DURO-TECH TPO MECHANICALLY FASTENED ROOFING SYSTEM

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SECTION 1 - - - GENERAL

INTRODUCTION

Created by Duro-Last®, the Duro-TECH TPO Mechanically Fastened Roofing System is an installation process for mechanically fastening Duro-TECH™ TPO membranes ("TPO membranes").

The following is information required to install the Duro-TECH TPO Mechanically Fastened Roofing System. Each installation of thermoplastic polyolefin ("TPO") products should comply with the detail drawings ("Details"), instructions, material descriptions, and other information stated herein.

Refer to *Section 2* for approved products.

WARRANTIES

This specification meets standard installation requirements for the following warranties:

DURO-TECH TPO MECHANICALLY FASTENED ROOFING SYSTEM WARRANTIES

Basic Warranties
Include material and labor
Do not include consequential damages

Warranty Name	Membranes Covered	Minimum Mil Thickness	Border Color
15-Year NDL Warranty	Duro-TECH TPO Duro-TECH TPO Fleece	45 mil (1.14 mm) 100 mil (2.54 mm)	Gray/Green
20-Year NDL Warranty	Duro-TECH TPO Duro-TECH TPO Fleece	60 mil (1.52 mm) 115 mil (2.92 mm)	Gray/Blue
25-Year NDL Warranty	Duro-TECH TPO Duro-TECH TPO Fleece	80 mil (2.03 mm) 135 mil (3.43 mm)	Gray/Olive Green

Residential Warranties
Do not include consequential damages and only cover materials

Warranty Name	Membranes Covered	Minimum Mil Thickness	Border Color
15-Year Residential Material Limited Warranty	Duro-TECH TPO Duro-TECH TPO Fleece	45 mil (1.14 mm) 100 mil (2.54 mm)	Gray/Fuchsia
20-Year Residential Material Limited Warranty	Duro-TECH TPO Duro-TECH TPO Fleece	60 mil (1.52 mm) 115 mil (2.92 mm)	Gray/Light Blue

Material Only Warranties
Do not include consequential damages

Warranty Name	Membranes Covered	Minimum Mil Thickness	Border Color
15-Year Material Only	Duro-TECH TPO Duro-TECH TPO Fleece	45 mil (1.14 mm) 100 mil (2.54 mm)	Gray/Black
20-Year Material Only	Duro-TECH TPO Duro-TECH TPO Fleece	60 mil (1.52 mm) 115 mil (2.92 mm)	Gray/Black

ULTRA WARRANTIES

All Hail, High Wind, and Hail and High Wind Warranties have additional installation requirements beyond the scope of this specification.

Hail Warranties must comply with this specification and the Hail Warranty Requirements located on the Duro-Last website.

High Wind Warranties must comply with this specification and the following Engineering documents prior to ordering:

- Wind Uplift Calculations ("Wind Calc")
- Warranty Letter of Intent

High Wind Warranties Do not include consequential damages			
Warranty Name	**Membranes Covered**	**Minimum Mil Thickness**	**Border Color**
15-Year NDL High Wind	Duro-TECH TPO Duro-TECH TPO Fleece	45 mil (1.14 mm) 100 mil (2.54 mm)	Gray/Yellow
20-Year NDL High Wind	Duro-TECH TPO Duro-TECH TPO Fleece	60 mil (1.52 mm) 115 mil (2.92 mm)	Gray/Purple

Hail Warranties Do not include consequential damages			
Warranty Name	**Membranes Covered**	**Minimum Mil Thickness**	**Border Color**
15-Year NDL Hail	Duro-TECH TPO Duro-TECH TPO Fleece	60 mil (1.52 mm) 115 mil (2.92 mm)	Gray/Orange

Hail and High Wind Warranties Do not include consequential damages			
Warranty Name	**Membranes Covered**	**Minimum Mil Thickness**	**Border Color**
15-Year Hail and High Wind	Duro-TECH TPO Duro-TECH TPO Fleece	60 mil (1.52 mm) 115 mil (2.92 mm)	Gray/Burgundy

SECTION 1

REQUIREMENTS

1. The Duro-TECH TPO Mechanically Fastened Roofing System must be installed by an authorized Duro-Last contractor ("contractor").
2. The contractor must comply with applicable codes.
3. A Duro-Last Quality Assurance Technical Representative ("DL QA Tech Rep") will inspect the installed Duro-TECH TPO Mechanically Fastened Roofing System in order to issue a warranty, or finalize a pre-inspection warranty, on a commercial or industrial project. Residential projects do not receive inspections.
   - Duro-Last does not perform destructive testing during the inspection, unless something identified during the visual inspection triggers a need for further investigation.
4. All materials used in the Duro-TECH TPO Mechanically Fastened Roofing System must be products of Duro-Last, or accepted products, as defined and described in this specification. Other materials may be accepted, but only after the contractor has requested a deviation from Duro-Last, and Duro-Last has approved such deviation prior to being used.
5. It is the contractor's responsibility to determine fastening requirements in accordance with Duro-TECH TPO Mechanically Fastened Roofing System specifications. Refer to *Section 2* and *Section 3* for complete instructions.
6. A "T-Patch" is required at intersections of three TPO membrane edges and a field-welded transition.
   - Refer to Detail TRG1066.
   - The minimum size of a patch is 4- x 4-inch (102- x 102-mm) or 4-inch (102-mm) diameter.
   - Unreinforced TPO membrane T-Patches may be a maximum of 60 mils (1.52 mm) thick.
   - Reinforced TPO membrane T-Patches may be a maximum of 45 mils (1.14 mm) thick.

CONTRACTOR TOOLS

TOOLS	
The following tools are required for efficient and proper installation	
Safety equipment (such as fall protection)	Equipment necessary to raise materials to the roof
Automatic & hand welders (hot-air) with spare heating elements	Silicone hand roller
Extension cords – cord length of 100 ft (30.5 m), #12/3 wire (2 mm) with ground	Ground fault interrupter
Variable speed power screw driver with reverse	P-3 screwdriver tips
Electric hammer drill with 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) (30.5 m and 7.5 m), chalk line, markers, lumber crayon
2-in. (51-mm) flat chisels, pry bar	Vise clamps, nail aprons, caulk gun, screw drivers
Tack claw	Ladders
Tarps	Pull tester
Core cutter	Panduit® banding tool
Approved cleaning fluid and rags	Push broom, heavy duty squeegee

DRAINAGE/SLOPE

Good roofing practices incorporate the use of positive drainage. The contractor is responsible to make sure the roofing system drainage meets applicable codes. **Ponding water areas are excluded from Duro-TECH TPO warranties.**

WEATHER CONSIDERATIONS

Only install as many TPO roofing components as can be covered with TPO membrane by the end of the working day or before the onset of inclement weather.

Do **not** allow any TPO roofing components to be installed over a wet substrate.

SECTION 1

DELIVERY

A complete Duro-TECH TPO Mechanically Fastened Roofing System and related materials will be delivered to the location designated by the contractor. Pallets of TPO membrane and accessory products will be labeled with manufacturer's/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 should note damaged materials and/or shortages on the freight bill. Concealed damage should be reported to the freight agent immediately.

Materials damaged in shipping, handling, or storage must not be used.

HANDLING

Once the Duro-TECH TPO Mechanically Fastened Roofing System is delivered, the contractor is responsible for all handling and installation. Adequate personnel and equipment should be available to safely lift and place the Duro-TECH TPO Mechanically Fastened Roofing System onto the roof. It is the contractor's responsibility to ensure that overloading of the roof does not occur.

Keep all TPO components away from ignition sources, heat, sparks, and open flames. Do not smoke while installing TPO components.

STORAGE

The TPO membrane and other Duro-TECH TPO Mechanically Fastened Roofing System materials should be kept clean and dry. Duro-TECH TPO Mechanically Fastened Roofing System 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 onto which water falls from higher structures. Follow the Product Data Sheet ("PDS"), Safety Data Sheet ("SDS"), and manufacturer storage guidelines and precautions for each product.

Keep all TPO components away from ignition sources, heat, sparks, and open flames. Do not smoke while installing TPO components.

CHEMICAL RESISTANCE

Chemical Resistance				
Duro-TECH TPO membranes are resistant to the chemicals listed below. If any other chemicals are present on a particular roof, contact the Duro-Last Engineering Services Department.				
• % indicates the maximum acceptable concentration of the listed chemical compound.				
Acetic acid (10% – 97%)	Calcium chlorate	Gelatin	Oxalic acid (aqueous) (50%)	Sodium chlorite (2% – 20%)
Acetone	Calcium chloride (50%)	Glucose	Paraffin	Sodium cyanide
Acetophenone	Calcium hydroxide	Glycerin	Paraffin wax	Sodium dichromate
Acriflavine (2%)	Calcium hypochlorite bleach (20%)	Glycol	Phenol	Sodium ferricyanide
Acrylic emulsions	Calcium nitrate	Hydrobromic acid (2% – 30%)	Phosphoric acid (95%)	Sodium ferrocyanide
Aluminum chloride	Calcium phosphate (50%)	Hydrofluoric acid (40%)	Potassium bicarbonate	Sodium fluoride
Aluminum fluoride	Calcium sulfate	Hydrogen peroxide (3% – 30%)	Potassium borate (1%)	Sodium hydroxide (10% – 50%)
Aluminum sulfate	Calcium sulfite	Hydrogen sulfide	Potassium bromate (10%)	Sodium hypochlorite (20%)
Alums (all types)	Carbon dioxide (wet and dry)	Hydroquinone	Potassium bromide	Sodium nitrate
Ammonia (aqueous)	Carbon monoxide	Inks	Potassium carbonate	Sodium silicate
Ammonia gas (dry)	Carbonic Acid	Iodine tincture	Potassium chlorate	Sodium sulfate
Ammonium carbonate	Castor oil	Isopropyl alcohol	Potassium chloride	Sodium sulfide (25%)
Ammonium chloride	Cetyl alcohol	Ketones	Potassium chromate (40%)	Sodium sulfite
Ammonium fluoride (20%)	Chrome alum	Lactic acid	Potassium cyanide	Stannous chloride
Ammonium hydroxide (10%)	Chromic acid (10% – 80%)	Lanolin	Potassium dichromate (40%)	Stannic chloride
Ammonium metaphosphate	Citric acid (10%)	Lead acetate	Potassium ferricyanide	Starch
Ammonium nitrate	Copper chloride	Linseed oil	Potassium ferrocyanide	Sugars and syrups
Ammonium persulfate	Copper cyanide	Magnesium carbonate	Potassium fluoride	Sulfamic acid
Ammonium sulfate	Copper fluoride	Magnesium chloride	Potassium hydroxide (10% – 50%)	Sulfates of calcium and magnesium
Ammonium sulfide	Copper sulfate	Magnesium hydroxide	Potassium nitrate	Sulfates of potassium and sodium
Ammonium thiocyanate	Cottonseed oil	Magnesium nitrate	Potassium perborate	Sulfur
Amyl alcohol	Cuprous chloride	Magnesium sulfate	Potassium perchlorate (10%)	Sulfuric acid (10%)
Aniline	Cyclohexanol	Magnesium sulfite	Potassium permanganate (20%)	Tallow
Anisole	Diethanolamine	Mercuric chloride	Potassium sulfate	Tannic acid (10%)
Antimony chloride	Ethanolamine	Mercuric cyanide	Potassium sulfide	Tartaric acid
Barium carbonate	Ethyl acetate	Mercurous nitrate	Potassium sulfite	Trichloroacetic acid (10%)
Barium chloride	Ethyl alcohol	Mercury	Propyl alcohol	Triethanolamine
Barium hydroxide	Ethylene glycol	Methyl Alcohol	Pyridine	Urea
Barium sulfate	Ethylene oxide	Methyl ethyl ketone	Silicone oil	Whiskey
Barium sulfide	Ferric chloride	Methylene chloride	Sodium acetate	White paraffin
Beer	Ferric nitrate	Milk and its products	Sodium bicarbonate	Wines
Benzoic acid	Ferric sulfate	Nickel chloride	Sodium bisulfate	Yeast
Benzyl alcohol	Ferrous chloride	Nickel nitrate	Sodium bisulfite	Zinc chloride
Bismuth carbonate	Ferrous sulfate	Nickel sulfate	Sodium borate	Zinc oxide
Borax	Fluorosilicic acid	Nitric acid (10%)	Sodium bromide oil solution	Zinc sulfate
Brine	Formaldehyde (40%)	Nitrobenzene	Sodium carbonate	EPS
Butyl alcohol	Formic acid	Oleic acid	Sodium chlorate	XPS
Calcium carbonate	Fructose	Olive oil	Sodium chloride	

CHEMICAL INCOMPATIBILITY

Chemical Incompatibility		
These chemicals may damage or compromise the Duro-TECH TPO membrane.		
Do **not** allow the following chemicals to directly contact the TPO membrane.		
Amyl acetate	Dichloroethylene	Lubricating oil (**petroleum-based**)
Amyl chloride	Diisooctyl phthalate	Mineral oil
Animal fats	Ethyl ether	Motor oil (**conventional and synthetic**)
Aqua regia	Ethyl chloride	Nitric acid (**fuming**)
Aviation gasoline (**80 – 100 octane**)	Ethylene dichloride	Nitric acid
Aviation turbine fuel	Furfural	50/50 Nitric/hydrochloric acid
Benzene	Gasoline (**higher octane = greater effect**)	50/50 Nitric/sulfuric acid
Bromine liquid	Gas liquor	Petrol (**gasoline**)
Bromine water	Gear box oil	Petroleum ether (**B.P. 100-140 C**)
Butyl acetate	Grease lubrication (**petroleum-based**)	Sulfuric acid
Carbon disulfide	Hexane	50/50 Sulfuric/nitric acid
Carbon tetrachloride	Heptane	Tetrahydrofuran
Chlorine (**gas**)	Hydrobromic acid	Tetralin
Chlorobenzene	50/50 Hydrochloric/nitric acid	Toluene
Chloroform	Hydrofluoric acid	Transformer oil
Chlorosulfonic acid	Hydraulic fluid	Trichloroethylene
Chromic/sulfuric acid	Iso-octane	Turpentine
Cyclohexanone	Naphthalene	Wet chlorine gas
Decalin	Jet fuel (**kerosene-based**)	White spirit
Dibutyl phthalate	Kerosene	Xylene

GENERAL TPO PRECAUTIONS AND INFORMATION

Keep all TPO components away from ignition sources, heat, sparks, and open flames. Do not smoke while handling or installing TPO components.

The TPO membrane must not contact surfaces which maintain or exceed temperatures of 150° F (65° C).

After opening, allow TPO membrane products to lay flat for at least 30 minutes prior to installation.

SUBSTRATE SEPARATION

The TPO membrane is defect-free when it leaves the factory. Certain substrates are not compatible with the TPO membrane and may cause premature failure of the TPO membrane.

Over the substrates listed below, install Duro-Guard® rigid board insulations, cover boards, fan fold boards and/or slip sheets prior to the installation of the TPO membrane.

EPDM	XPS (extruded polystyrene)	Modified-bitumen	Shingles
Aluminum-coated asphalt	Granulated cap sheet	PVC/CPA membranes	TPO (thermoplastic polyolefin)
Coated or smooth asphalt	Hypalon (CSPE)	Polyurethane	Sprayed urethane foam
EPS (expanded polystyrene)	Mineral-surfaced cap sheet	Coal tar pitch	

The TPO membrane is compatible with the following substrates, and no separation is required.

Acrylic coatings	Gypsum-based cover boards	Glass fiber boards
CPE roofing	Polyisocyanurate insulation boards	Wood decks
Cellular glass boards	Lightweight/structural concrete decks (smooth)*	
Gypsum	Pre-stressed concrete decks (smooth)*	

* New construction (less than 1 year old) decks require the use of an approved vapor barrier prior to installation of any Duro-TECH TPO Mechanically Fastened Roofing System. Refer to *Substrate Preparation* in *Section 3*.

PAINT APPLICATION

TPO membrane cannot be painted. Vinyl edge and termination products cannot be painted, including: Fascia Bar, Fascia Cover, and Termination Bar.

Duro-Last is not responsible for repair or replacement of these products if they have been painted. Contact the Duro-Last Quality Assurance Department with any questions.

Metal products may only be painted if they are made from bonderized steel. The performance and maintenance of the paint is not covered by the Duro-TECH warranties.

VAPOR BARRIERS

Duro-Last recommends the use of vapor barriers in certain situations; however, it is the responsibility of the contractor to ensure that all requirements are met. A roofing professional, such as a consultant or architect, may be utilized for roofing system design prior to installing any roofing system.

If a vapor barrier is required, the following products must be used:

a. Duro-Last Vapor Barrier

b. Duro-Last Torch Down Vapor Barrier

c. Duro-Last Duro-Blue® Separation Slip Sheet

   1. Tape all seams with 2-inch wide (51-mm) 3M® Construction Seaming Tape.
   2. Tape all penetrations with 2-inch wide (51-mm) 3M All Weather Flashing Tape.
   3. Fastener density must not exceed 1 fastener per 2 ft^2 (0.19 m^2).

OVERBURDEN

Any product (e.g. wood block, conduit, etc.) placed on top of, and in contact with, the TPO membrane must have an approved separator between it and the TPO membrane. Separators must be cut to at least the size of the products that lie on them. Refer to Detail T4090.

Approved Separators:

- TPO membrane (any thickness)
- Duro-TECH TPO Walkway Pad
- Drainage Mat
- Ballast Mat

HVAC CLEANERS

Cleaning rooftop air conditioning units is a necessary maintenance procedure, but the use of incompatible cleaners can potentially be harmful to the Duro-TECH TPO Mechanically Fastened Roofing System. Use only Duro-TECH TPO LVOC Splice Wash with the Duro-TECH TPO Mechanically Fastened Roofing System.

SECTION 2 – QUALITY ASSURANCE

PRE-JOB ASSESSMENT

When re-covering an existing roofing system, the contractor is responsible for conducting a thorough inspection of the deck and parapet, to determine the necessary fastener type and length, to evaluate the moisture content of the existing roofing system, and to note damaged areas which need to be repaired, prior to installation of the selected Duro-TECH TPO Mechanically Fastened Roofing System.

CORE CUTS

1. The contractor is responsible for performing a series of core cuts in order to evaluate the condition of the existing roofing system and determine fastener lengths, when applicable. The contractor and/or building owner are responsible for the repair of all core cuts.
2. Duro-Last does not approve of covering any existing roofing system that contains excess moisture. Excess moisture is defined as any water observed within a core cut or squeezed from a core sample.
3. DL QA Tech Reps do not check for moisture content of the roofing system.

FASTENER PULLOUT TESTS

1. Prior to ordering the Duro-TECH TPO Mechanically Fastened Roofing System, the contractor is responsible to ensure fastener pullout tests (“pullout tests”) have been conducted with the fastener intended for installation. The fastener manufacturer or the contractor may conduct the required testing. Utilize Duro-Last-supplied fasteners and an approved testing unit with current certification.
2. Locations of pullout tests should be evenly distributed throughout the deck and include areas where the integrity of the deck is in question. Areas with low pullout test results will require additional pullout tests. All pullout tests should be documented on a drawing showing the location and value of each pullout test.
    - The number of required pullout tests is as follows for each deck level or independent deck area:
        - Minimum of 10 tests for deck areas up to 50,000 ft^2 (468.5 m^2)
        - 5 additional tests for each additional 50,000 ft^2 (468.5 m^2) or portion thereof

FASTENER SELECTION AND DECK TYPES

The following tables summarize the appropriate fasteners and plates to use for different deck types and different Duro-TECH TPO Mechanically Fastened Roofing System materials. Other materials may be accepted, but only after the contractor has requested a deviation from Duro-Last, and Duro-Last has approved such deviation, in writing, prior to being used. Unless otherwise specified within this document or Details, all fasteners must be either e-coated or galvanized.

PLATE SELECTION

Refer to the following table when determining which plates to use and where to use them. **WHEN APPLYING TESTED ASSEMBLIES, THE APPROPRIATE PLATE MUST BE USED.**

	Poly-Plate	Cleat Plate®	HD Seam Plate	3-Inch Square Metal Plate	Insulation Plate	Induction Weld Plate	Auger Fastener Plate
Membrane Fastening							
Roof Membrane	Yes[1]	Yes	Yes	No	No	Yes	Yes
Wall Membrane	Yes[2]	Yes	Yes	Yes	No	Yes	NA
Base of Walls/Penetrations	Yes[1,2]	Yes	Yes	Yes	No	Yes	Yes
Insulations	Yes[2]	Yes	Yes	Yes	Yes	Yes[3]	Yes
Cover Boards	Yes[2]	Yes	Yes	Yes - Preferred	No	Yes[3]	Yes

1 When Poly-Plates are used, an insulation or coverboard must be installed on the deck. Cleat Plates or Duro-TECH TPO HD Seam Plates are recommended.

2 Poly-Plates are acceptable, but not recommended for these applications since they have a higher profile than the other plate options and may form a visible bulge under the TPO membrane.

3 Can be used over Duro-Guard polyisocyanurate rigid board insulations, cover boards and concrete decks. Other boards and decks may require an insulator beneath the plate. Refer to the Duro-TECH Induction Weld Roofing System specification.

FASTENER SELECTION AND DECK TYPES

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

Approved Decks/Parapets and Fasteners		
Deck Type	**Fastener Type**	**Notes**

Created: 02/25/2025

Steel	#14 HD Screws #15 EHD Screws	Pre-drilling not required.
		FM® projects require fastener rows to run perpendicular to, and fasten into, the high flutes.
		Must penetrate a minimum of 1 in. (25 mm) from the top surface of deck.
Wood (Plywood, OSB, or Plank)	#14 HD Screws #15 EHD Screws	Pre-drilling not required.
		Must penetrate a minimum of 1-in. (25-mm) from the top surface of deck.
Structural Concrete	#14 Concrete Nails #14 Concrete Screws #14 HD Screws #15 EHD Screws	Duro-Last Poly-Plates must not be used on installations over new concrete decks. Use either Cleat Plates or Duro-TECH TPO HD Seam Plates.
		Must penetrate a minimum of 1 in. (25 mm) from the top surface of deck. Pre-drill a minimum of 1/2 in. (13 mm) deeper than the required depth of the fasteners using a 3/16-in. (5 mm) bit for #14 fasteners and 7/32-in. (6-mm) bit for #15 fasteners.
Gypsum	Auger Fasteners	Minimum pullout requirements must be met.
		Pre-drill required for Auger Fasteners. Use a 7/16 – 9/16-in. (11 – 14-mm) bit.
		Must penetrate a minimum of 1-1/2 in. (38 mm) from the top surface of deck. Factory Mutual designed systems require minimum of 2-in. (51-mm) penetration.
		Fastener rows spaced greater than 60 in. (1,534 mm) are not permitted on gypsum decks.
Cementitious Wood Fiber (CWF), (Tectum)	Auger Fasteners	Minimum pullout requirements must be met.
		Do not pre-drill.
		Must penetrate a minimum of 1-1/2 inches (13 mm) from the top surface of deck. Factory Mutual designed systems require minimum of 2-in. (51-mm) penetration.
		Fastener rows spaced greater than 60 in. (1,534 mm) are not permitted on CWF decks.
Lightweight Concrete	Auger Fasteners #14 Concrete Nails #14 Concrete Screws #14 HD Screws #15 EHD Screws	Duro-Last Poly-Plates must not be used on installations over new lightweight concrete decks. Use either Cleat Plates or Duro-TECH TPO HD Seam Plates.
		Minimum pullout requirements must be met.
		Pre-drill required. Pre-drill a minimum of 1/2 in. (13 mm) deeper than the required depth of the fasteners. Augers: Use a 7/16 – 9/16-in. (11 – 14-mm) bit. #14: Use a 3/16-in. (5-mm) bit. #15: Use a 7/32-in. (6-mm) bit.
		Auger Fasteners must penetrate a minimum of 1-1/2 in. (38 mm) from the top surface of deck. Factory Mutual designed systems require minimum of 2-in. (51-mm) penetration.
		#14 and #15 fasteners must penetrate a minimum of 1 in. (25 mm) from the top surface of the deck.
		Fastener rows spaced greater than 60 in. (1,534 mm) are not permitted on lightweight concrete decks.
Masonry Block	Zamac Metal Anchors #14 Concrete Screws #14 Concrete Nails #14 HD Screws #15 EHD Screws	Must penetrate a minimum of 1 in. (25 mm) from the top surface. Pre-drill a minimum of 1/2 in. (13 mm) deeper than the required depth of the fasteners.
		Zamac: Use a 1/4-in. (6-mm) bit. #14: Use a 3/16-in. (5-mm) bit. #15: Use a 7/32-in. (6-mm) bit.

SECTION 2

FASTENER SPACING TABLE

Fastener spacing must be determined based on the table below and the results of the fastener pullout tests. If the average pullout value is less than 150 lbf (667.2 N), contact the Duro-Last Engineering Services Department for assistance.

1. It is the contractor's responsibility to determine fastening requirements, based on pullout tests. The pullout tests can be performed by either the fastener manufacturer or by the contractor.
2. The contractor should contact the Duro-Last Engineering Services Department for assistance in determining the fastening requirements when any of the following conditions apply:
   a. Building is 40 ft (12.2 m) tall or taller. Refer to the *Perimeter/Corner Roll Requirements for Building Roof Areas 40 Feet and Taller* Table in *Section 3* for perimeter/corner membrane attachment.
   b. Building is located in an area with design wind speeds greater than the following:
      i. ASCE® 7-05: 110 mph (177.0 km/h)
      ii. ASCE 7-10: 150 mph (241.4 km/h)
   c. A High Wind Warranty is required.
   d. Average fastener pullout resistance is less than 150 lbf (667.2 N).
3. Fastener spacing varies between the field, perimeter and corner areas of the roof with the fastener spacing decreasing in the perimeter and corner areas. The *Fastener Spacing for Building Roof Areas less than 40 Feet (12.2 m) Tall* Table lists fastener spacing for field, perimeter and corner areas.
4. The width of the Perimeter and Corner areas is the lesser of either 40% of the building height, at the eaves, or 10% of the overall plan width of the building and/or deck area. The Perimeter and Corner widths must not be less than 5 ft (1.5 m) wide. The Corner area is measured from each outer Corner and is equal to the width.

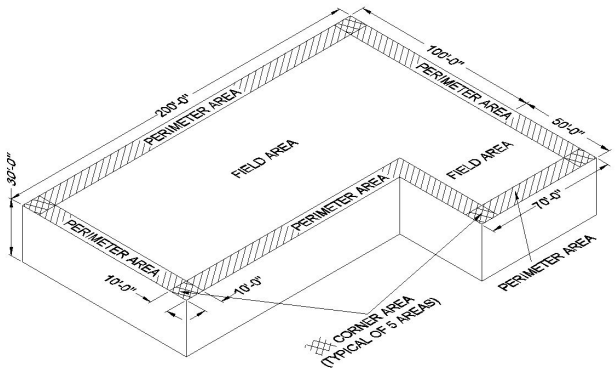
Example: Determine Perimeter and Corner Width

Building Width: 100 feet (30.5 m)
Building Length: 200 feet (61.0 m)
Building Height: 30 feet (9.1 m)

Step 1. Find 40% of the height:
0.40 x 30 feet (9.1 m) = 12 feet (3.6 m)

Step 2. Find 10% of the width:
0.10 x 100 feet (30.5 m) = 10 feet (3 m).

Result: The perimeter and corner width is the lesser of these two results: = 10 feet. (3 m).



Fastener Pullout Resistance	FASTENER SPACING IN. (MM) FOR BUILDING ROOF AREA LESS THAN 40 FT (12.2 M) TALL 60 LB/FT² (292.9 KG/M²) DESIGN								
	120-In. (3,048-mm) Rolls			60-In. (1,524-mm) Rolls			30-In. (762-mm) Rolls		
Pound-Force lbf (N)	Field In. (mm)	Perimeter* In. (mm)	Corner* In. (mm)	Field In. (mm)	Perimeter* In. (mm)	Corner* In. (mm)	Field In. (mm)	Perimeter* In. (mm)	Corner* In. (mm)
450 (2,001.7)	9 (229)	NA	NA	18 (457)	9 (229)	6 (152)	18 (457)	18 (457)	15 (381)
425 (1,890.5)	9 (229)	NA	NA	18 (457)	9 (229)	6 (152)	18 (457)	18 (457)	15 (381)
400 (1,779.3)	6 (152)	NA	NA	15 (381)	9 (229)	6 (152)	18 (457)	18 (457)	12 (305)
375 (1,668.1)	6 (152)	NA	NA	15 (381)	9 (229)	6 (152)	18 (457)	18 (457)	12 (305)
350 (1,556.9)	6 (152)	NA	NA	15 (381)	9 (229)	6 (152)	18 (457)	18 (457)	12 (305)
325 (1,445.7)	6 (152)	NA	NA	12 (305)	6 (152)	6 (152)	18 (457)	15 (381)	9 (229)
300 (1,334.5)	6 (152)	NA	NA	12 (305)	6 (152)	NA	18 (457)	15 (381)	9 (229)
275 (1,223.3)	6 (152)	NA	NA	12 (305)	6 (152)	NA	18 (457)	12 (305)	9 (229)
250 (1,112.1)	NA	NA	NA	9 (229)	6 (152)	NA	18 (457)	12 (305)	9 (229)
225 (1,000.9)	NA	NA	NA	9 (229)	NA	NA	18 (457)	9 (229)	6 (152)
200 (889.6)	NA	NA	NA	6 (152)	NA	NA	18 (457)	9 (229)	6 (152)
175 (778.4)	NA	NA	NA	6 (152)	NA	NA	15 (381)	9 (229)	6 (152)
150 (667.2)	NA	NA	NA	6 (152)	NA	NA	12 (305)	6 (152)	6 (152)
Less than 150 (667.2)	Contact the Duro-Last Engineering Services Department at 800-248-0280								

* Refer to the current ASCE 7 version for additional perimeter and corner width requirements.

DECK/SUBSTRATE CRITERIA

The TPO membrane may be installed directly to some decks while Duro-Guard rigid board insulations, cover boards, fan fold boards and/or slip sheets must be used on others to provide a proper separation. In all cases, the substrate onto which the TPO membrane is to be applied must be smooth and level without significant surface irregularities or depressions. It must be clean, dry, and free of grease, moisture, dust and loose debris. Acceptable substrates are listed below. Refer to *Substrate Preparation* in *Section 3* for the proper preparation and the installation requirements for each type of substrate.

DECKS TO WHICH THE TPO MEMBRANE MAY BE APPLIED DIRECTLY

1. Structural Concrete (poured in place or precast) *
2. Gypsum (poured in place or precast) *
3. Lightweight Concrete (insulating or cellular) *
4. Wood (plywood, OSB or lumber)

* New construction (less than 1 years old) decks require the use of an approved vapor barrier prior to installation of any Duro-TECH Mechanically Fastened Roofing System. Refer to *Substrate Preparation* in *Section 3*.

SECTION 2

DECKS REQUIRING RIGID BOARD INSULATIONS, FAN FOLD BOARDS, COVER BOARDS, AND/OR SLIP SHEETS

1. Any approved deck that does not meet the requirements due to contamination, roughness, etc.
2. Steel
3. Cementitious Wood Fiber (Tectum®)

APPROVED TPO MEMBRANES

1. Duro-TECH TPO membrane incorporates a weft-inserted, knitted scrim within TPO films to provide exceptional strength and waterproofing. Refer to the PDS for the physical properties of the TPO membrane.
2. Duro-TECH TPO Fleece membrane, in addition to a fleece backing, incorporates a weft-inserted, knitted scrim within TPO films to provide exceptional strength and waterproofing. Refer to the PDS for the physical properties of the TPO membrane.

APPROVED RIGID BOARD INSULATIONS, COVER BOARDS, AND FAN FOLD BOARDS

Only Duro-Guard rigid board insulations, fan fold boards, and/or cover boards may be used in conjunction with the TPO membrane.

1. When multiple layers of rigid board insulations are used, with or without a cover board, it is acceptable to loosely lay the underlying boards and mechanically fasten through the top layer and all subsequent layers at once.
2. When installing directly over a steel deck, Duro-Guard rigid board insulations and/or cover boards must have an adequate span rating, as published by the manufacturer, for the profile of the steel deck.
3. It is recommended to use Duro-Guard products in any Duro-TECH TPO Mechanically Fastened Roofing System. If Duro-Guard products are not used, then the proposed substitution should be approved, in writing, by the Duro-Last Engineering Services Department.

RIGID BOARD INSULATIONS

1. Polyisocyanurate (ISO)
    a. Duro-Guard ISO products, supplied by Duro-Last.
    b. Polyisocyanurate rigid board insulation that meets ASTM C1289 Class II; Grade 2 (20 psi (0.14 MPa)) or Grade 3 (25 psi (0.2 MPa)) requirements.
2. Polystyrene (EPS and XPS)
    a. An approved Duro-Guard rigid board insulation, fan fold board, cover board and/or slip sheet must always be used between bare polystyrene and the TPO membrane.
    b. Products
        i. Duro-Guard EPS and/or XPS products, supplied by Duro-Last.
        ii. Expanded polystyrene (EPS) products, either type II (1.5 pcf (0.07 kPa)), Type VIII (1.25 pcf (0.06 kPa)), or Type IX (2.0 pcf (0.10 kPa)) that meet ASTM C578 requirements.
        iii. Extruded polystyrene (XPS) products with minimum density of 16 psi (0.11 MPa) that meet ASTM C578 requirements.
    c. Type VIII EPS must always be covered with Duro-Guard rigid board insulations and/or cover board, or fan fold board with a minimum of 1.5 pcf (0.07 kPa) density, and must not be used directly below the TPO membrane.

COVER BOARDS

1. Duro-Guard Cover Boards with a minimum thickness of 1/4 inch (6 mm)
   a. DensDeck® Prime Roof Board with EONIC™ Technology, manufactured by Georgia-Pacific
   b. DensDeck Roof Board, manufactured by Georgia-Pacific
   c. SECUROCK® Gypsum-Fiber Roof Board, manufactured by USG Corporation
   d. SECUROCK Glass-Mat Roof Board, manufactured by USG Corporation
   e. DEXcell® Cement Roof Board, manufactured by National Gypsum Company
   f. DEXcell Glass Mat Roof Board, manufactured by National Gypsum Company
   g. DEXcell FA® Glass Mat Roof Board, manufactured by National Gypsum Company
   h. TOPROCK® DD Roof Board, manufactured by ROCKWOOL®

FAN FOLD BOARDS

1. Only Duro-Guard fan fold boards are to be used in warranted Duro-TECH TPO Mechanically Fastened Roofing Systems. Other fan fold boards may be accepted, but only after the contractor has requested a deviation from Duro-Last, and Duro-Last has approved such deviation, in writing, prior to being used. Other fan fold boards, if approved for use, may require the use of an approved slip sheet.

   Duro-Guard fan fold boards are manufactured with approved compatible facers on both sides of the boards. If these facers delaminate or are damaged enough to expose the inner polystyrene core, an approved slip sheet must be installed over the affected area prior to installing any TPO membrane.
2. Duro-Guard Fan Fold Boards
   a. EPS Fan Fold, 1/2-inch (13-mm) thick, supplied by Duro-Last.
   b. XPS Fan Fold – K (Crush Fold), 3/8-inch (10-mm) thick, supplied by Duro-Last.

APPROVED SLIP SHEETS

Only the following slip sheets are to be used in warranted Duro-TECH TPO Mechanically Fastened Roofing Systems. Other slip sheets may be accepted, but only after the contractor has requested a deviation from Duro-Last, and Duro-Last has approved such deviation, in writing, prior to being used.

1. Refer to the slip sheet's Product Data Sheet for applicability and installation information.
2. Slip Sheets
   - FR-10, manufactured by Atlas® Roofing Corporation
   - VersaShield®, manufactured by GAF®, Inc.
   - Duro-Weave® Separation Slip Sheet, supplied by Duro-Last
   - Duro-Blue® Separation Slip Sheet, supplied by Duro-Last
   - Geotextile Slip Sheet, supplied by Duro-Last

SECTION 3 – SYSTEM INSTALLATION

DECK/SUBSTRATE PREPARATION

The contractor is responsible for providing a properly prepared surface for the installation of the TPO membrane and any approved insulations, cover boards, fan fold boards, and/or slip sheets.

Any deck or substrate that does **not** meet requirements (due to contamination, roughness, conductivity, etc.) will require an approved insulation, cover board, fan fold board, and/or slip sheet.

NEW CONSTRUCTION

1. **Steel Decks**
   a. Approved insulations, fan fold boards, and/or cover boards must be used to provide a proper substrate on which to apply the TPO membrane.
   b. Approved insulations and/or cover boards must have an adequate span rating, as published by the manufacturer, for the profile of the steel deck. It may be necessary to fill the bottom flute with insulation.
   c. FM projects require fastener rows to run perpendicular to, and into the high flutes.
2. **Wood Decks** (plywood, OSB, or plank)
   a. Deck surface must be smooth, free of splintered wood and level without significant surface irregularities or depressions. Cracks or knotholes larger than 1/4 inch (6 mm) must be repaired.
   b. Carefully examine deck for loose or high fasteners. These must be repaired or replaced so that they are flush with the surface.
3. **Structural Concrete Decks**
   a. Deck must be cured and dry prior to installation of any Duro-TECH TPO Mechanically Fastened Roofing System.
   b. Duro-Last Poly-Plates must not be used on installations over concrete decks. Use steel Cleat Plate or Duro-TECH TPO HD Seam Plate.
   c. Approved vapor barrier required if deck is less than 1 year old.
4. **Gypsum Decks (poured in place or pre-cast)**
   a. Deck must be cured and dry prior to the installation of any Duro-TECH TPO Mechanically Fastened Roofing System.
   b. Approved vapor barrier required if deck is less than 1 year old.
   c. **Fastener rows spaced greater than 60 inches (1,534 mm) are not permitted on gypsum decks.**
5. **Cementitious Wood Fiber (“CWF”) Deck Panels**
   a. Joints between panels greater than 1/4 inch (6 mm) wide should be grouted or filled with compatible material recommended by panel manufacturer.
   b. **Fastener rows spaced greater than 60 inches (1,534 mm) are not permitted on CWF decks.**
6. **Lightweight Concrete Decks (insulating or cellular)**
   a. Deck must be cured, dry, and have a smooth surface.
   b. Do not leave the deck exposed beyond the maximum exposure time as defined by the lightweight insulating concrete manufacturer.
   c. Do not allow the deck to be exposed to precipitation.
   d. Duro-Last Poly-Plates must not be used on installations over lightweight concrete decks. Use steel Cleat Plate or Duro-TECH TPO HD Seam Plates.
   e. Approved vapor barrier required if deck is less than 1 year old.

REROOFING

Tear-Off

1. Deck attachment must meet all current building code requirements.
2. If the deck cannot be adequately prepared for the direct application of the TPO membrane, Duro-Guard insulations, fan fold boards, and/or cover boards must be used.
3. If rock ballast is removed from an existing roof system, confirm that the existing insulation or cover board is properly secured to the deck. If not, it must be secured as described in the *Insulation and Cover Board Installation* section below.
4. **Phenolic foam insulation must be completely removed**.
5. **Extreme caution must be used to prevent the TPO membrane from being contaminated by asphalt or bitumen.** Asphalt and bitumen are not compatible with the TPO membrane and proper separation must be provided between these products and the TPO membrane. Should the TPO membrane become soiled with asphalt or bitumen, the affected TPO membrane must be cleaned immediately, using approved procedures. If the asphalt or bitumen cannot be properly cleaned from the TPO membrane, new TPO membrane should be ordered and installed.

Duro-TECH TPO LVOC Splice Wash Cleaner may be used to clean the TPO membrane. If another cleaner is desired, contact Duro-Last to verify compatibility.

i. Always read SDS prior to using the cleaner.

ii. Prepare cleaner as directed on individual cleaner instructions.

iii. Spray application is preferred, but cleaner may also be applied with a mop.

iv. Scrub with a stiff-bristle brush.

v. Do not allow cleaner to sit for any extended period of time on the TPO membrane. Rinse immediately with either:
   - Power-washer
     - Maximum of 3,000 psi (20.7 MPa)
     - Fan tip attachment
     - 18-inch distance
   - Garden hose
     - Spray nozzle attachment

Re-Cover

1. Existing Built-Up Roofing System (BUR) or Modified-Bitumen Roofing System.
   a. **Extreme caution must be used to prevent the TPO membrane from being contaminated by asphalt or bitumen.** Asphalt and bitumen are not compatible with the TPO membrane and proper separation must be provided between these products and the TPO membrane. Should the TPO membrane become soiled with asphalt or bitumen, the affected TPO membrane must be cleaned immediately, using approved procedures. If the asphalt or bitumen cannot be properly cleaned from the TPO membrane, new TPO membrane should be ordered and installed.
   b. Blisters, buckles and other surface irregularities must be repaired or removed if there is a possibility of the existing roof affecting the performance of the new Duro-TECH TPO Mechanically Fastened Roofing System. The new Duro-TECH TPO Mechanically Fastened Roofing System should slope to drains without any obstructions.
   c. Areas with wet insulation and/or cover boards must be removed and replaced with products of similar thickness and the same, or greater R-value, or in compliance with applicable codes.

d. If the existing roofing system is smooth-surfaced or has a granular cap sheet and is free of sharp edges, any Duro-Guard rigid board insulations, fan fold boards, cover boards and/or approved slip sheets may be used to provide separation of the existing roofing system and new TPO membrane. In this instance, Duro-TECH TPO Fleece membrane may be installed directly over the existing roofing system without any separation.

e. Existing roofing systems with rock/gravel surfaces will require an adequate surface preparation. Duro-Guard EPS/XPS fan fold boards may be used when the surface is pea gravel or crushed stone which is 1/4 – 3/8 inch (6 – 10 mm) in size and has been leveled and maintained at 4 lb/ft^2 (.2 kg/m^2) for larger rock/gravel, utilize insulations as a separator. A cover board may be installed over the rigid board insulation.

f. If the rock/gravel surfacing is removed, Duro-Guard rigid board insulations, fan fold boards and/or cover boards must be used. If embedded rock/gravel remains that protrudes out of the deck more than 1/4 inch (6 mm), do not use fan fold board. Instead, use Duro-Guard rigid board insulations and/or cover boards. **Note: Removing the rock/gravel surfacing may affect the roofing system's fire rating and limit your choice of rigid board insulations and/or cover boards. Contact the Duro-Last Engineering Services Department for questions concerning fire-rated assemblies.**

g. When installing Duro-Guard EPS or XPS rigid board insulation over coal tar pitch, asphalt or modified-bitumen roofing systems, Duro-Weave Separation Slip Sheet must be used between the insulation and the existing Duro-TECH TPO Mechanically Fastened Roofing System.

2. Existing Single-Ply Roofing System

a. Cut the existing single-ply membrane free from the entire roof perimeter and at the base of all parapets and curbs. Slice the existing single-ply membrane between rows of fasteners prior to installing the new Duro-TECH TPO Mechanically Fastened Roofing System.

b. Loose or high fasteners must be repaired.

c. Existing single-ply membranes must be covered with either Duro-Guard rigid board insulations, fan fold boards, cover boards, and/or approved slip sheets.

1. Metal Roof Retrofit

a. It is the responsibility of the contractor to ensure that the weight limitations of the roofing systems are not exceeded when installing additional materials over pre-engineered buildings.

b. Metal roof panels must be clean, smooth, and free of sharp edges and loose, foreign material. Damaged areas and other factors affecting the installation of any Duro-TECH TPO Mechanically Fastened Roofing System must be repaired prior to the installation of the TPO membrane.

c. In order to provide a proper substrate for installation and to adequately separate the TPO membrane from the metal roof, the space between the ribs of the metal roof can be filled with insulation. An additional layer(s) must be added to create a clean, flat and continuous substrate. The product used as the top layer must have a span rating adequate for any gaps that may exist between the filler insulation and the metal ribs. Products to use for the top layer include:

i. Duro-Guard EPS rigid board insulation with a density of at least 1.5 pcf (0.07 kPa) (1-inch (25-mm) minimum thickness) that meets ASTM C578. EPS must have an approved facer or be covered with an approved slipsheet, Duro-Guard ISO or cover board.

ii. Duro-Guard ISO rigid board insulation with a density of at least 1.5 pcf (0.07 kPa) (1-inch (25-mm) minimum thickness) that meets ASTM C1289.

iii. Duro-Guard cover board 1/4 inch (6 mm) minimum thickness.

iv. Duro-Guard ISO HD, Duro-Guard EPS Fan Fold or Duro-Guard XPS Fan Fold may be used only if there are no gaps greater than 1/4 inch (6 mm) between the filler insulation and the metal ribs.

v. Duro-Guard EPS Flute Fill Combo may be used to fill the flutes and cover the metal roof with a single, custom-fit rigid board insulation. It must have a density of at least 1.5 pcf (0.07 kPa) (1-inch (6-mm) minimum thickness above the top flute) that meets ASTM C578. EPS must have an approved facer or be covered with an approved slipsheet, Duro-Guard ISO or cover board.

vi. Plywood or oriented strand board (OSB) as described below.

d. Plywood or OSB boards may be used to cover the metal roof. The span rating of the boards must be adequate for any gaps that will be covered and the minimum thickness of the board depends on how it will be used.

   If the board is used as a cover board over insulation, and the TPO membrane will be fastened to the underlying metal deck, plywood or OSB with a minimum thickness of 7/16 inch (11 mm) may be used. Attach the board with a minimum of 9 fasteners per 4- x 8-foot (1.2- x 2.5-m) board to prevent warping.

   If the board is applied directly to the metal roof in order to form a substrate into which the TPO membrane and other Duro-TECH TPO Mechanically Fastened Roofing System components will be fastened, the board must be plywood with a minimum thickness of 5/8 inch (16 mm). The plywood must be fastened to meet local building code requirements. Fastener pullout tests must be conducted prior to installing the TPO membrane in order to determine the fastening pattern.

e. High-density wood fiberboard is an acceptable cover board on metal roof retrofits when the roof slope is at least 1:12 (8%). High-density wood fiberboard is not acceptable for use as flute filler.

INSTALLATION

WOOD NAILER (GENERAL)

Wood nailers must be #2 grade lumber or better, or plywood, and both forms of nailers must withstand a minimum of 180 lbf/ft (2,626.9 N/m). Any pull values greater than 270 lbf (1,201 N) will allow for a fastener spacing of 18 inches (457 mm) on center. Pull values less than 270 lbf (1,201 N) will require additional fasteners. **The contractor is responsible for meeting building codes.**

Wood nailers are required along perimeter edges where 1 inch (6 mm), or greater, thickness of insulation is used. The top of the nailer must be flush with the top of the insulation. Wood nailers are not required at roof-to-wall transitions.

WOOD NAILER (PRESSURE-TREATED)

Prior to 2003, wood was treated with Chromated Copper Arsenate (CCA) to provide protection against decay from insects, fungi, microorganisms and moisture. The Environmental Protection Agency (EPA) deemed this chemical to have negative environmental concerns. The lumber industry worked with the EPA to provide an alternative, which had less environmental concerns, but still provided the needed protection. The resulting alternatives to CCA are Alkaline Copper Quarternary (ACQ) and Copper Azoles (CA). These new preservatives can be harmful to metal edge systems, metal flashings and fasteners.

Duro-Last does not recommend, or require, the use of pressure-treated lumber that is used for nailers in their roofing systems. If pressure-treated lumber is used, the following product guidelines must be followed in order to minimize the possibility of ACQ and CA causing corrosion within the Duro-TECH TPO Mechanically Fastened Roofing System.

Acceptable Products*

- Hot-dipped galvanized fasteners complying with ASTM A153 and connectors complying with ASTM A653, Class G185
- Duro-Last e-coated fasteners (HD or EHD Screws)
- Type 304 or Type 316 stainless-steel fasteners and connectors (recommended for maximum corrosion resistance)
- 400-series stainless-steel fasteners

* All fasteners must be FM-compliant.

Unacceptable Products

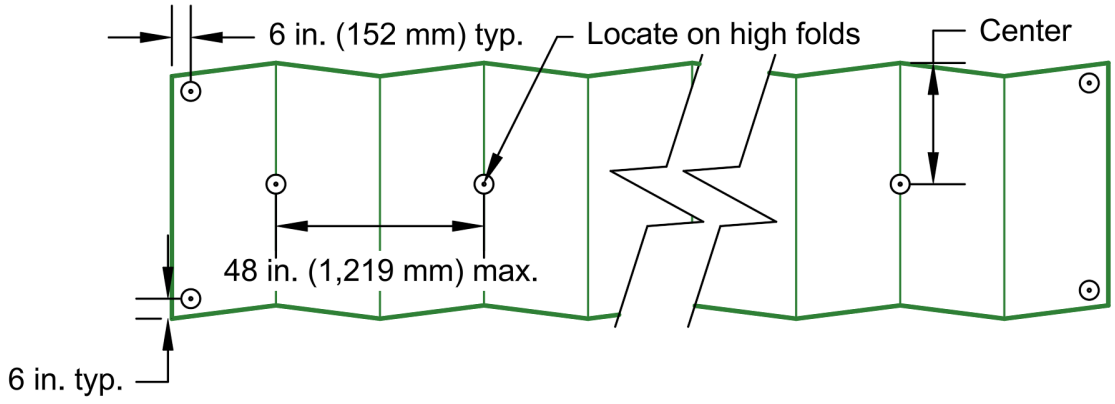
- Aluminum fasteners
- Aluminum edge systems or flashings**
- Carbon-steel fasteners
- Electroplated-galvanized steel fasteners and connectors
- Uncoated metal edge systems or flashings**
- Painted metal edge systems or flashings**
- GALVALUME® metal edge systems or flashings**

** Product may be used if separated from the pressure-treated lumber by an approved separation layer, such as the TPO membrane or an approved vapor barrier.

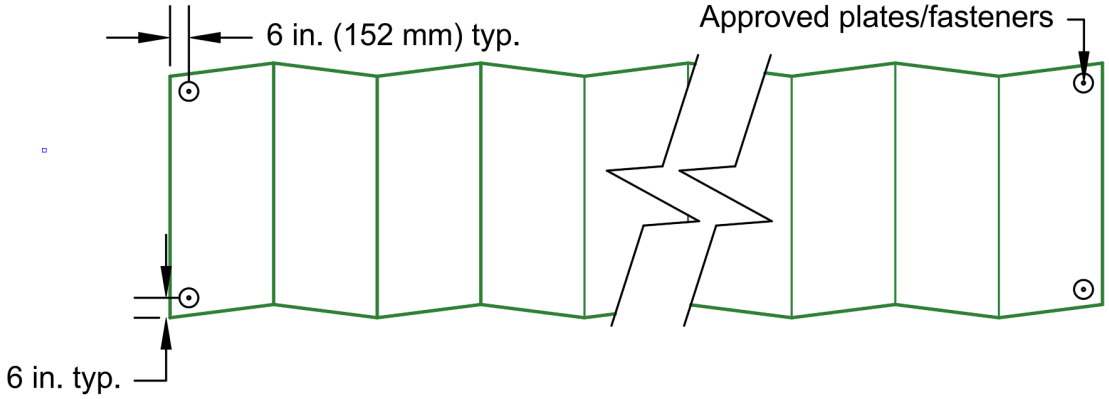
SECTION 3

RIGID BOARD INSULATION, FAN FOLD, COVER BOARD AND APPROVED SLIP SHEET INSTALLATION

1. Refer to *Approved Rigid Board Insulations*, *Cover Boards and Fan Fold Boards* and *Approved Slip Sheets* in *Section 2* for approved products. Other materials may be accepted, but only after the contractor has requested a deviation from Duro-Last, and Duro-Last has approved such deviation, in writing, prior to being used.
2. The use of multiple layers of rigid board insulation with joints staggered 50% between layers is recommended to eliminate thermal bridging.
3. Rigid board insulations and fan fold boards must be neatly fitted to the deck and around penetrations. Rigid board insulations and fan fold boards should be installed tightly against adjacent boards and it is recommended to stagger all joints between boards 50% from row to row. No gap should exceed 1/4 inch (6 mm) in width.
4. Cover boards must be neatly fitted to the deck and around penetrations. Cover boards may require a small gap between boards. Consult the cover boards' Product Data Sheets for gapping requirements. No gap should exceed 1/4 inch (6 mm) in width.
5. Attachment of rigid board insulations, fan fold boards, cover boards and approved slip sheets using mechanical fasteners.
    a. Refer to *Section 2* for approved fasteners and plates.
    b. Fastener pullout tests must be conducted as described in *Section 2*.
    c. When installing multiple layers (which may include rigid board insulations, cover boards and thermal barriers), it is acceptable to loosely lay the underlying boards and mechanically fasten through the top layer and all subsequent layers at once.
    d. Fasten rigid board insulation per Detail #T1020.
        i. 4- x 8-foot (1.2- x 2.5-m): minimum of 5 fasteners per board.
        ii. 4- x 4-foot (1.2- x 1.2-m): minimum of 4 fasteners per board.
        iii. 2- x 4-foot (0.6- x 1.2-m): minimum of 2 fasteners per board.
    e. Fasten cover boards per Detail #T1020, with exception of ISO HD fastened at rigid board insulation patterns.
        i. 4- x 8-foot (1.2- x 2.5-m): minimum of 4 fasteners per board.
        ii. 4- x 4-foot (1.2- x 1.2-m): minimum of 4 fasteners per board.
        iii. 2- x 4-foot (0.6- x 1.2-m): minimum of 2 fasteners per board.
    f. Fasten fan fold boards per Detail #T1030.
        i. TPO membrane laps spaced 60 inches (1,524 mm) or less.
            a. 4- x 50-foot (1.2- x 15.2-m) (50-foot parallel to TPO membrane laps): minimum of 16 fasteners per board.

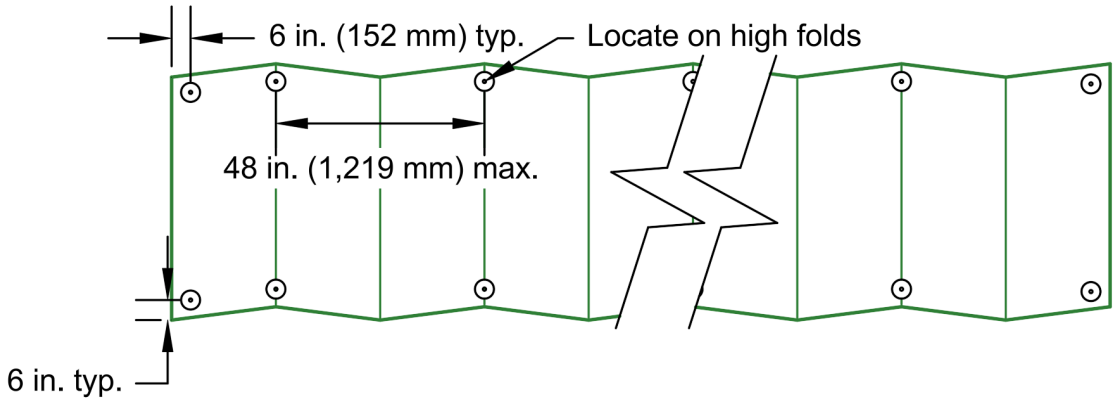


b. 4- x 50-foot (1.2- x 15.2-m) (50-foot perpendicular to TPO membrane laps): minimum of 4 fasteners per board.



ii. TPO membrane laps spaced greater than 60 inches (1,524 mm).

a. 4- x 50-foot (1.2- x 15.2-m) (TPO membrane laps ran either direction): minimum of 28 fasteners per board.



g. Fasten slip sheets as required by their individual PDSs.

SECTION 3

TPO MEMBRANE INSTALLATION

1. General Considerations

   a. Refer to *Deck/Substrate Criteria* in *Section 2* for substrate criteria.

   b. Refer to *Section 2* for approved fasteners and plates.

   c. Factory Mutual projects require fastener rows to run perpendicular to, and fasten into, the high flutes on steel decks.

   d. The maximum width of TPO membrane rolls that may be used is based on the fastener pullout resistance and the fastening pattern determined using the *Fastener Spacing for Building Roof Areas less than 40 Feet Tall* Table in *Section 2*. It is the responsibility of the contractor to make sure that fastener pullout tests are performed prior to ordering of any Duro-TECH TPO Mechanically Fastened Roofing System. The tests can be performed by either the fastener manufacturer or by the contractor.

   e. It is recommended that the TPO membrane be overlapped to allow for water to flow over rather than against each lap.

   f. After unwrapping and rolling out the TPO membrane, allow at least 30 minutes for the membrane to relax, prior to installation.

   g. Each type of TPO membrane is marked at 6-inch (152-mm) intervals to assist with fastener placement.

   h. Install fasteners and plates so that the edge of the plate is located between 1/2- to 1-inch (13- to 25-mm) from the edge of the TPO membrane. The maximum spacing between fasteners must be in accordance with the *Fastener Spacing Table* in *Section 2*.

   i. Position the next roll so that the TPO membrane overlaps the fastened edge of the installed TPO membrane section by 6 inches (152 mm). Uncut rolls will have a lap line located 6 inches (152 mm) from one edge of the roll to help with overlap alignment.

   j. The seam between the two sections of TPO membrane must be heat (hot-air) welded with a minimum width of 1-1/2 inches (40 mm).

   k. A “T-Patch” is required at intersections of three TPO membrane edges and a field-welded transition.
      - Refer to Detail TRG1066.
      - The minimum size of a patch is 4- x 4-inch (102- x 102-mm) or 4-inch (102-mm) diameter.
      - Unreinforced TPO membrane T-Patches may be a maximum of 60 mils (1.52 mm) thick.
      - Reinforced TPO membrane T-Patches may be a maximum of 45 mils (1.14 mm) thick.

   l. When rows of fasteners are added through the top of the TPO membrane, they must be covered by TPO membrane stripping which is heat (hot-air) welded to the TPO membrane. The cover strip must be wide enough to accommodate a 1-1/2-inch (40-mm) wide heat (hot-air) weld on all sides. Stripping may be any thickness of TPO membrane.

   m. Due to increased wind uplift pressures in the perimeter and corner areas of the Duro-TECH TPO Mechanically Fastened Roofing System, more fasteners are required in these areas than in the main field area of the Duro-TECH TPO Mechanically Fastened Roofing System. Options for effectively increasing the number of fasteners in the perimeter and corner areas are discussed below.

2. Deck Perimeter/Corner TPO Membrane Attachment: **General**

   a. It is the contractor’s responsibility to determine fastening requirements. It is recommended that the contractor contact the Duro-Last Engineering Services Department for assistance in determining the fastening requirements when any of the following conditions apply:

      i. Building roof area is 40 feet (12.2 m) tall or taller. Perimeter/corner roll requirements are listed in the table below (regardless of wall height). Contact the Duro-Last Engineering Services Department for fastener spacing.

      ii. Building is located in an area with design wind speeds greater than the following:

         a. ASCE 7-05: 110 mph

b. ASCE 7-10: 150 mph

iii. A High Wind Warranty is required.

iv. Average fastener pullout resistance is less than 150 lbf (667.2 N).

b. On buildings with multiple roof levels, treat all roof edges as perimeter edges if they stand 3 feet (0.9 m) or more above adjacent roof areas.

c. The perimeter/corner fastening requirements can be met by using narrower TPO membrane rolls, adding rows of fasteners through the top of installed TPO membrane, or by using Duro-TECH TPO induction welding techniques. These options are described below.

d. **120-inch (3,048-mm) fastener row spacing is not acceptable within 7 feet (2.1 m) of any perimeter edge.**

Roll Good Perimeter/Corner Roll Requirements for Building Roof Areas 40 Feet (12.2 m) and Taller (regardless of wall height) (Contact the Duro-Last Engineering Services Department for Fastener Spacing)		
Roof Height	**60-in. (1,524-mm) Rolls (Field Area)**	**120-in. (3,048-mm) Rolls (Field Area)**
40 to less than 80 ft (12.2 to less than 24.4 m)	Two 30-in. (762-mm) rolls adjacent to parallel perimeter edges	Two 30-in. (762-mm) rolls, then one 60-in. (1,524-mm) roll adjacent to all perimeter edges (picture frame layout)
80 to less than 100 ft (24.4 to less than 30.5 m)	Three 30-in. (762-mm) rolls adjacent to parallel perimeter edges	Three 30-in. (762-mm) rolls, then one 60-in. (1,524-mm) roll adjacent to all perimeter edges (picture frame layout)
100 ft (30.5 m) and above	Contact the Duro-Last Engineering Services Department	120-in. (3,048-mm) rolls are not allowed

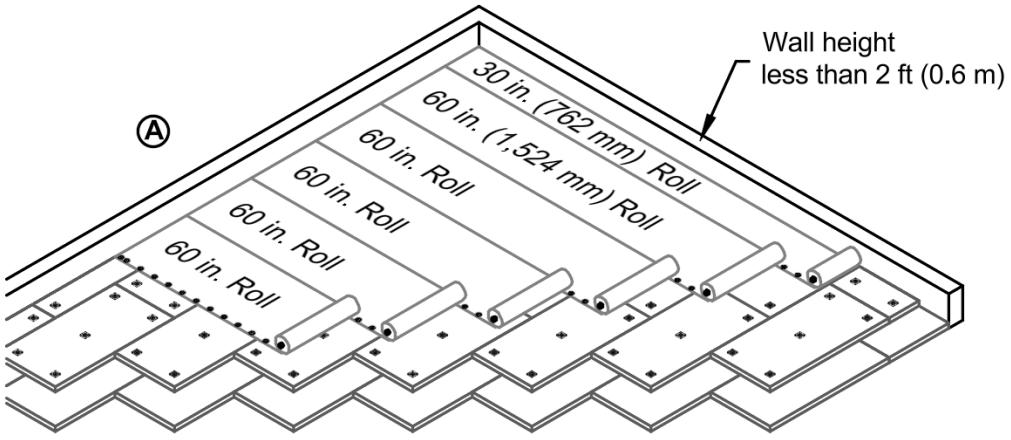
3. Roof Perimeter/Corner TPO Membrane Attachment (building roof area less than 40 ft. (12.2 m) tall): **Walls less than 2 feet (0.61 m) tall or no walls present**

a. Utilizing 30-, 60-inch (762-, 1,534-mm) wide rolls:

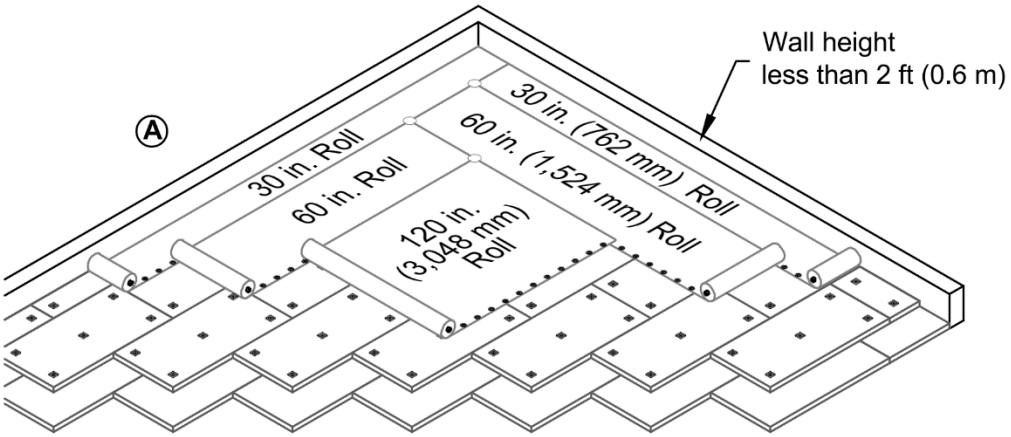
i. Install one 30-inch (762-mm) wide roll adjacent to perimeter edges that run parallel to fastening rows.

ii. Install 60-inch (1,534-mm) wide rolls in the remaining area of the roof.

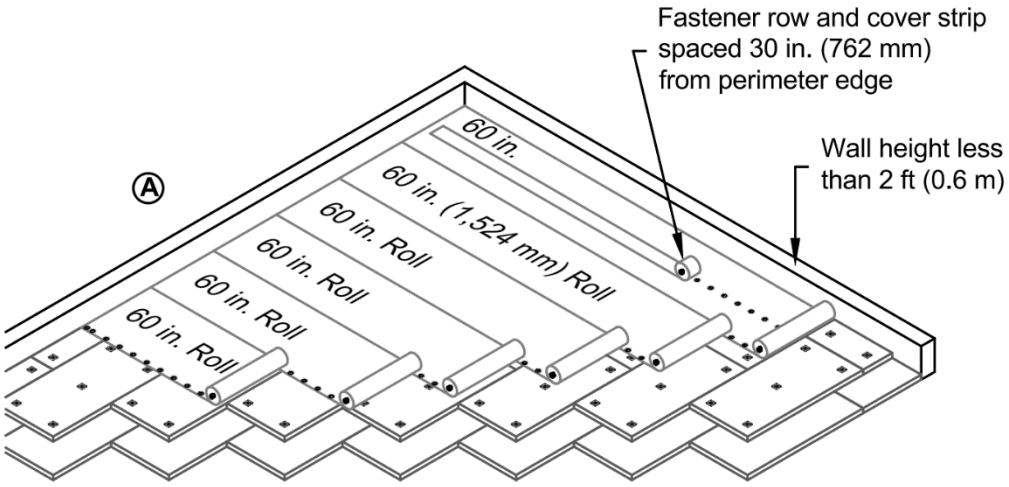
iii. Refer to Detail TRG1053, drawing “A”.



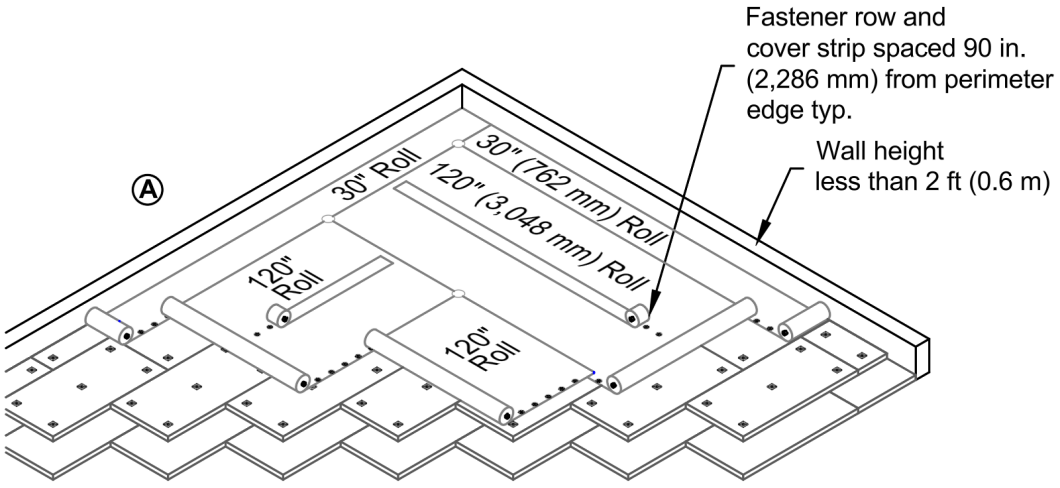
b. Utilizing 30-, 60-, and 120-inch (762-, 1,524-, and 3,048-mm) wide rolls:
   i. Install one 30-inch (762-mm) wide roll adjacent to perimeter edges.
   ii. Install one 60-inch (1,524-mm) wide roll adjacent to the 30-inch wide roll.
   iii. Install 120-inch (3,048-mm) wide rolls in the remaining area of the roof.
   iv. Refer to Detail TRG1052, drawing “A”.



c. Utilizing 60-inch (1,534-mm) wide rolls only:
   i. Install 60-inch (1,534-mm) wide rolls in the entire roof area.
   ii. Add rows of fasteners, with cover strips, 30 inches (762 mm) from the perimeter edges and parallel to the edges.
   iii. Refer to Detail TRG1055, drawing “A”.

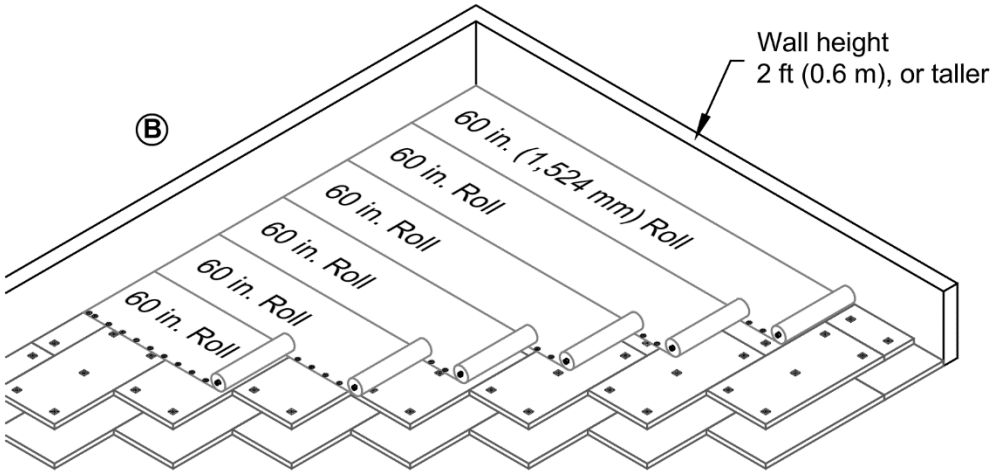


d. Utilizing 30- and 120-inch (762- and 3,048-mm) wide rolls:
   i. Install one 30-inch (762-mm) wide roll adjacent to perimeter edges.
   ii. Install 120-inch (3,048-mm) wide rolls in the remaining area of the roof.
   iii. Add rows of fasteners, with cover strips, 90 inches (2,286 mm) from the perimeter edges and parallel to the edges.
   iv. Refer to Detail TRG1054, drawing “A”.

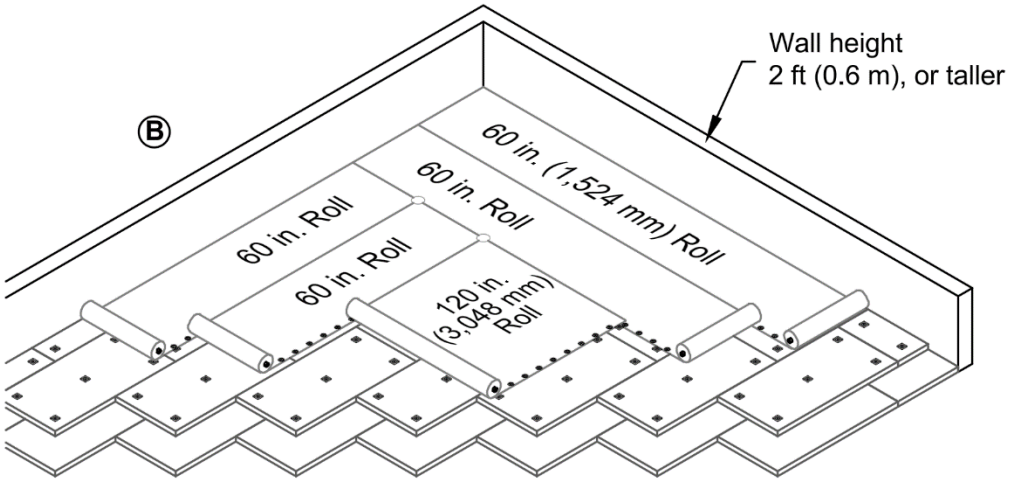


4. Roof Perimeter/Corner TPO membrane Attachment (building roof area less than 40 feet (12.2 m) tall): **Walls 2 feet (0.61 m) tall or taller**

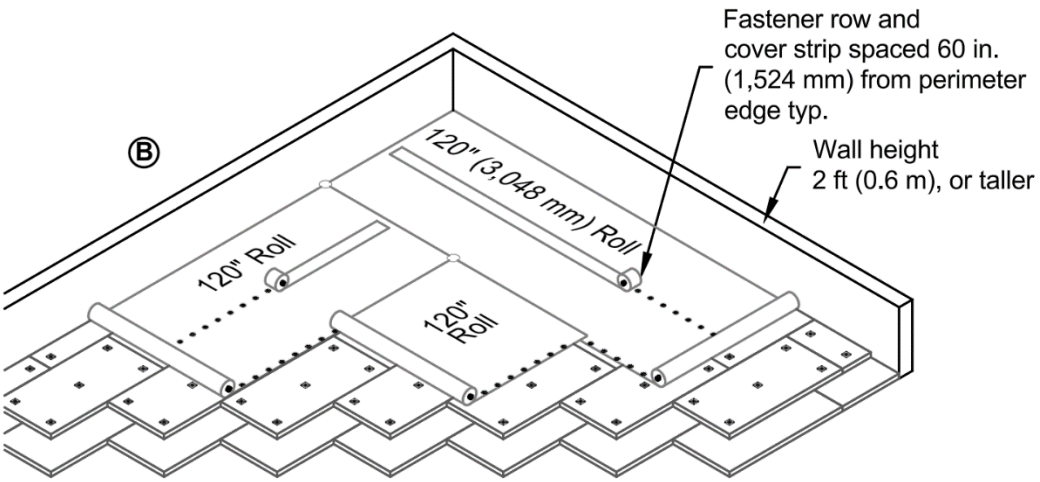
a. Utilizing 60-inch (1,534-mm) wide rolls only:
   i. Install 60-inch (1,534-mm) wide rolls in the entire roof area.
   ii. Refer to Detail TRG1053, drawing “B”.



b. Utilizing 60- and 120-inch (1,534- and 3,048-mm) wide rolls:
   i. Install two 60-inch (1,534-mm) wide rolls adjacent to perimeter walls.
   ii. Install 120-inch (3,048-mm) wide rolls in the remaining area of the roof.
   iii. Refer to Detail TRG1052, drawing “B”.



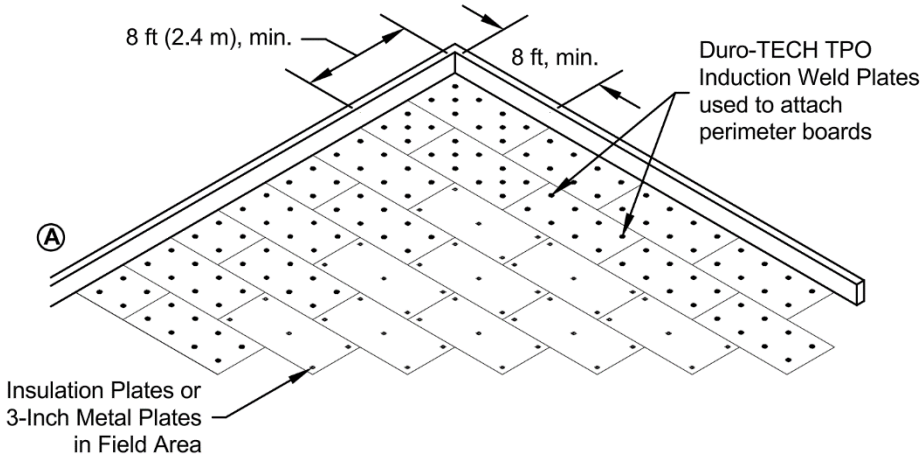
c. Utilizing 120-inch (3,048-mm) wide rolls only:
   iv. Install 120-inch (3,048-mm) wide rolls in the entire roof area.
   v. Add rows of fasteners, with cover strips, 60 inches (1,534-mm) from the perimeter walls and parallel to the walls.
   vi. Refer to Detail TRG1054, drawing “B”.



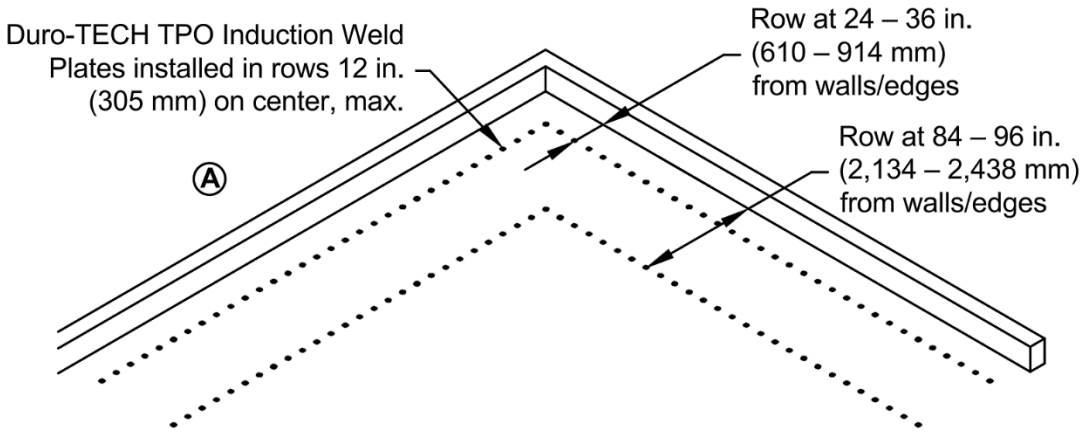
5. Roof Perimeter/Corner TPO membrane Attachment (building roof area less than 40 ft. (12.2 m) tall): **Duro-TECH TPO Induction Weld Roofing Systems (excludes fleece membranes)**

   a. The additional fastening requirement adjacent to roof perimeters may also be met by using induction welding techniques. This type of TPO membrane attachment is utilized by the Duro-TECH TPO Induction Weld Roofing Systems which use TPO induction plates to which the TPO membrane is attached by induction welding. These plates can be used to install Duro-Guard rigid board insulation and/or cover boards, or can be installed in rows when used in an overlay application utilizing Duro-Guard fan fold board or an approved slip sheet. Due to the high temperatures that the plates reach during welding, an appropriate barrier is required between the plates and certain slip sheets, polystyrene rigid board insulations, and fan fold products. Refer to the Duro-TECH TPO Induction Weld Roofing System specification for additional information.

   b. When attaching rigid board insulations and/or cover boards, use 8 fasteners per 4- x 8-foot (1.2- x 2.5-m) board in the perimeter areas and 10 fasteners per 4- x 8-foot (1.2- x 2.5-m) board in the corner areas. The perimeter areas must extend a minimum of 8 feet (2.5 m) into the roof. The corner areas must be at least 8 x 8 feet (2.5 x 2.5 m). Refer to Detail TRG1057. This fastening pattern is for a maximum 60-psf (2.87-kPa) field area design pressure. If the roofing system must be installed to meet a higher uplift pressure, contact the Duro-Last Engineering Services Department for assistance.



c. When using Duro-Blue, Duro-Weave, or Geotextile slip sheets, Duro-Guard EPS or XPS rigid board insulations, or fan fold boards, an appropriate barrier layer must be installed beneath the plates. The Duro-Last Induction Insulation Disc, a piece of TPO membrane, or approved flame-retardant slip sheet may be used for this purpose. The barrier piece must extend at least 1/2 inch (13 mm) beyond the edge of the plate. Install the first row of fasteners at a maximum of 12 inches (305 mm) on center between 24 to 36 inches (610 to 914 mm) from the roof perimeter. Install the second row of fasteners at 12 inches (305 mm) on center between 84 to 96 inches (2,134 to 2,438 mm) from the roof perimeter. Refer to Detail TRG1058. This fastening pattern is for a maximum 60-psf (2.87-kPa) field area design pressure. If the roofing system must be installed to meet a higher uplift pressure, contact the Duro-Last Engineering Services Department for assistance.



d. On metal retrofit applications where the metal panels do not provide adequate fastener pullout resistance, the plates may be fastened into steel purlins as long as the purlins are spaced no more than 60 inches (1,534 mm) apart. The first purlin must fall within 3 feet (0.9 m) of the perimeter edge. Install the plates a maximum of 6 inches (152 mm) on center into the purlins. This fastening pattern is for a maximum 60-psf (2.87-kPa) field area design pressure. If the roofing system must be installed to meet a higher uplift pressure, contact the Duro-Last Engineering Services Department for assistance.

HOT-AIR WELDING

1. Seams created by using heat (hot-air) welds may be completed using either an automatic or hand-held hot-air welder. The seam must be continuous and at least 1-1/2 inches (40 mm) wide.
2. Testing of TPO membrane seams should always be performed prior to welding sections of TPO membrane together. Perform the tests whenever a welder is turned on or after a significant change in the weather. Weld together two pieces of TPO membrane a minimum of two feet long. Once the seam has cooled, pull it apart for inspection. The delamination should occur at the top of the reinforcement fabric and the seam should be a minimum of 1-1/2 inches (40 mm) wide.
3. After a field TPO membrane seam cools, it must be inspected with a tack claw or similar tool (e.g. cotter key extractor), and all deficiencies repaired prior to inspection by Duro-Last.
4. **Contractors are responsible for calibrating their welders in accordance with the manufacturer's specifications.**
5. Automatic Welders
   a. Since automatic welders heat (hot-air) weld TPO membrane together at such a rapid rate it is critical that the welding temperature, air volume and drive speed be properly set. Weather and ambient air temperature can also affect performance. Adjustments may need to be made as conditions change.
   b. The following table shows an example of conditions and settings used to weld different TPO membranes together using a Leister® Varimat® V2. **These settings should be used simply as guidelines for initiating seam tests and not as exact settings for every case. These rates are approximate and can vary.**

Leister Varimat V2 (220-Volt Walker-Welder)				
Membrane (all mils)	**Ambient Temperature**	**Welding Temperature**	**Air Volume**	**Drive Speed**
Duro-TECH TPO	70° F (21° C)	1,040° F (560° C)	70%	8-1/2 ft/min. (2.6 m/min.)
NOTE: Always use the slower speed when welding different types of membrane together.				

6. Hand-Held Welders
    a. Average welding rates for all TPO membranes using a Leister Triac® 1G3 hand-welder with a 1-1/2-inch (40 mm) tip and setting between 7 and 9 are between 2 to 3 feet (0.6 to 0.9 m) per minute. **These rates are approximate and can vary.**

PARAPETS

The TPO membrane may be adhered or mechanically fastened onto walls. Surface preparation requirements on walls are the same as described in *Substrate Preparation* above. Refer to Details for installation references of edge terminations.

1. Parapets Mechanically Fastened
    a. Any slope equal to or greater than 12 inches (305 mm) per foot will be considered a parapet wall. Rolls may be a maximum of 30 inches (762 mm) wide when installed horizontally across a wall. Rolls may be a maximum of 60 inches (1,524 mm) wide when installed vertically up a wall. Refer to Details TRG6012 and TRG6013.
    b. Situate the TPO membrane at the base of the wall so that enough TPO membrane extends onto the roof to cover plates in the roof-to-wall transition and to accommodate the 1-1/2-inch (40 mm) wide heat (hot-air) weld between the parapet and deck TPO membrane.
    c. A row of fasteners must be installed at the roof-to-wall transition. These fasteners may be installed into the deck or the wall. When fastened into the deck, use the same fastener spacing that is being used to install the TPO deck membrane in the perimeter and corner areas.
    d. When installing rows of fasteners into walls, use the following fastener spacing.
        i. Concrete: 18 inches (457 mm) o.c., maximum.
        ii. 22-gauge, or thicker, steel: 18 inches (457 mm) o.c., maximum.
        iii. Plywood or other material with pullout value 300 lbf, (1,334.5 N) or greater: 18 inches (457 mm) o.c., maximum.
        iv. Plywood or other material with pullout value between 175 and 300 lbf (778.4 – 1,334.5 N): 12 inches (305 mm) o.c., maximum.
        v. For any wall with material pullout value less than 175 lbf (778.4 N) contact the Duro-Last Engineering Services Department.
    e. After the TPO membrane is attached, seam adjacent sections of the wall TPO membrane together with heat (hot-air) welds. Seam the edge of the TPO wall membrane to the roof TPO membrane with a continuous heat (hot-air) weld at least 1-1/2 inches (40 mm) wide.
2. Walls Adhered
    a. The maximum width TPO membrane roll that may be used on parapet walls is 60 inches (1,524 mm).
    b. When adhering TPO membrane to walls, utilize an approved Duro-TECH TPO membrane adhesive. Other materials may be accepted, but only after the contractor has requested a deviation from Duro-Last, and Duro-Last has approved such deviation, in writing, prior to being used.
    c. Adhesive must be applied to both the substrate and bottom side of the TPO membrane. Refer to the Product Data Sheet of the adhesive being used for acceptable substrates, coverage rates and application guidelines.
    d. After the TPO membrane is applied to the wall, apply pressure to the TPO membrane with a push broom or squeegee to complete the bond.

e. If extending up a wall more than 5 feet (1.5 m), rows of mechanical fasteners must be installed at each 5-foot increment. The TPO membrane may be installed so that the rows of fasteners on the wall run either horizontally or vertically.

f. Any field-welded transitions up the wall will require a T-Patch.

g. Situate the TPO membrane at the base of the wall so that enough TPO membrane extends onto the roof to cover plates in the roof-to-wall transition and to accommodate the 1-1/2-inch (40 mm) wide hot-air weld between the TPO wall membrane and TPO roof membrane.

h. A row of fasteners must be installed in the roof-to-wall transition. These fasteners may be installed into the deck or the wall. When fastened into the deck, use the same fastener spacing that is being used to install the roof TPO membrane in the perimeter and corner areas.

i. When installing rows of fasteners into walls, use the following fastener spacing.

   i. Concrete: 18 inches (457 mm) o.c., maximum.

   ii. 22-guage (0.71 mm), or thicker, steel: 18 inches (457 mm) o.c., maximum.

   iii. Plywood or other material with pullout value 300 lbf (1,334.5 N) or greater: 18 inches (457 mm) o.c., maximum.

   iv. Plywood or other material with pullout value between 175 and 300 lbf (778.4 – 1,334.5 N): 12 inches (305 mm) o.c., maximum.

   v. For any wall with material pullout value less than 175 lbf (778.4 N), contact the Duro-Last Engineering Services Department.

j. After the TPO membrane is attached, seam adjacent sections of the wall TPO membrane together with heat (hot-air) welds. Seam the edge of the TPO wall membrane to the TPO roof membrane with a continuous heat (hot-air) weld a minimum of 1-1/2 inches (40 mm) wide.

k. Any field-welded transitions up the wall will require a T-Patch.

SLOPE TRANSITIONS (e.g. deck-to-parapet, deck-to-curb, deck slope changes, etc.)

As instructed in the T1000-Series Details:

1. The TPO membrane must be mechanically fastened with approved plates/fasteners at all slope transitions that meet or exceed a change in slope of 1 inch/foot (1:12).
2. The fastener concentration must be the same as that being used to fasten the TPO membrane adjacent to the transition.
3. All field-welded transitions must have a T-Patch as listed under *Requirements* located on page 5. The T-Patch must be welded to the transition with a continuous heat (hot-air) weld a minimum of 1-1/2 inches (40 mm) wide.

PENETRATIONS

1. The TPO membrane must be fastened at the base of all deck penetrations. Such penetrations include, but are not limited to, pipes, drains, curbs, pitch pans, and expansion joints.
2. T-Patches must not be used in place of inside and outside corners.
3. The fastener concentration around penetrations must be the same as that being used to fasten the TPO membrane adjacent to the penetration. A minimum of one fastener is required on round penetrations, and a minimum of one faster per side on rectangular penetrations.
4. **Stack Flashings, Drain Boots, Inside, and Outside Corners cannot be field-fabricated.**
5. Outside and Inside Corners must be installed at all applicable locations as per Detail T1180.
6. Where applicable, seam the penetration skirt/base to the TPO membrane with a continuous heat (hot-air) weld, at least 1-1/2-in. (40-mm) wide.

SECTION 3

ROUND FLASHINGS

As instructed in Details T4070, T4080, and T4081:

1. The TPO membrane must not contact surfaces which maintain or exceed temperatures of 150° F (65° C) including insulated chimney pipes, exhaust pipes, and combustible fuel pipes.
2. All flashings, must be terminated a minimum of 8 in. (203 mm) above the top of the roofing system surface with exceptions for:
   - Pitch pans must be a minimum of 4 inches (102 mm).
   - Duro-TECH TPO universal pipe flashings must be a minimum of 3 inches (76 mm).
3. **Round Flashings cannot be field-fabricated.**

PITCH PANS

As instructed in the T4030, T4040, and T4045 Details:

1. Use pitch pans only when standard flashings cannot be used.
2. All pitch pans must be terminated a minimum of 4 in. (102 mm) above the top of the roofing system surface.

TWO-WAY AIR VENTS

As instructed in the T5020 Detail:

1. Install Duro-TECH Two-Way Air Vents between fastener rows and at high points of deck area. Vents must not be installed within 7 ft (2.1 m) of the building edge. Never install vents in low or drainage areas.
2. Duro-TECH TPO Two-Way Air Vents must not be used on:
   - Refrigerated buildings
   - Freezer buildings
3. Duro-TECH TPO Two-Way Air Vents are not required on:
   - Open-air structures (e.g. carports)
   - Duro-TECH roofing systems with overburden (e.g. ballast, paver, vegetation, etc.).

DRAINS AND SCUPPERS

Drain Assemblies with Clamping Rings

As instructed in the T2011 Detail:

1. All existing roofing system materials must be removed from drain bowl and clamping ring.
2. Use an approved sealant (1/2 tube minimum) between the TPO membrane and drain bowl assembly.
3. After the TPO 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.

Drain Boots

As instructed in the T2021 Detail:

1. Apply an approved sealant (1/2 tube minimum) to the outside of the Drain Boot tube and insert it into the drain.
2. Install a pair of composite drain rings (CDRs) to compress the Drain Boot to the pipe.
3. **Drain Boots cannot be field-fabricated.**

Scuppers

As instructed in the T2030, T2060, and T2061 Details, install the Scupper through the parapet.

1. **Outside Corners cannot be field-fabricated.**

SECTION 3

EXPANSION JOINTS

As instructed in the T1000-Series Details:

1. Fasten the TPO membrane on both sides of the joint.
2. Use the same fastener concentration that is being used to install the adjacent TPO membrane.
3. Install enough excess TPO membrane over the joint to allow for expansion/contraction per the *TPO Membrane Installation* section.

WALKWAY PADS

1. Duro-TECH TPO Walkway Pads are recommended at all roof access points, service units and high traffic areas.
2. Prior to inspection: Heat (hot-air) weld only one side of any Walkway Pads that will be covering field seams.

   After inspection: Heat (hot-air) weld the remaining side to complete the attachment of the pad, with a continuous heat (hot-air) weld, at least 1-1/2-in. (40-mm) wide.

SECTION 3

CAUTIONS AND WARNINGS

1. Duro-Last is not responsible for damage that may occur as a result of moisture created from condensation occurring within or beneath a deck subassembly or building.
2. Duro-Last recommends the use of vapor barriers, however it is the responsibility of the contractor to comply with applicable codes. A roofing design professional, such as a consultant or architect, may be utilized for roofing system design prior to installing any roofing system.
3. Refer to SDS 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. **Extreme caution must be used to prevent the TPO membrane from being contaminated by asphalt-based products, such as BUR or mod bit.** Asphalt-based products are incompatible with the TPO membrane and proper separation must be provided between these products and the TPO membrane. If the TPO membrane cannot be properly cleaned, cover or remove the contaminated section and install new TPO membrane.
5. The TPO membrane must not be in contact with substrates that maintain or exceed temperatures of 150° F (65° C), including insulated chimney pipes and combustible fuel pipes. Refer to the appropriate Details for information regarding the proper termination.
6. **TPO is extremely flammable.** Keep all TPO components away from ignition sources, heat, sparks, and open flames. Do not smoke while installing TPO components.
7. Do not cover existing roofing systems that contain excess moisture. Excess moisture is defined as any water observed within a core cut or squeezed from a core sample.
8. Phenolic foam is not an approved insulation in new construction or re-roofing applications. The Duro-TECH TPO Mechanically Fastened Roofing System must not, under any circumstances, be installed over phenolic foam.
9. Perlite and wood fiberboards are not acceptable substrates for Duro-Last roofing systems.
10. **If asbestos is encountered, the building owner must be notified at once.** The building owner is solely responsible for determining the proper course of action.
11. The Duro-TECH TPO Mechanically Fastened Roofing System **must not** be installed over areas of decks if one or more of the following conditions exist:
    a. The building structure is not sufficient to handle the load of the completed roofing system. This is the responsibility of the contractor and should be determined by a roofing design professional.
    b. It is not possible to find an approved fastener that will properly hold in the substrate.
    c. Decks are subjected to hot embers, slag, burning debris, or incompatible chemicals.
12. Refer to the applicable Safety Data Sheet for additional information.
13. Refer to the appropriate Warranty Form on the Duro-Last website for information on exclusions and requirements.

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