

# TEXAS DEPARTMENT OF INSURANCE

Engineering Services / MC 103-3A 333 Guadalupe Street P.O. Box 149104 Austin, Texas 78714-9104  
Phone No. (512) 322-2212 Fax No. (512) 463-6693

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## PRODUCT EVALUATION RC-251

Effective August 1, 2010  
Revised September 1, 2011

*The following product has been evaluated for compliance with the wind loads specified in the **International Residential Code (IRC)** and the **International Building Code (IBC)**. This product shall be subject to reevaluation **June 2014**.*

*This product evaluation is not an endorsement of this product or a recommendation that this product be used. The Texas Department of Insurance has not authorized the use of any information contained in the product evaluation for advertising, or other commercial or promotional purpose.*

*This product evaluation is intended for use by those individuals who are following the design wind load criteria in Chapter 3 of the IRC and Section 1609 of the IBC. The design loads determined for the building or structure shall not exceed the design load rating specified for the products shown in the limitations section of this product evaluation. This product evaluation does not relieve a Texas licensed engineer of his responsibilities as outlined in the Texas Insurance Code, the Texas Administrative Code, and the Texas Engineering Practice Act.*

**Duro-Last Single Ply Roofing Systems Installed Over Steel Decks**, manufactured by

**Duro-Last Roofing, Inc.**  
**525 Morley Drive**  
**Saginaw, Michigan 48601**  
**Telephone: (800) 248-0280**

will be accepted in designated catastrophe zones along the Texas Gulf Coast when installed in accordance with the manufacturer's installation instructions and this product evaluation.

## PRODUCT DESCRIPTION

**Duro-Last Membrane:** A nominal 40 mil, 50-mil, or 60-mil thick single ply roofing membrane. The membrane has a 35 ounce per square yard polyester-base fiber mat that is laminated with a plastic film.

**Insulation:** A polyisocyanurate foam insulation or a polystyrene rigid cellular foam insulation. Insulation shall comply with ASTM C 1289 or ASTM C 578.

**Duro-Last #14 HD Fasteners:** Fasteners are No. 14 diameter, threaded screws with drill or pinch points and truss heads.

**Duro-Last #15 Fasteners:** Fasteners are No. 15 diameter, threaded screws with drill or pinch points and truss heads.

**Duro-Last 3 inch Metal Plate:** A 3 inch square, 0.24 inch thick galvalume plate with a 0.25 inch diameter hole located at the center.

**Duro-Last 2.4 inch Barbed Metal Plate:** A 2.4 inch diameter, 0.038 inch thick galvalume plate.

**OMG Buildex 2  $\frac{3}{8}$  inch Eyehook Plate:** A 2  $\frac{3}{8}$  inch diameter, eyehook plate.

**Duro-Last Poly Plate:** A 2 inch diameter, polycarbonate plate with 10 prongs on the underside that extend down 0.26 inches with a 0.245 inch diameter hole located at the center.

**Duro-Last Insulation Plate:** A 3 inch diameter, polycarbonate plate with a recessed 0.28 inch diameter hole located at the center.

**Duro-Last Cleat Plate:** A  $2\frac{3}{8}$  inch diameter galvanized ribbed stress plate. The plate is 0.035 inch thick. The plate is stamped with cleats to hold the membrane in place without tearing or puncturing the membrane.

**Duro-Last Batten Bar:** A 1" wide, 18 gauge, galvalume steel batten bar with pre-punched holes every 6 inches on center.

**Duro-Last Tab Sealer 4725:** A solvent based contact bonding agent. The bonding agent is used in the Hybrid lab fastening method.

### LIMITATIONS and INSTALLATION

**Roof Framing:** Roof framing shall be steel purlins. The maximum allowable spacing of the purlins shall be as specified in each assembly listed in this evaluation report.

**Roof Deck:** For new roof applications, the steel roof deck shall be secured to the roof framing to resist the required uplift loads as specified in each assembly listed in this evaluation report.

**Positive Drainage of Roof Deck:** Roof decks, in which this product is to be installed upon, shall be provided with positive drainage. A minimum roof slope after construction of  $\frac{1}{4}$  inch per foot is recommended.

**Design Wind Pressures:** The design wind uplift pressures shall be as specified in the assemblies listed in this evaluation report.

#### Installation Over an Existing Roof Covering (Roof Recover):

**Acceptable Applications:** The single-ply roofing system may be installed over an existing built-up roof covering or an existing single-ply roof covering based on the requirements set forth in this product evaluation report.

**Inspection of Roof Covering Recover Installation:** Inspection of the roof covering recover installation shall be by a Texas Department of Insurance appointed engineer. The Texas Department of Insurance appointed engineer shall determine if the roof framing can support the combined weight of the existing roof covering and the roof covering recover.

**Roof Covering Replacement Versus Roof Covering Recover:** All existing roof coverings shall be completely removed and a new roof covering installed if any of the following conditions occur:

- The existing roof or roof covering is water soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for the additional roof covering.
- The existing roof has two or more applications of any type of roof covering.

**Positive Drainage:** The roof covering recover application shall not be required to meet the minimum roof slope of  $\frac{1}{4}$  inch per foot if positive drainage is provided.

**Roof Framing:** Roof framing shall be steel purlins. The maximum allowable spacing of the steel purlins shall be as specified in each assembly listed in this evaluation report.

**Roof Deck:** The existing steel roof deck shall be as specified in each assembly listed in this evaluation report. The underside of the steel deck shall be examined by the Texas Department of Insurance appointed engineer for corrosion. If corrosion exists, then it shall be treated with a rust inhibitor. A fastener withdrawal resistance test shall be conducted in the corroded area to determine

if the withdrawal resistance of the fastener complies with the minimum fastener requirements for the roof covering recover application. If the tested fastener fails to comply, then the deteriorated roof deck shall be replaced.

**Fastener Withdrawal Resistance:** The fastener withdrawal resistance shall be conducted in accordance with ANSI/SPRI FX-1-2006 and this evaluation report.

Fasteners used for the installation of the roof covering recover to the existing roof deck shall be as specified in the Installation Instructions section of this evaluation report. For the withdrawal test, the fasteners shall be installed in the existing roof deck as required for the roof covering recover installation. A Texas Department of Insurance appointed engineer shall review the data to verify the integrity of the existing roof deck and to compare results of the withdrawal tests with the minimum fastener requirements for the roof covering recover application.

The Texas Department of Insurance appointed engineer shall document all test results, including the locations on the roof surface where the tests are performed. A minimum of ten (10) withdrawal resistance tests are required for a roof area up to 50,000 square feet (a minimum of 50 percent of the tests shall be conducted at the perimeter and the corners). Five (5) additional tests are required for each additional 5,000 square feet of roof area or portion thereof (a minimum of 50 percent of the tests shall be conducted at the perimeter and the corners). The tests shall be located evenly spread across the surface of the roof. At least one withdrawal test shall be performed on each roof level if the roof consists of multiple levels.

The withdrawal resistance of each tested fastener shall comply with the minimum fastener requirements for the roof covering recover application. If a tested fastener fails to comply, then the Texas Department of Insurance appointed engineer shall examine that area for deterioration of the roof deck by removing the existing roof covering in that area. If that area of the roof deck has deteriorated, then the deteriorated roof deck shall be replaced.

**Existing Roof Covering Preparation:** The existing roof covering shall be prepared to receive the roof covering recover as specified in the Duro-Last installation instructions.

The existing roof covering surface shall be dry and free of dirt and debris.

If the existing roof covering is gravel surfaced, then the loose gravel shall be completely removed. The surface of the existing roof covering shall be relatively smooth.

If the existing roof covering has blisters, buckles, ridges, folds, or other deformations, then they must be removed and the surface patched to provide a smooth surface.

If the existing roof covering has loose fasteners, then the existing membrane shall be cut open, the loose fasteners removed, and the surface patched to provide a smooth surface.

**Roof Covering Recover Installation:** Installation of the roof covering recover shall be as specified in the Installation Instructions section of this evaluation report.

## INSTALLATION INSTRUCTIONS

**General Installation Requirements:** International Residential Code (IRC) and International Building Code (IBC) requirements shall be satisfied and the manufacturer's installation instructions followed, unless otherwise specified by this product evaluation report.

**Membrane Attachment:** The membrane shall be mechanically attached to the roof deck through the insulation board using the fasteners and plates specified in this evaluation report. The fasteners shall be

placed through the fastening tabs unless otherwise noted in this evaluation report. The following two lap types are used:

**Standard Lap:** The standard lap consists of placing the fasteners in the 3 inch or 6 inch wide preformed tab. The fastener placement shall be through the centerline of the tab in the 3 inch wide tab. However, for the 6 inch wide tab, the fastener placement shall be  $\frac{2}{3}$  the distance from the factory heat weld.

**Hybrid Lap:** The hybrid lap consists of placing the fasteners in the 6 inch wide preformed tabs. The fastener placement shall be through the centerline of the tab unless otherwise noted in this evaluation report. Prior to pulling the membrane for the next lap, the Duro-Last Tab Sealer 4725 is applied over the tab membrane and applied to the underside of the overlying membrane.

**Membrane Orientation:** The membrane shall be installed with its length oriented perpendicular to the steel deck flutes.

**Fasteners:** Fasteners shall be of sufficient length to penetrate into and through the steel deck a minimum of  $\frac{3}{4}$  inch.

**Installation:** Installation shall be in accordance with the following assemblies:

#### Assembly No. 1

Design Pressure: -142.5 psf  
Purlins: Minimum  $\frac{1}{4}$  inch thick steel  
Deck: Minimum 22 gauge, Type B, Grade 80 steel  
Attachment: Attached to steel supports spaced a maximum of 72 inches on center with Tek/5 screws spaced a maximum of 6 inches on center.  
Insulation: One or more layers. Minimum  $1\frac{1}{2}$  inches thick. Preliminary attached (minimum four (4) fasteners per 4 x 8 ft board or minimum two (2) fasteners per 4 x 4 ft board).  
Membrane: Duro-Last, minimum 40-mil thick.  
Fasteners: Duro-Last No. 15 screws with OMG Buildex  $2\frac{3}{8}$  inch diameter eyehook plates.  
Attachment: Hybrid Lap System. Fasteners spaced 6 inches on center within 6 inch wide tabs. The tabs are spaced 25 inches on center. Fasteners are installed through the insulation and into the roof deck. Use Tab Sealer 4725 applied over the tab membrane and to the overlying underside at the rate of 60 sq ft/gal.

#### Assembly No. 2

Design Pressure: -105 psf  
Purlins: Minimum  $\frac{1}{4}$  inch thick steel  
Deck: Minimum 22 gauge, Type B, Grade 80 steel  
Attachment:  
Option 1 Attached to steel supports spaced a maximum of 72 inches on center with puddle welds and washers spaced a maximum of 6 inches on center.  
Option 2 Attached to steel supports spaced a maximum of 72 inches on center with Tek/5 screws spaced a maximum of 6 inches on center.  
Insulation: One or more layers. Minimum  $1\frac{1}{2}$  inches thick. Preliminary attached (minimum four (4) fasteners per 4 x 8 ft board or minimum two (2) fasteners per 4 x 4 ft board).

### Assembly No. 2 (Continued)

Membrane: Duro-Last, minimum 40-mil thick.  
Fasteners: Duro-Last No. 15 screws with Duro-Last 3 inch metal plates  
Attachment: Hybrid Lap System. Fasteners spaced 6 inches on center within 6 inch wide tabs. The tabs are spaced 57 inches on center. Fasteners are installed through the insulation and into the roof deck. Use Tab Sealer 4725 applied over the tab membrane and to the overlying underside at the rate of 60 sq ft/gal.

### Assembly No. 3

Design Pressure: -82.5 psf  
Purlins: Minimum  $\frac{1}{4}$  inch thick steel  
Deck: Minimum 22 gauge, Type B, Grade 80 steel  
Attachment:  
Option 1 Attached to steel supports spaced a maximum of 72 inches on center with puddle welds and washers spaced a maximum of 6 inches on center.  
Option 2 Attached to steel supports spaced a maximum of 72 inches on center with Tek/5 screws spaced a maximum of 6 inches on center.  
Insulation: One or more layers. Minimum  $1\frac{1}{2}$  inches thick. Preliminary attached (minimum four (4) fasteners per 4 x 8 ft board or minimum two (2) fasteners per 4 x 4 ft board).  
Membrane: Duro-Last, minimum 40-mil thick.  
Fasteners: Duro-Last No. 15 screws with Duro-Last 3 inch metal plates  
Attachment: Hybrid Lap System. Fasteners spaced 6 inches on center within 6 inch wide tabs. The tabs are spaced 120 inches on center. Fasteners are installed through the insulation and into the roof deck. Use Tab Sealer 4725 applied over the tab membrane and to the overlying underside at the rate of 60 sq ft/gal.

### Assembly No. 4

Design Pressure: -60 psf  
Purlins: Minimum  $\frac{1}{4}$  inch thick steel  
Deck: Minimum 22 gauge, Type B, Grade 80 steel  
Attachment:  
Option 1 Attached to steel supports spaced a maximum of 72 inches on center with puddle welds and washers spaced a maximum of 6 inches on center.  
Option 2 Attached to steel supports spaced a maximum of 72 inches on center with Tek/5 screws spaced a maximum of 6 inches on center.  
Insulation: One or more layers. Minimum  $1\frac{1}{2}$  inches thick. Preliminary attached (minimum four (4) fasteners per 4 x 8 ft board or minimum two (2) fasteners per 4 x 4 ft board).  
Membrane: Duro-Last, minimum 40-mil thick.  
Fasteners: Duro-Last No. 15 screws with OMG Buildex  $2\frac{3}{8}$ " inch diameter eyehook plates or  $2\frac{3}{8}$ " inch diameter cleat plates.  
Attachment: Standard Lap System. Fasteners spaced 6 inches on center within 6 inch wide tabs. The tabs are spaced 84 inches on center. Fasteners are installed through the insulation and into the roof deck.

### Assembly No. 5

Design Pressure: -52.5 psf  
Purlins: Minimum  $\frac{1}{4}$  inch thick steel  
Deck: Minimum 22 gauge, Type B, Grade 80 steel  
Attachment:  
Option 1 Attached to steel supports spaced a maximum of 72 inches on center with puddle welds and washers spaced a maximum of 6 inches on center.  
Option 2 Attached to steel supports spaced a maximum of 72 inches on center with Tek/5 screws spaced a maximum of 6 inches on center.  
Insulation: One or more layers. Minimum  $1\frac{1}{2}$  inches thick. Preliminary attached (minimum four (4) fasteners per 4 x 8 ft board or minimum two (2) fasteners per 4 x 4 ft board).  
Membrane: Duro-Last, minimum 40-mil thick.  
Fasteners: Duro-Last No. 15 screws with Duro-Last 3 inch metal plates or  $2\frac{3}{8}$ " inch diameter cleat plates.  
Attachment: Hybrid Lap System. Fasteners spaced 12 inches on center within 6 inch wide tabs. The tabs are spaced 57 inches on center. Fasteners are installed through the insulation and into the roof deck. Use Tab Sealer 4725 applied over the tab membrane and to the overlying underside at the rate of 60 sq ft/gal.

### Assembly No. 6

Design Pressure: -52.5 psf  
Purlins: Minimum  $\frac{1}{4}$  inch thick steel  
Deck: Minimum 22 gauge, Type B, Grade 80 steel  
Attachment:  
Option 1 Attached to steel supports spaced a maximum of 72 inches on center with puddle welds and washers spaced a maximum of 6 inches on center.  
Option 2 Attached to steel supports spaced a maximum of 72 inches on center with Tek/5 screws spaced a maximum of 6 inches on center.  
Insulation: One or more layers. Minimum  $1\frac{1}{2}$  inches thick. Preliminary attached (minimum four (4) fasteners per 4 x 8 ft board or minimum two (2) fasteners per 4 x 4 ft board).  
Membrane: Duro-Last, minimum 40-mil thick.  
Fasteners: Duro-Last No. 15 screws with Duro-Last 3 inch metal plates or  $2\frac{3}{8}$ " inch diameter cleat plates.  
Attachment: Hybrid Lap System. Fasteners spaced 12 inches on center within 6 inch wide tabs. The tabs are spaced 57 inches on center. Fasteners are installed through the insulation and into the roof deck. Use Tab Sealer 4725 applied over the tab membrane and to the overlying underside at the rate of 60 sq ft/gal.

### Assembly No. 7

Design Pressure: -60 psf  
Purlins: Minimum  $\frac{1}{4}$  inch thick steel  
Deck: Minimum 22 gauge, Type B, Grade 80 steel  
Attachment:  
Option 1 Attached to steel supports spaced a maximum of 72 inches on center with puddle welds and washers spaced a maximum of 6 inches on center.  
Option 2 Attached to steel supports spaced a maximum of 72 inches on center with Tek/5 screws spaced a maximum of 6 inches on center.  
Insulation: One or more layers. Minimum  $1\frac{1}{2}$  inches thick. Preliminary attached (minimum four (4) fasteners per 4 x 8 ft board or minimum two (2) fasteners per 4 x 4 ft board).

### Assembly No. 7 (Continued)

Membrane: Duro-Last, minimum 40-mil thick.  
Fasteners: Duro-Last No. 14 screws with Duro-Last 2 inch diameter poly plates.  
Attachment: Standard Lap System. Fasteners spaced 6 inches on center within 6 inch wide tabs. The tabs are spaced 84 inches on center. Fasteners are installed through the insulation and into the roof deck.

### Assembly No. 8

Design Pressure: -67.5 psf  
Purlins: Minimum  $\frac{1}{4}$  inch thick steel  
Deck: Minimum 22 gauge, Type B, Grade 80 steel  
Attachment:  
Option 1 Attached to steel supports spaced a maximum of 72 inches on center with puddle welds and washers spaced a maximum of 6 inches on center.  
Option 2 Attached to steel supports spaced a maximum of 72 inches on center with Tek/5 screws spaced a maximum of 6 inches on center.

Insulation: One or more layers. Minimum  $1\frac{1}{2}$  inches thick.  
Fasteners: Duro-Last No. 15 screws with Duro-Last 3 inch diameter insulation plates  
Attachment: Minimum five (5) per 4 x 8 ft sheet (approximate fastener density of 1 fastener per 6.4 sq ft)

Membrane: Duro-Last, minimum 40-mil thick.  
Fasteners: Duro-Last No. 15 screws with Duro-Last batten bar  
Attachment: Hybrid Lap System. Fasteners spaced 12 inches on center within 6 inch wide tabs. The tabs are spaced 60 inches on center. Fasteners are installed through the insulation and into the roof deck. Use Tab Sealer 4725 applied over the tab membrane and to the overlying underside at the rate of 60 sq ft/gal.

**Note:** The manufacturer's installation instructions shall be on the job site during the installation. All fasteners shall be corrosion resistant as specified in the International Residential Code (IRC), the International Building Code (IBC), and the Texas Revisions.