# Weakley County Health Department
## Re-Roof
### Weakley County, Tennessee
TLM Job No.: J-7086

# ADDENDUM NO.: 3

July 3, 2024

This Addendum shall apply to the Drawings and Specifications for the above-referenced project and shall be bound into and made a part of the Construction Documents issued by TLM Associates, Inc., titled as indicated above.

**Item No. 1:** **Refer to attached Specification Section 07 54 23 – Thermoplastic Polyolefin (TPO) Roofing. This is a revised version of the spec and shall be used in place of the previous Section 07 54 23 that was released in Addendum No. 2.**

**Please acknowledge receipt of this Addendum in the appropriate location on the Bid Form.**

Sincerely,
**TLM ASSOCIATES, INC.**
***Architects + Engineers***

Jerry L. Hartsfield, AIA
Architect

# SECTION 07 54 23 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Fully adhered thermoplastic polyolefin (TPO) roofing system.
2. Tapered and Flat Roof insulation.
3. Demolition and disposal of existing roofing.
4. Sequencing of scope of work.

B. Extent of flexible sheet roofing (FSR) is indicated on drawings and is hereby defined to include non-traffic bearing sheet membrane system intended for weather exposure as primary roofing.

### 1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

### 1.3 PRE-INSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof replacement construction, conduct conference at Project site.

1. Meet with Owner, Designer, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, insulation Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:

1. Base flashings and membrane terminations.
2. Tapered insulation plan, including slopes, crickets, and thicknesses.
3. Roof plan showing orientation of roof deck and orientation of roofing, fastening spacings, and patterns for mechanically fastened insulation.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
5. Location and type of **all** penetrations details.
6. Fastener type, length and maximum spacing (for membrane securement) for Reinforced Mechanically Fastened systems.
7. **Pullout Test**: The roofing contractor shall perform pull out testing in all decking conditions. Include pullout test results and confirmation that pullout results are below the requirements identified in manufacturers “Withdrawal Resistance Criteria”.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. Installer must be approved by manufacturer and fully certified to install the roof membrane by the roof manufacturer under the warranty.
2. Installer must have 5 years (minimum) experience with the size, scope, and type of roof system specified herein. Contractor shall provide documentation from the installer, for review by the Owner and Designer, including a list of projects completed by the proposed installer, along with project references.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: For components of roofing system, tests performed by manufacturer and witnessed by a qualified testing agency.

D. Research/Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field quality-control reports. Refer to Part 3.8 – FIELD QUALITY CONTROL.

F. Written acknowledgement of SPECIFICATION SECTION 01 78 36 – TOTAL ROOFING SYSTEM WARRANTY.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty. (Also refer to Installer note above)

C. Contractor shall employ an independent inspection agency and/or the roofing manufacturer's technical inspector, to review progress at certain intervals. Refer to FIELD QUALITY CONTROL.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

A. Refer to SPECIFICATION SECTION 01 78 36 – TOTAL ROOFING SYSTEM WARRANTY. This Special Warranty shall include all roof penetrations, metal copings, roof insulation, flashing details and other elements within the scope of work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Roofing Manufacturers:

1. Carlisle
2. Firestone
3. GAF Materials Corp.
4. Johns Manville

B. Source Limitations: Obtain components including roof insulation, fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Tested by a qualified testing agency to resist uplift pressures at corners, perimeters, and field-of-roof zones, in accordance with project location, zone, building height (per IBC and ASCE 7). Basic Wind Speed: 72 MPH.

D. FM Global Listing: Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a roofing system and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail-Resistance Rating: SH (severe hail).

E. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

F. Energy Star Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

G. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

H. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

## 2.3 TPO ROOFING

A. Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible TPO sheet.

1. Thickness: 60 mils (1.5 mm), nominal.
2. Exposed Face Color: White.
3. ASTM testing requirements: See chart below:

| PHYSICAL PROPERTY | ASTM D6878 Requirement | 60-mil Std & HS |
|---|---|---|
| Tolerance on nominal thickness, % ASTM D751 test method | +15, -10 | ± 10 |
| Thickness over scrim, in. (mm) ASTM D6878 optical method, average of 3 areas | 0.012 min. (0.305) | 0.024 typical (0.610) |
| Breaking strength, lbf (kN) ASTM D751 grab method | 220 (976 N) min. | 250 (1.1) min. 360 (1.6) typ. |
| Elongation break of reinforcement, % ASTM D751 grab method | 15 min. | 15 min. 25 typ. |
| Tearing strength, lbf (N) ASTM D751 proc. B 8 by 8 in. | 55 (245) min. | 55 (245) min. 130 (578) typ. |
| Brittleness point, °F (°C) ASTM D2137 | -40 (-40) max. | -40 (-40) max. -50 (-46) typ. |
| Linear dimensional change, % ASTM D1204, 6 hours at 158 °F | ± 1 max. | ± 1 max. -0.2 typ. |
| Ozone resistance, no cracks 7X ASTM D1149, 100 pphm, 168 hrs | Pass | Pass |
| Water absorption resistance, mass % ASTM D471 top surface only 166 hours at 158 °F water | ± 3.0 max. | 3.0 max. 2.0 typ. |
| Factory seam strength, lbf /in. (kN/m) ASTM D751 grab method | 66 (290) min. | 66 (290) min. |
| Field seam strength, lbf /in. (kN/m) ASTM D1876 tested in peel | No requirement | 25 (4.4) min. 60 (10.5) typ. |
| Water vapor permeance, Perms ASTM E96 proc. B | No requirement | 0.10 max. 0.05 typ. |
| Puncture resistance, lbf (kN) FTM 101C, method 2031 (see supplemental section) | No requirement | 300 (1.3) min. 350 (1.6) typ. |
| Properties after heat aging ASTM D573, 670 hrs at 240 °F<br><br>Breaking strength, % retained<br>Elongation reinf., % retained<br>Tearing strength, % retained<br>Weight change, % | <br><br>90 min.<br>90 min.<br>60 min.<br>± 1.0 max. | <br><br>90 min.<br>90 min.<br>60 min.<br>± 1.0 max. |

## 2.4 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:

    a. Plastic Foam Adhesives: 50 g/L.
    b. Single-Ply Roof Membrane Adhesives: Standard VOC level.
    c. Single-Ply Roof Membrane Sealants: 450 g/L.
    d. Sealant Primers for Nonporous Substrates: 250 g/L.
    e. Sealant Primers for Porous Substrates: 775 g/L.
    f. Other Adhesives and Sealants: 250 g/L.

3. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, **55 mils (1.4 mm)** thick, minimum, of same color as TPO sheet.

C. Bonding Adhesive: Manufacturer's standard.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

E. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), prepunched.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.

G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

## 2.5 ASPHALT MATERIALS

A. Roofing Asphalt: ASTM D 6152, SEBS modified. (as applicable)

B. Asphalt Primer: ASTM D 41/D 41M. (as applicable)

2.6 WALKWAYS

A. Walkway Roof Pads:
   1. Colors and Textures: Slip resistant texture, White, with YELLOW/CONTRASTING EDGES
   2. Pads shall be 60mil reinforced TPO, adhered to roof as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:

   1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   4. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Install roofing and auxiliary materials to maintain weathertightness and to not void warranty.

## 3.4 ADHERED ROOFING INSTALLATION

A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer and allow to partially dry before installing roofing. Do not apply to splice area of roofing.

E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

## 3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

## 3.6 WALKWAY INSTALLATION

A. Roof-Pad Walkways: Install walkway roof pads according to manufacturer's written instructions in locations indicated, to form walkways. Adhere to TPO roof as recommended by the manufacturer.

## 3.7 FIELD QUALITY CONTROL

A. Initial and intermediate Roof Inspections: Provide the services of the roof manufacturer's technical inspector, or an independent third-party roof inspection firm, for the initial 8 hours of roof replacement work, as well as a minimum of one (1) Bi-Weekly inspection until the roof installation is completed. Provide written reports to document each site visit.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

## 3.8 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

**END OF SECTION 07 54 23**