

WVU DESIGN GUIDELINES & CONSTRUCTION STANDARDS

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 075000 – ROOFING SYSTEMS

PART 1 - GENERAL

1.1. Any deviation from the following instructions must be approved during design by WVU Facilities Management Personnel.

1.2. DEFINITIONS

- A. ASTM American Society for Testing and Materials
- B. FM Facilities Management
- C. NRCA National Roofing Contractors Association
- D. PE Project Engineer
- E. PM Project Manager
- F. SMACNA Sheet Metal and Air Conditioning Contractor's National Association

1.3. Related Standards

- A. Plazas and Decks. Section 070100
- B. Sealants. Section 079200
- C. The secretary of the US Department of the Interior's Standards for Rehabilitation.

1.4. Reference Standards

- A. NRCA Roofing and Waterproofing Manual
- B. SMACNA Architectural Sheet Metal
- C. ASTM, <http://www.astm.org/Standard/interests/roofing-standards.html>

1.5. Quality Control

- A. Roofing contractors shall be certified by the roofing system manufacturer as qualified to install the specified system and to receive the specified total system warranty. Contractors must not have a history or pattern of complaints filed against them and have at least five years of experience with roofing projects of similar size and scope.

1.6. General Requirements

- A. WVU's general preference for roofing systems is listed below. These preferences are based on a desire for reliable, durable, low maintenance and long lasting roof systems. The selection of a roofing system shall also consider roof traffic, budget, exposure to chemicals and building type.

- 1. Built-Up Roof Systems
- 2. Fully Adhered Bituminous Modified Roofing
- 3. EPDM Roofing (fully adhered)
- 4. Shingled (where applicable)
- 5. Metal Roofing
- 6. Vegetative roofs are acceptable for LEED projects

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7. TPO Roofs
 8. PVC
- B. Acceptable Manufacturers are listed. Others must be approved by WVU FM.
- C. Warranty shall be minimum 20 years on all roofs with 30 years on shingled roofs. Interim inspections during construction by roofing manufacturer to be conducted at 10%, 35%, 75%, and 100%. WVU FM representative shall be present during inspections. Roofing manufacturer and WVU FM representative shall sign-off on the sign-off sheet. Reports and photo documentation shall be submitted to WVU FM representative.
- D. Warranty shall not be issued by any manufacturer until final inspection is completed by the manufacturer's certified inspector and WVU representative.
- E. All roofs shall follow these general guidelines:
1. Nailer to be pressure treated wood
 2. All wood nailers shall be treated in accordance with Section 06300 Wood Treatment
 3. Drain pans shall be insulated.
 4. All piping shall be insulated horizontally to first elbow turning vertically.
 5. Roof-drain bodies to have 3" of insulation.
 6. All pipes to have 1 1/2" minimum insulation.
 7. All piping shall be insulated 6' vertically, where possible.
- F. Re-roofing projects shall be historically accurate and be reviewed by the WVU historical preservation committee.
- G. All roofing projects shall have a minimum sump area of 4' X 4' around each drain.
- H. Re-roofing projects shall be tested for asbestos, lead and asphaltic substances whose removal may require abatement or special environmental handling. Removal and disposal shall be the responsibility of the roofing contractor.
- I. Roofs shall have positive drainage with no ponding. Always provide slope to drains 1/4 "per foot at a minimum where possible.
- J. Provide minimum 6 inch diameter roof drains in all new construction. Always provide cast iron drain assemblies with flashing ring, sediment bucket, and dome cover. Scuppers shall be for overflow backup.
- K. Entire assembly shall meet FM Global I-90 rating, minimum.
- L. Preferred minimum insulation value equal to wall insulation, but never less than R-20 where possible. Two layers of insulation with staggered seams.
- M. At vertical projections through roof, provide minimum 8" clearance between top of flashing and roof surface. Always provide cricket on uphill side of any projection that interferes with positive drainage.
- N. It is desirable to avoid pitch pockets or pans. If a pitch pockets cannot be avoided, provide gooseneck or hood over and fill completely with pourable sealant. Mortar shall not be used.
- O. At areas where frequent foot traffic will occur (mechanical units, particularly), provide walk pads. Path of pads shall follow most convenient route between roof access and destination. At all equipment units provide additional non-slip, fully adhered pads for tool boxes, maintenance pedestrian traffic to all serviceable areas.
- P. No torches or kettles are allowed on roof without special permission of WVU project representative (a fire protection plan shall also be submitted with the request).
- Q. When determining set-up location, keep well away from fresh air intakes and on adjacent buildings.
- R. Ballast Roof System shall NOT be used.

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- S. Contractor shall take necessary precautions to protect new roofing systems, and adjacent, against damage until substantial completion.
- T. Owner representative shall be present when manufacturer conducts warranty inspection.
- U. Fall arrest and restraints are required and in compliance with all OSHA, federal state and local regulations.
- V. Thermal Imaging - WVU will conduct thermal imaging testing through a third party independent testing company.
 - 1. Written testing results must be provided to WVU by the testing company. This may include graphs or testing images to substantiate their findings. Based on the findings WVU may require that the roof be replaced.
 - 2. Final warranty inspection shall include review and documentation of the testing results. The warrantor must agree to warranty the roof based on the findings of the thermal testing.
 - 3. Test results will become part of the permanent file kept by WVU.

PART 2 - PRODUCTS

2.1. Built-Up Roof Systems

- A. General
 - 1. Basis of design is three-ply asphalt system with cap sheet. Two layer systems acceptable for lower durability requirements.
- B. Systems
 - 1. Three-ply Asphalt and Modified Cap Sheet.
 - a. Mop two Type IV fiberglass felts.
 - b. Mop one reinforced modified cap sheet (or approved equal) with granular surface or cover with ASTM D 1863 aggregate in asphalt flood coat.
 - c. Use Type III asphalt for all moppings and flood coat.

2.2. Fully Adhered Bituminous Modified Roofing

- A. Manufacturer's standard installation. System will be approved Class A, UL listed roof. The aggregate surfacing will be factory applied by the manufacturer to the cap sheet. Additional aggregate needed for seams or penetrations to be applied by contractor on site.
 - 1. Primer
 - a. Use primer recommended by manufacturer for this application
 - 2. Base Sheet
 - a. Modified bituminous base sheet with glass fiber reinforcing mat.
 - 3. Modified Bituminous Sheet Membrane
 - a. Modified asphalt sheet with glass fiber reinforcing mat.
- B. Approved manufacturers

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1. Johns Manville
 2. Soprema
 3. Durbigum
- C. Auxiliary Materials
1. Sheet Seaming System
 - a. Manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by membrane manufacturer.
 2. Cant Strips
 - a. New cut pressure treated wood, cedar, or fiber is to be used. Nailed into both wood nailer and blocking or just wood nailer when blocking is not used. Penetrate into nailer and blocking a minimum of 1-1/4 inches.
 3. Tapered Edge Strips and Flashing Accessories
 - a. Types recommended by membrane manufacturer, mechanical anchors, including adhesive tapes, flashing cement, and sealants.
 4. Flashing Material
 - a. Manufacturer's standard system compatible with multi-ply membrane.
 5. Wood Blocking and Nailer
 - a. Southern Pine, No. 2 grade free from warping and visible decay and pressure treated. Use alternating pattern when attaching wood to substrate.
 6. Surfacing Aggregate
 - a. Stone, free of sharp edges, complying with ASTM D-1863. Adhere aggregate to the roofing system using cold applied adhesive.
 - i. Where ASTM D-1863 aggregate is not available, provide aggregate complying with gradation size 6, 7 and 67 of ASTM of ASTM D-448, provide that moisture content by weight is three (3) percent or less and aggregate meets other requirements of ASTM D-1863.
 7. Walkway protection
 - a. Prefabricated pads designed specifically for protection of modified bitumen sheet roof systems.
 8. Cold Applied Membrane Adhesive
 - a. As recommended by membrane manufacturer for particular substrate and project conditions, formulated to withstand min. 90-psf uplift force, and is part of a UL approved roofing system.
 9. Mastic Sealer
 - a. Type recommended by insulation manufacturer for bonding edge joints and filling voids.
 10. Torch cap not acceptable.

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D. Insulating Materials

1. General
 - a. Provide insulating materials to comply with requirements indicated for materials and with referenced standards in sizes to fit applications indicated, selected from manufacturer's specifications for thickness, widths, and lengths.
2. Polyisocyanurate Board Roof Insulation
 - a. Top layer to be minimum 2.0-pcf density bonded to roofing felt facer sheets (two sides). Underlying and tapered layers may be of lesser density. Provide in thickness indicated, with a minimum k-value of 0.17 when tested according to ASTM C-518 after insulation is conditioned per RIC/TIMA 281-1 conditioning procedure.

2.3. EPDM Roofing

A. General

1. Total system warranty
 - a. 60 mil – 20 year
 - b. 90 mil – 30 year
2. Black Preferred
3. EPDM shall not be used around kitchen exhaust and in high traffic areas.
4. EPDM shall not be used in or around chemical sensitive area.

B. Approved manufacturers

1. Carlisle
2. Johns Manville

2.4. Shingled

A. General

1. Asphalt shingles are not a standard roof on most university buildings. Special permission from the project representative is required prior to specifying shingles. Slate or synthetic slate is preferred.

- B. Provide minimum 5/8" 3 ply plywood substrate.
- C. Minimum slope 4" in 12"
- D. Hot dipped galvanized nails
- E. 30 lb. felt
- F. Ice Guard to be used on edge course to be same width as felt.

2.5. Metal Roofing

- A. Where metal roof is proposed standing seam, double-lock connections are preferred.
- B. Provide a sufficient number of mechanically fastened metal snow guards.

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2.6. Sheet Metal

- A. Counter flashing
 - 1. Copper is first choice for historical preservation. If steel is used, provide 24 gage minimum. For exposed steel, provide Kynar finish, or approved equal, from manufacturer's standard colors.
 - 2. No surface mounted counter flashing shall be allowed. Reglet preferred.
- B. Scuppers/Gutters/Down spouts
 - 1. General
 - a. All detailing shall conform to manufacturers specifications.
 - b. Where architecturally acceptable, 16 oz. copper is preferred.
 - c. If steel (24 gauge minimum) is used, provide Kynar finish, or approved equal, from the manufacturer's standard colors. Match existing, where historical demands require.
 - 2. Overflow Scuppers: Make exterior perimeter high and place overflow scuppers such that bottom of scupper is 2" above top of finished roof.
 - 3. Scuppers and gutters as part of roof drainage system.
 - a. Place crickets between scuppers.
 - b. Connect all down spouts to underground storm drainage systems. If not possible, configure down spout so that it, and its discharge, drain away from base of building. Provide cleanout at base of down spout.
 - c. Provide expansion joints in gutters. Do not fasten the back of the gutter to the building.
 - d. Avoid internal gutters.
 - 4. Down spouts shall be kept external to the building and not run inside the walls of the structure, if possible based on building type and desired exterior appearance.

2.7. Re-roofing

- A. Inspect existing roof
 - 1. Core existing roof to verify conditions
 - 2. Pull-out testing is required.
 - 3. If existing roof is mechanically fastened, determine how to remove roof and methods to repair substrate.
- B. Test for asbestos, lead, and asphaltic substances whose removal may require abatement or special environmental considerations.
- C. Inspect existing skylights and report to WVU project representative whether it would be prudent to include skylight re-work with roof repairs. Likewise, for roof scuttle and other rooftop accessories.
- D. Remove existing roof to bare substrate. Never remove more roof than can be dried-in prior to completion of day's work or in the event of rain.
- E. Provide for substrate repair/replacement in Base Bid (by assumed quantities or percentages, and unit prices, if necessary).

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- F. Provide unit prices with bid to allow existing nailers to remain if determined to be satisfactory.
- G. Re-use of existing counter flashing is permissible if WVU project representative agrees. Verify height of finished roof and include repairs to counter flashing in Base Bid. Remove and replace caulk top of existing counter flashing where caulking exists.

PART 3 - EXECUTION

3.1. N/A

END OF SECTION 075000