

SECTION 07511
BUILT-UP ASPHALT ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Built-up asphalt roof membrane.
 - 2. Roofing insulation.
 - 3. Roof membrane surfacing material.
 - 4. Walkways.
- B. Related Sections:
 - 1. Division 6 Section "Miscellaneous Carpentry" for wood blocking, curbs, cants, and nailers; and wood-based, structural-use roof deck panels.
 - 2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
 - 3. Division 7 Section "Manufactured Roof Specialties."
 - 4. Division 7 Section "Roof Accessories."
 - 5. Division 7 Section "Roof Expansion Assemblies."

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 for definitions of terms related to roofing work not otherwise defined in this Section.
- B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt within a range of plus or minus 25 deg F measured at the mop cart or mechanical spreader immediately before application.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Install a watertight, built-up roofing and base flashing roofing system with compatible components that will not permit the passage of liquid water and will withstand wind loads, thermally induced movement, and exposure to weather without failure.
- B. FM Listing: Provide built-up roofing, base flashings, and component materials that comply with requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.
 - 1. Roofing system shall comply with the following:
 - a. Fire/Windstorm Classification: Class 1A-90.

1.5 SUBMITTALS

- A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work, for the following:
 - 1. Base flashings, cants, and membrane terminations.
 - 2. Tapered insulation, including slopes.

3. Crickets, saddles, and tapered edge strips, including slopes.

- C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system and is eligible to receive the standard roofing manufacturer's warranty.
- D. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.
- E. Warranty: Sample copy of standard roofing manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.
- F. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to perform Work of this Section who has specialized in installing roofing similar to that required for this Project; who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product; and who is eligible to receive the standard roofing manufacturer's warranty.
- B. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; complying with ASTM E 108, for application and slopes indicated.
- C. Preinstallation Conference: Before installing roofing system, conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Notify participants at least 5 working days before conference.
 - 1. Meet with Owner; Construction Manager; Owner's insurer, if applicable; testing and inspecting agency representative; roofing Installer; roofing system manufacturer's representative; deck 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. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and attachment to structural members.
 - 4. Review loading limitations of deck during and after roofing.
 - 5. Review flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing.
 - 6. Review governing regulations and requirements for insurance, certifications, and inspection and testing, if applicable.
 - 7. Review temporary protection requirements for roofing system during and after installation.
 - 8. Review roof observation and repair procedures after roofing installation.
 - 9. Document proceedings, including corrective measures or actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, warm, well-ventilated, weathertight location according to roofing system manufacturer's written instructions. Store rolls of felt and other sheet materials on end on pallets or other raised surfaces. Do not double-stack rolls.
 - 1. Handle and store roofing materials and place equipment in a manner to avoid significant or permanent damage to deck or structural supporting members.

- B. Do not leave unused felts and other sheet materials on the roof overnight or when roofing work is not in progress unless protected from weather and moisture and unless maintained at a temperature exceeding 50 deg F.
- C. Deliver and store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
- D. Protect roofing 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.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements.

1.9 WARRANTY

- A. Standard Roofing Manufacturer's Warranty: Submit a written warranty, without monetary limitation, signed by roofing system manufacturer agreeing to promptly repair leaks in the roof membrane and base flashings resulting from defects in materials or workmanship for the following warranty period:
 - 1. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Built-up Asphalt Roofing:
 - a. Celotex Corp. (The).
 - b. GAF Building Materials Corp.
 - c. Malarkey Roofing Co.
 - d. Johns-Manville Roofing Systems
 - e. Tamko Roofing Products, Inc.
 - f. Tremco, Inc.
 - g. U.S. Intec, Inc.
 - 2. Polyisocyanurate Board Insulation:
 - a. Celotex Corp. (The).
 - b. GAF Building Materials Corp.
 - c. Johns-Manville Roofing Systems
 - 3. Perlite Board Insulation:
 - a. GAF Building Materials Corp.
 - b. Johns-Manville Roofing Systems.

2.2 BASE-SHEET MATERIALS

- A. Base Sheet: Unperforated, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides, complying with ASTM D 4601, Type II.

2.3 ROOF MEMBRANE PLIES

- A. Ply Felt: Asphalt-impregnated, glass-fiber felt, complying with ASTM D 2178, Type VI.

2.4 FLASHING MATERIALS

- A. Backer Sheet: Unperforated, asphalt-impregnated and –coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides, complying with ASTM D 4601, Type II.
- B. Flashing Sheet: SBS-modified asphalt sheet, granular surfaced; suitable for application method specified; manufacturer's standard thickness and weight; of granule color and reinforced as follows:
 - 1. Reinforcing: Glass-fiber mesh or nonwoven glass-fiber mat.

2.5 ASPHALT MATERIALS

- A. Roofing Asphalt: ASTM D 312, Type III or Type IV, as recommended by built-up roofing membrane manufacturer.
 - 1. Label each container or provide certification with each load of bulk asphalt identifying type of roofing asphalt and indicating softening point, minimum flash point, equiviscous temperature, and finished blowing temperature.

2.6 AUXILIARY MEMBRANE MATERIALS

- A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with built-up roofing.
 - 1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.
- B. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.
- C. Mastic Sealant: Polyisobutylene, plain or modified bitumen, nonhardening, nonmigrating, nonskinning, and nondrying.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions of FM 4470; designed for fastening base sheets and base flashings and for backnailing ply felts to substrate; tested by manufacturer for required pullout strength; and acceptable to roofing system manufacturer.
- E. Metal Flashing Sheet: Metal is specified in Division 7 Section "Sheet Metal Flashing and Trim."
- F. Wood Nailer Strips: Furnish wood nailer strips complying with requirements of Division 6 Section "Miscellaneous Carpentry."
- G. Cants: 4" high perlite board cants, complying with ASTM C 728.
- H. Walkway Pads: Mineral-surfaced asphaltic composition panels, factory formed, nonporous, with a slip-resisting surface texture, manufactured specifically for adhering to built-up roofing as a protection course for foot traffic, of the following thickness:
 - 1. Thickness: 1/2 inch (12 mm).
- I. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Carey-Tred; Celotex Corp.
 - 2. Whitewalk Roof Pads; W.R. Meadows.
- J. Aggregate Surfacing: Clean, dry, opaque, water-worn gravel, complying with ASTM D 1863.
- K. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system.

2.7 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch thick.

1. Product: Subject to compliance with requirements, provide "Dens-Deck" by Georgia-Pacific Corporation.

B. Provide perlite board insulation for substrate board where indicated on Drawings.

2.8 VAPOR RETARDERS

A. Glass-Fiber Felts: Asphalt-impregnated, glass-fiber felt, complying with ASTM D 2178, Type IV.

2.9 INSULATION MATERIALS

A. General: Provide preformed, roofing insulation boards that comply with requirements, selected from manufacturer's standard sizes and of thicknesses indicated.

1. Provide preformed, tapered insulation boards where indicated for sloping to drain. Fabricate with the taper indicated on Drawings:
 - a. Provide 1/4 inch per 12 inches minimum, unless otherwise indicated.
2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated on Drawings.

B. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents complying with ASTM C 1289, classified by facer type as follows :

1. Facer Type: Type II, felt or glass-fiber mat on both major surfaces.
2. Facer Type: Type III, perlite insulation board, complying with ASTM C 728, 1/2 inch (12.7 mm) thick on 1 major surface and a felt or glass-fiber mat on the other.

C. Perlite Board Insulation: Rigid, mineral-aggregate thermal insulation board consisting of expanded perlite, cellulosic fibers, binders, and waterproofing agents with top surface seal-coated, complying with ASTM C 728, 1-inch thickness.

2.10 INSULATION ACCESSORIES

A. General: Furnish roofing insulation accessories recommended by insulation manufacturer for intended use and compatible with sheet roofing material.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions of FM 4470, designed for fastening roofing insulation to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

C. Substrate Joint Tape: 6 or 8 inches (150 or 200 mm) wide, coated, glass-fiber joint tape.

2.11 AGGREGATE BALLAST

A. Aggregate Ballast: Provide aggregate ballast that will withstand weather exposure without significant deterioration and will not contribute to membrane degradation, of the following type and size:

1. Aggregate Type: Smooth, washed, riverbed gravel or other acceptable smooth-faced stone.
2. Size: Ranging in size from 3/8 to 5/8 inches.

2.12 ROOF PAVERS

A. Roof Pavers: Lightweight, factory-cast, interlocking concrete units; beveled, doweled, or otherwise profiled; specially manufactured for use as roof ballast, and as follows:

1. Compressive Strength: 2500 psi (17 MPa), minimum.
2. Thickness: 2 inches (51 mm).
3. Size: 12 by 12 inches (300 by 300 mm).
4. Back: Grooved, with 4-way drainage capability.
5. Paver Supports: Manufacturer's standard high-density polyethylene paver pedestal and leveling plate system.

6. Color and Texture: Provide Construction Manager's selections from manufacturer's full range of colors and textures for materials and products of type indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.
- B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.
- C. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at roof penetrations and terminations and match the thicknesses of insulation required.
- D. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane.
- E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, 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 GENERAL INSTALLATION REQUIREMENTS

- A. Install built-up roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-Up Roofing."
- B. Start installation of built-up roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Cant Strips: Install and secure preformed 45-degree cant strips at junctures of built-up roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.
- D. Cooperate with inspecting and testing agencies engaged or required to perform services for installing built-up roofing membrane system.
- E. Coordinate installing roofing system components so insulation and roofing plies are not exposed to precipitation or left exposed at the end of the workday or when rain is forecast.
 1. Provide cutoffs at end of each day's work to cover exposed ply sheets and insulation with a course of coated felt with joints and edges sealed.
 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 3. Remove and discard temporary seals before beginning work on adjoining roofing.
- F. Asphalt Heating: Heat roofing asphalt and apply within plus or minus 25 deg F of equiviscous temperature, unless otherwise required by roofing system manufacturer. Do not raise roofing asphalt temperature above the equiviscous temperature range more than one hour before time of application. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Do not heat roofing asphalt within 25 deg F of flash point. Discard roofing asphalt maintained at a temperature exceeding 500 deg F for more than 4 hours. Keep kettle lid closed, unless adding roofing asphalt.

1. Aggregate Surfacing: Limit temperature of asphalt flood coat to the minimum required for proper embedment of aggregate and the maximum that will permit retention of required coating weight based on slope of surface.
2. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction. If mopping is applied directly to substrate, tape substrate joints.

3.4 SUBSTRATE BOARD INSTALLATION

- A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
 1. Fasten substrate board to top flanges of steel deck according to recommendations in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
 2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturer's written instructions.

3.5 VAPOR-RETARDER INSTALLATION

- A. Install 2 glass-fiber felt plies lapping each sheet 19 inches over preceding sheet. Embed each sheet in a solid mopping of hot roofing asphalt. Glaze-coat completed surface with hot roofing asphalt. Apply hot roofing asphalt at a rate of 20 lb/100 sq. ft., plus or minus 25 percent.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.6 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system manufacturer's written instructions for installing roofing insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated and to Shop Drawings.
- D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install required thickness in 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
 1. Top Layer Insulation; Facer Type: Install Type III, perlite insulation board as top layer of insulation.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush with ring of drain.
- F. Install insulation with long joints of insulation in continuous straight lines with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Attached Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roofing insulation to deck type indicated.
 1. Fasten insulation according to the insulation and roofing system manufacturers' written instructions to comply with specified wind-uplift requirements, but at least 1 fastener for each 4 sq. ft. and at least 2 fasteners per board.
 2. Fasten insulation according to the insulation and roofing system manufacturers' written instructions.

- ~~H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Loosely butt cover boards together and fasten to roof deck according to roofing system manufacturer's written instructions. Tape joints of cover boards.~~

3.7 ROOF MEMBRANE INSTALLATION

- A. Install ply felts according to roofing system manufacturer's written instructions, starting at low point of roofing system. Align ply felts without stretching. Shingle side laps of ply felts uniformly to achieve required number of membrane plies throughout. Shingle in direction to shed water. Extend ply felts over and terminate beyond cants.
1. Install 4 ply felts.
 2. Application: Embed each ply felt in a solid mopping of hot roofing asphalt applied at rate required by roofing system manufacturer, to form a uniform membrane without ply felts touching each other.
- B. Aggregate Surfacing: Promptly after installing and testing roof membrane, flashing, and stripping, flood-coat roof surface with 60 lb/100 sq. ft. of hot roofing asphalt. While flood coat is hot and fluid, cast the following average weight of aggregate in a uniform course:
1. Aggregate Weight: 400 lb/100 sq. ft., average.
 2. If aggregate surfacing is delayed, promptly apply glaze coat of hot roofing asphalt at the rate of 10 lb/100 sq. ft..
- C. Walkway Pads: Install walkway pads at locations shown, using units of size indicated or, if not indicated, of manufacturer's standard size.
1. Sweep away loose aggregate surfacing and set walkway pads in additional flood coat of hot roofing asphalt.

3.8 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
1. Prime substrates with asphalt primer if required by roofing system manufacturer.
 2. Backer Sheet Application: Install backer sheet and adhere to substrate in a solid mopping of hot roofing asphalt.
 3. Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt. Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer.
- B. Extend base flashing up walls or parapets a minimum of 8 inches above roof membrane and 4 inches onto field of roof membrane.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
1. Seal top termination of base flashing.
- D. Install stripping where metal flanges and edgings are set on built-up roofing according to roofing system manufacturer's written instructions.
1. Flashing-Sheet Stripping: Install flashing-sheet stripping in a continuous coating of asphalt roofing cement or in a solid mopping of hot roofing asphalt, and extend onto roof membrane.
- E. Roof Drains: Set 30-by-30-inch metal flashing in bed of asphalt roofing cement on completed built-up roofing membrane. Cover metal flashing with stripping, extending a minimum of 4 inches beyond edge of metal flashing onto field of roof membrane. Clamp roof membrane, metal flashing, and stripping into roof-drain clamping ring.
1. Stripping Material: Install not less than 2 plies of roof membrane felt, each set in a continuous coating of asphalt roofing cement or in a solid mopping of hot roofing asphalt.

- F. Roof Scuppers: Set metal scuppers in bed of asphalt roofing cement on completed built-up roofing membrane. Cover metal roof scuppers with stripping, extending a minimum of 4 inches beyond edge of metal flashing onto field of roof membrane.

3.9 FIELD QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform field inspections and quality-assurance tests.
 - 1. Testing agency will prepare reports stating whether inspected and tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace roof membrane that inspections and test reports indicate does not comply with specified requirements.
 - 1. Repair roof membrane that does not comply with specified requirements by re-adhering test specimens back in place and by applying additional plies, equal to the original number of plies specified, over test specimens according to roofing system manufacturer's written instructions.
- C. Additional testing, at Contractor's expense, may be performed to determine that corrected Work complies with specified requirements.
- D. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Construction Manager.
 - 1. Notify Construction Manager and Owner 48 hours in advance of the date and time of inspection.

3.10 PROTECTING AND CLEANING

- A. Protect built-up roofing membrane from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Construction Manager and Owner.
- B. Correct deficiencies in or remove built-up roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair base flashings to a condition free of damage and deterioration at the 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 07511