZ-11/191, CZ-11/191/1201	No Defects
4-3A-4-4A	CZ-11/191, CZ-11/191/1201	No Defects
4-5A-4-6A	CZ-11/191, CZ-11/191/1201	No Defects