

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 and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Built-up asphalt roofing.
 - 2. Vapor retarder.
 - 3. Roof insulation.
- B. Related Requirements:
 - 1. Section 01500 "Temporary Facilities and Controls" for additional requirements for protection of new and existing roofing; as well as maintaining waterproof enclosures.
 - 2. Section 07591 "Preparation for Re-Roofing" for removal of existing roofing.
 - 3. Section 07620 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
 - 4. Section 07920 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

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

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment. **The Contractor's roof foreman, sheet metal foreman, and other sub-contractors' foremen must be at this meeting.** If the Contractors' foremen are not in attendance, the meeting will be rescheduled and at the Contractor's expense.
 - 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. Examine deck substrate conditions and finishes for compliance with requirements, 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.

7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For built-up roofing. Include plans, elevations, sections, details, and attachments to other work, including:
 1. Tapered insulation, including slopes.
 2. Crickets, saddles, and tapered edge strips, including slopes.
 3. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Product Test Reports: For components of built-up roofing, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Research/Evaluation Reports: For components of built-up roofing, from ICC-ES.
- D. Field quality-control reports.
- E. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For built-up roofing to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by built-up roofing manufacturer to install manufacturer's product and has had a minimum of 3 years of experience installing similar roof systems and projects.

1.9 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 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.

1.10 FIELD CONDITIONS

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

1.11 WARRANTY

- A. The Contractor shall warrant all materials and workman-ship for a period of five (5) years from the date of acceptance of the completed work by the Owner. The Contractor shall make good any defects in materials or workman-ship which may develop during said five (5) year period by the repairing of such defects at his own expense without cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. CertainTeed Corporation.
 - 2. Firestone Building Products.
 - 3. GAF Materials Corporation.
 - 4. Johns Manville.
- B. Source Limitations: Obtain components including roof insulation and fasteners for built-up roofing from same manufacturer as built-up roofing or manufacturer approved by built-up roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed built-up 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. Built-up 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 built-up roofing manufacturer based on testing and field experience.

- C. FM Global Listing: Built-up roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a built-up 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.

2.3 ROOFING MEMBRANE SHEET MATERIALS

- A. Ply Sheet: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt.

2.4 BASE FLASHING SHEET MATERIALS

- A. Backer Sheet: ASTM D 226, Type I, asphalt-impregnated, perforated felt.
- B. Granule-Surfaced Flashing Sheet: ASTM D 3909 or ASTM D 6163, Grade G, Type I or II, glass-fiber-reinforced; granule-surfaced base flashing; suitable for application method specified, and as follows:
 - 1. Granule Color: Black.

2.5 ASPHALT MATERIALS

- A. Asphalt Primer: ASTM D 41.
- B. Roofing Asphalt: ASTM D 312, Type III.

2.6 AUXILIARY BUILT-UP ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing manufacturer for intended use and compatible with built-up roofing.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Cold-Applied Adhesive: Roofing manufacturer's standard asphalt-based, one- or two-part, asbestos-free, cold-applied adhesive specially formulated for compatibility and use with built-up base flashings.
- C. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing manufacturer for application.
- D. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening built-up roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing manufacturer.
- F. Aggregate Surfacing: ASTM D 1863, No. 6 or No. 67, clean, dry, opaque, water-worn gravel or crushed stone, free of sharp edges.

- G. Self-Adhering, High-Temperature Sheet (Underlayment at Top of Parapet Walls): Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
 3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
- H. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

2.7 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C 208, Type II, Grade 2, fibrous-felted, rigid insulation boards of wood fiber or other cellulosic-fiber and water-resistant binders, asphalt impregnated, chemically treated for deterioration.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. GAF Materials Corporation.
 - b. Georgia-Pacific.
 - c. Homasote Company.
 - d. Huebert Fiberboard Inc.
 - e. Temple-Inland, Inc.

2.8 VAPOR RETARDER

- A. Glass-Fiber Felts: ASTM D 2178, Type IV, asphalt impregnated. 2 plies set in and glazed-coated with ASTM D 312, Type III asphalt.
- B. Base Sheet: ASTM D 4601, Type II, nonperforated, asphalt-impregnated and -coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.

2.9 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces, maximum board thickness of 2 inches.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Atlas Roofing Corporation.
 - b. Carlisle SynTec Incorporated.
 - c. Firestone Building Products.
 - d. GAF Materials Corporation.
 - e. Hunter Panels.
 - f. Insulfoam LLC; a Carlisle company.
 - g. Johns Manville.
 - h. Rmax, Inc.
- C. Perlite Board Insulation (Cover Board): ASTM C 728, 1-inch thick, rigid, mineral-aggregate thermal insulation board composed of expanded perlite, cellulosic fibers, binders, and waterproofing agents with top surface seal coated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. GAF Materials Corporation.
 - b. Johns Manville.
- D. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
 - 1. Provide mitered boards for direction changes.
- E. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.10 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with built-up roofing.

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 cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing 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.
- C. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal./100 sq. ft. and allow primer to dry.

3.3 INSTALLATION, GENERAL

- A. Comply with built-up roofing manufacturer's written instructions.
- B. Asphalt Heating: Heat asphalt to its equiviscous temperature, measured at the mop cart or mechanical spreader immediately before application. Circulate asphalt during heating. Do not raise asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed asphalt manufacturer's recommended temperature limits during asphalt heating. Do not heat asphalt within 25 deg F of flash point. Discard asphalt maintained at a temperature exceeding finished blowing temperature for more than 4 hours.
 - 1. Apply hot roofing asphalt within plus or minus 25 deg F of equiviscous temperature.
- C. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging built-up roofing components or adjacent building construction.
- D. Rate of Bitumen Application:
 - 1. Insulation: 30 lbs./100 sq. ft.
 - 2. Asphalt Interply Moppings: 27 lbs./100 sq. ft. with tolerance of plus and minus 15 percent.
 - 3. Glaze Coat: 10 lbs./100 sq. ft.
 - 4. Asphalt Flood Coat: 60 lbs /100sq. ft.

3.4 VAPOR-RETARDER INSTALLATION

- A. Prior to vapor retarder installation, mechanically fasten base sheet to wood deck according to built-up roofing manufacturers written instructions.
- B. Built-up Vapor Retarder: Install two glass-fiber felt plies lapping each felt 19 inches over preceding felt. Embed each felt in a solid mopping of hot roofing asphalt. Glaze coat completed surface with hot roofing asphalt. Apply hot roofing asphalt within plus or minus 25 deg F of equiviscous temperature.
- C. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into built-up roofing.

3.5 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 built-up roofing manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation with long joints of insulation in a continuous straight line, 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.
- E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- G. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- H. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:
 - 1. Set each layer of insulation in a solid mopping of hot roofing asphalt.
- I. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.

3.6 BUILT-UP ROOFING INSTALLATION, GENERAL

- A. Install roofing according to roofing manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing" and as follows:
 - 1. Deck Type: I (insulated).
 - 2. Number of Ply Sheets: Four.
 - 3. Surfacing Type: A (aggregate).
- B. Coordinate installation of roofing so insulation and other components of built-up roofing not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
 - 1. Provide tie-offs at end of each day's work to cover exposed built-up roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
 - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
 - 3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.7 ROOFING MEMBRANE INSTALLATION

- A. Install four ply sheets starting at low point of roofing. Align ply sheets without stretching. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout

thickness of roofing membrane. Shingle in direction to shed water. Extend ply sheets over and terminate beyond cants.

1. Maximum moisture content of felts at time of application shall be 1 percent of dry weight.
2. Embed each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing manufacturer, to form a uniform membrane without ply sheets touching.
3. Squeegee, or press, felts into hot bitumen providing tight, smooth laminations without wrinkles, buckles, kinks, or "fishmouths". Air void pockets, as determined by test samples, shall not exceed 5 percent per interply mopping for individual sample and average of all samples shall be less than 3 percent per interply mopping.
4. The use of felt laying machines is prohibited. Traffic on recently installed membrane shall be kept to a minimum to prevent asphalt displacement. Use sequencing and equipment that will prevent asphalt displacement.
5. Application of hot asphalt on any surface that causes foaming of the asphalt shall be cause for rejection of the roof area.
6. Install roofing plies in continuous shingle-type sequence such that there are no laps against the flow of water.
7. Metal flanges for flashing sleeves shall be primed and set in a trowel coat of plastic cement and stripped in with two plies of fiberglass felts and hot bitumen moppings.
8. Extend vent stacks to maintain a minimum height of 8 inches above the completed membrane, if necessary.

- B. Aggregate Surfacing: After installing and testing roofing, base flashing, and stripping, promptly apply flood coat to 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.

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; secure to substrates according to built-up roofing manufacturer's written instructions and as follows:
1. Prime substrates with asphalt primer if required by built-up roofing manufacturer.
 2. Backer-Sheet Application: Mechanically fasten backer sheet to walls or parapets. Adhere backer sheet over built-up roofing at cants 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 applied at not less than 425 deg F or as per manufacturer's written instructions. Apply hot roofing asphalt to back of flashing sheet if recommended by roofing manufacturer.
- B. Extend base flashing up walls or parapets as indicated on Drawings above built-up roofing.
1. Extend backer sheet onto field of built-up roofing a minimum of 2 inches. Extend flashing sheet minimum of 2 inches beyond edge of backer sheet.
- C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
- D. Install stripping according to roofing manufacturer's written instructions, where metal flanges and edgings are set on built-up roofing.
1. Built-up Stripping: Install stripping of not fewer than two roofing ply sheets, setting each ply in a continuous coating of asphalt roofing cement or in a solid mopping of hot roofing asphalt, and extend onto roofing membrane 4 inches and 6 inches, respectively.
- E. Underlayment at Top of Parapet Walls: Install self-adhering underlayment in accordance with manufacturer's written instructions over sloped wood blocking, beneath metal copings. Lap

underlayment over top edges of roofing base flashings a minimum of 3 inches and over face of exterior wall a minimum of 1-1/2 inches, unless otherwise indicated on Drawings.

- F. Conduit Flashing: Conduit or pipe penetrations through the membrane shall be flashed with a sheet metal sleeve consisting of a 4-inch metal flange and stripped with two felt plies 4-inches and 8-inches beyond the edge of the flange respectively.
 - 1. Prepare conditions and install molded pipe flashing per manufacturer's specifications and details.

3.9 FIELD QUALITY CONTROL

- A. Membrane Samples:
 - 1. 4-inch by 36-inch test cuts taken perpendicular to the long dimension of felts may be required at the discretion of the Architect/Engineer, minimum one for each 5,000 sq. ft.
 - 2. Remove test samples before application of the surface coating at locations selected by Architect/Engineer.
 - 3. Take additional samples as directed by Architect/Engineer when deficiencies are found.
 - 4. Samples will be examined for compliance with roofing specifications, entrapped moisture, felt on felt, embedment of felt, and presence of harmful foreign materials.
 - 5. Repair of Built-Up Membrane Test Cut:
 - a. Immediately rebuild test area with cut felts of same type as roof system, set in plastic cement.
 - b. Cover repaired area with four layers of felts. Solid mop each layer into place in hot bitumen. Overlap cut area 3 inches on all sides with first layer. Lap each succeeding 3 inches on all sides over layer below.
- B. Samples of bitumen may be taken and tested for conformance to the specification for each shipment delivered to the Project by the Architect/Engineer.
- C. Field tests may be performed to evaluate moisture content of installed materials.
- D. Provide thermostatic controls and visual thermometer on bitumen kettle, maintain in working order, and keep calibrated.
- E. Bitumen temperatures may be periodically checked at the discretion of the Architect/Engineer in the kettle and/or on the roof.
- F. Withdrawal tests of installed fasteners may be required if attachment is in question.
- G. Application of roof system may be checked by Architect/Engineer and by Contractor.
- H. Aggregate samples may be required if delivered material is in question.

3.10 PROTECTING AND CLEANING

- A. Protect built-up roofing 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 built-up roofing that does not comply with requirements, repair substrates, and repair or reinstall roofing 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 07511

ROOFING WARRANTY**Owner** _____**Address** _____**Project** _____**Project Address** _____**Project No.** _____**Date of Final Acceptance** _____**Contractor** _____**Address** _____**Phone No.** _____

This warranty stipulates that the above-named Contractor shall, during a period of five (5) years from the date of final acceptance of the work, maintain the roof membrane and flashing systems in a watertight condition and repair all defects which result from faulty workmanship or defective materials, without further cost to the Owner, including replacement of any wet insulation caused by such defects.

Excluded from this warranty may be any and all damage to said roof, the buildings or their contents caused by acts or omissions of the owner; fire, lightening, winds of peak gust speeds of 72 mph or higher, hailstorm, or other unusual phenomenon of the elements; movement or failure of the supporting building structure that causes membrane or flashing failure; or vapor condensation beneath the roof.

Exclude from this warranty any damages to the building or the contents.

Before expiration of the above warranty period, the Roofing Contractor shall inspect the roof in the presence of the Owner and make necessary correction of all deficiencies not considered normal. The warranty shall remain force until the necessary repair work has been done.

Signed _____

Title _____

Date _____