

## TPO ROOFING SPECIFICATIONS

### PART1 GENERAL

#### 1.01 SUMMARY

- A. Project Name: City Hall and City Offices Roof Replacement - Grand Junction, Colorado.
- B. Furnish and install elastomeric sheet roofing system, including:
  - 1. Roofing manufacturer's requirements for the specified warranty.
  - 2. Removal of entire existing roof membrane and flashings.
  - 3. Preparation of roofing substrates.
  - 4. Insulation.
  - 5. Cover boards.
  - 6. Elastomeric membrane roofing. (60 mil white TPO)
  - 7. Metal 24 Gauge copings.
  - 8. Flashings.
  - 9. Walkway pads.
  - 10. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.
  - 11. Meet Minimum 90 PSF Uplift.
- C. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.
- D. Comply with the published recommendations and instructions of the roofing membrane manufacturer.
- E. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

#### 1.02 SUBMITTALS

- A. Product Data:
  - 1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including)insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
  - 2. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.
- B. Samples: Submit samples of each product to be used.
- C. Shop Drawings: Provide:
  - 1. The roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
- D. Specimen Warranty: Submit prior to starting work.
- E. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.
- F. Executed Warranty.

### **1.03 QUALITY ASSURANCE**

- A. Applicator Qualifications: Roofing installer shall have the following:
  - 1. At least five years of experience in installing the specified system.
  - 2. Capability to provide payment and performance bond to building owner.
- B. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
  - 1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
  - 2. Notify Architect well in advance of meeting.

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

- A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
- B. Store materials clear of ground and moisture with weather protective covering.
- C. Keep combustible materials away from ignition sources.

### **1.05 WARRANTY**

- A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
- B. Warranty: 20 year Full System Warranty covering membrane, roof insulation, Labor, and membrane accessories.
  - 1. Limit of Liability: No dollar limitation.
  - 2. Scope of Coverage: Repair leaks in the roofing system caused by:
    - a. Ordinary wear and tear of the elements.
    - b. Manufacturing defect in Firestone brand materials.
    - c. Defective workmanship used to install these materials.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Acceptable Manufacturer - Roofing System: Firestone Building Products Co. or equivalent.
- B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.
- C. Manufacturer of Metal Roof Edging: Metal supplied by manufacturer of roof membrane.
  - 1. Metal roof edging products by other manufacturers are not acceptable.

### **2.02 ROOFING SYSTEM DESCRIPTION**

- A. Roofing System:
  - 1. Membrane: Thermoplastic Olefin (TPO).
  - 2. Thickness: As specified elsewhere.
  - 3. Provide neoprene membrane in grease catch pans as indicated on the drawings.
  - 4. Membrane Attachment: Mechanically Attached.
  - 5. Meets Minimum 90 PSF Uplift.
- B. Insulation:
  - 1. Use ¼" per foot tapered Poly Iso to effect good drainage as required.
  - 2. Maximum Thickness: 3 inches
  - 3. Maximum Board Thickness: 3 inches; use a many layers as necessary; stagger joints in adjacent layers.

- C. Insulation Cover Board:
  - 1. Attachment: Cold adhesive attachment- I.S.O. FIX II Adhesive 12" O.C. Field, 6" O.C.
  - 2. Perimeter and 4" O.C. Corners

## **2.03 TPO MEMBRANE MATERIALS**

- A. Membrane: Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D 6878, with polyester weft inserted reinforcement and the following additional characteristics:
  - 1. Thickness: 0.060 inch (1.52 mm) plus/minus 10 percent, with coating thickness over reinforcement of 0.024 inch (0.61 mm) plus/minus 10 percent.
  - 2. Sheet Width: Provide the widest available sheets to minimize field seaming.
  - 3. Puncture Resistance: 265 lbf (1174 N), minimum, when tested in accordance FTM 101C Method 2031.
  - 4. Solar Reflectance: 0.79, minimum, when tested in accordance with ASTM C 1549.
  - 5. Color: White.
  - 6. Acceptable Product: ULTRAPLY TPO by Firestone or equivalent.
- B. Membrane Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.
- C. Curb and Parapet Flashing: Same material as membrane, with encapsulated edge which eliminates need for seam sealing the flashing-to-roof splice; precut to 18 inches (457 mm) wide.
- D. Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
  - 1. Thickness: 0.060 inch (1.52 mm) plus/minus 10 percent.
  - 2. Tensile Strength: 1550 psi (10.7 MPa), minimum, when tested in accordance with ASTM D 638 after heat aging.
  - 3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D 638 after heat aging.
  - 4. Tearing Strength: 12 lbf (53 N), minimum, when tested in accordance with ASTM D 1004 after heat aging.
  - 5. Color: White.
  - 6. Acceptable Product: ULTRAPLY TPO Flashing by Firestone or equivalent.
- E. Tape Flashing: 5-1/2 inch (140 mm) nominal wide TPO membrane laminated to cured rubber polymer seaming tape, overall thickness 0.065 inch (1.6 mm) nominal; TPO QuickSeam Flashing by Firestone or equivalent.
- F. Bonding Adhesive: Neoprene and SBR rubber blend, formulated for compatibility with the membrane other substrate materials, including masonry, wood, and insulation facings; ULTRAPLY Bonding Adhesive by Firestone or equivalent.
- G. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone or equivalent.
- H. Seam Plates: Steel with barbs and Galvalume coating; corrosion-resistance complying with FM 4470.
- I. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches

(33 mm) wide by 0.10 inch (2.5 mm) thick.

- J. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed; UltraPly TPO Cut Edge Sealant by Firestone or equivalent.
- K. General Purpose Sealant: EPDM-based, one part, white general purpose sealant; UltraPly TPO General Purpose Sealant by Firestone or equivalent.
- L. Molded Flashing Accessories: Unreinforced TPO membrane pre-molded to suit a variety of flashing details, including pipe boots, inside corners, outside corners, etc.; UltraPly TPO Small and Large Pipe Flashing by Firestone or equivalent.
- M. Roof Walkway Pads: Non-reinforced TPO walkway pads, 0.130 inch (3 mm) by 30 inches (760 mm) by 40 feet (12.19 m) long with patterned traffic bearing surface; UltraPly TPO Walkway Pads by Firestone or equivalent.

## **2.04 ROOF INSULATION AND COVER BOARDS**

- A. Polyisocyanurate Board Insulation (Flat and 1/4" Tapered) Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C 1289 Type II Class 1, with the following additional characteristics:
  - 1. Thickness: As indicated elsewhere.
  - 2. Size: 48 Inches by 48" Inches
  - 3. R-Value (LTTR): 3" = 17.4
  - 4. R-Value (LTTR): %" Tapered Varies on thickness
  - 5. Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C 1289.
  - 6. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
  - 7. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.
- B. Cover Board: Firestone Dens Deck Prime
  - 1. Size: 48 inches by 48 inches.
  - 2. Thickness: Minimum 0.5 inches.
- C. Adhesive for Insulation Attachment: Type as required by roof membrane manufacturer for roofing system and warranty to be provided; use only adhesives furnished by roof membrane manufacturer.

## **2.05 METAL ACCESSORIES**

- A. Parapet Copings: Formed metal coping utilizing Firestone Metal.
  - 1. Material and Finish: 22 gage, 0.022 inch thick galvanized steel with Kynar 500 finish in manufacturer's standard color; matching concealed joint splice plates; factory-installed protective plastic film.

## **2.06 ACCESSORY MATERIALS**

- A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
  - 1. Width: 3-1/2 inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
  - 2. Thickness: Same as thickness of roof insulation.

## **PART 3 INSTALLATION**

### **3.01 GENERAL**

- A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
- B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
- C. Does not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
- D. Perform work using competent and properly equipped personnel.
- E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
- F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice;  
do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).
- G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
  - 1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
  - 2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
  - 3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
- H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
- I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

### **3.02 EXAMINATION**

- A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.
- B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.
- C. Examine roof substrate to verify that it is properly sloped to drains.
- D. Verify that the specifications and drawing details are workable and not in

conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

### **3.03 PREPARATION**

- A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.
- B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.
- C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.
- D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

### **3.04 INSULATION AND COVER BOARD INSTALLATION**

- A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.
- B. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.
- C. Lay roof insulation in courses parallel to roof edges.
- D. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch (6 mm). Fill gaps greater than 1/4 inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch (6 mm).
- E. Cold Adhesive Attachment: Apply in accordance with membrane manufacturer's instructions and recommendations; "walk-in" individual roof insulation boards to obtain maximum adhesive contact.

### **3.05 SINGLE-PLY MEMBRANE INSTALLATION**

- A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.
- B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
- C. Install membrane without wrinkles and without gaps or fish mouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.
- D. Install membrane adhered to the substrate, with edge securement as specified.
- E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.
- F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches (1:6) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.

1. Exceptions: Round pipe penetrations less than 18 inches (460 mm) in diameter and square penetrations less than 4 inches (200 mm) square.
2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

### 3.06 FLASHING AND ACCESSORIES INSTALLATION

- A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.
- B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
  1. Follow roofing manufacturer's instructions.
  2. Remove protective plastic surface film immediately before installation.
  3. Install water block sealant under the membrane anchorage leg.
  4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
  5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
  6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
  7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.
- C. Existing Scuppers: Remove scupper and install new scupper.
- D. Scuppers: Set in sealant and secure to structure; flash as recommended by manufacturer.
- E. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing manufacturer.
- F. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weather tight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.
  1. Use the longest practical flashing pieces.
  2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
  3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
  4. Provide termination directly to the vertical substrate as shown on roof drawings.
- G. Roof Drains:
  1. Existing Drains: Remove all existing flashings, drain leads, roofing materials and cement from the drain; remove clamping ring.
  2. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
  3. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch (12 to 19 mm) of membrane to extend inside clamping ring past

- drain bolts.
4. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
  5. Apply sealant on top of drain bowl where clamping ring seats below the membrane
  6. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.
- H. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
  2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches (50 mm) deep, with at least 1 inch (25 mm) clearance from penetration, sloped to shed water.
  3. Structural Steel Tubing: If corner radii are greater than 1/4 inch (6 mm) and longest side of tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.
  4. Flexible and Moving Penetrations: Provide weather tight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
  5. High Temperature Surfaces: Where the in-service temperature is, or is expected to be, in excess of 180 degrees F (82 degrees C), protect the elastomeric components from direct contact with the hot surfaces using an intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer.

### **3.07 FINISHING AND WALKWAY INSTALLATION**

- A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance.
- B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch (25 mm) and maximum of 3.0 inches (75 mm) from each other to allow for drainage.
  1. If installation of walkway pads over field fabricated splices or within 6 inches (150 mm) of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches (150 mm) on either side.
  2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

### **3.08 FIELD QUALITY CONTROL**

- A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).
- B. Perform all corrections necessary for issuance of warranty.

### **3.09 CLEANING**

- A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.
- B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.
- C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.



### **3.10 PROTECTION**

- A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

**END OF SECTION**