

JOB 35-1195

COMANCHE PEAK STEAM ELECTRIC STATION

Construction Procedure  
DOCUMENT CHANGE NOTICE NUMBER 6

Notice applicable to Construction Procedure No. 35-1195- CCP-40 Rev. 5

This change will be incorporated in the next revision of the procedure.

Change the procedure as follows:

Please replace the following pages with the attached:

ATTACHMENT 5; Special Coating Procedure C-1 Rev. 1

Pages 1 through 5

Reviewed by:

Mark Wells 10/14/83  
Originator Date

N/A Lissa Hamatu 10/14/83  
Brown & Root Quality Assurance Date

Approved by:

[Signature] 10/14/83  
TUGCO Quality Assurance Date

D.A. Drankow 10/14/83  
Construction Project Manager Date

October 14, 1983  
Effective Date



JOB 35-1195

COMANCHE PEAK STEAM ELECTRIC STATION

Construction Procedure  
DOCUMENT CHANGE NOTICE NUMBER 5

Notice applicable to Construction Procedure No. 35-1195- CCP-40 Rev. 5.

This change will be incorporated in the next revision of the procedure.

Change the procedure as follows:

Please replace the following page(s) with the attached:

Page 7 of 13

Reviewed by:

Mark Wells 8/19/83  
Originator Date

V/A [Signature] 8-13-83  
Brown & Root Quality Assurance Date

Approved by:

[Signature] 8/29/83  
TUGCO Quality Assurance Date

P.C. [Signature] 8-30-83  
Construction Project Manager Date

August 30, 1983  
Effective Date





JOB 35-1195

COMANCHE PEAK STEAM ELECTRIC STATION

Construction Procedure  
DOCUMENT CHANGE NOTICE NUMBER 4

Notice applicable to Construction Procedure No. 35-1195- CCP-40 Rev. 5.

This change will be incorporated in the next revision of the procedure.

Change the procedure as follows:

Please replace the following page(s) with the attached:

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Reviewed by:

Mark Wells 8/16/83 U/A Tugco 8/16/83  
Originator Date Brown & Root Quality Assurance Date

Approved by:

[Signature] 8/16/83  
TUGCO Quality Assurance Date  
FOR CT BRAND

[Signature] 8-16-83  
Construction Project Manager Date

August 17, 1983  
Effective Date



JOB 35-1195  
Comanche Peak Steam Electric Station

Construction Procedure  
DOCUMENT CHANGE NOTICE NUMBER 3

This notice applies to Construction Procedure No. 35-1195- CCP-40 Revision 5.

This change will be incorporated in the next revision of the procedure.

Change the procedure as follows:

Replace the following pages with the attached:

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Page 5 of 13  
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Add pages:

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ATTACHMENT 4  
Page 1 of 2  
Page 2 of 2  
ATTACHMENT 5  
Page 1 of 5  
Page 2 of 5  
Page 3 of 5  
Page 4 of 5  
Page 5 of 5

Reviewed by:

Mark Wells 3/29/83  
Originator Date

W. R. Root 3-29-83  
Brown & Root Quality Assurance Date

Reviewed by:

Approved by:

C. T. Brown 6/24/83  
TUGCO Quality Assurance Date

D. J. Zwick 6-24-83  
Construction Project Manager Date

June 24, 1983  
Effective Date



JOB 35-1195  
Comanche Peak Steam Electric Station

Sheet 1 of 3

Construction Procedure  
DOCUMENT CHANGE NOTICE NUMBER 2

This notice applies to Construction Procedure No. 35-1195- CCP-40 Revision 5.

This change will be incorporated in the next revision of the procedure.

Change the procedure as follows:

Replace the following pages with the attached:

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Reviewed by:

Mark Wells 2-17-83  
Originator Date

N/A Root Quality Assurance 2-17-83  
Brown & Root Quality Assurance Date

Reviewed by:

Approved by:

C.T. Rucker 2/28/83  
TUGCO Quality Assurance Date

E.C. Frankum 3-3-83  
Construction Project Manager Date

March 4, 1983  
Effective Date



JOB 35-1195  
Comanche Peak Steam Electric Station

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Construction Procedure  
DOCUMENT CHANGE NOTICE NUMBER 1

This notice applies to Construction Procedure No. 35-1195-CCP-40 Revision 5.

This change will be incorporated in the next revision of the procedure.

Change the procedure as follows:

Replace the following pages with the attached:

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Reason for change: Additional requirements.

Reviewed by:

Mark Wille 1-5-83 Mark Wille 1-5-83  
Originator Date Brown & Root Quality Assurance Date

Reviewed by:

C. T. King 1-10-83  
TUGCO Quality Assurance Date

Approved by:

D. J. King 1-11-83  
Construction Project Manager Date

1/11/83  
Effective Date



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1.0	<u>INTRODUCTION</u>				
1.1	PURPOSE				
1.1.1	The purpose of this procedure is to establish the methods by which the surfacer and finish coats are to be applied to concrete surfaces in accordance with specification, drawing, and manufacturer's requirements.				
1.2	SCOPE				
1.2.1	The scope of this procedure covers the surface preparation and coating of cementitious surfaces inside the reactor building and radiation area as delineated by Reference 1.				
1.3	GENERAL DISCUSSION				
1.3.1	All coating materials addressed by this procedure shall be as manufactured by Imperial Professional Coating of New Orleans, Louisiana. The coating system will consist of a surfacer coat of NUTEC #11S, touch-up with NUTEC #11S or NUTEC #11, and a finish coat of NUTEC #1201. In order to prevent finish coat damage, the finish coat will normally be applied as close as possible to turn-over of the area to the owner or as required due to the setting of equipment or other items which would make an area inaccessible. Any permanent equipment located in the area to be coated will be adequately protected from contamination caused by surface preparation or coating application.				
2.0	<u>DEFINITIONS OF TERMS, ABBREVIATIONS AND SYMBOLS</u>				
2.1	TERMS				
2.1.1	Substrate - The uncoated surface to which a coating is applied.				
2.1.2	Pinhole - A minor discontinuity in the coating film which exposes the primer.				
2.2	ABBREVIATIONS				
2.2.1	(NONE)				
2.3	SYMBOLS				
2.3.1	(NONE)				



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### 3.0 SPECIAL ITEMS AND OPERATIONS

#### 3.1 QUALIFICATION OF PERSONNEL

3.1.1 Coating Application Personnel shall be qualified per previous experience and/or demonstrated ability. In addition, each applicator shall have been certified by the Paint Dept. Superintendent or his representative per technical data and demonstrated ability. Application procedures shall be in compliance with this procedure. This shall be verified by completing a form similar to Attachment 1 which will be executed by the B&R Paint Superintendent or his representative. A coating manufacturer's representative will be available for technical supervision upon initial painting effort.

#### 3.2 SAFETY REQUIREMENTS

3.2.1 All appropriate health, safety, and fire protection requirements pertaining to surface preparation and coating application shall be followed. It shall be the responsibility of the Safety Department representative who will be present to randomly monitor safety during coating application.

#### 3.3 INSTRUMENTS AND THEIR USE

3.3.1 The Painting Foreman and General Foreman shall have access to and be familiar with the use of thermometers, wet film gauges, and psychrometers for measuring relative humidity. Viscosity measuring devices will not be used. Wet film gauges will be randomly used during coating application; readings will be limited to the minimum necessary to control coating thickness.

#### 3.4 DOCUMENTATION

3.4.1 Records shall be maintained on Attachment 1 and 4 listed in Section 5.1. After completion, each form shall be forwarded to The Brown & Root Document Control Center for filing and distribution to the various parties as listed on the distribution list.





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3.5	RECEIVING, STORAGE AND DISPENSING OF COATING MATERIALS			
3.5.1	Receiving and Storage			
3.5.1.1	<p>Upon receipt of a shipment of coating materials, the B&amp;R QC Representative accepting shipment shall be responsible for completing all necessary receiving inspection documentation. General receiving procedures shall be in accordance with Brown &amp; Root Construction Procedure CP-CPM 8.1. It shall then be segregated from "Non-Q" materials and stored in the Paint Storage Building where temperatures will be maintained between 40°F and 100°F. Rises in air temperature up to 120°F is acceptable for as long as fourteen days. (Accumulative). Infrequent dips (for periods not to exceed 24 hours) in air temperature in storage areas as low as 33°F is acceptable; however, prior to application the coatings shall be brought back into the 50° - 90° range. Temporary storage may be required at the Receiving Warehouse due to receiving or other problems.</p>			
3.5.2	Dispensing			
3.5.2.1	<p>When coating materials are needed in the field, it shall be transferred from the controlled area to a designated temporary storage area or area of intended use in the field. Due to limited shelf-life of coating materials, this shall be done on a "first-in" "first out" basis. After materials have been partially used from an individual container, the said container cannot be resealed and returned to "Q" storage area for later use. Containers opened and partially distributed from the "Q" paint storage area may be resealed and the remaining contents used for "Q" painting. Except for thinners, the contents from partially used containers shall not be reused after a period of 7 days has elapsed from date of initial opening.</p>			
3.6	Special Coating Procedure			
3.6.1	<p>When items require special coating not covered under the content of this procedure, Attachment 4 shall be completed by the Protective Coatings engineer and transmitted to painting superintendent for construction. Special coatings procedures issued via Attachment 4 shall be attached to this procedure after completion.</p>			
3.6.2	<p>Special Coating Procedures added by Attachment 4 shall receive a unique identification number issued in sequence beginning with C-1. The scope of the procedure shall describe the working limits of the special procedure with pertinent storage and coating requirements listed under the requirements section. The approvals section shall have the signatures of the Project Civil Engineer, TUGCo QA Manager if safety related, Originator, and the Construction Project Manager. Each procedure shall exhibit the revision number and issue date.</p>			





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4.0	<u>PROCEDURE</u>				
4.1	PREPARATION OF SUBSTRATES AND COATING MATERIALS				
4.1.1	Preparation of Surfacer				
4.1.1.1	<p>Normal surface preparation shall consist of water blasting with 4,000 P.S.I. to 10,000 P.S.I. Additionally, surface preparation may be accomplished by the use of approximately 2,500 P.S.I. water blasting with sand injection, acid etching with an Imperial recommended solution, or straight sand blasting. Any heavy oil or grease deposits shall be removed by steam cleaning, trisodium phosphate washing with a mixture of 3-6 pounds T.S.P. per gallon of water, or use of an Imperial recommended detergent.</p> <p>Following surface preparation, the surface shall be free of construction dust, laitance, and loose deposits. If cleaning does not remove oil and grease, the contaminated concrete surface will be chipped away and patched before coating. All T.S.P. cleaned areas will be flushed with clean water. Holes or voids in the concrete surface that exceed 1/2" in depth shall be repaired with dry-pack or epoxy grout. Detrimental surface irregularities such as projections, fins, or ridges shall be reduced by bush-hammering, power grinding, or stoning. Wood particles of "fuzz" remaining after water blasting is acceptable. Recommended surface preparation shall include power tools which are capable of removing laitance and curing membranes from concrete surfaces.</p>				
4.1.1.2	<p>Markings on concrete - Before application of 11S, 11 or 1201, all markings (ink, pencil, chalk, or felt tip markers) on wall and floors shall be solvent wiped in accordance with SSPC-SP-1 using DL-6A or commercially available MEK or Xylol. Marking paint (surveyor marks) shall be removed by solvent wiping, water blasting, sandblasting, or power tool cleaning. Discolored coatings due to aging or stains shall be abraded and solvent wiped to remove the discoloration. Residual marking or discoloration remaining in pores below the plane of the surface is acceptable.</p>				
4.1.1.3	<p>Repair of embedded foreign objects - Embedded foreign objects such as nails, rebar chairs, bolts, wood, or plastic shall be repaired per the following guidelines before application of NUTEC 11S surfacer.</p> <ol style="list-style-type: none"> <li>1. Objects protruding from the surface shall be ground or cut smooth until the object is flush with the concrete surface prior to application of 11S.</li> <li>2. If the object is loosely adhered in the concrete, it shall be removed (in case of wood splinters or wood "fuzz" an attempt shall be made to remove by high pressure water blasting). Refer to section 4.1.1.1.</li> </ol>				

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4. Metal objects larger than four square inches shall be coated with an inorganic zinc primer in accordance with CCP-30.

5. Objects which are recessed to a depth greater than 1/2" shall be repaired using a "dry pack" or epoxy grout.

4.1.1.4 Surface appearance - Surface smoothness or "glossy" appearance in concrete will not be detrimental to the performance of NUTEC 11S providing the surface is free of water, oil, grease, laitance, efflorescence, deleterious curing membranes, or other contaminants as outlined in this procedure. If NUTEC 10 curing membrane is present with thickness sufficient to give a glossy appearance, the surface shall be abraded to "roughen" the NUTEC 10 prior to application of 11S surfacer.

#### 4.2 PREPARATION OF COATING MATERIALS

##### 4.2.1 Surface Coat

4.2.1.1 The surfacer, NUTEC #11S, is packaged, in a three component kit consisting of a base, curing agent, and filler. The base and curing agent shall be thoroughly mixed first. If necessary, box the mixture to assure that all the base and cure has been used. The filler shall then be slowly added under constant agitation and mixed until a smooth blend is achieved. The patching material, NUTEC #11, is prepared the same way. Partial mixes for NUTEC #11S shall be in accordance with Attachment 2.

##### 4.2.2 Finish Coat

4.2.2.1 The finish coat, NUTEC #1201, is a two component epoxy topcoat consisting of a base and cure. These shall be thoroughly mixed under constant agitation until a homogenous blend is achieved. Partial mixes of NUTEC #1201 shall be in accordance with Attachment 3. Minimum induction times shall be as follows:

#### TEMPERATURE °F

50-59  
60-69  
70-79  
80-90  
91-100

#### INDUCTION TIMES

45 min.  
30 min.  
20 min.  
10 min.  
NONE



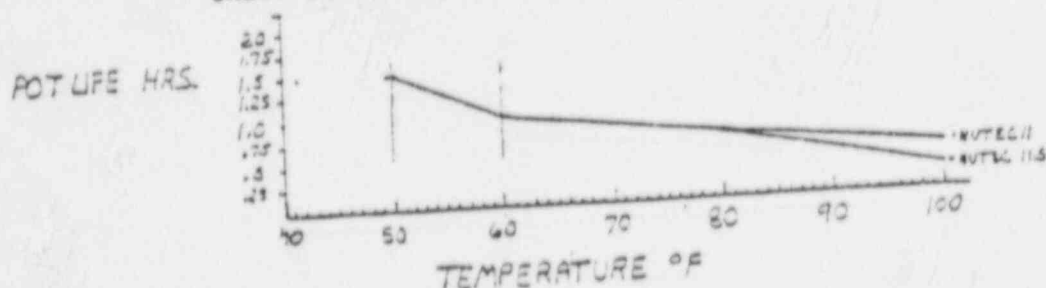
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#### 4.3 APPLICATION OF SURFACER & FINISH COATING

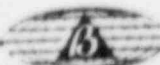
##### 4.3.1 Surfacers Coat

4.3.1.1 Coating material shall be applied using a bottom feed conventional pressure pot-mastic gun arrangement. To facilitate application on areas such as floors and for repair work, trowel, squeegee or float application without the use of the mastic arrangement may be used. Under normal conditions, the concrete surface shall be allowed to cure a minimum of 28 days prior to application of protective coatings. However, if the coatings are to be applied to pour backs, grouting, or patching to which NUTEC 10 has been applied as a curing compound, coating may be performed after a minimum of 6 days has elapsed from NUTEC 10 application time. Abandoned hilti bolt holes, tie holes, and spalled concrete as defined in CEI-20 and patched per CCP-12 and grout under base plates which have 3 square feet or less of exposed grouted surface to be coated, may be coated after 48 hours cure. Material shall be applied until the concrete surface is completely covered, with extra material being added to large holes or depressions. A single blade rubber squeegee is then used to smooth out the material. Care shall be taken to eliminate as many pinholes as possible by use of a back and forth motion. Application parameters shall be as follows:

1. Minimum and maximum values of surface and ambient temperatures shall be between 50°F and 100°F. Infrequent dips in temperature to 40°F is permissible during application and/or cure; however, the elapsed time the temperature is below 50°F shall be added to the cure time. Application of the coating shall not begin unless the surface temperature is 5°F above the dew point. Pot life shall be as stated in the chart below.



2. Humidity may vary as high as 100%; however, free standing water shall be removed. Coating application over a damp surface is permissible. Under no condition shall NUTEC 11S be applied to a surface containing free standing water. Free standing water may be identified by:



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- a. Reduced viscosity of 11S during application, and excessive sagging from bug holes.
  - b. Wet rings around bug holes.
  - c. Failure of 11S to adhere to the substrate during the squeegeeing or trowelling process.
  - d. Visible signs of surface water.
  - e. Running hand over the surface resulting in moisture on the hand.
  - f. Product instability resulting in white streaks.
3. Thickness of surface for level 1 service may vary between 10 and 35 mils, depending on the surface roughness. For areas other than level 1, the recommended dry film thicknesses for surfacer is 10-60 mils.
  4. Tack free times shall be as follows:

<u>TEMPERATURE °F</u>	<u>#11</u>	<u>#11S</u>
50-59	6 hrs.	8 hrs.
60-79	4 hrs.	6 hrs.
80-99	2 hrs.	4 hrs.
100	1 hr.	2 hrs.

5. Curing time shall be as follows:

<u>TEMPERATURE °F</u>	<u>CURING TIME BEFORE TOPCOATING WITH 1201</u>
50-59	72 hrs.
60-69	48 hrs.
70-79	24 hrs.
80-89	18 hrs.
90-100	12 hrs.



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TEMPERATURE °F                      FULL CURE 11, 11S

50-59	10 days
60-69	8 days
70-79	7 days
80-89	6 days
90-100	5 days

No appreciable cure takes place below 50°F, therefore, maintain area coated above 50°F. Infrequent dips in temperature to 40°F is permissible; however, duration below 50°F shall be added to cure time.

6. NUTEC 11S may be recoated with #11 or #11S as soon as the initial coat has dried such that the paint shall not adhere to the thumb when downward pressure is exerted on the paint film while turning a 90° angle. (this does not refer to a two pass application method). Dry time will vary with film thickness. At thicknesses greater than 35 mils, a minimum of 24 hours shall be allowed prior to applying a full coat of NUTEC 11.

7. NUTEC 11S may be touched up with #11S or #11 as soon as it has set to touch. #11S and #11 may be subjected to personnel foot traffic after 24 hours cure and lay down of material after full cure.

8. Thinning of #11S is not normally required; however, at lower temperatures, it is permissible to thin up to 5% by volume with Imperial's DL-54 thinner.

4.3.1.2 Imperial coatings may be applied in the following sequential order: #11S/1201/11S/1201 or 11S/1201/11/1201. Millage requirements per coat are as follows:

Service Level 1	
NUTEC 11S	10-35 Mils
NUTEC 11	3-20 Mils
NUTEC 1201	3-16 Mils

Areas other than Service Level 1	
NUTEC 11S	10-60 Mils
NUTEC 11	3-20 Mils
NUTEC 1201	3-16 Mils

4.3.1.3 Repair and recoating of NUTEC 11S - Remove all loose coating and concrete by sanding or wire brushing and feather edge adjacent to the coating. The area shall then be blown off with compressed air, washed with water or DL-54 thinner (Non-Q) and coated with NUTEC 11S or NUTEC 11 until the desired film thickness is achieved.





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- 4.3.1.4 Repair of Pinholes, blowholes, or overworked areas - Remove any contaminants by compressed air or clean water. Apply NUTEC 11 to the defective area and work back and forth to fill in area. NUTEC #11S surfacer may be smoothed by spraying a mist of Imperial DL-54 thinner on the #11S film 15-30 minutes after its application. By using a trowel or squeegee, the solvent can be worked over the surface to smooth or polish the film, thus eliminating the defects due to overworking of the 11S.
- 4.3.1.5 Mudcracking - Area shall be repaired by means of grinding, sanding, or wire brush. The area will then be blown down with compressed air and then wiped with DL-54 thinner.
- 4.3.1.6 Repair of Sags and Runs - Inside containment, runs or sags shall be abraded down to adjoining thickness. Outside containment, if coating is sound, sags and runs will not be repaired.
- 4.3.1.7 Repair of Embedded Foreign Particles - Embedded foreign particles shall be removed by abrading. In pinholes and discontinuities exist, then area shall be repaired in accordance with Section 4.3.1.4.
- 4.3.1.8 Treatment of Rust Stains - Remove residue, though not necessarily the stain, with bristle brush and water or Imperial Thinner #DL-54.
- 4.3.1.9 Treatment of Interfaces with Other Coatings - Interfaces with projecting coated items shall be constructed by abutting the 11S up to the projecting item. Interfaces with flush mounted coated items shall be constructed by feathering the 11S into the coated item.
- 4.3.1.10 Repair of Scorched Areas - If the concrete is not damaged, scorched areas shall be repaired by abrading the surface until the discolored area is removed. Visual inspection of the area shall be conducted to assure the area is acceptable. The area should then be coated with 11 or 11S as appropriate.
- 4.3.1.11 Coating of Expansion Joints - Expansion joints will not be coated. Coatings will be feathered back at the edges.
- 4.3.1.12 Repair of Scratches and Similar Damage - Any scratches or damaged areas shall be abraded by hand or mechanical methods until loosely adherent particles are removed. If the damaged area extends to concrete and is  $\frac{1}{4}$ " or less in diameter additional surfacer need not be applied. If the damage extending to concrete substrate is greater than  $\frac{1}{4}$ " in diameter but 2 sq. inches or less in area, the area may be repaired with 11 or 11S for surfacer prior to topcoating. Damages involving areas larger than that stated above shall be repaired with normal coating system.



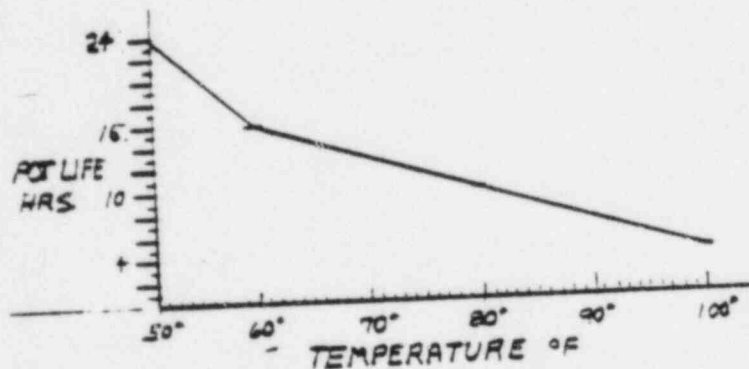
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#### 4.3.2 Finish

##### 4.3.2.1

Finish coat shall be applied by brush, roller, conventional or airless spray methods. If brush or roller application is used, care must be taken to ensure a smooth uniform finish surface. The material shall be allowed to become "tack free" before any other construction operations proceed which could create contamination by dust or other foreign matter. Pinhole criteria shall be in accordance with NACE T-6F-3, condition "B". Any runs or sags having a detrimental effect on the coating system shall be removed and repaired. The following application parameters shall govern:

1. The permissible range of surface and ambient temperature shall be between 50°F and 100°F. Infrequent dips in temperature to 40°F is permissible during application and/or cure; however, the elapsed time the temperature is below 50°F shall be deducted from the cure time. Application shall not begin unless the surface temperature is at least 5°F above the dew point. If increased workability is desired, Reacti: #1201 may be thinned up to 30% by volume with Imperial DL-6A thinner. It is normally advisable to use more thinner at lower temperatures and when using conventional spray equipment.



2. Thickness of 1201 topcoat for Service Level 1 and Service Level II areas shall be as specified in Section 4.3.1.2.
3. Coating materials shall be applied as a heavy, wet coat in even, parallel passes, overlapping each pass approximately 50%.





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4. Recoating time of NUTEC #1201 is 24 hours.

5. Tack free time is as follows:

TEMPERATURE °F	TACK FREE TIME
50	8 hrs.
60	4 hrs.
80	2 hrs.
100	1 hr.

6. Full cure time is as follows:

TEMPERATURE °F	FULL CURE TIME
50-59	11 days
60-79	8 days
80-99	7 days
100	5 days

#1201 may be subjected to personnel foot traffic after 24 hours at or above surface temperature of 80°F. At temperature durations below 50°F little or no curing will take place, therefore, after coating, maintain temperature above 50°F.

4.3.2.2 Repair of Runs and Sags - Runs or sags showing evidence of cracking must be removed. Runs or sags inside Service Level I areas which exhibit no other coating defects, shall be abraded to the thickness of adjoining coating. Runs or sags outside Service Level I areas which exhibit no other coating defect need not be removed.

4.3.2.3 Repair of Embedded Foreign Particles - Embedded foreign particles shall be removed by abrading. The area shall then be given a light overcoat of #1201. Any loose particles shall be removed by brushing, vacuum, or compressed air.

4.3.2.4 Repair of Pinholes and Discontinuities - Any loose particles shall be removed by brushing, vacuum or compressed air. The pinholes and discontinuities shall then be repaired by use of a brush or squeegee. Pinholes and small discontinuities may be repaired at time of final inspection without a later reinspection of the repair. If the repaired coating will be subjected to a high moisture environment after placement into service, the placement into service shall not be made until full cure of the repair.

4.3.2.5 Repair of Scratches and Damaged Areas - Any scratches or damages areas shall be abraded by hand or power tool cleaning or spot blasting until loosely adherent particles are removed. If the damaged area extends to concrete substrate and is  $\frac{1}{4}$ " or less in diameter, the damaged area may be coated with NUTEC #1201. If the damaged area extending to concrete substrate is greater than  $\frac{1}{4}$ " in diameter by 2 sq. inches or less in an area, the area may be repaired with NUTEC #11 with a topcoat of



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NUTEC #1201. Damaged areas to concrete substrate larger than the above values shall be repaired with the normal coating system.

- 4.3.2.6 Treatment of Rust Stains - If the topcoat surface is contaminated with rust stains, the area shall be cleaned by use of bristle brush and water or solvent wiping with Thinner DL-6A. Any remaining stains not acceptable from a cosmetic viewpoint will be covered by a light overcoat of NUTEC #1201.

#### 4.4 FINAL ACCEPTANCE TESTING

- 4.4.1 Full cure of the coating system shall be maintained prior to testing and/or inspection for other than visual inspection. Final acceptance inspection may be performed, when visual inspection only is required, after topcoat has cured per paragraph 4.3.2.1(4).

After final inspection, and resolution of all discrepancies are completed, the QC Inspector shall document the final acceptance by completing and signing the Final Acceptance Record and will transmit a copy of this record to the B&R Paint Superintendent as soon as possible after final acceptance is made.

#### 4.5 HOLD POINTS

- 4.5.1 On-site receipt of coating material.
- 4.5.2 Substrates before preparation if blasting or bush hammering is to be utilized and following all methods of preparation.
- 4.5.3 Mixing and preparation of coating material for application.
- 4.5.4 Film characteristics after drying and curing.
- 4.5.5 Control of ambient conditions and surface temperatures during all phases of the coating work.

#### 5.0 SUPPORTING INFORMATION

##### 5.1 ATTACHMENTS

1. Painter Qualification Record
2. Table for Partial Mixes of NUTEC 11S
3. Table for Partial Mixes of NUTEC #1201
4. Special Coating Procedure
5. Special Coating Procedure C-1



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5.2

#### REFERENCES

1. Gibbs & Hill Specification 2323-AS-31, "Protective Coating"  
Latest Revision
2. Steel Structures Paint Council, Vol.2, Second Edition
3. Imperial Data Sheet NUTEC #11S and NUTEC #1201, Dated 7/77
4. NACE Publication T-6F-3



BROWN & ROOT, INC. CPSES  JOB 35-1195	PROCEDURE NUMBER	REVISION	EFFECTIVE DATE	PAGE
	CCP-40	5	8/18/82	1 of 1

ATTACHMENT 1  
Painter Qualification Record

GENERAL DATA

Date \_\_\_\_\_ Report Number \_\_\_\_\_

TECHNICAL DATA

Name of Painter \_\_\_\_\_

Summary of Field Experience \_\_\_\_\_

Experience with Following Product Types \_\_\_\_\_

Application Test for Specified Substrate \_\_\_\_\_

Additional Qualifications (School) \_\_\_\_\_

Signature \_\_\_\_\_  
Applicator's Field Supervisor

Distribution: Painting Supt.  
QC Department  
TUGCO QA Vault (Original)







BROWN & ROOT, INC. CPSES  JOB 35-1195	PROCEDURE NUMBER	REVISION	EFFECTIVE DATE	PAGE
	CCP-40	5	8/18/82	1 of 1

### ATTACHMENT 3

TABLE FOR PARTIAL MIXES OF NUTEC #1201

Gal.	Qts.	Base		Cure		Maximum Permissible Thinner	
		lbs.	oz.	lbs.	oz.	qts.	oz.
0	1	2	9.6	0	6.4	0	9.6
0	2	5	3.2	0	12.8	0	19.2
0	3	5	14.4	1	3.2	0	23.0
1	0	10	8	1	8	1	6.4
1	1	13	1.6	1	14.4	1	16
1	2	15	11.2	2	4.8	1	25.6
1	3	18	4.8	2	11.2	2	3.2
2	0	20	14.4	3	1.6	2	12.8
2	1	23	3	3	0	2	22.4
2	2	26	3.2	3	14.4	3	0
2	3	23	12.8	4	3.2	3	9.6
3	0	31	6.4	4	9.6	3	19.2
3	1	34	0	5	0	3	28.8
3	2	36	9.6	5	6.4	4	6.4
3	3	39	3.2	5	12.8	4	16
4	0	41	12.8	6	3.2	4	25.6
4	1	44	8	5	8	5	3.2
4	2	47	0	5	14.4	5	12.8
4	3	49	11.2	7	14.0	5	22.4
5	0	52	4.8	7	11.2	6	0



BROWN & ROOT, INC. CPSES  JOB 35-1195	PROCEDURE NUMBER	REVISION	EFFECTIVE DATE	PAGE
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"Q" Coating \_\_\_\_\_

ATTACHMENT 4

Sheet \_\_\_\_\_ of \_\_\_\_\_  
Procedure # \_\_\_\_\_  
Rev. \_\_\_\_\_ Date \_\_\_\_\_

"Non-Q" Coating \_\_\_\_\_

SPECIAL COATING PROCEDURE NO. \_\_\_\_\_

SCOPE \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

REQUIREMENTS:

REFERENCE DOCUMENTS

APPROVALS

ORIGINATOR \_\_\_\_\_

PROJECT C.E. \_\_\_\_\_

TUGCO QA \_\_\_\_\_

CONST. P.M. \_\_\_\_\_

REV. \_\_\_\_\_ DATE \_\_\_\_\_



6/24/83

Sheet 7 of 11



BROWN & ROOT, INC. CPSES  JOB 35-1195	PROCEDURE NUMBER	REVISION	EFFECTIVE DATE	PAGE
	CCP 40	5	8/18/82	2 of 2

Sheet \_\_\_\_ of \_\_\_\_

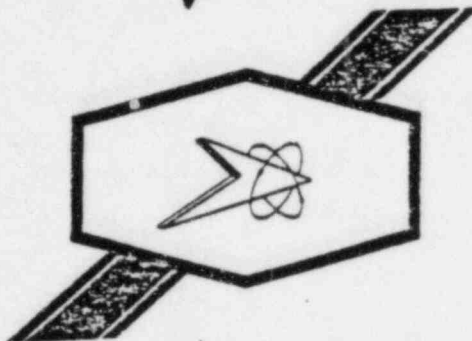
ATTACHMENT 4 (Continued) Procedure # \_\_\_\_\_

Rev. \_\_\_\_\_ Date \_\_\_\_\_

REQUIREMENTS (Continued)



# Imperial



## TECHNICAL REPORT

NUMBER

210-78

TITLE

NUTEC 11/REACTIC 1201  
Design Basis Accident per Bechtel CP 956

FOR

ICC

CUSTOMER

Submitted by: *Jerry Arnold*

Approved: *[Signature]*

Date: 12/77

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

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8511060074

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC 11/REACTIC 1201
2. TYPE SUBSTRATE: Concrete SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): All surfaces sandswept with Cresblast #4 blasting sand.
4. PRODUCT DATA: SAMPLE NO.(s): 3530
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: N/A

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)&R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
	NUTEC	11	2671/LB150/LB149	Squeegee	82°F/55%	See below	10/18/77 1 p.
	* NUTEC	11	2671/LB150/LB149	Squeegee	70°F/72%	.003-.005	11/4/77 11 a.
	REACTIC	1201	3070/2568	Spray	71°F/69%	See below	11/7/77 9 a.

\*Used for touch-up only

Total film thickness range: .004 - .031

11 1201

min.	.001-.002	.003-.005
avg.	.003-.005	.007-.008
max.	.010-.015	.010-.011

6. CURING CONDITIONS: AMBIENT TEMP. 70 - 80 °F REL. HUMIDITY 45 - 65 %
- MINIMUM CURE 11 DAYS

7. TEST PROCEDURE: DBA per Bechtel CP 956

8. TESTING PERFORMED BY: Coastal Science DATE SUBMITTED 11/18/77

APPROVED BY: [Signature]

DATE: 12/77

PREPARED BY: [Signature]

DATE: 12/77

TEST REPORT NO.: 210-77

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC 11/REACTIC 1201
2. TYPE SUBSTRATE: Concrete SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): All surfaces sandswept with Cragblast #4 blasting sand.
4. PRODUCT DATA: SAMPLE NO.(s): 3534
5. DATE AND TIME CURING COMPOUND 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/M(°F)%R.H.</u>	<u>THICKNESS (ins.)</u>	<u>TIME &amp; DATE APPLIED</u>
	NUTEC	11	2671/LB150/LB149	Squeegee	82°F/55%	.003-.005	10/18/77 1 p.m.
	* NUTEC	11	2671/LB150/LB/149	Squeegee	70°F/72%	.003-.005	11/4/77 11 a.
	REACTIC	1201	3070/2568	Spray	71°F/69%	.007-.008	11/7/77 9 a.

\*Used for touch-up only

Total Film Thickness Range: .010 - .018

6. CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 45-65 %  
MINIMUM CURE 11 DAYS
7. TEST PROCEDURE: DBA per Bechtel CP 956
8. TESTING PERFORMED BY: Coastal Science DATE SUBMITTED 11/18/77

APPROVED BY: [Signature]

DATE: 12/77

PREPARED BY: [Signature]

DATE: 12/77

TEST REPORT NO.: 210-77

# COASTAL SCIENCE ASSOCIATES

(504) 283-7251

6900 CANAL BOULEVARD • NEW ORLEANS, LOUISIANA 70124

DATE: 11/22/77

SAMPLE IDENTIFICATION: 8 STEEL PANELS; 2 CONCRETE COUPONS

DBA TEST CONDITIONS:

BECKEL CP956 BROKEN AT 6 HOURS FOR INSPECTION, RESEALED AND  
STARTED AGAIN AS PER CURVE SPECIFICATIONS. SPRAY PHASE AT 92  
HOURS WITH BORIC ACID SOLUTION.

SAMPLE NUMBER

COMMENTS

3538

SIDE ONE: NO FLAKES, BLISTERS, DELAMINATION  
SIDE TWO: NO FLAKES, BLISTERS, DELAMINATION  
SIDE THREE: NO FLAKES, BLISTERS, DELAMINATION  
SIDE FOUR: NO FLAKES, BLISTERS, DELAMINATION  
\*\*NOTE: PINHOLE ON SIDE #3 THERE PRIOR TO TESTING.

3534

SIDE ONE: NO FLAKES, BLISTERS, DELAMINATIONS  
SIDE TWO: NO FLAKES, BLISTERS, DELAMINATIONS  
SIDE THREE: NO FLAKES, BLISTERS, DELAMINATIONS  
SIDE FOUR: NO FLAKES, BLISTERS, DELAMINATIONS

REPORT NUMBER-----054112277-----

APPROVED BY

*Charles E. Evers*

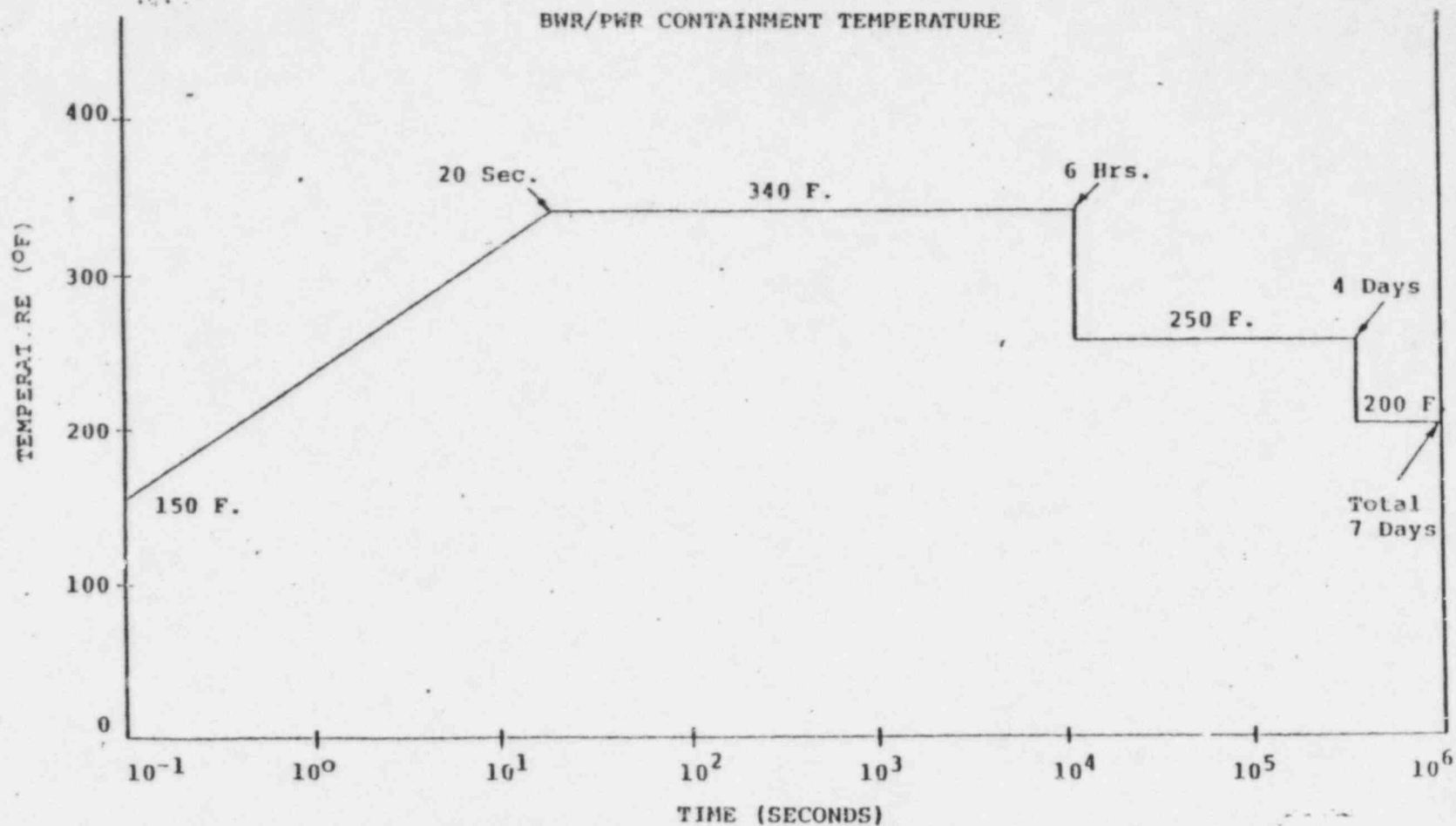
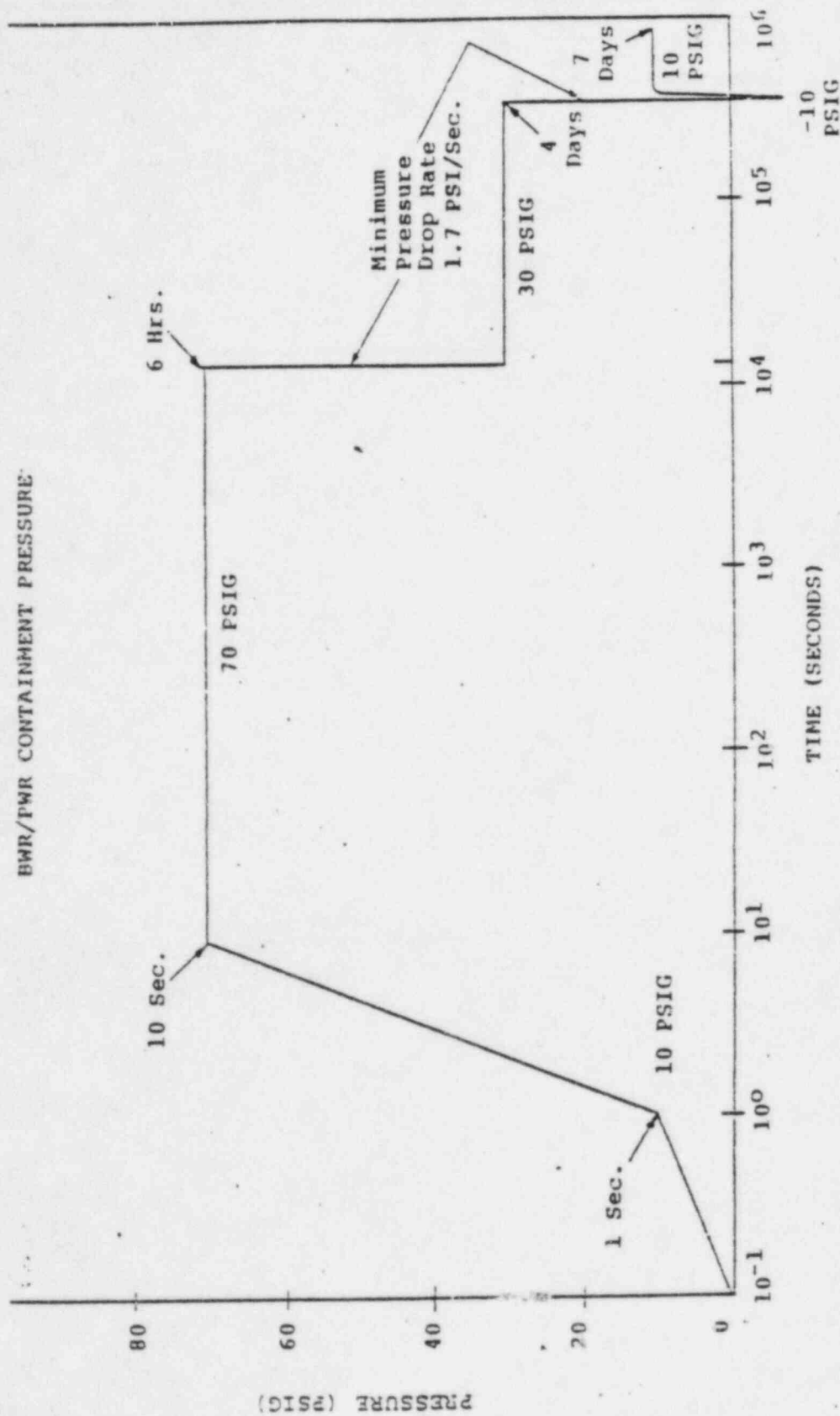
PROTECTIVE COATING QUALIFICATION CONDITIONS  
INSIDE CONTAINMENT

Table 1



# PROTECTIVE COATING QUALIFICATION CONDITIONS INSIDE CONTAINMENT

BWR/PWR CONTAINMENT PRESSURE



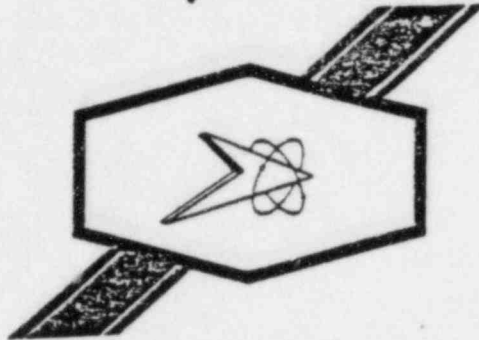
TIME (SECONDS)

Table 2

-10 PSIG



# Imperial



## TECHNICAL REPORT

NUMBER

412-80

TITLE

Design Basis Accident Testing  
Nutec 1201 and Nutec 1202 over Bare Concrete  
FOR

CUSTOMER

Submitted by: Gerald E. Arnold

Accepted by: *Gerald E. Arnold*

Approved: *James J. Bauer*

Date: July 2, 1980

SOUTHERN IMPERIAL COATINGS CORPORATION, INC.  
P. O. Box 29077, \* New Orleans, Louisiana 70189  
Phone: (504) 254-1443

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SCOPE - The purpose of this test was to evaluate the DBA performance of Nutech 1201 and Nutech 1202 over bare concrete.

BACKGROUND - During the application of the Nutech 11S/11/.201 system, bare concrete is sometimes exposed due to overworking of the Nutech 11S or Nutech 11, or stoning or abrading of the surfacer to the substrate. In Service Level I and Service Level II areas it is essential that the concrete be shielded from radioactive nuclides and that the surface be easily decontaminable. It is already known, from past testing that Nutech 1201 meets these requirements - that decontamination factor is well within the ANSI N5.12 criteria. However, in addition to the above requirements, the Nutech 1201 (and 1202) must be demonstrated to withstand the rigors of a Loss of Coolant Accident - that is, it must remain intact on the surface, to prevent clogging of the strainers and to facilitate decontamination work.

PROCEDURE - Two concrete coupons, measuring 2 x 4 x 2" and prepared in accordance with the proposed ASTM D01.43 concrete procedure, were topcoated with Nutech 1201 and Nutech 1202 epoxy polyamide topcoats. Each topcoat was applied to two faces on each concrete specimen. Details of the application and curing of the coatings are outlined in the attached panel preparation sheets.

The panels were then submitted to Oak Ridge National Laboratories for Design Basis Accident Testing at the ASTM D01.43 proposed FWR curve (307°F., 60 psig). Refer to the attached ORNL procedures.

RESULTS - No defects were noted on either coupon. Refer to the attached ORNL results sheet.

CONCLUSION - In those instances where the concrete remains exposed, application of Nutech 1201 or 1202 is satisfactory provided the application is pinhole free.

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 1201 and Nutec 1202
2. TYPE SUBSTRATE: Concrete SIZE: 2 x 4 x 2"
3. SURFACE PREPARATION (Describe): Wire brush cleaned to remove efflorescence from  
surface.
4. PRODUCT DATA: SAMPLE NO.(s): 6165
5. DATE AND TIME CURING COMPOUND 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/M(°F)*R.H.</u>	<u>THICKNESS (ins.)</u>	<u>TIME &amp; DATE APPLIED</u>
1	Epoxy	*1202	8353/7939	Spray	44° 71%	.005 - .006	02/07/80 02/08/80
2	Nutec	**1201	6637/6333	Spray	44° 71%	.005 - .006	02/07/80 02/08/80

\*Sides 1 & 2 coated with 1202

\*\*Sides 3 & 4 coated with 1201

6. CURING CONDITIONS: AMBIENT TEMP. 40 - 45 °F REL. HUMIDITY 70 - 75  
MINIMUM CURE 35 DAYS
7. TEST PROCEDURE: DBA
8. TESTING PERFORMED BY: Oak Ridge DATE SUBMITTED 03/15/80

APPROVED: James E. Arnold

TEST REPORT NO. \_\_\_\_\_

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 1201 and Nutec 1202
2. TYPE SUBSTRATE: Concrete SIZE: 2 x 4 x 2"
3. SURFACE PREPARATION (Describe): Wire brush cleaned to remove efflorescence from coupon.
4. PRODUCT DATA: SAMPLE NO.(s): 6163
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: N/A

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F) %R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	Epoxy	*1202	8353/7939	Spray	44° 71%	.005 - .006	02/07/80 02/80/80
2	Nutec	**1201	6637/6333	Spray	44° 71%	.005 - .006	02/07/80 02/80/80

\*Sides 1 & 2 coated with 1202

\*\*Sides 3 & 4 coated with 1201

6. CURING CONDITIONS: AMBIENT TEMP. 40 - 45 °F REL. HUMIDITY 70 - 75  
MINIMUM CURE 35 DAYS
7. TEST PROCEDURE: DBA
8. TESTING PERFORMED BY: Oak Ridge DATE SUBMITTED 03/15/80

APPROVED: Frederic E. Arnold  
TEST REPORT NO. \_\_\_\_\_

Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 14, 1980

### 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 53% 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  $1 \times 10^6$  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

Approved

R. P. Apple  
L. T. Smith

Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 14, 1980

ORNL Log Book No. A 7562; A5-5-80

Table 1. DBA solution composition, distilled water

Reagent	Concentration
Boric acid, $H_3BO_3$	0.28 M
Sodium hydroxide, NaOH	Required to adjust pH to 9.5

Table 2. DBA test conditions

Time	Temperature (°F)	Pressure (psig)	Comments
Start			Autoclave preheated.
10 s	307	60 (10 s)	Steam injected.
2 h 47 min	307	60	Pressure maintained by relief valve.
4.5 min	307-270	30	Spray solution added at 75°F.
25 min	270-250	30	
4 days	250	30	
3 min	250-230	0	Fresh spray solution added at 75°F after draining autoclave.
10 min	230-200	10	
3 days	200	10	
End of test			

Evaluated

Approved

R. P. Apple

L. T. Collins



Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 14, 1980

System Identification

1201/1202

Steel panel x Concrete block

DBA Test Results

ORNL Master Analytical Manual Method No. 2 0922.  
ORNL Log Book No. A 7562; A5-5-80

<u>Sample No.</u>	<u>DBA phase</u>	<u>Comments</u>
6163	spray	Coatings intact, no defects, sides 1, 2, 3, and 4.
6165	spray	Coatings intact, no defects, sides 1, 2, 3, and 4.

Evaluated

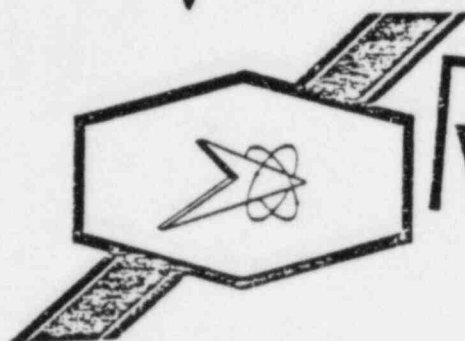
Approved

R. L. Apple

L. T. Cochran

VBR-11916

*Imperial*



JOB NO. 35-1195

E C E I V E

MAR 27 1980

E C E I V E

D

# TECHNICAL REPORT

NUMBER

346-79-G

TITLE

DBA Test Results-Short Intercoat Times:  
Nutec 11S/Nutec 11, Nutec 11/Nutec 1201

FOR

CUSTOMER

Submitted by: Gerald E. Arnold

Accepted by: *ABauer* 1/3/80

Approved:

Date: December 27, 1979

B & R DCC DIST.

PROJECT MGR.	
PROJECT ENGR.	
QA MGR.	/
PROJECT CONT. ENGR.	/ <i>4</i>
TUGCO QA	
PROJECT GEN. MGR.	
ARMS	/ <i>4</i>
<i>G. MacPail</i>	/ <i>4</i> (5)
<i>VBR</i>	/ <i>4</i>

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

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*8511060057*

SCOPE: The purpose of this test was to determine the feasibility of applying two coatings (Nutec 11S and 11 or, Nutec 11 and 1201) in a single day, for touch up purposes.

BACKGROUND: When applying the 11S/11/1201 concrete coating system, it is sometimes necessary to conduct repair or touch up work. Voids or pinholes may be left in the Nutec 11S coated surface. It would be advantageous to touch up these voids the same day prior to applying the next full coat.

Similarly, before applying the 1201 topcoat, the 11S or 11S/11 coated concrete should be pinhole free. If pinholes do exist they should be touched up with Nutec 11 prior to topcoating. Again, it would be ideal if both the repair and final coats could be applied in the same day.

SUMMARY: Design Basis Accident testing conducted by Coastal Science Associates revealed no significant defects on specimens which had the Nutec 11S and Nutec 11 applied at 6 hour intervals and others which had the Nutec 11 and Nutec 1201 applied with a 4 hour intercoat period. Because the cure time of each coating is dependent on film thickness, temperature, amount of thinning, and to some extent relative humidity, this practice is only recommended for touch up applications and not full coats.

PROCEDURES: Three concrete coupons, measuring 2 x 4 x 2" were all coated with Nutec 11S. Of these, two coupons were coated with Nutec 11, 24 hours later, and one was coated with Nutec 11 after only 6 hours. The one specimen with the 6 hour 11S/11 intercoat cure was then topcoated with Nutec 1201 following a 24 hour cure of the Nutec 11. The remaining two coupons with the 24 hour 11S/11 intercoat cure were handled as follows: One specimen was topcoated 4 hours after the application of the Nutec 11, while the other was topcoated following a 24 hour curing of the Nutec 11.

To summarize:

<u>Coupon #</u>	<u>Description</u>
3535	11S/11 6 hour intercoat cure
3537	11/1201 4 hour intercoat cure
3539	Standard 24 hour intercoat times

\*Refer to the attached panel preparation sheets for details of application and curing.

The coated specimens were allowed to cure approximately 22 days, then submitted to Coastal Science Associates for DBA Testing in accordance with the Houston Lighting and Power/South Texas Project conditions: 291°F. and 58PSIG (maximum). The duration of the test was four days-see attached diagram.

RESULTS: See attached Coastal Science Reports.

CONCLUSIONS: All test specimens, including those coated using short intercoat cure times, performed well under DBA conditions, exhibiting no significant defects. For minor repair applications, Nutec 11S may be coated with Nutec 11 as soon as the 11S has set to touch. The same is also true for topcoating Nutec 11

T.R. #346-73-G  
Page 2

with Nutec 1201. The set to touch time will be dependent on film thickness, % thinning, temperature, and to some extent relative humidity. Because of the number of variables that can effect the set time and the corresponding release of solvent, the practice of using short intercoat times is recommended only for small areas.

REFERENCE: Lab Notebook 133 pg. 155.

# TEST PANEL PREPARATION DAT

1. Product to be Tested: Nutec 11S/Nutec 11/Nutec 1201
2. Type Substrate: Concrete SIZE: 2 x 4 x 2"
3. Surface Preparation (describe): 100 psi compressed air
4. PRODUCT DATA: Sample No(s): 3535
5. Date and Time Curing Compound or Primer Applied: N/A

COAT	PRODUCT	PRODUCT CODE	BATCH #	APPLICATION METHOD	CONDITIONS R/M (°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
	Nutec	11S	2671/LB150/LB148	Squeegee	75/54	.015-.020"	10/17/77 11 a.m.
	Nutec	11	2671/LB150/LB149	Squeegee	82/48	.003-.005"	10/17/77 5 p.m.
	Nutec	1201	2467/2568	Spray	84/56	.004-.006"	10/18/77 4 p.m.

Total dry film thickness: .022-.031"

6. Curing Conditions: Ambient Temp. 70 - 80 °F Rel. Humidity 45 - 60%  
Minimum Cure 22 Days
7. Test Procedure: DEA per HL&P/South Texas
8. Testing Performed By: Coastal Science Associates Date: 11/11/77

Prepared By: Harold E. Arnold  
 Date: 12-27-79  
 Approved By: DB  
 Date: 1/3/80  
 Report No. \_\_\_\_\_

# TEST PANEL PREPARATION DATA

1. Product to be Tested: Nutec 11S/Nutec 11/Nutec 1201
2. Type Substrate: Concrete SIZE: 2 x 4 x 2"
3. Surface Preparation (describe): 100 psi compressed air
4. PRODUCT DATA: Sample No(s): 3537
5. Date and Time Curing Compound or Primer Applied: N/A

COAT	PRODUCT	PRODUCT CODE	BATCH #	APPLICATION METHOD	CONDITIONS R/M (°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
	Nutec	11S	2671/LN150/LB148	Squeegee	74/54	.015-.020"	10/17/77 11 a.m.
	Nutec	11	2671/LB150/LB149	Squeegee	82/55	.003-.005"	10/18/77 11:40 am
	Nutec	1201	2467/2568	Spray	84/56	.004-.006"	10/18/77 3:45 p.m.

Total dry film thickness: .022-.031"

6. Curing Conditions: Ambient Temp. 70 - 80 °F Rel. Humidity 45 - 60  
Minimum Cure 22 Days
7. Test Procedure: DBA per HL&P/South Texas
8. Testing Performed By: Coastal Science Associates Date: 11/11/77

Prepared By: Gerald E. Arnold  
 Date: 12-27-79  
 Approved By: DAJ  
 Date: 1/3/80  
 Report No. \_\_\_\_\_



# TEST PANEL PREPARATION DAT

1. Product to be Tested: Nutec 11S/Nutec 11/Nutec 1201
2. Type Substrate: Concrete SIZE: 2 x 4 x 2"
3. Surface Preparation (describe): 100 psi compressed air
4. PRODUCT DAT: Sample No(s): 3539
5. Date and Time Curing Compound or Primer Applied: N/A

COAT	PRODUCT	PRODUCT CODE	BATCH #	APPLICATION METHOD	CONDITIONS R/M (°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
	Nutec	11S	2671/LB150/LB148	Squeegee	74/54	.015-.020"	10/17/77 11 a.m.
	Nutec	11	2671/LB150/LB149	Squeegee	82/55	.003-.005"	10/18/77 11:40 am
	Nutec	1201	2467/2568	Spray	80/68	.004-.006"	10/19/77 11 a.m.

Total dry film thickness: .022-.031"

6. Curing Conditions: Ambient Temp. 70 - 80 °F Rel. Humidity 45 - 60  
Minimum Cure 22 Days
7. Test Procedure: DBA per HL&P/South Texas
8. Testing Performed By: Coastal Science Associates Date: 11/11/77

Prepared By: Harold S. Arnold  
 Date: 12-27-79  
 Approved By: DB  
 Date: 1/3/80  
 Report No. \_\_\_\_\_

ENVIRONMENTAL QUALIFICATION TEST PROFILE

### Temperature Versus Time

Revision D, 10/22/75

Additional  
Perk. Transient

291F

DBA TRIGLUCERIDE

291 F.

781, (10 <sup>4</sup> s)	4.78
--------------------------	------

2.78h (10<sup>4</sup> s) Time

1001

ENVIRONMENTAL QUALIFICATION TEST PROFILE

Pressure Versus Time

REVISION 0, 10/22/75

ADDITIONAL  
PEAK TRANSMISSION

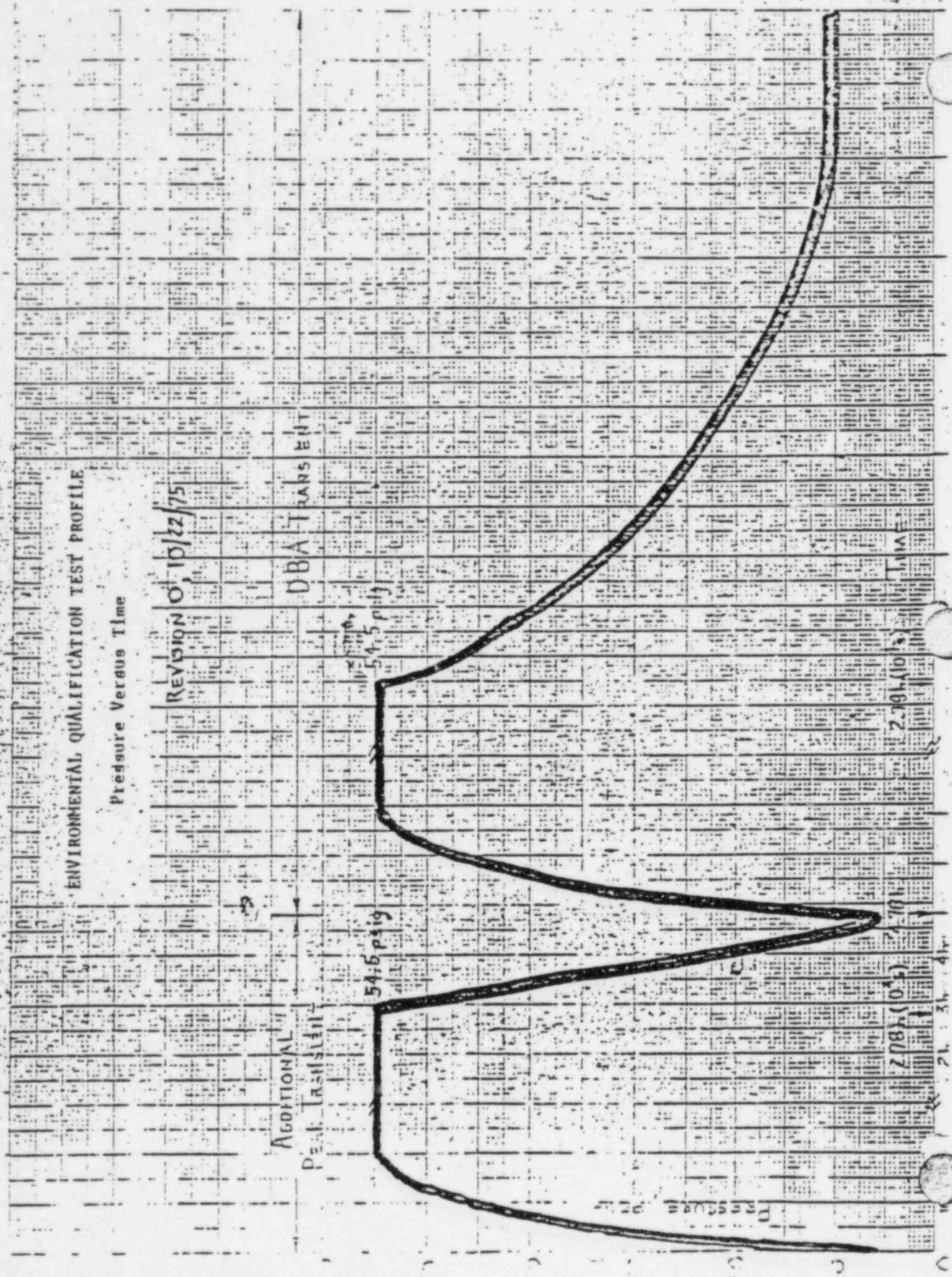
DBA TRANSMISSION

54.5 psig

54.5 psig

2.79 (10)

2.08 (0.1)



# COASTAL SCIENCE ASSOCIATES

(504) 283-7251

6900 CANAL BOULEVARD • NEW ORLEANS, LOUISIANA 70124

PRINT

DATE: 11/14/77

PRODUCT IDENTIFICATION: 1 CONCRETE

DBA TEST CONDITIONS:  
HOUSTON LIGHTING AND POWER, SHORTENED TO 96 HOURS.

SAMPLE NUMBER

COMMENTS

3535

SIDE ONE: NO BLISTERS, CRACKS, FLAKING, DELAMINATIONS,  
OR OTHER DEFECTS DETECTED

SIDE TWO: NO BLISTERS, CRACKS, FLAKING, DELAMINATIONS,  
OR OTHER DEFECTS DETECTED.

SIDE THREE: NO BLISTERS, CRACKS, FLAKING, DELAMINATIONS,  
OR OTHER DEFECTS DETECTED.

SIDE FOUR: NO BLISTERS, CRACKS, FLAKING, DELAMINATIONS,  
OR OTHER DEFECTS DETECTED.

REPORT NUMBER 852111477

APPROVED

*Charles B. Fung*

COOPERATIVE STUDIES • TECHNICAL PROGRAM EVALUATION • POLLUTION ABATEMENT  
MARINE COATINGS & TESTING • CHEMICAL / PHYSICS CONSULTING



# COASTAL SCIENCE ASSOCIATES

(504) 283-7251 6900 CANAL BOULEVARD • NEW ORLEANS, LOUISIANA 70124

PRINT

DATE: 11/14/77

PRODUCT IDENTIFICATION: 1 CONCRETE

DBA TEST CONDITIONS:  
HOUSTON LIGHTING AND POWER, SHORTENED TO 96 HOURS.

SAMPLE NUMBER

COMMENTS

3537

SIDE ONE: NO BLISTERS, CRACKS, FLAKING, DELAMINATIONS,  
OR OTHER DEFECTS DETECTED.

SIDE TWO: NO BLISTERS, CRACKS, FLAKING, DELAMINATIONS,  
OR OTHER DEFECTS DETECTED.

SIDE THREE: NO BLISTERS, CRACKS, FLAKING, DELAMINATIONS,  
OR OTHER DEFECTS DETECTED.

SIDE FOUR: NO BLISTERS, CRACKS, FLAKING, DELAMINATIONS,  
OR OTHER DEFECTS DETECTED.

REPORT NUMBER 352111477

APPROVED *Charles F. Fung*

COOPERATIVE STUDIES • TECHNICAL PROGRAM EVALUATION • POLLUTION ABATEMENT  
MARINE COATINGS & TESTING • CHEMICAL / PHYSICS CONSULTING

# COASTAL SCIENCE ASSOCIATES

(504) 283-7251

6900 CANAL BOULEVARD • NEW ORLEANS, LOUISIANA 70124

PRINT

DATE: 11/14/77

PRODUCT IDENTIFICATION: 1 CONCRETE

DBA TEST CONDITIONS:  
HOUSTON LIGHTING AND POWER, SHORTENED TO 96 HOURS.

SAMPLE NUMBER

COMMENTS

3539

SIDE ONE: NO BLISTERS, CRACKS, FLAKING, DELAMINATIONS,  
OR OTHER DEFECTS DETECTED.

SIDE TWO: ONE FLAKE, ABOUT 1/4", LOWER HALF.

SIDE THREE: NO BLISTERS, CRACKS, FLAKING, DELAMINATIONS,  
OR OTHER DEFECTS DETECTED.

SIDE FOUR: NO BLISTERS, CRACKS, FLAKING, DELAMINATIONS,  
OR OTHER DEFECTS DETECTED.

REPORT NUMBER 852111477

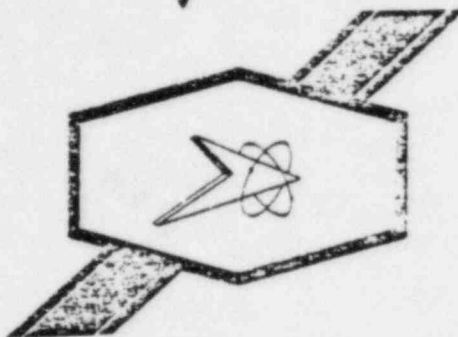
APPROVED

*Charles F. Fung*

COOPERATIVE STUDIES • TECHNICAL PROGRAM EVALUATION • POLLUTION ABATEMENT  
MARINE COATINGS & TESTING • CHEMICAL / PHYSICS CONSULTING



*Imperial*



## TECHNICAL REPORT

NUMBER  
115-3-78

TITLE  
DBA, RADIATION, DECONTAMINATION, TEST RESULTS #10/11S/11/1201

FOR  
SICC  
CUSTOMER

Submitted by: Oak Ridge National Laboratories

Approved:

Date: 4/5/78

SOUTHERN IMPERIAL COATINGS CORPORATION, INC.  
P. O. Box 19077 • New Orleans, Louisiana 70189  
Phone: (504) 254-1433

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85/1060169

DBA AND RADIATION TOLERANCE TEST BLOCK

PREPARATION DATA

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #10/NUTEC #11S/NUTEC #11/REACTIC #1201
2. TYPE SUBSTRATE: Concrete - Bechtel CP-956 SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): All surfaces blasted with 100 psi compressed air.
4. PRODUCT DATA: SAMPLE NO.(s): 2377
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 3/11/77

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#10	1297/1315/1347	Spray	75°F/78%	*	3/11/77
2	NUTEC	#11S	1310/1556/1312	Squeegee	75°F/58%	**	4/8/77
3	NUTEC	#11	1313/1314	Squeegee	78°F/64%	**	4/9/77
4	REACTIC	#1201	7497/7434	Spray	82°F/48%	**	4/11/77

\*Nutec #10 Spray Applied at 400 ft<sup>2</sup>/gal.

		NUTEC #11S	NUTEC #11	REACTIC #1201
MINIMUM Thickness	Broomed Surface	.010-.015 in	.003-.005 in	.003-.005 in
Average Thickness	Sides adjacent to Broomed surface	.015-.020 in	.005-.010 in	.007-.008 in
Maximum Thickness	Side opposite Broomed surface	.025-.035 in	.015-.020 in	.010-.012 in

Total Dry Film Thickness Range - .016-.067 inches

6. CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 40-65 %  
MINIMUM CURE 11 DAYS
7. TEST PROCEDURE: Radiation - DBA Bechtel CP-951 and CP-956
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 4/22/77

APPROVED BY: [Signature]  
DATE: 4/5/78  
PREPARED BY: Harold E. Arnold  
DATE: 4/5/78  
TEST REPORT NO.: 115-3-78

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

... PRODUCT TO BE TESTED: NUTEC #10/NUTEC #11S/NUTEC #11/REACTIC #1201  
1. TYPE SUBSTRATE: Concrete - Bechtel CP-956 SIZE: 2" x 4" x 2"  
2. SURFACE PREPARATION (Describe): All surfaces blasted with 100 psi compressed air  
...  
3. PRODUCT DATA: SAMPLE NO.(s): 2379  
4. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 3/11/77

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#10	1297/1315/1347	Spray	75°F/78%	*	3/11/77
2	NUTED	#11S	1310/1556/1312	Squeegee	75°F/58%	**	4/8/77
3	NUTEC	#11	1313/1314	Squeegee	78°F/64%	**	4/9/77
4	REACTIC	#1201	7497/7434	Spray	82°F/48%	**	4/11/77

\*Nutec #10 Spray Applied at 400 ft<sup>2</sup>/gal.

		NUTEC #11S	NUTEC #11	REACTIC #1201
** Minimum Thickness	Broomed Surface	.010-.015 in	.003-.005 in	.003-.005 in
Average Thickness	Sides adjacent to Broomed surface	.015-.020 in	.005-.010 in	.007-.008 in
Maximum Thickness	Side opposite Broomed surface	.025-.035 in	.015-.020 in	.010-.012 in

Total Dry Film Thickness Range - .016 - .067 inches

6. CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 40-65  
MINIMUM CURE 11 DAYS

7. TEST PROCEDURE: DBA - Bechtel CP-956

8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 4/22/77

APPROVED BY: [Signature]

DATE: 4/5/78

PREPARED BY: Harold E. Arnold

DATE: 4/5/78

TEST REPORT NO.: 115-2-78

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #10/NUTEC #11S/NUTEC #11/REACTIC #1201
2. TYPE SUBSTRATE: Concrete - Bechtel CP-956 SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): all surfaces blasted with 100 psi compressed air-
4. PRODUCT DATA: SAMPLE NO.(s): 2381
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 3/11/77

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#10	1297/1315/1347	Spray	75°F/78%	*	3/11/77
2	NUTEC	#11S	1310/1556/1312	Squeegee	75°F/58%	**	4/8/77
3	NUTEC	#11	1313/1314	Squeegee	78°F/64%	**	4/9/77
4	REACTIC	#1201	7497/7434	Spray	82°F/48%	**	4/11/77

\* NUTEC #10 spray applied at 400 ft<sup>2</sup>/gal.

		NUTEC #11S	NUTEC #11	REACTIC #1201
** Maximum Thickness	Broomed Surface	.025-.035 in	.015-.020 in	.010-.012 in
Average Thickness	Sides adjacent to Broomed surface	.015-.020 in	.005-.010 in	.007-.008 in
Minimum Thickness	Side opposite Broomed surface	.010-.015 in	.003-.005 in	.003-.005 in

Total Dry Film Thickness Range - .016 - .067 inches

6. CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 40-65 %  
MINIMUM CURE 11 DAYS
7. TEST PROCEDURE: Radiation - DBA - Bechtel CP-951 and CP-956
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 4/22/77

APPROVED BY: [Signature]

DATE: 4/5/78

PREPARED BY: Harold C. Arnold

DATE: 4/5/78

TEST REPORT NO.: 115-3-73

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #10/NUTEC #11S/NUTEC #11/REACTIC #1201
2. TYPE SUBSTRATE: Concrete - Bechtel CP-956 SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): All surfaces blasted with 100 psi compressed air.
4. PRODUCT DATA: SAMPLE NO.(s): 2382
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 3/11/77

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#10	1297/1315/1347	Spray	75°F/78%	*	3/11/77
2	NUTEC	#11S	1310/1556/1312	Squeegee	75°F/58%	**	4/8/77
3	NUTEC	#11	1313/1314	Squeegee	78°F/64%	**	4/9/77
4	REACTIC	#1201	7494/7434	Spray	82°F/48%	**	4/11/77

\* NUTEC #10 spray applied at 400 ft<sup>2</sup>/gal.

		NUTEC #11S	NUTEC #11	REACTIC #1201
** Maximum Thickness	Broomed Surface	.025-.035 in	.015-.020 in	.010-.012 in
Average Thickness	Sides adjacent to Broomed surface	.015-.020 in	.005-.010 in	.007-.008 in
Minimum Thickness	Side opposite Broomed surface	.010-.015 in	.003-.005 in	.003-.005 in

Total Dry Film Thickness Range - .016-.067 inches

6. CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 40-65 %  
MINIMUM CURE 11 DAYS
7. TEST PROCEDURE: DBA - Bechtel CP-956
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 4/22/77

APPROVED BY: [Signature]  
DATE: 4/5/78  
PREPARED BY: [Signature]  
DATE: 4/5/78  
TEST REPORT NO.: 115-3-70



DBA TEST RESULTS

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: 5/31/77

CBA Test Results:

ORNL Master Analytical Manual Method No. 2 0922;  
Bechtel Corp. Spec. No. CP-956;  
ORNL Log Book No. A 7562; 4-29-7

[illegible]

\*Irradiated.

\*\* (SA) = sand blast; (SH) = shot blast; (GR) = grit blast.

Evaluated

Approved \_\_\_\_\_

RADIATION TOLERANCE TEST RESULTS

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: 5-31-77

10/115/11/1201 (7-day cure)

ORNL Master Analytical Manual Method No. 2 0921;  
Bechtel Corp. Spec. No. CP-951;  
ORNL Log Book No. A 7562; 4-29-7

Cumulative Dose Rate:	Comments:

Additional Comments:

Approved

DECONTAMINATION TEST PANEL PREPARATION DATA

DECONTAMINATION TEST

BECHTEL CP-952 AND A.N.S.I. N-5.12

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: REACTIC #1201
2. TYPE SUBSTRATE: ASTM A-36 Carbon Steel SIZE: 2" x 4" x 1/4"
3. SURFACE PREPARATION (Describe): Sandblasted per SSPC-SP-10 with Cresblast #4 Blasting Sand. Surface profile between 1S70 and 2S70 as read on a Keane-Tator Profile Comparator Disc.
4. PRODUCT DATA: SAMPLE NO.(s): 688

<u>COAT</u>	<u>PRODUCT</u>	<u>PRODUCT CODES</u>	<u>BATCH #</u>	<u>APPLICATION METHOD</u>	<u>CONDITIONS R/M(°F) &amp; R.H.</u>	<u>THICKNESS (ins)</u>	<u>DATE APPLIED</u>
1	NUTEC	#6	6169/6170	Spray	82°F/63%	.0024- .0033	7/29/76 5:00 p.m.
2	REACTIC	#1201	6171/6172	Spray	92°F/59%	.0056- .0077	8/5/76 12:00 noon

Total Dry Film Thickness - .0080 - .0110

5. CURING CONDITIONS: AMBIENT TEMP: 75 ± 5 °F REL. HUMIDITY 60 ± 10
- MINIMUM CURE: 7 DAYS

6. TEST PROCEDURE Decontamination

7. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED: 8/12/76

APPROVED: [Signature]

TEST REPORT NO. 112-1-78

PREPARED BY: Gerald E. Arnold

DATE: 4/5/78



DECONTAMINATION TEST RESULTS

Manufacturer: Southern Imperial  
New Orleans, LA

Analyt: Chemistry Division  
Oak Ridge National Laboratory  
Date: September 15, 1976

Decontamination Test Results:

These tests performed according to ORNL Master Analytical Manual  
Method No. 2 0920 and Bechtel Corp. Spec. CP-952.

ORNL Log Book No. A 7562; 8-12-6

Sample Number	Contaminant	Decontamination Factor (DF)				Percent of Total Activity Removed <sup>1</sup>
		Water @25°C	Acid @25°C	Acid @80°C	Overall	
673 (1203)	Ce-144	87	1.9	1.6	270	99.4
	Ru-106	41	1.6	1.6	100	
	Cs-137	680	1.2	1.7	1400	
	Zr-95	20	1.5	1.0	31	
	TOTAL	70	1.6	1.5	170	
688 (1201)	Ce-144	120	2.1	1.0	250	99.4
	Ru-106	68	1.6	1.1	120	
	Cs-137	160	1.3	1.4	280	
	Zr-95	17	1.6	1.1	29	
	TOTAL	85	1.6	1.1	160	
772 (555)	Ce-144	1.7	4.0	1.8	13	90.0
	Ru-106	2.3	1.7	1.4	5.5	
	Cs-137	20	2.6	1.9	98	
	Zr-95	1.1	1.9	2.0	4.3	
	TOTAL	2.7	2.4	1.6	10	
	Ce-144					
	Ru-106					
	Cs-137					
	Zr-95					
	TOTAL					
	Ce-144					
	Ru-106					
	Cs-137					
	Zr-95					
	TOTAL					

<sup>1</sup>Percent of total activity removed =  $(1 - \frac{1}{DF}) \times 100$ .

Approved L.T. Corbin

P.O. Box 29077 New Orleans, Louisiana 70189 U.S.A. 504-254-1433



PROFESSIONAL COATINGS

VBR-7496

April 19, 1978

Mr. Don Sutton  
c/o Brown & Root  
Comanche Peak Steam Electric Station  
P.O. Box 1001  
GLEN ROSE, TX 76043

SUBJECT: Markings on Concrete

Attached is a copy of Technical report #246-78-G, describing the compatibility testing of Nutac #11S and Reactic #1201 over felt-tipped marking inks on concrete and Nutac #11S.

DBA testing over black and white felt-tipped markings revealed no significant defects, other than bleeding through of the black markings (black marking inks on #11S bled through the topcoat).

It is strongly recommended that a solvent dissolvable marker be used, such as a felt tip marking pen. A white marking pen would be desirable to prevent bleeding. Prior to application of the coating, I recommend the markings be solvent wiped per SSPC-SP-1 with DL-6A Universal Solvent, or Xylol. The cleaned surface shall be allowed to dry thoroughly before the coating is applied. Marking stains imbedded in the concrete and not removable by this procedure should not be deleterious to the coatings performance.

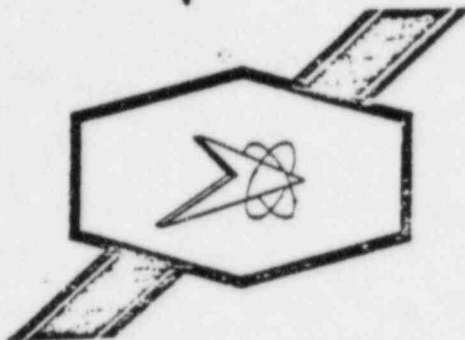
PREPARED BY: *Donald L. Curtis*

APPROVED BY: *JH*

DATE: 4/19/78

GEA/nd

*Imperial*



## TECHNICAL REPORT

NUMBER

246-78-G

TITLE

Effects of Felt-tip Markers on  
#11S/1201 system

FOR

Company Knowledge

S.R.#1396  
CUSTOMER

Submitted by: Coastal Science Associates

Approved: *SKL*

Date: 4/78

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

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8511060067

SUMMARY: Black and white felt tip markings were applied to concrete and Nutec #11S surfaces. The test specimen was completely coated with the Nutec #11S/Reactic #1201 system and then DBA tested to determine the effect of the markings.

The coated test specimen was exposed to DBA conditions in an autoclave for 24 hours (Coastal Science Associates) with maximum temperature and pressure of 307°F. and 58 psig.

Careful inspection of the specimen revealed no defects other than bleeding through of the black markings.

INTRODUCTION: The objective of this test was to determine what effect, if any, felt tip markings on concrete and Nutec #11S would have on the #11S/1201 system.

METHODS:

- a. Specimen: the test specimen used was a concrete coupon, measuring 2" x 4" x 2", and prepared in accordance with the proposed ASTM D1.43 (modified) mix and ASTM C192-69 procedure. The concrete specimen was cured by applying Nutec #10 as a curing membrane within 24 hours of the removal of the concrete from the forms.
- b. Markings: Two types of felt tip markers were used:
  1. White - white marker  
Carter's Ink Company  
Cambridge, Mass. 02142
  2. Black - Graphi 500  
Graphic Industries  
L.A., Calif. 90038

Each marker was applied to the concrete and to the applied Nutec #11S.

Marker	Location of Marking	Surface applied to:
White	Bottom face	Concrete
White	Side B	Nutec #11S
Black	Top face	Concrete
Black	Side D	Nutec #11S

- c. Application: Nutec #11S was applied to four faces of the concrete coupon and was allowed to cure fully. The marking inks were applied

liberally to the top and bottom faces (bare concrete) and to two of the four faces coated with Nutec #11S. Nutec #11S was applied to the top and bottom faces after the markings had dried for 24 hours. The entire coupon was then topcoated with Reactic #1201. No surface preparation was used between coats to remove the markings. Essentially, two systems were applied for testing:

1. Markings/Nutec #11S/Reactic #1201
2. Nutec #11S/Markings/Reactic #1201

See attached panel preparation sheet for application and curing details.

- d. Testing: The test specimen was allowed to cure for 17 days and then submitted to Coastal Science Associates for DEA testing at the Houston Lighting and Power curve, Revision 0, 10-22-75. The maximum temperature and pressure achieved was 307°F. and 58 psig.

RESULTS: No defects other than bleeding through of the black marking ink were noted. Coastal Science reported dense #6 blisters on Side D, however, microscopic inspection of the surface in question, revealed only the usual rough surface. Apparently the rough, sandpaper-like surface, contrasted by the bleeding-through black marking ink was mistaken to be uniformly covered with small blisters.

Although the test indicated no compatibility problems, as a precaution it is suggested that the markings be removed as well as possible by solvent wiping with Xylol, in accordance with SSPC-SP-1.

REFERENCES: Lab. Notebook #56, p.p.53,54,56



COASTAL SCIENCE ASSOCIATES, INC.  
6900 CANAL BLVD.  
NEW ORLEANS, LOUISIANA 70124  
TEL. 504-283-7251

SUBJECT: DESIGN BASIS ACCIDENT COATINGS TEST REPORT.

DATE: 3/21/78

DBA TEST CONDITIONS: 24 HR. HL&P, REVISION 0

HIGHEST TEMPERATURE DURING RUN..... 307 DEG. F.

HIGHEST PRESSURE DURING RUN..... 58 LBS./ SQ. IN.

SAMPLE NUMBER: 3790      SAMPLE TYPE: CONCRETE COUPON

SAMPLE #	DESCRIPTION
----------	-------------

3790	SITE 1: NO DEFECTS
	SITE 2: NO DEFECTS
	SITE 3: NO DEFECTS
	SITE 4: DENSE COVERAGE OF NO. 6 BLISTERS, SURFACE COAT

REPORT WRITTEN FOR: SOUTHERN IMPERIAL

REPORT # 069032178

APPROVED BY.. *Charles A. Frenzel*

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #10/ NUTEC #11S/REACTIC #1201
2. TYPE SUBSTRATE: Concrete SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): 100 psi air blast
4. PRODUCT DATA: SAMPLE NO.(s): 3790
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 8/2/77

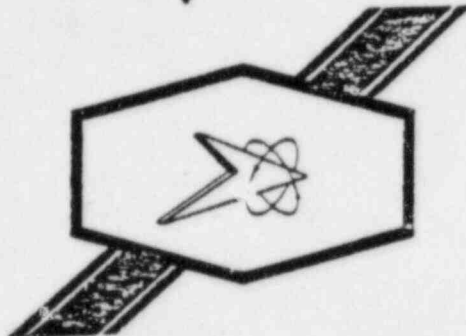
COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#10	6526/6531	Spray	92°F/53%	400 ft <sup>2</sup> /gal.	8/2/77
2	NUTEC	#11S	3227/3228/3229	Squeegee	68°F/60%	.025 - .035	2/11/78
3	REACTIC	#1201	3952/3953	Spray	65°F/66%	.005 - .006	3/3/78

Total dry film thickness: .030 - .041

6. CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 45 - 60%  
MINIMUM CURE 17 DAYS
7. TEST PROCEDURE: DBA per Houston Lighting & Power, Revision 0, 10/22/75
8. TESTING PERFORMED BY: Coastal Science Associates DATE SUBMITTED 3/16/78

APPROVED BY: *HL*  
DATE: 4/19/78  
PREPARED BY: *Small E. Kinard*  
DATE: 4/19/78  
TEST REPORT NO.: 246-78-G

# Imperial



## TECHNICAL REPORT

NUMBER

249-78-G

TITLE

Effects of "Mudcracking" on DBA performance  
of NUTEC #11S

FOR

S.R. #1401

CUSTOMER

Brown & Root, Inc.  
Comanche Peak

Submitted by: Coastal Science Associates

Approved: *SKL*

Date: 4/78

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

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8511060088

SUMMARY: The purpose of this test was to determine what effects cracking of the Nutec #11S film has on the performance of the concrete coating system. No defects were noted on the test specimen following DBA testing.

INTRODUCTION: "Mudcracking" of Nutec #11S has been noted on two occasions; in the laboratory and at the Comanche Peak jobsite. The "mudcracking" phenomenon was observed when rapid changes in surface or air temperature took place, immediately following application of the Nutec #11S. Elcometer adhesion and Designed Basis Accident tests were conducted on the laboratory specimen to assure that this phenomenon was not deleterious to the performance of the coating system. No defects were noted on the test specimen following DBA testing at 307° F. and 58 psig. Elcometer adhesion was also demonstrated to be excellent at 650 psi and 100% failure in the concrete. The laboratory data was further supplemented by tests conducted by Brown & Root Quality Control at the Comanche Peak jobsite. Elcometer adhesion tests were performed with values greater than 500 psi.

METHODS: Lab. panel #3795, a concrete coupon measuring 2" x 4" x 2" was coated with Nutec #11S. The concrete had been previously coated with a concrete curing membrane, Res X. The specimen was placed under running water, in search of water beads which would indicate the presence of a Res X surface film. Satisfied that such a surface film was not present on the concrete, the specimen was placed in an oven at 120° F. for 15 minutes in order to expedite the application. The concrete was still warm when the Nutec #11S was applied. The room temperature was 58° F. and dropping due to a heater malfunction. Overnight the temperature in the laboratory plunged to 28° F.

The Nutec #11S film (which had mudcracked overnight) was cured for an additional 5 days @ 70-80° F. An Elcometer Adhesion test was conducted on the mudcracked #11S film.

Shortly after the mudcracking incident at Comanche Peak, the Elcometer Adhesion damage was repaired with Nutec #11S and the entire coupon topcoated with Reactic #1201. Design Basis Accident testing was performed at Coastal Science Associates with the maximum temperature and pressure reaching 307° F. and 58 psig. The DBA test was conducted over a 24 hour period and performed in accordance with Houston Lighting & Power, Revision 0, 10/22/75.

Refer to attached Test Panel Preparation Data sheet for details of surface preparation, coating application, and curing.

RESULTS:

- a. Elcometer Adhesion - 650 psi with 100% breakage in concrete
- b. DBA testing - No defects: all sides

(See attached Results sheet from Coastal Science Assoc.)

T.R.#249-78-G  
Page 2.

CONCLUSIONS: The "mudcracked" film exhibited excellent adhesion to the concrete substrate and demonstrated the ability to withstand the high temperature and pressures of a Designed Basis Accident test. The laboratory test results were further supported by on-site Elcometer Adhesion tests conducted by Brown & Root Quality Control. The lowest value obtained in these tests was 500 psi.

The "mudcracking" phenomenon is believed to occur because of large differences in surface and air temperatures resulting in varying degrees of expansion or contraction within the thick #11S film itself. Such changes can occur whenever space heaters are used and also as in the case of the laboratory application.

Because of its density, the concrete exhibits a greater resistance to temperature change than does the surrounding air. The temperature of the #11S film in proximity with the concrete, closely approximates that of the concrete, whereas the #11S exposed to the air, more closely approximates the air temperature.

REFERENCES: Lab. Notebook #56, pp. 35,58

/nd

PHYSICAL PROPERTIES

BECHTEL CP-954 and A.N.S.I. N-5.12

1. PRODUCT TESTED: Nutec #11S
2. TYPE SUBSTRATE: 2" x 4" x 2" concrete coupon
3. SURFACE PREPARATION: Sandswept with Cresblast #4 blasting sand.
4. PRODUCT DATA: SAMPLE NOS. 3795

<u>COAT</u>	<u>PRODUCT</u>	<u>PRODUCT CODES</u>	<u>BATCH #</u>	<u>APPLICATION METHOD</u>	<u>CONDITIONS R/M(°F) &amp; R.H.</u>	<u>THICKNESS (ins.)</u>	<u>DATE APPLIED</u>
1	Res X		-----	Brush	70°F/48%	200 ft <sup>2</sup> /gal.	12/8/77
2	NUTEC	#11S	3386/3388/LB149	Squeegee	58°F/38%	.015 - .025	12/10/77

\* First day curing temperature ranged from 28-58°F.

5. CURING DATA:
- AMBIENT TEMP. \* 70-80 °F REL. HUMIDITY: 45-60 % MIN. CURE TIME 5 DAYS
6. TEST PROCEDURE: Bechtel Standard CP-954 and A.N.S.I. N-5.12
7. TEST RESULTS:
- 7.1 ABRASION: Federal Test Method Standard 141 Test Method 6192, 1000 cycles with a CS-17 Wheel and a 1000 gram load.
- LOW - N/A HIGH - N/A AVERAGE - N/A
- 7.2 ADHESION: Determined by use of the ELCOMETER ADHESION TESTER
- 650 psi
- 7.3 DIRECT IMPACT RESISTANCE: N/A

APPROVED

TEST REPORT NO. 249-78-G

PREPARED BY: Shelli C. Arnold

DATE: 4/78



DBA AND RADIATION TOLERANCE

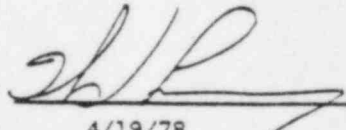
TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #11S/REACTIC #1201
2. TYPE SUBSTRATE: Concrete SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): Sandswept with Cresblast #4 blasting sand.
4. PRODUCT DATA: SAMPLE NO.(s): 3795
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: 12/8/77

<u>COAT</u>	<u>PRODUCT</u>	<u>PRODUCT CODES</u>	<u>BATCH #</u>	<u>APPLICATION METHOD</u>	<u>CONDITIONS R/M(°F) &amp; R.H.</u>	<u>THICKNESS (ins.)</u>	<u>TIME &amp; DATE APPLIED</u>
1	RES X	---	---	Brush	70°F/48%	200 ft <sup>2</sup> /gal.	10/8/77
2	NUTEC	#11S	3386/3388/ LBI49	Squeegee	58°F/38%	.015 - .025	10/10/77
3	REACTIC	#1201	3952/3953	Spray	62°F/66%	.003 - .004	3/3/78

Total Dry Film Thickness: .018 - .029"

6. CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 40-65 %  
MINIMUM CURE 8 DAYS
7. TEST PROCEDURE: DBA per Houston Lighting & Power, Revision 0, 10/22/75
8. TESTING PERFORMED BY: Coastal Science Associates DATE SUBMITTED 3/10/78

APPROVED BY: 

DATE: 4/19/78

PREPARED BY: 

DATE: 4/19/78

TEST REPORT NO.:

249-78-G

COASTAL SCIENCE ASSOCIATES, INC.  
6900 CANAL BLVD.  
NEW ORLEANS, LOUISIANA 70124  
TEL. 504-283-7251

SUBJECT: DESIGN BASIS ACCIDENT COATINGS TEST REPORT.

DATE: 3/13/78

DBA TEST CONDITIONS: ABBREVIATED HL&P (24 HOURS)

HIGHEST TEMPERATURE DURING RUN..... 307 DEG. F.

HIGHEST PRESSURE DURING RUN..... 58 LBS./ SQ. IN.

SAMPLE NUMBER: 3795                  SAMPLE TYPE: CONCRETE COUPON

SAMPLE #	DESCRIPTION
----------	-------------

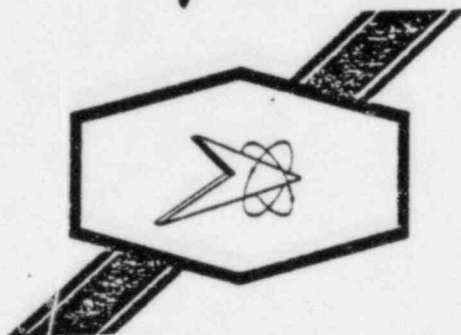
3795	SIDE 1: NO DEFECTS
	SIDE 2: NO DEFECTS
	SIDE 3: NO DEFECTS
	SIDE 4: NO DEFECTS

REPORT WRITTEN FOR: SOUTHERN IMPERIAL COATINGS

REPORT # 068031178

APPROVED BY. *Chabot*

# Imperial



## TECHNICAL REPORT

NUMBER

167-77

TITLE

Repairability of Nutec 11S/Nutec 11/Reactic 1201

FOR

CUSTOMER

Submitted by: Jerry Arnold

Approved: *J.A.*

Date: July 15, 1977

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

The information contained in this report, based upon our experience, is offered without charge as part of our service to customers. It is intended for use by persons having technical skill, at their own discretion and risk. We assume no liability in connection with its use. This information is not intended as a license to operate under, nor a recommendation to infringe, any patent covering any material or use.

8511060085

### Repairability of Damaged Concrete Systems

The following report describes the repairability of the three systems outlined below:

1. Conamet C cleaned/Nutec 11S/Nutec 11/Reactic
2. Nutec 10/ Conamet C cleaned/Nutec 11S/Nutec 11/Reactic 1201
3. L & M cure-fugitive dye/Nutec 11S/Nutec 11/Reactic 1201

Since, however, the damage incurred by the Elcometer adhesion tester occurred in the concrete, the actual repairability evaluations reflect only the Nutec 11S/Nutec 11/Reactic 1201 system.

The tested specimens were damaged by means of an Elcometer adhesion tester. A high strength aluminum dollie was applied to each coupon with an epoxy resin type adhesive in accordance with Imperial Test Method 03. The adhesive was allowed to cure thoroughly, then removed with the Elcometer. Failure occurred in the concrete. The purpose of this procedure is two fold; to generate adhesion data, and to inflict damage.

The damaged coupons were repaired with the original three coat system; Nutec 11S/Nutec 11/Reactic 1201. The affected areas were hand sanded to remove loose concrete and to feather edge the adjacent coating system. Compressed air, 100 psi, was used to remove any dust and contamination from the substrate prior to applying the Nutec 11S surfacer. Refer to the following panel preparation sheets for application and airing data of the applied touch up system.

#### NOTEBOOK REFERENCES

33-85,86

33-101,103

## TEST PANEL PREPARATION &amp;

## REPAIRABILITY &amp; MAINTENANCE

1. Product to be Tested: NUTEC #11S/NUTEC #11/REACTIC #1201
2. Type Substrate: Concrete - Bechtel CP-956 Size: 2" x 4" x 2"
3. Surface Preparation (describe): All surfaces blasted with 100 psi compressed air.
4. PRODUCT DATA: Sample No(s): 2369
5. Date and Time Curing Compound or Primer Applied: L & M cure/fugitive dye applied 3/3/77

COAT	PRODUCT	PRODUCT CODE	BATCH #	APPLICATION METHOD	CONDITIONS R/M (°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	L & M/Fugitive Dye			Spray	72/73	*	3/3/77
2	NUTEC	#11S	1310/1556/1312	Squeegee	76/59	.015-.020	4/4/77
3	NUTEC	#11	1313/1314	Squeegee	74/58	.005-.010	4/6/77
4	REACTIC	#1201	7497/7434	Spray	82/48	.007-.008	4/11/77

\*L & M Cure/Fugitive Dye Mixture applied at a spread rate of 250 ft<sup>2</sup>/gal.

6. Curing Conditions: Ambient Temp. 70-80 °F Rel. Humidity 40-60  
Minimum Cure 27 Days
7. Test Procedure: DBA - Houston Lighting & Power (Rev. 0, 10/22/75)
8. Testing Performed By: Coastal Sciences Date: 6/7/77

Approved By: [Signature]Date: 7/15/77Prepared By: [Signature]Date: 7/18/77Report No. 167-77

# TEST PANEL PREPARATION DATA

## REPAIRABILITY & MAINTENANCE

1. Product to be Tested: NUTEC #11S/NUTEC #11/REACTIC #1201
2. Type Substrate: Concrete - Bechtel CP-956 Size: 2" x 4" x 2"
3. Surface Preparation (describe): All surfaces blasted with 100 psi compressed air.
4. PRODUCT DATA: Sample No(s): 2367
5. Date and Time Curing Compound or Primer Applied: L & M cure/fugitive dye applied 3/3/77

COAT	PRODUCT	PRODUCT CODE	BATCH #	APPLICATION METHOD	CONDITIONS R/M (°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	L & M/Fugitive Dye			Spray	72/73	*	3/3/77
2	NUTEC	#11S	1121/1122/1123	Squeegee	80/60	.015-.020	3/10/77
3	NUTEC	#11	1124/1125	Squeegee	74/56	.005-.010	3/14/77
4	REACTIC	#1201	7497/7434	Spray	80/68	.007-.008	3/16/77

\*L & M Cure/Fugitive Dye Mixture applied at a spread rate of 250 ft<sup>2</sup>/gal.

6. Curing Conditions: Ambient Temp. 70-80 °F Rel. Humidity 40-60  
Minimum Cure 27 Days
7. Test Procedure: DBA - Houston Lighting & Power (Rev. 0, 10/22/75)
8. Testing Performed By: Coastal Sciences Date: 6/7/77

Approved By: [Signature]

Date: 7/19/77

Prepared By: Heath E. Arnold

Date: 7/18/77

Report No. 167-77



TEST RESULTS  
FOR TOUCH-UP AND REPAIR

PRODUCT IDENTIFICATION: \_\_\_\_\_ Steel Panel   X   Concrete Block

1st Coat: \_\_\_\_\_

2nd Coat: See Panel Preparation \_\_\_\_\_

3rd Coat: \_\_\_\_\_

TOUCH-UP PROCEDURE:

Method of Damage: Elcometer adhesion test - break in concrete

Surface Preparation: Damaged area hand sanded and feather edged

Touch-Up Coating:	1st Coat:	<u>NUTEC #11S</u>	<u>4/22/77</u>	<u>.015-.020</u>
	2nd Coat:	<u>NUTEC #11</u>	<u>5/2/77</u>	<u>.005-.010</u>
	3rd Coat:	<u>REACTIC #1201</u>	<u>5/11/77</u>	<u>.005-.007</u>

DBA TEST RESULTS:

ORNL Master Analytical Manual Method No. 2 0922.

Sample No.	DBA Phase	Comments
_____	_____	<u>See Coastal Science Report #040060777</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Approved By: *[Signature]*

Date: 7/19/77

Prepared By: *Harold E. Arnold*

Date: 7/18/77

Report No. 167-77

TEST RESULTS  
FOR TOUCH-UP AND REPAIR

PRODUCT IDENTIFICATION: \_\_\_\_\_ Steel Panel X \_\_\_\_\_ Concrete Block

1st Coat: \_\_\_\_\_  
2nd Coat: See Panel Preparation \_\_\_\_\_  
3rd Coat: \_\_\_\_\_

TOUCH-UP PROCEDURE:

Method of Damage: Elcometer adhesion test - break in concrete

Surface Preparation: Damaged area hand sanded and feather edged

Touch-Up Coating:	1st Coat:	<u>NUTEC #11S</u>	<u>4/22/77</u>	<u>.015-.020</u>
	2nd Coat:	<u>NUTEC #11</u>	<u>5/2/77</u>	<u>.005-.010</u>
	3rd Coat:	<u>REACTIC #1201</u>	<u>5/11/77</u>	<u>.005-.007</u>

DBA TEST RESULTS:

ORNL Master Analytical Manual Method No. 2 0922.

Sample No.	DBA Phase	Comments
_____	_____	<u>See Coastal Science Report #040060777</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Approved By: *[Signature]*

Date: 7/19/77

Prepared By: *Gerald C. Arnold*

Date: 7/19/77

Report No. 167-77

TEST RESULTS  
FOR TOUCH-UP AND REPAIR

PRODUCT IDENTIFICATION: \_\_\_\_\_ Steel Panel X Concrete Block

1st Coat: \_\_\_\_\_  
2nd Coat: See Panel Preparation \_\_\_\_\_  
3rd Coat: \_\_\_\_\_

TOUCH-UP PROCEDURE:

Method of Damage: Elcometer adhesion test - break in concrete

Surface Preparation: Damaged area hand sanded and feather edged

Touch-Up Coating:	1st Coat:	<u>NUTEC #11S</u>	<u>4/22/77</u>	<u>.015-.020</u>
	2nd Coat:	<u>NUTEC #11</u>	<u>5/2/77</u>	<u>.005-.010</u>
	3rd Coat:	<u>REACTIC #1201</u>	<u>5/11/77</u>	<u>.005-.007</u>

DBA TEST RESULTS:

ORNL Master Analytical Manual Method No. 2 0922.

Sample No.	DBA Phase	Comments
_____	_____	<u>See Coastal Science Report #040060777</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Approved By: [Signature]

Date: 7/19/77

Prepared By: Quall E. Arnold

Date: 7/18/77

Report No. 167-77

TEST RESULTS  
FOR TOUCH-UP AND REPAIR

PRODUCT IDENTIFICATION: \_\_\_\_\_ Steel Panel \_\_\_\_\_ X \_\_\_\_\_ Concrete Block

1st Coat: \_\_\_\_\_  
2nd Coat: \_\_\_\_\_ See Panel Preparation \_\_\_\_\_  
3rd Coat: \_\_\_\_\_

TOUCH-UP PROCEDURE:

Method of Damage: Elcometer adhesion test - break in concrete  
Surface Preparation: Damaged area hand sanded and feather edged  
Touch-Up Coating: 1st Coat: NUTEC #11S 4/22/77 .015-.020  
2nd Coat: NUTEC #11 5/2/77 .005-.010  
3rd Coat: REACTIC #1201 5/11/77 .005-.007

DBA TEST RESULTS:

ORNL Master Analytical Manual Method No. 2 0922.

Sample No.	DBA Phase	Comments:
_____	_____	See Coastal Science Report #040060777
_____	_____	_____
_____	_____	_____
_____	_____	_____

Approved By: \_\_\_\_\_

Date: 7/19/77

Prepared By: Gerald E. Arnold

Date: 7/18/77

Report No. 167-77

## TEST PANEL PREPARATION DATA

## REPAIRABILITY &amp; MAINTENANCE

1. Product to be Tested: NUTEC #10/NUTEC #11S/NUTEC #11/REACTIC #1201
2. Type Substrate: Concrete - Bechtel CP-956 Size: 2" x 4" x 2"
3. Surface Preparation (describe): NUTEC #10 cured concrete scrubbed and rinsed with diluted conamet C (Engineered Design Products)
4. PRODUCT DATA: Sample No(s): 2364
5. Date and Time Curing Compound or Primer Applied: NUTEC #10 Primer/Sealer applied 7/9/76

COAT	PRODUCT	PRODUCT CODE	BATCH #	APPLICATION METHOD	CONDITIONS R/M (°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	#10	6154/6155	Spray	86/70	*	7/9/76
2	NUTEC	#11S	1310/1556/1312	Squeegee	76/59	.015-.020	4/4/77
3	NUTEC	#11	1313/1314	Squeegee	74/58	.005-.010	4/6/77
4	REACTIC	#1201	7497/7434	Spray	82/48	.007-.008	4/11/77

\* NUTEC #10 applied at a spread rate of 350 ft<sup>2</sup>/gal.

6. Curing Conditions: Ambient Temp. 70-80 °F Rel. Humidity 40-60  
Minimum Cure 27 Days
7. Test Procedure: DBA - Houston Lighting & Power (Rev. 0, 10/22/75)
8. Testing Performed By: Coastal Sciences Date: 6/7/77

Approved By: [Signature]  
Date: 7/19/77  
Prepared By: [Signature]  
Date: 7/18/77  
Report No. 167-77

# TEST PANEL PREPARATION DATA

## REPAIRABILITY & MAINTENANCE

1. Product to be Tested: NUTEC #11S/NUTEC #11/REACTIC #1201
2. Type Substrate: Concrete - Bechtel CP-956 Size: 2" x 4" x 2"
3. Surface Preparation (describe): Concrete scrubbed and rinsed with concentrated Conamet C (Engineered Design Products)
4. PRODUCT DATA: Sample No(s): 2361
5. Date and Time Curing Compound or Primer Applied: N/A

COAT	PRODUCT	PRODUCT		APPLICATION METHOD	CONDITIONS		THICKNESS (ins.)	TIME & DATE
		CODE	BATCH #		R/M (°F) & R.H.			APPLIED
1	NUTEC	#11S	1310/1556/1312	Squeegee	76/59		.015-.020	4/4/77
2	NUTEC	#11	1313/1314	Squeegee	74/58		.005-.010	4/6/77
3	REACTIC	#1201	7497/7434	Spray	82/48		.007-.008	4/11/77

6. Curing Conditions: Ambient Temp. 70-80 °F Rel. Humidity 40-60  
Minimum Cure 17 Days
7. Test Procedure: DBA - Houston Lighting & Power (Rev. 0, 10/22/75)
8. Testing Performed By: Coastal Sciences Date: 6/7/77

Approved By: [Signature]  
 Date: 7/19/77  
 Prepared By: [Signature]  
 Date: 7/18/77  
 Report No. 167-77



# COASTAL SCIENCE ASSOCIATES

(504) 283-7251 6900 CANAL BOULEVARD • NEW ORLEANS, LOUISIANA 70124

Date: July 14, 1977

Product Identification: Steel Panel 4 Concrete Block

DBA Test Conditions: Houston Lighting and Power Curve,  
Rev. 0, Oct. 22, 1975

<u>Sample No.</u>	<u>Comments</u>
2367	No cracks, blisters, flakes, or loss of adhesion on any side.
2369	No cracks, blisters, flakes, or loss of adhesion on any side.
2364	No cracks, blisters, flakes, or loss of adhesion on any side.
2361	No cracks, blisters, flakes, or loss of adhesion on any side.

Approved

*C. A. Frazier*

Report #040060777

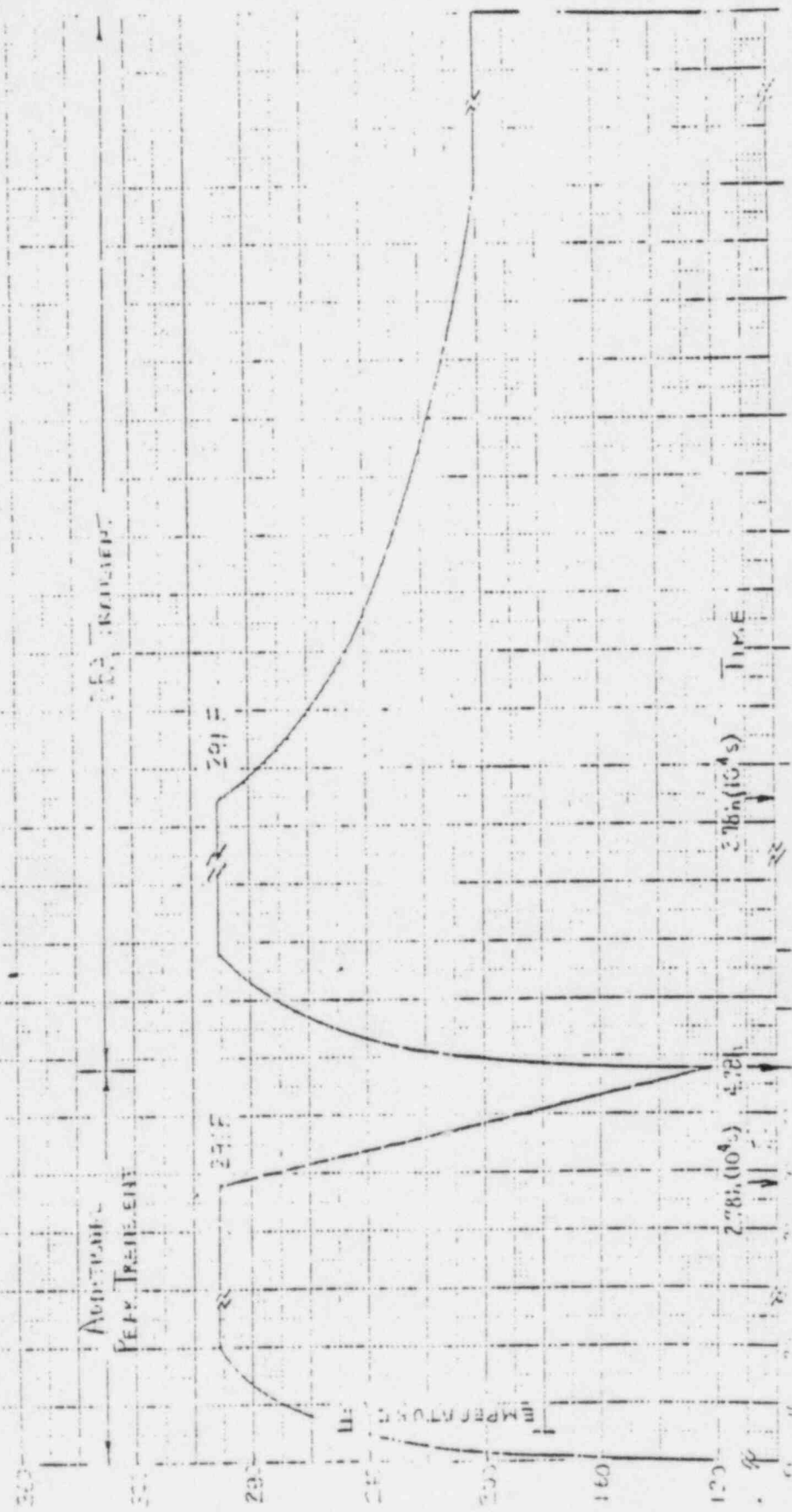
—

Houston Paver & Light. (South Texas)

## ENVIRONMENTAL QUALIFICATION: TEST PROFILE

### Temperature Versus Time

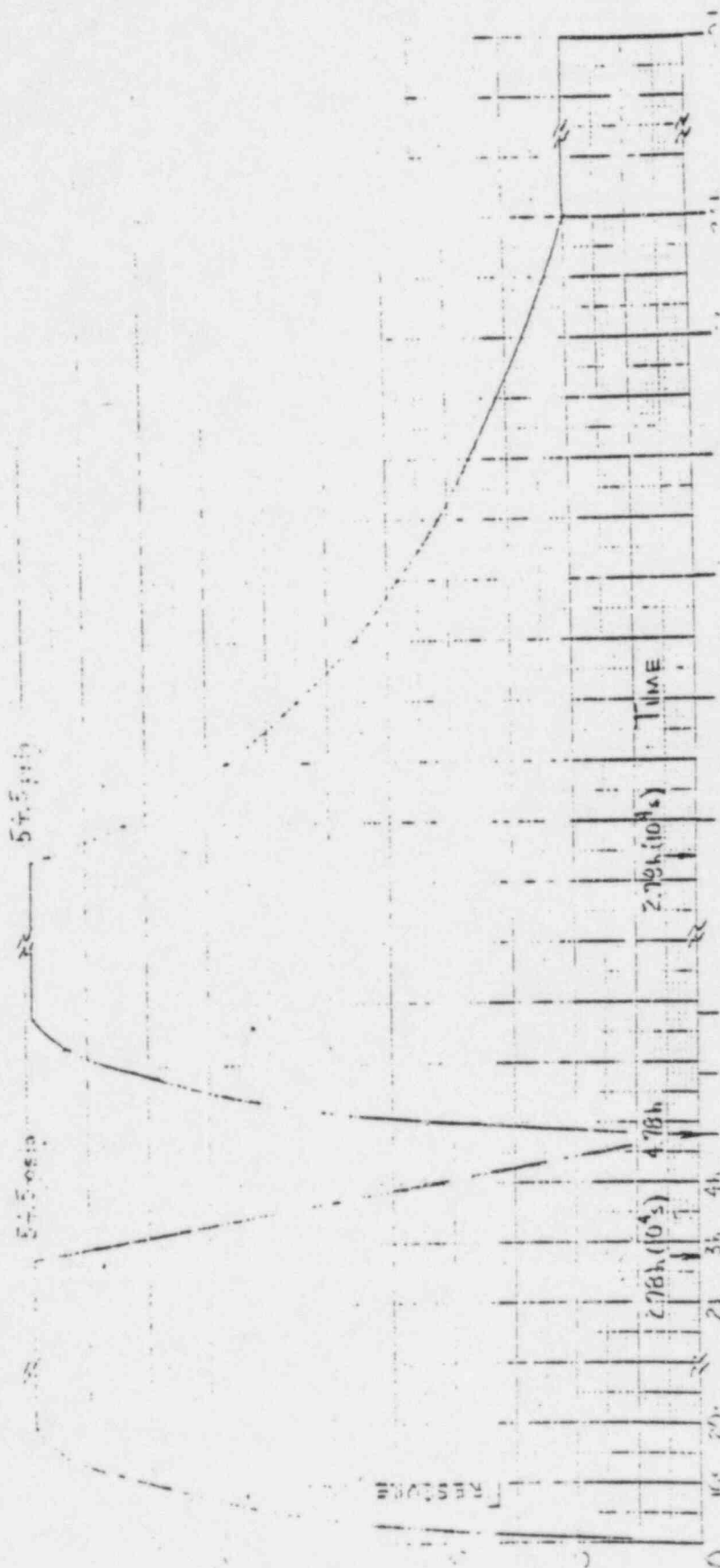
REVISION, 10/22/75



## Pressure Versus Time

REVISION 0, 10/22/75

CS-TRANSIENT



P.O. Box 19077 New Orleans, Louisiana 70189 U.S.A. 504-254-1433



PROFESSIONAL COATINGS

February 24, 1978

Commanche Peak Steam Electric Station  
Brown & Root, Inc.  
P.O. Box 1001  
GLEN ROSE, TX 76043

ATTENTION: Mr. Don Sutton

Dear Mr. Sutton:

Enclosed is a copy of Imperial's Technical Report #215-78-G demonstrating the compatibility of Concrecive 1411 Epoxy Mortar, with Imperial's NUTEC #11S/ REACTIC #1201 System.

Sincerely,

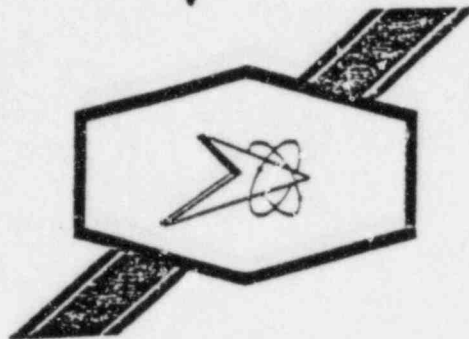
*G. E. Arnold*

Gerald E. Arnold  
Technical Support Representative  
Nuclear

GEA/nd

Enclosure

# Imperial



## TECHNICAL REPORT

NUMBER  
215-78-G

TITLE  
COMPATIBILITY TESTING - CONCRETE 1411 EPOXY MORTAR

FOR

CUSTOMER  
BROWN & ROOT

Submitted by: Gerald E. Arnold

Approved: *J. Bear*

Date: 1/25/78

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

The information contained in this report, based upon our experience, is offered without charge as part of our service to customers. It is intended for use by persons having technical skill, at their own discretion and risk. We assume no liability in connection with its use. This information is not intended as a license to operate under, nor a recommendation to infringe, any patent covering any material or use.

SUMMARY - Compatibility testing was initiated at the request of Brown and Root engineers relative to the South Texas Project. Elcometer adhesion and DBA tests were conducted to demonstrate the compatibility of Concrecive 1411 to Imperial's NUTEC 11S/REACTIC 1201 system. The results of these tests indicate that the Concrecive 1411 is compatible with the Imperial products.

INTRODUCTION - Concrecive 1411 is a 100% epoxy masonry and concrete mortar which is designated for use in repairing concrete damage at the South Texas Project. Brown and Root engineers requested that Imperial conduct tests to demonstrate that the proposed NUTEC 11S/REACTIC 1201 coating system and Concrecive 1411 are compatible.

METHODS -

- a) Specimens - 2" x 3 1/4" x 2" concrete specimens prepared in accordance with Bechtel CP956

Coupon No.	Batch	Pour Date	Curing Compound
478, 479 & 486	1-53	5-6-76	NUTEC #10 (5606/5607)
509, 512, & 513	1-53	5-6-76	NONE

- b) Surface preparation - 100 psi compressed air

- c) Application and Curing Data

Product	Batch #	Date and Time Applied	°F/% R.H.	DFT	Cure Data
Concrecive 1411	Lot 77654	1-5-78 9:30 a.m.	70°F/64%	Fill Voids*	4 days @ 70-80°C 45-65% R.H.
NUTEC #11S	3227/3228/ 3229	1-9-78 1:30 p.m.	58°F/46%	.020"-.025"	3 days @ 70-80°C 45-65% R.H.
REACTIC #1201	2467/2563	1-12-78 10:00 a.m.	58°F/66%	.005"-.006"	4 days @ 70-80°C 45-65% R.H.

\*Concrecive 1411 was applied to the entire surface - not just voids.  
An approximate DFT of 5-10 mils was obtained.

- d) Testing

1. Elcometer adhesion testing was performed in accordance with Imperial Test Method 03.



High strength aluminum dollies were applied to the coated specimens by means of an epoxy resin-type adhesive. The dollies were placed 1-13-78 at 11:00 a.m. and removed with an Elcometer adhesion tester 1-16-78 at 9:00 a.m.

2. Two of the six concrete specimens were then submitted to Coastal Science Associates for DBA testing in accordance with the test parameters established for the South Texas Project. The concrete coupons were subjected to 24 hours of LOCA simulated conditions with a maximum temperature of 307°F. and a maximum pressure of approximately 57 psig. The coating damage inflicted by the Elcometer testing was not repaired prior to DBA testing.

RESULTS -

a) Elcometer Adhesion

Lab. Panel #	Concrete Coupon #	Force required to remove dolly	Mode of Failure
3706	478	350 psi	100% concrete failure
3707	479	500 psi	80% 1411/concr. 20% concrete
3708	486	475 psi	100% concrete failure
3709	509	450 psi	100% concrete failure
3710	512	500 psi	100% concrete failure
3711	513	400 psi	100% concrete failure

b) DBA

Lab. Panel #	Concrete Coupon #	Results
3710	479	* Coating intact. Some delamination on broomed and smooth surfaces.
3707	512	No Defects.

\*Delamination was determined by "sounding" the test specimen. This ....

T.R.#215-78-G

Page 3.

observation was confirmed by removing the coating in the "defective" areas. The failure was found to occur between the Concresive 1411 and the concrete surface.

CONCLUSIONS - The results of the Elcometer adhesion and DBA testing demonstrates the compatibility of Concresive 1411 with the Imperial coating system. In all tests, the bond between the Concresive 1411 and the NUTEC #11S was excellent.

Some failures, however, did occur between the concrete surface and the Concresive 1411. Specimen # 3707 exhibited some loss of adhesion at the substrate in the adhesion test and specimen #3710 exhibited signs of delamination in the DBA test. This potential problem can be avoided by good surface preparation practices. The concrete specimens used had aged for 20 months. Apparently some contamination was present which was not readily removed by 100 psi compressed air. Use of Concresive 1411 should be restricted to damaged concrete, voids, and tie holes where a "physical bond" will be achieved and improve the performance of the overall system. Excess Concresive 1411 should be removed to avoid any potential adhesion problems.

REFERENCE - Lab. Notebook #56, p.39

COASTAL SCIENCE ASSOCIATES, INC.  
6900 CANAL BLVD.  
NEW ORLEANS, LOUISIANA 70124  
TEL. 504-283-7251

SUBJECT: DESIGN BASIS ACCIDENT COATINGS TEST REPORT.

DATE: 1/18/78

DBA TEST CONDITIONS: HOUSTON LIGHT AND POWER, 24 HR. SCREEN TEST

HIGHEST TEMPERATURE (DEG. F) REACHED DURING RUN 307

SAMPLE NUMBER: 3707 SAMPLE TYPE: CONCRETE COUPON

SAMPLE #	DESCRIPTION
----------	-------------

3707	SIDE 1: NO DEFECTS
------	--------------------

	SIDE 2: NO DEFECTS
--	--------------------

	SIDE 3: NO DEFECTS
--	--------------------

	SIDE 4: NO DEFECTS
--	--------------------

REPORT WRITTEN FOR: SOUTHERN IMPERIAL COATINGS

REPORT # 059011778

APPROVED BY.....

*Charles A. Frenzel*

COASTAL SCIENCE ASSOCIATES, INC.  
6900 CANAL BLVD.  
NEW ORLEANS, LOUISIANA 70124  
TEL. 504-283-7251

SUBJECT: DESIGN BASIS ACCIDENT COATINGS TEST REPORT.

DATE: 1/18/78

DBA TEST CONDITIONS: HOUSTON LIGHT AND POWER, 24 HR. SCREEN TEST

HIGHEST TEMPERATURE (DEG. F) REACHED DURING RUN 307

SAMPLE NUMBER: 3710 SAMPLE TYPE: CONCRETE COUPON

SAMPLE #	DESCRIPTION
3710	SIDE 1: ( SIDE WITH SAMPLE # ) NO DEFECTS
	SIDE 2: DELAMINATION OVER MOST OF SIDE. NO CRACKS OR BLISTERS.
	SIDE 3: NO DEFECTS
	SIDE 4: DELAMINATION BELOW ADHESION TEST CUT. NO OTHER DEFECTS

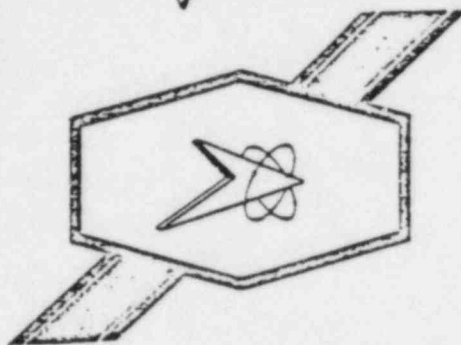
REPORT WRITTEN FOR: SOUTHERN IMPERIAL

REPORT # 359811778

APPROVED BY.....

*Charles A. Frenzel*

*Imperial*



# TECHNICAL REPORT

NUMBER  
205-1-78-G

TITLE  
COMPATIBILITY OF RES X with NUTEC #11S SURFACER

FOR  
Comanche Peak Steam Electric Station

CUSTOMER  
TEXAS UTILITIES

Submitted by: Gerald E. Arnold

Approved: *E. J. Buer*

Date: January 26, 1978

SOUTHERN IMPERIAL COATINGS CORPORATION, INC.  
P. O. Box 29077, \* New Orleans, Louisiana 70139  
Phone: (504) 254-1433

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SUMMARY - Extensive testing was conducted to determine if Imperial's NUTEC #11S surfacer is compatible with Burke's RES X concrete curing compound. Based on results of Elcometer adhesion and Design Basis Accident testing, it was concluded that the RES X is a dissipating membrane only if exposed to the ultraviolet rays of sunlight or to heat. Without these agents, the RES X remains on the concrete indefinitely. On porous wall surfaces the RES X penetrates easily leaving no appreciable surface film to interfere with the chemical adhesion of the NUTEC #11S to the concrete. The floors, especially steel trowelled finishes, however, pose a problem because of the lack of porosity and the build up of a RES X film on the surface. This film is incompatible with the NUTEC #11S and must be removed by physical means, specifically a high pressure water blast, sand blasting, or a combination of the two methods.

INTRODUCTION - Testing of Burke's RES X was performed at the request of Brown & Root in connection with the Texas Utilities' Comanche Peak Nuclear Power Plant. RES X is a dissipating concrete curing membrane consisting of a solution of resinous solids and petroleum solvents. The RES X film, according to literature, disintegrates by oxidation. Heat and ultraviolet rays are necessary for this reaction to occur. Recommended spread rates are 200ft.<sup>2</sup>/gallon for rough surfaces and 200 - 300 ft.<sup>2</sup>/gallon for smooth and steel trowel finishes. The purpose of this test was to determine if NUTEC #11S is compatible with RES X.

METHOD -

a) Elcometer adhesion (cinder blocks)

RES X was applied to two 3 1/2" x 7" x 2" high density cinder blocks at a spread rate of 200 ft.<sup>2</sup>/gallon. The RES X was cured in the laboratory at 70 - 80°F. and 45-65% R.H. NUTEC #11S was applied to one block after 24 hours and to the second block after 30 days. No surface preparation was performed between coats. Both specimens were topcoated with REACTIC #1201. Three high strength aluminum dollies were applied to each specimen and removed with an Elcometer adhesion tester following sufficient cure of the coating system. Tests were conducted in accordance with Imperial Test Method 03. For comparative purposes, 2 control specimens were coated with the Imperial system only.



1. Application and Curing Data

PRODUCT	BATCH #	Date Applied	F./% R.H.		DFT (inches)
(24 hour intercoat time - RES X/NUTEC #11S)					
RES X		10/31/77 - 1:50 p.m.	84	70	200 ft. <sup>2</sup> /gal.
NUTEC #11S	LB150/2671/ LB148	11/1/77 - 1:00 p.m.	80	75	.020 - .025
NUTEC #11	LB150/2671/ LB149	11/4/77 - 8:00 a.m.	70	72	.005 - .007
REACTIC #1201	3070/2568	11/7/77 - 9:30 a.m.	71	69	.006 - .009
Dollies applied 11/9/77 Dollies removed 11/14/77					
(32 day intercoat time - RES X/NUTEC #11S)					
RES X		10/31/77 - 1:50 p.m.	84	70	200 ft. <sup>2</sup> /gal.
NUTEC #11S	5386/3388/ LB148	12/2/77 - 9:00 a.m.	70	64	.020 - .23
REACTIC #1201	3070/2568	12/8/77 - 5:00 p.m.	67	71	.003 - .005
Dollies applied 12/13/77 Dollies removed 12/16/77					

2. Panel designation

Panel #	System	RES X/NUTEC #11S intercoat time
3448	11S/11/1201	24 hours
3464	RES X/11S/11/1201	24 hours
3449	11S/1201	32 days
3465	RES X/11S/1201	32 days

## b). Elcometer adhesion (concrete coupons)

RES X was applied to four 2" x 4" x 2" concrete coupons prepared in accordance with Bechtel CP954, at a spread rate of 100 ft.<sup>2</sup>/gallon. The RES X coated coupons were cured in the laboratory at 70 - 80°F. and 45-65% R.H. Two coupons were coated with NUTEC #11S after 48 hours. The remaining specimens were surfaced after 50 days, following a 3000 psi water blast which was achieved using a Graco Bulldog (30:1) and a .043" tip. All concrete blocks were topcoated with REACTIC #1201. One high strength aluminum dolly was applied to each specimen by means of an epoxy resin-type adhesive and removed with an Elcometer adhesion tester following sufficient cure of the coating system and adhesive. Tests were performed as directed by Imperial Test Method 03. Control specimens were also coated with the Imperial system only. The concrete substrates were allowed to stand for 48 hours and 50 days as were the RES X coated specimens.

## 1. Application and Curing Data

PRODUCT	BATCH #	Date Applied	F.	%R.H.	DFT (inches)
(48 hour intercoat time - RES X/NUTEC #11S)					
RES X		11/17/77 - 1:00 p.m.	78	65	100ft. <sup>2</sup> /gal.
NUTEC #11S	LB150/2671/ LB148	11.19.77 - 11:00 a.m.	72	70	.018 - .024
REACTIC #1201	2467/2491	11/26/77 - 10:00 a.m.	74	58	.005 - .007
Dollies applied 12/1/77 Dollies removed 12/3/77					
(50 day intercoat time - RES X/NUTEC #11S)					
RES X		11/17/77 1:00 p.m.	78	65	100ft. <sup>2</sup> /gal.
NUTEC #11S	3227/3228/ 3229	1/9/78 11:00 a.m.	78	67	.018 - .022
REACTIC #1201	2467/2568	1/12/78 10:00 a.m.	58	66	.004 - .006
Dollies applied 1/13/78 Dollies removed 1/16/78					

2. Panel designation

Lab. Panel #	Concrete #	RES X/#11S intercoat time	Surface Prep.
3493	632 (11S/1201)	48 hours	None
3494	667 (11S/1201)	48 hours	None
3495	801 (11S/1201)	50 days	3000 psi water
3496	861 (11S/1201)	50 days	3000 psi water
3525	602 (RES X/11S/1201)	48 hours	None
3526	680 (RES X/11S/1201)	48 hours	None
3527	793 (RES X/11S/1201)	50 days	3000 psi water
3528	803 (RES X/11S/1201)	50 days	3000 psi water

c) Elcometer adhesion (concrete coupons)

Four 2" x 4" x 2" concrete coupons were coated with RES X at spread rate of 250ft.<sup>2</sup>/gallon. The specimens were stored in darkness at 70-80°F. and 45-65% R.H. for 120 days prior to the application of the next coat. NUTEC #11S was applied to each coupon following a 100 psi compressed air blast. One high strength aluminum dolly was applied to each specimen directly to the #11S surfacer by means of an epoxy resin-type adhesive. The adhesive was allowed to cure for 72 hours. The dollies were removed with an Elcometer adhesion tester and the force required to remove the dollies and the mode of failure were recorded. The Elcometer adhesion testing was performed on the smooth surface of the concrete coupons.

1. Application and Curing Data

PRODUCT	BATCH #	Date Applied	°F./% R.H.		DFT (inches)
RES X		8/8/77 8:00 a.m.	81	87	250ft. <sup>2</sup> /gal.
NUTEC #11S	3386/3388/ LB149	12/10/77 9:00 a.m.	58	38	.020 - .025

2. Panel Designation

Lab. Panel #	Concrete #	RES X/#11S Intercoat time
3283	163	120 days
3284	171	120 days
3285	172	120 days
3286	188	120 days

d) Design Basis Accident

Concrete coupons previously used in adhesion tests (see b) 2.) were submitted to Coastal Science Associates for an autoclave screen test designed to simulate Loss of Coolant Accident temperature and pressure conditions. The maximum temperature and pressure obtained was 307°F. and 57 psig respectively. All specimens were inspected within one hour of their removal from the autoclave for signs of visual damage and then "sounded" by tapping with a solid instrument to determine if any disbonding had occurred at the substrate.

1. Application and Curing Data

See b) 1.

2. Panel designation

Lab. Panel #	System	RES X/11S Intercoat time	Date submitted for testing
3493	#11S/1201	48 hours	12/12/77
3525	RES X/11S/1201	48 hours	12/12/77
3495	#11S/1201	50 days	1/16/78
3527	RES X/11S/1201	50 days	1/16/78

RESULTS -

## a) Elcometer adhesion (cinder blocks)

Panel #	System	Intercoat time	Force Required to remove dolly	Failure mode
3448	11S/11/1201 (Control)	24 hrs	a) 250 psi b) 200 psi c) 300 psi	100% concrete 100% concrete 100% concrete
3464	RES X/11S/ 11/1201	24 hrs	a) 50 psi  b) 100 psi  c) 250 psi	95% 11S/con- crete. 5% concrete 90% 11S/con- crete. 10% concrete 100% concrete
3449	11S/1201 (Control)	32 days	a) 450 psi b) 600 psi c) 200 psi	100% concrete 100% concrete 100% concrete
3465	11S/1201	32 days	a) 50 psi  b) 100 psi  c) 100 psi	90% 11S/con- crete. 10% concrete 90% 11S/con- crete. 10% concrete 90% 11S/con- crete. 10% concrete

DISCUSSION - Cinder blocks used were of high density concrete. Although the surface is rough, the porosity is low and the RES X accumulates on the surface as a film. This adhesion test demonstrates that RES X cured under laboratory conditions without heat or ultraviolet rays has deteriorated very little, if any, thus resulting in poor adhesion of the NUTEC #11S to the substrate. Excellent adhesion was obtained with the control specimens.



b) Elcometer Adhesion (concrete coupons)

Panel #	System	Intercoat time	Surface Preparation	Force required to Remove dolly	Failure Mode
3493	11S/1201	48 hrs	None	450 psi*	100% concrete
3494	11S/1201	48 hrs	None	800 psi*	100% concrete
3525	RES X/11S/1201	48 hrs	None	500 psi*	50% concrete 50% 11S/concrete
3526	RES X/11S/1201	48 hrs	None	500 psi*	90% concrete 10% 11S/concrete
3495	11S/1201	50 days	3000 psi water	450 psi**	100% concrete
3496	11S/1201	50 days	3000 psi water	300 psi**	100% concrete
3527	RES X/11S/1201	50 days	3000 psi water	700 psi**	100% concrete
3528	RES X/11S/1201	50 days	3000 psi water	450 psi**	80% concrete 20% 11S/concrete

\* Adhesion tests performed on simulated wall surface.

\*\* Adhesion tests performed on simulated floor surface.

DISCUSSION - Specimens 3493, 3494, 3525, and 3526 represent adhesion tests on simulated wall surfaces. Even though the RES X had cured only 48 hours penetration into the porous concrete was sufficient to allow the NUTEC 11S to bond to the substrate. The values obtained (500 psi for both specimens) indicates good adhesion of the 11S to the concrete, however, the mode of failure (some disbonding between the 11S and the concrete) reveals a decrease in the bonding that is not normally observed with the NUTEC 11S surfacer. Note that in all control specimens failure occurred 100% in the concrete.

Specimens 3495, 3496, 3527, and 3528 represent adhesion tests on simulated floor surfaces. The surface tested is smooth and porosity is low. The RES X was allowed to stand for 50 days prior to the application of the NUTEC 11S. Because the test coupons were stored in the laboratory under controlled conditions, any appreciable dissipation of the RES X film was unlikely. The improvement in adhesion is due to the 3000 psi water blast used to remove the RES X film. Both RES X specimens exhibited good adhesion values with the majority of the failure in the concrete. Coupon #3528 demonstrated approximately 20% adhesion loss between the 11S and the RES X sealed concrete, indicating the water blast did not remove all of the residue on the surface.



## c) Elcometer adhesion (concrete coupons)

Panel #	System	Intercoat Time	Force required to remove dolly	Failure Mode
3283	RES X/11S	120 days	700 psi	100% concrete
3284	RES X/11S	120 days	350 psi	100% concrete
3285	RES X/11S	120 days	200 psi	100% 11S/ concrete
3286	RES X/11S	120 days	400 psi	100% 11S/ concrete

DISCUSSION - The results here are inconsistent, two specimens exhibiting excellent adhesion and the remaining two demonstrating poor bonding between the NUTEC 11S and the RES X sealed concrete. Specimens 3283 and 3284 were originally designated for other testing. The concrete coupons had previously (18 months) been treated with a 1% Silane solution which may have promoted adhesion.

Coupons 3285 and 3286 may better represent the potential problems on steel trowelled floors. The adhesion tests were performed on the smooth surface of each coupon. The smoothness of the concrete is a result of the method in which the coupons are prepared. In this case, the surface tested was very smooth and glossy thus simulating a steel trowelled finish. The RES X was cured for 120 days in the laboratory at 70-80° F. and 45-65% relative humidity, with no exposure to sunlight (ultraviolet rays). Prior to the application of NUTEC 11S only a 100 psi compressed air blast was used to remove any dust or other contaminants which may have accumulated over the four month period. The Elcometer testing indicates very poor adhesion of the 11S to the RES X sealed concrete. Therefore, it can be concluded that the RES X film will not disintegrate without heat or ultraviolet light.

## d) Design Basis Accident

Panel #	System	Intercoat Time	Results
3493	11S/1201	48 hours	No defects
3525	RES X/11S/1201	48 hours*	Two 1/2" diameter areas of delamination - coating intact.
3495	11S/1201	50 days	No defects
3527	RES X/11S/1201	50 days	No defects.

- \* The tested coating system was intact and no defects were visually discovered. However, upon "sounding" the specimen two areas of apparent delamination or disbonding were noted. This finding was confirmed by removing the coating in the questionable areas with a sharp instrument to determine the degree of disbonding.

DISCUSSION - This test demonstrates that if proper surface preparation procedures are used to remove the RES X, the adhesion of the NUTEC 11S surfacer to the concrete is assured.

More importantly, specimen 3525 indicates that if the RES X film does not dissipate with time or is not removed by some physical means, an adhesion problem is inevitable.

CONCLUSIONS - Burke's RES X is a dissipating concrete curing membrane consisting of a solution of resinous (hydrocarbons) solids and petroleum solvents. As an intact film the RES X is a poor base for subsequent coatings. This fact is substantiated by the results of this testing and is readily admitted to by the RES X manufacturer.

The dissipation rate of the RES X curing membrane depends upon oxidation resulting from heat and ultraviolet rays. The length of time which the RES X is exposed is irrelevant; the accumulative and quantitative amount of sunlight and heat is important. Without exposure to the ultraviolet rays of sunlight or heat, the RES X remains on the concrete as a surface film and can only be removed by physical means.

The major concern, therefore, is how effective the surface preparation is in removing any remaining surface film. Whether or not a 7 day, 30 day, or 120 day dissipation period is allowed, is unimportant. Based on laboratory tests, high pressure water (3000 psi) is sufficient to remove the RES X and providing an adequate base for adhesion of the NUTEC 11S surfacer. The only time limitation that should be imposed is the 28 day cure period established by ACI 301.

The main factor controlling build up of a surface film is the porosity of the concrete. Throughout the adhesion and DBA testing, simulated wall surfaces coated with RES X posed no compatibility problems because of the degree of porosity. The RES X penetrates well into formed wall surfaces, leaving no surface film to interfere with the adhesion of the NUTEC 11S surfacer. Despite this finding, high pressure water is recommended as a safeguard. The simulated floor surfaces, especially very smooth surfaces with very little porosity, pose a definite problem. Because of the low porosity, penetration is impeded and a surface film is effected. Without the natural breakdown of the film or proper physical preparation (e.g. waterblasting, sandblasting) to remove the film, poor adhesion of subsequent coating will occur.

Based on the results of the RES X testing program and discussions with Mr. Al Brownlee with Conspec Marketing and Manufacturing Company, the following recommendations are made. RES X should be applied to concrete surfaces in accordance with the manufacturer's recommendations. Care should be taken to avoid an unnecessary build up of RES X on the concrete, especially floor surfaces. The concrete shall be allowed to cure a minimum of 28 days as directed by ACI 301. Prior to application of Imperial's coatings, 4000 psi water blasting, 2500 psi water blasting with sand injection, or sand sweeping shall be used to remove any remaining RES X. Adequate surface preparation shall be made by visually inspecting the concrete surface for "water beads". Beading of the water indicates the presence of the RES X and additional surface preparation will be required until this beading is eliminated.

REFERENCES - LAB. Notebook 56, p.p. 1-17  
LAB. Notebook 33, p. 147

COASTAL SCIENCE ASSOCIATES, INC.  
6900 CANAL BLVD.  
NEW ORLEANS, LOUISIANA 70124  
TEL. 504-283-7251

SUBJECT: DESIGN BASIS ACCIDENT COATINGS TEST REPORT.

DATE: 12/19/77

DBA TEST CONDITIONS: HOUSTON LIGHT AND POWER, SHORT TO 48 HRS.

SAMPLE NUMBER: 3493      SAMPLE TYPE: CONCRETE COUPON

SAMPLE #	DESCRIPTION
3493	SIDE ONE: NO DEFECTS
	SIDE TWO: NO DEFECTS
	SIDE THREE: NO DEFECTS
	SIDE FOUR: NO DEFECTS

REPORT WRITTEN FOR: SOUTHERN IMPERIAL

REPORT # 857121977

APPROVED BY

*Charles H. Fring*

COASTAL SCIENCE ASSOCIATES, INC.  
6900 CANAL BLVD.  
NEW ORLEANS, LOUISIANA 70124  
TEL. 504-283-7251

SUBJECT: DESIGN BASIS ACCIDENT COATINGS TEST REPORT.

DATE: 12/15/77

DBA TEST CONDITIONS: HOUSTON LIGHT AND POWER, SHORTENED TO 48 HRS.

SAMPLE NUMBER: 3525      SAMPLE TYPE: CONCRETE COUPON

SAMPLE #	DESCRIPTION
3525	SIDE ONE: DELAMINATION, UPPER LEFT CORNER
	SIDE TWO: NO VISIBLE DEFECTS, NO DELAMINATION
	SIDE THREE: NO VISIBLE DEFECTS, NO DELAMINATION
	SIDE FOUR: NO VISIBLE DEFECTS, NO DELAMINATION

REPORT WRITTEN FOR: SOUTHERN IMPERIAL

REPORT # 056121577

APPROVED BY: *[Signature]*

COASTAL SCIENCE ASSOCIATES, INC.  
6900 CANAL BLVD.  
NEW ORLEANS, LOUISIANA 70124  
TEL. 524-283-7251

SUBJECT: DESIGN BASIS ACCIDENT COATINGS TEST REPORT.

DATE: 1/18/78

DBA TEST CONDITIONS: HOUSTON LIGHT AND POWER, 24 HR. SCREEN TEST

HIGHEST TEMPERATURE (DEG. F) REACHED DURING RUN 307

SAMPLE NUMBER: 3527

SAMPLE TYPE: CONCRETE COUPON

SAMPLE #	DESCRIPTION
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3527	SIDE 1: NO DEFECTS
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	SIDE 2: NO DEFECTS
--	--------------------

	SIDE 3: NO DEFECTS
--	--------------------

	SIDE 4: NO DEFECTS
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REPORT WRITTEN FOR: SOUTHERN IMPERIAL COATINGS

REPORT # 059011778

APPROVED BY...

*Charles A. Frey*



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TEL. 504-283-7251

SUBJECT: DESIGN BASIS ACCIDENT COATINGS TEST REPORT.

DATE: 1/18/78

DBA TEST CONDITIONS: HOUSTON LIGHT AND POWER, 24 HR. SCREEN TEST

HIGHEST TEMPERATURE (DEG. F) REACHED DURING RUN 387

SAMPLE NUMBER: 3495 SAMPLE TYPE: CONCRETE COUPON

SAMPLE #	DESCRIPTION
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3495	SIDE 1: NO DEFECTS
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	SIDE 2: NO DEFECTS
--	--------------------

	SIDE 3: NO DEFECTS
--	--------------------

	SIDE 4: NO DEFECTS
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REPORT WRITTEN FOR: SOUTHERN IMPERIAL COATINGS

REPORT # 059011778

APPROVED BY.....

*Charles A. Frey*

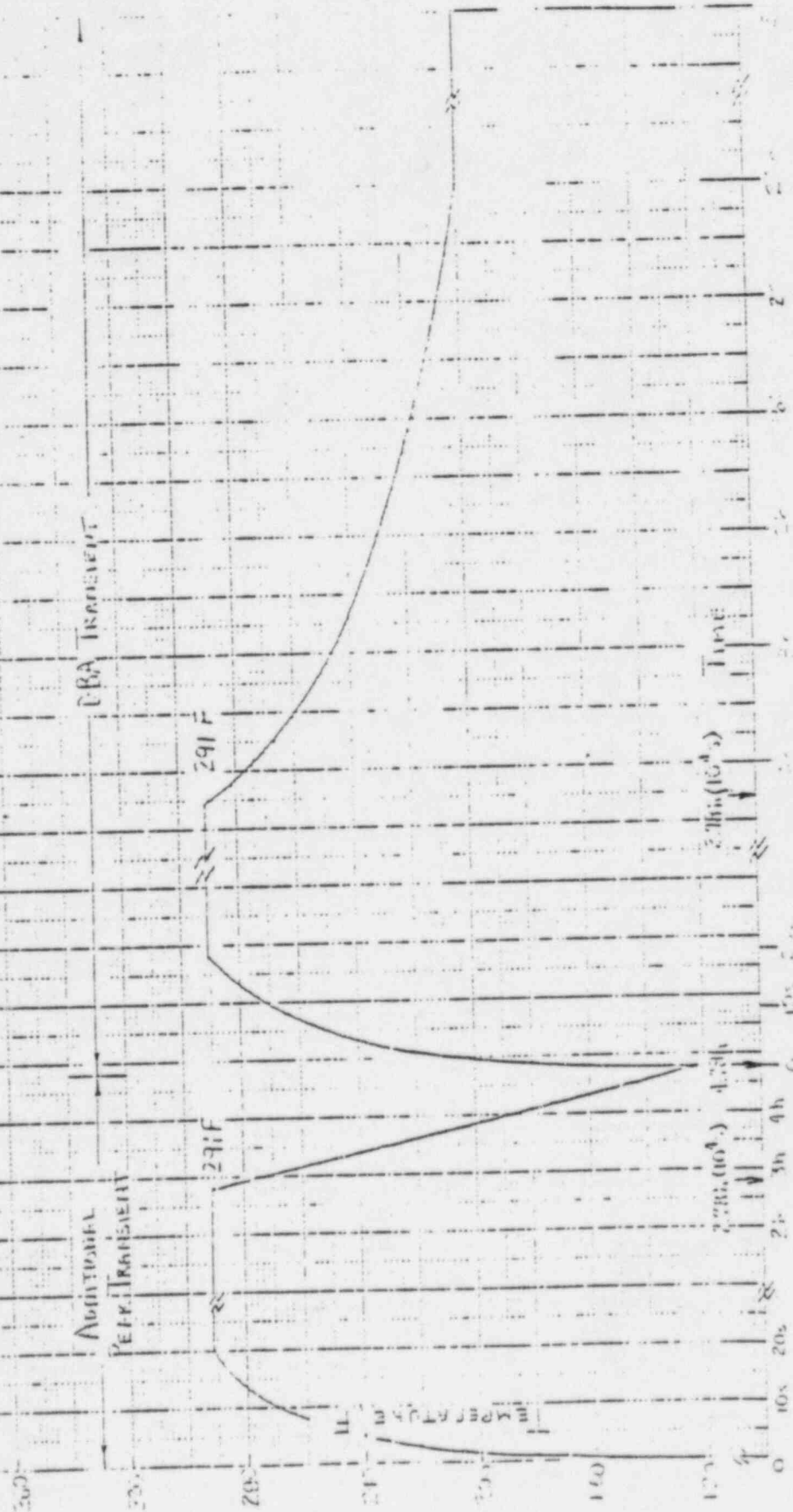
(1)

Anderson, James Light - (South Texas)

## ENVIRONMENTAL QUALIFICATION TEST PROFILE

Temperature Versus Time

REVISION: 0, 10/22/75



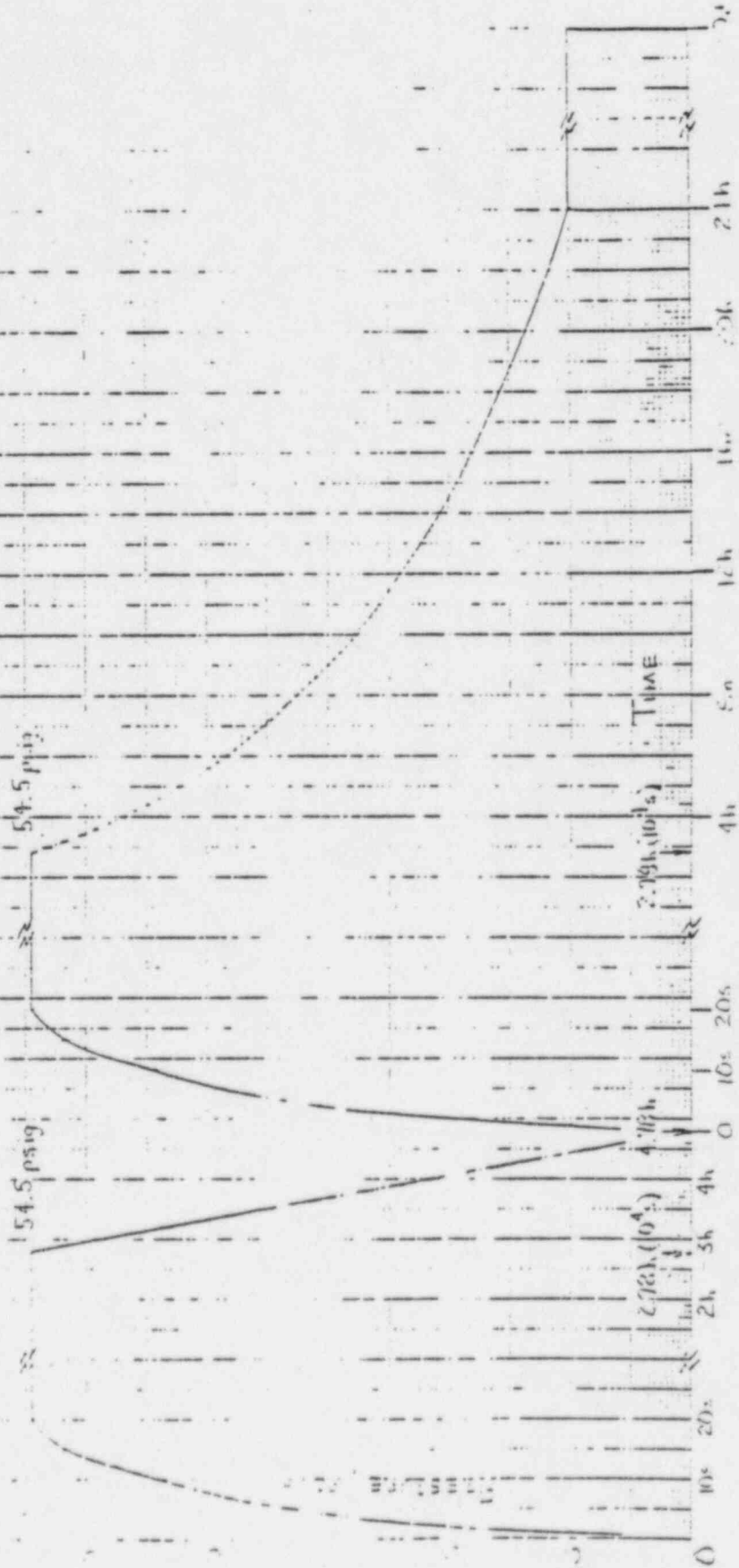
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Pressure Versus Time

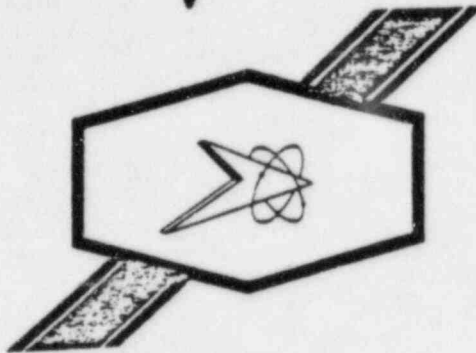
REVISION 0, 10/22/75

ACCELERATION  
PER TEST METHOD

DBA TRANSIENT



# Imperial



## TECHNICAL REPORT

NUMBER

175-1-77

TITLE

DBA, RADIATION TOLERANCE OF NUTEC #11S/11/1201

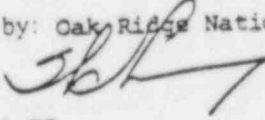
Over Sandblasted Concrete

FOR

SICC

CUSTOMER

Submitted by: Oak Ridge National Labs

Approved: 

Date: 12/77

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

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8511060053

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: 5-31-77

Report of Irradiation and DBA Testing  
Southern Imperial, New Orleans, Louisiana

The Irradiation and Design Basis Accident (DBA) tests are conducted, respectively, in accordance with Bechtel Corporation Standard Specification Coatings for Nuclear Power Plants, Spec. Nos. CP-951 and CP-956. The tests are designed also 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 except the decontamination 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  $1 \times 10^8$  rads/hour.

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 *G. G. Giddens*

Approved *L. T. Carlin*



DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #11S/NUTEC #11/REACTIC #1201
2. TYPE SUBSTRATE: Concrete - Bechtel CP-956 SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): All Concrete surfaces sandswept with Cresblast #4  
Blasting Sand to expose all rock pockets and voids.
4. PRODUCT DATA: SAMPLE NO.(s): 2373
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: None

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	11S	1310/1556/1312	Squeegee	76°/59%	*	4/4/77
2	NUTEC	11	1313/1314	Squeegee	74°/58%	*	4/6/77
3	REACTIC	1201	7497/7434	Spray	82°/48%	*	4/11/77

		NUTEC #11S	NUTEC #11	REACTIC #1201
* Minimum Thickness	Broomed Surface	.010-.015 in.	.003-.005 in.	.003-.005 in.
Average Thickness	Sides Adjacent to Broomed Surface	.015-.020 in.	.005-.010 in.	.007-.008 in.
Maximum Thickness	Side Opposite Broomed Surface	.025-.035 in.	.015-.020 in.	.010-.012 in.

Total Dry Film Thickness Range -.016 to .067 inches.

6. CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 40-65  
MINIMUM CURE 11 DAYS
7. TEST PROCEDURE: DBA - Bechtel CP-956
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 4/22/77

APPROVED: [Signature]  
TEST REPORT NO. 175-1-77  
DATE: 12/77  
PREPARED BY: Donald E. Arnold



DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA


1. PRODUCT TO BE TESTED: NUTEC #11S/NUTEC #11/REACTIC #1201
2. TYPE SUBSTRATE: Concrete - Bechtel CP-956 SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): All concrete surfaces sandswept with Cresblast #4  
Blasting Sand to expose all rock pockets and voids.
4. PRODUCT DATA: SAMPLE NO.(s): 2374
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: None

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	11S	1310/1556/1312	Squeegee	76°/59%	*	4/4/77
			Base/Cure/Fill				
2	NUTEC	11	1313/1314	Squeegee	74°/58%	*	4/6/77
			Base/Cure				
3	REACTIC	1201	7497/7434	Spray	82°/48%	*	4/11/77
			Base/Cure				

		NUTEC #11S	NUTEC #11	REACTIC #1201
* Maximum Thickness	Broomed Surface	.025-.035 in.	.015-.020 in.	.010 - .012 in.
Average Thickness	Sides Adjacent to Broomed Surface	.015-.020 in.	.005-.010 in.	.007-.008 in.
Minimum Thickness	Side Opposite Broomed Surface	.010-.015 in.	.003-.005 in.	.003-.005 in.

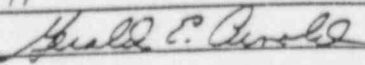
Total Dry Film Thickness Range - .016 to .067 inches.

6. CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 40-65 %  
MINIMUM CURE 11 DAYS
7. TEST PROCEDURE: DBA - Bechtel CP-956
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 4/22/77

APPROVED: 

TEST REPORT NO. 175-1-77

DATE: 12/77

PREPARED BY: 

DBA AND RADIATION TOLERANCE

TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #11S/NUTEC #11/REACTIC #1201
2. TYPE SUBSTRATE: Concrete - Bechtel CP-956 SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): All Concrete surfaces sandswept with Cresblast #4 blasting sand to expose all rock pockets and voids.
4. PRODUCT DATA: SAMPLE NO.(s): 2375
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: None

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	11S	1310/1556/1312 Base/Cure/Fill	Squeegee	76°/59%	*	4/4/77
2	NUTEC	11	1313/1314 Base/Cure	Squeegee	74°/58%	*	4/6/77
3	REACTIC	1201	7497/7434 Base/Cure	Spray	82°/48%	*	4/11/77

		NUTEC 11S	NUTEC 11	REACTIC 1201
* Maximum Thickness	Broomed Surface	.025-.035	.015-.020	.010-.012
Average Thickness	Sides Adjacent to Broomed Surface	.015-.020	.005-.010	.007-.008
Minimum Thickness	Side Opposite Broomed Surface	.010-.015	.003-.005	.003-.005

\* Minimum film thickness range - .016 to .067 inches

6. CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 40-65  
MINIMUM CURE 11 DAYS
7. TEST PROCEDURE: DBA Bechtel CP-956
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 4/22/77

APPROVED: [Signature]  
TEST REPORT NO. 175-1-77  
DATE: 12/77  
PREPARED BY: Donald E. Arnold

# DBA AND RADIATION TOLERANCE

## TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: NUTEC #11S/NUTEC #11/REACTIC #1201
2. TYPE SUBSTRATE: Concrete - Bechtel CP-956 SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): All concrete surfaces sandswept with Crashblast #4  
Blasting sand to expose all rock pockets and voids.
4. PRODUCT DATA: SAMPLE NO.(s): 2376
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: None

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)%R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
1	NUTEC	11S	1310/1556/1312	Squeegee	76°/59%	*	4/4/77
			Base/Cure/Fill				
2	NUTEC	11	1313/1314	Squeegee	74°/58%	*	4/6/77
			Base/Cure				
3	REACTIC	1201	7497/7434	Spray	82°/48%	*	4/11/77
			Base/Cure				

		NUTEC #11S	NUTEC #11	REACTIC #1201
* Minimum Thickness	Broomed Surface	.010-.015 in.	.003-.005 in.	.003-.005 in.
Average Thickness	Sides Adjacent to Broomed Surface	.015-.020 in.	.005-.010 in.	.007-.008 in.
Maximum Thickness	Side Opposite Broomed Surface	.025-.035 in.	.015-.020 in.	.010-.012 in.

Total Dry Film Thickness Range - .016 to .067 inches.

6. CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 40-65  
MINIMUM CURE 11 DAYS
7. TEST PROCEDURE: DBA - Bechtel CP-956
8. TESTING PERFORMED BY: Oak Ridge National Laboratories DATE SUBMITTED 4/22/77

APPROVED: [Signature]  
TEST REPORT NO. 175-1-77  
DATE: 12/77  
PREPARED BY: [Signature]

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: 5-31-77

11S/11/1201

ORNL Master Analytical Manual Method No. 2 0922;  
Bechtel Corp. Spec. No. CP-956;  
ORNL Log Book No. A 7562; 4-29-7

[illegible]

\*\* (SA) = sand blast; (SH) = shot blast; (GR) = grit blast.

Evaluated

Approved

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: 5-31-77

115/11/1201

ORNL Master Analytical Manual Method No. 2 0921;  
Bechtel Corp. Spec. No. CP-951;  
ORNL Log Book No. A 7562; 4-29-7

Test Conducted In: X air water

<u>Sample No.</u>	<u><math>1 \times 10^8</math> rads</u>	<u><math>1 \times 10^9</math> rads</u>
<u>2373</u>	<u></u>	<u>Coatings intact; no defects.</u>
<u>2374</u>	<u></u>	<u>Coatings intact; no defects.</u>
<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>
<u></u>	<u></u>	<u></u>

Additional Comments:

Evaluated

Approved

Manufacturer: Southern Imperial  
New Orleans, LA

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: 5-31-77

Table 1. DBA Solution Composition, Distilled Water.

0.28 M boric acid (3,000 ppm boron)  
0.064 M sodium thiosulfate  
Adjusted to pH 9.5 with sodium hydroxide

Table 2. DBA Test Conditions.

Time	Temperature (°F)	Pressure (psig)	Comments
Start	170	-	Autoclave preheated.
20 seconds	340	70 (10 sec)	Steam injected.
6 hours	340	70	Pressure maintained by relief valve.
20 seconds	220	30	Spray solution added at 75°F.
20 minutes	220-250	30	
4 days	250	30	
20 seconds	170	-15	Fresh spray solution added at 75°F after draining autoclave.
25 minutes	170-200	10	
3 days	200	10	
End of test			

ORNL Log Book No. A7562; 4-29-7.

Evaluated

Approved

*G. J. [Signature]*  
*L. T. [Signature]*



# PROTECTIVE COATING QUALIFICATION CONDITIONS INSIDE CONTAINMENT

BWR/PWR CONTAINMENT TEMPERATURE

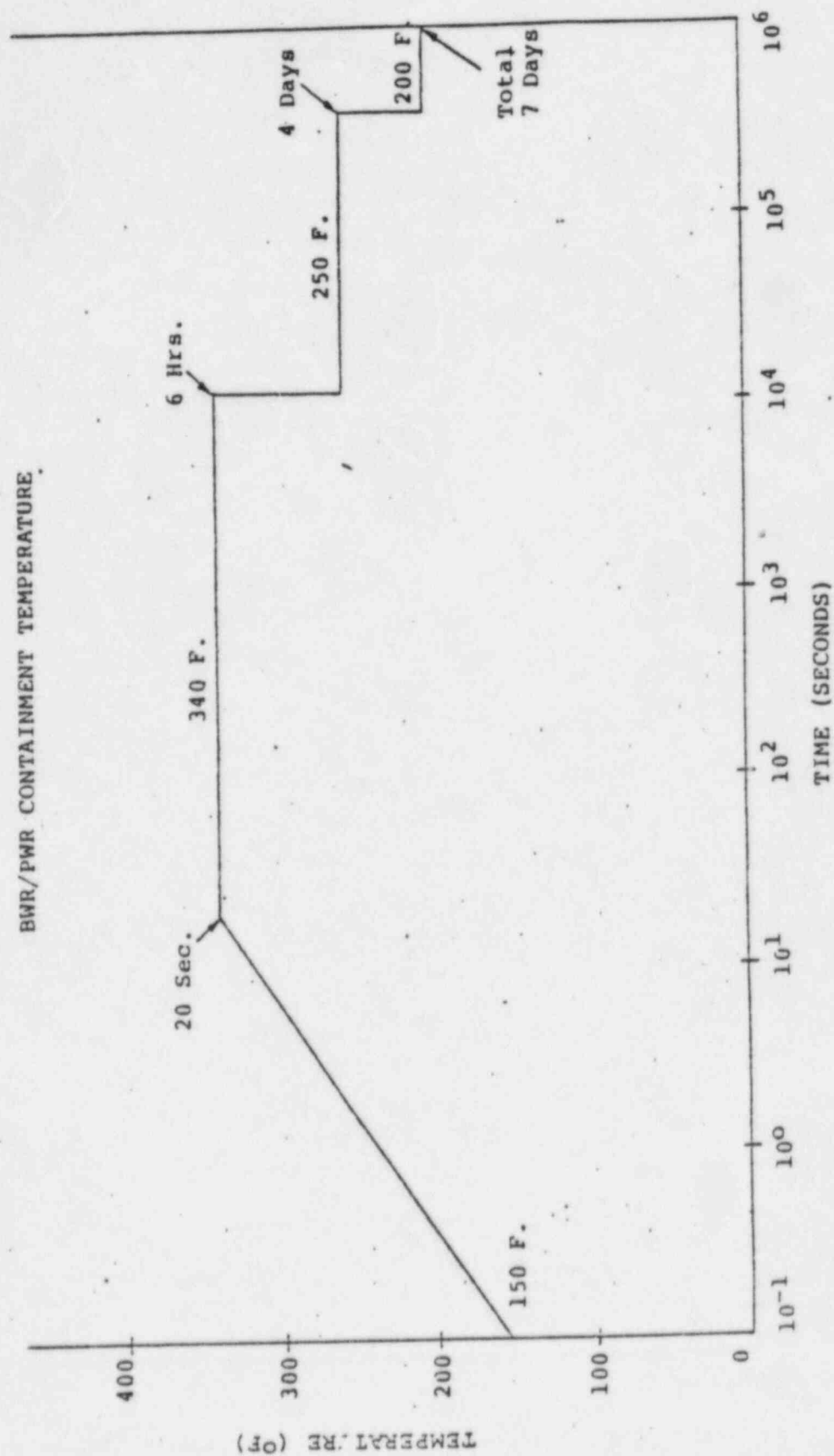


Table 1

# PROTECTIVE COATING QUALIFICATION CONDITIONS INSIDE CONTAINMENT

BWR/PWR CONTAINMENT PRESSURE

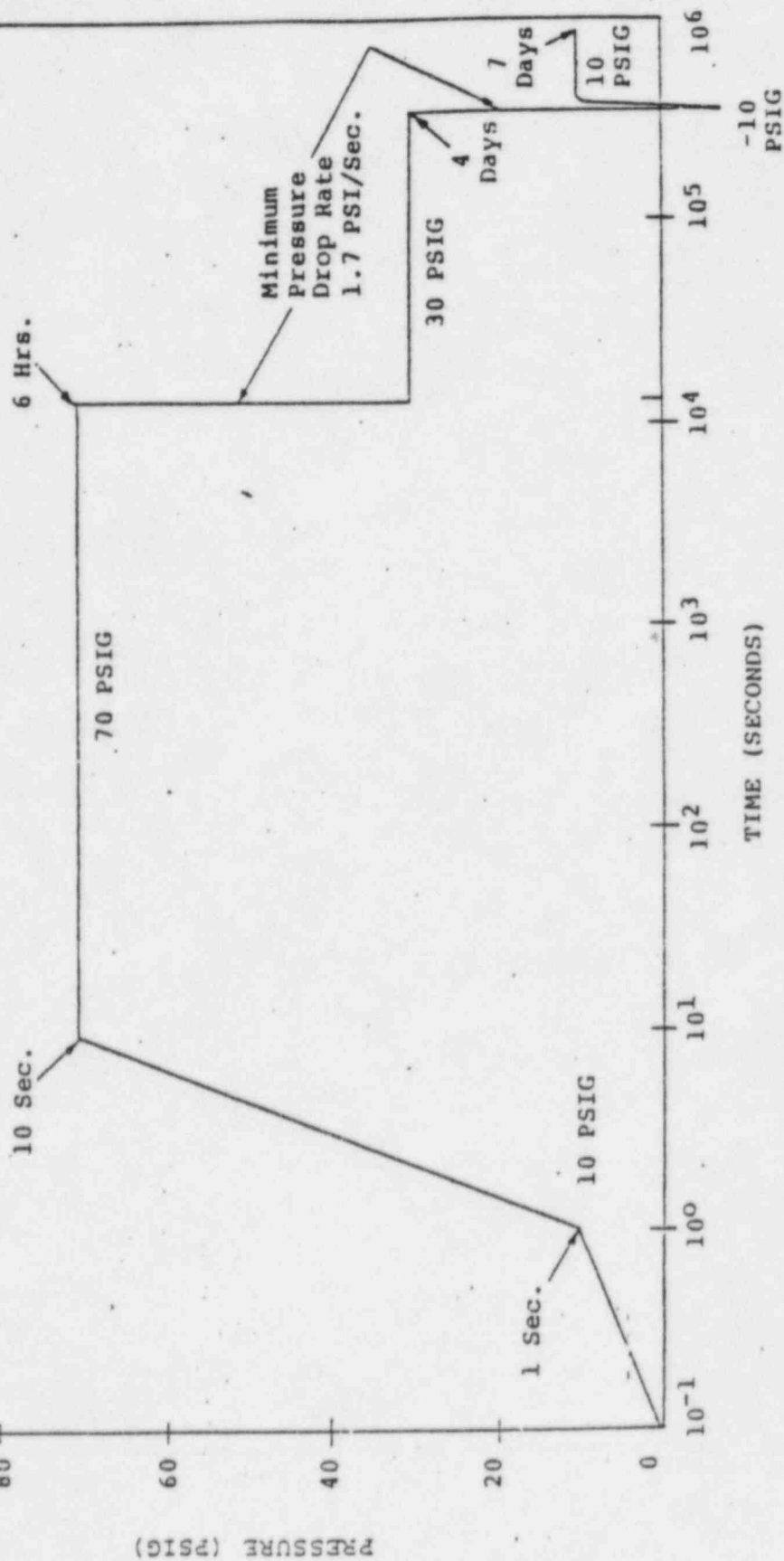


Table 2

REFERENCE: Lab. Notebook #33, p.111

REC'D FROM TUGCO (Tolson) 29 Aug 84 @ 1330 WCA

ARMS

T LAS UTILITIES SERVICES INC

CPPA - #7387

OFFICE MEMORANDUM

To George Bentinck /  
Richard Curtise -- QA/ Site Surveillance Glen Rose, Texas November 14, 1980

Subject Southern Imperial Test Report #175-1-77

COMANCHE PEAK STEAM ELECTRIC STATION

JOB NO. 35-1195

RECEIVE

NOV 17 1980

RECEIVE

Please find attached Southern Imperial Test Report #175-1-77 concerning DBA testing of the coating system Nuter #115/11/1201.

Please advise if further information on this system is needed.

*Mark Wells*

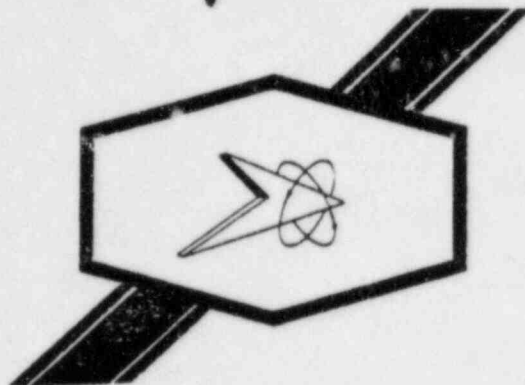
Mark Wells  
Coatings Eng.

MW/bgf  
Attachments  
cc: ARMS OL

B & P DOC DIST.

PROJECT VTR	
PROJECT DATA	
QA DATA	
PROJECT LOG	WCA
TUGCO LOG	
PROJECT REPORT	
ARMS	WCA
CPPA	WCA

# Imperial



Rec'd  
1/31/84-

12

## TECHNICAL REPORT

### NUMBER

#495-81

### TITLE

Nutec 11S/Nutec 1201  
Nutec 11S/Nutec 11/Nutec 1201  
Radiation Tolerance,  
Design Basis Accident Testing (ORNL)  
FOR

Company Knowledge

### CUSTOMER

Submitted by: Gerald E. Arnold

Accepted By:

*Gerald E. Arnold*  
*[Signature]*

Date: June 10, 1981

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

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4511050388

### SCOPE:

The purpose of this test is to evaluate the performance of Nutec 11S applied at film thicknesses of .020-.115" under design basis accident conditions specified for the South Texas Project. The effects of various mixing techniques and compressed air cleaning are also studied.

### BACKGROUND:

The six test specimens were included in the South Texas Project test to generate data on Nutec 11S at film thicknesses higher than the currently qualified 35 mil. maximum DFT imposed in Service Level 1 areas, to comply with the newly revised STP test requirements and to provide data on surface preparation other than abrasive blasting.

### SUMMARY:

All six specimens exhibited no defects when subjected to the STP design basis accident conditions (291°F., 70 PSIG). Two of the specimens were irradiated to  $2 \times 10^8$  rads; radiation tolerance was excellent.

### PROCEDURES:

Concrete coupons, measuring 2x4x2", were coated as described in the attached panel preparation sheets. On coupons A32, A34, and A38, Nutec 11S was applied at various film thicknesses and in 1-3 coats. Some faces also received a tight coat of Nutec 11.

Coupons A78, A83, and A85 were coated with Nutec 11S and Nutec 11 which had either been hand mixed with a spatula or with a Cowles mixer. One face of each coupon received no Nutec 11. Therefore, the coupons in both sets represent both the Nutec 11S/11/1201 and the Nutec 11S/1201 system.

The test specimens were submitted to Oak Ridge National Laboratories. Coupons A32 and A83 were irradiated to  $2 \times 10^8$  rads; all coupons were DBA tested per the South Texas requirements, with maximum temperature and pressure, of 291°F. and 70 PSIG, respectively. (See attachment summary)

Refer to the attached ORNL statement for a description of the tests performed.

### RESULTS:

Refer to individual ORNL results sheets.

<u>Coupon No.</u>	<u>Irradiation</u>	<u>DBA Results</u>
A32	Yes	No defects
A34	No	"
A38	No	"
A78	No	"
A83	Yes	"
A85	No	"



CONCLUSION:

At the LOCA conditions simulated in this test, the Nutec concrete system performed satisfactorily:

- A) Without Nutec 11 (Nutec 11S/1201)
- B) At Nutec 11S thicknesses of .020-.070" (one coat)
- C) At Nutec 11S thicknesses of .040-.115" (two-three coats)
- D) At Nutec 11 thicknesses of 1001-.010"
- E) At Nutec 1201 thicknesses of .003-.012"
- F) Regardless of dispersion speed (mixing)
- G) Over various prepared surfaces

The data demonstrates that both the 11S/11/1201 and 11S/1201 systems met the acceptance criteria of ANSI N5.12 and ANSI N101.2, when subjected to a radiation exposure level of  $2 \times 10^8$  rads and DBA conditions of 291°F and 70 PSIG.

This report should be reviewed in conjunction with Imperial's technical report #505-81, which describes the results of a second DBA test series on the Nutec concrete coating system.

# SUMMARY OF TEST PROCEDURES

Coupon #	Surface Prep.	System	Max. DFT (Mils)	Rad. Levels	Comments
A 32	Broomed surface was abrasive blasted; all other surfaces were stoned follow- ed by compressed air cleaning.	11S/1201 11S/11S/1201	70 (11S) 60 (11S)	$2 \times 10^8$ rads	
A 34		11S/1201 11S/11/1201 11S/11S/1201 11S/11S/11S/11/1201	25 (11S) 40 (11S) 115 (11S) 75 (11S)	No radiation	
A 38		11S/11/1201 11S/11S/11/1201 11S/11S/1201	45 (11S) 70 (11S) 70 (11S)	No radiation	
A 78		11S/11/1201	30 (11S) 10 (11) 12 (1201)	No radiation	#11S & #11 were hand mixed.
A 83	Broomed surface was abrasive blasted; all other surfaces were wire brushed follow- ed by compress- ed air cleaning.	11S/11/1201	30 (11S) 10 (11) 12 (1201)	$2 \times 10^8$ rads	#11S & #11 were hand mixed.
A 85		11S/11/1201	30 (11S) 10 (11) 12 (1201)	No radiation	#11S and #11 were mixed on a Cowles dissolver.

## TEST PROCEDURES

Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 26, 1981

## REPORT OF IRRADIATION AND DBA TESTING

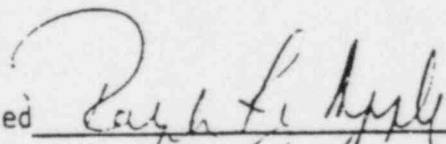
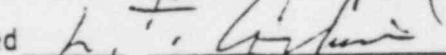
The irradiation and design basis accident (DBA) tests are conducted, respectively, in accordance with Bechtel Corporation specifications CP-951 and CP-956 in Standard Specification Coatings for Nuclear Power Plants (or with modifications as noted in Table 2, DBA test conditions). The tests are designed 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  $1 \times 10^8$  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

Approved

Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 26, 1981

ORNL Log Book No. A9675, A5-5-1

Table 1. DBA solution composition, distilled water

Reagent	Concentration
Boric acid, $H_3BO_3$	0.28 M
Sodium hydroxide, NaOH	Required to adjust pH to 9.5

Table 2. DBA test conditions

Time	Temperature (°F)	Pressure (psig)	Comments
Start	150		* Autoclave preheated.
10 min	150-291		Steam injected at 260°F.
20 min	291	70	Pressure maintained by relief valve.
45 min	291-260		
80 min	260	39	Pressure adjusted with $N_2$ .
120 min	260-220		
180 min	220	20	
210 min	220-160		
21 h	160	5	
10 d	125	2	Placed in fresh spray solution in constant temperature bath.
End of test			

Evaluated

Ralph L. Apple

Approved

L. T. Gorman

PANEL PREPARATION DATA



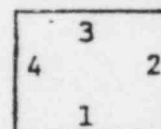
# TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 11S/Nutec 1201
2. TYPE SUBSTRATE: Concrete Size: 2 x 4 x 2
3. SURFACE PREPARATION (Describe): Carborundum stone used to remove high lights and loose particles; broomed surface blast swept to remove efflorescence. Cleaned with 100 psi compressed air
4. PRODUCT DATA: SAMPLE NO.(s): A-32
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: N/A

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)R.H.	THICKNESS (ins.)	TIME & I APPLIED
	Nutec	11S	2519/2530/2517	Squeegee	66°F/53%	*	2/4/81 3:00 p.m.
	Nutec	11S	2519/2530/2517	Squeegee	60°F/85%	**	2/5/81 9:00 a.m.
	Nutec	11S	2519/2530/2517	Squeegee	64°F/55%	***	2/9/81 9:30 a.m.
	Nutec	1201	9772/1959	Spray	73°F/52%	*****	2/16/81, 3:

FILM THICKNESS (ins.)		11S *	11S **	11S ***	11S ****	1201 *****
Side 1	max.	.060-.070				.003-.005
Side 2	min.	.040-.050				.003-.005
Side 3			.010-.020	.030-.040		.003-.005
Side 4			.010-.020	.030-.040		.003-.005

TOP VIEW OF COUPON



Numbered and broomed surface

TOTAL DRY FILM THICKNESS RANGE - Side 1 .063-.075 Side 3 .043-.065  
Side 2 .043-.055 Side 4 .044-.074

CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 45-65 %

MINIMUM CURE 7 DAYS

TEST PROCEDURE: DBA and Rad

TESTING PERFORMED BY: ORNL

DATE SUBMITTED 4-28-81

APPROVED Arnell E. Arnold

TEST REPORT NO. 495-81

# TEST PANEL PREPARATION DATA

DUCT TO BE TESTED: Nutec 11S/Nutec 11/Nutec 120L Nutec 11S/Nutec 1201

TYPE SUBSTRATE: Concrete Size: 2 x 4 x 2

SURFACE PREPARATION (Describe): Carborundum stone used to remove high lights and loose particles; broomed surface blast swept to remove efflorescence. Cleaned with 100 psi compressed air

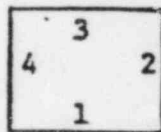
PRODUCT DATA: SAMPLE NO.(s): A-34

DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: N/A

DATE	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)R.H.	THICKNESS (ins.)	TIME & D. APPLIED
	Nutec	11S	2519/2530/2517	Squeegee	66°F/53%	*	2/4/81 3:00 P.M.
	Nutec	11S	2519/2530/2517	Squeegee	60°F/85%	**	2/5/81 9:00 a.m.
	Nutec	11S	2519/2530/2517	Squeegee	62°F/55%	***	2/9/81 9:30 a.m.
	Nutec	11	2476/2102/2444	Squeegee	62°F/43%	****	2/13/81,2:00
	Nutec	1201	9772/1959	Spray	73°F/52%	*****	2/16/81,3:00

FILM THICKNESS (ins.)		11S *	11S **	11S ***	11 ****	1201 *****
Side 1	Min.	.020-.025				.003-.005
Side 2		.025-.040			.001-.004	.003-.005
Side 3	Max.	.025-.035	.030-.040	.030-.040	.001-.004	.003-.005
Side 4			.020-.035	.030-.040		.003-.005

TOP VIEW OF COUPON



Numbered and broomed surf.

TOTAL DRY FILM THICKNESS RANGE - Side 1 .023-.030 Side 3 .086-.124  
Side 2 .029-.049 Side 4 .053-.080

CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 45-65 %  
MINIMUM CURE 7 DAYS

TEST PROCEDURE: DBA

TESTING PERFORMED BY: ORNL

DATE SUBMITTED 4-28-81

APPROVED Walter E. Arnold

TEST REPORT NO. 495-81

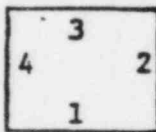
# TEST PANEL PREPARATION DATA

- DUCT TO BE TESTED: Nutec 11S/Nutec 11/Nutec 1201 , Nutec 11S/Nutec 1201
- TYPE SUBSTRATE: Concrete Size: 2 x 4 x 2
- SURFACE PREPARATION (Describe): Carborundum stone used to remove high lights and loose particles; broomed surface blast sweep to remove efflorescence. Cleaned with 100 psi compressed air
- PRODUCT DATA: SAMPLE NO.(s): A- 38
- DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: N/A

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)X.R.H.	THICKNESS (ins.)	TIME & D. APPLIED
	Nutec	11S	2519/2530/2517	Squeegee	66°F/53%	*	2/4/81 3:00 P.M.
	Nutec	11S	2519/2530/2517	Squeegee	60°F/85%	**	2/5/81 9:00 a.m.
	Nutec	11S	2519/2530/2517	Squeegee	62°F/55%	***	2/9/81 9:30 a.m.
	Nutec	11	2476/2102/2444	Squeegee	62°F/43%	****	2/13/81, 2:00
	Nutec	1201	9772/1959	Spray	73°F/52%	*****	2/16/81, 3:00

FILM THICKNESS (ins.)		11S *	11S **	11S ***	11 ****	1201 *****
Side 1	min.		.030-.045		.001-.004	.003-.005
Side 2	max.	.025-.030	.030-.040		.001-.004	.003-.005
Side 3		.025-.030		.030-.040		.003-.005
Side 4		.025-.030	.030-.040			.003-.005

TOP VIEW OF COUPON



Numbered and broomed surface

TOTAL DRY FILM THICKNESS RANGE - Side 1 .034-.054 Side 3 .058-.075  
Side 2 .059-.079 Side 4 .058-.075

CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 45-65 %  
MINIMUM CURE 7 DAYS

TEST PROCEDURE: DBA

TESTING PERFORMED BY: ORNL

DATE SUBMITTED 4-28-81

APPROVED

*Handwritten signature*

TEST REPORT NO. 495-81

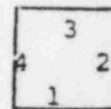
# TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 11S/Nutec 11/Nutec 1201, Nutec 11S/Nutec 1201
2. TYPE SUBSTRATE: Concrete SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): Blast swept on broomed surface to remove efflorescence; remaining faces wire brushed and blown down with 100 psi compressed air to remove dust and loose concrete.
4. PRODUCT DATA: SAMPLE NO.(s): A-78
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED \_\_\_\_\_

COAT	PRODUCT	PRODUCT	BATCH #	APPLICATION	CONDITIONS	THICKNESS	TIME & DATE APPLIED
		CODES		METHOD	R/M(°F) & R.H.	(ins.)	
	Nutec	11S*	2519/2086/2516	squeegee	71/73	See below	3-27-81
	Nutec	11*	2476/2683/2444	squeegee	73/64	"	4-2-81
	Nutec	1201	2606/2607	spray	69/51	"	4-5-81

FILM THICKNESS (ins.)	Nutec 11S	Nutec 11	Nutec 1201	TOTAL DFT RANGE
Side 1	.020-.030	.006-.010	.008-.012	.034-.052
Side 2 Min.	.020-.030		.008-.012	.028-.042
Side 3	.020-.030	.006-.010	.008-.012	.034-.052
Side 4	.020-.030	.006-.010	.008-.012	.034-.052

TOP VIEW OF COUPON



Numbered and broomed surface

- CURING CONDITIONS: AMBIENT TEMP. 65-80 °F REL. HUMIDITY 45-90 %  
 MINIMUM CURE 7 DAYS
- TEST PROCEDURE: DBA
- TESTING PERFORMED BY: ORNL DATE SUBMITTED 4-28-81

\*Hand mixed

APPROVED: Gerald E. Arnold

TEST REPORT NO: 495-81

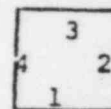
# TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 11S/Nutec 11/Nutec 1201, Nutec 11S/Nutec 1201
2. TYPE SUBSTRATE: Concrete SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): Blast swept on broomed surface to remove efflorescence; remaining faces wire brushed and blown down with 100 psi compressed air to remove dust and loose concrete.
4. PRODUCT DATA: SAMPLE NO.(s): A-83
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED N/A

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F) & R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
	Nutec	11S*	2519/2086/2516	squeegee	71/73	See below	3-27-81
	Nutec	11*	2476/2683/2444	squeegee	73/64	"	4-2-81
	Nutec	1201	2606/2607	spray	69/51	"	4-6-81

FILM THICKNESS (ins.)	Nutec 11S	Nutec 11	Nutec 1201	TOTAL DFT RANGE
Side 1	.020-.030	.006-.010	.008-.012	.034-.052
Side 2 min.	.020-.030		.008-.012	.028-.042
Side 3	.020-.030	.006-.010	.008-.012	.034-.052
Side 4	.020-.030	.006-.010	.008-.012	.034-.052

TOP VIEW OF COUPON



Numbered and broomed surface

- CURING CONDITIONS: AMBIENT TEMP. 65-80 °F REL. HUMIDITY 45-90  
MINIMUM CURE 7 DAYS
- TEST PROCEDURE: DBA / Radiation Tolerance
- TESTING PERFORMED BY: ORNL DATE SUBMITTED 4-28-81

\*Hand mixed

APPROVED: Arnell E. Arnold

TEST REPORT NO: 495-81



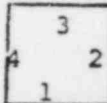
# TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 11S/Nutec 11/Nutec 1201, Nutec 11S/Nutec 1201
2. TYPE SUBSTRATE: Concrete SIZE: 2"x4"x2"
3. SURFACE PREPARATION (Describe): Blast swept on broomed surface to remove efflorescence;  
remaining faces wire brushed and blown down with 100 psi compressed air to remove dust and  
loose concrete.
4. PRODUCT DATA: SAMPLE NO.(s): A-85
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED \_\_\_\_\_

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)&R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
	Nutec	11S*	2519/LN138-17-2	squeegee	71/73	See below	3-27-81
	Nutec	11*	2476/LN138-17-1	squeegee	73/64	"	4-2-81
	Nutec	1201	2606/2607	spray	69/51	"	4-6-81

FILM THICKNESS (ins.)	Nutec 11S	Nutec 11	Nutec 1201	TOTAL DFT RANGE
Side 1	.020-.030	.006-.010	.008-.012	.034-.052
Side 2 min.	.020-.030		.008-.012	.028-.042
Side 3	.020-.030	.006-.010	.008-.012	.034-.052
Side 4	.020-.030	.006-.010	.008-.012	.034-.052

TOP VIEW OF  
COUPON



Numbered and  
broomed surface

CURING CONDITIONS: AMBIENT TEMP. 65-80 °F REL. HUMIDITY 45-90 %  
 MINIMUM CURE 7 DAYS

TEST PROCEDURE: DBA

TESTING PERFORMED BY: ORNL DATE SUBMITTED 4-28-81

\*Cowles Mixed

APPROVED: Wall E. Carroll

TEST REPORT NO: 495-81



## RESULTS

OAK RIDGE NATIONAL LABORATORY

OPERATED BY  
UNION CARBIDE CORPORATION  
NUCLEAR DIVISION



POST OFFICE BOX X  
OAK RIDGE, TENNESSEE 37830

May 26, 1981

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

Dear Jerry:

Enclosed are the test results on your recently submitted specimens.

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

Sincerely yours,

A handwritten signature in cursive script, appearing to read "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: May 26, 1981

SYSTEM IDENTIFICATION

Steel panel x Concrete block

11S/1201

RADIATION TOLERANCE TEST

ORNL Master Analytical Manual Method No. 2 0921; Bechtel Corporation  
Specification No. CP-951; ORNL Log Book No. A9675, A5-5-1.

Initial dose rate:  $1.0 \times 10^7$  rad  
Test conducted in: x air water

Sample No.

Cumulative dose

Test results

A-32

$2 \times 10^8$  rad

Coatings intact, no defects.

Evaluated

*Paul F. Apple*

Approved

*L. T. Gish*

Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 26, 1981

SYSTEM IDENTIFICATION

     Steel panel        x   Concrete block

11S/1201

DBA TEST

ORNL Master Analytical Manual Method No. 2 0922.  
ORNL Log Book No. A9675, A5-5-1

<u>Sample No.</u>	<u>DBA phase</u>	<u>Test results</u>
A-32	spray*	Coatings intact, no defects, all areas.
A-34	spray	Coatings intact, no defects, all areas.
A-38	spray	Coatings intact, no defects, all areas.

                      
\*Irradiated.

Evaluated

Ralph F. Apple

Approved

L. T. Corbin

Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 26, 1981

SYSTEM IDENTIFICATION

       Steel panel   x   Concrete block

115/11/1201

RADIATION TOLERANCE TEST

ORNL Master Analytical Manual Method No. 2 0921; Bechtel Corporation  
Specification No. CP-951; ORNL Log Book No. A9675, A5-5-1.

Initial dose rate: 1.0 x 10<sup>7</sup> rad  
Test conducted in:   x   air        water

Sample No.

Cumulative dose

Test results

A-83

2 x 10<sup>8</sup> rad

Coatings intact, no defects.

Evaluated

Ralph L. Apple

Approved

L. T. Coe

Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 26, 1981

SYSTEM IDENTIFICATION

Steel panel

x Concrete block

11S/11/1201

DBA TEST

ORNL Master Analytical Manual Method No. 2 0922.

ORNL Log Book No. A9675, A5-5-1

<u>Sample No.</u>	<u>DBA phase</u>	<u>Test results</u>
A-78	spray	Coatings intact, no defects, all areas.
A-83	spray*	Coatings intact, no defects, all areas.
A-85	spray	Coatings intact, no defects, all areas.

\*Irradiated.

Evaluated

Roger L. Apple

Approved

John C. Gorman



IN-4201

06/22/84

Allegation No. 12

If maximum limits are used, paragraph 4.3.1.2 of Procedure Number CCP-40, Rev. 5., allows a 102 mil thick coating system for 11S/1201/11S/1201. Is this system thickness qualified, for example for environmental (irradiation) conditions and DBA conditions, under ANSI 101.2-1972?

Evaluation of Validity

This allegation, which relates to a repair procedure involving limited total surface area, is addressed in our response to Allegation Number 1. Additionally, data developed by Imperial (See Test Report No. 495-81, attached) includes the results of irradiation and DBA tests of systems similar to those listed in Allegations No. 1 and No. 12. The coatings thicknesses tested range from 10 to 115 mils. All systems tested met DBA requirements. The systems subjected to irradiation were at film thicknesses of 10, 12, 30, 60 and 70 mils. These were unaffected by irradiation. In view of the limited areas involved and the available data, this allegation is without technical significance.

Safety Significance

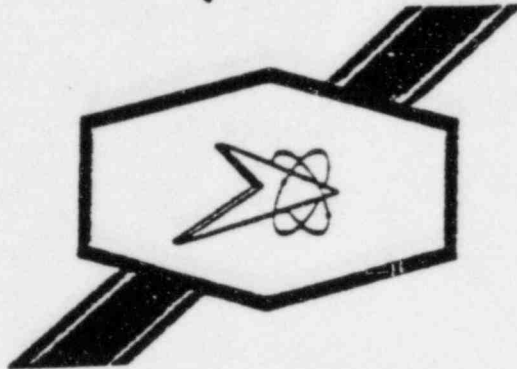
None

Generic Implications on Other Systems or Contractors

Not applicable

#12

# Imperial



## TECHNICAL REPORT

### NUMBER

#495-81

### TITLE

Nutec 11S/Nutec 1201  
Nutec 11S/Nutec 11/Nutec 1201  
Radiation Tolerance,  
Design Basis Accident Testing (ORNL)  
FOR

Company Knowledge

### CUSTOMER

Submitted by: Gerald E. Arnold

Approved By:

*Gerald E. Arnold*  
*[Signature]*

Date: June 10, 1981

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

The information contained in this report, based upon our experience, is offered without charge as part of our service to customers. It is intended for use by persons having technical skill, at their own discretion and risk. We assume no liability in connection with its use. This information is not intended as a license to operate under, nor a recommendation to imitate, any patent covering any material or use.

#### SCOPE:

The purpose of this test is to evaluate the performance of Nutec 11S applied at film thicknesses of .020-.115" under design basis accident conditions specified for the South Texas Project. The effects of various mixing techniques and compressed air cleaning are also studied.

#### BACKGROUND:

The six test specimens were included in the South Texas Project test to generate data on Nutec 11S at film thicknesses higher than the currently qualified 35 mil. maximum DFT imposed in Service Level 1 areas, to comply with the newly revised STP test requirements and to provide data on surface preparation other than abrasive blasting.

#### SUMMARY:

All six specimens exhibited no defects when subjected to the STP design basis accident conditions (291°F., 70 PSIG). Two of the specimens were irradiated to  $2 \times 10^8$  rads; radiation tolerance was excellent.

#### PROCEDURES:

Concrete coupons, measuring 2x4x2", were coated as described in the attached panel preparation sheets. On coupons A32, A34, and A38, Nutec 11S was applied at various film thicknesses and in 1-3 coats. Some faces also received a tight coat of Nutec 11.

Coupons A78, A83, and A85 were coated with Nutec 11S and Nutec 11 which had either been hand mixed with a spatula or with a Cowles mixer. One face of each coupon received no Nutec 11. Therefore, the coupons in both sets represent both the Nutec 11S/11/1201 and the Nutec 11S/1201 system.

The test specimens were submitted to Oak Ridge National Laboratories. Coupons A32 and A83 were irradiated to  $2 \times 10^8$  rads; all coupons were DBA tested per the South Texas requirements, with maximum temperature and pressure, of 291°F. and 70 PSIG, respectively. (See attachment summary)

Refer to the attached ORNL statement for a description of the tests performed.

#### RESULTS:

Refer to individual ORNL results sheets.

<u>Coupon No.</u>	<u>Irradiation</u>	<u>DBA Results</u>
A32	Yes	No defects
A34	No	"
A38	No	"
A78	No	"
A83	Yes	"
A85	No	"

CONCLUSION:

At the LOCA conditions simulated in this test, the Nutec concrete system performed satisfactorily:

- A) Without Nutec 11 (Nutec 11S/1201)
- B) At Nutec 11S thicknesses of .020-.070" (one coat)
- C) At Nutec 11S thicknesses of .040-.115" (two-three coats)
- D) At Nutec 11 thicknesses of 1001-.010"
- E) At Nutec 1201 thicknesses of .003-.012"
- F) Regardless of dispersion speed (mixing)
- G) Over various prepared surfaces

The data demonstrates that both the 11S/11/1201 and 11S/1201 systems met the acceptance criteria of ANSI N5.12 and ANSI N101.2, when subjected to a radiation exposure level of  $2 \times 10^8$  rads and DBA conditions of 291°F and 70 PSIG.

This report should be reviewed in conjunction with Imperial's technical report #505-81, which describes the results of a second DBA test series on the Nutec concrete coating system.

# SUMMARY OF TEST PROCEDURES

Coupon #	Surface Prep.	System	Max. DFT (Mils)	Rad. Levels	Comments
A 32	Broomed surface was abrasive blasted; all other surfaces were stoned followed by compressed air cleaning.	11S/1201 11S/11S/1201	70 (11S) 60 (11S)	$2 \times 10^8$ rads	
A 34		11S/1201 11S/11/1201 11S/11S/1201 11S/11S/11S/11/1201	25 (11S) 40 (11S) 115 (11S) 75 (11S)	No radiation	
A 38		11S/11/1201 11S/11S/11/1201 11S/11S/1201	45 (11S) 70 (11S) 70 (11S)	No radiation	
A 78		11S/11/1201	30 (11S) 10 (11) 12 (1201)	No radiation	#11S & #11 were hand mixed.
A 83	Broomed surface was abrasive blasted; all other surfaces were wire brushed followed by compressed air cleaning.	11S/11/1201	30 (11S) 10 (11) 12 (1201)	$2 \times 10^8$ rads	#11S & #11 were hand mixed.
A 85		11S/11/1201	30 (11S) 10 (11) 12 (1201)	No radiation	#11S and #11 were mixed on a Cowles dissolver.

TEST PROCEDURES



Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 26, 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  $1 \times 10^8$  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. Hyslop*

Approved *L. T. Gidner*

Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 26, 1981

ORNL Log Book No. A9675, A5-5-1

Table 1. DBA solution composition, distilled water

Reagent	Concentration
Boric acid, $H_3BO_3$	0.28 M
Sodium hydroxide, NaOH	Required to adjust pH to 9.5

Table 2. DBA test conditions

Time	Temperature (°F)	Pressure (psig)	Comments
Start	150		Autoclave preheated.
10 min	150-291		Steam injected at 260°F.
20 min	291	70	Pressure maintained by relief valve.
45 min	291-260		
80 min	260	39	Pressure adjusted with $N_2$ .
120 min	260-220		
180 min	220	20	
210 min	220-160		
21 h	160	5	
10 d	125	2	Placed in fresh spray solution in constant temperature bath.
End of test			

Evaluated

Ralph L. Apple

Approved

L. T. ...

PANEL PREPARATION DATA

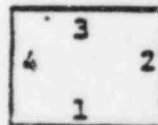
# TEST PANEL PREPARATION DATA

- PRODUCT TO BE TESTED: Nutec 115/Nutec 1201
- TYPE SUBSTRATE: Concrete Size: 2 x 4 x 2
- SURFACE PREPARATION (Describe): Carborundum stone used to remove high lights and loose particles; broomed surface blast swept to remove efflorescence. Cleaned with 100 psi compressed air
- PRODUCT DATA: SAMPLE NO.(s): A-32
- DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: N/A

QAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
	Nutec	115	2519/2530/2517	Squeegee	66°F/53%	*	2/4/81 3:00 p.m.
	Nutec	115	2519/2530/2517	Squeegee	60°F/85%	**	2/5/81 9:00 a.m.
	Nutec	115	2519/2530/2517	Squeegee	64°F/55%	***	2/9/81 9:30 a.m.
	Nutec	1201	9772/1959	Spray	73°F/52%	*****	2/16/81, 3:00

FILM THICKNESS (ins.)		115 *	115 **	115 ***	11 *****	1201 *****
Side 1	max.	.060-.070				.003-.005
Side 2	min.	.040-.050				.003-.005
Side 3			.010-.020	.030-.040		.003-.005
Side 4			.010-.020	.030-.040		.003-.005

TOP VIEW OF COUPON



Numbered and broomed surface

TOTAL DRY FILM THICKNESS RANGE - Side 1 .063-.075 Side 3 .043-.065  
Side 2 .043-.055 Side 4 .044-.074

CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 45-65 %  
MINIMUM CURE 7 DAYS

TEST PROCEDURE: DBA and Rad

TESTING PERFORMED BY: ORNL

DATE SUBMITTED 4-28-81

APPROVED

*Arvid E. Arnold*

TEST REPORT NO. 495-81

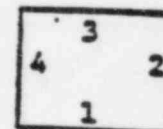
# TEST PANEL PREPARATION DATA

- PRODUCT TO BE TESTED: Nutec 11S/Nutec 11/Nutec 1201, Nutec 11S/Nutec 1201
- TYPE SUBSTRATE: Concrete Size: 2 x 4 x 2
- SURFACE PREPARATION (Describe): Carborundum stone used to remove high lights and loose particles; broomed surface blast swept to remove efflorescence. Cleaned with 100 psi compressed air
- PRODUCT DATA: SAMPLE NO.(s): A-34
- DATE AND TIME CURING COMPOUND OR PRIMER APPLIED: N/A

DATE	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F) R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
	Nutec	11S	2519/2530/2517	Squeegee	66°F/53%	*	2/4/81 3:00 P.M.
	Nutec	11S	2519/2530/2517	Squeegee	60°F/85%	**	2/5/81 9:00 A.M.
	Nutec	11S	2519/2530/2517	Squeegee	62°F/55%	***	2/9/81 9:30 A.M.
	Nutec	11	2476/2102/2444	Squeegee	62°F/43%	****	2/13/81.2:00
	Nutec	1201	9772/1959	Spray	73°F/52%	****	2/16/81.3:00

FILM THICKNESS (ins.)		11S *	11S **	11S ***	11 ****	1201 *****
Side 1	Min.	.020-.025				.003-.005
Side 2		.025-.040			.001-.004	.003-.005
Side 3	Max.	.025-.035	.030-.040	.030-.040	.001-.004	.003-.005
Side 4			.020-.035	.030-.040		.003-.005

TOP VIEW OF COUPON



Numbered and broomed surf.

TOTAL DRY FILM THICKNESS RANGE - Side 1 .023-.030 Side 3 .086-.124  
Side 2 .029-.049 Side 4 .053-.080

CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 45-65 %  
MINIMUM CURE 7 DAYS

TEST PROCEDURE: DBA

TESTING PERFORMED BY: ORNL

DATE SUBMITTED 4-28-81

APPROVED Sheld C. Bivall

TEST REPORT NO. 495-81



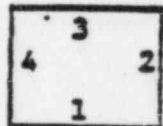
# TEST PANEL PREPARATION DATA

- PRODUCT TO BE TESTED: Nutec 11S/Nutec 11/Nutec 1201 . Nutec 11S/Nutec 1201
- TYPE SUBSTRATE: Concrete Size: 2 x 4 x 2
- SURFACE PREPARATION (Describe): Carborundum stone used to remove high lights and loose particles; broomed surface blast swept to remove efflorescence. Cleaned with 100 psi compressed air
- PRODUCT DATA: SAMPLE NO.(s): A- 38
- DATE AND TIME COATING COMPOUND OR PRIMER APPLIED: N/A

DATE	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F) TR. R.	THICKNESS (ins.)	TIME & DA APPLIED
	Nutec	11S	2519/2530/2517	Squeegee	66°F/53%	*	2/4/81 3:00 P.M.
	Nutec	11S	2519/2530/2517	Squeegee	60°F/85%	**	2/5/81 9:00 a.m.
	Nutec	11S	2519/2530/2517	Squeegee	62°F/55%	***	2/9/81 9:30 a.m.
	Nutec	11	2476/2102/2444	Squeegee	62°F/43%	****	2/13/81.2:0
	Nutec	1201	9772/1959	Spray	73°F/52%	*****	2/16/81.3:0

FILM THICKNESS (ins.)		11S *	11S **	11S ***	11 ****	1201 *****
Side 1	min.		.030-.045		.001-.004	.003-.005
Side 2	max.	.025-.030	.030-.040		.001-.004	.003-.005
Side 3		.025-.030		.030-.040		.003-.005
Side 4		.025-.030	.030-.040			.003-.005

TOP VIEW OF COUPON



↑  
Numbered and broomed surface

TOTAL DRY FILM THICKNESS RANGE - Side 1 .034-.054 Side 3 .058-.075  
Side 2 .059-.079 Side 4 .058-.075

CURING CONDITIONS: AMBIENT TEMP. 70-80 °F REL. HUMIDITY 45-65 %  
MINIMUM CURE 7 DAYS

TEST PROCEDURE: DBA

TESTING PERFORMED BY: ORNL DATE SUBMITTED 4-28-81

APPROVED

*[Signature]*

TEST REPORT NO. 495-81



# TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 11S/Nutec 11/Nutec 1201, Nutec 11S/Nutec 1201
2. TYPE SUBSTRATE: Concrete SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): Blast swept on broomed surface to remove efflorescence; remaining faces wire brushed and blown down with 100 psi compressed air to remove dust and loose concrete.
4. PRODUCT DATA: SAMPLE NO.(s): A-78
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED \_\_\_\_\_

COAT	PRODUCT	PRODUCT CODES	BATCH #	APPLICATION METHOD	CONDITIONS R/M(°F)&R.H.	THICKNESS (ins.)	TIME & DATE APPLIED
	Nutec	11S*	2519/2086/2516	squeegee	71/73	See below	3-27-81
	Nutec	11*	2476/2683/2444	squeegee	73/64	"	4-2-81
	Nutec	1201	2606/2607	spray	69/51	"	4-6-81

FILM THICKNESS (ins.)	Nutec 11S	Nutec 11	Nutec 1201	TOTAL DFT RANGE
Side 1	.020-.030	.006-.010	.008-.012	.034-.052
Side 2 Min.	.020-.030		.008-.012	.028-.042
Side 3	.020-.030	.006-.010	.008-.012	.034-.052
Side 4	.020-.030	.006-.010	.008-.012	.034-.052

TOP VIEW (COUPON)



Numbered on broomed surface

CURING CONDITIONS: AMBIENT TEMP. 65-80 °F REL. HUMIDITY 45-90  
 MINIMUM CURE 7 DAYS

TEST PROCEDURE: DBA  
 TESTING PERFORMED BY: ORNL DATE SUBMITTED 4-28-81

\*Hand mixed

APPROVED: Donald E. Arnold

TEST REPORT NO: 495-81

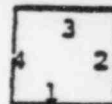
# TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 11S/Nutec 11/Nutec 1201, Nutec 11S/Nutec 1201
2. TYPE SUBSTRATE: Concrete SIZE: 2" x 4" x 2"
3. SURFACE PREPARATION (Describe): Blast swept on broomed surface to remove efflorescence; remaining faces wire brushed and blown down with 100 psi compressed air to remove dust and loose concrete.
4. PRODUCT DATA: SAMPLE NO. (s): A-83
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED N/A

<u>DATE</u>	<u>PRODUCT</u>	<u>PRODUCT CODES</u>	<u>BATCH #</u>	<u>APPLICATION METHOD</u>	<u>CONDITIONS R/M (°F) &amp; R.H.</u>	<u>THICKNESS (ins.)</u>	<u>TIME &amp; DATE APPLIED</u>
	Nutec	11S*	2519/2086/2516	squeegee	71/73	See below	3-27-81
	Nutec	11*	2476/2683/2444	squeegee	73/64	"	4-2-81
	Nutec	1201	2606/2607	spray	69/51	"	4-6-81

<u>FILM THICKNESS (ins.)</u>	<u>Nutec 11S</u>	<u>Nutec 11</u>	<u>Nutec 1201</u>	<u>TOTAL DFT RANGE</u>
Side 1	.020-.030	.006-.010	.008-.012	.034-.052
Side 2 min.	.020-.030		.008-.012	.028-.042
Side 3	.020-.030	.006-.010	.008-.012	.034-.052
Side 4	.020-.030	.006-.010	.008-.012	.034-.052

TOP VIEW OF COUPON



Numbered and broomed surface

6. CURING CONDITIONS: AMBIENT TEMP. 65-80 °F REL. HUMIDITY 45-90  
MINIMUM CURE 7 DAYS

7. TEST PROCEDURE: DBA / Radiation Tolerance

8. TESTING PERFORMED BY: ORNL DATE SUBMITTED 4-28-81

\*Hand mixed

APPROVED: Arnell E. Arnold

TEST REPORT NO: 495-81

# TEST PANEL PREPARATION DATA

1. PRODUCT TO BE TESTED: Nutec 11S/Nutec 11/Nutec 1201, Nutec 11S/Nutec 1201
2. TYPE SUBSTRATE: Concrete SIZE: 2"x4"x2"
3. SURFACE PREPARATION (Describe): Blast swept on broomed surface to remove efflorescence; remaining faces wire brushed and blown down with 100 psi compressed air to remove dust and loose concrete.
4. PRODUCT DATA: SAMPLE NO.(s): A-85
5. DATE AND TIME CURING COMPOUND OR PRIMER APPLIED

<u>COAT</u>	<u>PRODUCT</u>	<u>PRODUCT CODES</u>	<u>BATCH #</u>	<u>APPLICATION METHOD</u>	<u>CONDITIONS R/M(°F)&amp;R.H.</u>	<u>THICKNESS (ins.)</u>	<u>TIME &amp; DA APPLIED</u>
	Nutec	11S*	2519/LN138-17-2	squeegee	71/73	See below	3-27-81
	Nutec	11*	2476/LN138-17-1	squeegee	73/64	"	4-2-81
	Nutec	1201	2606/2607	spray	69/51	"	4-6-81

<u>FILM THICKNESS (ins.)</u>	<u>Nutec 11S</u>	<u>Nutec 11</u>	<u>Nutec 1201</u>	<u>TOTAL DFT RANGE</u>
<u>Side 1</u>	.020-.030	.006-.010	.008-.012	.034-.052
<u>Side 2 min.</u>	.020-.030		.008-.012	.028-.042
<u>Side 3</u>	.020-.030	.006-.010	.008-.012	.034-.052
<u>Side 4</u>	.020-.030	.006-.010	.008-.012	.034-.052

TOP VIEW C  
COUPON



Numbered and  
broomed surface

CURING CONDITIONS: AMBIENT TEMP. 65-80 °F REL. HUMIDITY 45-90  
MINIMUM CURE 7 DAYS

TEST PROCEDURE: DBA  
TESTING PERFORMED BY: ORNL DATE SUBMITTED 4-28-81

\*Cowles Mixed

APPROVED:

*Chall C. Cowles*

TEST REPORT NO:

495-81

RESULTS

OAK RIDGE NATIONAL LABORATORY

OPERATED BY  
UNION CARBIDE CORPORATION  
NUCLEAR DIVISION



POST OFFICE BOX X  
OAK RIDGE, TENNESSEE 37830

May 26, 1981

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

Dear Jerry:

Enclosed are the test results on your recently submitted specimens.

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

Sincerely yours,

L. T. Corbin, Section Head  
Analytical Chemistry Division

LTC:cmw

Enclosures

Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 26, 1981

SYSTEM IDENTIFICATION

Steel panel x Concrete block

115/1201

RADIATION TOLERANCE TEST

ORNL Master Analytical Manual Method No. 2 0921; Bechtel Corporation  
Specification No. CP-951; ORNL Log Book No. A9675, A5-5-1.

Initial dose rate:  $1.0 \times 10^7$  rad  
Test conducted in: x air water

Sample No.

Cumulative dose

Test results

A-32

$2 \times 10^8$  rad

Coatings intact, no defects.

Evaluated

Approved

Paul F. Apple  
L. T. Wilson



Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 26, 1981

SYSTEM IDENTIFICATION

Steel panel

x Concrete block

11S/1201

DBA TEST

ORNL Master Analytical Manual Method No. 2 0922.  
ORNL Log Book No. A9675, A5-5-1

<u>Sample No.</u>	<u>DBA phase</u>	<u>Test results</u>
A-32	spray*	Coatings intact, no defects, all areas.
A-34	spray	Coatings intact, no defects, all areas.
A-38	spray	Coatings intact, no defects, all areas.

\*Irradiated.

Evaluated

Ralph F. Apple

Approved

L. T. Perkins

Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 26, 1981

SYSTEM IDENTIFICATION

Steel panel x Concrete block

11S/11/1201

RADIATION TOLERANCE TEST

ORNL Master Analytical Manual Method No. 2 0921; Bechtel Corporation  
Specification No. CP-951; ORNL Log Book No. A9575, A5-5-1.

Initial dose rate:  $1.0 \times 10^7$  rad  
Test conducted in: x air water

Sample No.

Cumulative dose

Test results

A-83

$2 \times 10^8$  rad

Coatings intact, no defects.

Evaluated

R. L. H. H. H.

Approved

L. T. L. L. L.

Manufacturer: Imperial  
New Orleans, Louisiana

Analytical Chemistry Division  
Oak Ridge National Laboratory  
Date: May 26, 1981

SYSTEM IDENTIFICATION

Steel panel x Concrete block

115/11/1201

DBA TEST

ORNL Master Analytical Manual Method No. 2 0922.  
ORNL Log Book No. A9675, A5-5-1

<u>Sample No.</u>	<u>DBA phase</u>	<u>Test results</u>
A-78	spray	Coatings intact, no defects, all areas.
A-83	spray*	Coatings intact, no defects, all areas.
A-85	spray	Coatings intact, no defects, all areas.

\*Irradiated.

Evaluated

Approved

R. E. Apple  
L. T. Collins