

Bonding Procedure Specification

BPS 10000-PVC Fabric

Rev. No.: 0

Date: 02/13/06

Applicability

Gluing PVC-Fabric

SC/SS PVC Architectural Fabric

Scope:

This procedure is for gluing seams, patches and surface repairs of Safety Class/Safety Significant PVC coated architectural fabrics (such as Domes at TA-54). Typical joint configurations are lap seam to join two sheets or a patch which laps over the top of a rip or tear. Patches may be applied to one or both sides of the base fabric as determined by responsible facility operations personnel.

The gluing process uses solvent/chemicals to melt the PVC fabric coating from two faying surfaces which are then rolled together to bond the two surfaces.

The step by step process is detailed below:

1. Fabric Materials –

- a. Materials must be procured, stored and used in a manner such that traceability of manufacture and product type or grade is maintained to the point of use:
 - i. Materials shall be procured with product ID or label attached which identifies the product item number, style, color, grain, grade, width, finish, run number, date, inspector, from roll number, and the tag number which incorporates the plant location, run number, and the inspection number.
 - ii. Certified Material Test Reports or Certificates of Compliance shall record test results as specified in ASTM D-751 Standard Test Methods for Coated Fabrics for:
 1. Breaking Strength,
 2. Adhesion of Coating to Fabric,
 3. Adhesion of Welded Joints Test – (Peel Test),
 4. Seam Strength Test – (Shear Tensile Test),
 5. Tear Strength Test using the Tongue Tear Method.
 - iii. Receipt Inspection shall verify that Certified Material Test Reports or Certificates of Compliance against the original purchase order requirements and manufactures specified requirements.
 - iv. Fabric material shall be stored in a clean, dry, enclosed, and controlled area. Minimum temperature shall be $\approx 40^{\circ}\text{F}$ (5°C) with a maximum temperature of $\approx 140^{\circ}\text{F}$. Materials shall not be in direct contact with concrete floors and shall be stored on pallets or bins segregated by fabric material type and size.
 - v. Fabrics shall be stacked separately and segregated by manufacturer and product type.
 - vi. Wherever possible, different lot numbers or control numbers of a single type of fabric material shall be grouped within the stack or kept on separate shelves.
- b. Materials joined to existing materials will be from the same manufacture and the same product where possible.

Note: When fabric of the same manufacture and type are not available, use material recommended by manufacture
- c. When the seam or patch attaches two materials of different types the new material should be of the heavier or stronger material.

2. Tedlar® Film – Pressure sensitive Tedlar® film may be applied over the repaired surface to restore the weathering, mechanical, electrical, chemical, and stain-resistant properties of original Tedlar® coated fabric.

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- a. Materials must be procured, stored and used in a manner such that traceability of manufacture and product type or grade is maintained to the point of use:
 - i. Materials shall be procured with product ID or label attached which identifies the product item number, style, color.
3. Glue & Solvent –
 - a. Glue – Shelter-Rite repair cement as manufactured by Seaman Corporation.
 - b. Coating Sealer - Shelter-Rite coating sealer as manufactured by Seaman Corporation.
 - c. Solvent – Methyl Ethyl Ketone (MEK)
4. Personnel Qualification – personnel who glue PVC fabrics shall be trained and qualified as outlined in the PVC Bonding Performance Qualification Procedure.
5. Process/Workmanship Samples – samples shall be made at the start of each shift or when ever a change in materials or joint configuration is made (patches vs replacement panel seams).
 - a. Process/Workmanship samples (typically $\approx 4'' \times 12''$ patch glued in the center of an $\approx 8'' \times 16''$ fabric) will be made in-line with the fabric threads and will be cut and removed to $\approx 1'' \times 8''$ size with one end left loose.
 - b. *Note: The purpose of the workmanship samples is to provide QC (process control) function to verify that adequate bond can be made using current materials and conditions, since there is no acceptable consensus method to nondestructively test actual bond which will be performed in place (in situ).*
 - i. Each sample will be pulled apart to visually verify that the bond between two pieces of coated fabric is as strong as the bond of coating to fabric.
 - ii. In addition at least 66% of the faying surface area will be bonded and in no case shall the un-bonded area traverse across the entire faying surfaces.
6. Surface Preparation –
 - a. Prior to bonding the surfaces to be joined shall be cleaned to remove loose dirt, or deleterious materials that could adversely affect the glue area.
 - i. Using Formula 409®, Mr Clean, Fantastik®, Spray Nine, All-Purpose Cleaner or Zep
 1. Mix cleaning solution $\approx 1:1$ with water
 2. Apply with sponge, cloth, or spray directly onto vinyl.
 3. Allow to penetrate briefly.
 4. Rinse or wipe off with damp cloth, or use medium pressure spray gun.

Note: Make sure to wipe off all cleaner and residue repeat the above procedure as necessary. A mild bleach solution diluted $\approx 1:100$ with water may be used when fungus is present followed by thorough rinsing to ensure bleach and residue has been removed.
 - b. Surface should be wiped clean with clean dry rag.
 - c. Backing for the joint must be put in place. (typically this will be a rigid support such as piece of plywood or masonite)
 - d. Tedlar® Coating (film) if used on the manufactured fabric shall also be removed from the surface to be bonded.
 - i. Preferred method to remove Tedlar® is lightly sand the surface using a 180 Grit abrasive disk (flapper) or drum.
 - ii. Additionally the Tedlar® may be removed by lightly scoring the film then peeling it from the PVC coating.

Note: Using either method; care must be exercised to remove only the Tedlar® and preclude removing any PVC coating from the fabric.

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7. Joint Assembly and Alignment –

- a. New Seams
 - i. The seam must be fit and aligned such that there is a minimum of 1“ overlap and preferably 1.5” to 2” overlap at the seam.
 - ii. Once fit-up it can be tacked (fused in small areas) with several tacks to hold the fabric in place.
- b. Rips & Patches
 - i. For rips and tears it may be necessary to staple or sew the components to hold the fit-up and alignment while tacking the patch material in place.
 - ii. Staples and thread should be removed where possible.
 - iii. Patches may be attached on one or both sides of the existing base fabric.

Note: Patch both sides when practical however it may not be possible to patch both sides due to access or other constraints.

- iv. Patches should be cut such that there is ≈2” of over lap on to the existing sound base fabric in all directions.
- v. Patches should be trimmed with rounded corners.

8. Gluing Technique – Repair Patches and Seams

- a. Wash the surface of panel and patch material to be boned with MEK.
- b. Dry thoroughly*.
- c. Brush one coat of Shelter-Rite cement on panel and on the patch, and allow to dry thoroughly*.
- d. Apply a second coat of cement to the panel and patch, allow to dry until tacky.
- e. Assemble the patch to the panel and roll in a sequenced pattern to bond the two coated surfaces.

Note: Sequence and pattern will vary with different applications:

A typical sequence would be to start from the middle of the patch and proceed from the center out, using a roller diagonally to fuse the material moving forward to the edges.

- f. The work area for the gluing shall be suitability protected from inclement conditions including wind and/or rain.
- g. It is recommended to avoid extremely cold or extremely hot and humid conditions.*

9. Surface Repair/Sealing - Areas with damaged or missing coating can be repaired or reconditioned by following these steps:

- a. Wash the surface of panel and patch material with MEK.
- b. Dry thoroughly*.
- c. Brush one coat of Shelter-Rite cement on panel and on the patch, and allow to dry thoroughly*.
- d. Apply as many coats as necessary of Shelter-Rite Coating Sealer (clear or colored to match fabric), allowing sufficient time to dry between coats – approximately 15 minutes.

Notes:

1. *A repaired area should be allowed to dry thoroughly before being put into service*
2. *Several thin coats applied with a brush are better than one heavy coat.*
3. *We recommend that cement and sealer be purchased in quart cans so that it does not thicken up too much from exposure to air (unless you have a job that will require a gallon at one time).*
4. *A quart should treat 15 – 30 square feet of area.*

10. Visual Inspection –

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- a. Inspect the glued seam or patch for:
 - i. Loose edges, threads, etc.
 - ii. Overlaps or creases that would allow liquids to penetrate the joint,
 - iii. Peeling due to the surface being so heavily oxidized that it would not bond.
11. Tedlar® Film Replacement – Pressure sensitive Tedlar® film may be applied over the repaired surface to restore the weathering, mechanical, electrical, chemical, and stain-resistant properties of original Tedlar® coated fabric.

**Special Note: Under conditions of high humidity, proper technique is essential in securing the bond strength desired. The presence of surface moisture can destroy the effectiveness of the cement bond. The evaporation of solvent, which may reduce surface temperature below the dew point, can result in condensation of water vapor on the surface of the adhesive. Sometimes it is visible as a milky white appearance of the surface. The use of a solvent to clean the surface prior to cementing can also reduce temperatures below the dew point. It is necessary that the applied cement or sealer be allowed to remain long enough for the solvent to evaporate and the surface to come back to room temperature before the second coat is applied, otherwise no adhesion will result due to a water barrier.*

APPROVAL: Signatures on file at ENG

DATE: 02/13/2006