SECTION 07540

FULLY ADHERED TPO ROOFING SYSTEM

PART 1 GENERAL

The project: Re-Roofing of the North Section of Roof, located at Oxford Jr/Sr High School, 515 N. Water, Oxford, Kansas. This project includes partial tear off and disposing of the existing roof system and installation of a new fully adhered, .060 TPO Membrane Roof System.

1.01 SUMMARY

A. Furnish and install elastomeric sheet roofing systems, including:
1. Roofing manufacturer's requirements for the specified warranty.
2. Preparation of roofing substrates.
3. Treated Wood nailers for roofing attachment.
4. High Density Cover boards.
5. Elastomeric membrane roofing.
6. Metal roof edging and copings, pre-finished metal.
7. Flashings.
8 Walkway pads.
9. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.

B. Disposal of demolition debris and construction waste is the responsibility of the Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.

C. Comply with the published recommendations and instructions of the roofing membrane manufacturer, at http://manual.fsbp.com.

D. 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. Any modification of the Contract Sum will be made in accordance with the stipulations of the Contract Documents stated elsewhere.

E. All roofing shall be removed down to the metal (acoustical) deck.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 – Rough Carpentry: Wood nailers associated with roofing and roof insulation.

B. Section 07 62 00 – Sheet Metal Flashing and Trim: Formed metal flashing and trim items associate with roofing.

1.03 REFERENCES

A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.

- ASTM C177 – Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot Plate Apparatus; 2010.
- ASTM C209 – Standard Test Methods for Cellulosic Fiber Insulating Board; 2012.
- ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2013.
- ASTM C1549 – Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer; 2009.
- ASTM D638 – Standard Test method for Tensile Properties of Plastics; 2010.
- AST< D1004 – Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting; 2009.
- ASTM D1079 – Standard Terminology Relating to Roofing and Waterproofing; 2013.
- ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2010.
- ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2008.
- ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- ASTM D6878/D6878M – Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2011a.
- CAN-ULS-S770 – Standard Test Method Determination of L-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams: 2009.
- FM DS 1-28 – Wind Design; Factory Mutual System; 2007.
- FM DS 1-29 – Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System; 2006.
- PS 1 – Structural Plywood; 2009
- PS 20 – American Softwood Lumber Standard; 2010
- SPRIES-1 – Wind Design Standard for Edge Systems used with Low Slope Roofing Systems; 2003. (ANSI/SPRI ES-1)

1.04 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. Where UL of RM requirements are specified, provide documentation that shows that the roofing system to be installed Is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.

3. Installation Instructions: Provide manufacturer's instruction to installed, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.

B. 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.

2. For tapered insulation, provide project-specific layout and dimensions for each board.

C. Pre-Installation Notice: Copy to show that manufacturer's required Pre-Installation Notice (PIN) has been accepted and approved by the manufacturer.

D. Specimen Warranty: Submit prior to starting work.

E. Samples: Submit samples of each product to be used.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Roofing installer shall have the following:

1. At least five years' experience in installing 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 the Project Engineer well in advance of meeting.

1.06 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.

1.07 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Warranty: Firestone 15-year Red Shield Limited Warranty covering membrane, roof insulation, roof related sheet metal and membrane accessories.

Limit of Liability: No dollar limitation

1. 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. Damage due to winds up to 72 mph.
   d. Damage due to winds up to 72 mph.

2. Not Covered:
   a. Damaged due to winds in excess of 72 mph.
   b. Damage due to hurricanes or tornadoes.
   c. Hail.
   d. Intentional damage.
   e. Unintentional damage due to normal rooftop inspections, maintenance, or service.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design – Roofing System: Firestone Building Products Co., Carmel, IN. www.firestonebpco.com
   1. Firestone Building Products

   2. GenFlex Roofing Systems

   3. Approved equal

B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.

C. Manufacturer of Metal Roof Edging: Same manufacturer as roof membrane.

   1. Metal roof edging products by other manufacturers are not acceptable.

   2. Field- or shop-fabricated metal roof edgings are not acceptable.

D. Substitution Procedures: See Instructions to Bidders.

1. Submit evidence that the proposed substitution complies with the specified requirements.

2.02 ROOFING SYSTEM DESCRITION

A. Roofing System:

1. Membrane: Thermoplastic Polyolefin (TPO) single-ply membrane.

2. Thickness: .060

3. Membrane Attachment: Self-Adhering Membrane or Adhered with Bonding Adhesive.

4. Comply with applicable local building code requirements.

5. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification.

B. Cover Board: Gypsum-based Board:

1. Thickness: 1/2-inch (12.7mm)
   a. Attachment: Mechanically attached.

C. Crickets and Saddles: Tapered insulation of same type as specified for top layer; slope as indicated.

2.03 TPO MEMBRANE MATERIALS

A. Roofing Membrane: Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D6878, with polyester weft inserted reinforcement and the following additional characteristics:

1. Thickness: 0.60 inch (2.03mm) plus/minus 10 percent, with coating thickness over reinforcement of 0.030 inch (0.76 mm) plus/minus 10 percent.

2. Puncture Resistance: 415 lbf (1868N) minimum, when tested in accordance FTM 101C Method 2031.

3. Solar Reflectance: 0.79 minimum, when tested in accordance with ASTM C1549.

4. Color: White

5. Acceptable Product: 060 TPO by Firestone; or as approved by owner in accordance with Section 2.01D.

B. Insulation 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 eliminate 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 (1.52mm) plus/minus 10 percent.

2. Tensile Strength: 1550 psi (10.7 MPa) minimum, when tested in accordance with ASTM D638 after heat aging.

3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D638 after heat aging.

4. Tearing Strength: 12 lbf (53 N) minimum, when tested in accordance with ASTM D1004 after heat again.

5. Color: White.

6. Acceptable Product: UltraPly TPO Flashing by Firestone.

E. Pourable Sealer: Two-art polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone.

F. Seam Plates: Steel with barbs and Galvalume coating; corrosion-resistance complying with FM 4470.

G. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches (33 mm) wide by 0.10 inch (2.5mm) thick; Firestone Termination Bar by Firestone.

H. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed; UltraPly TPO Cut Edge Sealant by Firestone.

I. General Purpose Sealant: EPDM-based, one-part, white general-purpose sealant; UltraPly TPO General Purpose Sealant by Firestone.

J. 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.

K. 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.

2.06 ROOF INSULATION AND COVER BOARDS

A. Gypsum-Based Cover Board: Non-combustible, water resistant gypsum core with embedded glass mat facers, complying with ASTM C 1177/C 1177M, and with the following additional characteristics:

1. Size: 48 inches (1220 mm) by 96 inches (2440 mm) nominal.
   a. Exception: Board to be attached using adhesive or asphalt may be no larger than 48 inches (1220 mm) by 48 inches (1220), nominal.

2. Thickness: ½ inch, or as indicated elsewhere.

3. Surface water Absorption: 2.5 g, maximum, when tested in accordance with ASTM C 473.

4. Spanning Capability: Recommended by manufacturer for following minimum flute spans.

5. Surface Burning Characteristics: Flame spread of 0, smoke developed of 0, when tested in accordance with ASTM E 84.

6. Combustibility: Non-combustible, when tested in accordance with ASTM E 136.

7. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.

8. Mold Growth Resistance: Zero growth, when tested in accordance with ASTM D 3273 for minimum of 4 weeks.

9. Acceptable Product: ½ inch Dens-Deck Prime gypsum-board by Georgia-Pacific.

10. Insulation 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.

2.07 METAL ACCESSORIES

A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.

1. Wind Performance:
   a. Membrane Pull-Off Resistance: 100 lbs/ft (1460 N/m), when tested in accordance with ANSI/SAPRI ES-1, current edition.
   b. Fascia Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-2, current addition.

c. Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-270 rating.

2. Description: Two-piece fascia with 18/ inch extruded anchor bar and 24-gauge steel fascia cover.

3. Fascia Face Height: 5.5 inches (127 mm).

4. Edge Member Height Above Nailer: 1-1/4 inches (31 mm).

5. Length: 144 inches (3650 mm).

6. Functional Characteristics: Fascia retainer supports while allowing for fee thermal cycling of fascia.

7. Aluminum Bar: Continuous 6063-T6 alloy aluminum extrusion with pre-punched slotted holes; miters welded; injection molded EPDM splices to allow thermal expansion.

8. Anchor Bar Cleat: 20-gage, 0.036-inch (0.9 mm) G90 coated commercial type galvanized steel with pre-punched holes.

9. Fasteners: Factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners permitted.

10. Scuppers: TPO Coated Metal.

11. Accessories: Provide matching brick wall cap, downspout, extenders, and other special fabrications as shown on the drawings.

2.08 ACCESSIRY 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 ½ inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.

2. Thickness: 1.5 inches.

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. Do 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 Safety Data Sheets (SDS) 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 drain.

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. Remove and dispose of the existing roofing ballast, membrane, insulation, flashings and sheet metal.

B. Dispose of all materials in compliance with local, state and federal requirements.

C. Protect the existing building and grounds from construction related damage.

D. Examine the existing roof deck to ensure it is structurally sound and appropriate to receive new roofing.

E. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

F. 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.

3.05 INSULATION AND COVER BOARD INSTALLATION

A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. Install insulation in a manner that will not compromise the vapor retarder integrity.

C. 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.

D. Lay roof insulation in courses parallel to roof edges.

E. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than ¼ inch (6 mm). Fill gaps greater than ¼ inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported ver a space greater than ¼ inch (6 mm).

F. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by Factory Mutual for FM Class specified in PART 2 and membrane manufacturer, whichever is more stringent.

3.06 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 fully adhered to the substrate using TPO Bonding Adhesive.

3.07 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 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. Scuppers: Set in sealant and secure to structure; flash as recommended by manufacturer.

D. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight 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.

E. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetrations.

F. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.

G. 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.

H. Structural Steel Tubing: If corner radii are greater than ¼ inch (6 mm) and longest side of the tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide standard cub with flashing.

3.08 FINISHING AND WALKWAY INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.

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.

3.09 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 salesperson).

B. Perform all corrections necessary for issuance of warranty.

3.10 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 wit recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.11 PROTECTION

A. Protect new roofing from foot and construction traffic.

End of Section 07540