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DEPARTMENT OF  
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201 NORTH FIGUEROA STREET  
LOS ANGELES, CA 90012

OSAMA YOUNAN, P.E.  
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SUPERINTENDENT OF BUILDING

JOHN WEIGHT  
EXECUTIVE OFFICER

DURO-LAST ROOFING, INC.  
525 MORLEY DRIVE  
SAGINAW, MICHIGAN 48601

ATTN: EVAN J. KENNARD  
(800) 248-0280

RESEARCH REPORT: RR 26100  
(Csi # 07 54 19)

EXPIRATION DATE: SEPTEMBER 1, 2024  
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CODE: 2023 LABC

**GENERAL APPROVAL** – Renewal and Technical Modification - Duro-Last Membrane, Duro-Tuff Membrane, Duro-Fleece Membrane, Duro-Fleece Plus Membrane and Duro-Last X Membrane Roof Coverings over combustible and noncombustible roof decks.

## DETAILS

Duro-Last Single Ply PVC Roof Systems are a PVC film laminated to both sides of a polyester reinforcement fabric membrane that are installed using cold adhesive, mechanical fastening or induction welding.

Duro-Last Roofing membranes meet the physical properties specifications outlined in Table 1 below.

Duro-Last Roofing membranes meet the fire classification and allowable design pressures detailed in Appendix 1 and Appendix 2 attached.

TABLE 1: PHYSICAL PROPERTY SPECIFICATION		
Type	Product	Specification
Membrane	Duro-Last	ASTM D 4434, ASTM 3746
Membrane	Duro-Tuff	ASTM D 4434, ASTM 3746
Membrane	Duro-Fleece	ASTM D 4434, ASTM 3746
Membrane	Duro-Fleece Plus	ASTM D 4434, ASTM 3746
Membrane	Duro-Last X	ASTM D 4434, ASTM 3746

**PRODUCT DETAILS**

<b>TABLE 2: ROOF MEMBRANES</b>		
Duro-Last Membrane	PVC film laminated to both sides of a polyester reinforcement fabric (weft inserted scrim). The weft inserted scrim is an 18 x 14 polyester fabric construction with weft insertion composed of 840 x 1000 denier threads. Duro-Last membranes are available in 40, 50 and 60 mil thickness.	Min. 3-inch tab with min. 1.5-inch welded lap seam for adhered and induction welded systems; Side-laps shall be installed parallel to the direction of the wood trusses for mechanically attached systems over wood decks; Side-laps shall be installed perpendicular to the direction of the steel deck ribs for mechanically attached systems over steel deck; For in-lap attachment, the center of the plate shall be 1 1/4-inch from the tab edge;
Duro-Fleece Plus Membrane	PVC film laminated to both sides of a polyester reinforcement fabric (weft inserted scrim) and a polypropylene fleece bottom layer. The weft inserted scrim is an 18 x 14 polyester fabric construction with weft insertion composed of 840 x 1000 denier threads. The Fleece is 5.5 ounce per square yard polypropylene. Duro-Fleece membranes are available in 50 and 60 mil thickness.	
Duro-Tuff Membrane	Duro-Tuff Membrane roof cover is composed of a PVC film laminated to both sides of a polyester reinforcement fabric (weft inserted scrim). The weft inserted scrim is an 18 x 9 polyester fabric construction with weft insertion composed of 840 x 1000 denier threads. Duro-Tuff membranes are available in 50, 60 and 80 mil thickness that are installed using mechanically fastening, cold adhered or induction welded.	Min. 4-inch lap for mechanically fastened systems and min. 3-inch lap for adhered systems with min. 1.5-inch welded lap seam; Side-laps shall be installed parallel to the direction of the wood trusses for mechanically attached systems over wood decks; Side-laps shall be installed perpendicular to the direction of the steel deck ribs for mechanically attached systems over steel deck
Duro-Fleece Membrane	Duro-Fleece Plus Membrane roof cover is composed of a PVC film laminated to both sides of a polyester reinforcement fabric (weft inserted scrim) and a polypropylene fleece bottom layer. The weft inserted scrim is an 18 x 9 polyester fabric construction with weft insertion composed of 840 x 1000 denier threads. The Fleece is 3.8 ounce per square yard polypropylene. Duro-Fleece membranes are available in 50, 60 mil and 80 mil thickness.	
Duro-Last X Membrane	Duro-Last X Membrane roof cover is composed of a PVC film laminated to both sides of a polyester reinforcement fabric (weft inserted scrim) and a polypropylene fleece bottom layer. The weft inserted scrim is an 18 x 14 polyester fabric construction with weft insertion composed of 840 x 1000 denier threads. The Duro-Last X is 3.8 ounce per square yard polypropylene. Duro-Last X membranes are available in 50, 60 mil and 80 mil thickness.	

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Re: Duro-Last Membrane, Duro-Tuff Membrane, Duro-Fleece Membrane, Duro-Fleece Plus Membrane and Duro-Last X Membrane Roof Coverings

<b>TABLE 3: INSULATION</b>	
DEXcell FA Glass Mat Roof Board	Min. 1/4-inch thick gypsum roof board with fiberglass facer; Adhered boards shall be a maximum 4-ft x 4-ft
DEXcell Cement Roof Board	Min. 7/16-inch thick cement roof board with glass mesh; Adhered boards shall be a maximum 4-ft x 4-ft
Duro-Guard EPS	Min. 0.5-inch, min. 1.5 pcf EPS; Adhered boards shall be a maximum 4-ft x 4-ft
Duro-Guard EPS Fan Fold	Min. 0.5-inch, min. 1.25 pcf EPS board with polymeric film facer;
Duro-Guard EPS Fiberglass Facer (FGF)	Min. 0.5-inch, min. 1.5 pcf EPS with fiberglass facer; Adhered boards shall be a maximum 4-ft x 4-ft
Duro-Guard XPS Fan Fold	Min. 0.5-inch thick; Extruded polystyrene (XPS) with polymeric facer
Duro-Last Duro-Guard ISO II-A	Min. 0.5-inch thick; Min. 20 psi polyisocyanurate board with various facers; Adhered boards shall be a maximum 4-ft x 4-ft
Duro-Last Duro-Guard ISO II-G	
Duro-Last Duro-Guard ISO II-H	
Duro-Last Duro-Guard ISO III-A	
Duro-Last Duro-Guard ISO III-H	
Duro-Last Duro-Guard ISO Foil	
Duro-Last Duro-Guard ISO HD Composite	Min. 2-inch thick composite polyisocyanurate board; Adhered boards shall be a maximum 4-ft x 4-ft
Duro-Last Duro-Guard ISO HD-A	Min. 0.5-inch thick; Min. 90 psi polyisocyanurate board with coated fiberglass facers; Adhered boards shall be a maximum 4-ft x 4-ft
Duro-Last Duro-Guard ISO HD-G	
Duro-Last Duro-Guard ISO HD-H	
Georgia-Pacific DensDeck, Dens Deck Prime	Min. 0.25-inch thick gypsum roof board with fiberglass facer; Adhered boards shall be a maximum 4-ft x 4-ft
JM Invinsa Roof Board	Min. 0.25-inch thick; Min. 150 psi polyisocyanurate with coated fiberglass facers; Adhered boards shall be a maximum 4-ft x 4-ft
Insulfoam R-Tech Fan Fold	Min. 0.5-inch ASTM C 578 Type IX or Type II Expanded Polystyrene with polymeric facers; Adhered boards shall be a maximum 4 ft x 4 ft
USG SECUROCK Gypsum-Fiber Roof Board	Min. 0.25-inch thick gypsum roof board with fiber reinforcement; Adhered boards shall be a maximum 4 ft x 4 ft

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<b>TABLE 4: INSULATION ADHESIVES</b>		
Olybond Classic	Dual component, low-rise polyurethane foam adhesive	Applied in 3/4 to 1-inch wide ribbons
Duro-Grip CR-20 Adhesive	Dual component, low-rise polyurethane foam adhesive.	Apply in 3/4 to 1-inch wide ribbons
Duro-Grip Insta Stik	Single component polyurethane adhesive.	Apply in 3/4 to 1-inch wide ribbons
Duro-Grip OlyBond 500	Dual component, low-rise polyurethane foam adhesive	Apply in 3/4 to 1-inch wide ribbons
Duro-Grip WeatherTite One Step	Dual component, low-rise polyurethane foam adhesive.	Apply in 1/2 to 3/4-inch wide ribbons

<b>Table 5: MEMBRANE ADHESIVES</b>		
Duro-Fleece CR-20 Membrane Adhesive	Dual component, low-rise polyurethane foam adhesive	Fleeceback products only; Apply in "splatter pattern" at a rate of 8 lbs/100-ft <sup>2</sup>
Duro-Fleece Membrane Adhesive	Two-component membrane adhesive	Fleeceback products only; Apply in 3/4-inch wide ribbons
Duro-Last SB IV Adhesive	Low VOC solvent-based membrane adhesive. Barebacked products only	Barebacked products only; Fully adhere at a combined rate 60-ft <sup>2</sup> /gal (Apply 120-ft <sup>2</sup> /gal to both membrane and substrate). Coverage will vary depending on porosity of substrate.
Duro-Last WB II Adhesive	Polymeric waterborne membrane adhesive	Fleece backed membranes: Fully adhere at a rate of 100-ft <sup>2</sup> /gal to substrate only. Coverage will vary depending on porosity of substrate. <u>Barebacked membranes:</u> Fully adhere at a rate of 140-ft <sup>2</sup> /gal to substrate only. Coverage will vary depending on porosity of substrate.
Duro-Last Tab Sealer 4725	Solvent based contact bonding agent for use in Hybrid lap fastening for mechanically attached membranes	Hybrid lap (fastener/plate placement in 6-inch wide tab) fastening. Applied over the tab membrane and to the underside of the overlying membrane at an approximate rate of 30 ft <sup>2</sup> /gal/side.

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<b>TABLE 6: FASTENERS</b>	
Duro-Bond Plate 1302	3-inch induction welding plate for PVC membranes; welds not permitted at lap seams
Duro-Last 3-inch Metal Plates	3-inch x 3-inch square; 0.024-inch thick Galvalume steel
Duro-Last #14 Concrete Screw	Min. 1.25-inch penetration into concrete
Duro-Last Cleat Plates	Min. 2 3/8-inch diameter, 0.035-inch thick steel plate with cleats
Duro-Last Duro-Coated Hex Head Screws	Min. 1.25-inch penetration into concrete
Duro-Last Fluted Concrete Nail	Min. 1.25-inch penetration into concrete
Duro-Last #14 HD Fastener	#14 screw; Min. 1-inch penetration into No. 2 wood truss; Min. 3/4-inch penetration through the top rib of the steel deck or through wood deck
Duro-Last #15 Extra Heavy Duty Drill Point Fastener	#15 screw; Min. 3/4-inch penetration through the top rib of the steel deck or through wood deck
Duro-Last Auger Fastener	Min. 2-inch penetration into substrate
Duro-Last Auger Plates	Min. 2-inch diameter steel plate
Duro-Last Poly-Plate	Min. 2-inch diameter, 0.335-inch thick glass-filled polycarbonate plate with cleats
OMG XHD Fastener	#15 screw; Min. 3/4-inch penetration through the top rib of the steel deck or through wood deck
TRUFAST Twin Loc Coiled Batten Bar	100 ft. long, 1-inch wide, 0.040-inch thick Galvalume coil with pre-punched holes 3-inch o.c.
TRUFAST DP #12 Fastener	#12 screw; Min. 3/4-inch penetration through the top rib of the steel deck
TRUFAST 3" Metal Insulation Plate	Min. 3-inch diameter steel plate
TRUFAST Twin Loc-Nail Assembled Fastener	2.7-inch steel disk with locking staple; Min. 1.8-inch penetration into substrate
TRUFAST Twin Loc-Nail Batten Fastener	Locking staple; Min. 1.8-inch penetration into substrate; for use with TRUFAST Twin Loc Coiled Batten Bar

## INSTALLATION

### General

Installation of the PVC roofing membranes described in this report must comply with the 2023 Los Angeles Building Code and the report holder's published installation instructions and this report. The report holder's published installation instructions must be available on the jobsite at all times during installation.

The substrate to which the membrane is to be applied must be clean, dry, and free of frost, loose fasteners, and other protrusions or contaminants that will interfere with the adhesion or attachment of the membrane or that will puncture the membrane. All materials must be protected against contact with incompatible materials.

Substrates must be free of standing water, gross irregularities and sharp projections. The insulation must be tightly butted and fastened to the substrate using fasteners and plates noted above and the tables of this report.

For systems using mechanically attached Duro-Last membrane, insulation boards must be attached to the substrate using minimum two fasteners for insulation boards that have no dimension measuring more than 4 feet, and using minimum four fasteners for insulation boards having any one dimension measuring more than 4 feet.

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For systems using fully adhered Duro-Last Membrane, insulation boards must be attached in accordance with Appendix B of this report.

**Mechanically Attached Membrane:**

For mechanically attached Duro-Last membrane, the membrane must be rolled out on the substrate and mechanically attached to the roof deck through the slip sheet, insulation, barrier board and/or existing roof covering, if present, using fasteners and stress plates noted in Table 6 and Appendix B. The fasteners must be placed along and through the fastening tabs. See Appendix B for fastener and lap details. The two lap types are as follows:

**Standard:** Standard lap consists of fastener/plate placement in the 3-inch- or 6-inch-wide (76 mm or 152 mm) preformed tabs. Unless otherwise noted, fastener placement must be through the centerline of the tab width.

**Hybrid:** Hybrid lap consists of fastener/plate placement in the 6-inch-wide (152 mm) preformed tabs. Unless otherwise noted, fastener placement must be through the centerline of the tab width. Prior to the pulling of the membrane for the next lap, Duro-Last Tab Sealer 4725 must be applied (see Table 5) over the tab membrane and to the underside of the overlying membrane (two-sided application) at an approximate rate of 30 ft<sup>2</sup>/gal/side. Care must be used to avoid wrinkles and air pockets.

**Fully Adhered Membrane:**

For fully adhered Duro-Last membrane, the prefabricated roof section is positioned over the area to be covered. The roof section is folded back onto itself to expose half of the roof area to be covered by that section. Adhesive is applied in front of the fold along its length in accordance with Table 5 of this report. Care must be taken not to apply more of the adhesive than can be covered prior to the adhesive setting up. The top layer of membrane is lifted and, starting at the fold, a stiff squeegee or broom is used to push the membrane into the adhesive. Care must be used to avoid wrinkles and air pockets. As each new roof section is added, the adjacent sheets are overlapped a minimum of 3 to 6 inches, with care taken to avoid contamination of the membrane where seams will be welded together.

**Seam Welding:**

After the membrane is fastened or bonded, sheets must be welded (heat-fused) together using hot air supplied by either a handheld or self-propelled welder. Each membrane sheet overlaps the adjacent sheet 3 to 6 inches. Field welds must be a minimum of 1 1/2 inches wide. The welded seam must be checked for continuity and integrity.

**Vents, Parapets, Protrusions and Edge Details:**

All vents, parapets, protrusions and edge details must be flashed in accordance with Duro-Last's published installation instructions.

**Fire Classification:**

The mechanically fastened and adhered PVC single-ply membrane roofing systems, when installed in accordance with this report, are Class A, B or C roof covering systems in accordance with UL 790 (ASTM E 108), as noted Appendix A.

**Wind Resistance:**

When the Duro-Last Membranes specified in Table 2 are installed in accordance with this report, the allowable uplift capacities for the PVC single-ply membrane roofing systems are as noted in Appendix B. Metal edge securement systems for low-slope roofs (roof slope less than 2:12) must be designed in accordance with ANSI/SPRI ES-1.

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## CONDITIONS OF USE

The Duro-Last Fire-retardant Roof Covering Systems described in this report are approved as roof coverings subject to the following conditions:

1. Installation must comply with this report, the manufacturer's published installation instructions and the applicable code. In the event of a conflict between the manufacturer's published installation instructions and this report, this report governs.
2. The roof covering system must be installed by applicators authorized and trained by Dura-Last, Inc.
3. For applications where foam plastic insulation is installed directly over a steel deck, an ICC-ES evaluation report recognizing the specific foam plastic insulation for direct-to-steel-deck applications shall be required. Above-deck thermal insulation board shall comply with the applicable standards listed in Table 1508.2 of the 2023 Los Angeles Building Code.
4. Foam plastic insulation must be separated from the interior of the building by an approved thermal barrier in accordance with Section 2603.4.1.5 of the 2023 Los Angeles Building Code, except for installations in accordance with #3 above and must be classified for roofing system application.
5. Foam plastic insulation, where used, must bear the label of an approved agency indicating that the foam plastic has a flame-spread index of not more than 75 when tested at the maximum thickness intended for use in accordance with ASTM E 84, subject to the approval of the Los Angeles Department of Building and Safety.
6. The allowable wind uplift loads in Appendix B are for the roof covering system only. The deck and framing to which the system is attached must be designed for the applicable components and cladding wind loads in accordance with the 2023 Los Angeles Building Code.
7. Wind uplift pressure on any roof area, including edge and corner zones, must not exceed the allowable wind uplift pressure for the system installed in that particular roof area. The metal edge securement shall be designed and installed for wind loads in accordance with Chapter 16 of the 2023 Los Angeles Building Code and tested for resistance in accordance with Test Methods RE-1, RE-2 and RE-3 of ANSI/SPRI ES-1, except that the ultimate wind loads shall be determined from Figure 1609.3(1), 1609.3(2), or 1609.3(3) of the 2023 Los Angeles Building Code.
8. Duro-Last membranes are manufactured in Saginaw, Michigan, under a quality control program with inspections by Underwriters Laboratories Inc. (AA-668).

## IDENTIFICATION

The Duro-Last Fire-retardant Roof Covering System components (membrane, fasteners and adhesives) described in this report are identified with a label indicating the manufacturer's name (Duro-Last Roofing, Inc.), the product type, and Los Angeles Research Report (LARR) No. RR 26100.

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## DISCUSSION

The technical modification is to capture Duro-Last X Membrane as part of this general approval, capture compliance with the 2023 Los Angeles Building Code and to capture change in contact person for the general approval.

This report is in compliance with the 2023 City of Los Angeles Building Code.

The approval is based on test data in accordance with ICC ES Acceptance Criteria for Roof Covering Systems (AC75), dated April 2014 and ASTM D4434 – Standard Specification for Poly (Vinyl Chloride) Sheet Roofing Type III and data in accordance with FM 4474 and FM4470

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this Approval have been met in the project in which it is to be used.

EUGENE BARBEAU, Chief  
Engineering Research Section  
201 N. Figueroa St., Room 880  
Los Angeles, CA 90012  
Phone: 213-202-9812  
Email: [engineering-research@lacity.org](mailto:engineering-research@lacity.org)

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Attachments:	Appendix I: Fire Classification	(6 Pages)
	Appendix II: Wind Uplift	(23 Pages)