



# Thermoplastic Single Ply and Multi-Ply Roofing Systems

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## SECTION 07 55 63 THERMOPLASTIC SHEET ROOFING AND WATERPROOFING

### FLEX WATERPROOFING SYSTEMS EXTENSIVE GREEN ROOF SYSTEM APPLICATIONS

#### GUIDE SPECIFICATION FOR THE INSTALLATION OF A THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE WATERPROOFING SYSTEM

**This guide specification may be used for waterproofing roof decks and planters that are intended to be covered with soil and vegetation. This waterproofing system may be used in conjunction with extensive landscape designs. Projects with slope greater than 15 degrees should not utilize this system without written confirmation from Flex Membrane International. Consult with the Flex Technical Department for specific project detail and specification recommendations.**

#### **PART 1 - GENERAL CONDITIONS**

##### **1.01 DESCRIPTION**

###### **A. Scope**

To install an adhered thermoplastic polyolefin (TPO) membrane waterproofing system with integral flashing and other items.

The work includes but is not necessarily limited to the following:

1. Substrate Preparation
2. Insulation (**if specified**)
3. Waterproofing Membrane
4. Membrane Flashing
5. Protective Layer(s)
6. Sealants and Adhesives
7. Monitoring Of Installation Of Finishing Layers Or Backfill

###### **B. Related Work Under Other Sections**

1. Sitework: Installation of landscaping and irrigation system.

2. Concrete: Forming and finishing of structural concrete decks and walls.
3. Plumbing Piping and Specialties: Installation of drains and leader.

## **1.02 QUALITY ASSURANCE**

- A. Only an approved contractor authorized by the manufacturer prior to bid shall apply the waterproofing system.
- B. Installation of waterproofing membrane, flashing, membrane expansion joints, membrane containment grids, membrane protection layers, drainage layer and insulation shall be the responsibility of the membrane applicator to ensure undivided responsibility.
- C. Obtain primary waterproofing materials, membrane and flashing, from a single manufacturer with not less than 10 years of successful experience in waterproofing applications. Provide other system components only as approved by manufacturer of primary materials.
- D. On projects requiring a labor and material warranty, the waterproofing contractor shall arrange with the membrane manufacturer to have the services of a competent field representative at the site to accept substrate surface before installation of waterproofing materials. The field representative of the membrane manufacturer shall check and test all heat welded seams before the water test, and prior to installation of separation and protection layers. The field representative shall issue written daily reports. The contractor shall include all costs for the field representative, including expenses in his bid price.
- E. Pre-construction conference to be held with the owner, architect, the contractor's field superintendent, waterproofing foreman, waterproofing membrane manufacturer's field representative, and other involved trades to discuss waterproofing practices applicable to this project.
- F. There shall be no deviation made from the contract specification or the approved shop drawings without prior written approval by the owner, the owner's representative and/or design professional, and the membrane manufacturer.
- G. Water testing of the completed waterproofing system for a minimum of 24 hours is required for projects requiring a labor and material warranty. Water testing shall be witnessed and confirmed in writing by the owner's representative and/or design professional, the waterproofing contractor, and the membrane manufacturer.
- H. Trained and authorized personnel shall complete all work.

## **1.03 SUBMITTALS**

- A. The contractor shall submit to the owner's representative and/or design professional the following:
  1. A letter from the manufacturer certifying that the contractor is an approved applicator in good standing

2. Shop drawings and details
3. Specimen copy of manufacturer's warranty
4. Specimen copy of contractor's warranty

#### **1.04 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. All products delivered to the job site shall be in the original unopened containers or wrappings.
- B. Handle all materials to prevent damage. Place all materials on pallets and fully protected from moisture with canvas tarpaulins.
- C. Membrane rolls shall be stored lying down on pallets and fully protected from moisture with canvas tarpaulins.
- D. Bonding adhesives shall be stored at temperatures above 40 degrees F (5 degrees C).
- E. All flammable materials shall be stored in a cool dry area away from sparks and open flames. Follow precautions outlined on container or supplied by material manufacturer/supplier.
- F. Any materials that are determined to be damaged by the owner's representative and/or design professional are to be removed from the job site and replaced at no cost to the owner.

#### **1.05 JOB CONDITIONS**

- A. Proceed with waterproofing membrane installation only after substrate preparation is complete. Obtain acceptance from owner's representative and/or design professional and the membrane manufacturer's representative of concrete surface before proceeding with membrane installation.
- B. Substrate must be clean and smooth. Do not work in rain or snow or adverse weather conditions. Severe temperatures, moisture and humidity may affect the installation and performance of products during construction. Consult with the manufacturers and comply with applicable recommendations of all materials for workmanship and handling.
- C. Only as much of the new waterproofing as can be made weathertight each day including all flashing work, shall be installed.
- D. All work shall be scheduled and executed without exposing the interior building areas to the affects of inclement weather. The building and its contents shall be protected against all risks.
- E. This specification contemplates the use of a waterproofing system with structures designed to support the system, including the overburden. The owner, the owner's design professional, architect, or engineer must verify the adequacy of the structural support in writing.
- F. The contractor should take care during application and storage that overloading deck and structure does not occur.

- G. All new and temporary construction, including equipment and accessories, shall be secured in such a manner, at all times, as to preclude wind blow-off or damage.
- H. Arrange work sequence to avoid use of newly constructed waterproofing for storage, walking surface, and equipment movement. Where such access is absolutely required, the contractor shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. Approved protection shall be provided for all waterproofing areas that receive traffic during construction. Any damage that occurs to the waterproofing membrane and/or system is to be brought to the attention of the owner's representative and/or design professional and membrane manufacturer. All damage is to be repaired according to the membrane manufacturer's recommendations. The party responsible for damage shall bear the cost of repairs.
- I. Prior to and during application, all dirt, debris and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air and/or similar methods.
- J. All waterproofing materials, insulation, flashing and metal work removed for construction shall be immediately taken off the site to a legal dumping area authorized to receive such materials.
- K. If any unusual or concealed condition is discovered, stop work and notify the owner's representative and/or design professional and membrane manufacturer immediately, in writing.
- L. Liquid materials such as solvents and adhesives shall be stored and used away from open flames, sparks and excessive heat.
- M. Contaminants, such as grease, fats, oils, and solvents, shall not be allowed to come into direct contact with the waterproofing membrane. Any such contact shall be reported to the manufacturer.
- N. The contractor shall verify that all drain lines are clear before starting work. Report any blockages to the owner's representative and/or design professional and membrane manufacturer in writing.
- O. Site cleanup, including both interior and exterior building areas below or adjacent to, or in any way affected by the construction, shall be complete and to the owner's satisfaction.
- P. All landscaped areas affected by construction activities shall be raked clean and seeded, if required.
- Q. All paved areas shall be swept clean.
- R. All areas stained, dirtied, and discolored or otherwise damaged due to the work shall be cleaned, restored, and replaced as required.

- S. The contractor should take necessary precautions when using adhesives around air in-takes. The smell of the adhesive could be a disturbance to the building owner and occupants. It is the contractor's responsibility to coordinate equipment to be turned off and on with the owner if necessary.

#### **1.06 SEQUENCING OF THE WORK**

- A. Work in conjunction with other trades by the timely performance of the work, including installation of protection layer(s), drainage panels, and insulation. Coordinate with other trades to avoid traffic over completed membrane surfaces.
1. Water tests of completed sections of the waterproofing membrane shall be successfully completed before proceeding with protection layers and overburden. Schedule water tests promptly to allow timely installation of protection layers.
  2. Drains: Coordinate with the plumbing contractor the installation of drains as shown on the drawings, including flashing and associated waterproofing work. Drains are to be installed under the Plumbing Section, but flashed under the Sheet Membrane Waterproofing Section.

#### **1.07 WARRANTIES**

- A. Contractor's Warranty

The contractor shall supply the owner with a minimum two-year workmanship warranty. Any work related to waterproofing membrane, flashing, or metal work found to be defective or not in accordance with contract documents within two years of substantial completion, the contractor shall remove and replace at no cost to the owner. The obligation of the warranty shall run directly to the owner with a copy to the membrane manufacturer.

- B. Manufacturer's Warranty

Manufacturer's standard water proofing warranty shall apply:

##### **72 mil and 80 mil membrane**

Membrane Warranty 5 years, Membrane Warranty 10 years, Membrane Warranty 15 years, Membrane Warranty 20 years, Labor and Material Warranty 5 years, Labor and Material Warranty 10 years, Labor and Material Warranty 15 years.

##### **80 mil membrane**

Membrane Warranty 20 years, Labor and Material Warranty 20 years.

#### **NOTES:**

1. A waterproofing project management agreement or onsite membrane manufacturer's monitor is required to obtain a labor and material warranty.
2. The cost of exposing the waterproofing membrane or removal and replacement of overburden shall be borne by the owner with all warranties.

## **PART 2 - PRODUCTS**

### **2.01 WATERPROOFING MEMBRANE**

<u>Properties</u>	<u>Test Method</u>	<u>Value</u>	<u>Physical Properties</u>	
Color			White, Tan, Gray	
Roll Size			4', 6', 8', 10' or 12' wide x 100' long	
Weight			72 mil 0.35 lb./ft <sup>2</sup>	80 mil 0.40 lb./ft <sup>2</sup>
Thickness	ASTM D-751	± 10	0.072"	0.080"
Thickness over scrim	ASTM D-6878	0.012"	0.030"	0.034"
Breaking Strength	ASTM D-751	220 lbf	400 lbf	425 lbf
Seam Strength	ASTM D-1876	25 lbf	60 lbf	60 lbf
Elongation (min %)	ASTM D-751	15 %	25% typical	
Heat Aging	ASTM D-573	90%	> 90% typical	
Tear Strength	ASTM D-751 tongue method	55 lbf	130 lbf typical	
Brittleness Point	ASTM D-2137	-40°C	Pass	
Linear Dimensional Change	ASTM D-1204	± 1 %	- 0.2 % typical	
Water Absorption	ASTM D-471	± 3 % max.	2.0% typical	
Ozone Resistance	ASTM D1149	No Cracks	Pass	
Weather Resistance	ASTM G-155	No Cracks	Pass	
Flex TPO Plus membranes meet or exceed the requirements of ASTM 6878 Standard Specification for Thermoplastic Polyolefin (TPO) Based Sheet Roofing.				

## **2.02 MANUFACTURER**

- A. The manufacturer of the thermoplastic waterproofing membrane system shall have a track record of producing and marketing a reinforced TPO (thermoplastic polyolefin) sheet system for waterproofing applications for at least 10 years. Subject to this and other technical requirements, provide products of the following:

Flex Membrane International, Inc.  
2670 Leisch's Bridge Road  
Suite 400  
Leesport, PA 19533  
800-969-0108  
www.flexroofingsystems.com

## **2.03 SYSTEM FLASHING PRODUCTS AND ACCESSORIES**

### **A. Flashing Membranes**

1. Flex TPO Plus reinforced 72 mil or 80 mil flashing membrane
2. Flex TPO Plus non supported 60 mil flashing membrane
3. Flex TPO Pressure Sensitive Cover Strip

### **B. Adhesives**

1. Flex Deck Insulation Adhesive a polyurethane adhesive for adhering insulation and recover boards.
2. Olybond 500 a polyurethane adhesive for adhering insulation and recover boards, distributed by Flex Membrane.
3. Flex Modified Bitumen HS903 Adhesive for installation of Flex Modified Base Sheets
4. Flex Substrate Adhesive for installation of Flex fleece backed membranes.
5. Flex TPO Bonding Adhesive for installation of Flex flashing membranes.
6. Hot Steep Asphalt Type III to comply with ASTM D312

### **C. Accessories**

1. Flex TPO Clad Metal: a TPO .025" membrane laminated to 24 gauge G90 galvanized steel sheet metal.

2. Flex Membrane Termination Bar: extruded aluminum (.6063T6 alloy) mil finish bar, 1" wide, .090" thick with pre-punched oval holes 6" on center.
3. Fasteners: Flex Fasteners for attachment of membrane, flashing, termination bars, and expansion joints to concrete 1/4 inch x 1-1/2 inch nylon anchors with stainless steel pins.
4. Prefabricated Details  
Flex Inside/outside corners: premoulded .070" for hot air welding.  
Flex Pipe Flange: 0.125" thick prefabricated for pipe applications from 1" to 4.5" diameter.
5. Membrane Cleaner  
Flex TPO Weathered Membrane Cleaner

#### **2.04 LEVELING, PROTECTION AND DRAINAGE LAYERS**

1. Root Control: Flex DBR 50 or DBR 100 prefabricated drainage, water retention and roof barrier system.
2. The Flex 1120N Geotextile is installed as a separation or protection layer in Flex Protected Membrane Roof Systems. It also is used as a protection layer and filtration fabric in Flex Garden Roof Systems and Flex Below Grade Waterproofing Systems.
3. The Flex 1160N Geotextile is installed as a separation or protection layer in Flex Membrane Roof Systems. It also is used as a protection layer and filtration fabric in Flex Garden Roof Systems and Flex Below Grade Waterproofing Systems.

#### **2.05 THERMAL INSULATION**

1. Extruded Polystyrene board insulation: Styrofoam Highload 40,60, 100 as manufactured by Dow Chemical Company. Insulation to comply with ASTM C578 Type V, VI, VII and shall meet the IBC/IRC requirements for foam plastic insulation.
2. Flex ISO II polyisocyanurate insulation board. Insulation to comply with ASTM C 1289, Type II, Class1. Grade 2 (20 psi) or Grade 3 (25 psi).

#### **2.06 PLY SHEETS, BASE SHEETS, RECOVER BOARDS**

1. Premium Flex Ply Roofing Felt: fiberglass Type VI roofing felt conforms to ASTM D-2178.
2. Flex SBS 80 mil S/S Base Sheet: 80 mil SBS modified base sheet conforms to ASTM D-5147.
3. DensDeck Prime Roof Cover Board manufactured by Georgia Pacific in thickness of 1/4", 1/2", 5/8" distributed by Flex Membrane.

## **2.07 RELATED MATERIAL**

1. Sealant and Pitch Pocket Fillers
  - a. Vulkem 116 by Mameco International.
  - b. Bostik Chem Caulk
  - c. Sonneborn NP-1 by Chemrex, Inc
  - d. Flex Pourable Sealer
  - e. Flex Seam Sealer

### **Notes:**

- a. Sealant and termination line is to be above water line.
- b. Sealant is a maintenance item.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

1. The waterproofing contractor shall coordinate the installation so that each area is made weathertight at the end of each work period or onset of inclement weather.

### **3.02 EXAMINATION**

1. Examine all surfaces scheduled to receive waterproofing membrane and flashing for roughness, contaminants, unsound structural substrates or other conditions that may impair the waterproofing application. Notify the owner and copy the membrane manufacturer in writing of any such conditions; do not commence work until all defects are remedied.
2. The substrate shall be level and smooth. Sharp ridges, other projections and accumulation of bitumen shall be removed to ensure a smooth surface before installing waterproofing materials

### **3.03 VAPOR RETARDER (optional)**

1. Apply cut back Asphalt primer to the concrete deck.
2. Apply two plies of Flex premium ply roofing felts. Lap each felt 19 inches ( $\pm 1/2$ " ) over preceding one, and mopping with 20 lb. per square ( $\pm 25\%$ ) of Type III hot steep asphalt between felt laps. Glaze coat completed surface with Type III hot steep asphalt at a rate of 20 lb. per square (100 square feet).
3. Apply 1 ply of Flex 80 mil SBS Base Sheet. Adhere to deck with Flex Modified Bitumen Adhesive or hot steep asphalt.

### **3.04 INSULATION (below waterproofing membrane)**

1. Insulation shall be installed to an approved substrate according to the insulation manufacturer's recommendations.

2. Insulation shall be laid in parallel courses with end joints staggered, tightly butted.
3. Insulation shall be neatly cut to fit around penetrations and projections.
4. Do not install more insulation than can be made water tight by the end of the day.
5. Install DensDeck Prime Roof Cover Board over the insulation according to manufacturer's instructions. Adhere the board with either hot steep asphalt or Flex cold process insulation adhesive.

### **3.05 INSULATION (above waterproofing membrane)**

1. Install DensDeck Prime Roof Cover Board to an approved substrate according to manufacturer's instructions. Adhere the board with either hot steep asphalt or Flex cold process insulation adhesive.
2. Install the Flex TPO Waterproofing Membrane in an adhered fashion to the DensDeck Prime Roof Cover Board.
3. Install Flex 1120N Geotextile as a separation or protection layer.
4. Install a minimum 2" thick extruded polystyrene insulation board with drainage channels above the membrane and separation layer.

### **3.06 THERMOPLASTIC WATERPROOFING MEMBRANE INSTALLATION**

1. Comply with manufacturer's most recent printed specifications and their specific recommendations for this project except as modified in this section.
2. Flex TPO Plus 4', 5', 6', 8', 10' or 12' sheets are installed in the field of the roof.
3. Flex TPO Plus membrane sheets are adhered to the substrate with Flex TPO Bonding Adhesive.
4. The Flex TPO Bonding Adhesive is applied to the underside of the membrane and to the substrate with a paint roller at a coverage rate of approximately 60 square feet per gallon.
5. The adhesive is allowed to dry until tacky and the membrane is rolled in the adhesive coated substrate. Avoid wrinkling the membrane and immediately brush down with a broom or squeegee to remove any air pockets.
6. The membrane is overlapped along the length of the roll approximately 3 ½" where and a minimum of 4" at the end of roll sections.
7. The seams are completed by the hot air welding method. The welded seam shall be a minimum of 1 ½" when completed.
8. All seams are to be welded the same day as the membrane is installed. The seams are to be manually checked with a seam probe and any deficiencies

corrected that day.

9. All field splices or seams are overlaid with Flex TPO Pressure Sensitive coverstrip 6" wide. Roller apply Flex TPO Primer to the area of the membrane to be overlaid with a short nap length paint roller prior to applying the coverstrip.
10. The membrane must be properly secured at the perimeter of each roof level, roof section, expansion joint, all roof penetrations and any angle change which exceeds 2" in one horizontal foot.

### **3.07 TEMPORARY CUT-OFF**

1. All flashing shall be installed concurrently with the membrane in order to maintain a watertight condition as the work progresses.
2. When a break in the days work occurs in the central area of the project install a temporary watertight seal. The membrane shall be sealed to the deck and/or the substrate so that water will not be allowed to travel under the new or existing waterproofing. The edge of the membrane shall be sealed in a continuous heavy application of approved water or night seal of 6-inch girth. When work resumes the contaminated membrane shall be removed from the work area and disposed of off site. None of these materials shall be reused in the new work.
3. If inclement weather occurs while a temporary water stop is in place the contractor shall provide the labor necessary to monitor the situation to maintain a watertight condition.
4. If any water is allowed to enter under the newly completed waterproofing the affected area shall be removed and replaced at the contractor's expense.

### **3.08 MEMBRANE FLASHING**

1. Cover all vertical surfaces with Flex TPO flashing membranes or Flex TPO Clad Metal consistent with Flex's standard details and architectural plans and specifications.
2. All flashing shall be installed concurrently with the waterproofing membrane as the job progresses. No temporary flashing shall be allowed without the prior written approval of the project manager and membrane manufacturer. Approval shall be for specific locations on specific dates. Flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces.
3. No bonding adhesive shall be applied in lap areas that are to be welded. All sheets shall be applied in the same manner. Lap all sheets as required by welding techniques.
4. Weld and adhere the Flex TPO flashing membrane to the field of the roof and the vertical surface. All seams must be completed by the hot air welding method
5. Complete the entire waterproofing assembly and flashing in a single working day; avoid exposure of any components to rain, snow, or dew. Provide temporary flashing around exposed edges and at incomplete flashing areas from the new membrane to the structural

deck. Remove the temporary flashing completely before proceeding with subsequent work. If rain threatens during the day, or in an emergency, protect the unfinished exposed waterproofing and flashing components.

6. All flashing membranes shall be mechanically fastened along the top edge using Flex Termination Bar and Expansion pins with nylon sheaths set in pre-drilled holes 6" o.c. to secure flashing to masonry and concrete surfaces.
7. All flashing shall extend a minimum of 8 inches (20.32 cm) above the overburden unless previously accepted by the owner's representative and/or design professional and the membrane manufacturer.

### **3.09 METAL FLASHINGS**

1. Complete all metal work in conjunction with waterproofing and flashing so that a watertight condition exists daily.
2. Metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.
3. Metal joints shall be watertight.
4. Metal flashing shall have a 4 inch minimum nailing flange and shall be fastened into solid wood blocking with fasteners of the same type with two rows of annular ring nails, 4 inches on center staggered or into concrete with acceptable concrete anchors 6 inches on center staggered. Fasteners shall penetrate the wood nailer a minimum of 1 ¼ inches or into concrete a minimum of 1 inch.
5. Adjacent sheet of Flex TPO Clad Metal shall be spaced ¼ inch apart. The end joints of the metal shall be fastened 6 inches on center. The joints shall be covered with 1 inch wide aluminum tape. A 6 inch wide TPO membrane flashing strip shall be hot air welded over the joint.

### **3.10 WATER TESTS**

1. For projects requiring a labor and material warranty, water tests shall be conducted in areas no larger than 15,000 sq. ft. (1,400 sq. m), and must be judged to be successful by the owner and membrane manufacturer before the installation of any subsequent components of the waterproofing system.
2. Test for leaks by plugging drains and filling with 2 inches (5.08 cm) of water. Let stand for 24 hours.
3. Drain water from test area and mark all areas where water stands (flat areas).
4. Examine spaces below decks for signs of leakage and walk all membrane seams watching for signs of "bubbling" or expulsion of water. Critically examine all seams in flat areas of standing water.

### **3.11 DRAINAGE MAT AND ROOT CONTROL PROTECTION**

1. Flex DBR 50 or DBR 100 prefabricated drainage, water retention and root barrier system.

### **3.12 FILTER FABRIC**

1. Install the Flex 1120N or 1160 N Geotextile filter fabric over the drainage mat according to manufacturer's instructions.

### **3.13 MONITORING OF INSTALLATION OF FINISHING LAYERS AND BACKFILL**

1. The waterproofing contractor shall monitor finishing layer installation and backfill operations to assure no damage is done to the waterproofing membrane. Alert all parties concerned of any activities that might adversely affect the long-term performance of the waterproofing.

### **3.14 COMPLETION**

1. Prior to demobilization from the site, the work shall be reviewed by the owner/project manager and contractor. All defects noted, non-compliance with the specification or the recommendations of the membrane manufacturer shall be itemized in a punch list. These items must be corrected immediately by the contractor prior to demobilization to the satisfaction of the owner/project manager, and membrane manufacturer.
2. All warranties, as required in Part 1 of this specification shall be submitted for approval prior to the final payment.

**Flex Membrane International has attempted to obtain information from the manufacturers of other products often used in conjunction with Flex products with respect to the characteristics of such products, as well as their compatibility with those of Flex. Inasmuch as these other products as supplied in the field are subject to change without notification by the manufacturer, Flex expressly excludes from its warranty any responsibility for the performance or quality of the products of others used in conjunction with Flex products.**