

## SECTION 07 51 00

### BUILT-UP BITUMINOUS ROOFING

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Cants
- B. Concrete primer
- C. Vapor barrier
- D. Ventilating base sheet
- E. Base sheet
- F. Felts
- G. Asphalt
- H. Mineral – surfaced cap sheet
- I. Roof surface aggregate
- J. Roof walkway boards
- K. Flashing and reinforcing materials
- L. Fasteners and accessories

##### 1.02 MEASUREMENT AND PAYMENT

- A. General: Measurement and payment for built-up bituminous roofing will be either by the lump-sum method or by the unit-price method as determined by the listing of the bid item for built-up bituminous roofing indicated in the Bid Schedule of the Bid Form.
- B. Lump Sum: If the Bid Schedule indicates a lump sum for built-up bituminous roofing, the lump-sum method of measurement and payment will be in accordance with Section 01 20 00 - Price and Payment Procedures, Article 1.03.
- C. Unit Price: If the Bid Schedule indicates a unit price for built-up bituminous roofing, the unit-price method of measurement and payment will be as follows:
  - 1. Measurement
    - a. Built-up bituminous roofing, will be measured for payment by the square foot or square yard, as indicated in the Bid Schedule of the Bid Form, acceptably furnished and installed.

- b. Substrate preparation, installation accessories, flashings, protection of non-roofed areas from moisture, and protection of completed surfaces will not be measured separately for payment, but will be considered included with the measurement specified above.
- 2. Payment: Built-up bituminous roofing, will be paid for at the Contract unit price for the computed quantities as determined by the measurement method specified in Article 1.02.C.1.

**1.03 REFERENCES**

A. American Society for Testing and Materials (ASTM):

- 1. ASTM C981 Guide for Design of Built-Up Bituminous Membrane Waterproofing Systems for Building Decks
- 2. ASTM D41 Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing
- 3. ASTM D173 Specification for Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing
- 4. ASTM D312 Specification for Asphalt Used in Roofing
- 5. ASTM D1668 Specification for Glass Fabrics (Woven and Treated) for Roofing and Waterproofing
- 6. ASTM D1863 Specification for Mineral Aggregate Used on Built-Up Roofs
- 7. ASTM D2178 Specification for Asphalt Glass Felt Used in Roofing and Waterproofing
- 8. ASTM D2822 Specification for Asphalt Roof Cement
- 9. ASTM D3019 Specification for Lap Cement Used with Asphalt Roll Roofing, Non Fibered, Asbestos Fibered, and Non Asbestos Fibered
- 10. ASTM D3909 Specification for Asphalt Roll Roofing (Glass Felt Mat) Surfaced with Mineral Granules
- 11. ASTM D4586 Specification for Asphalt Roof Cement, Asbestos-Free
- 12. ASTM D4601 Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
- 13. ASTM D4897 Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing

B. Underwriters Laboratories Inc. (UL):

1. UL 580 Tests for Uplift Resistance of Roof Assemblies
2. UL 790 Tests for Fire Resistance of Roof Covering Materials

#### **1.04 REGULATORY REQUIREMENTS**

- A. In addition to the foregoing referenced standards, the regulatory requirements that govern the work of this Section include the following governing code:

California Code of Regulations (CCR), Title 24, Part 2, California Building Code, Chapter 15, "Roofs and Roof Structures."

#### **1.05 ROOF SYSTEM DESCRIPTION**

- A. Built-up bituminous composition roofing, base flashing, counterflashing, and flashings at metalwork and roof penetrations shall meet or exceed the requirements of an approved manufacturer's four-ply roofing specification suitable for this specific application and the applicable requirements of the California Building Code. Built-up roofing shall be one or both of the following roofing systems as indicated:

1. Roofing system shall be a mineral-surfaced cap sheet built-up roofing, using glass fabric felts, as indicated.
2. Roofing system shall be a gravel-surfaced built-up roofing, using glass fabric felts, as indicated.

- B. This Section also includes protection of the station structures and buildings to be roofed from moisture and rain until completion and acceptance of the roofing work.

#### **1.06 SUBMITTALS**

- A. General: Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

- B. Shop Drawings and Product Data: Submit manufacturer's specifications for materials and installation of the appropriate roofing system and related flashings, including pertinent flashing details.

- C. Samples:

1. Submit sample square, 8 by 10 inches in size, of the mineral-surfaced cap sheet. Mineral-surfaced cap sheet requires approval of the Engineer before it may be used in the work.
2. Submit sample bag of roof surface aggregates. Roof surface aggregates require approval of the Engineer before they may be used in the work.

#### **1.07 QUALITY ASSURANCE**

- A. Roofing shall meet Factory Mutual requirements for Class 1 or noncombustible built-up roofing assembly and zoned wind resistance in accordance with FM Bulletins 1-7, 1-28, 1-47, and 4470.

- B. Roofing shall meet Underwriter's Laboratories requirements for Class A built-up roofing assembly and Class 60 wind uplift resistance in compliance with UL 790 and UL 580.
- C. Roofing materials shall be furnished by a manufacturer specializing in the manufacture of roofing materials.
- D. Roofing work and related flashings shall be installed by a licensed applicator approved by the manufacturer who furnishes the materials. The Contractor shall submit proof of this in writing to the Engineer before starting the roofing application.
- E. Contract Drawings and Specifications for roofing and flashings are diagrammatic and of a general nature only. Therefore, manufacturer's specifications for roofing and related flashings shall govern the work as fully as if set forth herein, except as specifically indicated otherwise. All work shall be performed and completed as required to obtain the required warranty and guaranty.
- F. The Contractor and the Contractor's built-up roofing, roof deck insulation, and sheet metal installers shall review the Contract Drawings and Specifications jointly with the built-up roofing materials manufacturer and shall obtain the manufacturer's agreement that the selected roofing, insulation, and flashing systems are proper, compatible, and adequate for this application, and that the conditions and details indicated do not conflict with the recommendations of the built-up roofing materials manufacturer.
- G. The Contractor and the roofing materials manufacturer shall determine the requirement or necessity for a vapor barrier or ventilating base sheet over the roof deck or substrate, and shall provide such vapor barrier or ventilating base sheet as required to install a serviceable roof without defects and failures.
- H. The Contractor and roofing materials manufacturer shall determine the probability of thermal and structural movement in the roofing system and shall provide manufacturer's standard expansion joints in the roofing system as required to provide a serviceable roof without failures.

**1.08 ENVIRONMENTAL CONDITIONS AND PROTECTION**

- A. Provide protection of the building roof areas from moisture and rain. Provide water-repellent coverings as required. Leave no unroofed deck areas exposed to moisture and rain at any time.

**1.09 GUARANTY**

- A. Built-up bituminous roofing and related flashing installations, including related metalwork, shall be guaranteed against leakage, defective materials, and defective installation of the completed roofing work. Any such defects or leakage occurring during the period of the guaranty shall be promptly and completely corrected, including all affected work, at no additional cost to the District. Bulging or wrinkling of built-up roof surfaces will also be interpreted as defects requiring correction.
- B. In addition to the guaranty requirements specified in General Conditions Article GC4.9, provide the roofing manufacturer's 15-year roofing system guaranty, that shall state in essence that the roofing materials manufacturer shall, at its expense, make or cause to be made any repairs

necessary to maintain the applied roof and related flashings in a watertight condition for a period of 15 years. The guaranty shall be effective from the date of the Certificate of Substantial Completion issued by the District, and shall be signed by the roofing applicator and countersigned by the Contractor, and shall be submitted to the Engineer as specified in Section 01 77 00 - Closeout Procedures.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Materials' Standards: Materials shall conform with the manufacturer's specifications for the proposed and approved roofing system and applicable requirements of ASTM C981.
- B. Cants: Preformed cants of sizes or dimensions indicated, 45-degree slope, manufactured of compressed fiberglass or perlite board, or fabricated of pressure-treated Douglas fir with preservative, "Construction" or "No. 1" grade.
- C. Concrete Primer: ASTM D41.
- D. Vapor Barrier: As recommended by the roofing materials' manufacturer for the type of substrate.
- E. Ventilating Base Sheet: ASTM D4897, and as recommended by the roofing materials' manufacturer for the type of substrate.
- F. Base Sheet: ASTM D4601 as required to meet the requirements of the manufacturer's specifications approved for this work.
- G. Felts: ASTM D2178 as required to meet the requirements of the manufacturer's specifications approved for this work.
- H. Asphalt: ASTM D312, Type III.
- I. Mineral-Surfaced Cap Sheet: ASTM D3909, as required to meet the requirements of the manufacturer's specifications approved for this work, with minimum weight of 70 pounds per 108 square feet, in color as selected and approved by the Engineer from manufacturer's standards. Include loose, matching mineral granules for over-runs of lap cement or asphalt.
  - 1. Lap Cement: ASTM D3019.
- J. Roof Surface Aggregate: Roof surface aggregate (gravel surfacing) shall meet the applicable requirements of ASTM D1863 and shall be clean natural gravel or crushed aggregates in accordance with one of the following as indicated:
  - 1. Natural river-run pea gravel, graded in size from 1/4 inch to 1/2 inch or 5/8 inch, and applied at the rate of 400 pounds per 100 square feet.
  - 2. Crushed granite or marble, white in color, graded in size from 1/4 inch to 3/4 inch maximum, with not more than 10 percent by volume in smaller sizes, and applied at the rate of 400 pounds per 100 square feet.

- K. Roof Walkway Boards: Provide mineral-surfaced, bituminous composition walkway boards, 3/4 inch thick, where indicated or required for walkways to roof-mounted equipment. Provide only for gravel-surfaced roofs.
- L. Flashing and Reinforcing Materials:
  - 1. Composition Flashing System: Composition flashing system shall be by the same manufacturer as the roofing system, and shall be asphalt-saturated and coated felt, reinforced with woven cotton fabric.
  - 2. Flashing Cement: Bituminous product expressly recommended by the roofing materials manufacturer for flashing work on vertical surfaces, asphaltic flashing cement or flashing compound of troweling consistency.
  - 3. Fabric Reinforcement: Asphalt-saturated cotton fabric, treated with asphaltic resin, meeting requirements of ASTM D173, or woven glass fabric, treated with asphalt resin, meeting requirements of ASTM D1668, as applicable.
  - 4. Bituminous Plastic Cement: Asphaltic plastic cement, meeting requirements of ASTM D2822 or D4586.
- M. Fastener and Accessories: As recommended by the roofing materials manufacturer of the roofing system specification approved for this work.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine roof deck and other surfaces to receive roofing. Roof deck shall be dry and free from defects or irregularities that may jeopardize the quality of the work, and no roofing work shall be performed on affected areas until suitable corrections have been made. Check also to see that roof will drain properly.
- B. Inspect and approve the installation of roof deck insulation and flashings and sheet metalwork in connection with roofing work.

#### **3.02 APPLICATION**

- A. Roofing System: Installation of built-up roofing shall be in accordance with the roofing materials manufacturer's specification approved for this work. Cement all felts together with a continuous layer of hot asphalt so that felts do not touch felts. Use mop and roll method and broom with heavy industrial broom immediately after rolling. A felt laying machine of a type approved by the roofing materials manufacturer may be used. Use of a drum type machine will not be permitted.
- B. Roof Surfaces: Provide one or both of the following roof surface treatments for the roofing system as indicated:

1. Mineral-Surfaced Cap Sheet: Apply one layer of mineral-surfaced roofing cap sheet over roof surfaces, lapping sides 2 inches and ends 6 inches. Mop full width under each sheet with Type III asphalt at the rate of 25 pounds per square uniformly without voids. Firmly embed cap sheet over its entire surface. Over-runs of asphalt or lap cement at exposed laps shall have mineral surfacing (loose granules) embedded therein so that over-runs match the exposed surfaces of cap sheets throughout. Mineral surfacing (granules) shall be sprinkled on densely and embedded while asphalt is still hot.
  2. Flood Coat and Surface Aggregate: Flood the surface with hot asphalt at a rate of 60-70 pounds per square and, while still hot, embed uniformly and solidly therein the surface aggregate at the rate of 400 pounds per square in such a manner that asphalt will not show anywhere but will be completely covered. All felts shall have been coated, graveled, and glazed over at the close of each day. Water glazing will not be permitted.
- C. Roof Walkway Boards: Embed roof walkway boards solidly in the flood coat at locations indicated.
- D. Roof Penetrations:
1. Metal Priming: Metal flashings, outlet flanges, and metal curbs shall be primed and allowed to dry, before roofing materials are laid.
  2. Outlets: Properly seal drains, outlets, and penetrations in accordance with manufacturer's specifications and as indicated.
  3. Pipes, Vents, Gravel Stops, and Flashings: Install flanges of such items on top of last roofing ply in full bed of plastic cement 1/4 inch thick. Flanges shall then be covered with two additional plies of felt, 4 inches and 6 inches respectively, in full bed of plastic cement, feathered onto roofing.
- E. Flashings:
1. Flashing shall be installed at junctures of roofing with vertical surfaces of curbs, parapets, and other sloping and vertical surfaces where indicated and as necessary for providing a watertight installation.
  2. Flashing system shall consist of an approved system of the roofing materials manufacturer, and shall be applied over flat portion of roof perimeters and extended up over cant strips and up sloping and vertical surfaces full height to under metal counterflashings. Roof flashings shall be left in watertight condition by applying plastic cement to any and all areas not yet covered by metal flashings or counterflashings.
  3. Apply fabric reinforcement in hot asphalt or plastic cement at transitions, over joints, cracks, and other surfaces where fabric reinforcement is required or recommended.

### **3.03 FIELD QUALITY CONTROL**

- A. After completion of roofing and related work, a water ponding test shall be performed for all roof areas, parapets, curbs, penetrations, and accessories by applying a flood coat of water along

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the high areas so that water at least 1/4 inch deep flows over the areas. Tests shall be performed under the Engineer's observation.

- B. At roofs with parapets, roof drains shall be temporarily plugged, and at least one inch of water shall be allowed to stand on the roof for one hour.
- C. Should a leak or low spot appear, it shall be repaired, and the roof areas shall be retested as specified above until all work is watertight and acceptable.

**END OF SECTION 07 51 00**