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RESEARCH REPORT: RR 26105
(CSI # 07 54 23)

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REEVALUATION DUE
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GENERAL APPROVAL – UltraPly™ TPO, UltraPly™ TPO XR and UltraPly™ TPO SA Membrane Roof Coverings over combustible and noncombustible roof decks.

DETAILS

Firestone Single Ply UltraPly™ TPO Roof Systems are a Thermoplastic Polyolefin heat weldable roofing membrane produced with a polyester weft-inserted reinforcement. The UltraPly™ TPO XR Roof Systems are a Thermoplastic Polyolefin heat weldable roofing membrane produced with a polyester weft-inserted reinforcement and an 8-ounce polyester fleece backing.

UltraPly™ TPO and UltraPly™ TPO XR membranes are installed using cold adhesive, hot asphalt, mechanical fastening or induction welding. UltraPly™ TPO SA Membranes are self-adhered.

Firestone UltraPly™ TPO, UltraPly™ TPO XR and UltraPly™ TPO SA Roofing membranes meet the physical properties specifications outlined in Table 1 below.

Firestone UltraPly™ TPO, UltraPly™ TPO XR and UltraPly™ TPO SA Roofing membranes meet the fire classification and allowable design pressures detailed in Appendix I and Appendix II attached.

Tables 1 – 8 below provide physical property specifications, roof membrane composition and installation, base sheets / Vapor Barrier composition and installation, primer application rates, insulation composition and installation, insulation adhesives composition and installation, membrane adhesives composition and installation, and fastener composition and installation.

TABLE 1: PHYSICAL PROPERTY SPECIFICATION		
<u>Type</u>	<u>Product</u>	<u>Specification</u>
Membrane	UltraPly™ TPO	ASTM D 6878
Membrane	UltraPly™ TPO XR	ASTM D 6878
Membrane	UltraPly™ TPO SA	ASTM D 6878

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PRODUCT DETAILS

TABLE 2: ROOF MEMBRANES		
UltraPly™ TPO Membrane	Thermoplastic polyolefin (TPO) membrane manufactured with a polyester weft-inserted reinforcement. A reflective membrane suitable for low-slope applications. UltraPly™ TPO membranes are available in 45, 60 and 80 mil thickness.	Min. 2-inch wide side-laps with min. 1.5-inch wide heat weld; In-lap fastened systems shall have min. 6-inch wide side-laps with min. 1.5-inch wide heat weld; Side-laps shall be installed perpendicular to the direction of the steel deck ribs for mechanically attached systems
UltraPly™ TPO XR Membrane	Thermoplastic polyolefin (TPO) membrane manufactured with a polyester weft-inserted reinforcement and an 8-ounce fleece backing. A reflective membrane suitable for low-slope applications. UltraPly™ TPO XR membranes are available in 45 mil (UltraPly™ TPO XR 100), 60 mil (UltraPly™ TPO XR 115) and 80 mil (UltraPly™ TPO XR 135) thickness.	Min. 2-inch wide side-laps with min. 1.5-inch wide heat weld; In-lap fastened systems shall have min. 6-inch wide side-laps with min. 1.5-inch wide heat weld; Side-laps shall be installed perpendicular to the direction of the steel deck ribs for mechanically attached systems
UltraPly™ TPO SA Membrane	Thermoplastic polyolefin (TPO) membrane manufactured with a factory applied pressure sensitive adhesive. UltraPly™ TPO SA membranes are available in 45 and 60 mil thickness.	Min. 2-inch wide side-laps with min. 1.5-inch wide heat weld; End-laps shall be butted together and stripped by centering a 6" wide strip of UltraPly TPO membrane and heat welding the membrane strip along all edges.

TABLE 3: BASE SHEETS / VAPOR BARRIER		
BASEGARD SA	A Styrene-Butadiene-Styrene rubber modified, self-adhesive asphalt blend reinforced with a glass fiber mat.	Min. 3-inch wide side-laps; Min. 6-inch end laps; Side-laps shall be installed perpendicular to the direction of the steel deck ribs for mechanically attached systems
Firestone V-Force Vapor Barrier Membrane	A vapor retarder made of SBS modified bitumen adhesive laminated to a woven high density polyethylene top surface	Self-Adhered. Min. 3-inch side laps; Min. 6-inch end laps. All substrates except metal decks must be primed with vapor barrier primer.
Firestone MB Base	Fiberglass reinforced base sheet, asphalt coated on both sides. Applied in hot asphalt or mechanically attached.	Min. 2-inch wide side-laps; Side-laps shall be installed perpendicular to the direction of the steel deck ribs for mechanically attached systems
Firestone Channel Venting Base	Asphalt coated fiberglass base sheet. Sanded top surface and granules on bottom surface	Min. 3-inch wide side-laps; Min. 6-inch end laps; Side-laps shall be installed perpendicular to the direction of the steel deck ribs for mechanically attached systems
Firestone Ply IV (4)	Fiberglass reinforced, asphalt impregnated, roofing ply. Applied in hot asphalt	
Firestone Ply VI (6)	Fiberglass reinforced, asphalt impregnated, roofing ply. Applied in hot asphalt	
Firestone APP 80 Glass Base	Fiberglass reinforced, APP modified bitumen, smooth surfaced base sheet and burn off film.	
Firestone SBS Base	Fiberglass reinforced SBS base sheet with sanded surfaces	

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Firestone SBS Base P	Fiberglass reinforced SBS base sheet with surfacing agent	Min. 3-inch wide side-laps; Min. 6-inch end laps; Side-laps shall be installed perpendicular to the direction of the steel deck ribs for mechanically attached systems
Firestone SBS Glass Torch Base	Modified bitumen base sheet with a burn-off film and reinforced with non-woven fiberglass mat.	
Firestone SBS Glass Torch Base 1.5	Fiberglass reinforced, SBS Modified bitumen ply sheet with sanded bitumen top surface and burn off film	
Firestone SBS Glass FR Torch	Fiberglass reinforced, fire resistant, SBS modified bitumen ply with sanded top surface and burn-off film.	
Firestone SBS PolyBase	Polyester reinforced SBS modified bitumen membrane with sanded surfaces.	
Firestone SBS Poly Torch Base	Polyester reinforced modified bitumen membrane. Torch applied.	
Firestone SBS Premium Base	Fiberglass reinforced SBS modified bitumen with sanded surfaces.	
Firestone SBS Premium Poly Base	Polyester reinforced, SBS modified bitumen membrane with sanded surfaces.	
Firestone SBS Smooth	Polyester reinforced SBS modified bitumen membrane with sanded surfaces.	

TABLE 4: PRIMERS

Firestone SA-LVOC Primer	Applied at a rate of 0.5 gal/sq.
Firestone SA-Solvent Based (SB) Primer	
Firestone SA-Water Based (WB) Primer	Applied at a rate of 150 - 200 ft ² /gal

TABLE 5: INSULATION

GenFlex ISO Insulation	Polyisocyanurate foam insulation
GenFlex HD ISO	Polyisocyanurate with a coated fiberglass facer
GenFlex HD Composite ISO	Polyisocyanurate with a coated fiberglass facer composite insulation.
GenFlex Coated Glass Facer	Polyisocyanurate foam core laminated to a coated fiberglass facer
ISO 95+ GL	Polyisocyanurate foam insulation
ISOGARD HD	Polyisocyanurate with a coated fiberglass facer
ISOGARD HD Composite	Polyisocyanurate with a coated fiberglass facer composite insulation
RESISTA	Polyisocyanurate foam core laminated to a coated fiberglass facer
Georgia-Pacific DensDeck	Min. 0.25-inch Silicon treated gypsum
Georgia-Pacific DensDeck Prime	Min. 0.25-inch Silicon treated gypsum
USG SECUROCK Glass Mat Roof Board	Min.0.25-inch gypsum based core with fiberglass facers
USG SECUROCK Gypsum-Fiber Roof Board	Min. 0.5-inch fiber reinforced gypsum core.

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TABLE 6: INSULATION ADHESIVES		
I.S.O. Fix II	A single component polyurethane adhesive.	Partially adhered in 0.75 to 1-inch wide ribbons
I.S.O. Stick	A dual component polyurethane adhesive.	Partially adhered in 0.75 to 1-inch wide ribbons
I.S.O. Twin Pack Insulation Adhesive	A dual component polyurethane adhesive.	Partially adhered in 0.5 to 0.75-inch wide ribbons
Firestone I.S.O. Spray R	A two-part polyurethane adhesive	Partially adhered in 0.75 to 1-inch wide ribbons

TABLE 7: MEMBRANE ADHESIVES		
ASTM D 312, Type IV Asphalt	ASTM D 312, Type IV Asphalt	Fully adhered within the EVT range at a rate of 25-40 lbs/100 ft ²
Firestone I.S.O. Spray R	A two-part polyurethane adhesive	Partially adhered in 0.75 to 1-inch wide ribbons
Firestone XR Stick Membrane Adhesive	A low-rise polyurethane, low VOC, membrane adhesive.	Partially adhered in 0.75 to 1-inch wide ribbons
Firestone XR Bonding Adhesive	Solvent based adhesive	Fully adhered at rate of 70-90 ft ² /gal; Applied to substrate only
Firestone UltraPly Bonding Adhesive	Solvent based adhesive	Fully adhered at rate of 45-60 ft ² /gal; Applied to both the underside of membrane and the substrate
Firestone Single-Ply LVOC Bonding Adhesive	Solvent based bonding adhesive	Fully adhered at rate of 45-60 ft ² /gal; Applied to both the underside of membrane and the substrate
Firestone Single-Ply LVOC 1168 Bonding Adhesive	Solvent based bonding adhesive	Fully adhered at rate of 45-60 ft ² /gal; Applied to both the underside of membrane and the substrate
Firestone Water Based Bonding Adhesive P	Water based bonding adhesive	Fully adhered at a rate of 100-120 ft ² /gal. Applied to both the underside of membrane and the substrate
Owens Corning PermaMop Asphalt	ASTM D 312 Type IV Asphalt	Fully adhered within the EVT range at a rate of 25-40 lbs/100 ft ²

TABLE 8: FASTENERS	
Firestone All Purpose Fasteners	Min.0.75-inch penetration through the top rib of the steel deck or wood deck
Firestone Heavy Duty Fasteners	Min. 0.75-inch penetration through the top rib of the steel deck or wood deck; Min. penetration 1-inch into concrete deck (Heavy Duty Plus shall not be used in concrete deck)
Firestone Heavy Duty Plus Fasteners	Min. 0.75-inch penetration through the top rib of the steel deck or wood deck; Min. penetration 1-inch into concrete deck (Heavy Duty Plus shall not be used in concrete deck)
Firestone Concrete Drive Fasteners	Min. 1.25" embedment into min. 3" thick structural concrete
SFS InTech Dekfast #15 HS Fasteners	Min. 0.75-inch penetration through the top rib of the steel deck or wood deck; Min. penetration 1-inch into concrete deck (Heavy Duty Plus shall not be used in concrete deck)
SFS InTech Dekfast #14 Fasteners	Min. 0.75-inch penetration through the top rib of the steel deck or wood deck; Min. penetration 1-inch into concrete deck (Heavy Duty Plus shall not be used in concrete deck)

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Trufast #12 DP Fasteners	Min.0.75-inch penetration through the top rib of the steel deck or wood deck
Firestone UltraPly InvisiWeld Plate	Min. 3-inch diameter; Induction welded in the field of membrane; welds not permitted at lap seams
Firestone InvisiWeld-S Plate	Min. 3-inch diameter; Induction welded in the field of membrane; welds not permitted at lap seams
Firestone Insulation Fastening Plate	3-inch diameter; Galvalume steel plate
Firestone HD Seam Plate	2 3/8-inch diameter; 0.036-inch Galvalume steel plate with eyehooks
Firestone HD Plus Seam Plate	2.75-inch diameter; 0.037-inch Galvalume steel plate with eyehooks
Trufast 3” Metal Seam Plate	3-inch diameter; Galvalume steel plate
Firestone 1.7” LWC Base Ply Fastener	Full embedment of shank into substrate
Firestone Metal Batten Bar	1-inch wide steel batten bar
Firestone Polymer Batten Strip	0.75-inch wide plastic batten strip
Firestone Purlin Fastener	Min. 0.75-inch penetration through purlin
Firestone UltraPly QuickSeam R.M.A Strip	Prime at a rate of 200-250 ft ² /gal with Firestone Single-Ply QuickPrime Prime prior to adhering strip
SFS Intec SFS Purlin Fastener	Min. 0.75-inch penetration through purlin

INSTALLATION

General

Installation of the TPO roofing membranes described in this report must comply with the 2017 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.

Installation of Firestone Fire-Retardant Roof Covering Systems must comply with this report and the manufacturer’s published installation instructions. The manufacturer’s published installation instructions must be available at the jobsite at all times during installation. 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 Firestone TPO membranes, 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.

For systems using fully adhered Firestone TPO membranes, insulation boards must be attached in accordance with Appendix B of this report.

Mechanically Attached Membrane:

For mechanically attached Firestone TPO membranes, the membrane must be rolled out on the substrate and mechanically attached to the roof deck through the insulation, barrier board and/or existing roof covering, if present, using fasteners and stress plates noted in Table 8 and Appendix B. See Appendix B for fastener and lap details.

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Fully Adhered Membrane:

For fully adhered Firestone TPO membranes, 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 7 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 Firestone's published installation instructions.

Fire Classification:

The mechanically fastened and adhered TPO 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 I

Wind Resistance:

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

CONDITIONS OF USE

The Firestone 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 Firestone Building Products Co.
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 must be required. Above deck thermal insulation board shall comply with the applicable standards listed in Table 1508.2 of the 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 2017 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.

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6. The allowable wind uplift loads in Appendix II 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 2017 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 2017 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 2017 Los Angeles Building Code.
8. Firestone TPO membranes are manufactured in Tuscumbia, Alabama and Wellford, South Carolina under a quality control program with inspections by Underwriters Laboratories Inc. (AA-668).

IDENTIFICATION

The Firestone Fire-retardant Roof Covering System components (membrane, fasteners and adhesives) described in this report are identified with a label indicating the manufacturer’s name (Firestone Building Products Co.), the product type, and Los Angeles Research Report (LARR) No. RR 26105.

DISCUSSION

This report is in compliance with the 2017 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 July 2010 (editorially revised September 2016) and ASTM D6878 – Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing 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.

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Attachments: Appendix I: Fire Classification (3 Pages)
 Appendix II: Wind Uplift (69 Pages)