



Roof Section Repair Procedure for Box Truck and Semi-Trailer

Technical Bulletin

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Background: When a box truck or semi-trailer runs into an overhead obstruction or is “topped”, only a small portion of the roof (aluminum or translucent fiberglass reinforced plastic (FRP)) may be damaged or impacted. Traditional repair methods involve the removal and replacement of the full roof panel; taking days to complete and requiring a full-length sheet of aluminum or FRP to be purchased. In most situations, only a small portion of the roof (e.g., 3’-10”) is damaged and in need of replacement.

Repair of small hole or puncture damage to the translucent fiberglass reinforced plastic (FRP) roofs of box trucks can be an involved process requiring sanding, handling of messy liquid adhesives with clamp or hold times while the adhesive cures. The process might also require full replacement of the panel, taking the truck out of service for several days.

In collaboration with leading truck leasing companies, 3M has been bringing repair solutions to the box truck and semi-trailer industry that can reduce downtime without compromise to the quality of the repair. This takes innovation, creativity, and a willingness to try a new or different approach. Yesterday’s repair methods will not meet today’s needs.

Solution: This bulletin outlines a suggested partial roof repair procedure utilizing 3M™ VHB™ Tape (VHB Tape) and 3M™ Extreme Sealing Tape (3M EST). 3M assisted in the development of this partial roof repair system, understanding the need for a durable, long-lasting repair that can be completed easily and quickly with minimal skill and labor. The VHB Tape is used to bond the existing panel (FRP or aluminum) to the new panel and creates a secondary weather seal and the 3M EST is used to cover the roof panel overlap seam providing a primary weather seal.

This solution allows replacement of only the damaged portion of the roof or up to 50% of the length of the box or semi-trailer (truck/trailer) length. Two-part liquid adhesive systems were evaluated; however, this method requires the FRP material to be abraded and the seam to be “weighted” until the adhesive is fully cured. This is a slow and more variable process which can create fiberglass dust (a respiratory and skin irritant) and cause contamination of the workspace.

The use of the VHB Tape and EST system eliminates the need to grind FRP surfaces, eliminates liquid adhesive cure time, and can therefore reduce cycle allowing the truck/trailer to be returned to the rental fleet faster to generate revenue. In addition, operators tend to appreciate the simplicity of the overall repair process, especially the elimination of the FRP grinding step.

Replacing only the damaged portion of aluminum and FRP roofs is a quick and repeatable process utilizing fewer roofing raw materials, making it a more cost-effective and sustainable solution.

Roof Repair Procedure:

The following is a high-level overview of the lateral or partial roof repair procedure. *Always follow the specific procedures as defined by the manufacturer of the box truck or trailer, fleet operator and/or supplier of the translucent fiberglass reinforced plastic (FRP) or aluminum roof materials.*

- 1. Roof Removal:** Cut the damaged roof section adjacent to the roof bow with undamaged roof materials. Follow the cutting instructions provided by the truck/trailer manufacturer, roof material supplier or fleet operator. Remove the damaged roof section.

3M Technical Bulletin
Roof Section Repair Procedure for Box Truck and Semi-Trailer

- 2. Identify Overlap Distance:** Mark the existing roof material laterally at 3-4" from edge. Draw a line across the roof with a permanent marker. This line will serve as a guide for the surface preparation and VHB Tape application steps.



- 3. Surface Preparation for VHB Tape:** Clean both the existing and the new roof panel bond areas with isopropyl alcohol and water (50-70% IPA) on a clean wetted disposable paper towel.



Then prime the surfaces with the application of 3M™Tape Primer 94 (P94) with a foam brush or dauber bottle.



3M Technical Bulletin
Roof Section Repair Procedure for Box Truck and Semi-Trailer

- 4. Apply VHB Tape:** Apply 4" wide VHB 5962 Tape to the top of the existing panel (front damage) or top of the replacement panel (rear damage) starting on one side and moving laterally across the roof. Follow the marker guide lines and apply the VHB Tape without creasing the tape or entrapping air. Remove air bubbles by slitting through the VHB Tape lengthwise with a sharp utility knife and squeeze out the air. Apply pressure (>15 psi) to the tape with a Gundlach V300 laminate roller starting in the middle and working to the outside (at least 2 passes each way.)



- 5. Panel Dry Fit and Installation:** Dry fit the new roof section, adjust as needed. (*Do not remove the red protective tape liner during this step.*) Clamp panel in place on both sides about 18" from the overlap seam. While holding up new roof section, remove the remaining VHB Tape liner and allow the new roof section to contact the existing roof at the center.



Use laminate roller to apply firm pressure to the bonded components (>15 psi) starting in the middle and working towards the outside on both sides (2 passes minimum).



3M Technical Bulletin
Roof Section Repair Procedure for Box Truck and Semi-Trailer

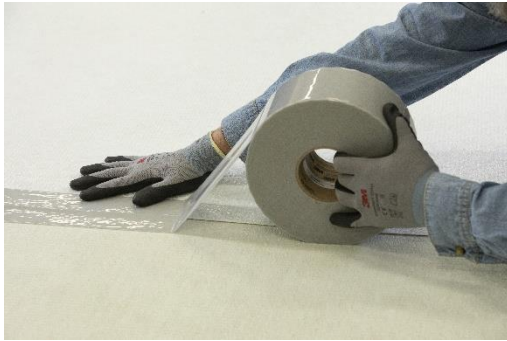
- 6. Surface Preparation for 3M EST:** Clean the roof panel 2-3" in each direction from the newly formed seam with 50-70% IPA on a clean wetted disposable paper towel.



Then prime the surface with the application of 3M Primer 94 (P94) with a dauber bottle (preferably) or a brush.



- 7. Apply 3M EST to Roof Seam:** Apply a 3-4" width of 3M Extreme Sealing Tape 4411G (3M EST) starting at one side and moving laterally across the roof seam. Ensure a minimum of 1-1/2" coverage on both sides of the seam. Use a gloved hand or plastic spreader to make contact to the roof surface (do not "pat" tape). Remove film liner and use a plastic spreader to force 3M EST into the seam.



Apply pressure to the bonded components (>15 psi) starting in the middle, working towards the outside on both sides (2 passes minimum).



3M Technical Bulletin
Roof Section Repair Procedure for Box Truck and Semi-Trailer

- 8. Adhesive/Sealant:** Apply adhesive/sealant at the intersection of the tape to the top horizontal rails and between the top trim and the roof panel in accordance with the manufactures' specification.
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Materials: The following materials and tools are used to complete the lateral roof repair on an FRP or aluminum panel roof system. There are 3rd party suppliers who combine items 1-3 in a convenient kit used to complete a single roof repair.

- 1. 3M™ VHB™ 5962 Tape:** 3M™ VHB™ 5962 Tape (VHB 5962 or VHB Tape) is a 0.062” thick, very conformable tape with a modified acrylic adhesive, providing excellent adhesion to medium to high surface energy substrates. VHB 5962 (3-4” wide by width of truck/trailer) is used to bond the existing panel (FRP or aluminum) to the new panel and creates a secondary weather seal.

VHB Tapes are fully cured, double-sided acrylic adhesive tapes that both bond and seal. They are unique viscoelastic materials with energy absorption and stress-relaxation properties. These tapes are designed to replace, weld, mechanical fasteners, and liquid adhesives. Since 1980, VHB Tapes have been used for sidewall panel and roof attachment on commercial vehicles such as trailers, truck bodies, ambulances, fire trucks, buses, and rail cars.

- 2. 3M™ Extreme Sealing Tape 4411G:** 3M™ Extreme Sealing Tape 4411G (EST 4411G or EST. 3- 4” wide by width of truck/trailer) is used to cover the roof panel overlap seam providing a primary weather seal. 3M EST consists of a flexible ionomer backing that easily conforms over joints screw heads, rivets, and other protrusions to provide immediate protection from water. The thick acrylic adhesive (0.036”) provides excellent sealing properties and UV durability.
- 3. 3M™ Tape Primer 94:** A primer that greatly enhances bond performance, helping to accelerate the bond build rate of the VHB 5962 tape (less than 5 minutes to ultimate strength depending on conditions) and allows application of the VHB Tape at lower temperatures (potentially down to 45°F)
- 4. V-300 Laminate Roller from Beno J. Gundlach, Co.:** VHB Tape and EST 4411G are pressure-sensitive adhesives (PSA) which require pressure (>15 psi) to facilitate wet-out of the adhesive onto the first substrate and to the bonded components.
- 5. Disposable Brush or Dauber Bottle:** A disposable brush or Designetics® dauber bottle with felt applicator tip is used to apply a thin layer of P94 to the aluminum or FRP roof panel. 3M suggests utilizing dauber bottles from Designetics®.

Safety and Handling: Use proper personal protective equipment as recommended by your on-site safety plan. Consult the SDS for each component to determine the appropriate levels of protection. It is suggested that you consult your local air quality regulations to be sure the cleaner is compliant. When using solvents be sure to follow the manufacturer’s precautions and directions for use when handling such materials.

Environment: The workplace should be free from excessive dust, dirt, and other airborne contaminants. Dust, dirt, oils, etc., that may interfere with the ability of the VHB Tape and 3M EST from forming a good bond to the surface. The workplace must be at a minimum temperature of **50°F** or above and free from sources of wide temperature variations such as open loading doors. All materials (tape, primer, FRP and aluminum panels, etc.) must be at or above the suggested minimum application temperature of **50°F**. Materials stored outdoors must be brought indoors and conditioned for a minimum of 12 hours or until it is verified that the substrates are at or above the minimum temperature requirement. Once the repair is made, the unit should be allowed to dwell for a minimum of 1 hour at **50°F** before being placed into service.

3M Technical Bulletin

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