DIVISION 7 THERMAL AND MOISTURE PROTECTION

GENERAL

The Consultant must consider the effects of environmental design factors; that is, the degenerative forces exerted on roofing systems and wall systems by exterior and interior conditions. These forces include sunlight exposure, rainfall, ice, snow, wind, the chemical environment and the installation environment. The task is to select components that will withstand such environmental factors, integrate these components into a complete system, and integrate Indoor Environmental Quality, Environment and Atmosphere requirements from the current LEED rating system in use.

Building occupancy factors should be considered in the design of roofing systems and wall systems. Humidity and occupancy help determine the necessity for vapor retarders and venting. Any occupancy with a chemical function, such as laboratories, will require special consideration. The system should be designed so that temperature and relative humidity can be controlled. Particular attention must be paid to operating costs.

Thermal and moisture protection materials/products shall contain the maximum amount of recycled content allowed that retains material integrity, contain as much locally harvested and processed or extracted and processed (within 500 miles) material, and FSC-certified content as feasible. Any adhesives or sealants must comply with the maximum allowable VOC requirements as defined by the applicable reference standard (e.g. SCAQMD). Submit product cut sheets indicating recycled content, place of origin, FSC-certified wood content, and VOC levels, as applicable. Track all purchases as a percentage

Density of insulation must be sufficient to allow foot traffic or other traffic on the roof. Resistance to water, liquid and vapor shall be specified. Select and install insulation for reuse in re-roofing.

Specify roof insulation by type and manufacturer. Specify minimum density or compressive strength. Specify roof insulation in order to obtain a "total system" warranty from the roofing manufacturer.

Specify application criteria. The insulation shall be two or more layers, with joints staggered.

Mechanical attachment is prohibited except on a steel metal deck; in this case, mechanically attach the first layer and fully adhere the next.

The Consultant must specify a "Class A" fire rated roof assembly on all University buildings. The assembly shall include both the deck and the insulation systems. Material used shall not contain asbestos.

Architectural metal and structural standing-seam roofing shall have a minimum slope of 4 inches per foot. Copper, lead-coated copper and terne-coated stainless steel are preferred.

Limit the use of exposed fasteners through the panels to end and side panels. Specify systems that do not penetrate the panels. Use continuous no-seam panels. Avoid skylight panels due to problems with leaks, condensation and safety concerns.

EXTERIOR WALL ASSEMBLIES

There are two important factors in designing exterior walls that should be incorporated into the roofing system:

1. Ensure that with the addition of the specified thickness of insulation, tapered insulation and associated crickets and saddles, there is a minimum 8" clear flashing height
2. Precautions should be taken to ensure that water cannot migrate from the exterior walls or curbs into the roofing system

Parapet walls and interior roof curbs should be part of the roof deck, not independent of the roof deck.

Incorporate parapet walls in the building design if possible. This will provide greater resistance to wind up-lift and provide a safer place for maintenance personnel to work. Keep the roof shape as simple as possible.

Two-piece, through-wall flashings should be installed at all masonry walls. Through-wall metal reduces the possibility of water entering the roofing system or building interior through vertical wall cavities. Weepholes should be provided on top of the through-wall metal to allow escape of any water entering the wall above the metal.

The exterior wall assembly or interior curbs shall be independent of the roofing system. Design the assembly so it will not interfere with future re-roofing of the building.

ROOFING

Several factors repeatedly show up during the inspection of roofs that have failed prematurely. They include inappropriate use of materials, poor drainage systems, poor details for installation of roof accessories, damage by construction traffic and poor access to all parts of the roof area. The design of a roof should incorporate these fundamental features: appropriate and proven materials, good drainage and drains, good accessory details, proper protection and good access to the roof and areas around roof-mounted equipment.

RE-ROOFING

Re-roofing projects are basically the same as new construction, except that thorough investigation is needed to determine conditions of the existing building, and projects must consider the condition and usability of existing flashings.

Protect building components from damage during the re-roofing process.

Water shedding roofs with a slope greater than 4" per foot shall be specified whenever practical. Low slope roofs shall be sloped a minimum of ¼" per ft.

Avoid locating long skylights, HVAC units and other obstructions perpendicular to the slope. Furnish crickets where necessary to provide drainage around obstructions. Valleys should not be located over a beam-column line.

DRAINAGE

Do not locate drains adjacent to roof columns, adjacent to walls that support decks or adjacent to walls that are extended to the roof deck. Locate drains symmetrically in order to simplify the tapered insulation design.

OVERFLOWS

Conductor heads should have an overflow port, permitting water to escape if the down-spout becomes obstructed.

Scuppers should be sloped outward and downward. An overflow scupper should be de-signed so that no more than 6 inches of water will accumulate at the inlet if the drain fails to work.

INTERNAL DRAINAGE SYSTEMS

A sump created by tapered insulation should be provided at the drain to lower it below the level of the roof.

Vertical leaders must have expansion joints at the drains if there is any possibility of deck movement. Horizontal leaders must be insulated to prevent condensation from forming and dripping to the ceiling.

Drains and slopes should be shown on a separate architectural roof plan. Key elevations and slope arrows should be given to the roofing contractor.

Mechanical equipment rooms above the lowest floor shall be curbed to prevent flooding. Incorporate ceiling mounted lifting eyes for ease of removal on equipment exceeding sixty (60) pounds installed five (5) feet or more above finished floor. Should ceiling re- strictions exist, design should include sufficient space for using a portable lifting device.

New mechanical equipment rooms (MER's) shall be designed to have access from the outside, via an opening large enough to facilitate the removal of the largest piece (or component) of equipment therein. It is desirable that access by truck be incorporated where possible.

American University requires that the Consultant minimize the visual impact of any equipment that must be located on building roofs. Where placement of such equipment is unavoidable, it shall be designed so that penetration of the roofing system is minimized. Adequate maintenance access shall be provided. Rooftop walkways, access to the roof by a service elevator and other necessary measures shall be included.

Consultant shall provide calculations to confirm structural adequacy from an engineer licensed by the District of Columbia and submit to Owner for review and Project Record. Equipment should not be installed above ceilings. Where this is unavoidable, or where units are installed in concealed locations, there should be auxiliary drain pans independently piped to drains and access panels to allow for full service and equipment removal. Auxiliary drain pans shall be independently supported.

Ample space shall be provided for service access to all equipment, including pulling tubes for converters, chillers and air-handling unit coils.

Lifting eyes shall be provided in equipment rooms in which the moving of heavy equipment is anticipated and for above ceiling equipment.

For renovation projects that involve small equipment rooms, direct access to the rooms from a corridor or a public space is required.

DRAIN TYPE

Drain receivers should be used on metal decks and other types of decks that may need the distributed loading for a secure connection to the deck. Threaded drains do not leak as often as hot-poured or caulked drains.

PENETRATIONS

Minimize penetrations through the roof membrane. Route the penetrations through side walls when possible. Use curbs; do not use pitch pockets. Reference the NRCA manuals for approved details.

ACCESSIBILITY TO ROOF

Walkout access from a stairwell extension is preferred. Access from a penthouse is also acceptable. Doors and hatches providing roof access shall have locks.

Provide hose bibs and electrical outlets on the roof for maintenance purposes. On a large roof, multiple access points at opposite ends will prevent unnecessary backtracking.

When stairways are not required, a roof scuttle shall be provided. It shall be a minimum

2'x 4' in size and have a fixed ladder. Where roof access is frequent and involves moving machinery and equipment, increase the size of the roof hatch to 3” x 5”. Include handrails and hatch restraints. Confirm with American University Risk Management the final layout of ladders, supports, and ease of equipment lifting to minimize employee injury.

DECKING

Deck selection should be made in close regard to the assembly category selected and may often dictate system component type. Because the deck is the foundation of the roof system, consideration for design should be based on stability.

INSULATION – 07 21 00

No other component of a building has a greater influence on the life-cycle costs or greater effect on other building components. Thus, careful thought must be given to thermal insulation, insulation type, location its durability, flammability and formaldehyde content. When renovating or fitting out an existing space, a thorough inspection and careful consideration must be given to the presence or condition of existing insulation to determine what repairs, replacement or new installations are necessary. It is important to ensure damaged insulation is removed and new insulation is properly installed, secured and sealed in accordance with industry standards and the manufacturer’s requirements.

The Consultant in accordance with Energy and Building codes shall determine “R” factors and “U” factors. Do not simply specify that roof insulation must meet a certain "R" or "U" factor for the roof structure; the Consultant should decide on the insulation best suited to the project, make the calculation and specify a thickness that enables the project to meet ASHRAE 90.1 requirements per LEED guidelines of minimum energy performance prerequisite (EAp2) and project building target for optimized energy performance (EAc1).

VAPOR RETARDERS – 07 26 00

Vapor retarders should be used only when necessary, as they tend to hide leaks in a roof system until large areas of insulation become wet. This results in an increase in the size of the damaged roof area, which translates into an increased cost for repairs.

FLASHING AND SHEET METAL – 07 62 00

All flashings should be detailed to permit thermal movement and to shed water "mechanically" by lapping. The detail shall be designed without the use of sealants. Thermal expansion will generally, over time, exceed the performance capacity of most sealants.

Keep the roof "clean" of penetrations and equipment. Do not install a metal roof if there is equipment that needs to be maintained or if there is an excessive number of penetrations planned.

Keep the roof design simple and sustainable. Use continuous panels, if possible, rather

than joining smaller panels using exposed fasteners.

All sheet metal materials should be designed for easy removal without interfering with building operations. No conduit or piping should be attached to coping covers. Where pipes cross over flashings or wall tops, there should be sufficient clearance to permit removal of metal without disturbing the pipes.

All metals used in the roofing assembly shall be of the same type and material. Preferred materials: copper, stainless steel, terne-coated stainless steel and aluminum
.
Mechanical or interlocking joints are preferred to ensure that wide metal sections stay in contact and do not admit water through open laps at metal joints.

Wood blocking attached on the perimeter of the roof must be pressure treated and provided in strict accordance with FM requirements for an I-90 rating.

With the use of metal gravel guards and fascia, temperature movements in heavy gauge metal must be considered. If heavy gauge metal is used, gravel guards should not be heavier than 24 to 26--gauge stainless steel, 16-ounce copper or 30-to 40 mil aluminum in maximum 10' lengths. Hook strips should be one gauge heavier than the fascia.

Gutters should be designed so they can be replaced without damaging the roof edges.

ROOF SPECIALTIES AND ACCESSORIES – 07 7100, 07 7720

If approved by the Owner, roof-mounted equipment must be supported on a properly constructed curb or an elevated metal frame.

Curbs must extend either a minimum of 8 inches above the finished roof surface or above the height of any emergency overflow pipe or scupper. See NRCA Details "IL-2" and "N" for fan curbs and equipment requiring a continuous edge curb.

Metal frames should be used to support heavy equipment or structures above the roof surface. Clearance below equipment shall be as suggested by NRCA Detail "M-1." Provide approved walkway pads up to and around equipment requiring frequent service or inspection. Location of pads to be confirmed by the Owner.

JOINT SEALERS – 07 92 00

Caulking should be reserved for sealing joints in vertical surfaces between relatively stable components of the building. It should not be used where significant water will stand or regularly run across the joint.

END OF DIVISION 7