# 075000 ROOFING SYSTEMS

## PART 1 - GENERAL

1.1 Description

A. This section details the guidelines and expectations for the design and installation of roofing systems on Johns Hopkins University Homewood Campus. Project conditions and requirements vary, thus precluding the absolute adherence to the items identified herein in all cases. However, unless there is adequate written justification and approval from the JHFRE Director of Operations and Maintenance, it is expected that these guidelines will govern the design and specifications.

1.2 Submittals

A. JHFRE'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.

B. Preferred Low/No Slope Options:

1. Built-Up Roof Systems
2. Fully Adhered Bituminous Modified Roofing
3. Liquid-Applied Membrane
4. TPO
5. Metal Roofing
6. PVC
7. Vegetative roofs (acceptable for LEED projects)

C. Preferred Steep Slope Options:

1. Slate/Synthetic Slate
2. Architectural Shingles

1.3 Quality Assurance

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.

B. The contractor shall provide JHFRE with a written standard roofer's guarantee, applicable to any leaks or failures due to defective materials or workmanship, occurring in the roof system or flashing

within two years from date of completion of the roof work. This does not include any limiting penal sum. Warranty shall not be issued by any manufacturer until final inspection is completed by the manufacturer's certified inspector and JHFRE representative.

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%. JHFRE representative shall be present during inspections. Roofing manufacturer and JHFRE representative shall sign-off on the sign-off sheet. Reports and photo documentation shall be submitted to JHFRE representative.

D. Thermal Imaging - JHFRE will conduct thermal imaging testing.

1. Written testing results will be provided, which may include graphs or testing images to substantiate their findings. Based on the findings, JHFRE 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 JHFRE.

E. All roofs shall follow these general guidelines:

1. Nailer board to be pressure treated wood.

2. Drain pans shall be insulated.

3. All piping shall be insulated horizontally to first elbow turning vertically.

4. Roof-drain bodies to have 3" of insulation.

5. All pipes to have 1 1/2" minimum insulation.

6. All piping shall be insulated 6' vertically, where possible.

F. Re-roofing projects shall be historically accurate and be reviewed by JHU historical preservation committee for approval before commissioning.

G. 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.

H. Entire assembly shall meet any minimum requirements of JHU Insurance provider.

1.4 Delivery and storage

A. Material deliveries and storage areas to be approved by JHFRE.

B. Material storage to comply with manufacturer's recommendations.

## PART 2 – PRODUCTS

2.1 General

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. All detailing shall conform to manufacturers specifications.

a. Where architecturally acceptable, 16 oz. copper is preferred.

b. 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. Provide minimum 6"diameter roof drains in all new construction. Always provide cast iron drain assemblies with flashing ring, sediment bucket, and dome cover.

3. Overflow Scuppers: Make exterior perimeter high and place overflow scuppers such that bottom of scupper is 2" above top of finished roof.

4. 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 wherever possible.

C. All roofing projects shall have a minimum sump area of 4' X 4' around each drain.

D. Roofs shall have positive drainage with no ponding. Always provide slope to drains ¼" per foot at a minimum where possible.

E. Preferred minimum insulation value equal to wall insulation, but never less than R-30CI. Two layers of insulation with staggered seams.

2.2 Built-Up Roof Systems

A. Substrate

1. Provide a minimum roof slope of 1/4" to 1/2" per foot using light weight fill or taper insulation toward drainage system (gutters, roof drains, or through wall scuppers).

2. Slope built-up roof 6' square with taper insulation toward roof drain and install gravel stop 3' square minimum.

3. Specify conventional standard 4 ply fiberglass felt built-up roof system with an aggregate finished surface using #7 stone conforming to ASTM # A - 4/7, minimum.

4. Provide walk out access to all roof levels for maintenance personnel by use of penthouse stairs or scuttle trap doors and stairway. Access ladders from one level to another are required.

B. Insulation

1. The thickness shall be such that the insulation's only value is equivalent to a minimum of a R-30 value. This value is for the insulation only, not the complete roofing system value.

2. All insulation shall be installed conforming to U.L./F.M. class 120 wind uplift guide.

C. Base Flashing

1. All base flashing, shall be a minimum of 8” high from the finished roof surface.

2. Mechanically fasten top of base flashing, and seal the top of all base flashing with approved roofing cement and fabric before applying metal counter flashing or metal cap flashing.

D. Finished Surface

1. Clean gravel or slag (embed in bitumen flood coat) meeting ASTM D 1863, which applies to aggregates specified for use in bituminous roofing.

2. White mineral surfaced cap sheet over ply sheets of the built-up roofing system.

2.3 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: Use primer recommended by manufacturer for this application

2. Base Sheet: Modified bituminous base sheet with glass fiber reinforcing mat.

3. Modified Bituminous Sheet Membrane: Modified asphalt sheet with glass fiber reinforcing mat.

B. Auxiliary Materials

1. Sheet Seaming System: Manufacturer’s standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by membrane manufacturer.

2. Cant Strips: 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".

3. Tapered Edge Strips and Flashing Accessories: Types recommended by membrane manufacturer, mechanical anchors, including adhesive tapes, flashing cement, and sealants.

4. Flashing Material: Manufacturer's standard system compatible with multi-ply membrane.

5. Wood Blocking and Nailer: 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: Stone, free of sharp edges, complying with ASTM D-1863. Adhere aggregate to the roofing system using cold applied adhesive.

a. 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: Prefabricated pads designed specifically for protection of modified bitumen sheet roof systems.

8. Cold Applied Membrane Adhesive: Type 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: Type recommended by insulation manufacturer for bonding edge joints and filling voids.

10. Torch cap NOT acceptable.

C. Insulating Materials

1. 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: 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-valve of 0.17 when tested according to ASTM C-518 after insulation is conditioned per RIC/TIMA 281-1 conditioning procedure.

2.4 Liquid-applied Membranes

A. Liquid-applied membrane shall be installed with an embedded polyester reinforcement fabric.

B. Membrane should be comparable to Tremco Products' Alpha Guard Bio & PUMA.

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.

2.6 Slate/Synthetic slate

A. Shall be 1/4” thick or equal and shall conform to physical requirements of grade S1 classifications.

B. Underlayment shall be installed on hips, ridges, rakes, roof penetrations, eaves and low-pitched roof slopes (between 2/12 and 4/12).

C. Install snow guards on all "A" frame substrate roofing systems to protect entrances, gutters and pedestrian traffic at lower levels.

2.7 Architectural Shingles

A. 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. Shingle shall be 25-year Class A fiberglass composition.

C. Provide minimum 5/8” 3-ply plywood substrate.

D. Minimum slope 4” in 12”

E. Hot dipped galvanized nails

F. 30 lb. felt

G. Underlayment shall be installed on hips, ridges, rakes, roof penetrations, eaves and low-pitched roof slopes (between 2/12 and 4/12).

H. Install snow guards on all "A" frame substrate roofing systems to protect entrances, gutters and pedestrian traffic at lower levels.

2.8 Re-roofing projects are not the preferred method, but acceptable in some cases.

A. The existing roof must be inspected.

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 JHFRE 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).

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 JHFRE 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 Provide access to all roof levels by means of penthouse doors, fixed access ladders or roof hatches.

3.2 Provide walk pads in all areas where frequent foot traffic will occur, which includes pathways to and completely around all mechanical units. Path of pads shall follow most convenient route between roof access and destination before encircling unit. The circle around serviceable units shall have additional non-slip, fully adhered pads for tool boxes.

3.3 Fall arrest and restraints are required and must be in compliance with all OSHA, federal state and local regulations throughout the duration of the project.

A. Roof edge protection is preferred, but roof anchors are permissible if edge protection is not viable.

3.4 Contractor shall take necessary precautions to protect new roofing systems, and adjacent, against damage until substantial completion.

3.5 When determining set-up location, keep well away from fresh air intakes and on adjacent buildings.

3.6 No torches or kettles are allowed on roof without special permission of JHU project representative (a fire protection plan shall also be submitted with the request).

3.7 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.