

## **Joint Standard**

# **SSPC-PA 6/NACE No. 10 Fiberglass-Reinforced Plastic (FRP) Linings Applied to Bottoms of Carbon Steel Aboveground Storage Tanks**

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## Foreword

This standard recommended practice specifies the procedures to design, apply, and inspect fiberglass-reinforced plastic (FRP) linings that are applied internally to the bottom of carbon steel aboveground storage tanks (ASTs). FRP linings are used worldwide to prevent the corrosion and deterioration of storage tank bottoms in petroleum, petrochemical, and other services. Experience has shown that the useful life of an FRP lining may exceed 25 years. API<sup>(1)</sup> Standard 653<sup>1</sup> permits a minimum remaining thickness of the tank bottom plate to be 1.25 mm (0.050 in.) when lined with FRP compared to a thickness of 2.5 mm (0.10 in.) if unlined or lined with a nonreinforced coating system and not equipped with a tank bottom leak detection system. This standard will serve as a resource for facility owners preparing specifications to achieve successful lining applications in ASTs in the petroleum/petrochemical industry. The practices described are also useful during preparation of specifications for ASTs in other services.

This joint standard was prepared by the SSPC/NACE Task Group 009 on Fiberglass-Reinforced Plastic Linings for Aboveground Storage Tank Floors. This task group is administered by NACE Specific Technology Group (STG) 80 on Intersociety Joint Coatings Activities, and also sponsored by STG 03 on Protective Coatings and Linings—Immersion/Buried. This standard is published by SSPC and NACE under the auspices of STG 80.

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<sup>(1)</sup> American Petroleum Institute (API), 1220 L St. NW, Washington, DC 20005-4070.

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## Joint Standard

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## Section 1: General

1.1 Procedures outlined below and detailed in subsequent sections of this standard shall be followed for the successful application of a FRP lining system.

1.1.1 Abrasive blast clean the storage tank bottom and, as a minimum, the lower 60 cm (24 in.) of the tank shell. The owner should confirm that this minimum tank shell height is acceptable. Inspect cleaned surfaces just prior to primer or coating application.

1.1.2 If required, apply primer to the storage tank floor and the lower 60 cm (24 in.) of the tank shell.

1.1.3 Apply caulk to the properly prepared tank floor, deep pits, equipment supports, striker (bearing) plates, and chine angle, as required.

1.1.4 Apply resin and glass reinforcement to the tank bottom and lower shell course. If a two-layer or double laminate system is applied, extend the first layer 45 cm (18 in.) up the tank shell and the second 30 cm (12 in.) up the tank shell. At least 15 cm (6 in.) of blasted and primed shell wall shall be visible above the first coat of laminate.

1.1.5 Repair defects in the laminate prior to the application of the topcoat. (See Section 2.)

1.1.6 Apply a topcoat to the laminate applied to the floor and to the tank shell.

1.1.7 During all phases of the tank lining system application, inspection shall be carried out by the applicator and, when appropriate, by the owner's inspector. (See Section 11.)

1.1.8 The lining applicator shall record all pertinent information concerning the entire tank bottom lining work within *NACE Coating Inspector's Logbook*<sup>2</sup> or equivalent. This logbook shall be available at all times to the owner or owner's inspector.

1.1.9 During all phases of the lining operation, the lining applicator shall comply with the owner's prescribed working procedures.

1.1.10 Do not line storage tank nozzles or coat internal tank equipment, piping, or heating coil supports. Terminate the FRP lining at such supports with a design that ensures leak and corrosion resistance of the applied lining.

1.1.11 All applicable safety regulations must be followed during surface preparation, application, and curing of the lining system.

1.2 For a listing of documents and standards that shall be used in conjunction with this standard, refer to Appendix A.

1.2.1 The lining manufacturer's technical data sheets for coating materials and glass reinforcement; material safety data sheets (MSDS); and application instructions shall be used in conjunction with the documents listed in Appendix A and the requirements contained within this standard.

1.2.2 Any conflict between documents shall be resolved by the owner.

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## Section 2: Definitions<sup>(2)</sup>

**Abrasive Blast Cleaning:** Also called abrasive blasting, a surface preparation method that uses an abrasive propelled by air pressure, centrifugal force, or water pressure to clean and usually to profile a surface.

**Barcol Hardness:** Hardness value obtained by measuring the resistance to penetration of a sharp steel point under a spring load.

**Caulk:** A heavy putty-like material composed of resin, curing agents, and fillers used to fill pitted areas, contour uneven surfaces, and encapsulate rivets.

**Coving:** Applying caulk at the intersection of the tank floor plate and shell in concave form.

**Curing:** Chemical process of developing the intended properties of a coating or other material (e.g., resin) over a period or time.

**Dry-Film Thickness (DFT):** Depth of cured film, usually expressed in micrometers (millionths of a meter) or mils (thousandths of an inch). For FRP linings, the dry-film thickness may be expressed in millimeters.

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<sup>(2)</sup> Some definitions are extracted from *Inspection of Coatings and Linings*,<sup>3</sup> SSPC, 2003; *Industrial Maintenance Coatings Glossary*,<sup>4</sup> SSPC 94-16; and *NACE Glossary of Corrosion-Related Terms*,<sup>5</sup> NACE, 2000.

**Fiberglass-Reinforced Plastic (FRP):** Resin linings, usually polyester, vinyl ester, or epoxy, into which layers of fiberglass are incorporated to optimize the lining's structural capability and performance.

**Fillet Weld:** A weld, approximately triangular in cross-section, joining two surfaces essentially at right angles to each other in a lap, tee, or corner joint.

**Holding Primer:** A thin-film primer applied to prevent rust blooming prior to the application of the topcoat system.

**Holiday Detector, High-Voltage Type:** Also called a spark tester, an instrument for detecting holidays in a nonconductive coating applied over a conductive substrate. A spark test instrument applies a voltage to the surface with a probe that creates a spark whenever a holiday, pinhole, or other defect is found. The spark triggers an alarm or light on the instrument. The voltage used depends on the coating type and thickness.

**Laminate:** A reinforced plastic composed of layers of resin and fiberglass.

**Lower Explosive Limit (LEL):** The concentration, at ordinary ambient temperatures, of a gas or vapor in air below which an explosion will not occur if the mixture is ignited. The concentration is expressed as a percent of the gas vapor in air by volume.

**Manufacturer's Technical Data Sheet:** Sheet printed by the supplier of a product to provide instructions and information on its use.

**Materials Safety Data Sheets (MSDS):** A printed source of information about the hazards of materials, including coatings. Federal law, the Hazard Communication Standard, requires that an MSDS be published and supplied by the manufacturer of a hazardous material. The law also requires that employees have ready access to the MSDS in the workplace. The MSDS contains the following

information: (1) product identification; (2) hazardous ingredients, their permissible exposure limits (PEL), and threshold limit value (TLV); (3) physical properties; (4) fire and explosion hazard data; (5) health hazard data; (6) chemical reactivity/stability data; (7) spill and leak procedures; (8) special protection information; and (9) additional special precautions.

**Mil:** One thousandth (0.001) of an inch. 1 mil = 25 micrometers (µm). The thickness of a coating on a surface sometimes is expressed in mils and sometimes in micrometers.

**Owner:** The representative of the facility owner's organization responsible for the work; others who are probably involved include safety personnel, tank engineers, storage tank inspectors, corrosion engineers, and coating and lining specialists.

**Pitting:** Localized corrosion of a metal surface confined to a small area that takes the form of cavities. For the purposes of this standard there are two general types of pits, described by Uhlig<sup>6</sup> as "shallow" and "deep." Shallow pits have diameters greater than their depths. Deep pits have depths greater than their diameters.

**Potable Water:** Water that is fit for human consumption, mainly drinking water.

**Surface Profile:** The roughened surface that results from abrasive blast cleaning or power tool cleaning to bare metal. For steel, surface profile is a measurement of the peak-to-valley height of the roughness.

**Topcoat:** The final coat applied over the FRP laminate to seal the laminate surface and enhance water and hydrocarbon resistance. Frequently this topcoat is also referred to as *gel coat*, *seal coat*, or *flood coat*.

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### Section 3: Lining Materials

3.1 The laminating resins most frequently used for FRP tank bottom linings include:

3.1.1 Epoxy or epoxy copolymers.

3.1.2 Epoxy-novolac.

3.1.3 Polyesters such as iso, bisphenol-a, and vinyl esters.

3.2 Primers, caulking/coving materials, laminating resin, and topcoats shall be supplied by one manufacturer, unless otherwise approved by the owner.

3.3 Suitable glass reinforcement, including continuous woven roving, random fiberglass mat, or other reinforcements recommended by the lining manufacturer, shall be approved by the owner.

3.4 FRP lining systems with proven long-term effectiveness can be proposed by the manufacturer for application to storage tanks in specific services. Alternatives will be considered; however, the owner is responsible for selecting the laminating system and design to be used.

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## Section 4: Storage Tank Preparation

4.1 Prior to lining application, including surface preparation, the owner shall clean and inspect the bottom of the AST and shall have made all repairs deemed necessary in accordance with API Standard 653. In addition, the following requirements shall be carried out on surfaces to be lined:

4.1.1 Remove weld spatter.

4.1.2 Remove any sharp weld peaks that would be detrimental to the lining application or the lining performance.

4.1.3 Repair by filling with weld metal, adhesively bonding steel plates, or welding steel plates on deep corrosion pits that cannot be adequately abrasive blast cleaned.

4.2 The tank bottom shall be inspected for contaminants such as chlorides, sulfates, or other substances that may affect the integrity and performance of the lining. The owner shall determine if high-pressure water wash with potable water is required to remove water-soluble contaminants, if present.

4.3 When required by the owner, dehumidification and/or temperature control equipment shall be installed. Guidelines for the use of such equipment are contained in NACE Publication 6A192/SSPC-TR 3.<sup>7</sup>

4.4 The underside of the roof of a floating roof storage tank and equipment, such as piping located on the tank bottom, shall be cleaned so that contaminants such as rust, scale, water, or oil shall not fall onto the tank bottom during surface preparation or FRP lining application. For fixed-roof tanks, tarpaulins may be required to prevent contamination during these operations.

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## Section 5: Applicator Qualifications and Submissions

5.1 The application of the FRP lining shall be undertaken by applicators, including supervisors and workers, qualified by commercial experience installing the type of lining specified. To satisfy this experience requirement, the applicator shall be certified to SSPC-QP-1<sup>8</sup> or equivalent and shall submit to the owner a list of similar installations and a record of performance of such lining applications.

5.2 Prior to the start of the work, the following data shall be submitted by the applicator for approval by the owner or owner's representative.

5.2.1 Tank ventilation, dehumidification, or heating requirements.

5.2.2 Details concerning explosion-proof lighting.

5.2.3 Lining application termination designs for use at equipment or pipe supports, bearing plates, or other termination points.

5.2.4 Repair procedures for damaged areas and detected holidays in accordance with the lining manufacturer's instructions and procedures.

5.2.5 Reference panels as described in Paragraphs 11.2 and 11.3 prepared by the lining manufacturer.

5.2.6 Plans for quality assurance and quality control, including names and degrees of training of lining inspectors. Inspectors are required to be NACE-certified or equivalent.

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## Section 6: Surface Preparation

6.1 The tank shall be properly lighted and properly ventilated. See SSPC-Guide 12<sup>9</sup> for information regarding lighting. Any owner-related standards shall take precedence. All parts of the work shall be clearly visible.

6.2 Oil, grease, and other hydrocarbon contaminants shall be removed using techniques described in SSPC-SP 1,<sup>10</sup> including the use of solvents and emulsions, and steam cleaning.

6.3 The tank bottom surfaces to be lined, including the shell, shall be abrasive blast cleaned to SSPC-SP 5/NACE No. 1<sup>11</sup> or to SSPC-SP 10/NACE No. 2.<sup>12</sup> SSPC-SP 5/NACE No. 1 is preferred. The surface profile shall be 63 to 100 µm (2.5 to 4 mils).<sup>13</sup>

6.4 The blasting abrasives shall conform to SSPC-AB 1,<sup>14</sup> Class A, or to SSPC-AB 3.<sup>15</sup>

6.5 All blasting residue, waste, and accumulation shall be removed before coating application. Surfaces to be coated

must be final cleaned by vacuuming. Accumulated dust and debris on, for example, heating coils and equipment supports, shall be removed.

6.6 After the tank bottom has been cleaned and until lining application and cure is completed, all workers entering the tank, including inspectors and supervisors, shall wear shoe covers. No contamination of the cleaned or coated surface

is acceptable. A "clean" area immediately adjacent to the outside entrance of the tank shall be made available to satisfy this requirement.

6.7 Water shall be prevented from entering any part of the tank to be lined.

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### Section 7: Holding Primer Application

7.1 When dehumidification is used, the holding primer application may be omitted if approved by the owner.

7.2 Without dehumidification, the holding primer shall be applied to properly prepared abrasive blast-cleaned surfaces before rust blooming has occurred.

7.3 Holding primer shall be spray applied at a thickness not to exceed 25- $\mu$ m (1-mil) dry-film thickness. If the holding primer is applied to a thickness that visibly masks the anchor pattern, it shall be removed by abrasive blast

cleaning and reapplied. Alternative holding primer selection and application may be proposed for approval by the owner.

7.4 The holding primer shall be applied to the floor and the lower 60 cm (24 in.) of the tank shell.

7.5 The concentration of solvent vapor, as measured at the point of holding primer application by portable LEL instruments, shall not exceed 10% of the lower explosive limit (LEL).

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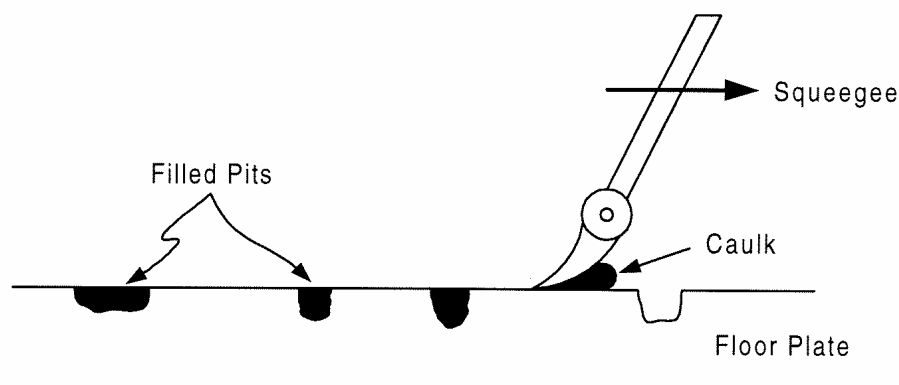
### Section 8: Caulking and Coving Application

8.1 After the holding primer is applied and prior to the FRP laminate application, the caulk and coving can be applied to the following:

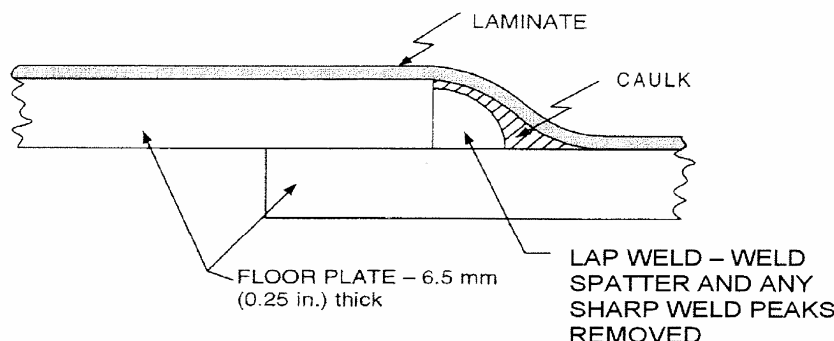
- (a) Plate lap welds.
- (b) Surface pits adequately cleaned by blast cleaning. See Figure 1 for squeegee application of caulk.

- (c) Chine or bottom angle formed by bottom sketch plate and shell plate.
- (d) Bearing (striker) plates and equipment supports.

In all applications, the caulk application shall make a smooth transition between the floor plate, equipment supports, striker plates, shell, and lap welds. See Figure 2.



**Figure 1:**  
**Squeegee Application of Caulk**

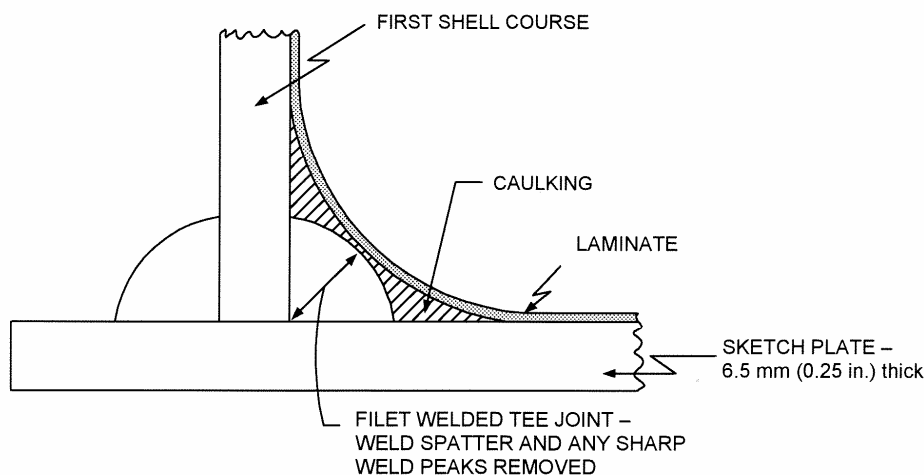


**Figure 2:**

**Schematic of Overlap at Floor Plate or Striker Plate Showing Caulking and Single Laminate Application**

8.2 At the shell-to-bottom angle, the coving shall be applied as in Figure 3. The thickness of the applied coving shall be

just sufficient to establish a smooth transition of the laminate.



**Figure 3:**

**Schematic of Caulking and Single Laminate Applied at Juncture of Sketch Plate and Shell Plate**

## Section 9: Laminate Application

9.1 Single laminate applications are most frequently used on AST bottoms; however, double laminates are applied when aggressive top-side and bottom-side corrosion is encountered. The owner shall specify the total thickness to be applied.

9.2 Tank bottom laminates are applied by either (1) hand lay-up of random fiberglass mat or (2) machine application of chopped fiberglass roving. These procedures are described in subsequent paragraphs.

9.3 The following instructions shall be followed when a single laminate lining with random fiberglass mat is applied:

9.3.1 Apply a full wet coat of resin using equipment and procedures recommended by the lining manufacturer.

9.3.2 Apply a nominal 460-g/m<sup>2</sup> (1.5-oz/ft<sup>2</sup>) fiberglass mat. A 5-cm (2-in.) overlap at all seams of the fiberglass mat is required. Use a ribbed roller to remove all entrapped air and completely wet the glass fibers. Apply additional catalyzed resin and roll to ensure that the glass is fully saturated and no entrapped air remains. Determine the wet film thickness at appropriate intervals to assure correct dry-film thickness shall be obtained. The wet film thickness of FRP laminates can be measured with the gauge shown in Figure 4.



**Figure 4:**  
**Wet-Film Thickness Gauge**

This gauge is used during the application of an FRP laminate. As shown, the support legs are tapered to a point to permit bypassing of the glass fibers, resulting in an accurate measurement. Laminate depths from 0.76 to 6.9 mm (30 to 270 mils) can be measured. Photograph reprinted with permission from Owens-Corning Fiberglass Corporation.<sup>(3)</sup>

9.3.3 Inspect the laminate after the resin has cured sufficiently to support foot traffic. Repair any defects in accordance with Paragraph 5.2.4. Using coarse abrasive paper, remove any glass fibers that protrude from the resin surface. Vacuum clean to remove sanding residues.

9.3.4 Measure the coating thickness in accordance with SSPC-PA 2<sup>16</sup> to ensure that the required dry-film thickness of 1.1 to 1.4 mm (45 to 55 mils) has been applied. Repair low dry-film thickness by applying additional resin. If the application is of a single laminate, perform high-voltage holiday inspection at this time. If holidays are detected, repair in accordance with Paragraph 5.2.4.

9.4 The following instructions shall be followed when a single laminate with chopped fiberglass roving is applied.

9.4.1 Apply catalyzed resin and chopped-glass roving simultaneously with application equipment as recommended by the lining manufacturer. Apply the roving at a nominal 460 g/m<sup>2</sup> (1.5 oz/ft<sup>2</sup>).

9.4.2 Using a ribbed roller, remove entrapped air and completely wet the glass fibers. Determine the wet film thickness at appropriate intervals to assure correct dry-film thickness shall be obtained.

9.4.3 Inspect the laminate after the resin has cured sufficiently to support foot traffic. Repair any defects in accordance with Paragraph 5.2.4. Using coarse abrasive paper, remove any glass fibers that protrude from the resin surface. Vacuum clean to remove sanding residues.

9.4.4 Measure the coating thickness in accordance with SSPC-PA 2 to ensure that the required dry-film thickness of 1.1 to 1.4 mm (45 to 55 mils) has been applied. Repair low dry-film thickness by applying

additional resin. Perform high-voltage holiday inspection at this time. If holidays are detected, repair in accordance with Paragraph 5.2.4.

9.5 The following instructions shall be followed when a double laminate with random fiberglass mat is applied:

9.5.1 Apply a coat of resin to the previously applied laminate as outlined in Paragraphs 9.3.1 and 9.3.2. Begin this procedure within 24 hours after the initial application.

9.5.2 Apply random fiberglass mat at 460 g/m<sup>2</sup> (1.5 oz/ft<sup>2</sup>) and resin in accordance with Paragraph 9.3.2. The seams of the second layer of glass mat must not overlap the seams of the first layer.

9.5.3 Inspect the laminate after the resin has cured sufficiently to support foot traffic. Repair in accordance with Paragraph 9.3.3, if required.

9.5.4 Measure the coating thickness in accordance with SSPC-PA 2. The dry-film thickness shall be 2.3 to 2.8 mm (90 to 110 mils). Repair low dry-film thickness by application of additional resin. Perform the high-voltage holiday inspection at this time. If holidays are detected, repair in accordance with Paragraph 5.2.4.

9.6 The following instructions shall be followed when a double laminate lining with chopped fiberglass roving is applied:

9.6.1 Apply catalyzed resin and chopped-glass roving to the previously applied laminate as outlined in Paragraphs 9.4.1 and 9.4.2. Apply the roving at a nominal 460 g/m<sup>2</sup> (1.5 oz/ft<sup>2</sup>).

9.6.2 Using a ribbed roller, remove entrapped air and completely wet the glass fibers. Determine the wet film thickness at appropriate intervals to assure correct dry-film thickness shall be obtained.

<sup>(3)</sup> Owens-Corning Fiberglass Corporation, One Owens-Corning Parkway, Toledo, OH 43659.

9.6.3 As an alternative to Paragraph 9.6.1 or 9.6.2, apply the double laminate thickness in a single coat application if approved by the owner. If such an application is undertaken, greater care is required in rolling out the wet laminate to remove entrapped air and wet the fiberglass.

9.6.4 Inspect the laminate after the resin has cured sufficiently to support foot traffic. Inspect and repair in accordance with Paragraph 9.4.3.

9.6.5 Measure the dry-film thickness in accordance with SSPC-PA 2. The dry-film thickness shall be 2.3 to 2.8 mm (90 to 110 mils). Repair low dry-film thickness by applying additional resin. Perform high-voltage holiday inspection at this time. If holidays are detected, repair in accordance with Paragraph 5.2.4.

9.7 The following instructions shall be followed when applying the topcoat:

9.7.1 Apply the topcoat over the single or double laminate lining in one or two coats depending on manufacturer's instructions. The topcoat shall have a dry-film thickness of 250 to 375  $\mu\text{m}$  (10 to 15 mils). Determine wet-film thickness at appropriate intervals to assure the correct dry-film thickness shall be obtained.

9.7.2 After the topcoat has cured, a single laminate FRP system shall measure approximately 1.5 mm (60 mils) thick and a double laminate system shall measure approximately 3.0 mm (120 mils) thick.

9.7.3 After 24 hours' cure, inspect for hardness. Barcol hardness values shall meet or exceed manufacturer's recommendations for that curing time.

9.7.4 Allow the FRP laminate system to cure in accordance with the lining manufacturer's instructions before returning to service. At this time, the lining hardness shall meet or exceed the hardness as demonstrated by the reference panels.

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## Section 10: Roof Leg Bearing (Striker) Plates

10.1 For new tanks, the laminate system shall be applied at the perimeter of the roof leg or striker bearing plate by procedures that maintain the leak-proof integrity of the bottom lining at that juncture. (See Paragraph 5.2.3.)

10.2 For existing tanks, the owner shall inspect the bearing plate for pitting, dimpling, or cutting. When required by the owner, a new bearing plate shaped to match the existing

bearing plate shall be welded into place using a continuous fillet weld.

10.3 The laminate system shall be applied at the perimeter of the repaired roof leg bearing plate by procedures that maintain the leak-proof integrity of the tank bottom lining at that juncture. (See Paragraph 5.2.3.)

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## Section 11: FRP Lining Inspection, Testing, and Repair

11.1 The term "inspector" as used in Section 11 refers to the owner's representative. The inspector shall be NACE certified or meet equivalent criteria.

11.2 Reference panels of the FRP lining shall be prepared and furnished to the purchaser prior to execution of any work. Two 15-cm x 15-cm (6-in. x 6-in.) samples are required as follows:

- (a) The first shall show the FRP lining stepwise from primer, laminate(s), and topcoat.
- (b) The second shall show the complete FRP lining.

11.3 Reference panels shall be used by the inspector as a standard for appearance, final hardness and cure, thickness, and holiday verification evaluations.

11.4 Compliance with this standard shall be evaluated by the inspector; these evaluations may include but not be limited to examination of the items listed in Table 1. Reference documents and standards are also listed.

11.5 Evaluation by the inspector shall not relieve the lining applicator's inspector of making all necessary inspections and ensuring that all work meets the required specifications.

11.6 Defects found by the inspector when comparing the applied lining to the reference panel, such as voids, cracks, wrinkles, air bubbles (3.00-mm [0.125-in.] diameter or larger), dry laminate, or others, shall be repaired by the agreed-on procedure of Paragraph 5.2.4. The repair shall then be re-inspected and approved by the inspector. A high-voltage holiday test of the repaired area may be required by the inspector.

**Table 1:  
Items Evaluated by Inspector**

| Evaluation Item                                                                           | Reference Documents and Standards                                          |
|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Material Inspection and Storage                                                           | SSPC-PA 1 <sup>17</sup>                                                    |
| Air Contamination                                                                         | ASTM <sup>(4)</sup> D 4285 <sup>18</sup>                                   |
| Surface Cleaning                                                                          | SSPC-SP 5/NACE No. 1 or SSPC-SP 10/NACE No. 2 and SSPC-VIS 1 <sup>19</sup> |
| Surface Profile                                                                           | NACE Standard RP0287                                                       |
| Dry-Film Thickness                                                                        | SSPC-PA 2                                                                  |
| Application Equipment                                                                     | Lining manufacturer's specification                                        |
| Application                                                                               | Lining manufacturer's specification and SSPC-PA 1                          |
| Recoat Intervals                                                                          | Lining manufacturer's specification                                        |
| Visual Inspection                                                                         | Reference standard                                                         |
| Hardness                                                                                  | Barcol hardness (ASTM D 2583 <sup>20</sup> )                               |
| Holiday Test                                                                              | NACE Standard RP0188 <sup>21</sup>                                         |
| Environment (relative humidity; dewpoint; air and tank metal temperature within the tank) | Lining manufacturer's specification and SSPC-PA 1                          |

## References

1. API Standard 653 (latest revision), "Tank Inspection, Repair, Alteration, and Reconstruction" (Washington, DC: API).
2. NACE Coating Inspector's Logbook, 3<sup>rd</sup> ed. (Houston, TX: NACE, 1996).
3. The Inspection of Coatings and Linings (Pittsburgh, PA: SSPC, 2003).
4. Protective Coatings Glossary, SSPC 00-07, 2000.
5. "NACE Glossary of Corrosion-Related Terms," NACE, 2000.
6. H.H. Uhlig, Corrosion and Corrosion Control (New York, NY: John Wiley and Sons, 1963).
7. SSPC Publication SSPC-TR 3/NACE 6A192 (latest revision), "Dehumidification and Temperature Control During Surface Preparation, Application, and Curing for Coatings/Linings of Steel Tanks, Vessels, and Other Enclosed Spaces" (Pittsburgh, PA: SSPC and Houston, TX: NACE).
8. SSPC-QP-1 (latest revision), "Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Industrial Structures)" (Pittsburgh, PA: SSPC).
9. SSPC-Guide 12 (latest revision), "Guide for Illumination of Industrial Painting Projects" (Pittsburgh, PA: SSPC).
10. SSPC-SP 1 (latest revision), "Solvent Cleaning" (Pittsburgh, PA: SSPC).
11. SSPC-SP 5/NACE No. 1 (latest revision), "White Metal Blast Cleaning" (Pittsburgh, PA: SSPC and Houston, TX: NACE).
12. SSPC-SP 10/NACE No. 2 (latest revision), "Near-White Blast Cleaning" (Pittsburgh, PA: SSPC and Houston, TX: NACE).
13. NACE Standard RP0287 (latest revision), "Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape" (Houston, TX: NACE).
14. SSPC-AB 1 (latest revision), "Mineral and Slag Abrasives" (Pittsburgh, PA: SSPC).
15. SSPC-AB 3 (latest revision), "Ferrous Metallic Abrasive" (Pittsburgh, PA: SSPC).
16. SSPC-PA 2 (latest revision), "Measurement of Dry Coating Thickness with Magnetic Gages" (Pittsburgh, PA: SSPC).

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18. ASTM D 4285 (latest revision), "Standard Test Method for Indicating Oil or Water in Compressed Air" (West Conshohocken, PA: ASTM).

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21. NACE Standard RP0188 (latest revision), "Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates" (Houston, TX: NACE).

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<sup>(5)</sup> Society of the Plastics Industry Inc. (SPI), 1801 K. St. NW, Suite 600K, Washington, DC: 20006-1301.

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**Appendix A:**  
**Documents and Standards to Be Used in Conjunction with this Standard**

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**NACE International**

|        |                                                                                                    |
|--------|----------------------------------------------------------------------------------------------------|
| RP0287 | Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape |
| RP0188 | Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates                |

**Society of Protective Coatings (SSPC)**

|               |                                                                                                  |
|---------------|--------------------------------------------------------------------------------------------------|
| SSPC-AB 1     | Mineral and Slag Abrasives                                                                       |
| SSPC-AB 3     | Ferrous Metallic Abrasive                                                                        |
| SSPC-PA 1     | Shop, Field and Maintenance Painting                                                             |
| SSPC-PA 2     | Measurement of Dry-Coating Thickness with Magnetic Gages                                         |
| SSPC-VIS 1    | Visual Standard for Abrasive Blast Cleaned Steel                                                 |
| SSPC-Guide 12 | Guide for Illumination of Industrial Painting Projects                                           |
| SSPC-SP 1     | Solvent Cleaning                                                                                 |
| SSPC-QP 1     | Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Structures) |

**NACE/SSPC Joint Documents**

|                       |                           |
|-----------------------|---------------------------|
| SSPC-SP 5/NACE No. 1  | White Blast Cleaning      |
| SSPC-SP 10/NACE No. 2 | Near-White Blast Cleaning |

**American Society for Testing and Materials (ASTM)**

|             |                                                                                       |
|-------------|---------------------------------------------------------------------------------------|
| ASTM D 2583 | Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor |
| ASTM D 4285 | Standard Test Method for Indicating Oil or Water in Compressed Air                    |

**American Petroleum Institute (API)**

|                  |                                                        |
|------------------|--------------------------------------------------------|
| API Standard 653 | Tank Inspection, Repair, Alteration and Reconstruction |
|------------------|--------------------------------------------------------|

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