STANDARD SPECIFICATION
RADIATION TOLERANCE TESTS PROCEDURES
AND ACCEPTANCE CRITERIA

1.0 DESCRIPTION

1.1 This section provides a procedure for a uniform radiation tolerance test.

1.2 The Procedure includes:

1.2.1 Preparation of Test Specimens

1.2.2 Irradiation and Dosimetry

1.2.3 Test Environment

1.2.4 Postirradiation Examination and Evaluation

1.2.5 Documentation

2.0 PREPARATION OF TEST SPECIMENS

2.1 Preparation of Steel Specimens:

2.1.1 Panels: The minimum size for carbon steel panels shall be 2 by 4 inches by 1/8 inch thick with rounded edges and corners. Larger sizes may be used where feasible. The steel for each specimen shall meet the requirements of ASTM A36, "Standard Specifications for Structural Steel."

2.1.2 Surface Preparation: Surface preparation shall be according to SSPC-SP10 with a profile between 1S70 and 2S70 (approximately 1.0 to 2.0 mils) as read on a Keane-Tator Profile Comparator Disc. Each coating shall be evaluated over a sandblasted surface.

2.2 Preparation of Concrete Specimen:

2.2.1 Concrete Composition:

Cement, ASTM C150, Type II, Low alkali, blend 4 cements of Type II
Gravel, ASTM C33, size 3/8 inches
Sand, ASTM C33
Water-reducing admixture, ASTM C494
Air entraining admixture, ASTM C260
Possolans, ASTM C608
Water - Demineralized or distilled water

2.2.2 Concrete Proportions:

Cement, 7 sacks per cubic yard
Sand-Gravel ratio, 55 sand, 45 gravel by volume
Pozzolans, to 15 percent replacement of cement
Air entraining admixture, 4-7 percent
Water reducing admixture, as per manufacturer's instructions
Water, to produce a 3 inch slump

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2.2.3 Preparation of Test Specimen: Make and cure the specimen according to ASTM C192. The face to be tested shall be composed to the form to simulate poured walls and wood troweled surfaces: Broom finish top surface to simulate floors. No test face shall be saw cut. When applicable, concrete curing agents compatible with the coating system shall be used.

2.2.4 Panels: The minimum size for concrete panels shall be 2 by 4 inches by 2 inches thick. Larger sizes may be used where feasible.

2.2.5 Curing Time: Before concrete specimens are coated, they shall be cured a minimum of 28 days in accordance with ACI 301, "Specifications for Structural Concrete for Buildings." If a concrete curing primer is used, it must be applied on the concrete within 24 hours after removal of the forms.

3.0 APPLICATION AND CURE OF COATINGS

3.1 All specimens except those made of concrete shall be coated completely with the entire coating system. The concrete specimens shall be coated in an identical fashion except that the top end may be left uncoated. This procedure allows moisture and gases to escape and thus eliminates blistering by effects not related to the test.

3.2 All applications shall be in accordance with the coating manufacturer's latest published instructions for the system. Care shall be taken to apply the materials so that the characteristics of the system are similar to the coatings applied on a full scale structure.

3.3 Sandblasting, acid etching and sacking of concrete surfaces is not allowed.

3.4 All specimens shall be marked for identification.

3.5 All coatings or coating systems shall be cured at ambient temperature. No elevated temperature curing is allowed.

4.0 IRRADIATION AND DOSIMETRY

4.1 The test specimens are to be exposed to a Spent Fuel source, closely resembling actual conditions, enriched U(235) as U(3)O(8), having a dose rate of approximately 2 to 3 x 10(7) Rads per hour. The sample temperature shall not exceed 140 F. If the specimen is irradiated in a nonuniform source in which certain areas receive more radiation than others, it must be periodically rotated so that all areas receive the same average exposure and dose. Specimens shall be exposed in air, in deionized water, or in both, depending on the intended service. No fewer than two specimens of the same coating system shall be exposed for each test. The specimens shall be irradiated to and examined at:

A. - 1 x 10(9)
B. - 1 x 10(8)
C. - 1 x 10(7)

4.2 Calibration: The irradiation exposure shall be determined by an acceptable chemical dosimeter or other approved methods of dosimetry calculations.

5.0 POSTIRRADIATION EXAMINATION AND EVALUATION AND ACCEPTANCE

5.1 After irradiation to the specified exposure level and under the specified test conditions, the specimens shall be examined and compared with an unirradiated specimen for evidence of the following defects: fine-line cracking, checking, softening, tackiness, blistering, flaking, chalking, loss adhesion or delamination, discoloration. The defects shall be dealt with as follows:

5.1.1 Fine-line cracking: ASTM D661, "Evaluating Degree of Resistance of Cracking of Exterior Paints". Fine-line cracking is not permitted.

5.1.2 Checking: ASTM D660, "Evaluating Degree of Resistance to Checking of of Exterior Paints." Checking is not permitted.

5.1.3 Softening and Tackiness: Neither softening nor tackiness of the coatings shall be permitted.

5.1.4 Blistering: ASTM D714, "Evaluating Degree of Blistering of Panels". No blistering is allowed.

5.1.5 Flaking: ASTM D772, "Evaluating Degree of Resistance to Flaking (Scaling) of Exterior Paints". Flaking shall not be permitted.

5.1.6 Chalking: ASTM D659, "Standard Method of Evaluating Degree of Resistance to Chalking of Exterior Paints." Heavy chalking shall not be permitted.

5.1.7 Loss of adhesion or delamination: Any evidence of loss of adhesion or delamination shall constitute failure.

5.1.8 Discoloration: Only slight discoloration is acceptable.

5.1.9 Any other changes in coating properties which will render the coating system nonfunctional will be cause for rejection.

6.0 DOCUMENTATION OF TEST RESULTS

6.1 The manufacturer shall submit the following documents for approval:

6.1.1 Product Identification:

Weight per gallon	Range from _____ to _____
Viscosity and Method	Range from _____ to _____
Total Solids: (Vol.)	
Flash Point ASTM D93-73	
When applicable (for surfacer)	
_____ Compression strength	ASTM C579-68 7 days @ 73 F.
_____ Tensile strength	ASTM C307-61 7 days @ 73 F.
_____ Modulus of Elasticity	ASTM C580-68 7 days @ 73 F.
_____ Flexural strength	ASTM C580-68 7 days @ 73 F.
Storage Life	
Pot Life	
Initial Set Time ASTM C308-64	

6.1.2 Sample Preparation Documentation:

Substrate: Steel, Concrete, or Other
Surface Preparation: (Describe)
Coating System: (Describe each coat specifically, mil thickness, Batch No., etc.).
Curing Conditions: Time, Temp.

6.1.3 All test reports on tests performed by independent laboratory.

6.1.4 A color photograph in which the test specimen appears in the same size as the actual test specimen.

7.0 RETENTION OF RECORDS AND SPECIMENS

7.1 The test specimens shall be retained and be made available for observation until an approval by Bechtel is granted.