



## PAVER 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 paver system consists of the Duro-Last membrane, paver protection mat, interlocking pavers or individual pavers (see "Paver Installation" #1 and #2, page 9), fasteners, prefabricated corners; parapet, stack, and curb flashings; vents and other related Duro-Last approved products necessary for the proper and warrantable installation of the Duro-Last paver system.
5. IN NO INSTANCE IS DURO-LAST RESPONSIBLE FOR DETERMINING THE ABILITY OF THE ROOF STRUCTURE TO SURVIVE AND WITHSTAND THE WEIGHT ADDED BY THE PAVER SYSTEM.
6. The Duro-Last contractor is responsible for following all applicable building, plumbing, and electrical codes.
7. The use of pavers on roofs of buildings that are located in high wind zones (100 mph+) will not be approved. For this and other special conditions, consult with the Duro-Last Engineering Services Department.
8. 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' (30 m), #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' and 25') (30 and 7.5 m), chalk line, markers, lumber crayon
• 2-inch (50 mm) 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

**MEMBRANE DESCRIPTION**

1. The Duro-Last membrane is a polyvinyl chloride polymer blend, which is reinforced with a high-strength weft-inserted polyester scrim that has a thread pattern of 18 x 14 threads per inch. Refer to the Spec Data Sheets in the “Product Data Sheets” section for a listing of all of the test results and physical properties of the membrane.
  1. The 40 mil (1 mm) thick membrane has a system weight of approximately 0.25 lb/ft<sup>2</sup> (1.22 kg/m<sup>2</sup>). The prefabricated roof cover is supplied in sections that are either folded or rolled. Individual sections may be as large as 2,500 ft<sup>2</sup> (232 m<sup>2</sup>), with no single dimension exceeding 100-ft (30 m). Deck sheets can be fabricated up to 3,000 ft<sup>2</sup> (279 m<sup>2</sup>) when using 10-ft (3.05 m) laps, 30'-6" (9.3 m) wide with a full reverse, not to exceed 100-ft (30.5 m) long.
  2. The 50 mil (1.27 mm) thick membrane has a system weight of approximately 0.32 lb/ft<sup>2</sup> (1.56 kg/m<sup>2</sup>). The prefabricated roof cover is supplied in sections that are either folded or rolled. Individual sections may be as large as 2,000 ft<sup>2</sup> (186 m<sup>2</sup>), with no single dimension exceeding 80-ft (24 m). Deck sheets can be fabricated up to 2,500 ft<sup>2</sup> (232 m<sup>2</sup>) when using 10-ft (3.05 m) laps, 30'-6" (9.3 m) wide with a full reverse, not to exceed 80-ft (24.4 m) long.
  3. The 60 mil (1.52 mm) thick membrane has a system weight of approximately 0.39 lb/ft<sup>2</sup> (1.9 kg/m<sup>2</sup>). The prefabricated roof cover is supplied in sections that are either folded or rolled. Individual sections may be as large as 1,500 ft<sup>2</sup> (139 m<sup>2</sup>), with no single dimension exceeding 60-ft (18.28 m).
  4. The prefabricated roof section is positioned on the deck then unrolled and pulled taut to remove any wrinkles. The next section of roofing membrane is then positioned to provide a minimum of 6-inch (.23 m) overlap. These steps are repeated to completely cover the decking or insulation and decking. The entire deck membrane is covered with an approved protection mat. To weigh down the membrane using interlocking pavers, 10 lbs per square foot **-or-** individual pavers, non-interlocking, 15 lbs per square foot is required. See “Paver Installation” #1 and # 2, page 10.

**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 -15 to 115 °F (-26 to 46 °C).

**DELIVERY**

A complete 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 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 is 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 (5 °C). Keep combustible materials away from heat, sparks, and open flames. Follow precautions outlined on the containers or supplied by the material manufacturer.

**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 a minimum 3 mil polyethylene or polypropylene slip sheet 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 <sup>®</sup> and DensDeck <sup>®</sup> Prime	Glass Fiber Board
Cellular Glass Boards	Polyisocyanurate Insulation Boards	USG SECUROCK <sup>®</sup> Gypsum-Fiber Roof Board
EPDM (clean)	Lightweight\Structural Concrete Decks (Smooth)	Wood Decks
Gypsum	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, but not the vinyl edging. See the Chemical Resistance section for approved paint types for the membrane. If prohibited painting does occur and cause 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.

## 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 water. Excess water is defined as water observed within a core cut or moisture squeezed from the core sample taken.
3. Duro-Last's post-installation warranty inspection does not check the moisture content of the substrate.

### **PULL 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<sup>2</sup> (4,645 m<sup>2</sup>) and five additional pull tests for each additional 50,000 ft<sup>2</sup> 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 INSTALLATION**

1. This section is to provide the basis for the decision on the type of fastener and fastener spacing required for the application of the membrane on a prepared surface. For installation over particleboard, waferboard oriented strand board, or other wood composite board and layered sheet gypsum decks, contact the Duro-Last Engineering Services Department.
2. Fastener attachment along the tabs at parapet walls is shown on the Fastener Spacing Tables.
3. The authorized Duro-Last dealer/contractor must ensure that fasteners are properly driven into the deck and/or insulation surface. (See detailed drawing 1040)
4. The use of pavers on roofs of buildings that are located in high wind zones (100 mph+) will not be approved. For this and other special conditions, consult with the Duro-Last Engineering Services Department.
5. Pullout tests must be performed on each deck and that fastener spacing must be determined based on the "Fastener Spacing Tables." If the minimum pullout values required cannot be achieved contact the Duro-Last Engineering Services Department for assistance.

### **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 (50 mm) Poly-Plate	2.4-inch (61 mm) Cleat Metal Plate	3-inch (76 mm) 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.

Deck Type	Fastener Type	Notes
<b>Steel</b>	Duro-Last HD Screws Duro-Last XHD Screws	Must penetrate a minimum of 1-inch (25 mm) from the top surface of deck.
<b>Wood</b>	Duro-Last HD Screws Duro-Last XHD Screws	Must penetrate a minimum of 1-inch (25 mm) from the top surface of deck.
<b>Structural Concrete</b>	Duro-Last Concrete Nail Duro-Last Concrete Screw Duro-Last HD Screws Duro-Last XHD Screws	Must penetrate a minimum of 1-inch (25 mm) from the top surface of deck. Pre-drill a minimum of 1/2-inch (12.7 mm) deeper than the required depth of the fasteners using a 3/16-inch bit.
<b>Gypsum</b>	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 (11 – 14mm) bit.
		* Must penetrate a minimum of 1-1/2-inch (38 mm) from the top surface of deck.
		* Factory Mutual designed systems require minimum of 2-inch (50 mm) penetration.
<b>Cementitious Wood Fiber (Tectum)</b>	Auger Fastener* Liquid Auger Fastener**	Minimum pullout requirements must be met. See "Fastener Spacing Tables", page 7.
		<b>Do not pre-drill.</b>
		* Must penetrate a minimum of 1 1/2-inch (38 mm) from the top surface of deck.
		* Factory Mutual designed systems require minimum of 2-inch (50 mm) penetration.
<b>Lightweight Concrete</b>	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 (11 – 14 mm) bit. Others: Use a 3/16-inch (5 mm) bit.
		* Must penetrate a minimum of 1-1/2-inch (38 mm) from the top surface of deck.
<b>Walls and Curbs</b>	<b>Fastener Type</b>	<b>Notes</b>
<b>Cinder and Concrete Block</b>	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 (25 mm) from the top surface. Pre-drill a minimum of 1/2-inch (12.7 mm) deeper than the required depth of the fasteners using a 3/16-inch (5 mm) bit (1/2-inch (12.7 mm) for metal anchors).

**FASTENER SPACING PER PULL TEST RESULTS**

The roof membrane is mechanically fastened at the perimeter of each roof level, roof section, curb, skylight, interior wall, penthouse, etc., at any inside angle change where slope or combined slopes exceed 2-inches in one horizontal foot, and at other penetrations in accordance with the applicable Duro-Last details. Duro-Last fasteners and distribution plates are used.

**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.	

1. The use of pavers on roofs of buildings that are located in high wind zones (100 mph+) will not be approved. For this and other special conditions, consult with the Duro-Last Engineering Services Department.
2. \* Typically, for buildings 40-feet (12 m) or taller and/or located within high wind zones (greater than 110 mph [177 km/h]) or special wind regions;
  - 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 in. (1.5 m) on center unless approved, in writing, by the Duro-Last Engineering Services Department.

The tables above 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 five-feet wide.

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

**PREPARATION FOR INSTALLATION****PRECAUTIONS**

The Duro-Last Paver System should not be installed over certain areas of roofs, if one or more of the following conditions exist:

1. Roof slope is greater than 2-inches per horizontal foot.
2. The building structure is not sufficient to handle the load of the completed system.
3. The combined weight of the paver assembly exceeds the dead load limits according to the local building codes.
4. It is not possible to find an approved fastener that will properly hold in the substrate whereby the integrity of the deck/substrate is questionable.
5. Roofs are subject to hot embers, slag or burning debris.
6. Incompatible chemicals are exhausted directly onto the roof. (See "Chemical Resistance", page 4).
7. Steam source in excess of 120°F is exhausted directly onto the roof.
8. Free water is located during core cuts. (See "Core Cuts", page 5).

**SUBSTRATE PREPARATION**

1. The roof deck must be clean, smooth, free of fins, sharp edges and loose of foreign material. Damaged areas and other factors affecting the installation of the Duro-Last Roofing System must be repaired prior to installation of the membrane.
2. On pea gravel or crushed stone ballast built-up roofs.
  - a. If the pea gravel or crushed stone is 1/4-3/8 inches (6 mm - 10 mm), in size, is leveled and maintained at 4 lbs/sq. ft. (20Kg/m<sup>2</sup>), a minimum Duro-Last 1/2-inch underlayment or 1-inch thick insulation must be used.
  - b. If the loose stone on an old B.U.R. is vacuumed or swept, a separator not less than 3/8-inch (12 mm) thick such as fanfold or polyisocyanurate must be used.
  - c. EPS insulation cannot be used over coal tar pitch without a slip sheet between the EPS and coal tar pitch.
  - d. Duro-Last underlayments are approved for direct application over aged coal tar pitch roofs.
  - e. On new construction or re-cover applications, a separator/slip sheet is required between Duro-Last membrane and EPS insulation/fanfold products that are not sold by Duro-Last, Inc.
3. All Polystyrene insulation (Styrofoam, Formular, Dow, EPS, etc. - blue, white, gray, green, or pink) must have an approved non-styrene facer or a slip sheet covering. Polyethylene or poly-propylene facers are acceptable, only after compatibility testing by Duro-Last.
4. All expanded and extruded fanfold underlayments purchased from outside suppliers must have a minimum 3-mil polyethylene or polypropylene slip sheet placed over their entire surface before installing the Duro-Last membrane.
5. A metal deck requires a minimum separation of 1/2-inch (13 mm) hardboard (gypsum, plywood, or oriented strand board) or 1-inch (25 mm) rigid insulation from the Duro-Last membrane.
6. All concrete surfaces must be troweled smooth. If they are not, a minimum 3/8-inch approved fan-fold underlayment is required.
7. Plywood must be nailed or screwed, staples will not be accepted.
8. If H-Clips are used in plywood deck, place duct tape over them prior to the installation of the membrane.

## SECTION 3 - - - IMPLEMENTATION

### MEMBRANE INSTALLATION

1. Take precautions to avoid water from flowing beneath any completed sections of the membrane system by completing the flashings, terminations and daily seals by the end of each work day.
2. If it is not possible to complete all flashings by the end of each work day, temporary seals must be provided.
3. Concentrated loads from installation equipment will cause deformation of insulation and possible damage to the membrane if proper protection is not provided. A protection course and/or sleepers must be used to prevent damage to the membrane and insulation.
4. Sweep all loose debris from the substrate.
5. Position the Duro-Last membrane over the acceptable substrate without stretching.
6. Position temporary weight on the membrane to prevent the movement or displacement of membrane not weighted.
7. Allow the membrane to relax.
8. Position adjoining sheets in the same manner overlapping the edges a minimum of 2-inches.
9. Using an approved automatic heat welding machine or hand held heat gun and silicone roller, continuously weld a minimum 1-1/2 inch wide seam. All welded seams must then be manually checked for voids or seal deficiencies. Probe with a tack claw. Corrections shall be made using an approved hand held heat gun and silicone roller.

### PROTECTION MAT INSTALLATION

1. A 6-7 ounce per square yard non-woven polyester mat sold expressly for roofing membrane protection is required over the entire Duro-Last membrane prior to placement of the paver system.
2. After completing all membrane and flashing seams, position protection mat loosely over the membrane with all edges overlapping at least 6-inches.
3. Extend the protection mat a minimum of 2-inches above the anticipated paver level at the parapets and penetrations to protect the flashings.
4. The protection mat must extend to drain bases and scupper openings but must not cover or restrict water flow to the drains.
5. Following the placement of the mat, it is necessary to install the pavers or temporary weight to prevent the movement or displacement of approved paver mat that is not weighted.
6. Do not cover field welds with paver mat and pavers until final warranty inspection.

### PAVER INSTALLATION

1. Interlocking type concrete pavers shall be manufactured for rooftop application and provide full coverage. The minimum weight shall be 10 pounds per square foot. Interlocking pavers are to be installed to the manufacturer's specifications.
2. Individual smooth troweled pavers with a minimum weight of 15 pounds per square foot may be used if not interlocking. Individual pavers can be no larger than 24-inches square and weigh no more than 80 pounds per unit for easy removal and replacement. Individual pavers are to be installed loose laid and butted together with gaps no greater than 1/2-inch.
3. **Lightweight "patio" stones and "crushed stone" are not acceptable for paver system.**
4. Use of temporary weight to prevent wind uplift is the responsibility of the Duro-Last Contractor/Dealer. For immediate protection against wind uplift, Duro-Last recommends sufficient weight to be placed on the protection mat on the membrane as each section of membrane is installed and completed.
5. Care must be exercised during the application of pavers to prevent damage to either the membrane or insulation.

6. Heavily traveled areas during paver installation must be protected by placing temporary walkways to prevent possible damage to the deck membrane and insulation.
7. Do not cover field welds with paver mat and pavers until final warranty inspection.

**INSTALLATION OVER EXISTING ROOFS**

1. Duro-Last Roofing, Inc. does not approve the practice of roofing over existing roofing systems that contain free water. This is water observed by taking core cuts, seeing standing water in the core or having water flowing into the cut, or squeezing the core sample and getting water droplets.
2. For installation over an existing roof, the authorized Duro-Last Dealer/Contractor will conduct an inspection of the proposed job site roof conditions, determine the needed fastener type and length, and note damaged areas to be repaired prior to installation of the Duro-Last Roofing System. The inspection shall include a series of core cuts and pull tests (see fastener section for minimum requirements).
3. If asbestos is encountered, the building owner shall be notified at once, and the owner will determine the proper course of action.
4. All existing single-ply roofing membrane must be cut free from the entire roof perimeter and around all penetrations and cut in between fastener rows, prior to the installation of the Duro-Last membrane. When re-roofing after a tear-off, caution should be used to prevent the Duro-Last membrane from contacting incompatible materials.
5. The existing membrane must be separated from the Duro-Last membrane with an approved separator layer. See slip sheet requirements.
6. If the existing system is mechanically fastened, cut the membrane open and remove all loose fasteners before installing the slip sheet.
7. If a PVC membrane has been installed directly on styrene insulation without a separation sheet, then the old membrane must be removed, affected insulation replaced, and an approved slip sheet installed.
8. Remove any and all existing stone aggregate. **Do not re-use.** Reuse of existing pavers are accepted if the pavers meet the minimum weight requirements as stated on page 9, Paver Installation.
9. The type of insulation and its density needs to be determined, to insure that the insulation will meet Duro-Last Roofing, Inc. requirements. It is a good practice to make many cuts in the old membrane.
10. When roofing over asphalt or coal tar roofs (including tear-off) an approved separator must be used.
11. Duro-Last will warrant its membrane in ponding water situations. We have found no adverse effects on Duro-Last membranes because of a lack of positive drainage on a structure. Although Duro-Last does not require positive drainage, good roofing practices incorporate the use of positive drainage for the safety of the structure.

**INSULATION**

Insulation products must be neatly fitted to the roof deck and its penetrations. No gap should exceed 1/4-inch (6 mm) in width. No more insulation products 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. Fastening of the insulation is **not** required. DURO-LAST FASTENERS, DURO-LAST PLATES AND APPROVED FASTENING PATTERNS ARE REQUIRED FOR ATTACHMENT OF ALL INSULATION PRODUCTS SHOULD THE PROJECT SPECIFICATIONS REQUIRE THEM. (See detail 1020 & 1030.) Also, see section UL/FM/CODES for types of insulation to be used for Factory Mutual and Underwriters Laboratories approvals. Minimum compression characteristics of insulation products as determined by ASTM D-1621 will be as follows:

- Polyisocyanurate products: 20 PSI (137.8 kPa)
- Fiberglass products: 16 PSI (110.3 kPa)
- Extruded polystyrene products: 25 PSI (172.3 kPa)
- Expanded polystyrene products: 15 PSI (124.1 kPa) and 1.5 PCF (24 Kg/m<sup>3</sup>) density (certified) and a minimum 1-inch (25 mm) thick.

- Expanded polystyrene products covered with or laminated to a hardboard facer: 12 PSI (82.7 kPa) and 1.25 PCF (20 Kg/m<sup>3</sup>) densities and a minimum of 1-inch (25 mm) thick.

**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 foot (2,643 N/M) of nailer in any direction. Fasteners used to attach wood nailers must be spaced no greater than 18-inch (455 mm) apart. Wood nailers are required in any situation where 1-inch (25 mm) 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.

**NAILS BY OTHERS**

Where applicable, ring shank nails must be hot-dipped galvanized, having a minimum head diameter of 3/8".

**HOT AIR WELDING**

1. Position the membrane so that an overlap of the top membrane overlaps the bottom membrane a minimum of 6-inches. Ensure the welding area is dry, clean and free of foreign material.
2. Weld the top membrane to the bottom membrane using a hand-held welder or an automatic welding machine, and silicone roller. A minimum 1½-inch (38 mm) wide continuous weld is required.
3. All field-welded seams must be inspected with a tack claw and all deficiencies repaired prior to inspection by Duro-Last.

**FLASHINGS**

1. The Duro-Last membrane must not contact surfaces, including all insulated chimney pipes, exhaust pipes and combustible fuel pipes, which maintain or exceed temperatures of 120° F.
2. 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.
3. See "Mechanically Fastened" details section for installation references.

**PITCH PANS**

1. Use pitch pans only when standard Duro-Last flashings cannot be used.
2. Only CSL self-leveling pitch pan sealers or Duro-Caulk Plus may be used when creating a pitch pan.
3. All pitch pans must be terminated at a minimum of 4 inches above the roof surface.
4. See Details 4030, 4040, 4045 and 4050 for installation references.

**LEAD STACK FLASHINGS**

Existing lead stack flashing must be removed prior to installation of a Duro-Last stack flashing. Precautions must be taken to protect exposed cast iron from rusting.

**ROOF DRAINS**

1. All existing roofing materials must be removed from drain bowl and clamping ring. 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 (½ tube min). If bolts are broken or missing, replacements must be installed.
2. If the Duro-Last drain boot is to be used, apply ½ tube of sealant (min) to the outside of the drain boot and insert it into the drain. Install composite compression drain rings as low into the drain as possible.
3. See Details 2011, 2020, 2021, 2025, 2030, 2041, 2050, 2060, 2061 and 2070 for installation references.

**EXPANSION JOINTS**

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

**ROOFING ASPHALT ON MEMBRANE**

Asphalt used for low-slope and flat roofing is incompatible with the Duro-Last roofing membranes. Should the Duro-Last membrane become soiled with roofing asphalt, the affected membrane must be cleaned, 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.

**WARRANTY**

A 15 year full commercial warranty will be issued after the successful completion of the system by the installing contractor, and passing inspection by a Duro-Last Technical Representative.

**NOTE:** Pursuant to paragraphs 4b and 4c of the Duro-Last 15-Year Warranty, it is the responsibility of the building owner, at his or her expense, to remove pavers in the event that a repair of the membrane is required. Do not cover field welds with paver mat and pavers until final warranty inspection.

***A Duro-Last Paver System is applicable to new construction and re-cover, and may be installed over any substrate provided the following conditions are met:***

1. The Duro-Last paver system and its applicability to any given installation is to be in compliance with all conditions stated here.
2. The Duro-Last paver system must be installed by an authorized Duro-Last dealer/contractor.
3. The proper separation and slip sheet required is provided between the Duro-Last membrane and the substrate.
4. The roof structure is designed to carry the dead load.
5. Where mechanical attachment is not possible or desirable.
6. IN NO INSTANCE IS DURO-LAST RESPONSIBLE FOR DETERMINING THE ABILITY OF THE ROOF STRUCTURE TO SURVIVE AND WITHSTAND THE WEIGHT ADDED BY THE PAVER SYSTEM.
7. A 6 - 7 ounce per square yard approved protection mat is installed on top of the roofing membrane prior to the placement of the pavers.
8. The roof membrane is mechanically fastened at the perimeter of each roof level, roof section, curb, skylight, interior wall, penthouse, etc.; at any inside angle change where slope or combined slopes exceed 2-inches in one horizontal foot; and at other penetrations in accordance with the applicable Duro-Last details. Duro-Last fasteners and distribution plates are used.
9. All field seams are left exposed for warranty inspection. Once accepted by the Duro-Last Technical Representative, the seam may be covered with the protection mat and the appropriate pavers.
10. Proper paver retention is installed at all roof perimeters, drains, scuppers, and etc. Retention device shall be at least the height of the paver and be approved by Duro-Last.
11. The Duro-Last Roofing System will be inspected for warranty consideration by a Duro-Last Technical Representative per current Duro-Last Roofing, Inc. inspection policies.
12. Duro-Last Roofing, Inc. is not responsible for damage that may occur as a result of the dew point falling within a roof deck sub-assembly or building.
13. Fastener pull-out tests are conducted on the roof deck with approved fasteners, and the substrate has sufficient holding power to meet the requirements of Duro-Last specifications.

**CAUTIONS AND WARNINGS**

1. All Polystyrene insulation (Styrofoam, Formular, Dow, EPS, etc. - blue, white, gray, green, or pink) must have an approved non-styrene facer or a 3-mil polyethylene 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.
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. 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.
4. Perlite and wood/mineral fiber-boards are not acceptable substrates for the Duro-Last membrane.
5. Wood fiber boards are only acceptable when a metal roof is being retrofitted.
6. If asbestos is encountered, the building owner must be notified at once. The owner is solely responsible for determining the proper course of action.
7. A Duro-Last roof shall not be installed over areas of roofs if one or more of the following conditions exist:
  8. The building structure is not sufficient to handle the load of the completed system.
  9. It is not possible to find an approved fastener that will properly hold in the substrate.
  10. Roofs are subject to hot embers, slag or burning debris.
11. Incompatible chemicals exhausted directly onto the roof or may come in contact with the roof in liquid form (See Chemical Resistance in the General Section).