SECTION 07 51 00

BUILT-UP BITUMINOUS ROOFING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
1. Built-up roofing membrane, conventional application.
2. Insulation, tapered.
3. Base flashings.
4. Roofing cant strips, accessories, roofing vents, and walkways.

B. Related Sections:
1. Section 01 73 29 - Cutting and Patching:
2. Section 07 62 00 - Sheet Metal Flashing and Trim for counterflashings.

1.02 REFERENCE STANDARDS

A. ASTM International:
1. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
2. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
3. [ASTM C1371[-2004a] - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.]
4. [ASTM C1549[-2004] - Standard Test Method for Determination of Solar Reflectance Near ASTM D43 - Standard Specification for Coal Tar Primer Used in Roofing, Dampproofing, and Waterproofing.]
5. ASTM D450 - Standard Specification for Coal-Tar Pitch Used in Roofing, Dampproofing, and Waterproofing.
6. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
7. ASTM D5643 - Standard Specification for Coal Tar Roof Cement, Asbestos Free.
8. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
9. [ASTM E408[-1971(1996) e1] - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.]
10. [ASTM E903[-1996] - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.]
11. [ASTM E1918[-1997] - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.]
12. [ASTM E1980[-2001] - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.]

B. FM Global
1. FM DS 1-28 - Wind Loads to Roof Systems and Roof Deck Securement.

C. Intertek Testing Services (Warnock Hersey Listed):
1. WH - Certification Listings.

D. National Roofing Contractors Association
1. NRCA - The NRCA Roofing and Waterproofing Manual.

E. South Coast Air Quality Management District:
1. SCAQMD Rule #1168 - Adhesive and Sealant Applications.

F. [Underwriters Laboratories Inc.:]
   1. UL - Fire Resistive Directory.
   2. UL (RMSD) - Roofing Materials and Systems Directory.

1.03 SYSTEM DESCRIPTION

A. Design Criteria:
   1. Meet requirements of CBC Chapter 15.
   2. Meet requirements of Class A roof per CBC Table 15-A.
   3. Comply with recommendation of NRCA, including any condition not indicated on the Drawings.
   4. Prevent water or moisture from penetrating any area of roofing application.
   5. Flashings shall not depend solely upon mastic or sealant for primary waterproof protection.
   6. Meet requirements of manufacturer's specifications which are consistent with specified built-up bituminous roofing systems and construction conditions
   7. Provide built-up roofing system and component materials which have been tested for application and slopes indicated and which are listed by UL for Class external fire exposure [and for Factory Mutual Class wind resistance of I-90, in accordance with FM DS 1-28].
   8. [All materials must have been tested by UL as a completed system.
   9. [Insulation, securement materials, and method of installation shall meet requirements of Factory Mutual Class 1. Listing of material and assembly as Class 1 Roof by Factory Mutual shall constitute proof of compliance with requirements.]

B. Comply with recommendation of NRCA, including any condition not indicated on the Drawings.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate Work with installation of associated roof penetrations and counterflashings installed by other sections as Work of this section proceeds.
   2. Coordinate work of this Section with related work provided under other sections as required avoiding delays and preventing omission of related work required for correct installation.

B. Preinstallation Meeting:
   1. Contractor shall arrange meeting to review built-up bituminous roofing work after review of submittals and prior to delivering any material to site.
   2. Meeting to be attended by University's Representative, University's Inspector of Record, Contractor, and Contractor's installer, agents of accepted manufacturers, sheet metal installer, installers of other work in and around roofing that must precede, follow, or penetrate roofing (including Mechanical and Electrical Installers as applicable).
   3. Participants shall have had at least one week's advance notice of meeting date and time.
   4. Hold meeting at the job site.
   5. The following major considerations shall be reviewed at the meeting:
      a. Review in detail the Contract specifications, roof plans, roof decks, surface preparation, slopes, quantity and location of roof vents, drainage, flashing details, and other related roofing.
      b. Review in detail job conditions, schedule, construction sequence, application requirements, and quality of completed installation.
      c. Review methods for storing and handling materials.
      d. Review in detail the means of protecting completed work during remainder of construction period.
      e. Discuss the acceptance of the substrate as indicated under "Execution" below.
   6. Contractor shall produce meeting notes that record discussions of meeting and any conflict, incompatibility, or inadequacy and they will indicate that the installer of roofing has reviewed and accepted the substrates for roofing.
   7. Distribute meeting notes to all attendees prior to installation of roofing.

C. [Sequencing:]

D. Scheduling:
1. Do not install final built-up bituminous roofing until all other trades on roof have been completed.
2. Schedule work started in particular area to permit completion, inclusive of installation of bitumen, gravel, or protection boards where required, at the end of each work day. Phased construction of final built-up bituminous roofing will not be permitted.

1.05 [SUSTAINABLE CHARACTERISTICS]

A. Section 01 35 63 - Sustainability Project Requirements: Requirements for sustainable design compliance.

B. [Sustainable Sites Characteristics:]
1. [Roof Surface: Minimum solar reflectance index (SRI) of 78] [for 75 percent of roof area], calculated in accordance with ASTM E1980.]
a. Reflectance: Measured in accordance with ASTM E903, ASTM E1918, or ASTM C1549.
b. Emittance: Measured in accordance with ASTM E408 or ASTM C1371.

*********OR*********

2. [Roof Surface: ENERGY STAR compliant with the following performance:]
a. Emissivity: Minimum 0.9 for 75 percent of roof area in accordance with ASTM E408.

C. Materials and Resources Characteristics:
1. [Recycled Content Materials: Furnish materials with maximum available recycled content including:

SPEC NOTE ***List materials specified in this section required to have recycled content.***

a. [_____.]
2. [Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.]

SPEC NOTE ***List materials specified in this section required to be regional materials.***

a. [_____.]

1.06 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures, for submittal procedures.

B. Product Data: Provide data indicating membrane and bitumen materials, base flashing materials, insulation, and surfacing.

C. Certifications: Submit the following certifications indicating:
1. Built-up bituminous roofing manufacturer's qualifications Specified in this Section.
2. Built-up bituminous roofing installer's qualifications Specified in this Section.
3. Materials to be used in manufacturer's systems compliance with standards designated. Include certificates of compliance for surface aggregate and materials delivered in hot-bulk equipment.

D. Samples: Only as requested.

E. Installer's Compliance: Submit a written statement from Contractor's installer stating that:
1. Contract Documents have been reviewed with the primary roofing material manufacturer's representative.
2. Installer intends to comply with the Contract Documents.

3. Roofing details do not conflict with manufacturer's product/system warranty.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.07 [SUSTAINABLE DESIGN SUBMITTALS]

A. Section 01 35 63 - Sustainability Project Requirements: Requirements for sustainable design submittals.

B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
   1. Sustainable Sites Certificates:
      a. Certify roofing materials solar reflectance index.
   2. Materials Resources Certificates:
      a. Certify recycled material content for recycled content products.
      b. Certify source for regional materials and distance from Project site.

C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
   1. Provide cost data for the following products:
      a. Products with recycled material content.
      b. Regional products.

1.08 QUALITY ASSURANCE

A. Provide products which are free from asbestos, and which comply with the applicable provisions of the California Volatile Organic Compound Regulations (VOC).

B. Built-Up Bituminous Roofing Manufacturer: Obtain primary roofing from a single manufacturer. Provide secondary materials as recommended by manufacture of primary materials.

C. Built-Up Bituminous Roofing Installer's Qualifications:
   1. Installer shall be licensed or otherwise certified by manufacturer of accepted roofing system to do work requiring warranty, including materials and workmanship.
   2. Installer shall have applied accepted roofing system on two or more projects which have been completed for at least 10 years. Information on completed systems shall include date of installation, general contractor, owner, contact, and other related information which will facilitate verifications of qualifications.
   3. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of bituminous sheet roofing work and at any time roofing work is in progress, proper supervision of workers shall be maintained. A copy of the specification shall be in the possession of the Supervisor/Foremen and on the roof at all times.

1.09 DELIVERY, STORAGE, AND PROTECTION

A. Labels: Clearly label materials except gravel with material name, production date or product code, and inspection agency approvals where required.

B. Deliver, store, and handle packaged materials in manufacturer's original containers with seals unbroken and labels intact until time of use.

C. Unload materials carefully and store off ground, deck, or surface where material could become wet or damp, at temperatures maintained above 50 and below 75 degrees Fahrenheit. Protect from elements. Do not dump onto ground.

D. Keep all moisture sensitive materials dry at all times while being transported, stored, and installed.

E. Store materials on raised pallets. Do not double stack pallets.
   1. Cover top and all sides of moisture sensitive materials and allow for adequate ventilation.
   2. Utilize covers made from breathable materials.

F. Handle materials in a manner to prevent damage. Store rolls in an upright position.
   1. Discard rolls which have been flattened or damaged.
   2. Remove damaged materials from the Site and replace with new materials.

G. Avoid concentrated loading of building structure with materials. When storing pallets on the roof, locate over columns.

H. Do not store materials or debris on newly installed roof surfaces.

I. Store liquid materials such as adhesives, thinners, and cleaners in areas away from sparks, open flames, and excessive heat.
   1. No smoking is to be allowed in the area where solvent, adhesives, thinners, or welding agents are being used.
   2. Exercise caution at all times when working with solvent-type materials and comply with the limitations as described by the solvent manufacturer.
   3. Obtain specific approval of University's Representative prior to storage of flammable materials on project site.

1.10 SITE CONDITIONS

A. Environmental Requirements:
   1. Proceed with roofing work when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.
   2. Do not apply roofing membrane during unsuitable weather.
   3. Do not apply built-up bituminous roofing when ambient temperature is below 40 degrees Fahrenheit or above 95 degrees Fahrenheit.
   4. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
   5. Apply built-up bituminous roofing in dry weather.

1.11 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five-year manufacturer's material and labor warranty to cover failure to prevent penetration of water.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet and Bitumen Materials:
   1. GAF Materials Corporation.
   2. Johns Manville Roofing Systems Group.
   3. or equal.

B. Roof Insulation:
   1. GAF Materials Corporation.
   2. Johns Manville Roofing Systems Group.
   3. or equal.

2.02 BUILT-UP BITUMINOUS ROOFING SYSTEMS (BURS)

A. General Requirements:
   1. Materials for single built-up bituminous roofing system, except roof insulation board and protection board, shall be products of, or recommended by, one manufacturer.
   2. Materials quantities stipulated for systems are minimal for application over area of one square defined as 100 square feet. Total bitumen content shall be within tolerances recommended by manufacturer.

B. [System 1:] Aggregate surfaced roof over concrete.]
   1. Description:
      a. Concrete Primer, Asphalt: One gallon.
      b. Asphalt: One mopping at nominal 30 pounds.
      c. Roof Insulation Board: One layer with thermal resistance of 25 and thickness of 4 inches.
      d. Asphalt: One mopping at nominal 30 pounds.
      e. Cover Board: One layer.
      f. Asphalt: Four moppings at nominal 23 pounds each
      g. Roofing Felts: Four plies of fiberglass roofing felt laid in asphalt.
      h. Asphalt: Top flood coat at 60 pounds.
      i. Aggregate Surfacing: 400 pounds embedded in top flood coat.
      j. [Cap Sheet: Provide in lieu of aggregate surfacing at areas to receive traffic surfacing.]
   2. System: Johns Manville Roofing Systems Group's "Specification 4GIG"; or equal.

C. [System 2:] Cap sheet roof over concrete.]
   1. Description:
      a. Concrete Primer, Asphalt: One gallon.
      b. Asphalt: One mopping at nominal 30 pounds.
      c. Roof Insulation Board: One layer with thermal resistance of 25 and thickness of 4 inches.
      d. Asphalt: One mopping at nominal 30 pounds.
      e. Cover Board: One layer.
      f. Asphalt: Three moppings at nominal 23 pounds each
      g. Roofing Felts: Three plies of fiberglass roofing felt laid in asphalt.
      h. Asphalt: One mopping at nominal 23 pounds.
      i. Cap Sheet: One ply laid in asphalt.
   2. System: Johns Manville Roofing Systems Group's "Specification 4GIC"; or equal.

2.03 COMPONENTS

A. Roof Insulation Boards:
   1. Description:
      1) Closed cell polyisocyranurate core bonded in the foaming process to universal fiberglass reinforced facers.
      2) Meet physical requirements of ASTM C1289, type II, Class 1, Grade 2.
      3) Thermal resistance and thickness as indicated in description of roofing systems.
      4) Provide tapered insulation were note or required to provide the indicated slope.
   2. Product: Johns Manville Roofing Systems Group's "Energy 3"; or equal.]

B. Felts, Fabrics, and Dry Sheet:

1. Asphalt Base Sheet: ASTM D2626.
2. Fiberglass Base Sheet: ASTM D2178, Type IV. Johns Manville Roofing Systems Group's "PermaPly 28"; or equal.
3. Fiberglass Roofing Felt: ASTM D2178 Type IV. Johns Manville Roofing Systems Group's "Glass Ply IV"; Glass Base"; GAF Materials Corp.'s "Gafglas Ply 4"; or equal.
4. Mineral Surface Cap Sheet: ASTM D3909. Johns Manville Roofing Systems Group's "Glass Kap"; GAF Materials Corp.'s "Gafglas Mineral Surface Cap Sheet"; or equal. Color as selected by University's Representative].
5. Base Flashing: Johns Manville Roofing Systems Group's "GlasTite Flexible"; or equal.

C. Asphalt Primer: ASTM D41.

D. Bitumen:
1. Asphalt: ASTM D312, type as recommended by built-up bituminous roofing manufacturer for region, climate and slope of roof.
2. Bituminous Plastic Cement: ASTM D4586, Type II, cut back asphalt type.

E. Composition Flashing Systems: All composition flashing systems are to be modified bitumen by same manufacturer as roofing system or built-up bituminous roofing manufacturer's standard.

F. Fabric Reinforcement: Bituminous woven glass fabric meeting requirements of ASTM D1668.

G. Cants: Fiberboard, minimum 3-inch vertical leg, 4 inch wherever possible, 45 degree slope.

H. Surfacing Aggregate: Clean, hard, durable river aggregate conforming to ASTM D1863, gradation size No. 7, and as recommended by built-up bituminous roofing system manufacturer.

I. Fasteners:
1. Mechanical Fasteners for Insulation: Meet [Factory Mutual's and] insulation manufacturer's requirements.
2. [Base Sheet to Lightweight [Insulating]***—or—***[Cellular] Concrete: Twin legged fastener, electro zinc plated, fastener to provide positive attachment and resistance to specified wind up-lift forces.]
3. [Base Sheet to Wood Nailers: One-inch square head nails in length as required to fully penetrate into substrate.]

J. Traffic Surfacing:
1. Description: 3/4-inch-thick panels manufactured from asphalt, reinforcing fibers, and mineral granules, thoroughly ground and molded under heat, and compressed between tops and bottoms of inert fiberglass membranes with skid-resistant mineral granules applied to top surface; color as selected from manufacturer's standard range.
2. Product: Johns Manville Roofing Systems Group's "DynTred Plus"; Asphalt Products Oil Corp.'s "DEK-TOP"; Celotex Corp.'s "Carey-Tred"; W.R. Meadows, Inc.'s "Sealtight Whitewalk Traffic Pad"; or equal.

K. Other Accessories: As recommends by built-up bituminous roofing manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to receive built-up bituminous roofing and verify that:
1. Surfaces and site conditions are ready to receive work.
2. Deck is supported and secure.

3. Deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
4. Voids in substrate have been patched flush with surrounding surfaces.
5. Nailing strips, blocking, reglets, other embedded items, and items to penetrate surfaces have been installed in proper locations.
6. Low spots or areas where ponding water may occur have been adequately corrected.
7. Roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.
8. New flashings and other related items have been installed or fabricated and are on Site ready for installation when roofing work commences
9. Conditions are otherwise satisfactory for application.

B. Assure that related work of other trades has been completed, and that the sequence of the flashing work may proceed in accordance with good flashing practice and the intent of the Specifications.

C. Notify University's Representative immediately in writing of any discrepancy between field conditions and the ability to achieve the intent of these Specifications, and do not proceed with the work until adequate correction has been made.

D. Do not start work until unsatisfactory conditions have been corrected. Start of work shall signify acceptance of, and responsibility for, condition of receiving surface.

3.02 PREPARATION

A. Protection:
1. Protect surrounding work from damage by roofing materials or operations; especially protect paving and building walls adjacent to hoists and kettles.
2. Prevent bitumen, [aggregate,] and debris from entering and clogging roof drains and rainwater conductors.
3. [Protect existing fresh air intakes, doors, and windows as required to prevent entry of asphalt fumes.]
4. Be responsible for costs of repair or restoration of other work damaged by materials or operations of built-up bituminous roofing

B. Clean roof and flashing areas thoroughly of loose materials and foreign matter to provide sound, dry, and level decks for positive attachment of roof system materials.

C. [Concrete Deck Preparation:]
1. Fill surface honeycomb and variations with latex filler.
2. Confirm dry deck by moisture meter with 12 percent moisture maximum.

D. [Metal Deck Preparation:]
1. Apply fire-retardant vapor retarder.
2. Apply fire-retardant vapor retarder to deck surface with adhesive in accordance with roofing and vapor retarder manufacturers' instructions.
3. Extend vapor retarder under cant strips and blocking.

3.03 GENERAL APPLICATION REQUIREMENTS

A. Apply built-up bituminous roofing and related work in accordance with materials manufacturer's specifications for systems accepted for this Project and meeting requirements of CBC Chapter 15, except where other requirements are indicated or specified.

B. Make attachments to metal work and accessories integral with waterproofing in accordance with accepted built-up bituminous roofing manufacturer's recommendations.

C. Bitumen:
   1. Do not exceed temperature limitation recommend by roofing materials manufacturer for heating bitumen.
      a. Bitumen shall be applied at its Equiviscous temperature (EVT) for the method of application being used, plus or minus 25 degrees Fahrenheit.
      b. Do not exceed the flash point.
      c. Do not exceed the finishing blowing temperature.
   2. Provide clearly visible thermometer on each kettle or delivery truck used to heat bitumen.
   3. Remove overheated bitumen from site immediately.
   4. Do not apply hot bitumen under conditions that would cause foaming.

D. Lay multiple-ply courses of felt and hot bitumen in shingle plies and comply with recommendations of roofing material manufacturer.
   1. Lap felts with direction of drainage.
   2. Start installation of plies at lowest point of roof, with plies perpendicular to slope of roof deck.
   3. Except where spot mopping sheets, lay felt plies in bitumen while still hot and tacky and broom thoroughly for full felt width to eliminate trapped air or gases.
   4. Lay out roof areas accurately for proper lap and sequence of plies.
   5. Lay out plies accurately and broom each into hot, tacky bitumen.
   6. Ensure felts are free from fishmouths, buckles, blisters, and other faulty workmanship.
   7. Built-up bituminous roofing displaying voids will be rejected.
   8. Do not use wet, once wet, or damaged rolls.

E. Provide cant strips where indicated, where required, and wherever feasible to prevent 90 degrees bending of membrane system. Turn up all membranes up on cant trip where they abut against vertical surface.

F. Provide membrane base flashings at cant strips and other sloping and vertical surfaces, at roof edges, and at major penetrations through roof deck. Nail or provide other forms of mechanical anchorage of membrane flashing to vertical surfaces as recommended by roofing material manufacturer.

G. Valley and Ridge Lines: Reinforce with one additional ply layer, centered on line, set on top of the top membrane ply in full 25 pound per 100 square foot mopping of hot asphalt.

H. Provide any other roofing accessories necessary to conform to built-up roofing manufacturer's requirements.

3.04 ROOF INSULATION

A. Install where required by built-up bituminous roofing systems.

B. Verify proper thickness, locations, and attachment of insulation stops.

C. [Install roof insulation boards with edges parallel to flutes of metal decking and bearing on deck surface.]

D. [Install first layer of roof insulation boards on metal decks with mechanical fasteners.]

E. [Install second layer of roof insulation boards in broken joint construction, so that each layer breaks joints to a minimum of 6 inches both ways with preceding layer.]

F. [Where noted, mop roof insulation boards solidly into place using hot steep asphalt; press firmly into place.]

G. [Mop roof insulation boards solidly into place using hot steep asphalt and/or fasten mechanically, per [FM requirements and] manufacturer's directions; press firmly into place.]

H. [In addition, the first 4-foot width around the perimeter of the roof and all openings shall be mechanically secured in accordance with FM requirements.]

I. Lay boards with edges in moderate contact without forcing.

J. Cut roof insulation boards to fit neatly around vertical surfaces and deck projections.

K. Joint Tape: Tape joints in top layer of insulation according to manufacture's instruction. In addition, apply joint tape to joints between wood blocking or insulation stops and insulation boards.

L. Do not leave installed roof insulation boards exposed to weather.

M. In addition, meet requirements of materials manufacturers.

N. Tapered Insulation at Crickets:
1. Apply multi-layers of tapered insulation in pattern to achieve positive slope of 1/8 inch per foot. Slope to drains.
2. Stagger the joints of each layer from the preceding course by one-half the board's dimension. Set boards into 30 pounds of asphalt. Bring boards into moderate uniform contact at sides and ends while asphalt is hot and fluid. Install top layer with joints continuous in both directions.

O. Cant Strips:
1. Install at intersection of vertical surfaces and where otherwise required.
2. Install into hot asphalt to top of insulation.
3. Mechanically fasten into nailers with square head roofing nails at 12 inches on center, minimum three nails per piece. Utilize nails with sufficient length to achieve minimum 1-1/2-inch penetration into nailers.
4. Miter corners for tight fit.

P. Tapered Edging: Install wherever necessary to achieve smooth transitions for the roof membrane. Do not allow transitions greater than 1/4 inch.

Q. Water Cut-Offs: Provide at exposed edges of roof insulation boards at end of day's work and whenever rain is imminent. Extend cut-offs 6 inches on roof deck, carry up and over roof insulation boards, and extend 6 inches on top of built-up roofing. Remove before continuing installation of roof insulation boards.

3.05 BUILT-UP BITUMINOUS ROOFING INSTALLATION

A. [Remove temporary composition flashing.]

B. Complete application of built-up bituminous roofing daily up to line of termination at end of day's work. Daily aggregate surfacing is not necessary.

C. Apply fiberglass roofing felts in a solid, continuous asphalt moping
1. Lay plies straight and flat.
2. Apply all ply sheets so they are properly shingled to flow of water.

3. Provide enough overlap so that every cross section will have required number of plies.
4. Stagger all end laps at least 12 inches.
5. Install one extra ply sheet, 36 inches wide, at all waterways.

D. Ensure full and continuous seal and contact between asphalt and ply sheets or base sheet, including ends, edges, and laps by applying asphalt uniformly and by brooming fully before asphalt cools.
1. Use minimum 34-inch-wide brooms or squeegees.
2. Do not walk on membrane until asphalt cools down
3. Keep equipment off hot membrane.

E. Do not allow sheets to contact other sheets even at roof edges or over cants and tapered edge strips.
1. Cut out fishmouths or side laps not completely sealed with asphalt, and patch with ply sheet set in hot asphalt.
2. Remove and replace all sheets which are fully and continuously bonded or which have inadequate mopping along end or edge laps.

F. At Roof Edges and Openings: Provide bleed sheets (felt envelopes) to prevent bitumen drippage.

G. Roof Sumps and Drains:
1. Temporarily plug drains to prevent asphalt drippage; remove at end of each workday.
2. Install tapered insulation to form a minimum 24 by 24 inch sump area.
3. Bring roofing felt plies down over insulation and extend into roof drain flashing ring.
4. Over felts in sump, apply modified bitumen flashing to extend minimum 4 inches out of sump onto main roof deck and into roof drain flashing ring.
5. Verify installation of gravel stops at outer edge of sump.
6. Coordinate to embed gravel stop in plastic cement over flashing with flange stripped in with flashing.
7. Embed aggregate surfacing in plastic cement on top of flange and stripping for 6 inches from raised lip of gravel stop.

H. Turn up all membranes up on cant trip where they abut against vertical surface.

I. Provide membrane base flashings at cant strips and other sloping and vertical surfaces, at roof edges, and at major penetrations through roof deck. Nail or provide other forms of mechanical anchorage of membrane flashing to vertical surfaces as recommended by roofing material manufacturer.

J. Composition Flashing:
1. Install in accordance with manufacturer's recommendations and requirements specified.
2. Provide at termination of roofing on curbs, vertical surfaces, and where indicated or required for complete watertight installation.
3. Verify proper locations of nailers at top of flashing.
4. Prime vertical and horizontal substrate surfaces to be flashed with asphaltic products with asphalt primer and allow to dry before applying flashing.
5. Strip Flashing: Refer to Section 07 62 00 – Sheet Metal Flashing and Trim and other related Sections for flashing and similar work. Coordinate to provide a complete watertight and weatherproof roofing system.
    a. Prime all flanges (both sides) with asphalt primer and allow to dry.
    b. Set flanges in 1/8-inch-thick continuous bed of plastic roofing cement.
    c. Fasten flange as detailed.
    d. Apply two strip flashing sheets into 1/8-inch-thick continuous bed of flashing cement extending 4 and 6 inches (respectively) onto completed roof membrane.

6. Base Flashing: Apply over cants and run up parapet walls where indicated on the Drawings (maximum 24 inches above roof line).
    a. Apply base sheet and modified bitumen built-up base flashing system consisting of a minimum of a base sheet, a ply sheet, and polymer modified top sheet.
    b. Mechanically fasten base sheet at 12 inches on center in rows 8 inches apart.
    c. Apply ply sheet over base sheet in a continuous 1/8-inch-thick layer of flashing cement.
    d. Apply modified bitumen base flashing over ply sheet in a continuous 1/8-inch-thick layer of flashing cement.
    e. Fasten top edge at 6 inches on center.
    f. Do not seal top edge of base flashing.

K. Sheet Metal:
1. Supervise installation of sheet metal items integral with built-up bituminous roofing and ensure conformity with built-up bituminous roofing manufacturer's recommendations.
2. Metal flashings that are an integral part of roofing shall be installed simultaneously with roofing application.
3. [Fill bottom half pitch pockets at window washing system davits with non-shrink grout and top half with elastomeric pitch pocket filler. Crown top for slope to drain.]

3.06 SURFACING

A. Do not install surfacing until the inspection of the membrane has been performed and "punch list" repairs have been completed.

B. [Aggregate:]
1. Aggregate surfacing to fully cover all membranes and strip flashing surfaces.
2. Coat roof surface with uniform and continuous layer of asphalt at minimum rate of 60 pounds per square foot unless otherwise indicated.
3. Apply aggregate into hot asphalt, uniformly at a minimum rate of 400 pounds per square foot. Ensure complete coverage and minimum 50 percent embedment.

C. [Cap Sheet:]
1. Assure roof surface is clean, free of dust, dirt, or moisture. Light priming is required if contamination of surface or oxidation has occurred.
2. Applied cap sheet to be free of buckles, wrinkles, blisters, fishmouths, or voids.
3. Apply cap sheet over and parallel to the roofing plies and lapped so that the flow of water is over or parallel to, but never against the laps.
4. Pre-cut cap sheet into 12 foot maximum lengths and allow to relax.
5. Starting at the low point, install cap sheet surfacing over the entire roof field surface, extending above the cant strip 2 inches into a continuous mopping of hot asphalt applied at a nominal rate of 25 pounds per 100 square feet.
6. Place tension on the ends of cap sheet lengths as they are flopped into place so that the sheet lays flat in the asphalt and adheres.
7. Install cap sheet with 2 inch side laps and 6 inch end laps.
8. Stagger end laps not less than 3 feet apart.
9. "Brooming in" may be necessary to ensure bond between asphalt and sheet.
10. Sprinkle mineral granules in exposed asphalt along edges and ends of mineral cap sheets.

3.07 TRAFFIC SURFACING INSTALLATION

A. Sweep areas to receive traffic surfacing clean of dust, sand, and gravel prior to installation.

B. Apply mineral surfaced cap sheet surfacing over completed roof membrane at areas indicated on drawings.
1. Cut mineral surfaced cap sheet into 18 foot lengths and allow to relax one hour.

2. Set in continuous mopping of 25 pounds per square foot of hot asphalt.
3. Install one ply of mineral surfaced cap sheet extending 1 foot beyond sides of panels.
4. Lap ends 6 inches and laps sides 12 inches. Stagger end joints.
5. Apply mineral surfaced cap sheet after strip flashing has been applied, but prior to base flashing application.

C. Install traffic surfacing panels over mineral surfaced cap sheet with plastic roofing cement in accordance with manufacturer's recommendations. Space panels 6 inches apart, unless indicated otherwise, to permit unrestricted flow of roof water. Lay out panels so that end pieces are not less than one-half full length.

D. Install aggregate over mineral cap sheet and up to edge of panels.

3.08 FIELD QUALITY CONTROL

A. See Section 01 45 00 - Quality Control and Section 01 45 19 - Inspection of Work, for general requirements for field quality control and inspection.

B. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.

3.09 CLEANING

A. Remove bituminous markings from adjacent finished surfaces.

B. Repair or replace defaced or disfigured finishes caused by Work of this Section.

C. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by Work of this Section, consult manufacturer of surfaces for cleaning advice and conform to their [documented] instructions.

D. At completion of the work of this section, remove all excess materials, cartons, wrappings, and tools and implements from the Site.

3.10 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials. Provide special protection or avoid heavy traffic on completed work when ambient temperature is above 80 degrees Fahrenheit.

END OF SECTION