

## 07000 THERMAL AND MOISTURE PROTECTION

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### 07111 COMPOSITE SHEET WATERPROOFING

#### PART 1: GENERAL

- 1.01 Composite sheet waterproofing shall be provided under concrete topping or with suitable wearing surface in above grade mechanical rooms and any habitually wet areas.
- 1.02 In areas where composite sheet waterproofing is used, the membrane edges shall be turned-up a minimum of 6" and sealed around all penetrations. Connections to walls and parapets shall be through the use of termination bars.
- 1.03 Membrane roofing shall be taken up and over the top of curbs and low parapets.

### 07160 BITUMINOUS DAMPPROOFING

#### PART 1: GENERAL

- 1.01 All foundation walls and below grade walls shall be damp-proofed with a minimum of three layers bituminous damp-proofing and protection board. Damp-proofing shall be back-filled with clean, crushed stone and a continuous drainage tile provided either to lowest point of grade or storm sewer. Foundation drainage systems shall not connect to the roof drainage system prior to the first storm water manhole or collection device.

### 07210 BUILDING INSULATION

#### PART 1: GENERAL

- 1.01 Roof designs must comply with the North Carolina State Energy Code - Volume X and with all other applicable NCSU, federal, state, and local codes and ordinances. Thermal calculations must include the use of aged "R values."
- 1.02 Roof insulation shall have a minimum u value of 0.10. Density of rigid roof insulation shall be sufficient not to fail under roof traffic. Roof insulation must be specified to make up a 'total roofing system' to be warranted by roofing manufacturer.
- 1.03 Drains through decks should have an insulated horizontal leg below the deck.

## 07500 ROOFING MATERIALS

### PART 1: GENERAL

- 1.01 The designer should provide a complete roof plan of each roof area and provide large-scale details clearly indicating relationships between membranes, flashings, counter flashings, expansion joints, all metal work, roof accessories, roof-top equipment, any interruptions of the membranes or flashings, and all penetrations and use of sealants. Call out specific manufacturer's standard details by number, when designing around that manufacturer's system.
- 1.02 The designer should specify the generic roofing material and application system (i.e. solid mopped, ballast, adhered or mechanically fastened), best meeting that specific building's requirements. An experienced and financially responsible manufacturer of that generic roofing system should be chosen as the basis of specifications/details. All detailing and specification items should conform to the requirements of that commercial system, except that the designer may exceed the manufacturer's requirements when in the Owner's best interests.
- 1.03 Specific Manufacturers shall not be specified directly except in the case of an alternate. Specifications shall be written as 'performance-based' only and shall not limit the use of any material or manufacturer meeting the performance criteria specified.
- 1.04 The designer must decide whether any alternates are appropriate or in the Owner's best interests. Alternate/s must meet the base bid specifications, and be listed by manufacturer and material and application method. Do not use the term, "or approved equal."
- 1.05 Roof Designer shall refer to the most recent version of the North Carolina State Construction Office guidelines for Roofing Design Criteria for specific information on use of roofing systems and materials for use on NC State University Buildings.
- 1.06 Special care must be taken when investigating each building's specific roofing needs. Generic roofing type and installation method must be selected to meet those specific, identified needs.
- 1.07 Designer is responsible for conducting structural analysis on all building areas to receive roofing. Roofing systems must be selected to ensure the structural integrity of each roof support system, including all snow and other code requirements.
- 1.08 New roofs should be built with a minimum pitch of 1/4 in/ft.
- 1.09 Replacement roofs should be built with a minimum pitch of 1/8 in/ft.
- 1.10 Roofs of the following bituminous materials shall use the following slope guidelines:

- Type I asphalt - 1/4 in/ft maximum pitch.
- Type II asphalt - 1/4 - 1 1/2 in/ft pitch.
- Type III asphalt - 1 - 3 in/ft pitch.
- Type III or IV asphalt - vertical flashings.
- 1.11 Coal tar pitch and modified coal tar products are to be considered on no-slope roofs and roofs where slopes do not exceed 1/4"/ft. The designer should specify a roofing material that complies with Energy Star Roofing Guidelines on roof slopes between 1/4"/ft and 3"/ft.
- 1.12 Use of a vapor retarder below the roof insulation should be considered where the indoor relative humidity during winter months is expected to exceed 45%. Controlled environments such as art galleries, animal rooms, libraries, some laboratory spaces, refrigerated spaces and natatoriums would meet this criteria.
- 1.13 Use of an air barrier is highly recommended over non-monolithic decks such as concrete/wood plank, steel, etc. A properly installed air barrier prevents excessive wind uplift forces acting on the roofing system, and is required with some roofing systems on certain height buildings.
- 1.14 All rooftop traffic patterns must be identified and the roofing system protected from abuse with the roofing system manufacturer's required walkway materials and installation methods.
- 1.15 Areas where the roof could be damaged by chemical attack should be protected as recommended by each roofing system manufacturer.
- 1.16 Flood testing of completed roofing systems is recommended. Where flood testing of completed roofing systems is appropriate, the Owner's designated representative must be notified in advance for coordination.
- 1.17 All newly added wood blocking must be pressure treated. Specify the type of treatment compatible with each generic roofing material. Treated wood shall not be left exposed.
- 1.18 In roof replacement, all existing wood blocking and other edge securement materials must be checked for anchorage. These must receive additional fastening/modification where required, to provide adequate anchorage, as demanded by the roof system's manufacturer.
- 1.19 All aesthetically sensitive roofing systems and their appurtenant accessories should be designed to complement the building's design, architectural and historical significance.
- 1.20 The designer should demand a contractor warranty of at least two (2) years. The warranty shall cover all materials (insulation, roof membrane, flashings, sheet metal, sealants, and any other roof components used), and workmanship to maintain the roofing system and flashings watertight and weathertight, effective from the date of substantial completion. Contractor must be on site within twenty-four (24) hours to make necessary leakage repairs.
- Likewise, the roofing system manufacturer must provide a 10-year minimum roofing system watertight warranty. A separate, extended membrane weathering warranty (normally for 20 years) should be considered, where available.
- 1.21 Single-ply roofing systems should be chosen with care. Only those materials that have a proven record of success will be specified for the NCSU campus.

- 1.22 Inverted protected roofs (such as IRMA) will only be considered for use with Coal Tar Pitch applications.
- 1.23 Where slate shingles are specified they shall be noted as having a 75 year expected life minimum. Minimum slope for slate shingled roofs shall be 6:12. The contractor shall supply 1 square of replacement slate shingles for future maintenance.
- 1.24 Where asphalt shingles are specified they shall be noted as having a 30- year minimum warranty. Slope for shingled roofs shall be a minimum of 4:12. Shingles shall comply with the latest version of ASTM designations and requirements for fiberglass mat, fire rating and wind resistance.
- 1.25 If architectural sheet metal roofing is specified, it shall be supported by a continuous structural deck. Corrosion-resistant metals shall be specified for roofs having acid emitting vents or fume hoods.
- 1.26 Protection should be provided to single-ply membranes subject to mechanical damage from dropped tools, equipment, or mechanical equipment covers. Likewise, protection should be provided in areas subject to chemical attack from lubricants or exhaust fan emissions.
- 1.27 Roofing designer shall take special consideration to the design, termination and placement of vapor barrier at all penetrations, vents, piping and curbs.
- 1.28 For the replacement of existing roofing systems, the designer shall verify and repair or replace as necessary the vapor barrier to provide a watertight system.
- 1.29 Access to the roof should be through full width stairways or penthouse structures (preferred) rather than roof hatches. This access is mandatory if equipment is located on the roof. If the equipment has large components (fans, motors, etc.), then full elevator access to the roof is required.
- 1.30 Roof drain placement should be symmetrical and no greater than 40 feet apart. Interior roof drains should be accessible with interior cleanouts. The roof drainage system shall not connect with the foundation drainage system prior to the first storm drainage manhole or collection device.
- 1.31 Roofs located under towers taller than 6' shall be protected from damage by falling ice.
- 1.32 Any roof work on existing roofs (such as penetrations) shall be conducted in a manner to ensure a leak-free installation and preserves and maintains any existing roof warranties.

## 07620 SHEET METAL FLASHINGS AND TRIM

### PART 1: GENERAL

- 1.01 Provide flashing pans under all above grade showers.
- 1.02 Provide flashing for all openings in exterior walls.
- 1.03 Provide flashing for all roof drains, floor drains, and scuppers.
- 1.04 Provide flashing and sleeves, 2" above floor, for all openings in laboratory and kitchen floors.
- 1.05 Gutters, down spouts, and all other exposed metal work should be specified for durability and resistance to corrosion, as well as to match existing building metal work.

Sixteen/twenty-ounce copper, lead-coated copper, and Kynar-coated 24 gauge galvanized steel are recommended, depending on each building's specific requirements.

## 07720 ROOF SPECIALTIES

### PART 1 GENERAL

- 1.01 Concrete pavers or pads should be used along pedestrians traffic areas such as the routes used by service mechanics to reach roof-top equipment.
- 1.02 Concrete pavers and splash blocks used on roofs must be specifically made for rooftop use, and of high-density concrete or other approved material for use by roof system manufacturer.
- 1.03 Pavers or pads should be used to stabilize ballast at high wind erosion points.
- 1.04 All equipment to be roof mounted must be approved by the owner. All roof equipment shall be mounted on curbs or raised support frames. Curbs must extend no less than 8" above the finished roof surface and support frames must allow at least 18" clearance from the lowest point of the frame to the finished roof surface.