Adhered Roofing System
Part I
Design Criteria

January 2010

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ATTACHMENTS

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PART I
Design Criteria

The information contained herein is to serve as criteria for specifiers regarding the design of this VersiWeld VersiFleece TPO Adhered Roofing System. Specifiers are advised to fully familiarize themselves with this section and the "Application" Section, Part II, prior to completing the project specifications.

Information pertaining to the Versico products utilized with this roofing system can be found in "Attachment I", Products and Spray Equipment, included at the end of this section.

A. DESCRIPTION

The VersiWeld VersiFleece TPO Adhered Roofing System incorporates, 12' or 6' wide, scrim-reinforced, white, gray or tan VersiWeld Thermoplastic Polyolefin (TPO) membrane laminated to a 55-mil thick non-woven polyester fleece-backing. The membrane is fully adhered to an acceptable substrate with a spray-applied, two-component, low-rise DASH Adhesive. Adjoining sheets of VersiWeld membrane are overlapped and joined together with a minimum 1-1/2" wide hot air weld.

NOTE: DASH Adhesive and FAST Adhesive are equivalent products. These adhesives can be used interchangeably.

B. GENERAL DESIGN CONSIDERATIONS

1. There are no maximum slope restrictions for the application of this roofing system. When roof slopes exceed 5" per horizontal foot, use of an Automatic Hot Air Welding Machine may be more difficult. A Hand Held Hot Air Welder should be specified.

2. **Do not apply DASH Adhesive** when surface and/or ambient temperatures are **below 25° F**.

   When using **DASH Adhesive in non-heated spray equipment**, surface and/or ambient temperatures must be **60° F or warmer**.

3. The addition of **FAST Adhesive Catalyst** to FAST Adhesive (Part B) is required to speed up reaction time when temperatures are **below 50° F.**

4 Petroleum based products, certain chemicals and waste products may not be compatible with this roofing system. Contact Versico for verification of compatibility and recommendations concerning an acceptable roofing assembly.

5. The following projects should be sent to Versico for review prior to installation and preferably prior to bid to ensure that Versico's minimum warranty requirements are met:
   a. Air pressurized buildings, canopies, and buildings with large openings where the total wall openings exceed 10% of the total wall area on which the openings are located (such as, airport hangars, warehouses and large maintenance facilities).

   b. Cold storage buildings and freezer facilities.

6. Projects requiring a 20-year Total System Warranty will require additional enhancements. Refer to Attachment III at the end of this section of applicable requirements.

7. It is the responsibility of the specifier to review local, state and regional codes to determine their impact on this VersiWeld VersiFleece TPO Roofing System.

8. Coordination between various trades is essential to avoid unnecessary rooftop traffic over completed sections of the roof and to prevent subsequent damage to the VersiWeld membrane roofing system.

9. Concentrated loads from rooftop equipment may cause deformation of insulation/underlayment and possible damage to the membrane if proper protection is not provided. A protection course or sleepers must be specified.

10. The VersiWeld white membrane meets the ENERGY STAR® Roofing Products program guidelines for energy efficiency. This product can help reduce energy costs. Energy savings is climate specific and may vary significantly from building to building and geographic location. The greatest savings will occur in buildings located in hot, sunny climates that have a large roof surface to building volume ratio, and lower levels of insulation with lesser thermal resistance.

    For additional information on savings obtainable from installing the ENERGY STAR Roofing Product, contact Versico, one of Versico's Representatives/Distributors or call 1-888-STAR-YES (1-888-782-7937).

11. **Drainage**

    a. Drainage must be evaluated by the specifier in accordance with all applicable codes. Slopes may be provided by tapering the structure or through the use of tapered insulation; a sufficient number of roof drains should also be specified and properly located to allow for positive drainage. Significant ponding that could remain after 48 hours should be eliminated with the addition of auxiliary drains in low areas where ponding is anticipated.

       Versico specifically disclaims responsibility for the design and selection of an adequate drainage system and drain accessories. Selection must be made by the building owner or the owner's design professional.

    b. Small incidental areas of ponded water will not impact the performance of this roofing system; however, in accordance with industry standards, the roofing assembly **should be designed to prevent ponding** of water on the roof for prolonged periods (longer than 48 hours). Good roofing practice dictates proper drainage to prevent possible excessive live load and, in the event of a roof leak, to minimize potential interior damage to the roofing assembly and to the interior of the building.

    c. **Tapered edge strips, crickets or saddles** are recommended where periodic ponding of water may occur.

12. On new construction projects, especially in cold climate regions, moisture generated due to the construction process could adversely impact various components within the roofing assembly if not addressed. Refer to "Attachment V", Constructed Generated Moisture, for additional information.

13. On structural concrete decks, when a vapor retarder is not used, gaps in the deck along the perimeter and around penetrations must be sealed along with vertical joints between tilt-up panels, if present, to prevent infiltration of hot humid air and possible moisture contamination resulting from condensation. This is specifically important when adhesive is used to attach the roof insulation.

14. **Retrofit - Recover Projects** (when the existing roofing material is left in place)

    a. The removal of existing wet insulation and membrane must be specified. The specifier shall select an appropriate and compatible material as filler for voids created by removal of old insulation or membrane.

    b. Entrapment of water between old and new membrane can damage and deteriorate new insulation/underlayment between the two membranes. **If a vapor retarder or air barrier is not specified**, Versico recommends existing membrane be perforated to avoid potential moisture accumulation to allow for detection of moisture to enable the

building owner to take corrective action. This can be accomplished by drilling approximately 3/4" diameter holes every 100 square feet in the existing built-up roof or single-ply membrane (excluding PVC membrane).

c. **Existing PVC** membrane may be totally removed or existing membrane must be cut into maximum 10' X 10' sections. All PVC flashings at the perimeter, roof drains and roof penetrations must be removed.

d. When specifying this roofing system over an existing **gravel surfaced built-up roof, loose gravel must be removed** to avoid the entrapment of moisture. In all cases, **a membrane underlayment is required.** Refer to Paragraph I.11, Insulation /Underlayment, for minimum thickness of acceptable underlayment.

e. Existing Phenolic Foam insulation must be removed prior to the installation of this roofing system.

C. QUALITY ASSURANCE

1. Versico recommends the use of Versico supplied products for use with VersiWeld Roofing Systems. The performance or integrity of products by others, **when selected by the specifier and accepted as compatible by Versico**, is not the responsibility of Versico and is **expressly disclaimed** by the Versico warranty.

2. This roofing system must be installed by a Versico Authorized Roofing Applicator in compliance with drawings and specifications as approved by Versico.

3. There must be no deviations made from Versico's specifications or Versico's approved shop drawings without the **PRIOR WRITTEN APPROVAL** of Versico.

4. After completion of the installation, upon request, an inspection shall be conducted by a Technical Representative of Versico to ascertain that the membrane roofing system has been installed according to Versico's published specifications and details applicable at the time of bid. This inspection is to determine whether a warranty shall be issued. It is not intended as a final inspection for the benefit of the owner.

5. Solar reflectance of this roofing product may decrease over time due to environmental defacement such as dirt, biological growth, ponded water, etc. The roof should be monitored at regular intervals and maintained or cleaned when necessary to assure maximum solar reflectance. Refer to “Application” Section, Part II, for cleaning procedures.

D. WARRANTY

A Membrane System Warranty is available for roofing systems on commercial buildings within the United States and applies only to **products manufactured or marketed by Versico**. The membrane system is defined as membrane, flashings, adhesives, sealants and other Versico brand products utilized in the installation. For a complete description of these products, refer to the "Attachment I”, Products and Spray Equipment, at the end of this section.

APPLICATIONS SUCH AS WALKING DECKS, TERRACES, PATIOS OR AREAS SUBJECTED TO CONDITIONS NOT TYPICALLY FOUND ON ROOFING SYSTEMS WILL **NOT** BE ELIGIBLE FOR A SYSTEM WARRANTY

1. **A 10 or 15-year Total System Warranty**

Versico’s Total System Warranty requires that only materials from among those manufactured or marketed by Versico are to be specified and used to complete the roofing system. Some of the Versico brand materials included are: insulation, membrane, adhesives, sealants, fasteners and plates, termination bars, metal edgings and copings.

2. **A 20 year Total System Warranty** is available for a charge for projects utilizing VersiFleece 115 Membrane and incorporating additional design enhancements as outlined in Attachment IV, 20-Year Warranty Design Enhancements, in this specification.

Note: The 15 or 20-year Total System Warranty **is not available for** applications directly over **existing sprayed polyurethane foam** roof systems.

3 A warranty covering leaks caused by hail, maximum 1" diameter with VersiFleece 100 membrane and maximum 2" diameter with VersiFleece 115 membrane, can be issued. Contact Versico for specific information.

4. On projects utilizing VersiFleece 115 membrane, a 5, 10, 15 or 20-year warranty with limited coverage for accidental punctures (up to 16 man-hours per year) is available for an additional charge. A limited 5-year puncture warranty is free of charge upon request.

5. Upon review by Versico, projects incorporating white VersiWeld VersiFleece TPO Membrane may be eligible for a 10- year Reflectivity Warranty Amendment. These projects must be submitted to Versico prior to installation and preferably prior to bid.

6. **Access for warranty service**

   It shall be the owner's responsibility to expose the membrane in the event that warranty service is required when access is impaired. Such impairment includes, but is not necessarily limited to:

   a. Design features, such as window washer systems, which require the installation of traffic surface units in excess of 80 pounds per unit.

   b. Any equipment, ornamentation, building service units and other top surfacing materials which are not defined as part of this specification.

   c. Rooftop equipment that does not provide Versico with reasonable access to the membrane system for purposes of warranty investigation and related repairs.

   d. Severely ponded conditions.

7. The formation or presence of mold or fungi in a building is dependent upon a broad range of factors including, but not limited to, the presence of spores and nutrient sources, moisture, temperatures, climatic conditions, relative humidity, and heating/ventilating systems and their maintenance and operating capabilities. These factors are beyond the control of Versico and Versico shall not be responsible for any claims, repairs, restoration or damages relating to the presence of any irritants, contaminants, vapors, fumes, molds, fungi, bacteria, spores, mycotoxins, or the like in any building or in the air, land, or water serving the building.

E. CODE APPROVALS

1. Building codes are above and beyond the intended purpose of this specification. The respective **owner** or **specifier** should consult local codes for applicable requirements and limitations.

2. For code approvals with this roofing system, refer to the Versico VersiFleece Code Approval Guide published separately, the Factory Mutual Approval Guide or Underwriters Laboratories Fire Resistance or Roofing Materials and Systems Directory.

F. ROOF DECK CRITERIA

1. Proper decking shall be provided by the building owner. The building owner or its designated representative must ensure the building structure is investigated by a registered engineer to assure its ability to withstand the total weight of the specified roofing system, as well as construction loads and live loads, in accordance with all applicable codes. The specifier must also designate the maximum allowable weight and location for material loading and storage on the roof.

2. **Acceptable decks, minimum pullouts and approved Versico Fasteners** (for mechanical securement of insulation, when specified):

Deck Type	Minimum Pullout	Approved Fastener	Minimum Penetration
Steel, 22 gauge or heavier	360 pounds	InsulTite, ASAP, HPV or HPVX Fasteners	3/4"
Steel, less than 22 gauge	300 pounds	InsulTite, ASAP, HPV or HPVX Fasteners	3/4"
Structural Concrete, rated 3,000 psi or greater	800 pounds	CD-10 or MP 14-10 Fastener	1"
Wood Planks and Plywood, minimum 15/32 inch thick APA Grade CDX	360 pounds	InsulTite ASAP, HPV or HPVX Fasteners	1"; Maximum 1-1/2" on wood planks
Oriented Strand Board (OSB), Min. 7/16 inch thick APA rated non-veneer	250 pounds	HPV or HPVX Fasteners	1"
Fibrous Cement	225 pounds	Gyptec Fasteners	1-1/2"
Gypsum	300 pounds	Gyptec Fasteners	1-1/2"
		Lite-Deck Fasteners	2"

3. Withdrawal resistance tests are strongly suggested to determine the suitability of a roof deck. Fibrous cement, gypsum, lightweight insulating concrete, steel decks lighter than 22 gauge and oriented strand board less than 5/8" in thickness must be tested. Refer to Attachment II, Withdrawal Resistance Criteria, for specific procedures to conduct pullout tests.

4. **As an option to mechanical fastening, DASH Adhesive may be used to attach insulation**. Refer to "Attachment II" in Part II, Application, for applicable requirements.

5. For direct application over an acceptable roof deck/substrate, the substrate must be smooth, steel trowel finished (structural concrete), free of debris, protrusions, sharp edges and loose and foreign material. Cracks or voids in the substrate, greater than 1/4", must be filled with DASH Adhesive or an appropriate material.

G. WOOD NAILERS

A **horizontal wood nailer** is used to provide an effective substrate for some installation details or other roof accessories. In addition, it is used to provide solid protection for edges of the membrane underlayment. Minimum thickness of the nailer must be such that the top of the nailer is flush with the top of the membrane underlayment.

1. Wood nailers are required for the securement of metal edgings, scuppers, and insulated pipes. **Parapet walls and most curbs do not require the utilization of wood nailers.**

   Note: The width of the wood nailers must be specified to exceed the width of the metal flange of edgings and insulated metal collars.

2. When treated lumber is specified, it is recommended that only lumber, which has been pressure treated with salt preservatives be specified. Lumber treated with other wood preservatives such as, Creosote, Pentachlorophenol, Copper Naphthenate or Copper 8-quinolinolate will adversely affect the VersiWeld membrane when in direct contact and are, therefore, **unacceptable**.

   If non-treated lumber is to be specified, it must be stored to protect from moisture sources. A seal should be provided between the non-treated lumber and a concrete or gypsum substrate (similar to a sill sealer).

3. Methods used to fasten the nailer vary with building conditions; however, it is essential that secure attachment of durable stock be accomplished. Factory Mutual Loss Prevention Data Sheet 1-49 (Perimeter Flashing, June 1985) contains options for the spacing and sizing of fasteners.

4. Wood nailers and their attachment method are not covered by the Versico Warranty.

H. VAPOR RETARDER

1. The use of a vapor retarder to protect insulation and reduce moisture accumulation within an insulated roofing assembly should be investigated by the specifier, especially on projects with high interior humidity, such as, swimming pools, breweries, pulp mills, etc.

2. In the generally temperate climate of the United States, during the winter months, water vapor flows upward from a heated, more humid interior toward a colder, drier exterior. Vapor retarders are more commonly required in northern climates than in southern regions, where downward vapor pressure may be expected and the roofing membrane itself becomes the vapor retarder.

3. On cold storage/freezer facilities, the perimeter details must be selected to provide an air seal and prevent outside air from infiltrating and condensing within the roofing assembly.

4. Consult the latest publications by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) and NRCA (National Roofing Contractors Association) for specific information.

5. If insulation is to be adhered to the vapor retarder with DASH Adhesive, the vapor retarder must be compatible and shall be fully adhered to the substrate. Available products include Versico supplied "peel and stick" rubberized asphalt membrane with compatible film coating (Versico 725 Air and Vapor Barrier), and spray or roller applied butyl coatings. Installation requirements for Versico's 725 Air and Vapor Barrier are identified in "Attachment V" in Part II, Application.

I. INSULATION/UNDERLAYMENT

1. **General**

   a. Roof insulation thickness must be determined by the thermal value required for each project and may be subject to code approval limitations. On projects where a vapor retarder is used, the specifier must calculate insulation thickness to ensure the temperature at the vapor retarder will not fall below the calculated dew point.

   b. Multiple layers of insulation are recommended with all joints staggered between layers.

2. **Structural concrete, gypsum, fibrous cement or wood decks**

   a. For new construction or projects with a complete tearoff of existing roof materials, the membrane may be directly adhered to the substrate.

   b. The substrate must be relatively smooth, dry, free of protrusions, debris, sharp edges and loose and foreign materials. All gaps in the substrate greater than 1/4 inch must be filled with DASH Adhesive or other suitable material.

   c. If an insulation is specified over the roof deck, refer to Paragraph I.9 for acceptable insulation/underlayment types. Insulation may be secured to the deck with DASH Adhesive or approved Versico Fasteners/Plates.

3. **Projects with lightweight insulating concrete**

   a. VersiWeld VersiFleece TPO membrane may be adhered directly over certain types of cellular or perlite lightweight insulating concrete substrates which have a minimum compressive strength of 200 pounds per square inch. Versico must be contacted for acceptable lightweight insulating concrete substrates.

1) Except when the lightweight insulating concrete is to be poured over slotted steel decks, pressure relief vents must be specified at a minimum rate of 1 every 2,000 square feet to relieve vapor pressure which may result from possible moisture entrapment beneath the lightweight insulating concrete between the time of concrete placement and membrane installation.

a) Vents must be installed in accordance with Detail VWF-8 as the job progresses.

b) Versico must be contacted for acceptable pressure relief vents.

2) The surface of the lightweight insulating concrete must be smooth finished, free of protrusions, sharp edges and loose and foreign materials.

b. When the use of vermiculite lightweight insulating concrete is to be specified, Versico must be contacted to determine applicable requirements pertaining to priming, venting and warranty wind speed coverage. Projects where the VersiFleece membrane has been approved over vermiculite will be limited to wind speed coverage of 55 mph peak gust wind speed unless otherwise approved by Versico.

c. The direct application of this roofing system **is not permitted** on applications where the lightweight insulating concrete, regardless of type, is specified over an existing roofing material or vapor retarder.

d. If a membrane underlayment is specified in conjunction with a lightweight insulating concrete substrate, refer to Paragraph I.9 for acceptable insulation/underlayment types.

4. **For projects over a smooth surface asphalt built-up roof, modified bitumen or mineral surfaced cap sheet**, where no additional insulation or underlayment is specified, the membrane may be adhered directly to the substrate.

a. **Do not adhere membrane directly onto low melting point asphalt**. When the softening point of the asphalt falls below 185° F, the minimum membrane underlayment must be 1/2" thick Versico Recovery Board (mechanically fastened only) or an acceptable insulation. Refer to Paragraph I.9 for acceptable insulation/underlayment types.

1) **For slopes less than 2" to one horizontal foot**, the specifier must investigate the existing roofing material to ensure the asphalt has a minimum softening point of 185° F.

2) Previous repairs to existing roofing material should be investigated by the specifier to determine if asphalt with a softening point below that mentioned above or other contaminants may contact the VersiFleece membrane. Temporary repairs completed with any contaminants (i.e., plastic roof cement) must be removed.

b. The substrate must be relatively smooth, dry and clear of debris, fins, loose edges, foreign materials, oils, grease and fresh roof cement.

CAUTION: **Direct application over coal tar** built-up roofs is **not permitted**. When DASH Adhesive is specified to secure insulation, minimum 1" thick Polyisocyanurate insulation is required when using white VersiWeld Membrane. If gray or tan VersiWeld Membrane is specified, the minimum Polyisocyanurate thickness shall be 1.4".

5. This roofing system can be **installed over an existing standing seam, flat seam or corrugated metal roof.** Typically, a base layer of insulation will be attached between the flutes of a standing seam metal roof with DASH Adhesive. Subsequent layers of an acceptable insulation are then adhered to the base layer with DASH Adhesive. Refer to Versico's Metal Retrofit Roofing System Specification.

6. For **projects directly over existing adhered or mechanically fastened single-ply membrane** (excluding PVC which is not acceptable), **Versico must be contacted** regarding suitability and requirements prior to project bid.

7. **Projects over existing sprayed-in-place polyurethane foam**

When no additional thermal value is required, the membrane may be adhered directly over the **existing sprayed polyurethane foam** providing the substrate is dry, relatively smooth, free of protrusions and loose or foreign materials.

Note: Existing sprayed polyurethane foam roof shall be minimum 1" in thickness.

a. The existing polyurethane foam system must be inspected and tested (core cuts, moisture surveys, etc.) to determine if moisture is present within the existing assembly. Wet polyurethane foam shall be removed and replaced with compatible materials.

b. The existing polyurethane foam must be investigated to determine proper adhesion to the substrate. Areas of inadequate adhesion must be secured, removed or replaced.

c. Substrate preparation procedures are dependent upon the type of existing coating over the polyurethane foam system as follows:

1) For existing silicone or Hysunite coatings, complete removal of the coating (scarfing) is required prior to adhesion of the VersiFleece membrane.

2) For acrylic or urethane coatings, if the coating is tightly adhered, the membrane may be adhered directly over the coating providing the substrate is perforated (through the coating and into the sprayed-in-place urethane foam). Perforations are to be approximately 1/4" in diameter, spaced 3" to 6" on center over entire field area.

Note: Urethane coatings which have "reverted" (turned gummy) must be removed by scarfing prior to applying DASH Adhesive.

d. **If additional sprayed polyurethane foam is specified** over the existing foam, the sprayed polyurethane foam manufacturer must be contacted regarding surface preparation procedures or required primers.

8. For projects specified in conjunction with **new sprayed-in-place polyurethane foam insulation**, VersiFleece membrane can be adhered directly to the new urethane foam surface with DASH Adhesive. Refer to Versico's VersiFleece/SPF Adhered Roofing System Specification for specific requirements.

9. **For all other substrates**, an acceptable insulation/underlayment is required. Any of the Versico underlayments listed below may be specified:

Versico Insulation	Minimum Thickness	See Notes
Versico Recovery Board	1/2"	1
Dens-Deck/Dens-Deck Prime	1/4"	6
EPS/Composite Board	1-1/4"	2 & 3
EPS overlaid with Recovery Board or Dens-Deck/Dens-Deck Prime	1-1/4" combined thickness	2 & 3
Thermapink or Dow Extruded Polystyrene overlaid with HP Recovery Board or Dens-Deck/Dens-Deck Prime	1" combined thickness	2, 3 & 4
Thermapink or Dow Extruded Polystyrene (for white membrane only)	1" combined thickness	2, 3, 4 & 5
Polyisocyanurate	1"	N/A
Polyisocyanurate overlaid with Recovery Board or Dens-Deck/Dens-Deck Prime	1-1/4" combined thickness	N/A

Notes:

(1) 1/2" thick HP Recovery Board cannot be specified as the sole membrane underlayment over wide rib (Type B) or intermediate rib (Type F) steel decks. HP Recovery Board must be specified in conjunction with 1/2" thick gypsum board or 3/4" thick perlite. Two layers of 1/2" thick HP Recovery Board are also acceptable.

(2) Local codes must be consulted regarding the acceptance of polystyrene insulation directly over steel decks.

(3) Versico EPS, the EPS surface of Versico EPS/Composite, Thermapink or Dow roof insulation cannot be installed directly over coal-tar pitch roof surfaces. An impervious separator sheet such as 6-mil polyethylene shall be installed beneath the insulation.

(4) Thermapink or Dow insulation cannot be installed directly over existing PVC membranes. A protective mat must be used as a separator.

(5) Thermapink or Dow insulation cannot be used directly under tan or gray membrane.

(6) Dens-Deck/Dens-Deck Prime is recommended for use on top of an approved insulation. The direct use over an existing roofing membrane or monolithic deck is not permitted for 20 -year warranted projects (not acceptable directly over lightweight insulating concrete, regardless of warranty length).

Tapered Versico EPS, Thermapink 25, Dow Deckmate and Polyisocyanurate Insulations are also available.

10. **Insulations Supplied By Others**

Restrictions:

a. Perlite is not an acceptable underlayment for use with this roofing system.

b. Fiberglass insulation cannot be specified with this roofing system, even if overlaid with additional insulation or membrane underlayment.

c. Versico Roofing Systems cannot be specified in conjunction with Phenolic insulation.

J. INSULATION ATTACHMENT

1. Versico DASH Adhesive may be **used to attach an approved insulation** to new or tearoff construction over structural concrete, fibrous cement, gypsum, cellular or perlite lightweight insulating concrete (minimum 200 psi compressive strength), wood and steel decks.

a. With DASH Adhesive, 4' x 8' boards can be used providing full attachment is provided. For uneven substrates, trimming or slitting of boards or the use of maximum 4' x 4' boards may be necessary.

b. If oriented strand board (OSB) is proposed as the membrane underlayment, a polyisocyanurate/OSB composite board should be used since attachment of individual OSB panels is not recommended due to board stiffness and potential bowing on uneven surfaces.

c. For new galvanized steel decks, power washing is required to remove finishing oils, if present.

d. DASH Adhesive may also be used to attach insulation to an existing asphalt or coal tar pitch roof, modified bitumen or mineral surfaced cap sheet.

1) For projects with existing Type III or IV asphalt, coal tar pitch, modified bitumen or mineral surface cap sheets, the existing roof must be inspected to determine if moisture is present within the existing assembly. Wet insulation and membrane shall be removed and replaced with compatible materials.

2) Blisters, buckles, wrinkles and fishmouths shall be cut out or mechanically fastened.

3) Remove loose gravel, dust and residue from a gravel surfaced BUR by using of a Hydro-Vac (wet vacuum equipment). Power vacuum equipment or a power sweeper followed by air blowing or another suitable means are also acceptable. Care shall be exercised in areas where evidence of ponding is obvious (remove residue from low areas prior to proceeding).

CAUTION: **On coal tar pitch**, when using VersiWeld (white) VersiFleece membrane, minimum 1" thick polyisocyanurate is the required membrane underlayment. If VersiWeld, gray or tan, VersiFleece membrane is used, minimum 1.4" thick polyisocyanurate is required.

e. For specific installation requirements and adhesive coverage rates with DASH Adhesive, refer to "Attachment IV" in Part II Application.

2. When **insulation** is to be **mechanically fastened** to the roof deck, Versico Fasteners and Plates are required for all projects.

a. Versico Insulation must be mechanically fastened to the roof deck with one 3" diameter plate and fastener every 2 square feet as shown in Versico Detail VWF-27.1, except as follows:

1) When a single or top layer of minimum 1-1/2" thick Versico Polyisocyanurate insulation is specified, the Versico insulation may be secured at the minimum rate of 1 per 4 square feet (8 fasteners per 4' x 8' board). Refer to Detail VWF-27.2.

2) 1/4" or 1/2" Dens-Deck may be fastened at the rate of 15 fasteners/plates per 4' x 8' board (1 per 2.1 square feet). 1/4" or 1/2" Dens-Deck Prime may be fastened at the rate of 12 fasteners/plates per 4' x 8' board (1 per 2.67 square feet). 5/8" thick Dens-Deck Prime may be fastened at the rate of 8 fasteners/plates per 4' x 8' board (1 per 4 square feet).

b. When an approved oriented strand board (OSB) is specified as the membrane underlayment, it must be mechanically fastened to the roof deck in accordance with Versico Detail VWF-27.3. If OSB is to be secured with Insulation Adhesive, an OSB composite board is recommended. Refer to Attachment IV in Application Section.

K. MEMBRANE BONDING

VersiFleece membrane shall be fully adhered to an acceptable substrate with a two component, spray applied, low-rise DASH Adhesive. The adhesive is applied to the substrate only and the membrane is positioned into the foamed adhesive after the adhesive begins to string and rolled with a weighted steel roller, 100-150 pounds or a nylon bristle push broom, to ensure proper adhesion.

L. MEMBRANE SPLICING

Adjoining sheets of VersiWeld VersiFleece TPO membrane are spliced together with a minimum 1-1/2" wide hot air weld along selvage edges. At end laps, overlay butt edges with 6" wide VersiWeld Reinforced membrane and hot air weld along all edges. Seal all membrane edges (where scrim reinforcement is exposed) with Cut-Edge Sealant.

For specific splicing procedures, refer to Part II, Application.

M. FLASHING

1. The height of the new wall flashing and termination must extend above the anticipated water level (due to heavy rain) or slush line (due to water under accumulated snow).

2. Install surface mounted reglets and compression terminations directly to wall surface.

3. Where metal counterflashing or surface mounted reglets are used, seal with a rubber grade caulking to prevent moisture migration behind new wall flashing.

4. On Total System Warranty projects, Versico's Termination Bar, in conjunction with Water Cut-Off Mastic, must be specified under all metal counterflashings.

5. The removal of existing loose flashing must be specified. New flashing must not extend above throughwall counterflashing and must not conceal any weep holes.

7. The specifier must examine structural supports for rooftop equipment to determine if reasonable access to the membrane beneath the equipment is provided.

8. At roof drains and compression seal terminations (Termination Bars and Coping Stones), the fleece-backing must be removed from the back of the membrane so Water Cut-Off Mastic can be applied directly to the EPDM surface.

9. Bitumen based roof cement must be removed or concealed with an acceptable underlayment.

10. When **hot pipes** or other similar penetrations exceed 120° F, they must be designed to incorporate an insulated metal collar and rain hood to maintain a surface temperature less than 120° F for the protection of the flashing.
11. When **sleepers** are used for mounting rooftop equipment, they must be designed to provide adequate support. An appropriate detail must be selected to prevent depression of the insulation and possible damage to the membrane. Refer to the Common Detail VWC-24.

7. At **expansion joints**, mechanical securement of the membrane is required. Refer to applicable VWF-3 Details.

8. Existing Roof Tie-Ins

   Depending on the type of the existing roofing system, the tie-in method will vary. Total isolation between the two roofing systems or weep holes may be required to address moisture migration from one roofing system to the other.

   Prior to the selection of any tie-in detail, ensure that the selected detail will not restrict drainage. For tie-ins to built-up roofs, Versico's uncured EPDM Flashing is required. Refer to VWF-13 Details in "Application Section".

N. METAL WORK

1. Termination bars and surface mounted reglets must be installed directly to the wall surface.

2. Versico recommends VersiWeld Coated Metal, Versico VersiTrim Metal Edging/Coping, VersiTrim 1000, 2000 or 3000 Metal Edging or Drip Edge for membrane termination. Installation instructions are available from Versico.

3. Metal work by others, when specified and approved by Versico, must be fastened to prevent metal from pulling free or buckling and sealed to prevent moisture from entering the roofing system or building. **Unless supplied by Versico, metal work securement is not included in this specification and is excluded from the Versico Warranty.**

4. **On retrofit projects**, existing counterflashing, edging, expansion joint covers, copings, etc., shall not be reused unless investigated by the specifier to determine its compliance to Versico's current details.

O. WALKWAYS

Walkways are required at all traffic concentration points (i.e., roof hatches, access doors, rooftop ladders, etc.), and if regular maintenance (once a month or more) is necessary to service rooftop equipment.

Walkway types:

1. **VersiWeld Heat Weldable Walkway Rolls** are required when walkway pads are to be specified. The Walkway Rolls are heat welded to the VersiWeld membrane using an Automated Heat Welder or Hand-Held Heat Welder.

   As an option, walkway pads may be adhered to the membrane surface with QA Seam Tape/TPO Primer.

2. **Smooth concrete pavers**, when specified insulation that is mechanically fastened, must be loose laid over a slip sheet of membrane or 2 layers of Protective Mat. When insulation is attached with DASH Adhesive, concrete pavers may be placed over one layer of Protective Mat. Pavers cannot weigh more than 80 pounds per paver for ease of removal.

3. Versico Interlocking Rubber Pavers, 24" X 24" X 2", weighing approximately 6 pounds per square foot, may be loose laid directly over the membrane. Installation instructions sheets are available from Versico.

4. Pavers are not recommended for use as walkways where roof slopes exceed 2" in 12".

5. Walkways are considered a maintenance item and are excluded from the Versico warranty.

6. Window washing equipment will require special maintenance. Runways or window washing tracks must be utilized to prevent damage to membrane or insulation. Such details must be reviewed by Versico to determine reasonable access to the membrane and associated insulation/underlayment components.

This specification represents the applicable information available at the time of its publication. Owners, specifiers and Versico Authorized Roofing Applicators should consult Versico or their Versico Manufacturer's Representative for any information which has subsequently been made available.

Review the appropriate Versico warranty for specific warranty coverage, terms, conditions and limitations.

VersiWeld VersiFleece TPO Adhered Roofing System
"Attachment I"
Products and Spray Equipment
January 2010

A. Membrane

VersiWeld VersiFleece TPO 100 or 115 membrane incorporates 45 or 60-mil thick Thermoplastic Polyolefin (TPO) membrane laminated to a 55-mil non-woven fleece backing resulting in a total finished sheet thickness of 100 or 115- mils. Membrane sheets are available in rolls 12' or 6' wide by 50' or 100 ' long. VersiWeld VersiFleece TPO Membrane is available in white, gray or tan and conforms to the following.

Property	Test Method	Property of Unaged Sheet	Property After Aging (1) 28 days @ 240° F
Thickness of reinforced sheet over fleece, in. (mm) tolerance is ±10	ASTM D 751	0.045 (1.14 – VF 100) 0.060 (1.52 – VF 115)	
Breaking Strength, min, lbf (kN)	ASTM D 751 Grab Method	300 (1.3) min. - VF100 400 (1.8) typical - VF100 400 (1.8) min. VF115 500 (2.2) typical VF115	300 (1.3) min. - FB100 400 (1.8) typical - FB100 400 (1.8) min. FB115 500 (2.2) typical FB115
Elongation at break of internal fabric,%	ASTM D 751	25 typical	25 typical
Tearing Strength, min, lbf (N) 8" by 8" specimen	ASTM D 751 B Tongue Tear	55 (245) Min. 130 (578) typical	55 (245) Min. 130 (578) typical
Brittleness Point, °F (°C)	ASTM D 2137	-40 (-40) Min. -50 (-46) Typical	
Linear Dimensional Change (shrinkage), %	ASTM D 1204	+/- 0.5 Max. -0.2 typical	
Ozone Resistance, 100 pphm, 168 hours	ASTM D 1149	No Cracks	No Cracks
Resistance to Water Absorption After 7 days immersion @ 158°F (70°C) Change in mass, %	ASTM D 471 (fleece removed, edges sealed)	4.0 Max. 2.0 typical	
Resistance to microbial surface growth, rating (1 is very poor, 10 is no growth)	ASTM D 3274 2 yr. S. Florida	9 – 10 typical	
Field seam strength, lbf/in. (kN/m) Seam tested in peel	ASTM D1876	40 (7.0) Min. 60 (10.5) typical	
Water vapor permeance, Perms	ASTM E 96	0.10 Max. 0.05 typical	
Puncture resistance, lbf (N)	FTM 101C Method 2031	350(1.6) min. - VF100 450 (2.0) typical - VF100 400 (1.8) min. VF115 500 (2.2) typical VF115	350(1.6) min. - VF100 450 (2.0) typical - VF100 400 (1.8) min. VF115 500 (2.2) typical VF115
Resistance to xenon-arc Weathering (2) Xenon-Arc, 17,640 kJ/m^2 total radiant exposure visual condition at 10X	ASTM G 155 0.70 W/m^2 80°C B.P.T.	No Cracks No loss of breaking or tearing strength	

(1) Aging conditions are 28 days at 240° F (116° C) equivalent to 400 days at 176° F (80° C) for breaking strength, elongation, tearing strength, linear dimensional change, ozone and puncture resistance.
(2) Approximately equivalent to 14,000 hours exposure at 0.35 W/m^2 irradiance. B.P.T. is black panel temperature.

B. Flashing: VersiWeld **non-reinforced flashing** is available in rolls **12" and 24" wide by 50' long**. Flashing is used for inside/outside corners, field fabricated pipe flashings, sealant pockets and scuppers, when the use of pre-molded accessories is not feasible.

6" wide by 100' long VersiWeld **reinforced membrane** is available for overlaying end laps.

C. Pressure-Sensitive Cover Strip: A 6" wide, 45-mil reinforced VersiWeld TPO membrane laminated to a pressure-sensitive, non-staining, cream-colored tape. The cover strip is suitable for stripping in metal drip edge. The product is available in white, gray and tan and is used in conjunction with TPO Primer.

D. **VersiWeld Bonding Adhesive:** A high-strength, synthetic rubber adhesive used for bonding VersiWeld non-fleece-backed membrane to various surfaces. The adhesive is applied to both the membrane and the substrate at a coverage rate of approximately 60 square feet per gallon per finished surface (includes coverage on both surfaces).

E. **Versico Low VOC Bonding Adhesive:** An alternate, high-strength, adhesive using a blend of VOC exempt and non-exempt solvent which complies with the State of California Clean Air Act of 1988 (updated in 1997).

F. **Aqua Base 120 Bonding Adhesive**: A semi-pressure-sensitive, water based adhesive used a two-sided contact adhesive. Coverage rate is 120 square feet per gallon finished surface (applied to membrane and substrate).

G. **Cut-Edge Sealant:** A clear sealant used to seal cut edges of reinforced VersiWeld membrane. A coverage rate of approximately 225 - 275 linear feet per squeeze bottle can be achieved when a 1/8"diameter bead is applied.

H. **Water Cut-Off Mastic:** Used as a mastic to prevent moisture migration at drains, compression terminations and beneath certain metal edging (at a coverage rate of approximately 10' per tube or 100' per gallon).

I. **Universal Single-Ply Sealant:** Used to seal above termination bars and metal counterflashings.

J. **Thermoplastic One-Part Pouable Sealaer:** A one-part, moisture curing, elastomeric polyether sealant used to fill TPO Molded Pourable Sealer Pockets. Packaged in 4, 2-liter foil pouches inside a reusable plastic bucket. 1 pouch will fill 2 TPO Molded Pourable Sealer Pockets.

K. **Weathered Membrane Cleaner:** Used to prepare membrane that has been exposed to the elements for approximately 7 days prior to hot air welding at an approximate coverage rate of 600 linear feet per gallon on a 4" wide surface.

L. **Versico DASH Adhesive**: A construction grade, two-component, polyurethane adhesive. The low-rise, expanding characteristics are designed to bond VersiFleece TPO and insulation to a variety of substrates.

M. **FAST Adhesive:** A two component (Part A and B), spray applied, low rise adhesive for bonding VersiWeld VersiFleece TPO membrane to various surfaces. FAST Adhesive can also be used as an insulation adhesive over compatible substrates as outlined in "Attachment IV" in Part II, Application Section. When used for membrane securement, a coverage rate of approximately 10,000 square feet per 50 gallon "drum set" (3,000 square feet per 15 gallon drum set) can be achieved.

N. **FAST Adhesive Catalyst:** Added to FAST Adhesive (Part B Side) to quicken adhesive reaction time. Required when temperatures are below 50º F; recommended for temperatures between 50º F and 70º F

O. **Versico TPO Primer:** A primer used to prepare the surface of the membrane for the application of the Pressure-Sensitive Cover Strip.

P. **VersiWeld Coated Metal :** A 24 gauge, galvanized steel sheet coated with a layer of non-reinforced VersiWeld Flashing. The sheet is cut to the appropriate width and used to fabricate metal drip edges or other roof perimeter edging profiles. VersiWeld Membrane may be heat welded directly to the coated metal. Coated metal is available in sheets 4' X 10' and comes packaged 25 sheets per pallet. Available in white, gray or tan.

Q. **VersiWeld Heat Weldable Walkway Rolls:** Manufactured from specially compounded TPO, offering superior tear, puncture and weather resistance and designed to protect the VersiWeld membrane in those areas exposed to repetitive foot traffic or other hazards. The walkway material may be heat welded to the VersiWeld membrane using an automated heat welder or hand held heat welder. Walkway Rolls are 30 inches wide by 50 feet long and are nominal 120 mils thick (.12 inch thick). Available in white only.

R. **Pre-Molded Accessories:**

1. **Inside Corners:** A pre-molded corner flashing for inside corners. Available in white, gray or tan; 60-mil thick.

2. **Outside Corners:** A pre-molded corner flashing for outside corners. Available in white, gray or tan; 60-mil thick.

3. **TPO Curb Wrap Corners**: Fabricated flashings are made of 45-mil thick reinforced VersiWeld membrane designed to reduce installation time to flash a curb when compared to conventional methods. Each corner is fabricated with a 6" wide base flange and a 12" overall height. Six sizes are available to fit curbs up to 6' by 6' in size. One curb requires 4 corners for a complete installation. TPO Curb Corners are packaged in boxes of twelve. Custom sizes are available as a special order product requiring lead time.

4. **Pipe Flashings:** A pre-molded white, gray or tan pipe flashing used for pipe penetrations. Available for 1" – 6" diameter pipes with clamping rings included.

5. **Split Pipe Seals:** A prefabricated flashing consisting of 45-mil thick reinforced VersiWeld Membrane for pipes 1" – 6" in diameter. A split (cut) and overlapped tab are incorporated to allow the pipe seal to be opened and wrapped around the pipe when it is not possible to pull a standard pipe flashing over a round penetration. Custom sizes are available as a special order product requiring lead time.

6. **TPO Square Tubing Wraps**: Fabricated flashings made of 45-mil thick reinforced VersiWeld membrane for square tubing. A split (cut) and overlap tab are incorporated into these parts to allow the seals to be opened and wrapped around a square penetration. Available for 3", 4", 5" and 6" diameter square tubing.

7. **TPO T-Joint Covers:** A 60-mil thick non-reinforced TPO flashing cut into a 4.5" diameter circle used to seal step-offs at splice intersections. Installation is mandatory on all VersiFleece 115 membrane systems and on VersiFleece 100 systems where step-offs have not been properly sealed. Packaged in boxes of 100. Available in white, tan or gray.

8. **Molded TPO Sealant Pockets:** A pre-fabricated, interlocking, 2-piece, injection molded, flexible pocket with a rigid polypropylene vertical wall and pre-formed deck flanges. Used in conjunction with Thermoplastic One-Part Pourable Sealer for waterproofing pipe clusters or other odd shaped penetrations. Available in white, gray or tan. Forms a 7-1/2" by 6" oval when completed.

9. **Pre-Fabricated Sealant Pockets:** A two-piece, pre-fabricated sealant pocket that utilizes reinforced TPO membrane and coated metal to form a rigid, oversized sealant pocket with a weldable horizontal deck flange. Available in 12" (total volume of 1.87 gallons), 16" (total volume of 2.77 gallons) and 20" (total volume of 3.81 gallons). Packaged 2 per carton and available in white only. Refer to the applicable Technical Data Bulletin for dimensions and installation instructions.

10. **Sealant Pocket Extension Legs:** Designed for use with the TPO Molded Sealant Pocket and the Pre-Fabricated Sealant Pocket to extend the length in increments of 10". Fabricated from 45-mil thick reinforced TPO membrane and TPO coated metal. Can be used full length, cut to size for customized lengths or welded to each other for extra long applications. Packaged 10 legs per carton and available in white only.

S. Fasteners:

1. **HPV Fastener:** A threaded "E-Coat" square head fastener for insulation attachment into steel, wood plank, minimum 15/32" thick plywood or minimum 7/16" thick oriented strand board.

2. **HPVX Fastener:** A heavy-duty #15 threaded fastener with a Phillips head for use primarily on steel decks lighter than 22 gauge where increased pullout resistance is necessary.

3. **InsulTite Fasteners**: A threaded, Phillips head fastener used with 3" diameter Versico Insulation Plates. Used for insulation attachment into steel or wood decks.

4. **Pre-Assembled ASAP Fastener and Plate:** A 3" diameter plastic plate with Pre-Assembled # 12 Fastener with a Phillips Drive for use into steel or wood decks.

5. **CD-10 Fasteners:** A hammer-driven, non-threaded fastener for use with structural concrete decks rated 3,000 psi or greater.

6. **MP 14-10 Concrete Fasteners:** A #14 threaded fastener used for minimum 3,000 psi concrete decks.

7. **GypTec Fastener:** A non-penetrating, plastic fastener and corresponding plate used with lightweight substrates such as cementitious wood fiber and gypsum decks.

8. **Term Bar Nailins:** A 1-1/4" long, 1/4" diameter expansion anchor with corrosion resistant zinc plated steel pin and a zinc alloy body. The fastener is set by hammering the drive pin into place. Used for fastening Termination Bars to concrete, brick or block walls.

S. Insulation Fastening Plates: A nominal 3" diameter metal plate used for insulation attachment in conjunction with the appropriate Versico Fastener.

T. Versico Seam Probe: A hand tool used to check the integrity of heat welded seams on heat welded roofing systems. The probe has a heat-treated tip and the handle is tapped to fit standard threaded extension handles allowing the tool to be used from a standing position.

U. Vapor Retarder

1. **Versico 725 Air and Vapor Barrier** - A 40-mil thick composite consisting of 32-mil self-adhering rubberized asphalt membrane laminated to an 8-mil spunbonded polyester fabric which is fully compatible with DASH Adhesive. Available in rolls 36" wide by 75' long (225 square feet).

Technical Data – Versico 725 Air and Vapor Barrier		
Property	**ASTM**	**Results**
Thickness		40 mils
Tensile Strength	D-412	200 psi min.
Elongation (1)	D-412	200% min.
Pliability	D-146	-15° C
Peel Adhesion	D-903	5 lbs./in. min.
Puncture Resistance	E-154	20 lbs. min.
Permeability	E-96	0.05 perms
(1) Rubberized asphalt compound only.		

2. **CCW 702 Primer** - A single component, solvent based, high tack primer used to provide maximum adhesion between Versico 725 Air and Vapor Barrier and an approved substrate. Applied by spray or long nap roller with a coverage rating ranging from approximately 250 square feet per gallon on smooth finishes (i.e., concrete) to 75 square feet per gallon on porous surfaces (i.e., Dens-Deck Prime gypsum board). Available in 5-gallon containers.

Technical Data – Versico 702 Primer	
Property	**Results**
Weight Per Gallon (lbs)	7.7
Solids Content (% by weight)	38%
VOC Content	540 g/l
Color	Blue
Flash Point	44° F
Adhesion to Concrete (1b/lin. In.	7

V. Spray Equipment

The following is a list of necessary equipment for application of FAST Adhesive.

2. **Proportioning Unit** (Pump) - a hydraulically or air operated, high pressure metering unit capable of providing minimum 1,000 psi operating pressure designed to accurately spray two component urethane systems.

3. **Raw Material Transfer System** (for transferring Part A and B from drum sets to Proportioning Unit) – a minimum of 2 transfer pumps with material supply hoses, air supply hose and necessary fittings.

4. **Hoses** (for carrying Part A and B materials from Proportioning Unit to spray gun) - for application of FAST Adhesive, low voltage automatic dual heated hose assemblies available in lengths of 50' which can be combined up to 300 '.

5. **Spray Gun** (for spray applying FAST Adhesive) - a high-pressure spray gun for the application of two component polyurethane foams. Recommended features include an air purge design and non-atomizing spray tip.

6. **Air Compressor** (to power Transfer Pumps and Spray Gun) - a three phase, 230 watt unit capable of providing 19 - 40 cubic foot per minute (9 l/sec) at 120 pounds (54 kg) of pressure depending on the spray rig.

7. **Generator** - Use of a generator with a capacity of 8 to 25 kw is recommended depending on type of spray rig.

Conventional two-component pumping systems manufactured by Gusmer, Graco, Glas-Craft, etc. are readily available new and used. Contact the respective manufacturer for additional information.

VersiWeld VersiFleece TPO Adhered Roofing Systems

"Attachment II"

Withdrawal Resistance Criteria
(When insulation is to be Mechanically Attached)

January 2010

A. Withdrawal resistance testing may be conducted by an independent laboratory, fastener manufacturer's representative or a representative of Versico. The results of the pullout tests must be documented and submitted to Versico when the pullout results are less than those listed below.

1. On **fibrous cement or gypsum decks**, a withdrawal resistance test is required with the Versico GypTec Fasteners. A minimum pullout value of 300 pounds per fastener must be achieved into gypsum decks. Pullout values into cementitious wood fiber decks must exceed 225 pounds per fastener.

2. For **steel decks lighter than 22 gauge** pullout tests must be conducted with Versico HPVX or InsulTite Fasteners to verify a minimum pullout value of 300 pounds per fastener can be achieved.

3. On **oriented strand board (OSB) decks** less than 5/8 inch thick, a withdrawal test is required with the Versico HPVX or InsulTite Fasteners to verify suitability of the deck. Pullout values into OSB decks must exceed 250 pounds per fastener.

4. On **lightweight insulating concrete decks**, where the Versico GypTec Fastener is specified, a minimum pullout of 300 pounds per fastener is required. For **lightweight insulating concrete poured over steel**, Versico HPVX or InsulTite Fasteners are recommended for use through the lightweight concrete into the steel deck below with a minimum pullout of 300 pounds per fastener.

B. On all other acceptable roof decks, a withdrawal resistance test is strongly recommended.

C. On retrofit projects, a core cutter shall be used to remove existing roofing material prior to conducting the withdrawal resistance test (even if the existing roofing membrane is specified to remain). Existing roofing materials could contribute to a higher, misleading pullout value. The following minimum trial fastener samples must be installed and tested over the roof deck at each level:

1. For each roof level of 5,000 square feet or less, conduct a minimum of 3 pullouts.

2. For each roof level greater than 5,000 square feet and less than 20,000 square feet, conduct a minimum of 10 pullouts.

3. For each roof level greater than 20,000 square feet and less than 50,000 square feet, conduct a minimum of 15 pullouts.

4. For each roof level of 50,000 square feet and less than 100,000 square feet, conduct a minimum of 20 pullouts.

5. For each roof level greater than 100,000 square feet, conduct a minimum of 1 pullout per each 5,000 square feet.

Note: On projects with multiple roof levels, when pullouts are conducted on the main roof level, smaller canopies, overhangs, penthouses, etc., of 1,000 square feet or less will not require pullout tests providing these areas consist of the same decking material as the main roof level.

The trial fastener installations should be tested in various locations of the roof deck including roof corners and perimeter (areas parallel to the edge of the roof with a width which is 0.4 times the building height). Designate the test locations on a roof plan and include with the submittals to Versico, when requested.

VersiWeld VersiFleece TPO Adhered Roofing System
"Attachment III
20-Year Total System Warranty Projects
January 2010

Information contained in this Attachment outlines the necessary enhancements required for projects where a 20-year Total System Warranty is specified. At the applicator's or specifier's discretion, projects may be forwarded to the Versico System Design and Review Group for evaluation prior to installation.

A. **Restrictions/Applicability**

1. **VersiWeld VersiFleece TPO 115 Membrane** is required.
2. The building height shall be limited to maximum 100'.
3. All products specified for this roofing system must be products manufactured or marketed by Versico.
4. Shop drawings must include all pertaining details.
5. The minimum slope requirement is 1/8" per horizontal foot. Sufficient drainage must be provided by tapering the structure, the use of tapered insulation and the proper placement of roof drains. On existing projects, ponding of water should be eliminated through the addition of crickets and saddles.
6. On recover projects where the existing roofing material is to be left in place, all wet roofing material must be totally removed. A thorough roof investigation utilizing moisture scanning devices is strongly recommended.
7. Mechanical attachment of roof insulation is not permitted for projects with Fibrous Cement and Gypsum decks. DASH Adhesive must be used and peak gust wind speed shall be limited to 80 mph.

B. **Acceptable Deck Types**

1. Steel (22 gauge or heavier).
2. Structural Concrete (minimum 3,000 psi).
3. Plywood (minimum 15/32" thick).
4. Wood Planks (minimum 1" thick).
5. Fibrous Cement and Gypsum (insulation/underlayment secured with DASH Adhesive)
6. Lightweight Insulating Cellular Concrete (minimum 200 psi)

C. **Acceptable Insulation/Underlayment**

1. Minimum 1" Versico Polyisocyanurate.
2. Minimum 1/4" thick Dens-Deck over any Versico Insulation.
3. 1/2" thick Versico Recovery Board over any Versico insulation.
4. OSB/Polyisocyanurate Composite (supplied by Versico).
5. Minimum 7/16" OSB over any Versico insulation. OSB must be mechanically fastened.

D. **Insulation Securement**

1. DASH Adhesive may be used to attach polyisocyanurate, EPS, extruded polystyrene, Dens-Deck or Recovery Board.

2. When mechanical securement is specified:

   a. Minimum 1-1/2" Polyiso - 1 per 4 square feet.

   b. Polyisocyanurate less than 1-1/2" thick - 1 per 2 square feet.

   c. HP Recovery Board or Dens-Deck - 1 per 2 square feet.

   d. OSB Board - 17 per 4' x 8' board as outlined in Versico Specifications.

E. **Splice Requirements**

1. Along selvege edges, a minimum 1-1/2" wide hot air weld is required.

2. At end laps, butt membrane together and overlay with 6” wide Reinforced VersiWeld membrane hot air welded along all edges.

F. **Metal Accessories**

1. VersiTrim (secured with HPV Fasteners), VersiWeld Coated Metal or Metal Termination Bar/Gutter.

   Note: Conventional metal fascia systems which require flanges to be “stripped -in” are not acceptable.

2. Versico Termination Bar is required when a compression bar termination is specified and must be utilized with counterflashing by others.

3. Certain metal accessories by others may be used upon Versico’s acceptance.

G. **Warranty Wind Speed (Maximum Peak Gusts)**

1. 80 mph - adhered to standard Polyisocyanurate or 1/4” thick Dens-Deck.

VersiWeld VersiFleece TPO Roofing Systems
"Attachment IV"
Mechanically Attacheded Membrane Option
January 2010

A. General

As an option to fully adhering the VersiFleece Membrane to an approved substrate with DASH Adhesive, the membrane my be loose laid and mechanically fastened over an approved substrate to an acceptable deck type using Versico HPVX Fasteners and HPVX Plates.

B. Approved Deck Types

Minimum 22 gauge steel, minimum 1" thick wood planks or minimum 15/32" plywood. Projects incorporating other deck types should be submitted to Versico for review prior to installation.

C. Approved Substrates

Existing Type III or IV smooth built-up roofing, mineral surfaced cap sheets or modified bitumen. Substrate must be dry and free of debris or other contaminants.

D. Fastening Requirements

Projects shall not exceed 40' in height and must be located in Wind Zone 1 (up to 100 mph) or Wind Zone 2 (100-119 mph) as defined in Versico's VersiWeld Mechanically Attached Roofing System Specifications for 12' wide sheets.

6' or 12' wide membrane sheets shall be mechanically fastened to the roof deck with Versico HPVX Fasteners and HPVX Plates spaced a maximum of 12" on center along hot air welded field splices.

1. **Wind Zone 1** (Up to 100 mph):

   Steel and Wood Plank decks – A row HPVX Fasteners and HPVX Plates shall be positioned along the center of the **first 12' sheet around the building perimeter** spaced a maximum of 12" on center. VersiWeld Pressure-Sensitive Cover strips (in conjunction with TPO Primer) or 6" wide VersiWeld Reinforced membrane shall be used to overlay the fasteners and plates or use a 6' sheet.

   Plywood decks – Use a row of HPVX Fasteners and HPVX Plates along the center of the **first two full 12' membrane sheets** or use two rows of 6' sheets**.**

2. **Wind Zone 2** (100-119 mph):

   Steel and Wood Plank decks – A row HPVX Fasteners and HPVX Plates shall be positioned along the center of the **first two 12' sheets around the building perimeter** spaced a maximum of 12" on center. VersiWeld Pressure-Sensitive Cover strips (in conjunction with TPO Primer) or 6" wide VersiWeld Reinforced membrane shall be used to overlay the fasteners and plates or use 6' sheets.

   Plywood decks – Use a row of HPVX Fasteners and HPVX Plates along the center of the **first three full membrane sheets or** use three rows of 6' sheets**.**

3. Projects located in **Wind Zones 3 and 4 (120 mph or greater)** or projects with a building height greater than 40' must be submitted to Versico for review prior to installation for applicable enhancements.

E. Warranty

Projects meeting the conditions above can be eligible for a maximum 15 year System Warranty with wind speed coverage up to 55 mph peak gusts. Projects requiring a 20-year System warranty must be submitted to Versico for review prior to installation.

VersiWeld VersiFleece TPO Adhered Roofing Systems
"Attachment V"
Construction Generated Moisture

January 2010

A. While buildings should ultimately be designed to fit their intended purpose and accommodate their occupants, they must also tolerate various construction conditions (i.e., time of construction, material and process used).

In cold climatic regions, buildings in their construction phase will most likely experience an aggressive upward moisture drive as a result of hydration of freshly poured concrete floors and the practice of using oil or propane fired heaters.

According to NRCA:

1. Construction processes can release large quantities of water vapor. For example, wall or ceiling plaster or 4" thick concrete slabs release roughly one quart of water (2 pounds) for each square foot of surface area during the drying process. A building that is 120,000 square feet in size could experience up to 30,000 gallons of construction-generated moisture.

2. The combustion process of an oil-or propane-fired heater, used for temporary heat during construction, produces more water as a by-product of burning than the weight of the fuel consumed. Approximately one gallon of water will be produced for each gallon of heating oil burned. This generated moisture, if not addressed through ventilation or contained using vapor retarders, will subject the roof assembly to potential harmful effects that vary from mold accumulation to reduced insulation efficiency.

B. **Moisture Migration**

Moisture vapor penetrates a roof assembly either by **air leakage** or by **diffusion**.

1. **Air leakage** occurs through joints in the metal deck or tilt-up panels, insulation and joints and gaps around penetrations. Air leakage will also occur as a result of imperfections, such as punctures and tears.

2. **Diffusion** of moisture is caused by the differences in vapor pressure that occur with varying temperature conditions and relative humidities. The greater the temperature differential, the more active the moisture drive.

Air leakage can allow the transport of significantly greater amounts of moisture than can be transported by way of diffusion.

C. **Impact of Air Leakage**

Warm, humid air that infiltrates through gaps and joints will begin condensing beneath the roofing membrane and could freeze in colder temperatures. Hot, humid air will always seek the path of least resistance, thus, insulation joints become the most common route. High levels of moisture condensing along the insulation joints could eventually break the cell structure of polyiso insulation allowing gases to escape, which in turn promotes board shrinkage and possible edge collapse.

D. **Preventing Moisture Damage**

While occupancy generated moisture is usually addressed through the use of a vapor retarder, construction generated moisture can be addressed by simply incorporating multiple layers of insulation and staggering the joints. This will significantly reduce air leakage, which is responsible for the transport of greater amounts of moisture into the assembly.

NRCA recommends 2 or more layers of roof insulation, which has long been recognized as an advantage in terms of eliminating heat transfer and maximizing roof system efficiency. Studies have also revealed an 8 - 10 % reduction in energy costs between assemblies with equal R-Value when designed with multiple layers versus those designed with a single layer of insulation.

Metric Conversions

Length
1/8 inch = 3 mm
1/4 inch = 6 mm
7/16 inch = 11 mm
15/32 inch = 12 mm or 1.2 cm
1/2 inch = 13 mm or 1.3 cm
5/8 inch = 16 mm or 1.6 cm
3/4 inch = 19 mm or 1.9 cm
1 inch = 2.5 cm
1-1/4 inches =3.8 cm
1-1/2 inches = 4 cm
2 inches = 5 cm
3 inches = 8 cm
4 inches = 10.5 cm
5 inches = 13 cm
5-1/2 inches = 14 cm
6 inches = 16.5 cm
9 inches = 23 cm
12 inches = 31 cm
18 inches = 46 cm
24 inches = 61 cm
30 inches = 76 cm
3 feet = .9 m
4 feet = 1.2 m
5 feet = 1.5 m
6 feet = 1.8 m
8 feet = 2.4 m
10 feet = 3 m
12 feet = 3.7 m
50 feet = 15 m
75 feet = 23 m
100 feet = 30 m
250 feet = 76 m
300 feet = 92 m

Welding Speed
10 feet per minute = 3 m per minute
15 feet per minute = 4.6 m per minute

Thickness
.045 inch = 1.1 mm
.060 inch = 1.5 mm

Drum Sizes
15 gallon = 57 liters
50 gallon = 190 liters

Slope
2 inches in 12 inches = 16 cm/m
3 inches in 1 horizontal foot = 25 cm/m
5 inches in 12 inches = 41 cm/m
18 inches in 12 inches = 150 cm/m

Fastening Rate
1 per 2 square feet = 1 per 1.86 m^2
1 per 4 square feet = 1 per 3.72 m^2
1 per 5.3 square feet = 1 per 4.93 m^2
1 per 6.4 square feet = 1 per 5.95 m^2

Weight
80 pounds = 36 kg
100 pounds = 45 kg
150 pounds = 68 kg
300 pounds = 136 kg
360 pounds = 163 kg
500 pounds = 227 kg
800 pounds = 363 kg

Wind Speed
55 mph = 88.5 km per hour
72 mph = 116 km per hour
80 mph = 129 km per hour
90 mph = 145 km per hour
100 mph = 161 km per hour
120 mph = 193 km per hour

Temperature
32° Fahrenheit = 0° Celsius
40° Fahrenheit = 5° Celsius
60° Fahrenheit = 16° Celsius
70° Fahrenheit = 21° Celsius
80° Fahrenheit = 27° Celsius
90° Fahrenheit = 32° Celsius
120° Fahrenheit = 49° Celsius
185° Fahrenheit = 85° Celsius
1000° Fahrenheit = 538° Celsius

Compressive Strength
225 psi = 15.8 kg/cm^2
3,000 psi = 211 kg/cm^2