

Exterior Research & Design, L.L.C.

Building Science and Envelope Consultants

Certificate of Authorization #9503



Evaluation Report 02641.03.04-R2

**Evaluation
of
IB Single Ply Roof Systems
for
Florida Product Approval
#FL2534-R2**

Prepared for:
IB Roof Systems, Inc.
2877 Chad Drive
Eugene, Oregon 97408

Prepared by:
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July 18, 2005

Manufacturer: IB Roof Systems, Inc.
2877 Chad Drive
Eugene, OR 97408

Product Category: Roofing

Sub-Category: Single Ply Roof Systems

Evaluation Method: Method 1: Products specifically addressed in the FBC through performance criteria and standardized testing or comparative rational analysis methods.

Compliance Statement: IB Single-Ply Membrane single ply roof systems, as marketed by IB Roof Systems, Inc., have demonstrated compliance with the following sections of the Florida Building Code through testing in accordance with the following Standards. Compliance is subject to the Installation Requirements and Limitations / Conditions of Use set forth herein.

| Standards: | Section | Property | Standard | Year |
|-------------------|----------------|--------------------|-----------------|-------------|
| Non-HVHZ: | 1504.3.1 | Wind | FM 4470 | 1992 |
| | 1504.6 | Weathering | ASTM G154 | 2000 |
| | 1504.7 | Impact | FM 4470 | 1992 |
| | 1505.1 | Fire | ASTM E108 | 2000 |
| | 1507.13.2 | Physicals | ASTM D4434 | 1996 |
| HVHZ: | 1515.2.4 | Impact | FM 4470 | 1992 |
| | 1523.1.2 | Fire | ASTM E108 | 2000 |
| | 1523.6.2 | Physicals | TAS 110 | 2000 |
| | 1523.6.2 | System Performance | TAS 114 | 1995 |

Product / System Description: IB Single-Ply Membrane is a nominal 40-mil (1.0 mm) to 80-mil (2.0-mm) thick polyester fabric (9x9, 1000 denier) reinforced plasticized polyvinyl chloride (PVC) roof cover with a white, gray, blue, brown, tan or green weathering surface and a black or gray underside. IB Single-Ply Membrane is supplied in rolls 72 in. (1.8 m) by 100 ft (33.3 m) long. Side and end laps are sealed using hot air welding. The roof cover is mechanically attached to Approved substrates using fasteners and stress plates, as outlined in the Limitations / Conditions of Use herein.

Quality Assurance Documentation:

1. Listing through FM Approvals (QUA 1860). Continued QA documentation comes in the form of the FM Approval Mark on all product containers.
2. Non-IB Roof System materials used in the system shall be manufactured under a quality assurance program administered by an Approved Quality Assurance Entity, and materials and/or packaging shall carry the appropriate labeling from the Quality Assurance Entity.
3. All testing forming the basis of this report was conducted in full accordance with the requirements of the Florida Building Code. System testing was conducted using full-scale test specimens using the appropriate test standard.

Installation Requirements:

1. IB Roof Systems roof covers shall be installed in accordance with IB Roof Systems' published installation instructions, subject to the Limitations / Conditions of Use noted below. For installations within the HVHZ, the HVHZ Limitations supercede published installation instructions.

2. System attachment requirements for wind load resistance are set forth in Appendix 1.
3. For installations over profiled steel deck, membrane shall be installed running perpendicular to steel deck flutes.

Limitations / Conditions of Use:

FOR HVHZ JURISDICTION:

1. Refer to a current Approved Roofing Materials Directory for fire rating.
2. Fastener spacing for membrane attachment is based on a min. fastener resistance value in conjunction with the max. design value listed within a specific system (Appendix 1). Should the fastener resistance be less than that required, as determined by the B.O., a revised fastener spacing, prepared, signed and sealed by a Florida PE, Architect or RRC may be submitted. Said revised fastener spacing shall utilize the data from TAS 105 and calculations per RAS 137.
3. Perimeter and corner areas shall comply with the enhanced uplift pressure requirements of these areas. Fastener densities shall be increased for membrane, as calculated in compliance with RAS 137. Calculations shall be prepared, signed and sealed by a Florida Registered Professional Engineer, Architect or Registered Roof Consultant.
4. All attachment and sizing of perimeter nailers, metal profile, and/or flashing termination designs shall conform with RAS 111 and applicable wind load requirements.
5. For recover installations, the existing roof shall be examined in accordance with FBC Section 1521.
6. If mechanical attachment to the structural deck through lightweight insulating concrete is proposed, field withdrawal resistance testing shall be conducted to determine fastener spacing. All testing and fastening design shall be in compliance with TAS 105 and RAS 137. Calculations shall be signed and sealed by a Florida PE, Architect or RRC.
7. All insulation products used within the roof system shall hold a current NOA or other Approval acceptable to the AHJ.

GENERAL:

1. Refer to a current Approved Roofing Materials Directory for fire rating.
2. For steel deck installations, foam plastic insulation shall be separated from the building interior in accordance with FBC Section 2603.4 unless the exceptions stated in FBC Sections 2603.4.1 and 2603.8 apply.
3. Unless otherwise noted in Appendix 1, wood decking and its attachment shall be as specified by the Designer of Record to meet project design criteria in accordance with FBC Chapter 23 to the satisfaction of the AHJ.
4. Unless otherwise noted in Appendix 1, steel decking and its attachment shall be as specified by the Designer of Record to meet project design criteria in accordance with FBC Chapter 22 to the satisfaction of the AHJ.
5. Structural concrete roof decks shall be as specified by the Designer of Record to meet project design criteria in accordance with FBC Chapter 19 to the satisfaction of the AHJ.
6. Existing roof decks shall comply with the applicable sections of the FBC.
7. For recover installations, the existing roof shall be examined in accordance with FBC Section 1510.
8. The maximum design pressure for the selected assembly shall meet or exceed the Zone 1 design pressure determined in accordance with FBC Chapter 16. Zones 2 and 3 shall employ a tighter membrane attachment density designed by a qualified design professional to resist the elevated

pressure criteria. Commonly used methods are RAS 137 and FM LPDS 1-29.

9. For existing roof decks in a recover or re-roof (tear off) installation, membrane fasteners shall be tested in the existing deck for withdrawal resistance in accordance with TAS 105. Data shall be analyzed by a qualified design professional for comparison of the resultant MCRF to the design value noted for each assembly.
 - If the resultant MCRF is greater than the design value, installation of the subject roof assembly is permissible.
 - If the resultant MCRF is less than the design value, selection of an alternate fastener and system, or determination of an alternate membrane attachment is required.

Certification of Independence:

1. ERD East does not have, nor does it intend to acquire or will it acquire, a financial interest in any company manufacturing or distributing products it evaluates.
2. ERD East is not owned, operated or controlled by any company manufacturing or distributing products it evaluates.
3. Robert Nieminen, P.E. does not have nor will acquire, a financial interest in any company manufacturing or distributing products for which the evaluation reports are being issued.
4. Robert Nieminen, P.E. does not have, nor will acquire, a financial interest in any other entity involved in the approval process of the product.

Continued Compliance:

Evaluation for compliance is valid until such time as the named product(s) changes, the referenced Quality Assurance documentation changes, or provisions of the Code that relate to the product change. Acceptance of this Evaluation Report by the named client constitutes agreement to notify ERD or Robert Nieminen, P.E. if the product changes or the referenced Quality Assurance documentation changes.

Respectfully submitted,



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TABLE 1: WIND UPLIFT PERFORMANCE – NEW CONSTRUCTION – WOOD DECKS

| System No. | Deck (A) | Insulation | | IB Single-Ply Membrane | | Max. Design Pressure (E) |
|------------|---|--|------------------------|--|---|-----------------------------|
| | | Type (B) | Attachment (C) | Fasteners (D) | Attachment | |
| W-1 | Min. 19/32-inch plywood attached 6" o.c. with 8d common nails to support members spaced max. 24" o.c. | (Optional) One or more layers, any combination | Preliminarily attached | IB HP-1 or HP-2 Fastening System or Olympic HD or XHD Fasteners & 2-inch Barbed Metal Plates | Max. 12 in. (305 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -30.0 psf NO HVHZ |
| W-2 | Min. 19/32-inch plywood attached 6" o.c. with 8d common nails to support members spaced max. 24" o.c. | (Optional) One or more layers, any combination | Preliminarily attached | IB HP-1 or HP-2 Fastening System or Olympic HD or XHD Fasteners & 2-inch Barbed Metal Plates | Max. 6 in. (305 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -45.0 psf |

- A. Unless otherwise noted, plywood sheathing and its attachment shall be as specified by the Designer of Record to meet project design criteria in accordance with FBC Chapter 23 to the satisfaction of the Authority Having Jurisdiction.
- B. Any one layer or combination of polyisocyanurate, polystyrene, wood fiberboard, perlite, DensDeck or DensDeck Prime documented as meeting the fire classification requirements of FBC 1505.1 / 1523.6.2 with IB Single-Ply membrane.
- C. Preliminary insulation attachment: Minimum four fasteners per 4 x 8 ft board or minimum two fasteners per 4 x 4 ft board.
- D. Fasteners shall be of sufficient length to embed into lumber by not less than 1-inch or penetrate through plywood sheathing by not less than 3/4-inch.
- E. The maximum design pressure for the selected assembly shall meet or exceed the field area (Zone 1) design pressure determined in accordance with FBC Chapter 16 or RAS 128. Perimeter and corner areas (Zones 2 and 3) shall employ tighter membrane attachment designed to resist the elevated pressure criteria. Density increases shall be established through rational analysis by a qualified design professional. For projects within the HVHZ, analysis shall be in accordance with RAS 137. This is analogous to General Limitation #7 in typical Miami-Dade NOAs.

TABLE 2: WIND UPLIFT PERFORMANCE – NEW CONSTRUCTION - STEEL DECKS

| System No. | Deck (F) | Insulation | | IB Single-Ply Membrane (I) | | Max. Design Pressure (K) |
|------------|--|-------------------------------------|------------------------|---|---|--------------------------|
| | | Type (G) | Attachment (H) | Fasteners (J) | Attachment | |
| S-1 | Min. 22 ga., type B, Grade 80 steel attached 6" o.c. with puddle welds & washers or Traxx/4 or 5 screws to support members spaced max. 6 ft o.c. | One or more layers, any combination | Preliminarily attached | IB HP-1 or HP-2 Fastening System, Olympic XHD Fasteners & XHD Seam Plates or Dekfast #15 HS Fasteners and HS Plates | Max. 12 in. (305 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -45.0 psf |
| S-2 | Min. 22 ga., type B, Grade 80 steel attached 6" o.c. with puddle welds & washers or Traxx/4 or 5 screws to support members spaced max. 6 ft o.c. | One or more layers, any combination | Preliminarily attached | IB HP-1 or HP-2 Fastening System, Olympic XHD Fasteners & XHD Seam Plates or Dekfast #15 HS Fasteners and HS Plates | Max. 6 in. (150 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -60.0 psf |

- F. Unless otherwise noted, steel decking and its attachment shall be as specified by the Designer of Record to meet project design criteria in accordance with FBC Chapter 22 to the satisfaction of the Authority Having Jurisdiction.
- G. Any one layer or combination of polyisocyanurate, polystyrene, wood fiberboard, perlite, DensDeck or DensDeck Prime documented as meeting the fire classification requirements of FBC 1505.1 / 1523.6.2 with IB Single-Ply membrane.
- H. Preliminary insulation attachment: Minimum four fasteners per 4 x 8 ft board or minimum two fasteners per 4 x 4 ft board.
- I. Membrane shall be run with its length perpendicular to the steel deck flutes.
- J. Fasteners shall engage the top flute of the steel deck and shall be of sufficient length to penetrate the top flute by not less than ¾-inch.
- K. The maximum design pressure for the selected assembly shall meet or exceed the field area (Zone 1) design pressure determined in accordance with FBC Chapter 16 or RAS 128. Perimeter and corner areas (Zones 2 and 3) shall employ tighter membrane attachment designed to resist the elevated pressure criteria. Density increases shall be established through rational analysis by a qualified design professional. For projects within the HVHZ, analysis shall be in accordance with RAS 137. This is analogous to General Limitation #7 in typical Miami-Dade NOAs.

TABLE 3: WIND UPLIFT PERFORMANCE – NEW CONSTRUCTION – CONCRETE DECKS

| System No. | Deck (L) | Insulation | | IB Single-Ply Membrane | | Max. Design Pressure (P) |
|------------|------------------------------------|--|------------------------|--|---|--------------------------|
| | | Type (M) | Attachment (N) | Fasteners (O) | Attachment | |
| C-1 | Min. 2,500 psi structural concrete | (Optional) One or more layers, any combination | Preliminarily attached | Olympic CD-10 Fasteners & XHD Seam Plates or Dekfast Dekspikes and Dekfast HS Plates | Max. 12 in. (305 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -45.0 psf |
| C-2 | Min. 2,500 psi structural concrete | (Optional) One or more layers, any combination | Preliminarily attached | Olympic CD-10 Fasteners & XHD Seam Plates or Dekfast Dekspikes and Dekfast HS Plates | Max. 6 in. (150 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -60.0 psf |

- L. Structural concrete roof decks shall be as specified by the Designer of Record to meet project design criteria in accordance with FBC Chapter 19 to the satisfaction of the Authority Having Jurisdiction.
- M. Any one layer or combination of polyisocyanurate, polystyrene, wood fiberboard, perlite, DensDeck or DensDeck Prime documented as meeting the fire classification requirements of FBC 1505.1 / 1523.6.2 with IB Single-Ply membrane.
- N. Preliminary insulation attachment: Minimum four fasteners per 4 x 8 ft board or minimum two fasteners per 4 x 4 ft board.
- O. Fasteners shall be installed with a pilot hole in accordance with the fastener manufacturer’s published installation instructions. Fasteners shall be of sufficient length to embed in the concrete not less than 1-inch for non-HVHZ and not less than 1¼-inch for HVHZ.
- P. The maximum design pressure for the selected assembly shall meet or exceed the field area (Zone 1) design pressure determined in accordance with FBC Chapter 16 or RAS 128. Perimeter and corner areas (Zones 2 and 3) shall employ tighter membrane attachment designed to resist the elevated pressure criteria. Density increases shall be established through rational analysis by a qualified design professional. For projects within the HVHZ, analysis shall be in accordance with RAS 137. This is analogous to General Limitation #7 in typical Miami-Dade NOAs.

TABLE 4: WIND UPLIFT PERFORMANCE – NEW CONSTRUCTION – LIGHTWEIGHT CONCRETE

| System No. | Deck (Q) | LWIC (R) | IB Single-Ply Membrane (S) | | Max. Design Pressure (U) |
|------------|---|---|--|---|--------------------------|
| | | | Fasteners (T) | Attachment | |
| LWC-1 | Vented steel per System S-1 or concrete | Cellular, aggregate or hybrid lightweight insulating concrete, min. 2-inch top coat thickness | Steel Deck: IB HP-1 or HP-2 Fastening System, Olympic XHD Fasteners & XHD Seam Plates or Dekfast #15 HS Fasteners and HS Plates Concrete Deck: Olympic CD-10 Fasteners & XHD Seam Plates or Dekfast Dekspikes and Dekfast HS Plates | Max. 12 in. (305 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -52.5 psf |
| LWC-2 | Vented steel per System S-2 or concrete | Cellular, aggregate or hybrid lightweight insulating concrete, min. 2-inch top coat thickness | Steel Deck: IB HP-1 or HP-2 Fastening System, Olympic XHD Fasteners & XHD Seam Plates or Dekfast #15 HS Fasteners and HS Plates Concrete Deck: Olympic CD-10 Fasteners & XHD Seam Plates or Dekfast Dekspikes and Dekfast HS Plates | Max. 6 in. (150 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -60.0 psf |

- Q. Unless otherwise noted, steel decking and its attachment shall be as specified by the Designer of Record to meet project design criteria in accordance with FBC Chapter 22 and FBC Section 1917.4.1 to the satisfaction of the Authority Having Jurisdiction. Structural concrete roof decks shall be as specified by the Designer of Record to meet project design criteria in accordance with FBC Chapter 19 to the satisfaction of the Authority Having Jurisdiction.
- R. LWIC shall be cast in accordance with FBC Section 1917 to the satisfaction of the Authority Having Jurisdiction. For systems where specific LWIC is referenced, refer to current LWIC Product Approval for specific deck construction and limitations. For systems where specific LWIC is not referenced, the minimum design mix shall be 300 psi.
- S. If LWIC is cast over steel deck, membrane shall be run with its length perpendicular to the steel deck flutes.
- T. If LWIC is cast over steel deck, membrane fasteners shall engage the top flute of the steel deck and shall be of sufficient length to penetrate the top flute by not less than ¾-inch. If LWIC is cast over concrete deck, membrane fasteners shall be installed with a pilot hole in accordance with the fastener manufacturer’s published installation instructions. Fasteners shall be of sufficient length to embed in the concrete not less than 1-inch for non-HVHZ and not less than 1¼-inch for HVHZ.
- U. The maximum design pressure for the selected assembly shall meet or exceed the field area (Zone 1) design pressure determined in accordance with FBC Chapter 16 or RAS 128. Perimeter and corner areas (Zones 2 and 3) shall employ tighter membrane attachment designed to resist the elevated pressure criteria. Density increases shall be established through rational analysis by a qualified design professional. For projects within the HVHZ, analysis shall be in accordance with RAS 137. This is analogous to General Limitation #7 in typical Miami-Dade NOAs.

TABLE 5: WIND UPLIFT PERFORMANCE – RECOVER OR REROOF CONSTRUCTION

| System No. | Deck (V) | Insulation | | IB Single-Ply Membrane (DD) | | Max. Design Pressure (psf) | Fastener Design Value (lb/fastener) (AA) |
|------------|--|---|------------------------|---|---|-----------------------------|--|
| | | Type (W) | Attachment (X) | Fasteners (Z) | Attachment | | |
| R-1 | Wood, steel, concrete or lightweight concrete (BB) | (Optional) One or more layers, any combination | Preliminarily attached | Wood Deck: IB HP-1 or HP-2 Fastening System or Olympic HD or XHD Fasteners & 2-inch Barbed Metal Plates Steel Deck: IB HP-1 or HP-2 Fastening System, Olympic XHD Fasteners & XHD Seam Plates or Dekfast #15 HS Fasteners and HS Plates Concrete Deck: Olympic CD-10 Fasteners & XHD Seam Plates or Dekfast Dekspikes and Dekfast HS Plates | Max. 12 in. (305 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -30.0 psf NO HVHZ | 168 |
| R-2 | Wood, steel, concrete or lightweight concrete (BB) | (Optional) One or more layers, any combination | Preliminarily attached | Wood Deck: IB HP-1 or HP-2 Fastening System or Olympic HD or XHD Fasteners & 2-inch Barbed Metal Plates Steel Deck: IB HP-1 or HP-2 Fastening System, Olympic XHD Fasteners & XHD Seam Plates or Dekfast #15 HS Fasteners and HS Plates Concrete Deck: Olympic CD-10 Fasteners & XHD Seam Plates or Dekfast Dekspikes and Dekfast HS Plates | Max. 6 in. (150 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -45.0 psf | 125 |
| R-3 | Steel, concrete or lightweight concrete (BB) | (Optional) One or more layers, any combination | Preliminarily attached | Steel Deck: IB HP-1 or HP-2 Fastening System, Olympic XHD Fasteners & XHD Seam Plates or Dekfast #15 HS Fasteners and HS Plates Concrete Deck: Olympic CD-10 Fasteners & XHD Seam Plates or Dekfast Dekspikes and Dekfast HS Plates | Max. 12 in. (305 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -52.5 psf | 293 |

TABLE 5: WIND UPLIFT PERFORMANCE – RECOVER OR REROOF CONSTRUCTION

| System No. | Deck (V) | Insulation | | IB Single-Ply Membrane (DD) | | Max. Design Pressure (psf) | Fastener Design Value (lbf/fastener) (AA) |
|------------|--|--|------------------------|--|--|----------------------------|---|
| | | Type (W) | Attachment (X) | Fasteners (Z) | Attachment | | |
| R-4 | Steel, concrete or lightweight concrete (BB) | (Optional) One or more layers, any combination | Preliminarily attached | Steel Deck: IB HP-1 or HP-2 Fastening System, Olympic XHD Fasteners & XHD Seam Plates or Dekfast #15 HS Fasteners and HS Plates Concrete Deck: Olympic CD-10 Fasteners & XHD Seam Plates or Dekfast Dekspikes and Dekfast HS Plates | Max. 6 in. (150 mm) o.c. in min. 5 in. (127 mm) side laps spaced max. 67 in. (1.7 m) apart. Outside of seam sealed with min. 1.5 in (38 mm) heat weld. | -60.0 psf | 168 |

- V. The existing roof deck shall comply with the applicable sections of the FBC, and shall be examined in accordance with FBC Sections 1510 and/or 1521. All footnotes in preceding Tables apply, depending on the deck type.
- W. Any one layer or combination of polyisocyanurate, polystyrene, wood fiberboard, perlite, DensDeck or DensDeck Prime documented as meeting the fire classification requirements of FBC 1505.1 / 1523.6.2 with IB Single-Ply membrane.
- X. Preliminary insulation attachment: Minimum four fasteners per 4 x 8 ft board or minimum two fasteners per 4 x 4 ft board.
- Y. For installations over existing profiled steel deck, care shall be taken to install membrane running perpendicular to steel deck flutes, so as not to overload single sections of steel decking.
- Z. Fasteners shall be of sufficient length to penetrate wood or steel decking by not less than ¾-inch, to embed within concrete decking by not less than 1-inch for non-HVHZ or 1¼-inch for HVHZ. For re-roof (tear-off) construction over steel deck, fasteners shall engage the top flute of the steel deck. For recover construction over steel deck, fasteners shall be of sufficient length to penetrate the bottom flute by not less than ¾-inch.
- AA. Fasteners shall be tested in the existing deck for withdrawal resistance. A qualified design professional shall review the data for comparison to the fastener design value for the system. For HVHZ, testing / analysis shall be per TAS 105 and RAS 137.
- BB. Reference to lightweight concrete decks with this footnote indicates fastener installation through the lightweight concrete to the underlying steel or structural concrete roof deck.