

**SECTION 07-54-23
TRITON PROTAN PVC MEMBRANE
RHINOBOND INDUCTION WELDED SYSTEM**

This specification works as a guideline and may be modified, as necessary, by the “Designer of Record” to fulfill the needs of the individual project. Any changes or improvements to the content of this specification should be made only with the written consent of the “Designer of Record.”

PART ONE - GENERAL

1.1 Description

- A. Furnish and install a weather and watertight PVC sheet roofing membrane, induction welded directly to 3-inch diameter polymer coated plates, complete, in place, as shown on the drawings, specified herein, or needed for a complete and proper watertight and warrantable installation.

1.2 Quality Assurance

- A. Standards: Comply with standards specified in this section and as listed in the General Requirements.
- B. Qualifications of Manufacturer: Products used in the work included in this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Owner.
- C. Qualifications of Contractor: The Contractor and his personnel shall be currently approved by the manufacturer of the approved products as qualified to install the materials of this section.
- D. Qualifications of Installers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this section.
- E. Roofing Inspections: Make all required notifications and secure all required inspections by the manufacturer of the approved materials to facilitate issuance of the specified roof warranty.
- F. Building Code: Applicable code/insurance requirements to be identified by the Owner or Owner's representative.

1.3 References

- A. Materials used in this section shall be listed in the latest edition of the following:
 - i. Factory Mutual System Approval Guide – Equipment, Materials, Services for Conservation of Property.

1.4 Submittals

- A. Prior to the time of bidding, the contractor shall submit to the owner or owner's representative the following items:

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- i. Complete material list of all items proposed to be furnished and installed under this section, along with product data (TDS) and SDS sheets for each.
- ii. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.
- iii. Dimensioned shop drawings to include an outline of the roof and appropriate details for flashings and terminations.
- iv. Certification from insulation, roofing and accessory components manufacturers that all materials supplied comply with identified ASTM and industry standards.
- v. Verification that system specifications meet all identified code and insurance requirements including but not limited to the following, if required:
 - a. Factory Mutual Research Laboratories (FM)
Northwood, MA
 - b. ASCE 7 – Minimum Wind Design Requirements

Note: It is the building owner/owner's representative's responsibility to determine what submittals are required for the project.

1.4 Product Handling

- A. Delivery and Storage:
 - i. Deliver all packaged materials to the job site in their original, unopened containers with all labels intact and legible at the time of the inspection.
 - ii. Store all materials in an approved manner, up off the roof deck or ground, and protected from exposure to the elements.
 - iii. Protect materials during handling and application to prevent damage or contamination.
 - iv. Safety Data Sheets (SDS) shall be available at the job site at all times
- B. FM Listing: Provide roofing system and roof covering material which has been evaluated by Factory Mutual System for fire spread, wind uplift and hail damage, and bearing FM Class I approval markings and subject to FM's follow-up inspection.
- C. Protection: Use all necessary means to protect the materials in this section before, during, and after installation, and to protect the work and materials of all other trades.
- D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of and at no additional cost to the Owner.



1.5 Scheduling

- A. Work is to be performed on a daily basis, with each section completed and weathertight before progressing to the next day's work. All seams must be heat welded before leaving the job site the day the sheets are installed.
- B. Completion of work shall be defined as the installation of all specified roof preparation, insulation, field membrane, flashings, counterflashing, sheet metal, fasteners, and caulking.
- C. Temporary overnight tie-ins may be installed at the end of each day's work and must be completely remove (including any contaminated materials) before proceeding with the next day's work.
- D. The Installer is cautioned that certain Triton Protan PVC membranes are incompatible with asphalt, coal tar, heavy oils, roofing cements, creosote, and some preservative materials. These materials must not remain in contact with Protan PVC membranes.
- E. Where applicable, the Installer will arrange for pullout tests in accordance with the latest versions of the SPRI/ANSI Standard Field Test Procedures FX-1 and IA-1 for fasteners and adhesives, respectively, to verify condition of the deck/substrate and confirm expected pullout values.

1.6 Warranty

- A. As part of the work of this section, pay all required fees, secure all required inspections, and complete all items necessary to secure and deliver to the Owner a Manufacturer's Warranty of 20 or 25 years, as requested.

PART TWO - PRODUCTS

2.1 General

- A. Components of the RhinoBond-attached Triton Protan SE PVC Membrane Roof System are to be products manufactured or supplied by Triton, Inc.
- B. Components other than those supplied or manufactured by Triton, Inc. may be submitted for review and acceptance by Triton. Triton's acceptance of any other product is based on chemical compatibility and published performance data provided by the component manufacturer. Other components may be considered on a job-by-job basis and must be approved in writing by Triton. Triton offers no warranty or guarantee for the performance or suitability of any component not manufactured or approved by Triton.

2.2 Products Supplied by Manufacturer

- A. Roofing Membrane

Triton Protan Slip-Resistant* SE PVC Roof Membrane is a high quality, polyester reinforced thermoplastic polyvinyl chloride waterproofing membrane. In addition to high tensile and tear strength, Protan SE PVC is UV-resistant, FM-Approved, self-extinguishing, and extremely resistant to high and low temperatures. The single-ply membrane has a unique surface that drastically increases wet and dry friction, resulting in increased roof-top slip-resistance* and enhanced safety after installation.

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PHYSICAL PROPERTIES	TEST METHOD	TYPICAL VALUE
Colors	-	White, Light Gray, or Dark Gray available
Membrane Thickness	ASTM D-751	72 mils (1.8 mm)
Tensile Strength	ASTM D-751	247 lbf (1100 N)
Elongation	ASTM D-751	> 250%
Tear Strength (Trapezoidal)	ASTM D-1004	47 lbf (210 N)
Dimensional Stability	ASTM D-1204	-0.1%
Low Temp Bend	ASTM D-2136	Pass @ -40°C
Water Absorption	ASTM D-570	< 2.8%
Resistance to Static Load	ASTM D-5602	44 lbf (20 Kg)
Impact Resistance	EN 1269(A)	800 mm
Seam Strength	EN 12316	34 lbf (150 N)
Lap Joint Strength	ASTM D-751	106% of original
UV exposure 5,000 hrs.	ASTM G-154	Excellent, no cracking or crazing
Heat Aging	ASTM D-3045	Pass
Fire Resistance	FM 4470	Class A
Hail Resistance	FM 4470	Severe Hail (SH)
Wet Dynamic Coefficient of Friction (New)	ISO 8295	0.8
Wet Dynamic Coefficient of Friction (Aged)	ISO 8295	0.9

B. Flashing Membrane

- i. Triton Protan G, fiberglass reinforced PVC membrane.
- ii. Triton Protan SE, polyester reinforced PVC membrane. Used as a formable flashing for field fabricated details.

C. Prefabricated Membrane Details

- i. Inside/Outside Corners – supplied by Triton Inc. in various sizes
- ii. T-Patches – supplied by Triton Inc.
- iii. Round Split-Pipe Boots – supplied by Triton Inc.
- iv. Square Split Boots – supplied by Triton Inc.
- v. Universal Conical Boots – supplied by Triton Inc.



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- vi. Single Skirt Through-Wall Scupper – supplied by Triton Inc.
- vii. Sealant Pockets – supplied by Triton Inc.
- D. Bonding Adhesive
 - i. TritoBond SB, solvent-based bonding adhesive for field and flashings. Supplied in 5-gallon buckets and applied with a roller, or approved spray equipment, per specifications.
- E. Membrane Coated Sheetmetal
 - i. PVC Coated Metal, manufactured by FlashCo.
 - ii. Contact Triton Inc. for other approved suppliers of PVC-coated metal.
- F. Walkpads
 - i. CrossGrip, loose-laid PVC walkway mat that allows water passage underneath. Rated for wind gusts up to 90 mph.
- G. System Fasteners – Wood/Steel
 - i. Corrosion-resistant, self-tapping, self-drilling screw with low profile head.
 - ii. Corrosion-resistant, factory-made plate.
 - iii. Screw and plate type fastener to be Factory Mutual approved.
 - iv. Approved Products
 - a. #14 Heavy Duty OMG Insulation Fasteners – supplied by OMG Roofing Products, used to fasten insulation to steel or wood roof decks. Not to be used to fasten RhinoBond plates. Use with 3” OMG insulation plates.
 - b. 3” RhinoBond® Plates – supplied by OMG Roofing Products, used to attach insulation and membrane to substrate. 3” diameter, specially coated Galvalume, with recessed center and a raised, flat bonding surface. Meets FM 4470 criteria for corrosion resistance.
 - c. #15 Extra Heavy Duty OMG Membrane Fasteners – supplied by OMG Roofing Products, used to fasten insulation and membrane to steel and wood decks. Used to secure RhinoBond plates.
 - d. 2” Metal Membrane Seam Plates – supplied by OMG Roofing Products, used with either #14 or #15 HD fasteners to attach Triton Protan PVC. Do *not* use 2” metal seam plates to fasten insulation.



2.3 Other Materials

All other materials not specifically described but required for a complete and proper installation of the work in this section, shall be as selected by the Contractor, approved by the manufacturer, and subject to the approval of the Owner.

A. Insulation

- i. Polyisocyanurate, manufacturer to be approved by Triton prior to bidding.
- ii. Expanded Polystyrene (EPS), manufacturer to be approved by Triton prior to bidding.
- iii. Extruded Polystyrene (XPS), manufacturer to be approved by Triton prior to bidding.

B. Cover Board

- i. DensDeck® Prime, gypsum roof board with fiberglass facer, by Georgia-Pacific
- ii. Everboard, 100% recycled roof board, by Continuus Materials

C. Membrane Cleaner

- i. Acetone for cleaning soiled membrane prior to welding.

D. All Purpose Sealant

- i. One-Part Urethane Sealant used to seal termination bar, sheet metal, banding clamps, etc.
- ii. ChemLink M-1 or other approved sealant.

E. Pourable Sealer

- i. One-Part Pourable Sealer used to fill sealant pockets.
- ii. ChemLink 1-Part or other approved sealer.

F. Water Cut-Off

- i. One-part, low viscosity, self-wetting, butyl-blend mastic for sealing membranes to wood, concrete, metal, plastic and other substrates. Used in a compression seal mastic at roof drains and membrane terminations. Contact Triton Inc. for approved suppliers.
- ii. Lucas #8600 Edge-Seal manufactured by RM Lucas

G. RhinoBond Induction Welder

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- i. 110V induction welding device that creates a radio frequency that allows the membrane to be welded to a specially coated plate.

PART THREE - EXECUTION

3.1 Description

- A. The latest manufacturer application techniques are to be followed along with the following requirements. These specific minimum requirements must be included in the bid and are not to be altered.

3.2 Inspection

- A. Examine the areas and conditions under which work in this section will be installed. Correct conditions that are detrimental to the proper and timely completion of the work. Do not proceed until such conditions have been corrected.

3.3 Surface Conditions

- A. Surfaces scheduled to receive roofing are to be free of any standing water, frost, snow or loose debris.
- B. Substrate is to be smooth, free of sharp projections, and free of obvious depressions.
- C. All metal fittings specified or shown on drawings are to be in place before roofing.
- D. All nailers, roof curbs, equipment supports, vents, or other roof penetrations shall be securely installed prior to roofing.
- E. All surfaces scheduled to receive new PVC membrane must be free of physical contact with any bituminous materials, clean, and smooth.
- F. Any bituminous contaminated surfaces and/or rough surfaces must be covered with an appropriate material to achieve a smooth uncontaminated substrate to receive the new membrane. Rough surfaces and/or bituminous contaminated surfaces must be covered with a rigid material such as plywood, DensDeck, or Securock Roof Board, mechanically fastened in place per industry standards. Other materials may be acceptable with Triton's prior approval and will completely divorce the new membrane from the contaminated surface. **It is the responsibility of the roofing contractor to verify all substrate conditions and the need for additional materials as noted above.**

3.4 Installation – General

- A. Perform all related work specified elsewhere necessary for the installation of the specified membrane system.
- B. Ensure that fasteners do not penetrate conduit, post tension cables or other miscellaneous items located within or on the underside of the roof deck.



- C. Install continuous code-compliant wood nailers at the perimeter of the entire roof and around roof penetrations and projections, as shown on the manufacturer's detail drawings.
- D. Wood nailers or wood blocking for penetrations, curbs, or snow protection systems should be installed prior to the installation of the roof membrane whenever possible.

3.5 Vapor Retarder (when specified)

- A. Specific climatic and building conditions may require the use of a vapor retarder. It is the responsibility of the design professional to determine the need for a vapor retarder. A vapor retarder may also act as an air barrier which may help in reducing internal air pressure. Vapor retarders/air barriers should be considered on buildings where internal air pressure is high such as airplane hangars and buildings with overhead doors such as warehouses and freight terminals to prevent uplift of roof from inside.
- B. The National Roofing Contractor's Association recommends the installation of vapor retarders when interior relative humidity is 45% or greater and the outside mean temperature average in January is below 40° F.
- C. Install a vapor retarder over a suitable substrate with all laps and penetrations sealed in accordance with the vapor retarder manufacturer's instructions. In recover situations where the existing roofing membrane is left in place, the existing roofing membrane may adequately serve as a vapor retarder/air barrier if all splits, punctures, etc. are patched prior to installation of the new roofing system.

3.6 Insulation and Cover Board Installation

- A. Triton-approved roof insulations and cover boards shall be installed in accordance with the insulation manufacturer's instructions, local building codes, and insurance requirements.
- B. Secure the insulation and cover board to the roof deck using Triton approved RhinoBond plates and fasteners. Follow Designer's and/or insulation manufacturer's instructions for fastener placement and spacing.
- C. All insulation and cover board is to be cut neatly to fit tightly around all penetrations and projections with a maximum allowable gap of ¼"
- D. Open joints are to be repaired with like insulation material in pieces with length and width dimensions larger than 12".
- E. Taper all insulation to provide a smooth transition into roof drains. Minimum sump dimensions should be 36" x 36" where possible. Tapered crickets may be installed on top, or under, the roof insulation to create slope between drains. Non-compatible crickets must be covered with acceptable insulation or cover board.
- F. Install only as much insulation as what can get covered with new membrane by the end of the day or before inclement weather. Do not leave uncovered insulation exposed to the elements.
- G. Insulation installed over steel roof decks must be checked to ensure that no edge is left unsupported by the flute. All insulation shall be of sufficient thickness and density to prevent breakage under normal roof construction traffic.

- H. End joints in each row of insulation must be offset against the previous row. When multiple layers of insulation are installed, succeeding layers are to be installed with joints staggered at least 12" in relation to the previous layer. All joints, side and end, must be staggered at least 12".
- I. Minimum attachment rates shall be as follows
 - i. 2' x 4' boards shall be 2 fasteners per board
 - ii. 4' x 4' boards shall be 4 fasteners per board
 - iii. 4' x 8' boards up to 2" thick shall be 6 fasteners per board
 - iv. 4' x 8' boards 2" thick or greater shall be 5 fasteners per board
- J. The perimeter and corner area will be determined by building height and width and other conditions according to ASCE 7 or Factory Mutual 1-29 guidelines. To meet perimeter and corner wind uplift requirements, increase fastener density by decreasing the spacing between fastener points in one or both directions. The total tributary area to each fastener is no more than 60% for the perimeter and 40% for corners, based on the field of roof fastening density. See Detail Drawings.
- K. Fasteners are to be installed consistently in accordance with manufacturer's recommendations. Fasteners are to have minimum penetration of 1 inch through the structural deck.
- L. Fasten the insulation and cover board with RhinoBond plates and fasteners in a 2' x 2' or 2' x 3' grid pattern, according to the designer's and manufacturer's wind design requirements. Fasteners must be tight enough that the RhinoBond plate does not turn, but not too tight as to deform the RhinoBond plate.

3.7. Membrane Installation

- A. General - Unroll the Triton Protan SE PVC Membrane and position over the properly prepared, installed, and attached boards without stretching. Allow the membrane to relax prior to installation, at least 15 minutes when the temperature is above 60°F, or 30 minutes when the temperature is below 60°F. Inspect and remove any damaged membrane. Overlap sheets a minimum of 3", leaving space for a 1-1/2" minimum weld. Laps in the membrane sheets shall be installed in a shingled manner in the direction of drainage so as not to restrict the flow of water.
- B. Field, Perimeter, and Corner Areas
 - i. Perimeter Over the properly prepared, installed, and attached insulation and cover board assembly, follow either the 2'x2' or 2'x3' grid pattern. Full-width Triton Protan PVC rolls are to be installed so as to properly shed water. See Detail Drawings for fastener layouts. Refer to FM for their requirements for perimeter and corner enhancements.
 - a. Membrane should run perpendicular to the direction of steel deck flutes.
 - b. Seam overlaps may be placed over RhinoBond plates, welding of the plate will not be affected.
 - c. All membrane seams shall be shingled to shed water.

- d. All membrane sheets are to be overlapped a minimum of 3" and allows for a 1-1/2" minimum weld.
- C. After installation of the field membrane and before installation of flashing, install approved base attachment in accordance with Triton details.
- D. Laps are to be hot air welded using a hot air welder approved by the manufacturer. Laps shall be welded daily.
- E. Tack welding of the membrane for purposes of temporary restraint during installation is not permitted.
- F. All seams are to be fully welded a minimum of 1-1/2" from the edge of the lap with an uninterrupted flow of material from the edge of the completed seam.
- G. Allow laps to cool and then check for fishmouths and other voids. Repairs are to be made daily by hot air welding.
- H. 1" wide cross-section samples of welded seams should be taken at least two times a days, once in the morning and once in the afternoon.
- I. Refer to Triton's Installation Training Manual for detailed installation instructions and guidelines.

3.6 Flashings

- A. All wall flashings should be totally bonded to the substrate using TritoBond SB bonding adhesive. Apply over the clean, dry, compatible substrate using an approved solvent-resistant roller. Apply in a uniform coat to both the vertical substrate and back-side of the PVC membrane at the rate of 2 gallons per 100 square feet each side, depending upon substrate finish. Allow adhesive to dry completely before installing flashing membrane. The bonded sheet shall be pressed firmly into place using a weighted roller.
- B. Flashings shall extend a minimum of 6" onto the roof membrane, 2 1/2" past any RhinoBond plate, and 8" up the vertical above the finished roofing level. Submit requests for exceptions in writing for signed approval by the manufacturer.
- C. Flashings terminated with an aluminum termination bar should be secured 9" O.C. as per detail drawings and water cut-off caulking applied where flashings are terminated.
- D. Flashings are to be secured at the counter-flashed top edge with fasteners spaced 6" - 12" O.C.
- E. Flashings to be as per detail drawing when shown.
- F. No bitumen shall be in contact with any Triton Protan PVC membranes.

3.8 RhinoBond Induction Welding

- A. Welding equipment must be approved by Triton and any workers intending to use the equipment must have successfully completed a Triton training course prior to welding.
- B. All membrane to be welded must be clean and dry.

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- C. Active the weld between membrane and RhinoBond plate using an approved RhinoBond induction device. The induction coil must be positioned over the center of the RhinoBond plate, $\pm 1"$. The induction device must elevate the temperature of the RhinoBond plate from ambient to 400-500°F (204-260°C). Cycle time will be affected by available power. Use a heavy gauge power cord, at minimum 12 gauge by 100 ft.
- D. When the induction welding cycle is complete, immediately place a Cool & Clamp magnetic weight on the welded assembly. This device must be left in place for at least 60 seconds.

3.9 Temporary Water Cut-Off

- A. Temporary water cut-offs are to be constructed at the end of each working day to protect the roofing, building, and building interior from damage due to the elements.
- B. Construction of temporary water cut-offs is to be detailed by the Contractor and approved by the manufacturer and the Owner's Representative.

3.10 Clean-Up and Completion

- A. All debris shall be removed from the premises promptly and the construction area left clean daily.
- B. The Contractor shall be responsible to assure that his Subcontractors have properly removed and disposed of all debris relating to their contract.
- C. At the completion of the contract, Contractor is to remove and dispose of all equipment or temporary facilities related to their contract within 3 days.
- D. Prior to demobilization from the site, the work must be reviewed by the Owner's Representative and the Installer. All defects noted and non-compliances with the specifications or manufacturer's requirements shall be itemized in a punch-list. These items must be corrected immediately by the Installer to the satisfaction of the Owner's Representative and Triton Inc. prior to demobilization.

**Not guaranteed to prevent slips, falls, or injuries. The term slip-resistant is used because the membrane has been tested with a higher Coefficient of Friction than traditional membranes.*

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- END OF SECTION -



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