



## Part I - Design Criteria

May 2009

# WeatherBond PRO Weld-Free TPO Fully Adhered and Mechanically Attached Systems

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# WeatherBond PRO Weld-Free TPO Fully Adhered and Mechanically Attached Systems

May 2009

## Part I - Design Criteria

The information contained herein is to serve as the design of WeatherBond's Fully Adhered and Mechanically Attached Weld-Free TPO Membrane Roofing Systems using White Peel & Stick/Pressure Sensitive TPO Accessories. Installers and customers are advised to fully familiarize themselves with this section and the applicable "Application" Section, Part II, prior to completing the project specifications.

Information pertaining to the WeatherBond products utilized with these roofing systems can be found in the "Products" Section included in this manual.

### A. DESCRIPTION

1. **The Fully Adhered Roofing System** incorporates **WeatherBond PRO White TPO** 45, 60, 72 or 80-mil membrane with White Peel & Stick/Pressure Sensitive Accessories. An acceptable insulation is mechanically-attached to the roof deck or adhered with WeatherBond supplied urethane-based insulation adhesive or hot asphalt and the TPO membrane is adhered to the insulation with Substrate Adhesive. Adjoining sheets of TPO membrane are spliced together using Peel & Stick Seam Tape/TPO Primer. There are no maximum slope restrictions for the application of this roofing system.
2. **The Mechanically Attached Roofing System** incorporates 45, 60, 72 or 80-mil **TPO** membrane. An acceptable insulation is mechanically fastened to the roof deck and the reinforced membrane is mechanically attached with the WeatherBond HPWX Fastener and 2 3/8" diameter Fastening Plates secured 6" minimum to 12" maximum on center, depending on project criteria, along the center of the membrane splice.

Adjoining sheets of TPO membrane are spliced together using Peel & Stick Seam Tape/TPO Primer and HPWX Fasteners and 2 3/8" Seam Fastening Plates. Field membrane sheets are either 8', 10' or 12' wide depending upon wind load requirements, building height and type of roof deck. At the roof perimeter, a heavier fastening density is required utilizing 4', 5' or 6' wide sheets or 10" wide Pressure Sensitive TPO RUSS (Reinforced Universal Securement Strip). The maximum roof slope for this roofing system is 18" in one horizontal foot.

### B. DESIGN CONSIDERATIONS

1. The following projects should be sent to WeatherBond for review prior to installation and preferably prior to bid to ensure WeatherBond'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.
  - c. Fully Adhered Roofing System projects over 250' in height.
  - d. Mechanically Attached Roofing System projects exceeding the heights identified in "Attachment MA-1," Membrane Securement Criteria, at the end of this section.

2. Petroleum based products; certain chemicals and waste products (i.e., grease, oil, animal fats, etc.) are not compatible with these roofing systems. WeatherBond should be contacted for verification of compatibility and recommendations concerning an acceptable roofing assembly.
3. It is the responsibility of the specifier and installer to review local, state and regional codes to determine their impact on the specified WeatherBond Roofing System.
4. Coordination between various trades is essential to avoid unnecessary rooftop traffic over completed sections of the roof and to prevent subsequent damage to the membrane roofing system.
5. 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.
6. The WeatherBond PRO White TPO membrane meets the ENERGY STAR® Roofing Products program guidelines for energy efficiency. This product will 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.

8. **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.

**WeatherBond 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 loads 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. When the slope of the taper exceeds 2" to one horizontal foot additional membrane securement at the base of the tapered edge strip, cricket or saddle will be required.
  - d. On **WeatherBond PRO White TPO Fully Adhered Roofing Systems**, a slope greater than 1/8" per horizontal foot is recommended to serve the long-term aesthetics.
9. 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," Construction Generated Moisture, for additional information.
  10. 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.

11. **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 a filler for voids created by removal of old insulation or membrane.

- b. Entrapment of water between the 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**, WeatherBond recommends the existing membrane be perforated to avoid potential moisture accumulation and to allow the 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 the existing membrane must be cut into maximum 10' by 10' sections. All PVC flashings at the perimeter, roof drains and roof penetrations must be removed.

### C. QUALITY ASSURANCE

1. WeatherBond recommends the use of WeatherBond supplied products for use with these WeatherBond Roofing Systems. The performance or integrity of products by others, **when selected by the specifier and accepted as compatible by WeatherBond**, is not the responsibility of WeatherBond and is **disclaimed** by the WeatherBond Warranty.
2. The roofing system must be installed in compliance with drawings and specifications as approved by WeatherBond.
3. There should be no deviations made from WeatherBond's specification or WeatherBond's approved shop drawings without the **PRIOR WRITTEN APPROVAL** of WeatherBond.

### D. WARRANTY

A Membrane Warranty is available for roofing systems on residential and commercial buildings within the United States and applies only to **membrane manufactured or marketed by WeatherBond**.

1. A **15-year Membrane Warranty** for 45-mil membrane for residential and commercial applications.
2. A **Limited Lifetime Membrane Warranty** for 60-mil and thicker membrane for residential applications.
3. A **20-year Membrane Warranty** for 60-mil and thicker membrane for commercial applications.

**CAUTIONS:** Industrial pollutants, environmental dirt, and ponding conditions will discolor the surface of the WeatherBond PRO TPO membrane. Lack of additional membrane protection during application will increase the probability of soiling the white surface of the WeatherBond PRO TPO membrane and will affect the aesthetics of the roofing system. All these factors will result in color variations of the WeatherBond PRO TPO membrane in comparison to the original undisturbed membrane. When aesthetics are of importance, the specifier's requirements must be added in the project specifications pertaining to precautionary installation methods and necessary clean up procedures.

**WeatherBond disclaims responsibility for the cleanliness or discoloration of the membrane system caused by environmental conditions including, but not limited to, dirt, pollutants, biological agents and discoloration caused by or resulting from the initial installation.**

#### 4. Access for warranty service

It shall be the owner's responsibility to expose the membrane in the event warranty service is required when access is impaired. Such impairment includes, but is not 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 WeatherBond with reasonable access to the membrane system for purposes of warranty investigation and related repairs.
- d. Severely ponded conditions.

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

5. 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 WeatherBond and WeatherBond 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.

#### **F. ROOF DECK/SUBSTRATE CRITERIA**

1. Proper decking shall be provided by the building owner. The building owner or its designated representative must ensure that 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. Withdrawal resistance tests are strongly suggested to determine the suitability of a roof deck. Refer to "Attachment I" at the end of this section for identification of approved decks and proper procedures for conducting pullout tests.
3. For direct application over an acceptable roof deck/substrate or when HP Protective Mat is specified and approved by WeatherBond as the membrane underlayment in accordance with the following chart, 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 an appropriate material.
4. On retrofit projects, all existing phenolic insulation must be removed.
5. The following chart identifies the **acceptable roof decks/substrates** and the **minimum underlayment** requirements for WeatherBond PRO TPO Roofing Systems.

Construction Type	Acceptable Roof Deck/Substrate	Mechanically Attached	Fully Adhered
New Construction	Steel (min. 22 gauge) (1) (2), Wood Plank (3/4" min.) and Fibrous Cement	Insulation	Insulation
	Structural Concrete (min. 3000 psi) or Gypsum	Insulation	Direct Application
	Plywood (min. 15/32" thick) or Oriented Strand Board (min. 7/16" thick)	Direct Application	Direct Application
	Lightweight Insulating Concrete	Direct Application	Direct Application (10)
Retrofit/No Tearoff	Existing Smooth Surface BUR (3) or Mineral Surface Cap Sheet	Direct Application (6)	Direct Application (6)
	Gravel Surfaced BUR (4) or Coal Tar Pitch (4) (5)	Insulation	Insulation
	Existing Single-Ply	Direct Application (8)	Insulation
	Modified Bitumen	Direct Application(6) (9)	Direct Application(6) (9)
	Sprayed-in-Place Urethane	Complete Tearoff Required	Complete Tearoff Required
Retrofit/Tearoff	Existing roof material removed (regardless of deck type)	Insulation	Insulation

**Notes:**

Refer to Paragraph I, Insulation/Underlayment, for various WeatherBond insulations approved with this roofing system.

- (1) Local codes must be consulted regarding thermal barrier requirements.
- (2) Mechanically Attached Systems cannot be specified on steel decks less than 22 gauge or for corrugated steel decks, regardless of gauge. Refer to the
- (3) Existing Type III or IV smooth asphalt BUR only.
- (4) Loose gravel must be removed to avoid entrapment of moisture.
- (5) Existing coal tar could drip into the building, especially when new insulation does not provide sufficient thermal value to prevent the surface of the coal tar from softening.
- (6) Possible staining/discoloration of the membrane may result when installing this system directly over existing smooth surfaced BUR or modified bitumen. If aesthetics are critical, an approved insulation should be specified beneath the membrane.
- (7)
- (8) An approved underlayment is **required** over existing ballasted single-ply systems and PVC roofing systems of any type.
- (9) Direct application permitted over smooth surfaced modified bitumen. Membrane shall be positioned with length of sheets parallel to modified bitumen field seams. At end laps or other locations where Seams intersect modified bitumen field seams. 6" wide Peel & Stick Uncured Flashing must be applied over intersections.
- (10) New approved cellular or perlite lightweight insulating concrete must have a minimum compressive strength of 225 psi. Except when the lightweight concrete is poured over slotted steel decks, pressure relief vents must be installed every 2,000 square feet in accordance with WeatherBond Detail WBPA-8. Direct application is not permitted where lightweight concrete is poured over an existing roofing material. Equilibrium moisture content after hydration/curing shall not exceed 12%. Refer to Part II "Application", Attachment III for additional requirements.

**G. WOOD NAILERS**

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

1. Wood nailers are required for securement of metal edgings and scuppers, certain curbs, pourable sealer pockets, pipes, etc., as shown on the applicable detail. **Parapet walls and most curbs do not require utilization of wood nailers.**

**Note:** The width of nailers must exceed the width of metal flange of edgings, scuppers, etc.

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 any of the wood preservatives such as, Creosote, Pentachlorophenol, Copper Naphthenate and Copper 8-quinolinolate will adversely affect the TPO 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, May 1998) contains options for the spacing and sizing of fasteners.
4. Wood nailers are not covered by the WeatherBond 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.

**I. INSULATION/UNDERLAYMENT**

1. 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 the insulation thickness to ensure the temperature at the vapor retarder will not fall below the calculated dew point.
2. Multiple layers of insulation are recommended with all joints staggered between layers.
3. Restrictions:
  - a. WeatherBond Roofing Systems cannot be specified in conjunction with Phenolic Insulation.
  - b. Fiberglass insulation cannot be specified with WeatherBond’s Fully Adhered and Mechanically Attached Roofing Systems, even if overlaid with additional insulation or membrane underlayment.
  - c. Do not specify perlite boards directly under the TPO membrane on Fully Adhered or Mechanically Attached Roofing Systems.

**4. WeatherBond Insulation/Underlayment**

<b>WeatherBond Insulation</b>	<b>Minimum Thickness</b>	<b>Mechanically Attached</b>	<b>Fully Adhered</b>
HP Recovery Board	1/2"	Acceptable (1)	Acceptable (1)
Dens-Deck/Dens-Deck Prime	1/4"	Acceptable (6)	Acceptable (Dens-Deck Prime only) (6)
EPS Composite Board	1-1/4"	Acceptable (2,3)	Acceptable (2,3)
EPS overlaid with HP Recovery Board or Dens-Deck/Dens Deck Prime	1-1/4"	Acceptable (2,3)	Acceptable (2,3)
Thermapink 18 and 25 Dow Styrofoam or Recovermate Extruded Polystyrene	1/2"	Acceptable (2,3,4,5)	Not Acceptable (must be overlaid with approved insulation)
Polyisocyanurate Insulation	1"	Acceptable	Acceptable

**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 at least specified with 1/2" thick gypsum board or 3/4" thick perlite.
  - (2) Local codes must be consulted regarding the acceptance of expanded or extruded polystyrene insulation directly over steel decks.
  - (3) EPS, the EPS surface of EPS Composite Board, Foamular or Dow roof insulation cannot be installed directly over coal-tar pitch roof surfaces.
  - (4) Foamular or Dow insulation cannot be installed directly over existing PVC membranes. A layer of protective mat must be specified as a separator.
  - (5) Foamular or Dow insulation cannot be installed directly under gray or tan WeatherBond PRO TPO membrane.
- Dens-Deck/Dens-Deck Prime is recommended for use on top of an approved insulation. Their direct use over an existing roofing membrane or monolithic roof deck is not permitted for projects with a 20-year warranty. Tapered EPS, ThermaPink 25, Dow Deckmate or Deckmate Plus and Polyisocyanurate Insulations are also available.

## J. INSULATION ATTACHMENT

### 1. Fully Adhered Roofing Systems

- a. **Insulation (by others)** must be mechanically secured to the roof deck with **one 3" diameter plate and fastener every 2 square feet except as follows:**

For **structural concrete, minimum 22 gauge steel or minimum 15/32" thick plywood decks:**

- 1) When a single or top layer of **minimum 1-1/2" thick Polyisocyanurate (by others)** is specified, the WeatherBond or approved Insulation may be secured at the minimum rate of 1 per 3.2 square feet (**10 WeatherBond Fasteners and Plates per 4' x 8' board; 5 fasteners per 4' x 4' board**).
  - 2) When a single or top layer of **minimum 2" thick WeatherBond or Polyisocyanurate (by others)** Insulation is specified, the WeatherBond or approved insulation may be mechanically secured with **one WeatherBond Fastener and Plate every 4 square feet**.
  - 3) **Dens-Deck Prime** (1/4" or 1/2" thick) may be fastened at the rate of 12 fasteners/plates per 4' x 8' board (1 per 2.67 square feet). **Dens-Deck Prime** (5/8" thick) may be fastened at the rate of 8 fasteners/plates per 4' x 8' board (1 per 4 square feet).
  - 4) **On reroof/no tearoff projects** with a maximum roof height of 40' **any WeatherBond or approved insulation** (i.e., Recovery Board, Polyisocyanurate Insulation less than 1-1/2" thick) may be secured at the minimum rate of **11 fasteners per 4' x 8' board (5 fasteners per 4' x 4' board)**.
- 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 WeatherBond Detail WBWF-27.4. If OSB is to be specified in conjunction with WeatherBond urethane based insulation adhesive, a composite board is recommended.
- c. **Alternate Insulation Attachment Methods**
- 1) **WeatherBond FAST Adhesive**, a spray-applied, two-component, low-rise urethane adhesive may be specified for insulation attachment in lieu of mechanical securement. Refer to "**Attachment III**" in Part II, Application, in the Fully Adhered Roofing System Specification for requirements.
  - 2) **DASH DC**, a two-component polyurethane adhesive applied in approximately 1/2" - 3/4" beads spaced a maximum of 12" on center in the field of the roof and 6" on center at the perimeter (based on building height) may be utilized. Refer to the applicable WeatherBond Technical Data Bulletin for specific installation instructions.
  - 3) The building owner or specifier may select an alternate insulation attachment method, which incorporates a **solid mopping** of insulation **with hot asphalt**.
  - 4) When adhesive marketed by others is specified, contact the respective manufacturer regarding specific installation requirements and available warranty coverage. WeatherBond warranties exclude products not supplied or marketed through WeatherBond.

### 3. Mechanically Attached Roofing Systems

- a. Either 2 3/8" diameter WeatherBond Seam Fastening Plates or 3" diameter WeatherBond Insulation Fastening Plates with WeatherBond Fasteners may be used for insulation securement.

**Note:** WeatherBond Approved urethane based insulation adhesive may be used for insulation attachment.

- b. When fasteners and plates by others are specified, they must be recommended by the respective manufacturer and accepted by WeatherBond prior to installation.
- c. **WeatherBond Recovery Board, Dens-Deck/Dens-Deck Prime or Polyisocyanurate** insulation must be mechanically secured to the roof deck with a minimum of **1 fastener and plate every 8 square feet**. Refer to Detail WFA-27.1 for fastening pattern.



**CAUTION:** Polyisocyanurate Insulation with a thickness **less than 1-1/2"** installed **over an existing roofing membrane** without a tearoff must be mechanically fastened to the roof deck with a **minimum of 1 fastener and plate every 4 square feet**. Refer to Detail WFMA-27.2 for fastening pattern.

- d. **Foamular Durapink or DOW Recovermate** extruded polystyrene insulation must be fastened at a minimum rate of **1 fastener and plate per 4 square feet**. Refer to Paragraph I.4, WeatherBond Insulation/Underlayment, for applicability and restrictions. Fastening pattern shall conform to WeatherBond Detail WFA-27.3.
- f. When standard **gypsum board** is specified as membrane underlayment, it must be fastened no less than 1 insulation fastener/plate every 8 square feet. Refer to Detail WFMA-27.1.

## **K. MEMBRANE**

For identification of physical properties, refer to the "Products" Section included with this manual.

### **1. Fully Adhered Roofing Systems**

- a. WeatherBond PRO TPO Reinforced Membranes - 45, 60, 72 or 80-mil may be specified:

### **3. Mechanically Attached Roofing Systems**

45, 60, 72 or 80-mil reinforced TPO membrane may be specified. Membrane is available in widths of 4', 5', or 6' to be used as a perimeter membrane sheet and 8', 10' and 12' to be used as field membrane sheets.

## **L. MEMBRANE SECUREMENT CRITERIA**

### **a. Mechanically Attached Roofing Systems (membrane fastening)**

- a. WeatherBond fasteners and fastening Plates must be used for membrane securement and are dependent on the roof deck type. Refer to "Attachment II", Withdrawal Resistance Criteria, at the end of this section, for specific fastener and plate requirements.
- b. The **field and perimeter membrane width and fastening** requirements are **dependent** upon the project **wind zone, building height and deck type** and are outlined in "Attachment III" at the end of this section.

### **b. Fully-Adhered Roofing System (membrane bonding)**

Maximum 12' wide WeatherBond PRO TPO Membrane is fully adhered to an approved insulation or substrate with WeatherBond PRO TPO Bonding Adhesive or WeatherBond PRO TPO Low VOC Bonding Adhesive. The Bonding Adhesive shall be applied to both the membrane and the surface to which it is being bonded at a coverage rate of approximately 60 square feet per gallon per finished surface (includes coverage on both membrane and the substrate).

As an option, AquaBase 120 Bonding Adhesive (water-based) may be used when applied to both the membrane and the surface to which it is being bonded at a coverage rate of approximately 120 square feet per gallon per finished surface (includes coverage on both membrane and the substrate).

## **M. MEMBRANE SPLICING**

Adjoining sheets of TPO membrane are spliced together using PS Seam Tape/TPO Primer. Refer to Part II, "Application Section" for specific requirements for individual roofing systems.

## **N. ADDITIONAL MEMBRANE SECUREMENT**

Additional membrane securement is required at the perimeter of each roof level, roof section, curb, skylight, interior wall, penthouse, etc., at any inside angle change where slope or combined slopes exceed 2" in one horizontal foot, and at other penetrations in accordance with the applicable WeatherBond details.

Securement may be achieved as follows:

1. On **Mechanically Attached Roofing Systems**, WeatherBond HPWX fastening Plates are used to secure membrane at the base of walls and penetrations and flashed as shown on the applicable WeatherBond detail (excluding OSB, cementitious wood fiber and gypsum decks where required WeatherBond fastener is installed with associated 2 3/8" diameter plate).
2. As an option, **TPO PS RUSS** 6" wide strip of reinforced WeatherBond PRO TPO membrane, may be installed in conjunction with WeatherBond fasteners and 2 3/8" diameter Seam fastening Plates spaced a maximum of 12" on center below the membrane (HPWX fasteners and HPWX Plates are required for Mechanically Attached Roofing Systems over steel and wood decks). The securement strip shall be installed horizontally at the base of walls or penetrations.

The underside of deck membrane is primed with TPO Primer, spliced to the RUSS and continued as wall flashing resulting in continuous membrane flashing without penetration of the deck membrane.

3. On **Mechanically Attached Roofing Systems**, when mechanical securement is not provided in some of the WeatherBond PRO TPO Details (i.e., pipes and sealant pockets), additional fastening Plates must be used for membrane securement. The plates must be positioned a maximum of 12" away from the penetration, spaced a maximum of 12" on center and flashed in accordance with the applicable WeatherBond Detail.

## O. 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 bar terminations directly to wall surface.
3. WeatherBond's Termination Bar, in conjunction with WeatherBond Water Cut-Off Mastic, should be specified under all metal counterflashings.
4. The removal of existing **loose** flashing must be specified. New flashing must not extend above throughwall counterflashing and must not conceal any weep holes.
5. The specifier must examine structural supports for rooftop equipment to determine if reasonable access to the membrane beneath the equipment is provided.
6. Bitumen based roof cement must be removed or concealed with an acceptable underlayment.
7. **Peel & Stick Uncured Flashing** must be limited to overlayment of vertical seams (as required at angle changes, splice intersections), or to flash inside/outside corners, vent pipes, scuppers and other unusually shaped penetrations where use of pre-molded pipe flashings or pressure sensitive Coverstrip is not practical.
8. In areas where metal counterflashing or surface mounted reglets are used, they must be sealed with a rubber grade caulking to prevent moisture migration behind the new wall flashing.
9. When **hot pipes** or similar penetrations exceed 180° F, they must be designed to incorporate an insulated metal collar and rain hood to maintain a surface temperature less than 180° F for protection of the flashing.
10. 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 applicable Common Detail.
11. **Existing Roof Tie-Ins**

Depending on the type of the existing roofing system, the tie-in method will vary. Total isolation between 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 the selected detail will not restrict drainage. Refer to the BWFC-13 Details for specific criteria or consult WeatherBond.

**P. METAL WORK**

1. Termination bars and surface mounted reglets must be installed directly to the wall surface.
2. Metal work by others, when specified, must be fastened to prevent the metal from pulling free or buckling and sealed to prevent moisture from entering the roofing system or building.
3. **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 WeatherBond's current details.

**Q. ROOF WALKWAYS (Not Covered by the WeatherBond Warranty)**

Pavers are not recommended for use as walkways where roof slopes exceed 2" per horizontal foot.

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Foamular and DuraPink are a Trademarks of Owens Corning  
Styrofoam is a Trademark of Dow Chemical Company

This specification represents the applicable information available at the time of its publication. Owners, specifiers and WeatherBond authorized roofing applicators should consult WeatherBond or their WeatherBond Independent Sales Representative for any information that has subsequently been made available.

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

# Fully Adhered and Mechanically Attached Roofing Systems

## “Attachment I”

### Withdrawal Resistance Criteria

May 2009

- A. The following chart indicates the appropriate WeatherBond fastener for use with the referenced roof deck and includes the **minimum pullout** and fastener penetration requirements for membrane/insulation securement on Mechanically Attached Roofing Systems and for insulation attachment on Fully-Adhered Roofing Systems.

Deck Type	Minimum Pullout	Approved Fasteners & Plates for membrane securement on Mechanically Attached Systems (1) and approved fasteners for insulation attachment on Fully Adhered Systems (5)	Minimum Penetration
Steel, 22 gauge or heavier (2)	500 pounds (Mechanically Attached)	HPWX fasteners & HPWX (2 3/8") Plates	3/4"
	360 pounds (Fully-Adhered)	HPWX, or Insulation fasteners	
Steel, less than 22 gauge (3)	300 pounds (Fully-Adhered only) (3)	HPWX, or Insulation fasteners	3/4"
Lightweight Insulating Concrete over Steel (4)	360 pounds	HPWX fasteners & HPWX Plates (Mechanically Attached)	3/4"
		HPWX, or Insulation fasteners (Fully-Adhered)	
Structural Concrete, rated 3,000 psi or greater	800 pounds	Contact WeatherBond	1"
Wood Planks and Plywood, min. 15/32" thick APA Grade CDX	360 pounds	HPWX fasteners & HPWX Plates or (Mechanically Attached)	1" (Max. 1-1/2" on wood planks)
		HPWX, or Insulation fasteners (Fully-Adhered)	
Oriented Strand Board (OSB), Min. 7/16" thick (7) APA Rated non-veneer	360 pounds (Mechanically Attached)	HPWX fasteners & HPWX Plates	1"
	250 pounds (Fully-Adhered)	HPWX	1"
Cementitious Wood Fiber and Gypsum	300 pounds	Contact WeatherBond	1-1/2"

**Notes:**

1. For membrane fastening density requirements, refer to Attachment III at the end of this section.
2. Mechanically Attached Roofing Systems are not permitted over corrugated steel decks, regardless of gauge.
3. Mechanically Attached Roofing Systems are not permitted over steel decks less than 22 gauge unless used in conjunction with lightweight insulating concrete and acceptable pullouts are obtained using HPWX fasteners.
4. fasteners are installed through the lightweight insulating concrete into the steel deck below.
5. For Fully-Adhered systems, only 3" diameter insulation fastening plates can be used for insulation attachment.

- B. Withdrawal resistance testing may be conducted by an independent laboratory, fastener manufacturer or a representative of WeatherBond on the following roof decks. The results of the pullout tests must be documented and submitted to WeatherBond when the pullout results are less than listed above.

1. Cementitious wood fiber or gypsum
2. Lightweight insulating concrete over steel decks lighter than 22 gauge
3. Minimum 7/16" thick oriented strand board (OSB)

4. For 22 gauge steel, wood plank, plywood or structural concrete decks, a withdrawal resistance test is strongly recommended.
5. **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 will contribute to a higher, misleading pullout value.
6. The following minimum trial fastener samples must be installed and tested over the roof deck at each level:
  - a. For each roof level of 5,000 square feet or less, conduct a minimum of 3 pullouts.
  - b. For each roof level greater than 5,000 square feet and less than 20,000 square feet, conduct a minimum of 10 pullouts.
  - c. For each roof level greater than 20,000 square feet and less than 50,000 square feet, conduct a minimum of 15 pullouts.
  - d. For each roof level greater than 50,000 square feet and less than 100,000 square feet, conduct a minimum of 20 pullouts.
  - e. 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.
7. The trial fastener installations must be tested in various locations of the roof deck including roof corners and perimeters (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 WeatherBond when requested.

# WeatherBond PRO Weld-Free TPO Mechanically Attached Roofing Systems "Attachment MA-1"

## Membrane Securement Criteria

May 2009

- A. For designation of wind zones listed on the following chart, refer to Basic Wind Speed Map in this Attachment. If Factory Mutual approvals are specified, contact WeatherBond for fastener/plate options and additional membrane securement requirements, which may be applicable.

To determine appropriate securement requirements, identify project wind zone from the map (at the end of this section) and select the chart based on project deck type. The building height is then used to determine membrane securement requirements for the project.

Wind Zone	Deck Type (1)	Building Height	Field Membrane Width	Fastening Density (Field & Perimeter Sheets)
<b>Zone 1 Up to 100 MPH</b>	Steel, Lightweight Insulating Concrete over Steel, Structural Concrete, Wood Planks	Max. 40'	12'	12" O.C.
	Steel, Lightweight Insulating Concrete over Steel, Structural Concrete, Plywood, Wood Planks or Oriented Strand Board (3)	Max. 75'	10'	12" O.C.
	Gypsum and Cementitious Wood Fiber	Max. 75'	10' 8'	9" O.C. 12" O.C.
<b>Zone 2 100-119 MPH</b>	Steel, Lightweight Insulating Concrete over Steel, Wood Planks (New or Tearoff)	Max. 40'	12'	6" O.C.
	Steel, Lightweight Insulating Concrete over Steel, Wood Planks (Reroof/No Tearoff)	Max. 40'	12'	12" O.C.
	Steel, Lightweight Insulating Concrete over Steel, Plywood, Wood Planks or Oriented Strand Board (3)	Max. 50'	10'	12" O.C.
	Structural Concrete	Max. 40'	12'	12" O.C.
		Max. 75'	10'	12" O.C.
	Gypsum and Cementitious Wood Fiber	Max. 50'	10' 8'	9" O.C. 12" O.C.
<b>Zone 3 120-129MPH (4)</b>		Steel, Lightweight Insulating Concrete over Steel	Max. 75'	10' 8'
	Max. 50'		10'	12" O.C.
	Plywood, Wood Planks (2), Oriented Strand Board (3), Gypsum and Cementitious Wood Fiber	Max. 50'	8'	9" O.C.
		<b>Zone 4 130 MPH or Greater</b>	Steel or Lightweight Insulating Concrete over Steel	Max. 75'
Max. 50'	8'			12" O.C.
Plywood, Wood Planks (2), Oriented Strand Board, Gypsum or Cementitious Wood Fiber	<b>NOT ACCEPTABLE (2)</b>			

Notes:

1. Refer to "Attachment II, for minimum roof deck/pullout requirements and the required WeatherBond Fastener.
2. On plywood or wood plank decks, if pullout tests exceed 425 pounds per fastener, the membrane securement requirements for steel decks may be followed providing the pullout tests are submitted to WeatherBond for approval.
3. On oriented strand board decks less than 5/8" in thickness, HPWX fasteners are required for membrane securement. For oriented strand board decks 5/8" thick or greater, HPWX fasteners may be used for membrane securement if a minimum pullout value of 360 pounds can be achieved.
4. Those areas located between wind zone contours of 120-129 MPH within 20 miles of the coastline shall be considered as a Zone 4 Wind Zone.

- B. **Perimeter sheets are required along the roof perimeter**, which is defined as all edges of each roof section. Where multi-level roofs meet at a common wall, the adjacent edge of the upper roof is treated as a roof perimeter if the difference in height is greater than 3'. Perimeter sheets are not required at the base of the wall at the lower level. Refer to Detail WFMA-2 in Part II "Application" for further information.

The number of perimeter sheets required is dependant on project wind zone and building height as identified in the chart below. **At roof ridges** (when slopes exceed 3" to the horizontal foot), one perimeter membrane sheet, centered approximately over the roof ridge is required.

1. **When using 12' and 10' wide field sheets, 6' or 5' wide perimeter sheets** are utilized along roof edges
2. **When using 8' wide field sheets, 4' wide perimeter sheets** are utilized along roof edges.
3. As an option to the use of perimeter sheets, 10" wide TPO PS RUSS can be used beneath the field sheets to create perimeter sheets. Refer to the WeatherBond PRO Weld-Free TPO Mechanically Attached Application Section, Part II, for specific requirements.

Wind Zone	Building Height	# of Perimeter Sheets Required (Note 1)
Up to 100 mph (Zone 1)	Up to 50'	1 or 2 (Note 2)
	51 to 75'	2
100 to 129 (Zones 2 & 3)	Up to 75'	2 (Note 3)
130 mph or Greater (Zone 4)	Up to 75'	4

**Notes:**

1. Fastener spacing for perimeter membrane sheets is equivalent to the fastener spacing for field sheets.
2. Two perimeter sheets required when 12' sheets are fastened 12" o.c.
3. Gypsum and cementitious wood fiber decks in Zone 3 require 3 perimeter sheets.

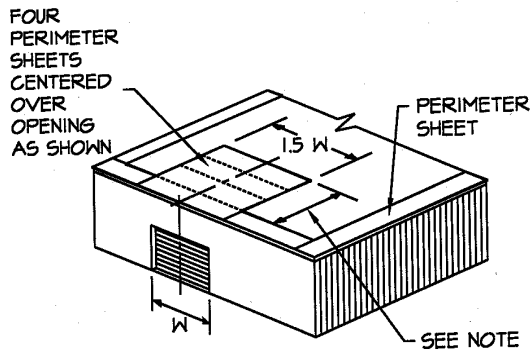
**B. Buildings With Large Openings and Overhangs**

When any wall contains major openings with a combined area, which exceeds 10% of the total wall area on which the openings are located, four (4) perimeter sheets (centered over the opening) must be specified as shown.

1. When using 12' or 10' wide field membrane sheets, 6' or 5' wide perimeter sheets are utilized. When using 8' wide field sheets, 4' wide perimeter sheets are utilized. 10" wide PS RUSS can also be used beneath the field sheets to create perimeter sheets.
2. As an option to the above perimeter securement, an adhered membrane section may be used in lieu of the mechanically attached membrane at large openings in accordance with the WeatherBond Specification for WeatherBond PRO Weld-Free TPO Fully Adhered Systems.

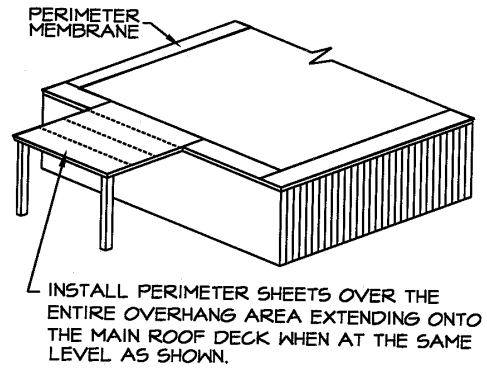
### Large Openings

Note: Fastening plates are required at the end laps of the Perimeter membrane sheets on both sides of the opened area



### Overhangs

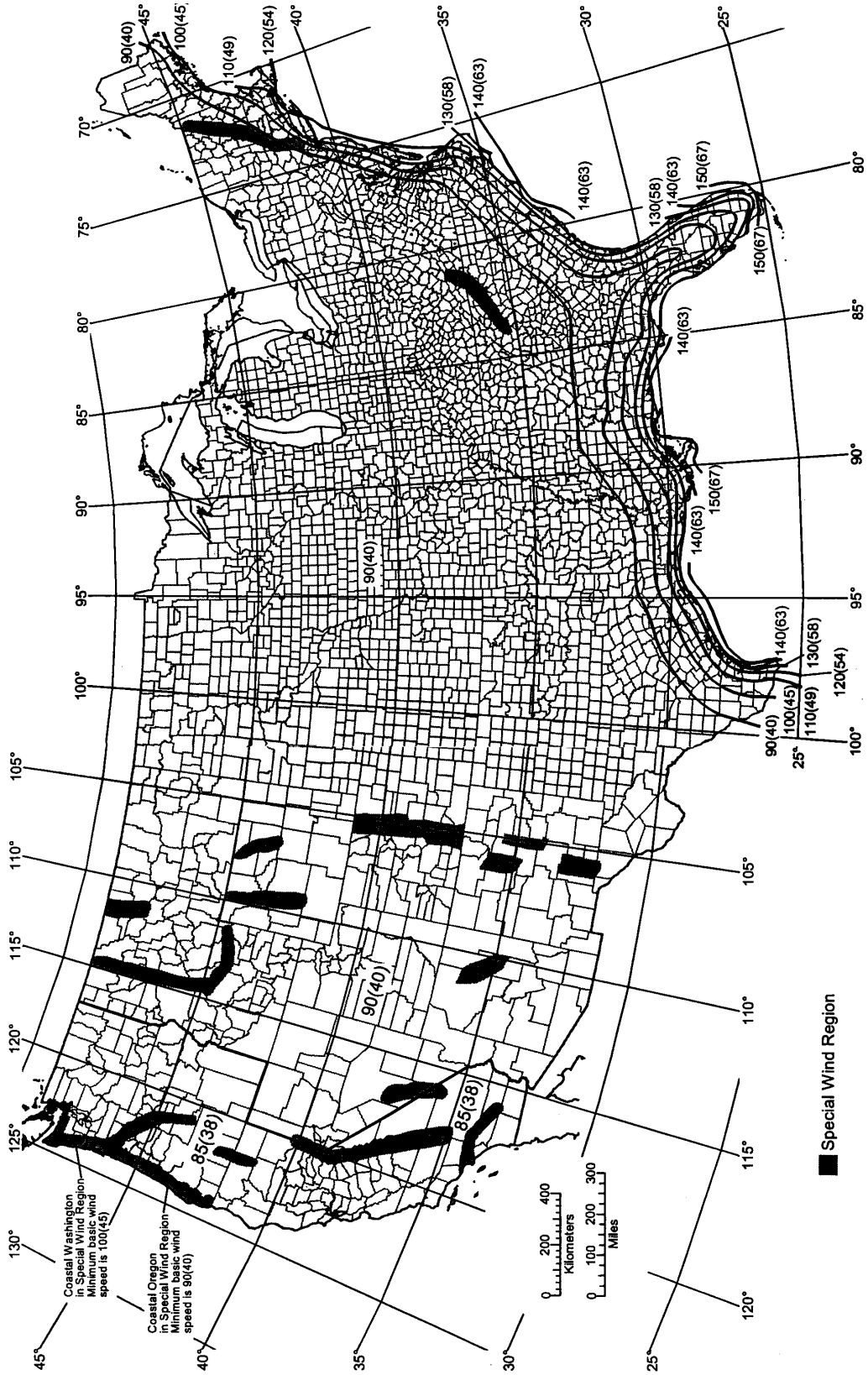
The membrane must be specified with perimeter sheets installed over the entire overhang area extending onto the main roof deck when at the same level.





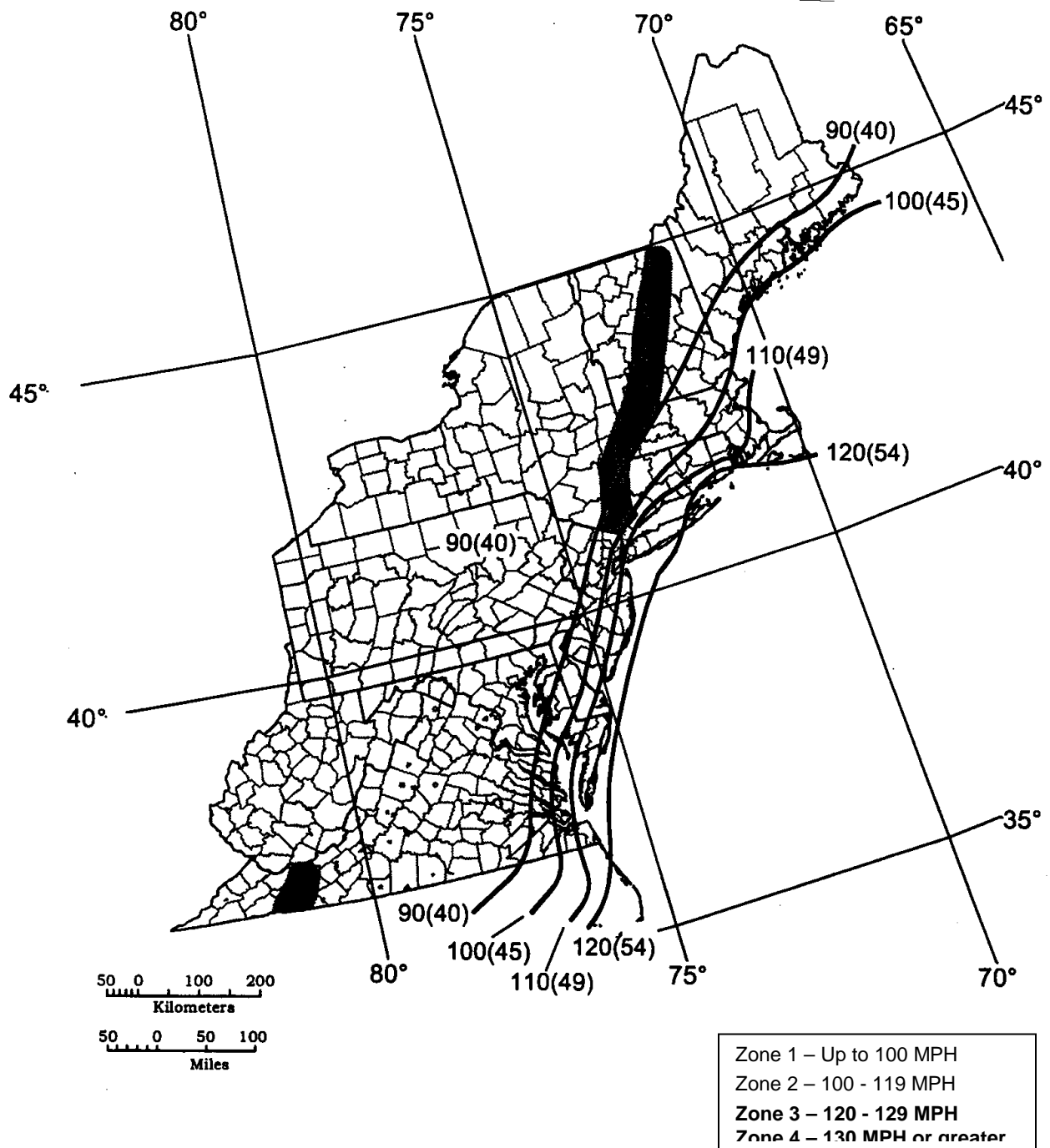
# Basic Wind Speed Map

(Based on ASCE 7-02)



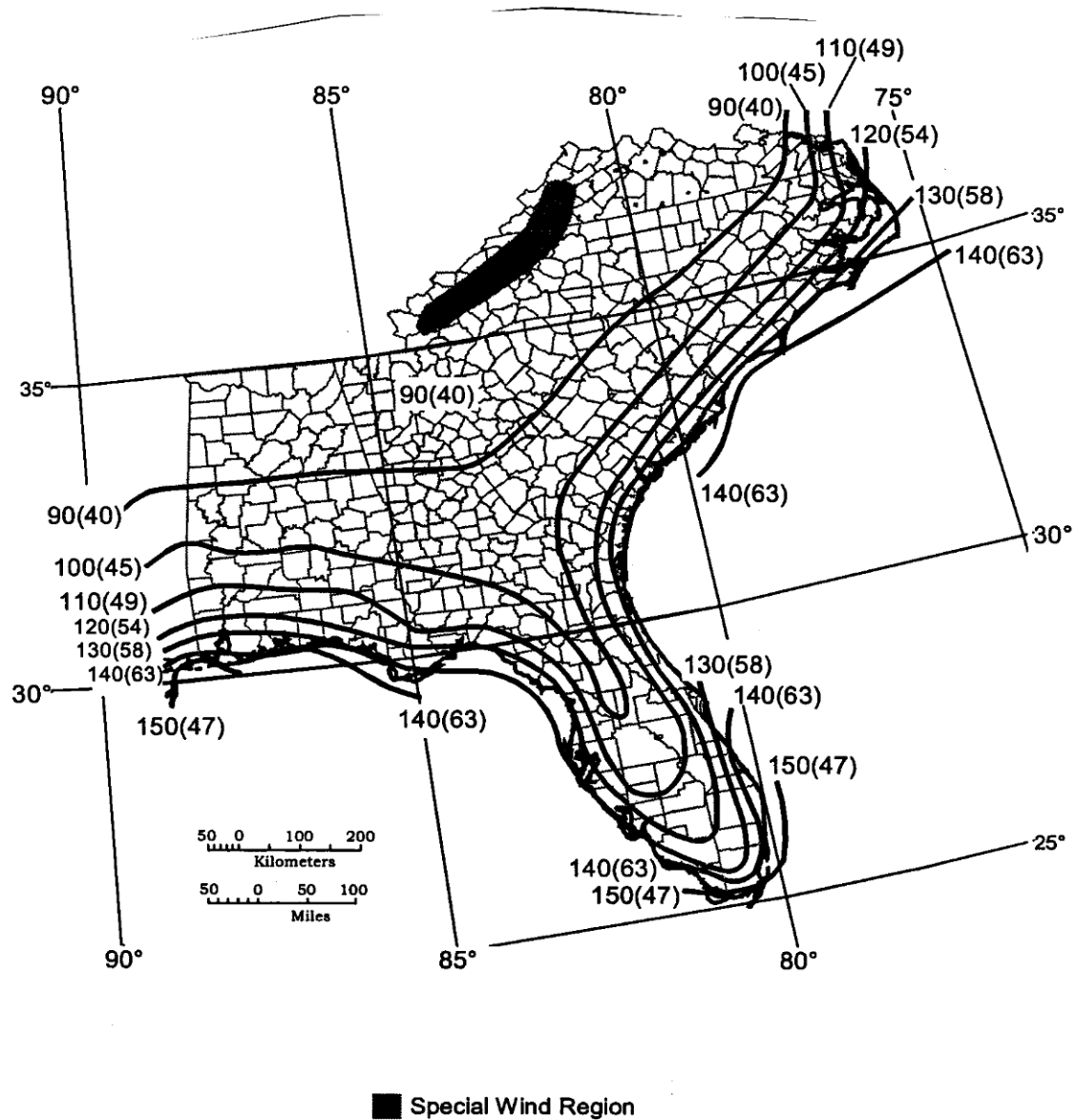
Zone 1	Up to 100 MPH
Zone 2	100 - 119 MPH
Zone 3	120 - 129 MPH

- Notes:**
1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33ft (10m) above ground for Exposure C category.
  2. Linear interpolation between wind contours is appropriate.
  3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
  4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions. Seek 50-yr MRI wind speed values from local building officials. As a minimum, increase the wind speed values by 10% except where minimum wind speed values are noted in Washington and Oregon



**Notes:**

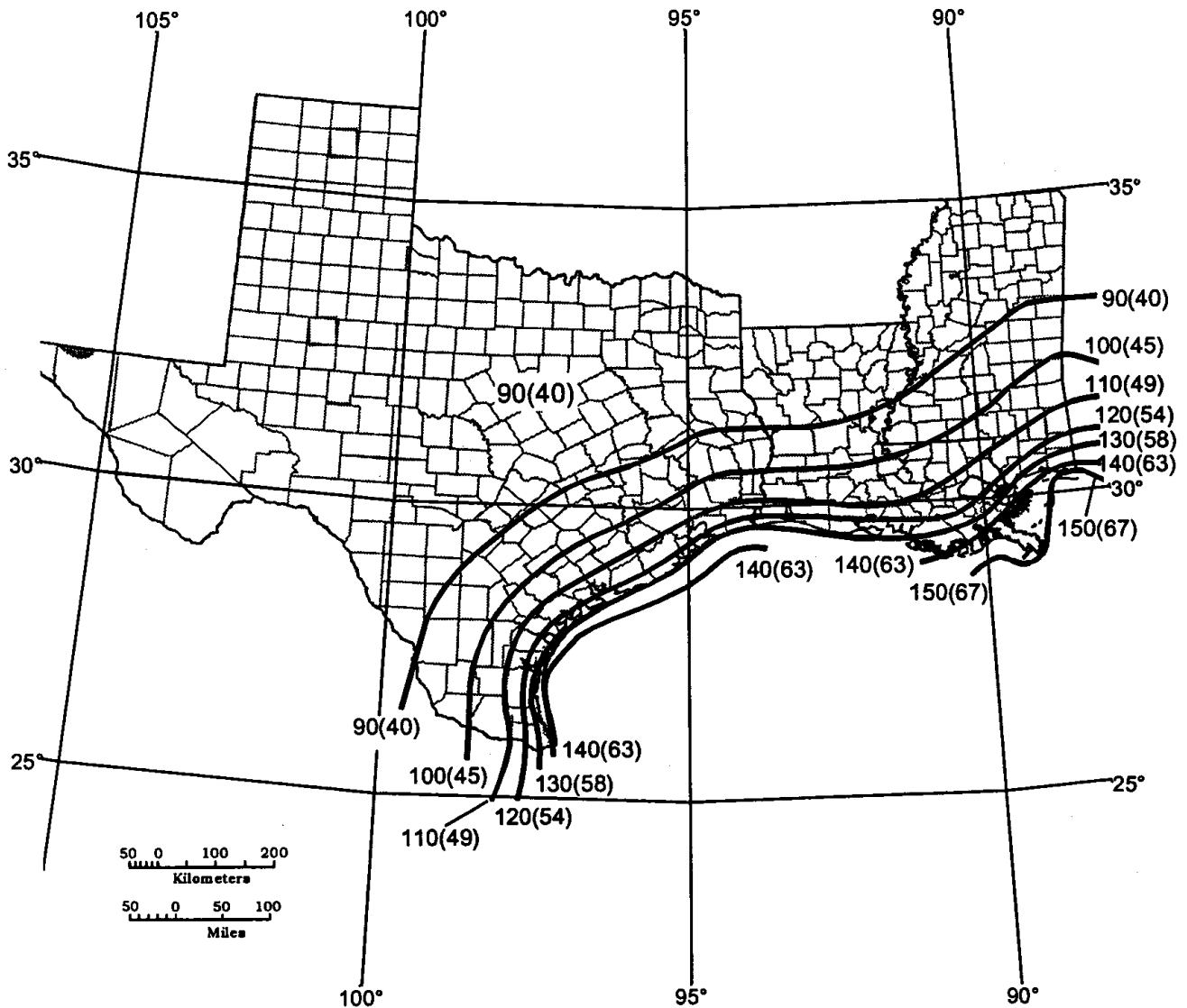
1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33' above Ground for Exposure C category.
2. Linear interpolation between wind contours is appropriate.
3. Islands and coastal areas outside the last contour shall use the wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions, Seek 50 year MRI wind speed values from local building officials. As a minimum, increase the wind speed values by 10%.



Zone 1 – Up to 100 MPH
Zone 2 – 100 - 119 MPH
Zone 3 – 120 - 129 MPH
Zone 4 – 130 MPH or greater

#### Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33' above Ground for Exposure C category.
2. Linear interpolation between wind contours is appropriate.
3. Islands and coastal areas outside the last contour shall use the wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions, Seek 50 year MRI wind speed values from local building officials. As a minimum, increase the wind speed values by 10%.

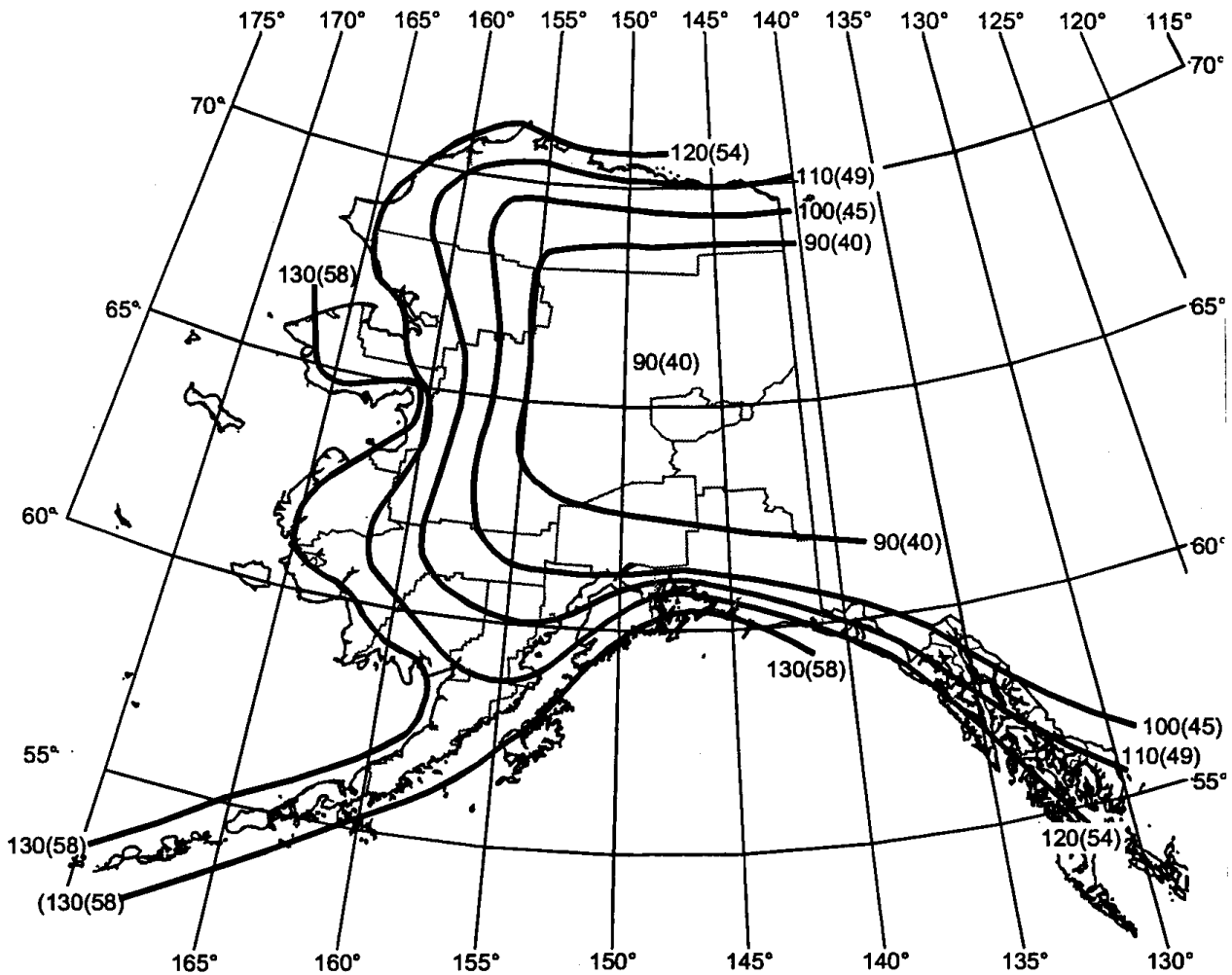


Zone 1 – Up to 100 MPH
Zone 2 – 100 - 119 MPH
Zone 3 – 120 - 129 MPH
Zone 4 – 130 MPH or greater

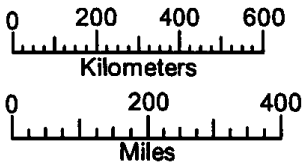
■ Special Wind Region

**Notes:**

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33' above Ground for Exposure C category.
2. Linear interpolation between wind contours is appropriate.
3. Islands and coastal areas outside the last contour shall use the wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions, Seek 50 year MRI wind speed values from local building officials. As a minimum, increase the wind speed values by 10%.



Zone 1 – Up to 100 MPH
Zone 2 – 100 - 119 MPH
Zone 3 – 120 - 129 MPH
Zone 4 – 130 MPH or greater



Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33' above Ground for Exposure C category.
2. Linear interpolation between wind contours is appropriate.
3. Islands and coastal areas outside the last contour shall use the wind speed contour of the coastal area. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions, Seek 50 year MRI wind speed values from local building officials. As a minimum, increase the wind speed values by 10%.

# WeatherBond RBR Fully Adhered Roofing Systems

## “Attachment II”

### Construction Generated Moisture

May 2009

- 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.