Imperial

TECHNICAL REPORT

NUMBER

463-81

TITLE

Design Basis Accident Testing - NUTEC #6/NUTEC #1201
Above average film thicknesses and multicoat application.

FOR

COMPANY KNOWLEDGE

CUSTOMER

Submitted by: Gerald E. Arnold
Accepted:
Approved:

Date: January 16, 1981

SOUTHERN IMPERIAL COATINGS CORPORATION, INC.
P. O. Box 29077, • New Orleans, Louisiana 70189
Phone: (504) 254-1433

PANEL PREPARATION DATA

SCOPE: To evaluate the performance of the NUTEC #6/NUTEC #1201 coating system at higher film thicknesses and in multi-coat applications under Design Basis Accident conditions.

BACKGROUND: This information is invaluable because:

a. applications commonly exceed the specified film thickness range for a particular jobsite.

b. repair and touch-up work usually result in multi-coats of primer and topcoat which cumulatively exceed the specified dry film thickness for the total system.

SUMMARY: Steel panels were coated with Nutec 6 and Nutec 1201 in multi-coats and at higher than usual film thicknesses. The panels were then submitted to Oak Ridge National Laboratories for DBA testing at a maximum temperature and pressure of 385°F. and 70 psig respectively.

Systems (and film thicknesses) tested are as follows:

1. Nutec #6(8-11.5 mils)/Nutec 1201 (8-11.5 mils)

2. Nutec #6(4-6 mils)/Nutec 6(4.5-7 mils)/Nutec 1201 (4.5-6 mils)

3. Nutec #6/4.5-6.0 mils)/Nutec #6 (5.5-6.5 mils)/Nutec #6 (4.5-5.5 mils) Nutec #1201 (5.0-7.5 mils).

4. Nutec #6/(3.0-5.0 mils/Nutec 1201 (5.5-7.5 mils)/Nutec 1201(7.0-8.0 mi

5. Nutec #6 (3.5-5.5 mils)/Nutec 1201 (6.0-7.5 mils)/Nutec 1201 (5.0-6.5 mi Nutec #1201 (6.0-8.0 mils).

In addition to DBA testing, systems #3 and #5 were irradiated to 1×10^9 rads.

RESULTS: All panels passed the radiation and DBA testing.

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #6/NUTEC #1201
2. TYPE SUBSTRATE: ASTM A-36 Carbon Steel SIZE: 2" x 4" x ¼"
3. SURFACE PREPARATION (Describe): Abrasive blasted per SSPC-SP-10, near white blast, with a profile of 1.5 mils as read on a Keane-Tator Profile Comparator disc.
4. PRODUCT DATA: SAMPLE NO.(s): 7830
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 9/24/80

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#6	2067/8461	Spray	92/72	F- .008-.0085 B- .009-.0095	9/24/80
2.	NUTEC	#1201	1958/1959	Spray	82/84	F- .008-.0085 B- .010-.015	9/26/80

Total Dry Film Thickness Range - Front - .016-.017
Back - .019-.0245

6. CURING CONDITIONS: AMBIENT TEMP. 80-95 °F REL. HUMIDITY 70-85 %
MINIMUM CURE 20 DAYS
7. TEST PROCEDURE: DBA
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 10/16/80

APPROVED: Gerald C. Arnold

TEST REPORT NO. 463-81

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #6/NUTEC #1201
2. TYPE SUBSTRATE: ASTM A-36 Carbon Steel SIZE: 2" x 4" x ¼"
3. SURFACE PREPARATION (Describe): Abrasive blastedper SSPC-SP-10, near white blast, with a profile of 1.5 mils as read on a Keane-Tator Profile Comparator disc.
4. PRODUCT DATA: SAMPLE NO.(s): 7831
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 9/24/80

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#6	2067/8461	Spray	92/72	F- .010-.0115 B- .0080-.0085	9/24/80
2	NUTEC	#1201	1958/1959	Spray	82/84	F- .010-.0115 B- .0105-.0115	9/26/80

Total Dry Film Thickness Range - Front - .020-.023
Back - .0185-.0200

6. CURING CONDITIONS: AMBIENT TEMP. 80-95 °F REL. HUMIDITY 70-85
MINIMUM CURE 20 DAYS
7. TEST PROCEDURE: DBA
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 10/16/80

APPROVED: Gerald E. Arnold
TEST REPORT NO. 463-81

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #6/NUTEC #6/NUTEC #1201
2. TYPE SUBSTRATE: ASTM A-36 Carbon Steel SIZE: 2" x 4" x ¼"
3. SURFACE PREPARATION (Describe): Abrasive blasted per SSPC-SP-10, near white blast, with a profile of 1.5 mils as read on a Keane-Tator profile Comparator disc.
4. PRODUCT DATA: SAMPLE NO.(s): 7832
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 9/24/80

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#6	2067/8461	Spray	92/72	F- .0045-.005 B- .005-.0055	9/24/80
2	NUTEC	#6	2067/8461	Spray	90/94	F- .0055-.006 B- .0045-.005	9/25/80
	NUTEC	#1201	1958/1959	Spray	82/84	F- .005 B- .0045-.005	9/26/80

Total Dry Film Thickness Range - Front - .015-.016
Back - .014-.0155

6. CURING CONDITIONS: AMBIENT TEMP. 80-95 °F REL. HUMIDITY 70-85 %
MINIMUM CURE 20 DAYS
7. TEST PROCEDURE: DBA
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 10/16/80

APPROVED: Gerald E. Arnold

TEST REPORT NO. 463-81

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #6/NUTEC#6/NUTEC 1201

2. TYPE SUBSTRATE: ASTM A-36 Carbon Steel SIZE: 2" x 4" x ¼"

3. SURFACE PREPARATION (Describe): Abrasive blasted per SSPC-SP-10, near white blast, with a profile of 1.5 mils as read on a Keane-Tator Profile Comparator disc.

4. PRODUCT DATA: SAMPLE NO.(s): 7833

5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 9/24/80

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#6	2067/8461	Spray	92/72	F- .004-.005 B- .0055-.006	9/24/80
2	NUTEC	#6	2067/8461	Spray	90/94	F- .007 B- .0055-.006	9/25/80
	NUTEC	#1201	1958/1959	Spray	82/84	F- .006 B- .005	9/26/80

Total Dry Film Thickness Range - Front .017-.018
Back .016-.017

6. CURING CONDITIONS: AMBIENT TEMP. 80-95 °F REL. HUMIDITY 70-85
MINIMUM CURE 20 DAYS

7. TEST PROCEDURE: DBA

8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 10/16/80

APPROVED: Gerald E. Arnold

TEST REPORT NO. 463-81

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #6/NUTEC #6/NUTEC #6/NUTEC #1201
2. TYPE SUBSTRATE: ASTM A-36 Carbon Steel SIZE: 2" x 4" x ¼"
3. SURFACE PREPARATION (Describe): Abrasive blasted per SSPC-SP-10, near white blast, with a profile of 1.5 mils as read on a Keane-Tator Profile Comparator disc.
4. PRODUCT DATA: SAMPLE NO.(s): 7834
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 9/24/80

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#6	2067/8461	Spray	92/72	F- .0045-.005 B- .0045-.0055	9/24/80
2	NUTEC	#6	2067/8461	Spray	90/74	F- .006 B- .0055	9/25/80
3	NUTEC	#6	2067/8461	Spray	82/92	F- .0055 B- .006	9/26/80
4	NUTEC	#1201	1958/1959	Spray	90/78	F- .0055-.0065 B- .005	9/29/80

Total Dry Film Thickness Range - Front - .0215-.0230
Back - .0210-.0220

6. CURING CONDITIONS: AMBIENT TEMP. 80-95 °F REL. HUMIDITY 70-85 %
MINIMUM CURE 17 DAYS
7. TEST PROCEDURE: DBA/Irradiation
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 10/16/80

APPROVED: Gerald E. Arnold
TEST REPORT NO. 463-81

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #6/NUTEC #6/NUTEC #6/NUTEC #1201
2. TYPE SUBSTRATE: ASTM A-36 Carbon Steel SIZE: 2" x 4" x ¼"
3. SURFACE PREPARATION (Describe): Abrasive blasted per SSPC-SP-10, near white blast, with a surface profile of 1.5 mils as read on a Keane-Tator Profile Comparator disc.
4. PRODUCT DATA: SAMPLE NO.(s): 7835
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 9/24/80

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#6	2067/8461	Spray	92/72	F- .005-.0055 B- .0055-.006	9/24/80
2	NUTEC	#6	2067/8461	Spray	90/74	F- .006-.0065 B- .0055-.006	9/25/80
3	NUTEC	#6	2067/8461	Spray	82/92	F- .0045-.005 B- .004-.0045	9/26/80
4	NUTEC	#1201	1958/1959	Spray	90/78	F- .0065-.006 B- .007-.0075	9/29/80

Total Dry Film Thickness Range - Front - .0220-.0230
Back - .0220-.0240

6. CURING CONDITIONS: AMBIENT TEMP. 80-95 °F REL. HUMIDITY 70-85 %
MINIMUM CURE 17 DAYS
7. TEST PROCEDURE: DBA
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 10/16/80

APPROVED: Gerald E. Arnold

TEST REPORT NO. 463-81

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #6/NUTEC #1201/NUTEC #1201

2. TYPE SUBSTRATE: ASTM A-36 Carbon Steel SIZE: 2" x 4" x ¼"

3. SURFACE PREPARATION (Describe): Abrasive blasted per SSPC-SP-10, near white blast, with a surface profile of 1.5 mils as read on a Keane-Tator Profile Comparator Disc.

4. PRODUCT DATA: SAMPLE NO.(s): 7836

5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 9/24/80

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F/%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#6	2067/8461	Spray	92/72	F- .003-.0025 B- .0045-.005	9/24/80
2	NUTEC	#1201	1958/1959	Spray	82/84	F- .007-.0075 B- .0055-.006	9/26/80
	NUTEC	#1201	1958/1959	Spray	90/78	F- .007 B- .007-.0075	9/29/80

Total Dry Film Thickness Range - Front .017-.018
Back .017-.0185

6. CURING CONDITIONS: AMBIENT TEMP. 80-95 °F REL. HUMIDITY 70-85 %
MINIMUM CURE _____ DAYS

7. TEST PROCEDURE: DBA

8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 10/16/80

APPROVED: Gerald E. Arnold

TEST REPORT NO. 463-81

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #6/NUTEC #1201/NUTEC #1201
2. TYPE SUBSTRATE: ASTM A-36 Carbon Steel SIZE: 2" x 4" x ¼"
3. SURFACE PREPARATION (Describe): Abrasive blasted per SSPC-SP-10, near white blast, with a surface profile of 1.5 mils as read on a Keane-Tator Profile Comparator Disc.
4. PRODUCT DATA: SAMPLE NO.(s): 7837
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 9/24/80

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#6	2067/8461	Spray	92/72	F- .004-.0045 B- .004-.0045	9/24/80
2	NUTEC	#1201	1958/1959	Spray	82/84	F- .006-.0065 B- .006-.0065	9/26/80
3	NUTEC	#1201	1958/1959	Spray	90/78	F-.0075-.008 B- .007	9/29/80

Total Dry Film Thickness Range - Front .0175-.0190
Back .0170-.0180

6. CURING CONDITIONS: AMBIENT TEMP. 80-95 °F REL. HUMIDITY 70-85 %
MINIMUM CURE 17 DAYS
7. TEST PROCEDURE: DBA
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 10/16/80

APPROVED: Gerald E. Arnold
TEST REPORT NO. 463-81

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #6/NUTEC #1201/NUTEC #1201/ NUTEC #1201
2. TYPE SUBSTRATE: ASTM A-36 Carbon Steel SIZE: 2" x 4" x¼"
3. SURFACE PREPARATION (Describe): Abrasive blasted per SSPC-SP-10, near white blast, with a surface profile of 1.5 mils as read on a Keane-Tator Profile Comparator Disc.
4. PRODUCT DATA: SAMPLE NO.(s): 7838
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 9/24/80

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#6	2067/8461	Spray	92/72	F- .0035-.004 B- .004-.0045	9/24/80
2	NUTEC	#1201	1958/1959	Spray	91/74	F- .0065-.007 B- .006-.0065	9/25/80
3	NUTEC	#1201	1958/1959	Spray	82/84	F- .005 B- .0055-.005	9/26/80
4	NUTEC	#1201	1959/1959	Spray	90/78	F- .007-.0075 B- .0075-.008	9/29/80

Total Dry Film Thickness Range - Front .0220-.0235
Back .0230-.0240

6. CURING CONDITIONS: AMBIENT TEMP. 80-95 °F REL. HUMIDITY 70-85 %
   MINIMUM CURE 17 DAYS
7. TEST PROCEDURE: DBA/Irradiation
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 10/16/80

APPROVED: Gerald E. Arnold

TEST REPORT NO. 463-81

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #6/NUTEC #1201/NUTEC #1201/NUTEC #1201

2. TYPE SUBSTRATE: ASTM A-36 Carbon Steel SIZE: 2" x 4" x ¼"

3. SURFACE PREPARATION (Describe): Abrasive blasted per SSPC-SP-10, near white blast, with a surface profile of 1.5 mils as read on a Keane-Tator Profile Comparator Disc.

4. PRODUCT DATA: SAMPLE NO.(s): 7839

5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 9/24/80

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#6	2067/8461	Spray	92/72	F- .004-.0045 B- .005-.0055	9/24/80
2	NUTEC	#1201	1958/1959	Spray	91/74	F- .006-.0065 B- .007-.0075	9/25/80
3	NUTEC	#1201	1958/1959	Spray	82/84	F- .005 B- .006-.0065	9/26/80
4	NUTEC	#1201	1958/1959	Spray	90/78	F- .007-.0075 B- .006-.0065	9/29/80

Total Dry Film Thickness Range - Front .0220-.0235
Back .0240-.0260

6. CURING CONDITIONS: AMBIENT TEMP. 80-95 °F REL. HUMIDITY 70-85 %

MINIMUM CURE 17 DAYS

7. TEST PROCEDURE: DBA/Irradiation

8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 10/16/80

APPROVED: Harold E. Arnold

TEST REPORT NO. 463-81

TEST PROCEDURES

(OAK RIDGE NATIONAL LABORATORIES)

Manufacturer: Imperial
New Orleans, LA

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: 11/13/80

Report of Irradiation and DBA Testing

The irradiation and design basis accident (DBA) tests are conducted, respectively, in accordance with Bechtel Corp. *Standard Specification Coatings for Nuclear Power Plants*, specs. CP-951 and CP-956 (or with modifications as noted in Table 2, DBA test conditions). The tests are designed to meet the specifications set in both A.N.S.I. report N 101.2–1972, *Protective Coatings (Paints) for Light Water Nuclear Reactor Containment Facilities*, and N 5.12–1974, *Protective Coatings (Paints) for the Nuclear Industry*. The DBA test spray solution and the test conditions are listed in Tables 1 and 2. After both the DBA and the irradiation tests, the coatings are examined for signs of chalking, blistering, cracking, peeling, delamination, and flaking, according to ASTM standards where applicable. All test panels are returned to the coating manufacturer.

The irradiation tests are run using a spent fuel assembly, removed from the High-Flux Isotope Reactor (HFIR) at ORNL, as the source of radiation. These fuel assemblies are stored under 20 feet of demineralized water. The fuel is 93% enriched U^{235} as U_3O_8 combined with aluminum. The spent fuel assemblies are removed after each 23-megawatt day period. Irradiation is done using the gamma energy from the accumulated mixed fission products. This more readily simulates conditions around a reactor than does a cobalt source. Also, the higher gamma activity affords shorter irradiation time to achieve accumulated doses. The dose rate four days after removal of a fuel assembly from the reactor is 1×10^8 rads/hr.

The fuel assembly is 20 inches high. A 20-foot long, 3-1/2-inch diameter pipe, with one end capped, is used for the air irradiation tests. The capped end is lowered into the four-inch opening of the center of the fuel assembly. The open end, above the water level, is covered with an "O" ring sealed flange to which is attached a steel cable and an air outlet hose. The air inlet is located at the bottom of the pipe. The test specimens are connected to the bottom of the cable and lowered into the radiation field. Also at the center of the fuel assembly is a stainless steel clad cadmium tube used as a neutron absorber. This prevents contamination of the test specimens by induced radiation.

Evaluated Ralph F. Hyde

Approved L. T. Corbin

Manufacturer: Imperial
New Orleans, LA

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: 11/13/80

Report of Irradiation and DBA Testing

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Evaluated Ralph F. Hyde

Approved L. T. Corbin

Manufacturer: Imperial
New Orleans, LA

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: 11/13/80

ORNL Log Book No. A 7562; A10-29-80

Table 1. DBA solution composition, distilled water

Reagent	Concentration
Boric acid, H_3BO_3	6200 ppm
Hydrazine, NH_2NH_2	50 ppm
Trisodium phosphate, $Na_3PO_4 \cdot 12H_2O$	Required to adjust pH to 9.7

Table 2. DBA test conditions

Time	Temperature (°F)	Pressure (psig)	Comments
Start	214		Autoclave preheated.
58 s	385	68	Steam injected.
10 min	385	70	Pressure maintained by relief valve.
4 min	385–340	70	
6 h	340	70	
20 s	220	30	Spray solution added at 75°F.
20 min	220–250	30	Adjusted pressure with N_2.
4 days	250	30	
20 s	170	–15	Fresh spray solution added after draining autoclave.
25 min	170–200	10	
3 days	200	10	

Evaluated Robert V. Apple

Approved W. T. Colwin

RESULTS

IRRADIATION & DBA

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE CORPORATION
NUCLEAR DIVISION

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37830

November 13, 1980

Mr. Gerald E. Arnold
Technical Representative
Imperial Professional Coatings
P. O. Box 29077
New Orleans, Louisiana 70189

Dear Jerry:

The enclosed report contains test results recently obtained on the Imperial protective coatings. This test was designed to encompass the 385 and the 340°F envelope curves.

If we can be of further assistance, please feel free to call on us.

Sincerely,

L. T. Corbin

L. T. Corbin, Section Head
Analytical Chemistry Division

LTC:dmw

Enclosures

Manufacturer: Imperial
New Orleans, LA

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: 11/13/80

System Identification

x Steel panel ___Concrete block

6/1201/1201/1201

Radiation Tolerance Test Results

ORNL Master Analytical Manual Method No. 2 0921, Bechtel Corp. Spec. No. CP-951.
ORNL Log Book No. A 7562; A10-17-80

Initial dose rate: 1.2×10^7 rad/hour

Tested conducted in: x air ___water

Sample No.	Cumulative dose rate: comments	
	1 × 10 rads	1×10^9 rads
7838		Front: coatings intact, no defects. Rear: coatings intact, no defects.
7839		Front: coatings intact, no defects. Rear: coatings intact, no defects.

Evaluated Boyd F. Kyle

Approved L. T. Corbin

Manufacturer: Imperial
New Orleans, LA

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: 11/13/80

System Identification

x Steel panel ___Concrete block

6/6/6/1201

Radiation Tolerance Test Results

ORNL Master Analytical Manual Method No. 2 0921, Bechtel Corp. Spec. No. CP-951.
ORNL Log Book No. A 7562; A10-17-80

Initial dose rate: 1.2×10^7 rad/hour

Tested conducted in: x air ___ water

Sample No.	Cumulative dose rate: 1×10 rads	comments: 1×10^9 rads
7834		Front: coatings intact, no defects. Rear: coatings intact, no defects.
7835		Front: coatings intact, no defects. Rear: coatings intact, no defects.

Evaluated Ralph F. Apple

Approved L. T. Corbin

Manufacturer: Imperial
New Orleans, LA

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: 11/13/80

System Identification

x Steel panel ___ Concrete block

6/1201

DBA Test Results

ORNL Master Analytical Manual Method No. 2 0922.
ORNL Log Book No. A 7562; A10-29-80

Sample No.	DBA phase	Comments
7830	spray	Front: coatings intact, no defects. Rear: coatings intact, no defects.
7831	spray	Front: single surface crack. Rear: coatings intact, no defects.

Evaluated Ralph F Apple

Approved L. Tolbert

Manufacturer: Imperial
New Orleans, LA

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: 11/13/80

System Identification

x Steel panel ___Concrete block

6/6/1201

DBA Test Results

ORNL Master Analytical Manual Method No. 2 0922.
ORNL Log Book No. A 7562; A10-29-80

Sample No.	DBA phase	Comments
7832	spray	Front: coatings intact, no defects. Rear: coatings intact, no defects.
7833	spray	Front: coatings intact, no defects. Rear: coatings intact, no defects.

Evaluated Ralph F. Apple

Approved L. T. Corbin

Manufacturer: Imperial
New Orleans, LA

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: 11/13/80

System Identification

x Steel panel ___Concrete block

6/6/6/1201

DBA Test Results

ORNL Master Analytical Manual Method No. 2 0922.
ORNL Log Book No. A 7562; A10-29-80

Sample No.	DBA phase	Comments
7834*	spray	Front: coatings intact, no defects. Rear: single blister, #2.
7835*	spray	Front: coatings intact, no defects. Rear: coatings intact, no defects.

*Irradiated.

Evaluated C. L. F. Apple

Approved L. T. Corbin

Manufacturer: Imperial

New Orleans, LA

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: 11/13/80

System Identification

x Steel panel ___ Concrete block

6/1201/1201

DBA Test Results.

ORNL Master Analytical Manual Method No. 2 0922.
ORNL Log Book No. A 7562; A10-29-80

Sample No.	DBA phase	Comments
7836	spray	Front: coatings intact, no defects. Rear: coatings intact, no defects.
7837	spray	Front: coatings intact, no defects. Rear: coatings intact, no defects.

Evaluated Ralph P. Apple

Approved L. T. Corbin

Manufacturer: Imperial
New Orleans, LA

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: 11/13/80

System Identification

x Steel panel ___Concrete block

6/1201/1201/1201

DBA Test Results

CRNL Master Analytical Manual Method No. 2 0922.
ORNL Log Book No. A 7562; A10-29-80

Sample No.	DBA phase	Comments
7838*	spray	Front: coatings intact, no defects. Rear: coatings intact, no defects.
7839*	spray	Front: coatings intact, no defects. Rear: coatings intact, no defects.

*Irradiated.

Evaluated Ralph P. Apple

Approved L. T. Corbin

Imperial

TECHNICAL REPORT

EVALUATION OF INTERCOAT BI

NUTEC 11S

Submitted by: Gerald E.

Approved: Robert R. Taylor 12/21/81

Date: December 8, 1981

SOUTHERN IMPERIAL COATINGS CORPORATION, INC.
P. O. Box 29077, • New Orleans, Louisiana 70189
Phone: (504) 254-1433

A.

SCOPE:

The purpose of this test is to evaluate the intercoat binding between Concresive 1411 and Nutec 11S by means of radiation exposure and design basis accident testing.

INTRODUCTION:

Concresive 1411 is an epoxy grouting material manufactured by Adhesive Engineering. This grout is used to fill large holes in concrete which are not easily handled by Nutec 11S. Concresive 1411 is usually applied several days prior to application of the first surfacer coat Nutec 11S. Concresive 1411 is presently being used at Shearon Harris (CP&L), South Texas Project (HL&P), and several of the Tennessee Valley Authority nuclear projects.

SUMMARY:

Following radiation exposure and design basis accident testing, the test specimens, coated with Concresive 1411 followed by the Nutec concrete coating system, exhibited no defects.

PROCEDURES:

Two concrete specimens, A437 and A438, were first grouted with Concresive 1411 to fill all voids. The Concresive was allowed to harden for 6 hours, at which time, Nutec 11S was applied to all surfaces. Nutec 1201 was applied following a 22 hour cure of the Nutec 11S. A detailed description of the application and curing can be found in the attached test panel preparation sheet.

The test specimens were submitted to ORNL for irradiation and design basis accident testing.

RESULTS:

Refer to the attached ORNL result sheets; no defects were exhibited by either specimen.

CONCLUSION:

The test results indicate that the bond between Concresive 1411 and Nutec 11S meets the requirements of ANSI N101.2, design basis accident testing. Concresive 1411 application should be restricted to voids. Care should be taken to avoid indiscriminate use of Concresive 1411 which may result in a hard surface film which could potentially interfere with the adhesion of subsequent coats. Concresive 1411 may be topcoated as soon as no permanent impression can be made in the patch when moderate pressure is applied with the thumb; a slight tackiness is acceptable. If the Concresive 1411 has been used liberally resulting in large, glossy areas which have cured longer than 24 hours, the Concresive surface should be lightly sanded to provide a "tooth" for the subsequent coating.

APPENDIX A

PANEL PREPARATION SHEET

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Concreative 1411/Nutec 11S/Nutec 1201
2. TYPE SUBSTRATE: Concrete 2 x 4 x 2"
3. SURFACE PREPARATION (Describe): Abrasive swept with G-50 steel grit to remove laitance and efflorescence.
4. PRODUCT DATA: SAMPLE NO. (s): A437, A438

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F) %R.H.	THICKNESS (Ins.)	TIME & DATE APPLIED
1	Concreative	1411	79553	Trowell	86°F/44%	Fill Voids*	9/29/81 10am
2	Nutec	11S	3021/2024/2680	Squeegee	88°F/46%	.015 - .025"	9/29/81 4pm
3	Nutec	1201	2967/1959	Spray	90°F/72%	.004 - .006"	9/30/81 2pm

* Max. ¼" in thickness

CURING CONDITIONS: AMBIENT TEMP. 75-85 °F REL. HUMIDITY 60-75 % MINIMUM CURE 2 DAYS

TEST PROCEDURE: Radiation Tolerance/DBA

TEST PREFORMED BY: ORNL DATE SUBMITTED: 10/2/81

APPROVED BY: Harold E. Ennes REPORT NUMBER: 548-81

NIC#17/81

APPENDIX B

ORNL PROCEDURES

Manufacturer: Imperial

New Orleans, Louisiana

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: October 29, 1981

REPORT OF IRRADIATION AND DBA TESTING

The irradiation and design basis accident (DBA) tests are conducted, respectively, in accordance with Bechtel Corporation specifications CP-951 and CP-956 in Standard Specification Coatings for Nuclear Power Plants (or with modifications as noted in Table 2, DBA test conditions). The tests are designed to meet specifications set in both ANSI report N 101.2-1972, Protective Coatings (Paints) for Light Water Nuclear Reactor Containment Facilities, and N 5.12-1974, Protective Coatings (Paints) for the Nuclear Industry. The DBA test spray solution and the test conditions are listed in Tables 1 and 2. After both the DBA and irradiation tests, coatings are examined for signs of chalking, blistering, cracking, peeling, delamination, and flaking, according to ASTM standards where applicable. All test panels are returned to the coating manufacturer.

The irradiation tests are run using a spent fuel assembly, removed from the High-Flux Isotope Reactor at ORNL, as the source of radiation. These fuel assemblies are stored under 20 ft of demineralized water. The fuel is 93% enriched U-235 as U_3O_8 combined with aluminum. The spent fuel assemblies are removed after each 23-megawatt-day period,. Irradiation is done using the gamma energy from accumulated mixed fission products. This more readily simulates conditions around a reactor than does a cobalt source. Also, the higher gamma activity affords shorter irradiation time to achieve accumulated doses. The dose rate four days after removal of a fuel assembly from the reactor is 1×10^8 rad/h.

The fuel assembly is 20 in. high. A 20-ft-long, 3-1/2-in.-diameter pipe, with one end capped, is used for air irradiation tests. The capped end is lowered into a 4-in. opening at the center of the fuel assembly. The open end, above water level, is covered with an O-ring-sealed flange to which is attached a steel cable and an air outlet hose. The air inlet is located at the bottom of the pipe. Test specimens are connected to the bottom of the cable and lowered into the radiation field. Also at the center of the fuel assembly is a stainless steel-clad cadmium tube used as a neutron absorber. This prevents contamination of the test specimens by induced radiation.

Evaluated Ralph L. Boyd

Approved L. F. Colwick

Manufacturer: Imperial
New Orleans, Louisiana

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: October 29, 1981

ORNL Log Book No. A9675, A10-8-1

Table 1. DBA solution composition, distilled water

Reagent	Concentration
Boric acid, H_3BO_3	2000 ppm
Sodium hydroxide, NaOH	Required to adjust pH to 9.5

Table 2. DBA test conditions

Time	Temperature (°F)	Pressure (psig)	Comments
Start	164	—	Autoclave preheated.
20 s	285	48	Solution added at 290°F.
1.5 min	340	70	*
1.5-5 min	285	48	Pressure maintained by relief valve.
5-7 min	285-267	48	Pressure adjusted with N_2.
13 min	267	48	
13-53 min	267-220	48	Pressure adjusted with N_2.
53-58 min	220-210	48-0	Pressure released at 0.15 psig/s.
58-167 min	210-150	0	
2.8-27.8 h	150-135	0	End of first part of test.
11 d	135	0	Specimens immersed in a constant-temperature bath.
End of test			

*Gas that evolved from the specimens upon addition of the hot chemical solution resulted in a pressure and subsequent temperature increase exceeding the specifications of the designed temperature-pressure curves.

Evaluated Roy L. Beatty

Approved L. T. Lyon

APPENDIX C

ORNL

RADIATION TOLERANCE RESULTS

DESIGN BASIS ACCIDENT RESULTS

12/4/81

OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE CORPORATION
NUCLEAR DIVISION

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37830

December 1, 1981

Mr. Gerald E. Arnold
Technical Representative
Imperial Professional Coatings
P. O. Box 29077
New Orleans, Louisiana 70189

Dear Jerry:

Enclosed are combined reports describing test results recently obtained on Imperial protective coatings. Your attention is called to the temperature-pressure anomalies of A9675, A10-8-1.

If we can be of further assistance, please feel free to call on us.

Sincerely,

L. T. Corbin

L. T. Corbin, Section Head
Analytical Chemistry Division

LTC:dmw

Enclosures

Manufacturer: Imperial
New Orleans, Louisiana

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: October 29, 1981

SYSTEM IDENTIFICATION ____ Steel panel __x__ Concrete block

Concresive 1411/Nutec 115/Nutec 1201

RADIATION TOLERANCE TEST

ORNL Master Analytical Manual Method No. 2 0921; Bechtel Corporation Specification No. CP-951; ORNL Log Book No. A9675, A10-5-1 .

Initial dose rate: 1.2×10^7 rad/h

Test conducted in: __x__ air ____ water

Sample No.	Cumulative dose	Test results
A437	1×10^7 rad	Coatings intact, no defects all areas.
A438	1×10^7 rad	Coatings intact, no defects all areas.

Evaluated Ralph L. Boyle

Approved L. T. Corbin

Manufacturer: Imperial
New Orleans, Louisiana

Analytical Chemistry Division
Oak Ridge National Laboratory
Date: October 29, 1981

SYSTEM IDENTIFICATION

____ Steel panel x Concrete block

Concresive 1411/Nutec 11S/Nutec 1201

DBA TEST

ORNL Master Analytical Manual Method No. 2 0922.
ORNL Log Book No. A9675, A10-8-1.

Sample No.	DBA phase	Test results
A437	spray*	Coatings intact, no defects all areas.
A438	spray*	Coatings intact, no defects all areas.

*Irradiated.

Evaluated Paul L. Angle

Approved L. T. Corbin