

SECTION 07 51 00
BUILT-UP BITUMINOUS ROOFING

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section includes asphaltic modified bituminous built-up roofing, energy cap aggregate surfacing, with base flashing for new roofing system.
- B. This section includes liquid applied flashing which shall be covered under the same roofing warranty as the roof system.

1.2 RELATED WORK

- A. Wood cants, blocking, and wood edge strips: Section 06 10 00, ROUGH CARPENTRY.
- B. Insulation: Section 07 22 00, ROOF AND DECK INSULATION.
- C. Vapor barrier: Section 07 22 00, ROOF AND DECK INSULATION.
- D. Base sheet for insulated roof assemblies: Section 07 22 00, ROOF AND DECK INSULATION.
- E. Metal base flashing, pipe flashing, counter flashing, bitumen stop-fascia, coping, splash pan, reglet, expansion joint cover and scupper: Section 07 60 00, FLASHING AND SHEET METAL.

1.3 APPLICABLE PUBLICATIONS

- A. Applicable publications listed below form a part of this Specification as referenced. Publications are referenced in the text by the number designation only.
- B. American Society for Testing and Materials (ASTM):
 - A167-99(R2004).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate
 - D41-05.....Asphalt Primer Used in Roofing, Dampproofing and Waterproofing
 - D312-00(R2006).....Asphalt Used in Roofing
 - D448-08.....Sizes of Aggregate for Road and Bridge Construction
 - D751-06.....Test Methods for Coated Fabrics
 - D1863-05.....Mineral Aggregate Used on Built-Up Roofs
 - D2178-04.....Asphalt Glass Felt Used in Roofing and Waterproofing

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- D3884-07.....Abrasion Resistance of Textile Fabrics
(Rotary Platform Double-Head Method)
- D3909-97(R2004).....Asphalt Roll Roofing (Glass Felt) Surfaced
with Mineral Granules
- D4586-07.....Asphalt Roof Cement, Asbestos Free
- D4601-04.....Asphalt Coated Fiberglass Base Sheet Used
In Roofing
- D4897-01.....Asphalt Coated Glass Fiber Venting Base
Sheet Used in Roofing
- D6163-00.....Specification for Styrene Butadiene
Styrene (SBS) Modified Bituminous Sheet
Materials Using Glass Fiber Reinforcements
- F1667-05.....Driven Fasteners: Nails, Spikes, Staples
- C. FM Global (FMG):
- P7825C-05.....Approval Guide Building Materials
- 4470:.....Approved Standard for Class 1 Roof
Coverings
- D. National Roofing Contractors Association (NRCA):
- "Quality Control Guidelines for the Application of Built-up
Roofing."
- "The NRCA Roofing and Waterproofing Manual".
- E. Underwriters Laboratories (UL) - Roofing Systems and Materials
Guide (TGFU R1306)
- F. American Society for Testing and Materials (ASTM) - Annual Book of
ASTM Standards
- G. Sheet Metal and Air Conditioning Contractors National Association,
Inc. (SMACNA) - Architectural Sheet Metal Manual
- H. Asphalt Roofing Manufacturers Association (ARMA)
- I. National Roofing Contractors Association (NRCA)
- J. American Society of Civil Engineers (ASCE)

1.4 DEFINITIONS

Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual for definitions of roofing terms related to this section.

1.5 PERFORMANCE REQUIREMENTS

- A. Provide an installed roofing membrane and base flashing system that does not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.

- B. Manufacturer shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

1.6 WARRANTY

- A. Roofing system is subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period is extended to twenty years.
- B. Provide Manufacturer's standard warranty with single source coverage and no monetary limitation, where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship. Include wind coverage for 3-second gusts up to 100 m.p.h. on all roofing, liquid applied flashings and edge metal.
Duration: Twenty (20) years from the date of completion.

1.7 INSPECTIONS, HOUSEKEEPING AND GENERAL MAINTENANCE

- A. The Contractor must furnish all labor, materials, tools and supervision to complete the following.
 - 1. For the purposes of this contract, samples, test reports, certificates, and manufacturers' literature and data will be submitted to Project Engineer for approval. The following text refers to all items collectively as submittals. Submit for approval, all of the items specifically mentioned under the separate sections of the specification prior to work for the specific section, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work will be equal to the approved submittals. Refer to sample and shop drawings elsewhere in specifications.
 - 2. Roof installer must have 5 or more years of roofing experience and a reputable roof material manufacturer capable of providing a 20 year warranty and preventive maintenance with the following requirements below:
 - a. Response time for leaks:
For each leak associated with the installed roof or roofs which is covered under this agreement, the Contractor must respond to any reported leak no later than two business days of notification. If necessary, a follow-up inspection to the roof leak area will be conducted to examine the repair quality and identify

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additional roofing concerns. Quarterly activity reports shall be developed and provided to the government throughout the 20 year warranty. These reports shall provide the following:

1. Number of customer calls into the system.
2. Response time for each call.
3. Overview of follow up recommendations.

- b. Inspections, housekeeping and preventive maintenance on a semi-annual (two times per year) basis during the term of this agreement, contractor must provide roof inspections, preventive maintenance and general housekeeping services, on a schedule to be agreed upon by the contractor and the Government.

B. Roof inspection includes the following:

1. Visual inspection of the roof membrane and roof surface conditions.
2. Inspection of the flashing systems including, but not limited to, the metal edge system, base flashings on equipment and adjoining walls, counterflashing and termination details, soil stacks and vents, and inspection of rooftop projections and equipment including, but not limited to, pitch pans, HVAC equipment, skylights, and access hatches.

C. Preventive maintenance includes the following:

1. Metal edge flashing components - tears, splits and breaks in the membrane flashings will be repaired with appropriate repair mastics and membranes.
2. Tears and splits in the flashing membrane will be repaired with appropriate repair mastics and membranes. Open split flashing strip-ins will be repaired with appropriate repair mastics and membranes. Unsecured rooftop equipment will be secured. Exposed fasteners will be sealed. Termination bar and counterflashings will be sealed.
3. Roof membrane maintenance repairs - tears, breaks and splits in the flashing membrane will be repaired with appropriate repair mastics and membranes. Splits and blisters, which threaten the roof integrity, will be cleaned, primed and repaired with appropriate repair mastics and membranes. Metal projections (hoods and clamps) will be sealed.

D. General rooftop housekeeping includes the following:

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1. Removal of debris (i.e., leaves, branches, paper and similar Items) from the roof membrane (excluding HVAC and other major equipment).
2. Removal of debris from the roof drains, gutters and scuppers.
3. All debris will be disposed of at the Government's approved on-site location.

E. Inspection reports

1. Contractor will provide roof inspection reports based upon regular inspections.

F. Government responsibilities

1. The Contractor is not responsible for any repairs to any part of the building other than the roof or roofs installed. If the leak is not within the warranty coverage, the contractor shall advise the Government.

G. Warranty limitations

1. The warranty begins once the Contractor is paid in full and the project is 100% completed and accepted by the Government as per specifications and drawings.

1.8 GENERAL REQUIREMENTS

- A. Contractor is to survey all roof penetrations for antennas, satellite dishes, rail post, exhaust, vents and all other items on the roof for any discrepancies on the drawings and bring up to project engineer prior to construction.
- B. Coordinate all construction with project engineer prior to start of work.
- C. Any drawings provided by the V.A. are for reference only and it is the responsibility of the Contractor to field verify all drawings, installation methods and dimensions for accuracy.
- D. Contractor must clean construction site on a daily basis.
- E. Coordinate all construction interruption of utilities and devices including all electric installation with project engineer prior to start of work.
- F. Location of dumpster and method of possible trash disposal of materials must be coordinated and have the approval of the project manager.
- G. Any removal of guard rails and grounding systems are to be coordinated with the project manager.

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- H. The roof drain within a section of roof being replaced shall be plugged to prevent debris from entering drain. Unplug roof drain after new roof is installed.
- I. The Contractor is responsible to provide all materials and labor to achieve proper pitching to all drains with tapered insulation, extra layers, etc.
- J. Contractor must provide manifests and any other disposal documents to the project engineer as required by the V.A., Federal, State or other local municipalities.
- K. All work is to be done as per V.A., State and local specifications.
- L. This job must have a full time superintendent.
- M. All workers must abide by O.S.H.A. regulations.
- N. Contractor must have at least 5 years experience or more of roofing and must submit locations of past work.
- O. Contractor is required to visit site and meet with project engineer prior to bidding.
- P. Contractor is to properly bond the insulation to the roof deck and properly clean underlying decking prior to applying adhesive to suit roof installation requirement.
- Q. Contractor is to flash around entire perimeter of roof, around vents, stacks, penetrations etc with proper base flashing procedure with roof plies and granule cap sheet as specified on specs and drawings. All penetrations into building must be fire sealed as per V.A. Design Manual and NFPA 101 if no sealing is available prior to applying new roof.
- R. All seams for the granule cap sheet are to overlap as per manufacturer's requirements.
- S. Coordinate with project manager prior to using torches. A hot work permit must be obtained.
- T. All lightning rods and connections must be attached back to the railing using proper clamps of the same metal or a di-electric material to prevent corrosion.

1.9 QUALITY CONTROL

- A. Applicator Qualifications: Installer experienced in installation of systems similar in complexity to that required for this Project, including specific requirements indicated:
 - 1. Work shall be performed by installer approved in writing by roofing material manufacturer.

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2. Work shall comply with printed instructions of the roofing materials manufacturer.
- B. Product/Material Qualifications:
1. Provide manufacturer's label on each container or certification with each load of bulk bitumen, indicating Flash Point (FP), Finished Blowing Temperature (FBT), Softening Point (SP), Equiviscous Temperature (EVT).
 2. Provide manufacturer's certification that field applied bituminous coatings and mastics, and field applied roof coatings comply with limits for Volatile Organic Compounds (VOC) per the National Volatile Organic Compound Emission Standards for Architectural Coatings pursuant to Section 183(e) of the Clean Air Act with limits as follows:
 - a. Bituminous Coatings and Mastics: 500 g/l (4.2#/gal.).
 - b. Roof Coatings: 250 g/l (2.1#/gal.).
 3. Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system.
- C. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to built-up roofing for storage, handling and installation.
- D. FMG Listing: Provide roofing membrane, base flashing, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a roofing system and that are listed in FMG "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.
1. Fire/Windstorm Classification: Class 1A-105.
 2. Hail Resistance: MH.
- E. Manufacturer's Qualifications: Manufacturer shall provide a roofing system that meets or exceeds all criteria listed in this section. Contractor shall furnish proof of 5 years of roofing experience of the roof manufacturer prior to the start of work.
- F. Installer's Qualifications:
- Installer shall be classified as a Master or Master Select™ contractor as defined and certified by GAFMC. Contractor shall furnish proof of 5 years of roofing experience of the roof installer prior to the start of work.
- G. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing manufacturer.
- H. Final Inspection

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Manufacturers representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed and final punch list completed.

1.10 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data:
 - 1. Asphalt materials, each type.
 - 2. Roofing cement, each type.
 - 3. Roof walkway.
 - 4. Fastening requirements.
 - 5. Roll goods
- C. Certificates:
 - 1. Indicate materials and method of application of roofing system meet requirements of FMG.
 - 2. Statements of qualification for manufacturers and installers.
 - 3. Inspection Report: Copy of roofing system manufacturer's inspection report certifying completed roofing complies with manufacturer's warranty requirements.
- D. Warranty: As specified in Part 1 of this Section:
 - 1. Warranty sample form with specific language to address Contract provisions.
- E. Shop Drawings: Provide manufacturers standard details and approved shop drawings for the roof system specified
- F. Contract Close-out Submittals:
 - 1. Maintenance Manuals.
 - 2. Warranty signed by installer and manufacturer.

1.11 DELIVERY, STORAGE AND MARKING

- A. Deliver roofing materials to the site in original sealed packages or containers marked with the name and brand or trademark of the manufacturer or seller.
- B. Keep roofing materials dry and store in a dry, weather-tight facility or under canvas covers. Do not use polyethylene or plastic covers to protect materials. Store above ground or deck level on wood pallets. Cover ground under pallet stored materials with plastic.
 - 1. Store rolled materials (felts, base sheets, and paper) on end. Do not store hems on top of rolled materials.
 - 2. Aggregates shall be maintained surface dry as defined by ASTM D1863.

- C. Protect from damage due to handling, weather and construction operations before, during and after installation.

1.12 PRE-INSTALLATION CONFERENCE

- A. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, architect, owner, manufacturer's representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.

1.13 REGULATORY REQUIREMENTS

- A. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.

1.14 DELIVERY, STORAGE AND HANDLING

- A. Deliver all roofing materials to the site in original containers, with factory seals intact. All products are to carry manufacturer's label
- B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.
- C. Store roll goods on end on pallets in a clean, dry, protected area. Take care to prevent damage to roll ends or edges. Do not double stack modified bitumen products.
- D. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.
- E. Remove manufacturer supplied plastic covers from materials provided with such. Use "breathable" type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material is to be installed.
- F. Materials shall be stored above 55°F (12.6°C) a minimum of 24 hours prior to application.

1.15 ENVIRONMENTAL REQUIREMENTS

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

- B. Ambient temperatures must be above 45°F (7.2°C) when applying hot asphalt or water based adhesives.

PART 2 - PRODUCTS

2.1 ROOFING SYSTEM

- A. Install built-up roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of NRCA "Quality Control Guidelines for the Application of Built-up Roofing."
- B. Glass sheet, asphalt bitumen, mineral surfaced.
 - 1. Substrate: Concrete.
 - 2. Components: Quantity.
 - a. Base Sheet: 1 Ply
 - b. Ply Sheet: 2 Plies
 - c. Mineral Surfaced Cap Sheet: 1 Ply
- C. Where liquid applied flashing is indicated on drawings, provide liquid-applied reinforced flashing membrane with integral colored finish. Product shall be fully compatible with roofing system. Provide cold liquid-applied reinforced flashing membrane with non-woven reinforcing fabric, for a finished dry film membrane thickness of .080 inch nominal per ply; integral color finish as selected by V.A., conforming to ASTM C 836. Components include methyl-methacrylate resin. Acceptable product: "ALT R230 THIXO Membrane" or V.A. Contracting Officer-approved equal.

2.2 MATERIALS

- A. ROOF BOARD
 - a. Underlayment or overlayment board with a water-resistant and silicone treated gypsum core with glass fiber facers embedded on both sides, and pre-primed on one side. GP Dens-Deck® Prime Roof Board, distributed by BMCA®.
 - b. Board Thickness: 5/8"
- B. BASE / PLY SHEETS
 - a. Smooth surfaced, resilient, asphalt modified bitumen membrane containing a core of non-woven polyester mat coated with weather resistant, APP polymer-modified asphalt. Conforms to or exceeds requirements of ASTM D 6222 Type I Grade S. Each roll contains one square of material, approximately 39.625" x 32.25' (1 m x 9.8 m), 85.4 lbs. (38.7 kg) Ruberoid® Torch Smooth roof membrane.

C. MEMBRANE MATERIALS

- a. ENERGY STAR listed, fire resistant, coated granule surfaced modified bitumen membrane containing a core of non-woven polyester mat coated with weather resistant, APP polymer-modified asphalt. Conforms to or exceeds the requirements of ASTM D 6222 Type I Grade G. Each roll contains one (1) square of material, approximately 39.5" x 32.4' (1 m x 10.3 m), 106 lbs. (48.1 kg) Ruberoid® EnergyCap™ Torch Granule FR roofing membrane.

D. FLASHING MATERIALS

- a. Smooth surfaced, resilient, asphalt modified bitumen membrane containing a core of non-woven polyester mat coated with weather resistant, APP polymer-modified asphalt. Conforms to or exceeds requirements of ASTM D 6222 Type I Grade S. Each roll contains one square of material, approximately 39.625" x 32.25' (1 m x 9.8 m), 85.4 lbs. (38.7 kg) Ruberoid® Torch Smooth flashing membrane.
- b. ENERGY STAR listed, fire resistant, coated granule surfaced modified bitumen membrane containing a core of non-woven polyester mat coated with weather resistant, APP polymer-modified asphalt. Conforms to or exceeds the requirements of ASTM D 6222 Type I Grade G. Each roll contains one (1) square of material, approximately 39.5" x 32.4' (1 m x 10.3 m), 106 lbs. (48.1 kg) Ruberoid® EnergyCap™ Torch Granule FR roofing membrane.

E. BITUMEN / ADHESIVES

- a. Asphalt Primer: ASTM D 41 Leakbuster™ Matrix™ 307 Premium Asphalt Primer, by BMCA®
- b. Insulation Adhesive: Oly-Bond 500™ distributed by BMCA®

F. ACCESSORIES

- a. Standard Vents

A spun aluminum vent, pre-flashed with modified bitumen designed to waterproof soil pipes and roofing protrusions. The Standard MVent, by Mweld.

NOTE: Not for use over active pipes that emit steam or excessive moisture vapor, condensation may occur.

Not for use over boiler or heater/furnace vent pipes.
- b. Adjustable Vents

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A two-piece roof-flashing unit consisting of a pre-flashed spun aluminum base and a flexible upper boot, allowing for waterproofing of tall or awkward roof protrusions. The Adjustable MVent, by Mweld.

c. Plumbing Vents

Pre-flashed with modified bitumen membrane and is designed to waterproof vent pipes. It can be used as a pipe cover to replace finger and cap flashing on standard vent pipe details. The Pre-Flashed Plumbing Vent, by Mweld.

d. Drains

A spun aluminum (or copper) roof drain with strainer cap, and waterproofing plumbing seal attached. Pre-flashed with modified bitumen and available in full sizes to accommodate new construction applications. Refer to Section 22 14 00 Storm Drainage.

- e. A Pre-flashed metal through-wall roof drain designed for easy installation to aid in quick lateral removal of water. The Mscupper, by Mweld.

f. Sealant Pans

A structural urethane outer shell, bonded to the roof surface, filled with a urethane rubber sealant. The urethane sealant conforms to the shape of any roof penetration through a roof surface to protect the roof system from moisture. The M-Curb and M-Thane, by Mweld

g. Gravel Guard

Three-piece fascia system with roof flange design that creates water and wind proof seals at the building perimeter. The Gravel Guard MB, by BMCA®.

- h. EnergyCote™ Coating, a brilliant white, water based, low VOC, highly reflective elastomeric coating which cures to form a seamless rubber membrane. It has been specifically designed to treat seams, laps, flashings and other edges and details in reflective cap sheet products such as EnergyCap™. Designed to add reflectivity and protect areas of asphalt bleed-out on white reflective asphalt roll roofing to give a uniform, brilliant white finish across the whole roof area.

i. TOPCOAT® Flexseal

Solvent-based synthetic elastomeric sealant.

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j. TOPCOAT® Topester Fabric

Non-woven, 100% fully spun-bonded polyester fabric.

PART 3 - EXECUTION**3.1 GENERAL**

- A. Do not apply if deck will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon.
- B. Phased construction is not permitted. The complete installation of roofing system is required in the same day except for area where temporary protection is required when work is stopped.

3.2 EXAMINATION

- A. Verification of Conditions: Examine substrates, areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion:
 - 1. Do not proceed until unsatisfactory conditions, including moisture, have been corrected.
 - 2. Do not install roofing materials over wet insulation.
 - 3. Do not install roofing materials unless roof openings, wood nailers, edge venting, insulation board, flashing, curbs, and roof joints are constructed.
 - 4. Do not install roof materials unless deck and/or insulation provides designed drainage to working drains.
- B. Do not apply roof system if roofed deck will be used as a work platform.
- C. Existing Intake Louvers:
 - 1. Use large fans during placement to direct airflow away from existing intake louvers.
 - 2. If required to install roof near intake louvers after work hours, it shall be done so without additional cost to the Government.
- D. Verify that the surfaces and site conditions are ready to receive work.
- E. Verify that the deck is supported and secured.
- F. Verify that the deck is cleaned and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.
- G. Verify that the deck surfaces are dry and free of ice or snow.
- H. Verify that all roof openings, curbs, pipes, sleeves, ducts, vents or other penetrations through the roof are solidly set, and that all flashings are tapered.

3.3 PREPARATION

- A. Sweep substrate to broom clean condition. Remove all dust, dirt and debris.
- B. Remove surface irregularities that may damage materials or cause installation defects.
- C. Coordinate operations with roof insulation and sheet metal work to permit continuous roofing operations.
- D. Treat cracks greater than 1/8" (3 mm) in width in accordance with the deck manufacturer's recommendations.
- E. In all retrofit roof applications, it is required that deck be inspected for defects. Any defects are to be corrected per the deck manufacturer's recommendations prior to the new roof application.

3.4 INSTALLATION

- A. Comply with roofing system manufacturer's written instructions and applicable recommendations of NRCA "Quality Control Guidelines for the Application of Built-up Roofing."
- B. Cooperate with inspection and test agencies required to perform services in connection with built-up roofing system installation.
- C. General:
 - 1. Provide uniform and positive adhesion between all installed materials, including adhesion to insulation or substrate, and between each ply of felt.
- D. INSTALLATION - GENERAL
 - 1. Install GAFMC's Ruberoid® roofing system according to all current application requirements in addition to those listed in this section.
 - 2. GAFMC Ruberoid Specification #: I-0-2-TGPFR(EC)
 - 3. When the slope of the roof is 1/2" per foot or greater, install all plies parallel with the slope of the roof, and install intermediate wood nailers as required for the specific roof slope. Plies must extend over ridges and nailed on 6" centers.
 - 4. Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.
- E. PLY / CAP SHEET
 - 1. The surface over which the membrane is to be installed must be clean, smooth, dry and prepared in accordance with article 3.02 "Substrate Preparation". Do not apply membrane directly to a

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- fresh asphalt glaze or flood coat, or over base plies with excessive asphalt mopping bleed out at laps.
2. For slopes $\frac{3}{4}$ " per foot (6.2 cm per meter) and over, membrane must be run parallel to the roof slope and back nailed in accordance with GAFMC steep slope application requirements. On slopes less than $\frac{3}{4}$ " per foot (6.2 cm per meter), install cap sheet perpendicular to the slope.
 3. Never apply membrane by any method except welding with a propane torch or other equipment specifically designed for application of torchable modified bitumen.
 4. The coiled membrane must be unrolled approximately 10 ft. (3 meters), and aligned. The propane torch flame is then applied uniformly across the exposed back surface of the membrane and lap areas until the compound reaches the proper application temperature and exhibits a slight sheen. A complete burn-off of release films where present on the underside of the rolls, membrane selvage edges or both surfaces is necessary. Avoid overheating which may result in damage to or improper adhesion of the membrane. (The flame should be moved from side to side in the shape of an "L", applying about 75% of the heat to the membrane and 25% to the substrate or underlying plies including the lap area of the previously installed courses.) The membrane is slowly unrolled as heat is applied to ensure proper adhesion. When complete, re-roll the opposite end of the membrane and install in the same manner.
 5. A minimum $\frac{3}{8}$ " (10 mm) bitumen flow-out must be obtained at all seam areas. Dry laps are not acceptable. To ensure the proper $\frac{3}{8}$ " (10mm) flow of bitumen at the seam areas, a roller may be used. Roller application should follow behind the torch no more than 4 ft. (1.2 m) nor less than 3 ft. (0.91 m) to be sure that the membrane will be at the proper temperature to produce proper flow. Hand rollers or "walking-in the seam" methods are also acceptable. Check all seams for full and uniform adhesion. Un-adhered seams must be lifted with a heated trowel and resealed by lightly torching the seam area.
 6. (Optional) Matching granules may be broadcast into the modified bitumen bleed out at seams while hot to enhance the finished appearance of the membrane.
 7. All end laps must be staggered a minimum of 18" (45.7 cm) so that no adjacent end laps coincide. If end laps fall in line or

are not staggered the proper distance, a full width of membrane must be installed over the end laps. End laps, flashing sheets and other seams formed over granule surfaces require pre-heating of the top surface of the underlying granule surface membrane to a point where the granules just begin to sink into, and the modified bitumen compound comes up through the granules to ensure proper seam construction and adhesion.

8. All laps must be parallel or perpendicular to the slope of the roof such that the flow of water is never against the lap.
9. Interply and cap application: Over the base sheet or approved substrate, install 19 11/16" (50 cm) and 39 3/8" (100.0 cm) width Ruberoid® smooth starter plies, and follow with a 39 3/8" (100.0 cm) width granule surfaced sheet, applied shingle style. Lap plies 3" on side laps and 6" (15.2 cm) on end laps. Stagger adjacent end laps a minimum of 18" (45.7 cm).
10. Membranes must not be applied during adverse weather or without precautionary measures in temperatures below 45°F (7.2°C). Contact GAFMC Contractor Services for details.
11. If damage by other trades or any inadvertent damage should occur to the EnergyCap™ product during installation, and for aesthetic purposes only, an additional fog coat of EnergyCote™ coating can be applied to the sheet at a rate of ½ to 1 gallon per 100 sq ft.

F. BITUMINOUS BASE FLASHINGS

1. Install GAFMC base flashing specification 2XTT(EC) over all cant strips, horizontal to vertical transitions, roof edges and roof penetrations. Flashings are to be secured in accordance with current GAFMC application guidelines.
2. Prime all metal and masonry surfaces with asphalt primer, and allow adequate drying time prior to adhering flashing plies.
3. Backer plies installed over masonry or other non-nailable substrates must be cut into manageable lengths to ensure adequate adhesion to the cant strip and vertical surfaces without excessive voids. All vertical laps shall be 4" (10.2 cm). Backer plies shall extend onto the field of the roof as shown in the applicable GAFMC construction detail.
4. The finished ply of base flashing shall be run vertically to provide a selvage edge that will aid in achieving proper adhesion at the 3" (7.6 cm) vertical laps. If the sheet is run horizontally, the vertical laps must be a minimum of 6" (15.2

cm) and the selvage edge must be removed from the sheet or fully covered by the counterflashing. The finished flashing ply must extend out onto the field of the roof as shown in the applicable GAFMC construction detail, and must be extended a minimum of 4" (10.2 cm) beyond the edge of the prior flashing plies. The flashing must be soundly adhered to the parapet, cant area and roof surface to result in a minimum void, non-bridging construction.

5. Base flashing heights must be a minimum of 8" (20.3 cm) and a maximum of 24" (61.0 cm) above the roofline, except where liquid applied flashings are indicated on drawings.
6. Corner membrane flashings, such as "bow ties" for outside corners and "footballs" for inside corners or other membrane reinforcements are required to ensure that base flashing corners are sealed at cant areas. An alternate method of corner reinforcing is to install a smooth MB membrane reinforcement piece on the prepared corner substrate prior to final surfacing membrane. Refer to MB Flashing Details section of the GAFMC Application and Specifications Manual.

G. LIQUID APPLIED FLASHINGS

1. Liquid applied flashings shall be provided where indicated on drawings and elsewhere as required. Preparation of substrate, priming if required, and installation of liquid applied flashings shall be in strict accordance with manufacturer's written recommendations.

H. PENETRATIONS

1. Horizontal penetrations shall be flashed with M-Curbs filled with M-Thane sealant, then coated with Topcoat® Flexseal.
2. Vertical penetrations shall be flashed with Topcoat® Topester Fabric embedded between two coats of Topcoat® Flexseal.

I. WALKWAYS

1. Walkways for normal rooftop traffic shall be constructed from 30"x 30"x 1/4" thick EPDM walk pads, separated by 1/2 inch, to allow for drainage.
2. Adhere walkway pads to the roof surface using an adhesive compatible with both EPDM and the torch-down cap sheet.

J. ROOF PROTECTION

1. Protect all partially and fully completed roofing work from other trades until completion.

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2. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.
3. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.
4. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.

K. CLEAN-UP

1. All work areas are to be kept clean, clear and free of debris at all times.
2. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.
3. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.
4. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.
5. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.
6. Clean and restore all damaged surfaces to their original condition.

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