MECHANICALLY FASTENED SYSTEMS

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SECTION 1 - - - GENERAL

INTRODUCTION

The following is the information required to install the Duro-Last roofing system. Each installation should be in compliance with the detail drawings, instructions, material descriptions, and other information stated herein.

REQUIREMENTS

1. The Duro-Last roofing system must be installed by an authorized Duro-Last contractor.
2. A Duro-Last Technical Representative must inspect the Duro-Last roofing system for compliance with the Duro-Last specifications before a commercial/industrial warranty is issued. Note: Duro-Last does not perform destructive testing unless visual inspection necessitates a need for further investigation.
3. All materials used in the installation of the Duro-Last roofing system must be products of Duro-Last, Inc. or accepted products as defined and described in the specification. Other materials must be accepted in writing by the Duro-Last Engineering Services department prior to being used in the Duro-Last roofing system.
4. The Duro-Last contractor is responsible for following all applicable building, plumbing, and electrical codes.
5. Buildings 40 ft. or taller and/or located within high wind zones (greater than 110 mph) or special wind regions, the following applies:
    a. The Duro-Last Engineering Services Department should be involved in determining the fastening requirements. Typically, the ASCE 7 Specification will be used to determine the fastening requirements. When appropriate, specifications set forth by entities such as FM Global, SPRI or State/Local Agencies will be utilized.
    b. Fastening tab spacing may not exceed 60 inches on center unless approved, in writing, by the Duro-Last Engineering Services Department.
6. It is the contractor's responsibility to verify the accuracy of information provided to Duro-Last, including but not limited to pull test results, building height, and roof dimensions. Measurements used during the quotation phase of a project must be checked for accuracy by the installing contractor.

TOOLS

The authorized Duro-Last contractor should have the following tools, which are necessary for the efficient and proper installation of the Duro-Last roofing system.

• Safety Equipment (such as fall protection)		• Equipment necessary to raise materials to the rooftop
• Hand welders (hot-air) with a spare heating element (Optional: Automatic welder)		• Silicone hand roller
• Extension cords - cord length of 100 ft., #12/3 wire w/ground		• Ground fault interrupter
• Variable speed power screw driver with reverse		• P-3 screwdriver tips for screws
• Electric hammer drill w/depth gauge		• R-3 square drive tips for concrete screws
• Metal snips, hacksaw, keyhole saw, hammers, scissors, utility knives with retractable blades		• Measuring tapes (100 ft. and 25 ft.), chalk line, markers, lumber crayon
• 2-inch flat chisels, pry bar		• Vise clamps, nail aprons, caulk gun, screw drivers
• Tack claw		• Ladders
• Tarps		• Gripull
• Core cutter		• Pull tester
• Detergent-based cleaning fluid and rags		• Panduit bander

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MEMBRANE DESCRIPTION

A. The Duro-Last membrane is a polyvinylchloride polymer blend, which is reinforced with a high-strength weft-inserted polyester scrim that has a thread pattern of 18 x 14 threads per square inch. Refer to the Product Data Sheets for a listing of all of the test results and physical properties of the membrane.

1. The 40-mil thick membrane has a system weight of approximately 0.25 lb/ft^2. The prefabricated roof cover is supplied in sections that are either folded or rolled. Individual sections may be as large as 2,500 ft^2, with no single dimension exceeding 100 ft. Deck sheets can be fabricated up to 3,000 ft^2 when using 10-ft. laps, 30'-6" wide with a full reverse, not to exceed 100 ft. long.
2. The 50-mil thick membrane has a system weight of approximately 0.32 lb/ft^2. The prefabricated roof cover is supplied in sections that are either folded or rolled. Individual sections may be as large as 2,000 ft^2, with no single dimension exceeding 80 ft. Deck sheets can be fabricated up to 2,500 ft^2 when using 10-ft. laps, 30'-6" wide with a full reverse, not to exceed 80 ft. long.
3. The 60-mil thick membrane has a system weight of approximately 0.39 lb/ft^2. The prefabricated roof cover is supplied in sections that are either folded or rolled. Individual sections may be as large as 1,500 ft^2, with no single dimension exceeding 60 ft.

APPLICABILITY

The Duro-Last roofing system consists of the Duro-Last membrane, fasteners, prefabricated corners, parapet flashings, stack flashings, curb flashings, two-way vents, and other related Duro-Last approved products. The Duro-Last roofing system consists of products manufactured by Duro-Last, Inc., or accepted products as defined and described in the specifications. Alternate materials must be pre-approved in writing by the Duro-Last Engineering Services Department prior to their use with the Duro-Last roofing system.

DRAINAGE/SLOPE

Duro-Last has found no adverse effects on its membrane because of a lack of positive drainage, however, good roofing practices incorporate the use of positive drainage for the safety of the structure. The installing contractor is responsible to make sure roof drainage meets local building code requirements.

WEATHER CONSIDERATIONS

The Duro-Last membrane is designed to perform in all types of weather. The Duro-Last membrane is regularly subjected to DSET, EMMAQUA Exposure and low temperature cracking (ASTM D-2136) testing. Installation of the Duro-Last membrane is limited only by the exposure limitations of the installers. It is Duro-Last's recommendation that installation be performed within the temperature range of –15º to 115º F.

DELIVERY

The Duro-Last roofing system and related materials will be delivered to the location designated by the Duro-Last contractor in the original packaging and with shipping labels intact. Containers will be labeled with manufacturers/supplier's name, product name, and identification. Each shipment should be checked for damages and/or shortages at the time of delivery. The freight agent must note damaged materials and/or shortages on the freight bill. Concealed damage must be reported to the freight agent immediately. Materials damaged in shipping, handling, or storage cannot be used.

HANDLING

Once the Duro-Last roofing system is delivered, the contractor and contractor's crew are responsible for all handling and installation of the roofing system. Adequate personnel and equipment should be available to safely lift and place the Duro-Last roofing system onto the rooftop. Folded or rolled prefabricated sections of membrane must be placed on the roof near load-bearing members, and in a manner convenient to final placement.

STORAGE

Duro-Last materials should be kept clean and dry. Materials should be stored on pallets and covered with tarps. Care should be taken to place materials away from areas where water may pond or areas that water falls onto from higher elevations. All sealants must be stored at temperatures above 40° F. Keep combustible materials away from heat, sparks, and open flames. Follow precautions outlined on the containers or supplied by the material manufacturer.

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SUBSTRATE SEPARATION

The Duro-Last membrane is defect-free when it leaves the factory. Certain substrates are not compatible with the Duro-Last membrane and may cause premature failure of the membrane. Over the substrates listed below, install an approved slip sheet, fan fold board or cover board prior to the installation of the Duro-Last membrane.

Acrylic Coatings	Extruded Polystyrene	Modified Bitumen	Shingles
Aluminum Coated Asphalt	Granulated Cap Sheet	Old Duro-Last Roofs	TPO (Thermoplastic Polyolefin)
Coated or Smooth Asphalt	Hypalon (CSPE)	Polyurethane	Sprayed Urethane Foam
Expanded Polystyrene	Mineral Surfaced Cap	Coal Tar Pitch	PVC/CPA Membranes

The Duro-Last membrane is compatible with the following substrates, and no separation is required.

CPE Roofing	GP DensDeck™ and DensDeck™ Primed	Glass Fiber Board
Cellular Glass Boards	Polyisocyanurate Insulation Boards	
EPDM (clean)	Lightweight\Structural Concrete Decks (Smooth)	Wood Decks
Gypsum	Smooth Pre-stressed Concrete Decks	

CHEMICAL RESISTANCE

Duro-Last membrane is resistant to the chemicals listed below. If any other chemicals are present on a particular roof, please contact the Engineering Services Department.

Acrylic Paint	Linseed Oil	Copper Sulfate	Lard (Animal Fats)
Latex Paint	Masonry Cleaner	Ferric Chloride	Phosphoric Acid
Fertilizer Solution	Muriatic Acid	Fiberglass Mat	Polypropylene
Fruit Juice	Oleic Acid	Furnace Residue	Zinc Chloride
Hydrogen Peroxide	Sodium Hydroxide	Detergent Solution	Bleach

PAINT APPLICATION

The Duro-Last membrane may be painted, although vinyl edging may not be painted. See the Chemical Resistance section for approved paint types for the membrane. If the vinyl edging is painted and causes damage to the edgings, Duro-Last Roofing, Inc. will not be held responsible for repair or replacement under the warranty. Should you have any questions, please contact the Duro-Last Quality Assurance Department.

VAPOR BARRIERS

Duro-Last recommends the use of vapor barriers, however it is the responsibility of the Duro-Last contractor of record to ensure that all applicable specifications, building codes, regulations and ordinances are complied with and followed. A roofing professional, such as a consultant or architect, should be utilized for correct roof system design prior to installing any roof system.

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SECTION 2 - - - QUALITY ASSURANCE

PRE-JOB INSPECTION

When recovering an existing roofing system, the authorized Duro-Last contractor is responsible to conduct an inspection of the proposed job site roof conditions to determine the needed fastener type and length, evaluate the moisture content of the existing roofing system, and to note damaged areas to be repaired prior to installation of the Duro-Last roofing system.

CORE CUTS

1. The Duro-Last contractor is responsible for performing a series of core cuts to determine and verify the above information. The Duro-Last contractor and/or building owner is responsible for the repair of all core cuts.
2. Duro-Last, Inc. does not approve the practice of roofing over existing roofing systems that contain excess moisture. Excess moisture is defined as water observed within a core cut or water squeezed from the core sample taken.
3. Duro-Last's post-installation warranty inspection does not check the moisture content of the substrate.

PULLOUT TESTS

1. Fastener pullout tests must be conducted on the roof deck with approved fasteners to verify the integrity of the deck and to establish fastening patterns that meet the requirements of Duro-Last specifications. Contact the Duro-Last Engineering Services Department with any questions.
2. It is the responsibility of the Duro-Last contractor to make sure pullout tests are performed on site. The tests can be performed by either the fastener manufacturer or the authorized Duro-Last contractor. The sections of decking where integrity is in question should be the locations for the tests. The pullout tests must be documented on a roof drawing showing the location and pullout value of each test. In situations where new construction prevents on-site pullout tests, a pre-assembled deck representing the proposed deck type should be constructed and tested.
3. The number of pullout tests required will be as follows: perform a minimum of 10 tests for up to 50,000 ft^2 and five additional pull tests for each additional 50,000 ft^2 or portion thereof, on each project. Areas of low pullout results will require additional pullout tests.
4. It is the responsibility of the Duro-Last contractor to verify pullout values prior to installation.

FASTENER SELECTION AND DECK TYPES

The fasteners used to attach insulation, recover board and Duro-Last membrane must be supplied by Duro-Last, Inc. The following tables summarize the appropriate fasteners to use for different deck types and system components. If a fastener type is needed that is not listed below, the Duro-Last Engineering Services Department must approve its use, in writing, prior to installation.

PLATE SELECTION

When determining which plates to use and where to use them, refer to this table.

	2-inch Poly-Plate	2.4-inch Cleat Metal Plate	3-inch Square Metal Plate	Insulation Plate
Membrane Fastening				
Fastening Tabs	Yes	Yes	No*	No
Parapet Flashings	Yes	Yes	Yes	No
Base of Walls/Penetrations	Yes	Yes	Yes	No
Insulation Boards	Yes	Yes	Yes	Yes
Cover Boards	Yes	Yes	Yes	No

* Allowed by deviation only or on the Duro-Roof system.

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FASTENER SELECTION BASED ON DECK TYPE

When determining which fastener type to use for a specific deck type, refer to this table. Note that pullout tests must be performed on each deck and that fastener spacing must be determined based on the "Fastener Spacing Tables" on the following page. If the minimum pullout values required cannot be achieved contact the Duro-Last Engineering Services Department for assistance.

Deck Type	Fastener Type	Notes
Steel	Duro-Last HD Screws Duro-Last XHD Screws	Must penetrate a minimum of 1 inch from the top surface of deck.
Wood	Duro-Last HD Screws Duro-Last XHD Screws	Must penetrate a minimum of 1 inch from the top surface of deck.
Structural Concrete	Duro-Last Concrete Nail Duro-Last Concrete Screw Duro-Last HD Screws Duro-Last XHD Screws	Must penetrate a minimum of 1 inch from the top surface of deck. Pre-drill a minimum of 1/2 inch deeper than the required depth of the fasteners using a 3/16-inch bit.
Gypsum	Auger Fastener* Liquid Auger Fastener**	Minimum pullout requirements must be met. See "Fastener Spacing Tables", page 7.
		Pre-drill required for auger fasteners. Use a 7/16 – 9/16-inch bit.
		* Must penetrate a minimum of 1-1/2 inches from the top surface of deck. * Factory Mutual designed systems require minimum of 2-inch penetration.
		** Liquid Augers must penetrate a minimum of 2 inches from the top surface of the deck.
Cementitious Wood Fiber (Tectum)	Auger Fastener* Liquid Auger Fastener**	Minimum pullout requirements must be met. See "Fastener Spacing Tables", page 7.
		Do not pre-drill.
		* Must penetrate a minimum of 1-1/2 inches from the top surface of deck. * Factory Mutual designed systems require minimum of 2-inch penetration.
		** Liquid Auger must penetrate a minimum of 2 inches beyond the top surface of the deck.
Lightweight Concrete	Auger Fastener* Liquid Auger Fastener** Duro-Last Concrete Screw Duro-Last Concrete Nail Duro-Last HD Screws Duro-Last XHD Screws	Minimum pullout requirements must be met. See "Fastener Spacing Tables", page 7.
		Pre-drill required. Augers: Use a 7/16 – 9/16-inch bit. Others: Use a 3/16-inch bit.
		* Must penetrate a minimum of 1-1/2 inches from the top surface of deck. * Factory Mutual designed systems require minimum of 2-inch penetration.
		** Liquid Auger must penetrate a minimum of 2 inches from the top surface of the deck.
Walls and Curbs	**Fastener Type**	**Notes**
Cinder and Concrete Block	Zinc Plated Metal Anchors Duro-Last Concrete Screw Duro-Last Concrete Nail Duro-Last HD Screws Duro-Last XHD Screws	Must penetrate a minimum of 1 inch from the top surface. Pre-drill a minimum of 1/2 inch deeper than the required depth of the fasteners using a 3/16-inch bit (1/2-inch for metal anchors).

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FASTENER SPACING TABLES* – FOR USE WITH ALL DECK TYPES

60 psf System Design Table (Field Area Only)

Fastener Pullout Resistance		Fastener Spacing Along Laps					
		120-inch Lap Spacing		60-inch Lap Spacing		28-inch Lap Spacing	
lb.	N	in.	mm	in.	mm	in.	mm
450	2000	9	230	18	457	24	610
375	1670	6	230	15	380	18	455
350	1550	6	150	15	380	18	455
325	1445	6	150	12	305	18	455
300	1330	6	150	12	305	18	455
275	1220	N.A.		12	305	18	455
225	1000	N.A.		9	230	18	455
210	930	N.A.		6	150	18	455
175	780	N.A.		6	150	15	380
150	665	N.A.		6	150	15	380
140	620	N.A.		N.A.		12	305
Less than 140 (620)		N.A.		N.A.		N.A.	

90 psf System Design Table (Field Area Only)

Fastener Pullout Resistance		Fastener Spacing Along Laps					
		120-inch Lap Spacing		60-inch Lap Spacing		28-inch Lap Spacing	
lb.	N	in.	mm	in.	mm	in.	mm
450	2000	6	230	12	305	18	455
375	1670	N.A.		9	230	18	455
350	1550	N.A.		6	150	18	455
325	1445	N.A.		6	150	18	455
300	1330	N.A.		6	150	15	380
275	1220	N.A.		6	150	15	380
225	1000	N.A.		6	150	18	455
210	930	N.A.		N.A.		12	305
175	780	N.A.		N.A.		9	230
Less than 175 (780)		N.A.		N.A.		N.A.	

Pullout values greater than 450 lbs can only be used with the Duro-Roof system.

1. For buildings 40 ft. or taller and/or located within high wind zones (greater than 110 mph) or special wind regions:
   a. The Duro-Last Engineering Services department should be involved in determining the fastening requirements. The ASCE 7 Specification will be used to determine the fastening requirements. When appropriate, specifications set forth by entities such as FM Global, SPRI or State / Local Agencies will be utilized.
   b. Fastening tab spacing may not exceed 60 inches on center unless approved, in writing, by the Duro-Last Engineering Services department.

The tables to the left indicate the membrane fastening within the FIELD AREA only. Membrane attachment on Duro-Last designed roof systems, buildings in special wind regions or those 40 feet or taller, and all Factory Mutual-insured buildings will require special field, perimeter, and corner fastening.

The width of the perimeter area is determined by the either the lesser of 40% of the building height at the eaves or 10% of the overall plan width of the building and/or roof area. The perimeter must never be less than 5 feet wide.

Contact the Duro-Last Engineering Services department for additional information.

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SECTION 3 - - - IMPLEMENTATION

ROOF PREPARATION

RECOVER – Built-up Roofs (BUR)

a. If the BUR is gravel surfaced and the pea gravel or crushed stone is 1/4 – 3/8-inch in size, it must be leveled and maintained at 4 lb/ft^2. A minimum 3/8-inch fan fold recover board, supplied by Duro-Last, approved recover board, or 1 inch thick insulation must be used to overlay the gravel.

b. If the loose stone on an old BUR is vacuumed or swept, a minimum 3/8-inch fan fold board, supplied by Duro-Last, approved recover board, or 1 inch thick insulation must be used to overlay the existing system. CAUTION: Removing more than the loose gravel may affect the fire rating. Contact the Duro-Last Engineering Services Department for assistance regarding fire rated assemblies.

c. If the BUR is a smooth or granular surfaced application, and is free of sharp edges and debris, it can be recovered with an approved slip sheet, although Duro-Last fan fold board is recommended.

d. EPS insulation cannot be used over coal tar pitch or asphalt without a slip sheet between the coal tar pitch and the insulation as well as between the membrane and the insulation. Duro-Last underlayments are approved for direct application over aged coal tar pitch roofs.

e. When roofing over asphalt or coal tar roofs (including tear-off), an approved separator sheet must be used. Asphalt-based products are incompatible with the Duro-Last roofing membrane. Note: Should the Duro-Last membrane become soiled with roofing asphalt, the affected membrane must be cleaned immediately using approved cleaners and procedures. If the asphalt cannot be properly cleaned from the membrane, the affected membrane must be removed and new membrane installed, or overlay the affected area with an approved slip sheet and new membrane. Extreme caution should be taken if you are doing a tear-off while installing the membrane.

RECOVER – Single-Ply Roofs

a. The existing single-ply roofing membrane must be cut free from the entire roof perimeter, cut free around all penetrations, and cut in between fastener rows prior to the installation of the Duro-Last membrane. When reroofing after a tear-off, caution should be used to prevent the Duro-Last membrane from contacting incompatible materials. (See "Substrate Separation", page 4)

b. If the existing system is mechanically fastened, there is often a problem with loose fasteners. Because of this problem, cut the membrane open and remove all loose fasteners before installing the slip sheet.

c. If a PVC membrane has been installed directly over styrene insulation without a separation sheet, then the old membrane must be removed, damaged insulation replaced, and an approved slip sheet installed.

d. If the existing membrane is ballasted and the Duro-Last membrane is to be mechanically fastened, it is necessary to do fastener pullout tests on the deck. Also, the type of insulation and its density needs to be determined to ensure that the insulation will meet the Duro-Last specification (See "Substrate Separation", page 4). Be aware that if the existing insulation is "loose-laid" it must be fastened with an approved fastening pattern (See Detail 1020).

RECOVER – Metal Roof Recover/Retrofit

a. The metal roof panel must be clean, smooth, and free of sharp edges and loose foreign material. Damaged areas and other factors affecting the installation of the Duro-Last roofing system must be repaired prior to the installation of the membrane.

b. A metal roof panel must be separated from the Duro-Last membrane by using a recover board of at least 7/16-inch hardboard (gypsum), plywood, or oriented strand board (OSB) or 1-inch rigid insulation. When 1-inch rigid insulation is used, flute filler must be used and must consist of polyisocyanurate insulation. Note: According to International Building Code (IBC), the use of above-deck thermal insulation (including extruded or expanded EPS) is covered with an approved roof covering and passes the tests of FM 4450 or UL 1256 when tested as an assembly. The gaps between the ribs of the metal and the insulation fill cannot exceed the recover board manufacturer's recommendation for spanability. Flute filler must be fastened as needed to hold it in place. (Note: Duro-Last fanfold may be used if the flutes are filled with no gaps exceeding 1/4 inch total in between metal ribs.)

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c. Insulation/recover board must be neatly fitted to the roof deck and its penetrations. 4 x 8-ft. boards must be attached with a minimum of 5 fasteners/distribution plates. See details 1020 & 1030 found in the detail section of this manual for mechanical attachment of additional sizes of recovery boards. Gaps between insulation/recovery boards cannot exceed 1/4 inch in width. No more insulation/recovery board will be installed than can be covered with membrane and completed before the end of the day's work or before the onset of inclement weather. Duro-Last fasteners and plates as well as approved fastening patterns are required for attachment of all insulation/recover board. Contact the Duro-Last Engineering Services Department with any questions.

d. High-density wood fiberboard is acceptable on metal building recovers when the building slope is at least 1 inch vertically for every 12 inches horizontally. High-density wood fiber will not be accepted as flute filler.

e. Plywood is acceptable to recover metal roofs. The minimum thickness, if it is being used as recover board, shall be 7/16 inch. Fasteners must penetrate through both the plywood and the existing metal roof.

f. If plywood will be acting as the new substrate for membrane attachment, the plywood must be a minimum of 9/16 inch thick and a pull-test must be conducted on the new lumber to determine the proper lap spacing and attachment along the tab. Contact the local building authority to determine compliance of deck attachment to the building structure. Note: It is the responsibility of the contractor to ensure that the weight requirements of the building are not exceeded when installing additional materials over pre-engineered buildings.

NEW CONSTRUCTION

a. All concrete surfaces must be troweled smooth. If the concrete surface is not smooth, a minimum 3/8-inch fan fold board, supplied by Duro-Last, is required.

b. The roof deck or existing roof system must be clean, smooth, free of sharp edges, and loose foreign material. Damaged areas and other factors affecting the installation of the Duro-Last roofing system must be repaired prior to the installation of the membrane.

c. A metal deck must be separated from the Duro-Last membrane by at least 7/16-inch hardboard (gypsum, plywood, or oriented strand board) or 1-inch rigid insulation. It is the responsibility of the contractor to ensure that the selected insulation is adequate to span the flutes of the deck. If it is not, the flutes must be filled with an approved insulation. See "Insulation Selection and Installation" for further details.

d. All plywood surfaces must be smooth and free of all foreign material. Gaps between sheets of plywood should not exceed 1/4 inch. Prior to the installation of the membrane an approved slip sheet or duct tape must be installed over any H-clips if they are used on any plywood decking.

INSTALLATION

WOOD NAILER

Wood nailers must be a #2 grade lumber, or better and must be fastened to the deck, wall or existing secured nailer in such a manner that they resist 180 lb of force per linear ft. of nailer in any direction. Fasteners used to attach wood nailers must be spaced no greater than 18 inches apart. Wood nailers are required in any situation where 1 inch or greater of insulation is added to the roof perimeter edge. The top of the nailers must be flush with the top of the insulation. Wood nailers are not required at a change of plane such as the intersection between a parapet wall and the decking.

Duro-Last Engineering Services requires that for nailers and other lumber supports identified as ACQ or CA treated, only stainless steel fasteners be used. Additionally, for all new construction, untreated lumber should be used for nailers with standard e-coated fasteners. Further, treated lumber dating 2003 or earlier is acceptable for use with e-coated fasteners as lumber prior to 2003 of age is unlikely to contain the copper based treatments.

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INSULATION SELECTION AND INSTALLATION

Insulation products must be neatly fitted to the roof deck and its penetrations. 4 x 8-ft. insulation boards must have a minimum of 5 fasteners/distribution plates installed per board. No gap should exceed ¼ inch in width. No more insulation products should be installed than can be covered with membrane and completed before the end of the day's work or before the onset of inclement weather. Duro-Last fasteners and Duro-Last plates as well as approved fastening patterns are required for attachment of all insulation products.

The minimum compression characteristics of insulation products as determined by ASTM D-1621 will be as follows:

- Polyisocyanurate products: 20 psi
- Fiberglass products: 16 psi
- Extruded polystyrene products: 25 psi
- Expanded polystyrene products: 15 psi and 1.5 pcf density (certified) and a minimum 1 inch thick.
- Expanded polystyrene products covered with or laminated to a hardboard facer: 12 psi and 1.25 pcf densities and a minimum of 1 inch thick.

PERIMETER MEMBRANE INSTALLATION

a. The first fastening tab on all perimeter roof sections that have tabs parallel with the roof edge or parapet wall must be between 24 – 36 inches from the edge or the wall. If the parapet wall is greater than 24 inches tall, the perimeter tab may be placed up to 63 inches away from the roof edge when utilizing roof sections with maximum lap spacing of 60 inches on center.

b. When using roof sections with fastening tabs spaced 120 inches, the first tab along all perimeter roof edges must be located 24 – 36 inches from the edge. The second tab must be placed 84 – 96 inches from the edge. Parapet wall height does not change this requirement.

c. On buildings with multiple roof levels, treat all roof edges as perimeter edges if they stand 3 ft. or more above adjacent or surrounding roof areas.

d. On buildings located in high wind zones (greater than 110 mph) or on structures that are 40 feet or taller, additional wind tabs and/or increased fastener density may be required. Contact the Duro-Last Engineering Services department for assistance.

MEMBRANE INSTALLATION

a. The prefabricated roof section is unrolled and positioned on the deck to expose the first securement tab. The securement tab is mechanically fastened to the deck with approved fasteners and stress distribution plates (see "Fastener Selection and Deck Types", page 6). The roof section is then unfolded and pulled taut to remove any wrinkles exposing the second securement tab. This process is repeated until the entire roof section has been mechanically fastened to the deck, including all securement tabs and edges. The next section of roofing membrane is then positioned to provide a minimum of 6 inches overlap. The above procedure is repeated for each roof section.

b. The edge of the stress distribution plate must be installed flush with the outside edge of a fastening tab.

c. The maximum fastener spacing is 18 inches on center in rows 60 inches apart. For tab spacing greater than 60 inches, the maximum fastener spacing is 12 inches on center. (Refer to the Fastener Spacing Table, page 7.)

d. When installing membrane, ensure that the appropriate side of the membrane is exposed to elements. For white and gray membrane, the smooth side should be exposed. On the tan membrane, it will be the embossed side of the membrane that should be exposed.

e. If the membrane is attached to the support structure beneath the roof deck, special precautions must be taken. If the membrane is attached to a steel purlin structure, all fasteners must penetrate a minimum of 1-3/4 inches from the top of the purlin using Duro-Last purlin fasteners. If the membrane is being attached to a wood truss structure, all fasteners must penetrate a minimum of 1 inch from the top surface of the truss with approved Duro-Last fasteners.

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HOT-AIR WELDING

a. Position the membrane so that the top membrane overlaps the bottom membrane a minimum of 6 inches. Ensure the welding area is dry, clean and free of foreign material.

b. Weld the top membrane to the bottom membrane using a hand-held welder or an automatic welding machine, and silicone roller. A minimum 1-1/2-inch wide continuous weld is required.

c. All field-welded seams must be inspected with a tack claw or similar tool (cotter key extractor), and all deficiencies repaired prior to inspection by Duro-Last.

ROOF PENETRATIONS

a. The Duro-Last membrane must be fastened at the base of all roof penetrations. Such penetrations include, but are not limited to, pipes, drains, curbs, pitch pans, and expansion joints.

b. The fastener spacing around penetrations shall be the same as that being used to fasten the roof membrane adjacent to the penetration. A minimum of one fastener is required.

FLASHINGS

a. The Duro-Last membrane must not contact surfaces which maintain or exceed temperatures of 120° F including all insulated chimney pipes, exhaust pipes, and combustible fuel pipes.

b. All flashings, with the exception of pitch pans, must be terminated at a minimum of 8 inches above the roof surface. See “Pitch Pans” section for pitch pan installation criteria.

c. See “Mechanically Fastened” details section for installation references.

PITCH PANS

a. Use pitch pans only when standard Duro-Last flashings cannot be used.

b. Only Duro-Last Duro-Caulk Plus or approved sealer may be used when creating a pitch pan.

c. All pitch pans must be terminated at a minimum of 4 inches above the roof surface.

d. See Details 4030, 4040 and 4045 for installation references.

TWO WAY AIR VENTS

a. Install Duro-Last Two-Way Air Vents following these guidelines:

    1. Install at a rate of one vent for every 1,000 ft^2 of deck area.
    2. Do not install the vents near drains or in valleys.
    3. Evenly space the vents across the roof area and center them between fastening tabs.

b. It is the contractor’s responsibility to ensure that adequate secondary drainage exists to prevent flooding during extreme weather when water could infiltrate the two-way vent.

c. See Detail 5020 for installation references.

ROOF DRAINS AND SCUPPERS

a. Drain Assemblies with Clamping Rings

    1. All existing roofing materials must be removed from drain bowl and clamping ring.
    2. Use Duro-Caulk Plus between the membrane and clamping ring (1/2 tube minimum).
    3. After the Duro-Last membrane is properly installed onto the bowl and the clamping ring set in place, all bolts securing the ring must be installed to provide constant, even compression on the sealant. If bolts are broken or missing, replacements must be installed.

b. Duro-Last Drain Boots

    1. If the Duro-Last drain boot is to be used, apply 1/2 tube of sealant (minimum) to the outside of the drain boot and insert it into the drain.
    2. Install composite compression drain rings as low into the drain as possible.

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c. See Details 2011, 2020, 2021, 2025, 2030, 2041, 2050, 2060, 2061, 2070 and 2071 for installation references.

EXPANSION JOINTS

a. See Details 1140, 1150, 1160, 1170 and 6160 for installation references.

WALKWAY PADS

a. Duro-Last Roof Trak® III Walkway Pad is recommended at all roof access points, service units and high traffic areas. The risk of potential third party damage to the Duro-Last roofing system may increase should the building owner choose not to utilize the Duro-Last Roof Trak III Walkway Pad. Note: Prior to inspection of the installation by Duro-Last, attach only one side of any Walkway Pads that will be covering any field seams. This will allow the Duro-Last Technical Representative to inspect the entire field seam. After the inspection, hot-air weld the remaining side to complete the attachment of the pad.

CAUTIONS AND WARNINGS

1. Duro-Last Roofing, Inc. is not responsible for damage that may occur as a result of moisture created from condensation occurring within or beneath a roof deck subassembly or building.
2. Duro-Last recommends the use of vapor barriers, however it is the responsibility of the Duro-Last contractor of record to ensure that all applicable specifications, building codes, regulations and ordinances are complied with and followed. A roofing professional, such as a consultant or architect, should be utilized for correct roof system design prior to installing any roof system.
3. All Polystyrene insulation (Styrofoam, Formular, Dow, EPS, etc. - blue, white, gray, green, or pink) must have an approved non-styrene facer or an approved slip sheet covering when installed in direct contact with existing or new PVC membranes. Polyethylene or polypropylene facers are acceptable only after testing, and approval by Duro-Last for compatibility.
4. Phenolic foam is not an approved insulation in new construction or re-roofing applications. The Duro-Last roofing system may not, under any circumstance, be installed over phenolic foam.
5. Perlite and wood/mineral fiber-boards are not acceptable substrates for the Duro-Last membrane. (See #5 below for exception on wood fiber board)
6. High density wood fiber boards are only acceptable on a metal roof that is being retrofitted where the slope of the roof will be 1 inch per 12 inches or greater.
7. If asbestos is encountered, the building owner must be notified at once. The owner is solely responsible for determining the proper course of action.
8. A Duro-Last roof shall not be installed over areas of roofs if one or more of the following conditions exist:
    a. The building structure is not sufficient to handle the load of the completed system.
    b. It is not possible to find an approved fastener that will properly hold in the substrate.
    c. Roofs are subject to hot embers, slag, or burning debris.
    d. Incompatible chemicals exhausted directly onto the roof or may come in contact with the roof in liquid form. (See “Chemical Resistance”, page 4.)
    e. Steam is exhausted directly onto the roof that is in excess of 120º F.

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