Compliance: The installation/construction and repair/modification of all roofing/water-protection systems should be in complete compliance with the current revision of the *NRCA Roofing and Waterproofing Manual.* This manual shall be viewed as the "final authority" for establishing the minimum requirements for roofing and waterproofing systems. The requirements of these *Guidelines* often exceed the minimum requirements of the *Manual*. When they do, they should be complied with. Additional technical information is found in the *Division 07 Technical Sections* of these *Standards.* Once a roofing system has been selected, use the appropriate technical sections.

Warranty Requirement: Require completed roofing installation to be warranted by roofing installer and primary roofing products manufacturer against defects in materials and application for the time period mentioned below.

Pre-Award Approval of Roofing Installer and Guarantee: Observe requirements contained in UNL Standard Instructions to Bidders regarding submittal of written confirmation by roofing/membrane manufacturer that roofing installer identified by bidding contractor is an "approved applicator" for the roofing system specified and that the manufacturer will guarantee the roof as required by the Bid Documents for the period specified.

Sloped Roofs:

1. ***Slate Roofing:*** Slate roofing is the preferred option for sloped roofs. All valleys on slate roofs should be of open, sheet-copper construction. The weight of the copper sheeting should be a minimum of 16 OZ./SF. Some synthetic composite substitutes for slate are also permitted. This should be discussed with NU FPC prior to design.

2. ***Metal Roofing:*** Some metal roofing systems are also allowable. In order to be considered for approval, a metal roofing system must be warranted for leak-tightness for a minimum of 20 years.

3. ***Shingle Roofing****:* Asphalt shingle roofs are permitted if approved by the University Project Manager. Slopes on asphalt roofs shall not be steeper than 8;12 nor flatter than 3:12. Shingle roof systems shall be Class A fire rated and shall pass ASTM D7158 Class H, 150 MPH, and shall pass ASTM D3018 Type 1, ASTM D3161 Class F Impact Resistance. Shingle roofs shall be vented in the soffits and in the ridge vents providing ventilation that exceed code minimum requirements. Shingle roofs shall have a lifetime warranty with 10 years none prorated.

4. ***Underlayment:*** A minimum of one layer of No. 30, non-perforated, Asphalt saturated, organic felt conforming to ASTM-D-226, Type II shall be installed beneath all sloped roofing systems.

5. ***Ice Dam Protection:*** Additional ice dam protection shall be installed Per IBC. It shall extend up the roof from each of its lower edges to a point 24" inside the exterior wall line of the building (as a minimum). Ice dam membrane shall also be provided at eaves, rakes, hips, ridges, penetrations, etc.

Flat Roofs:

1. ***Membrane Systems:*** A fully adhered, 60 mil, EPDM membrane system is the standard flexible membrane system for use on University buildings. A fully adhered 60 mil, Thermoplastic Polyolefin (TPO) is acceptable if approved the NU FPC. These systems must have a 20 year warranty, minimum.

   PVC membrane roofs are not allowed.

2. ***Built-up Systems:*** A four-ply asphalt system is the preferred built-up roofing system. Modified-bitumen cap sheets are acceptable but are not preferred. These systems must have a 20 year warranty, minimum.

3. ***Insulation:*** Polyisocyanurate board/sheet type insulation should be used with all roofing systems. Sheets should be 4 x 4 ft. maximum dimensions, should be installed with joints staggered and should be a minimum of 2 layers deep. Joints should be butted tight, with a maximum gap of 1/8".

4. ***"U"-Factor:*** Roof insulation shall provide an average "U"-factor of not more than 0.08 for the roof assembly.

5. ***Slope:*** A slope of ¼" per ft. (minimum) is required on all flat roofs. Sloping the deck is preferred to sloping the insulation.

6. ***Pitch Pockets:*** Do not permit the use of pitch pockets. All equipment, pipes, walkways, and other rooftop appliances such as masts, antennas or satellite dishes, shall be mounted on flashed curbs or pipe pedestals.

7. ***Layout:*** Keep shape of roof areas as simple as possible. Use curbed roof relief and/or expansion joints to divide roof into rectangular shapes.

8. **Flashing/Counterflashing:** Require the use of two-piece counterflashing assemblies which allow the removal of the counterflashing flanges to facilitate removal and replacement of the base flashing.

9. ***Overflow Drains and Scuppers:*** On each roof areas containing roof drains, overflow drains or overflow scuppers shall be provided. Overflow drains shall have the same capacity as the roof drains and be located with the inlet flow line 2 inches above the low point of the roof area. Overflow scuppers, if used, shall have an area three times that of the roof drains serving the roof area and have an opening height of not less than 4 inches. The overflow scuppers shall be located with the inlet flow line 2 inches above the low point of the roof. Overflow drains and scuppers shall not be connected to the storm drain lines but discharge to an appropriate location on the exterior of the building.

Roof Replacement: When a roof replacement is undertaken, the load bearing capacity and structural integrity of the roof should be reviewed. Structural repairs/upgrades should be accomplished in conjunction with the roof replacement project as appropriate. The same is true of the roof drainage system.

Roof Mounted Equipment: Each piece of roof-mounted equipment should be installed on an approved box curb that is appropriately flashed into the roofing system. Otherwise, it should be supported to provide a minimum of 3' of clear space between the surface of the roof and the bottom of the equipment support structure to facilitate roof maintenance and replacement.

At the time of roof replacement, existing equipment shall be evaluated. Equipment that is no longer used shall be removed, along with associated curbs, piping, pipe supports, etc.

Green Roofs: It is the preference of the University of Nebraska-Lincoln that storm water detention and heat island effect be dealt with in ways other than putting a green roof on a building. In the event that a green roof is still chosen, some design issues to consider are the following:

1. ***Access:*** Provide direct access onto the roof by means of a door that discharges from an upper level on to the green roof level. This is to accommodate grounds workers for maintenance of plants. Access by means of a ladder shall NOT suffice.

2. ***Fall Protection:*** Provide a parapet that is an extension of the building wall, high enough to meet OSHA requirements for fall protection.

3. ***Existing Building:*** For an existing building that does not have a parapet, provide a perimeter guard rail that complies with OSHA requirements.

4. ***Plant Selection:*** Plant selection shall be approved by an F&S horticulturist. Species shall be chosen to require the minimum amount of maintenance and care.