



## ADHERED 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. The Duro-Last membrane must be installed over properly prepared decks/substrates. The decks/substrate must be compatible with the roofing membrane.
3. Perimeter edge termination details must include sealant as shown in the detail drawings included in this specification (i.e. FA3010, FA3030, FA3040, FA3110, FA3120, FA3500, FA3510, FA3560, FA6000 and FA6010). Any other type of edge termination must be approved in writing by Duro-Last, Inc. prior to installation.
4. The 2 or 4-inch vinyl gravel stop or vinyl drip edge cannot be used on Duro-Last fully adhered installations.
5. 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.
6. 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.
7. The Duro-Last contractor is responsible for following all applicable building, plumbing, and electrical codes.
8. For buildings 40 ft. (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. The Peel Stop detail described in detail drawings FA9060 and FA9060A is required when the Duro-Last membrane is adhered to polyisocyanurate insulation board. The Peel Stop detail may also be required in other instances. Refer to "Membrane Installation" on page 10 and detail drawings FA9060 and FA9060A for requirements.
  - c. 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.
9. The maximum size deck sheet that may be installed is 52'-6" x 20' (16 x 6 m).
10. The maximum length of parapet flashing to be fully adhered is 50 ft. (15 m).
11. To be eligible for any of the Duro-Last 20 year warranties, the following criteria must be met.
  - a. Complete the "20-Year Fully Adhered Project Approval" form and submit to Engineering Dept.
  - b. Duro-Last membrane must have a thickness of 50 mil or greater.
  - c. An approved cover board such as Duro-Guard ISO HD, DensDeck Prime® or SECUROCK® Gypsum-Fiber Roof Board must be used.

**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.

## SPECIFICATION: ADHERED SYSTEMS

<ul style="list-style-type: none"> <li>• Safety Equipment (such as fall protection)</li> </ul>	<ul style="list-style-type: none"> <li>• Equipment necessary to raise materials to the rooftop</li> </ul>
<ul style="list-style-type: none"> <li>• Hand welders (hot-air) with a spare heating element (Optional: Automatic welder)</li> </ul>	<ul style="list-style-type: none"> <li>• Silicone hand roller</li> </ul>
<ul style="list-style-type: none"> <li>• Extension cords - cord length of 100' (30 m), #12/3 wire w/ground</li> </ul>	<ul style="list-style-type: none"> <li>• Ground fault interrupter</li> </ul>
<ul style="list-style-type: none"> <li>• Variable speed power screw driver with reverse</li> </ul>	<ul style="list-style-type: none"> <li>• P-3 screwdriver tips for screws</li> </ul>
<ul style="list-style-type: none"> <li>• Electric hammer drill w/depth gauge</li> </ul>	<ul style="list-style-type: none"> <li>• R-3 square drive tips for concrete screws</li> </ul>
<ul style="list-style-type: none"> <li>• Metal snips, hacksaw, keyhole saw, hammers, scissors, utility knives with retractable blades</li> </ul>	<ul style="list-style-type: none"> <li>• Measuring tapes (100' and 25') (30 and 7.5 m), chalk line, markers, lumber crayon</li> </ul>
<ul style="list-style-type: none"> <li>• 2-inch (50 mm) flat chisels, pry bar</li> </ul>	<ul style="list-style-type: none"> <li>• Vise clamps, nail aprons, caulk gun, screw drivers</li> </ul>
<ul style="list-style-type: none"> <li>• Tack claw</li> </ul>	<ul style="list-style-type: none"> <li>• Ladders</li> </ul>
<ul style="list-style-type: none"> <li>• Tarps</li> </ul>	<ul style="list-style-type: none"> <li>• Pull tester</li> </ul>
<ul style="list-style-type: none"> <li>• Core cutter</li> </ul>	<ul style="list-style-type: none"> <li>• Panduit bander</li> </ul>
<ul style="list-style-type: none"> <li>• Detergent-based cleaning fluid and rags</li> </ul>	<ul style="list-style-type: none"> <li>• Paint rollers</li> </ul>
<ul style="list-style-type: none"> <li>• Push Brooms / Heavy duty squeegee</li> </ul>	

### **MEMBRANE DESCRIPTION**

1. 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 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.
2. The 40 mil (1 mm) thick membrane has a system weight of approximately 0.25 lb/ft<sup>2</sup> (1.2 kg/m<sup>2</sup>). The roof cover is prefabricated using hot-air weld and supplied in sections rolled on carpet tubes. Individual sections may be as large as 52'-6" x 20' (16 x 6 m). The maximum length of parapet flashing to be fully adhered is 50 ft. (15 m).
3. 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 roof cover is prefabricated using hot-air weld and supplied in sections rolled on carpet tubes. Individual sections may be as large as 52'-6" x 20' (16 x 6 m). The maximum length of parapet flashing to be fully adhered is 50 ft. (15 m).
4. 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 roof cover is prefabricated using hot-air weld and supplied in sections rolled on carpet tubes. Individual sections may be as large as 52'-6" x 20' (16 x 6 m). The maximum length of parapet flashing to be fully adhered is 50 ft. (15 m).

### **APPLICABILITY**

The Duro-Last roofing system consists of the Duro-Last membrane, fasteners, prefabricated corners, parapet flashings, stack flashings, curb flashings, 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 fully adhered Duro-Last membrane is subject to temperature limitations above 40° F (4.5° C) for a period of 72 consecutive hours with no precipitation occurring. It is Duro-Last's recommendation that installation be performed within the temperature range of 40 to 115° F (4.5 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'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 and adhesives 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. These substrates are listed below.

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.

Polyisocyanurate Insulation Boards	GP DensDeck™ and DensDeck™ Primed	Glass Fiber Board
Wood Decks	Smooth Structural Concrete Decks	Cellular Glass Boards
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, 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.

### **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<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 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
<b>Membrane Fastening</b>				
Peel Stop*	No	Yes	Yes	No
Parapet Flashings	Yes	Yes	Yes	No
Base of Walls/Penetrations	Yes	Yes	Yes	No
Insulation Boards	No	No	Yes **	No
Cover Boards	No	No	Yes **	No

\* Refer to detail drawing FA9060 for peel stop requirements.

\*\* 3-inch Square Metal Plates must be used to fasten insulation and cover boards when Duro-Last membranes are adhered.

**Fastener Selection Based on Deck Type**

When determining which fastener type to use for a specific deck type, refer to this table.

<b>Deck Type</b>	<b>Fastener Type</b>	<b>Notes</b>
<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 (5 mm) bit.
<b>Gypsum</b>	Auger Fastener* Liquid Auger Fastener**	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.
		** Liquid Augers must penetrate a minimum of 2-inch (50 mm) from the top surface of the deck.
<b>Cementitious Wood Fiber (Tectum)</b>	Auger Fastener* Liquid Auger Fastener**	<b><i>Do not pre-drill.</i></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.
		** Liquid Auger must penetrate a minimum of 2-inch (50 mm) beyond the top surface of the deck.
<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	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. * Factory Mutual designed systems require minimum of 2-inch (50 mm) penetration.
		** Liquid Auger must penetrate a minimum of 2-inch (50 mm) from the top surface of the deck.
<b>Walls and Curbs</b>		Notes
<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).

**DECK / SUBSTRATE CRITERIA****APPROVED DECKS**

1. Steel Deck:  
An approved substrate is required on steel decks. See the “Approved Insulation / Substrates” (page 8) section.
2. Poured Structural Concrete, Minimum 3,000 psi:  
If the concrete is structurally sound, clean, smooth, dry, free of sharp edges, dust, contaminants, oil, grease, and loose foreign material which may affect the installation of the roofing system and its performance, the Duro-Last membrane may be adhered directly to the poured-in-place concrete deck.
3. Precast/Prestressed Concrete Deck:  
If the concrete is structurally sound, clean, smooth, dry, free of sharp edges, dust, contaminants, oil, grease, and loose foreign material which may affect the installation of the roofing system and its performance, the Duro-Last membrane may be adhered directly to the precast/prestressed concrete deck. All joints between sections of concrete units must be grouted. Height variations from adjoining concrete units must be trowelled smooth.
4. Poured or Precast Gypsum:  
An approved substrate is required over gypsum decks. “Approved Insulation / Substrates” (page 8).
5. Lightweight Concrete:  
An approved substrate is required over lightweight concrete decks. See the “Approved Insulation / Substrates” (page 8). Lightweight concrete must be completely dry before installing the Duro-Last adhered assembly. Consult the lightweight concrete manufacturer for drying times.
6. Cementitious Wood Fiber Deck:  
An approved substrate is required over cementitious wood fiber decks. “Approved Insulation / Substrates” (page 8).
7. Plywood/OSB Deck - Minimum 15/32 inch:  
If the plywood is structurally sound, clean, smooth, dry, free of sharp edges, splinters, dust, contaminants, oil, grease, and loose foreign material which may affect the installation of the roofing system and its performance, the Duro-Last membrane may be adhered directly to the plywood deck. Gaps exceeding 1/4-inch wide in the plywood deck must be filled or covered with an approved substrate.
8. Lumber Deck Minimum 3/4 inch:  
If the lumber is structurally sound, clean, smooth, dry, free of sharp edges, splinters, dust, contaminants, oil, grease, and loose foreign material which may affect the installation of the roofing system and its performance, the Duro-Last membrane may be adhered directly to the lumber deck. Gaps exceeding 1/4-inch wide in the lumber deck must be filled or covered with approved filler. Height variations from adjoining lumber units must be feathered smooth.

NOTE: If the above listed decks do not meet the requirements for direct-to-deck adhesion, a Duro-Last approved substrate will be required. See the “Approved Insulation / Substrates” (page 8).

**APPROVED INSULATION / SUBSTRATES****Polyisocyanurate Insulation**

1. Must be installed in accordance with details FA9060 and FA9060A. These details are located at the end of this section.
2. Insulation must be Duro-Last-approved insulation for use with adhered single-ply membranes as identified in the current Factory Mutual Approval Guide.
3. The polyisocyanurate insulation must be a minimum of 2.0 PCF when tested in accordance with ASTM D-1621 and as certified by the insulation manufacturer.
4. On steel decks, use at least the minimum thickness required by the insulation manufacturer to span the flutes (1-inch [25 mm] minimum).
5. When attaching the insulation with fasteners and plates, 3-inch Square Metal Plates must be used.

**DensDeck® & Approved Recover Board**

1. Must be installed in accordance with Detail Drawings FA9060 and FA9060A. These details are located at the end of this section.
2. Recover board must be a minimum of 1/4-inch (6.4 mm) thick for the fully adhered Duro-Last membrane.
3. On steel decks, use at least the minimum thickness required by the product manufacturer to span the flutes.
4. When attaching the insulation with fasteners and plates, 3-inch Square Metal Plates must be used.

**NOTE:** All other insulations and substrates must be approved by the Duro-Last Engineering Services Department.

## SECTION 3 - - - IMPLEMENTATION

**SUBSTRATE PREPARATION****RECOVER – Existing Single-Ply Roofs**

The building owner/representative and Duro-Last contractor must verify the conditions of the roof deck and the existing roof assembly. Deteriorated decking, wood blocking, insulation and all saturated materials must be removed and replaced.

1. A Duro-Last approved substrate board must be mechanically fastened over the existing assembly. See “Approved Insulation/Substrate” for more information.
2. The existing single-ply 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)
3. 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 substrate board.
4. If a PVC membrane has been installed directly over styrene insulation without a separation sheet, then the old membrane must be removed. Damaged insulation must be replaced.

**RECOVER – Existing Bitumen Roofing**

The building owner/representative and Duro-Last contractor must verify the conditions of the roof deck and the existing roof assembly. Deteriorated decking, wood blocking, insulation and all saturated materials must be removed and replaced.

1. Gravel surface roofs must be leveled to ensure insulation lays flat. If the gravel is removed by power brooming or vacuuming, additional methods of leveling may be required to provide a suitable level surface for the recover board. **CAUTION:** Removing more than the loose gravel may affect the resulting fire rating. All blisters must be cut and fastened down or removed prior to the installation of the recover board.
2. Smooth or granular surface roofs. All blisters must be cut and fastened down or removed prior to the installation of the recover board.
3. A Duro-Last approved insulation (1-inch [25 mm] minimum) or substrate board must be installed over the existing roof system.

**NEW CONSTRUCTION**

The building owner/representative and Duro-Last contractor must ensure that the deck/substrate is structurally sound and meets standard industry construction practices prior to the application of the Duro-Last Roofing system.

**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 foot (2,643 N/M) of nailer in any direction. Fasteners used to attach wood nailers must be spaced no greater than 18-inches (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.

Duro-Last 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 is unlikely to contain the copper based treatments.

**INSULATION SELECTION AND INSTALLATION**

1. Insulation products must be neatly fitted to the roof deck and its penetrations. Insulation boards should be installed tightly against adjacent insulation boards and all joints staggered 50% from row to row. No gap should exceed 1/4-inch (6.4 mm) 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.
2. When mechanically fastening insulation to the approved substrate, **a minimum of 250 lb. of pull out resistance per fastener is required. Special design consideration may be required if pull out resistance is less than the minimum 250 lb.** Duro-Last requires a minimum of 1 fastener for every 2 ft<sup>2</sup> (.19 m<sup>2</sup>) of board in perimeter areas and 1 fastener for every 3.2 ft<sup>2</sup> (.3 m<sup>2</sup>) of board in the field area. The width of the perimeter area is determined by either the lesser of .4 times the building height or .1 times the width of the roof, but must never be less than 4 ft. wide. Fasteners and stress distribution plates must be Duro-Last-approved for substrate attachment. 3" Square Metal Plates must be used when fastening insulation and cover boards. See detail drawings for insulation fastener spacing and patterns. See "FM Codes" section to determine the width of the perimeter enhancements needed from the roof edge.
3. Insulation attachment using low-rise foam is approved. See the "Product Data Sheet" found in this Duro-Last specification manual for approved products used for insulation attachment. Installation will be in compliance with the adhesive manufacturer recommendations and requirements. Contact the Duro-Last Engineering Services Department with any additional questions.
4. Polyisocyanurate attachment using hot (Type III or IV) asphalt must be in accordance with asphalt manufacturer's instruction and the NRCA and ARMA recommendations. The insulation must rest evenly on the approved deck/substrate so that there are no air spaces between the board and the deck/substrate. The maximum board size with hot asphalt attachment is 4 x 4 ft. Precautions should be used to protect the Duro-Last membrane from coming in contact with asphalt that has been pushed-up to the board surface. This can be accomplished by taping over the seams of the insulation boards. Remove all asphalt from the substrates before attaching the Duro-Last membrane. The following requirements must be met when attaching a polyisocyanurate board using hot asphalt:
  - a. The proposed board must be compatible with the roof substrate, Duro-Last membrane and the hot asphalt used to attach the board.
  - b. Insulation boards cannot be attached directly to steel decks with asphalt.
  - c. Expanded or extruded polystyrene insulation must NOT be attached with asphalt.
  - d. For alternative methods of board fastening, contact the Duro-Last Engineering Services Department.

**ADHESIVE CONSIDERATIONS**

1. The Duro-Last membrane must be adhered to the substrate with adhesive supplied by Duro-Last, Inc. Never thin the adhesive. The adhesive may be applied by using rollers. The adhesive must be applied in smooth even coats with no puddles or lumps. Adhesive must cover 100% of the substrate. Never apply adhesive in temperatures less than 50° F (5° C).
2. See the product data sheets for adhesive being used for coverage rates. Note that the actual coverage may vary depending upon the type of substrate and atmospheric conditions. Care should be taken when estimating the amount of adhesive that will be required to ensure that the adhesive is applied in amounts consistent with the coverage estimate.

**MEMBRANE INSTALLATION**

1. When Duro-Last membrane is adhered to polyisocyanurate, the peel stop detail FA9060 and FA9060A will be used. The peel stop detail must be installed on the exposed roof perimeter edge (roof edge with no adjacent wall or tie-ins) and installed 2'-0" (0.61 m) from the exterior roof edge regardless of parapet wall height. This includes roofs that are located within a main roof and exceed the height of the main roof by 3'-0" (0.91 m) or higher. Review the peel stop details FA9060 and FA9060A to determine when to use. Contact the Duro-Last Engineering Services Department for any additional information.
2. When projects are located in wind zones of 130 mph or greater, the membrane will be adhered to DensDeck<sup>®</sup> or approved recover boards and the use of details FA9060 and FA9060A, Option 3 is required.

3. The surface of the deck/substrate must be inspected prior to the installation of the Duro-Last membrane. The deck/substrate must be clean, smooth, dry, and free of sharp edges, dust, contaminants, oil, grease, and loose, foreign material that may affect the installation of the roofing system and its performance. All damaged, broken or wet materials must be removed and replaced.
4. Refer to product data sheet for water based or solvent based adhesive for application details.
5. The membrane may be applied as described in the following steps. Application techniques may vary as long as the requirements described within this specification are met.
  - a. Position the prefabricated roof section over the area to be covered. If roll goods are used, cut the sheets to length and allow material for edge termination where required.
  - b. Fold the roof section back onto itself to expose half of the roof area to be covered by that section.
  - c. Apply adhesive in front of the fold along its length. Be careful not to apply more of the adhesive than can be covered prior to the adhesive setting up. Start with moderate amounts of adhesive and adjust the amount as you get a feel for how fast the adhesive is setting up. Changing rooftop conditions throughout the day may affect the amount of time it takes adhesives to set up.
  - d. Lift the top layer of membrane and, starting at the fold, use a stiff squeegee or broom to push the membrane into the adhesive. Care must be used to avoid wrinkles and air pockets. Apply the membrane to cover the adhesive that has been applied and then repeat steps "c" and "d" until the first half of the roof section is completed.
  - e. Repeat steps "b", "c" and "d" for the second half of the roof section.
  - f. As each new roof section is added, overlap the adjacent sheets a minimum of 3 to 6-inches (51 to 152 mm).
  - g. Be careful not to contaminate the membrane with adhesive where seams will be welded together.
  - h. DO NOT THIN ADHESIVES.**

**HOT-AIR WELDING**

1. Position the membrane so that the top membrane overlaps the bottom membrane a minimum of 4-inches (102 mm). 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 1-1/2-inch (38 mm) wide continuous weld is required.
3. 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.

**WALLS AND PENETRATIONS**

The Duro-Last membrane may be adhered or mechanically fastened onto the walls. See details FA6000 and FA6010 for mechanically attached requirements. The previous sections which outlined acceptable products and proper substrate preparation, also apply to the walls.

1. Walls Mechanically Attached
  - a. When mechanically attaching membrane to a parapet wall, position the deck sheet as shown in details FA6000 or FA6010, use separate parapet flashing as shown and install termination bar.
  - b. When using detail FA6000, install a termination bar as shown. Order a separate wall flashing and add a minimum 6-inch skirt to the width of the wall flashing needed to cover the desired height (8-inch minimum above the membrane) and/or width of the wall. Weld the 6-inch skirt to the deck sheet membrane close to the termination bar.
  - c. When using detail FA6010, order the parapet flashing with a skirt (skirt not to exceed 31-inches) to the width and height of the wall flashing to allow approximately 3 to 6 inches of skirt from the wall flashing to flash onto the deck sheet and weld the skirt as close to the termination bar as possible.
2. Walls Fully Adhered
  - a. Adhesive must be applied to both the wall/substrate and to the membrane. See the product data sheets on the adhesive being used for coverage rates between both surfaces. The actual coverage may vary depending upon the type of substrate and atmospheric conditions.

- b. It is not acceptable to adhere the same sheet of membrane that is covering the roof deck to a wall. Instead, a separate sheet must be used and mechanical fasteners installed through one of the sheets at the roof-to-wall transition. This can be accomplished by ordering the wall sheet with a fastening tab at the base of the wall that will lie against either the wall or the roof deck/substrate.
  - c. The minimum height of termination of the wall sheet is 8-inches (203 mm) above the roof membrane. If the membrane will extend up the wall for more than 60-inches (1.5 m), a row of mechanical fasteners must be installed. The membrane must never extend up the wall more than 60-inches (1.5 m) without a row of fasteners. Refer to the appropriate detail drawings for information regarding the proper termination.
  - d. A row of mechanical fasteners are required at all transitions on the wall except at the top if the membrane will extend to the outside face of the wall. These rows of fasteners can be approved fasteners with the appropriate plate or termination bar, and installed through fastening tabs on prefabricated sheets.
  - e. It is recommended that wall sheets be kept small for easier handling. The installer may wish to install the membrane on the walls prior to installing on the roof deck. This will avoid potential problems with keeping the new membrane on the roof deck clean while working on the walls.
3. **Roof Penetrations**
- a. Mechanical fastening is required at all roof penetrations. These include, but are not limited to, pipes, drains, curbs, pitch pans, and expansion joints.
  - b. The pullout resistance of the fasteners determines the fastener spacing of the transition points. To determine the spacing, refer to the pullout chart in the “Mechanically Fastened” section.

**FLASHINGS**

1. 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.
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.

**PITCH PANS**

1. Use pitch pans only when standard Duro-Last flashings cannot be used.
2. Only Duro-Last Duro-Caulk Plus or approved sealer such as CSL 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 and 4045 for installation references.

**TWO WAY AIR VENTS**

1. The Duro-Last 2-way air vents are not required with a fully adhered application. Duro-Last reserves the right to incorporate their use if needed.

**ROOF DRAINS AND SCUPPERS**

1. **Drain Assemblies with Clamping Rings**
  - a. All existing roofing materials must be removed from drain bowl and clamping ring.
  - b. Use Duro-Caulk Plus between the membrane and bowl as shown in detail 2011 (1/2 tube minimum).
  - c. 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.
2. **Duro-Last Drain Boots**
  - a. If the Duro-Last drain boot is to be used, apply one-half (1/2) tube of sealant minimum to the outside of the drain boot and insert it into the drain.
  - b. Install composite compression drain rings as low into the drain as possible.
3. See Details 2011, 2020, 2021, 2025, 2030, 2041, 2050, 2060, 2061, 2070 and 2071 for installation references.

**EXPANSION JOINTS**

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

**WALKWAY PAD**

1. 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, 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. Refer to the Material Safety Data Sheet (MSDS) prior to using any adhesive for information regarding the safe use of the product. It may be necessary to shut down air intake systems and block the intake vents to prevent fumes from entering the building.
4. Asphalt-based products are incompatible with the Duro-Last roofing membrane. 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. **Note: Extreme caution must be taken not to contaminate the roof area with loose asphalt.**
5. The Duro-Last membrane must not be in contact with substrates that maintain or exceed temperatures of 120° F, including all insulated chimney pipes and combustible fuel pipes. Refer to the appropriate detail drawings for information regarding the proper termination.
6. Duro-Last, Inc. does not approve the practice of roofing over existing roofing systems that contain excess 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.
7. 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.
8. Perlite and wood/mineral fiber-boards are not acceptable substrates for the Duro-Last membrane.
9. If asbestos is encountered, the building owner must be notified at once. The owner is solely responsible for determining the proper course of action.
10. 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 120° F (49° C).