These guidelines are updated periodically and users are encouraged to check this site as needed for the most current edition. Comments and suggestions concerning improvements to this section of the guidelines may be submitted to the following: cdaaroe@uncg.edu or m_takacs@uncg.edu.

07100. WATERPROOFING

1. GENERAL

1.1 Provide waterproofing at the following locations:

1.1.1 Vertical walls below grade
1.1.2 Plaza decks and elevated walkways
1.1.3 Floors of all mechanical rooms located above other occupied areas
1.1.4 Toilets, housekeeping closets, shower rooms, and around all floor drains except when located in a slab-on-grade
1.1.5 Utility tunnels and vaults

1.2 Waterproofing systems should be designed with the following performance requirements in mind:

1.2.1 Be compatible with the substrate to which it is applied and achieve complete adhesion to it
1.2.2 To perform in a constantly wet environment
1.2.3 Have the durability to withstand subsequent construction activity
1.2.4 Accommodate anticipated structural movement of the substrate(s) to which it is applied

2. QUALITY ASSURANCE

2.1 The manufacturer of the waterproofing material shall submit a letter stating that the applicator has been approved to apply the waterproofing system specified.

2.2 The suitability of the substrate upon which the waterproofing system is to be installed must be remediated prior to installation of the waterproofing system.

3. GUARANTEE

Waterproofing systems shall be guaranteed for a minimum of two years. The Contractor shall agree to repair or replace work that fails to perform due to failures of materials or workmanship.

4. FOUNDATION DRAINAGE

4.1 Provide foundation drainage for all exterior walls where floors are below grade.

4.2 Provide positive slope for all foundation drainage connected to the storm drainage system.

4.3 Do not connect downspouts to foundation drainage systems.

07216. INSULATION

1. INSULATION

1.1 When specifying insulation, the Designer should make the calculation for "R" factors, "U" factors, and "K" factors and specify the type and thickness of the insulation required, not simply specify that the insulation meet those factors. The Designer should use in-service "R" values where applicable.

1.2 The Designer should specify the application requirements for insulation. Roof insulation, when used for the control of heat flow, should be installed in two or more layers with joints staggered.

2. INSULATION ASSEMBLY

The final thickness of the insulation assembly should be calculated in the overall design of the roofing system in order to comply with the minimum 8 inch clear flashing height above the finished roof surface.

3. INSULATION DENSITY

The density of insulation for roofing systems must be sufficient to allow for foot traffic and have a high compressive strength, rigidity and impact resistance. The insulation must be moisture resistant and dimensionally stable.

4. INSULATION COMPONENTS

Roof insulation, cover boards, fasteners/adhesives are to be considered components of a total system assembly and must be specified as part of, and included in, the total system warranty issued by the roofing manufacturer.

07300. ROOFING GENERAL REQUIREMENTS

Updated: December 23, 2014

1. DESIGN CONSIDERATIONS

1.1 UNCG endeavors to maximize the life and performance of new roofing systems by specifying high quality, proven materials that are appropriate for the specific application; designing roofs with simplified drainage systems of adequate capacity and slope; designing sound, functional details; incorporating quality accessories and flashing materials; and, providing access for future maintenance and replacement of the roof and rooftop-mounted equipment.

1.2 Careful consideration should be given to the following criteria:

1.2.1 Building and roof life expectancy
1.2.2 Thermal requirements
1.2.3 Solar Reflectance Index (SRI)
1.2.4 Positive slope and dependable drainage
1.2.5 Fire, wind and impact resistance
1.2.5 Ease of maintenance

1.3 For new buildings, pitched roofs are strongly preferred over low-sloped roofs. If low-sloped roofs are provided, the incorporation of parapet walls into the design is preferred as an edge treatment both for the control of water run-off and safety of maintenance personnel. Gravel stop edges and low parapets less than 42 inches should be avoided.

1.4 Green roofing systems are recognized for their social, aesthetic and environmental benefits. Consult with UNCG before proposing the use of “green” or “pre-vegetated” roof systems to determine if the location is appropriate.

1.5 Avoid installation of roof-mounted equipment. Install air-handling equipment in attic spaces of steep-sloping roofs.

1.6 Details at roof-to-wall intersections should allow for adequate flashing heights and future maintenance. Minimum flashing heights of 8 inches above the finished roof surface should be maintained at all walls, curbs, roof penetrations, and under windows directly adjacent to roof surfaces.

1.7 Storage of Materials

Roofing felts, membranes and insulation are to be stored in a dry trailer or building. Roofing felts or insulation, which become wet must be removed and replaced. Wet materials shall not be dried and used. Wetted membrane must be evaluated to determine the effect on adhesion, lap seals or blister potential. Remove any such material if there is any possibility of failure.

2. REFERENCES AND CODES

All new roof and reroofing projects shall comply with the applicable building codes and guidelines described in the latest edition of the following publications:

- North Carolina Construction Office's "Roofing Design Criteria"
- N.C. Building Code
- NRCA Roofing and Waterproofing Manual
- SMACNA Architectural Sheet Metal Manual
- UL and FM Manuals
- Asphalt Roofing Manufacturers Association Manuals
- Steel Deck Institute Roof Deck Design Manual
- Copper Development Association Manual
- Copper and Common Sense Publication by Revere Copper, Inc.
- "The Slate Book" as authored by Brian Sterns, Alan Stearns and John Meyer

3. REROOFING

3.1 Reroofing projects should integrate the same criteria used in new roof design. In addition, the pre-design work for reroofing should include a detailed examination and evaluation of the existing roofing system and its deficiencies, the existing roof deck and below deck conditions, the existing drainage system, and the usability and/or limitations of existing flashings.

3.2 Reroofing over an existing roof is prohibited except in special conditions.

3.3 When an existing roof is to be removed, the Contractor shall remove no more than can be dried-in during the same day. Care shall be taken to keep materials from blowing off the roof and littering surrounding areas. The roof shall be watertight at the end of each work period and when rain threatens.

3.4 Existing roof-mounted equipment that is abandoned should be removed and the roof deck properly repaired.

4. DESIGN COORDINATION

It is the University's preference that a Registered Roof Consultant (RRC) be engaged as part of the project design team. At a minimum, the design of any roofing system shall be reviewed by an approved Registered Roof Consultant.

5. DRAWINGS

5.1 Providing adequate number of well conceived, fundamentally sound details that accurately illustrate how all of the components of the roofing system interface is critical for a successful roofing project.

5.2 Provide details that clearly illustrate membrane and sheet metal flashings, drains, terminations, junctions, corners, transitions, penetrations, joints, etc. for each unique condition. Isometric drawings shall be provided for complex assemblies.

5.3 In order to adequately communicate information to Contractors, UNCG prefers the scale of roof details to be 3" = 1'-0".

6. ROOFTOP ACCESSIBILITY

6.1 Provide adequate, permanent access to all roof areas from the building interior. Walk-out access by way of stairwell extensions or via penthouses is preferred. Door thresholds should allow for continuation of adjacent wall and counter flashing under the door sill. When these options for roof access are not practicable, a roof hatch should be provided. The hatch should be a minimum of 2' x 3' and have a fixed ladder.

6.2 From the rooftop, permanent, exterior ladders may be provided to connect different roof levels. The bottoms and upper walk-through platforms of ladders should be designed to keep them from interfering with proper flashing of the roof. Ladders longer than 20 feet must be caged in accordance with requirements of the federal Occupational Safety and Health Administration (OSHA).

6.3 On low-rise buildings, ladders that extend from grade to the rooftop are discouraged.

6.4 Roof access through windows is unacceptable.

6.5 Doors and hatches providing roof access shall be lockable.

7. ROOF DECKS

7.1 The roof deck should be chosen on the basis of suitability to provide structural support, dimensional stability, and fire resistance for the roof assembly. Additionally, it should be designed with adequate attachment to the building structure, accommodate slope and drainage, limit deflection due to concentrated and uniform loading, and allow for building and roof movement.

7.2 The Designer shall inspect and approve the roof deck construction prior to the installation of the roofing system.

8. DRAINAGE DESIGN FOR LOW-SLOPED ROOFS

8.1 All buildings shall have a positive means of conducting rainwater from the roof to an underground storm water system. Designer to confirm invert elevations of

existing storm water pipe and manholes that will receive the rainwater from the roof.

8.2 Drains and slopes should be shown on a separate architectural roof plan. Key elevations and slope arrows should be given.

8.3 The consultant should not simply specify a standard per-foot slope, but should make provisions in the design for complete, positive drainage throughout the entire roof area.

8.4 All roofs shall be designed to have positive drainage equivalent to ¼" per foot slope after all loading deflections or camber of the roof deck are calculated. Overly complex roof geometries that result in complicated drainage layouts should be avoided. "Four-way" slope should be utilized to the greatest extent practicable. The use of saddles and crickets should be minimized. However, when required, properly calculated tapered saddles should be designed between drains, and crickets should be designed on the upslope side of mechanical, skylight and other curbs to promote drainage of these areas. Ponding water is not acceptable.

8.5 Structural slope is preferred over the use of tapered insulation systems to provide drainage.

8.6 Primary drains and scuppers should be recessed, or sumped below the roof membrane surface.

8.7 Drainage Type

8.7.1 Internal drainage systems are preferred for low-sloped roof systems.

8.7.2 The use of external drainage systems (gutter and downspout) for low-sloped roofs is discouraged, and requires prior approval of the University.

8.8 Drainage Capacity

8.8.1 Primary and secondary roof drainage capacities shall be carefully calculated to meet or exceed the prevailing building and plumbing codes.

8.8.2 Each major roof section should have at least two drains, or four per 150 squares of roof area.

8.8.3 Minimum size of drains and drain piping shall be 4-inch diameter.

8.9 Overflows

8.9.1 Overflow drains should not be located in drain sumps.

8.9.2 Scuppers shall be sloped outward and downward.

8.9.3 The scupper length should not be less than four times the calculated head of water and not less than 6 inches.

8.9.4 The bottom of the scupper should be no more than 4 inches above the lowest roof surface.

8.10 Drain Type

8.10.1 Cast iron body with cast iron dome shall be used. The drains strainer should be easily removable and its top must extend at least 4 inches above the adjacent roof surface.

8.10.2 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.

9. EXTERNAL DRAINAGE SYSTEMS FOR STEEP-SLOPED ROOFS

9.1 When designing external drainage, the consultant shall follow the recommendations for materials, gauges, shapes, and details published in the SMACNA Architectural Sheet Metal Manual. Reference to this manual in the contract documents shall not be a substitute for appropriate specifications and details.

9.2 Downspouts shall be securely fastened to the vertical plane, emptying at grade, into a cast iron boot with an integral clean out and connected to the storm water system.

9.3 Conductor heads, when used, should have an overflow port permitting water to escape if the downspout becomes obstructed.

10. FASTENERS

10.1 Fastening requirements for all insulation and overlay boards must be illustrated and/or specified, including density for the “field” and any required increases for perimeter and corner attachment.

10.2 Fasteners and flashing patterns shall be approved by the roofing manufacturer for the application and system rating. Pullout tests may be required for some deck types.

10.3 If unique tools or specific installation techniques are necessary to properly install fasteners, a pre-installation meeting or training session held with the Contractor and the manufacturer's technical representative should be required.

10.4 Fasteners should be corrosive resistant and meet or exceed FM Specification #4470.

11. PENETRATIONS AND MECHANICAL CURBS

11.1 The Designers shall make every effort to minimize penetrations through the roof membrane. Alternate routing for pipes, conduit, etc. that utilize side wall penetrations and alternate methods such as sheet metal enclosures shall be used when possible.

11.2 The structural design of the roof deck should allow for the concentrated loading of mechanical equipment.

11.3 Mechanical equipment housings must be watertight and insulated. The installation of drainage piping is encouraged to direct equipment discharge water to adjacent roof drains, primary scuppers, or self-draining roof perimeters.

11.4 The maximum amount of space available (a minimum of 12 inches) should be provided between mechanical units, perimeters, penetrations, walls, drains, etc. to allow for the proper installation of roofing materials.

11.5 The use of "pitch-pockets" or "pitch-pans" around projections is discouraged because they necessitate maintenance.

12. PIPING AND CONDUIT SUPPORTS

Piping and conduit shall be supported by pre-manufactured pipe supports, not pressure treated lumber. Samples of each type of support shall be submitted for approval.

13. BUILDING MAINTENANCE SYSTEM

13.1 The Designer should consider including in the design of all new and reroofing projects a building maintenance system(s) for the protection of workers and maintenance personnel.

13.2 Building maintenance systems should be installed in accordance with OSHA requirements.

14. TESTING

For re-roofing projects, all roof drains shall be tested prior to tear-off of the existing roof and at the completion of the new roof to insure proper operation of the drains. Testing shall be done in the presence of the consultant and the Owner's representative.

15. GUARANTEE

The Contractor shall be responsible for all repairs of water damage to the building, including furnishings, occurring during the construction phase of the project. The Designer shall survey, in the presence of the Owner and Contractor, existing water damage prior to construction and prepare a written and photographic record of this survey with copies distributed to both the Owner and Contractor. The Contractor shall be responsible for all damage not so documented.

07310. SHINGLES AND ROOFING TILES

1. Natural slate shingles, clay or concrete roofing tiles are preferred. Fiberglass and asphalt composition shingles are to be avoided.

2. Provide asphalt-saturated organic felt underlayment, un-perforated, 30 lb. minimum.

3. Provide 16 oz. lead-coated copper flashings for hips, ridges and valleys.

4. Provide copper or stainless steel slating nails of appropriate gauge and length such that the point of the nail penetrates through the roof deck except where the underside of the roof deck is exposed to view, where shorter nails may be used.

5. Match existing tiles and shingles on reroofing projects.

6. Install shingles and tiles in accordance with the National Roofing Contractors Association.

7. Snow/ice protection will be specified and detailed on drawings at building perimeters and entrance to prevent snow/ice slides off of sloped roofs. Spacing of guards will be per manufacturer's recommendation. Acceptable materials are copper and stainless steel.

07400. METAL PANELING ROOFING

1. SYSTEM DESIGN CONSIDERATIONS

1.1 The minimum slope for non-structural, architectural metal roofing is 4 inches per foot.

1.2 Apply architectural metal roofing panels over a solid substrate (roof deck) with an appropriate underlayment.

1.3 Condensation is a critical factor when designing metal roofing systems. Careful consideration must be made when evaluating the performance criteria and placement of vapor barriers, insulation, and underlayment used as part of the system. Ventilation between the underside of the metal panels and the substrate is recommended because of the potential for condensation on the underside of roof panels. In addition to ventilation, certain metals may necessitate the use of underside coatings on the panels.

1.4 Provide one piece, single length panels where possible.

2. PANEL SEAMING

2.1 Traditional double interlocked standing seams or mechanically seamed panels are preferred.

2.2 Batten seamed and flat-locked soldered seams may be considered when matching those traditional panel types on existing buildings.

3. PANEL MATERIALS

Panel and trim materials may be made of aluminum, aluminum-zinc-coated steel, copper, lead-coated copper, terne-coated stainless steel or zinc. The Designer will discuss with Facilities Design and Construction various options most suitable for specific project issues and applications.

4. PANEL CLIPS, FASTENERS, TRIM AND ACCESSORIES

Provide all components required for a complete sheet metal roofing assembly including trim, copings, fascia, corner units, ridge closures, clips, flashings, sealants and similar items.

5. SINGLE SOURCE

Roofing panels, clips, closures, and other accessories must be the standard products by the same manufacturer.

6. UNDERLAYMENT

Select proper underlayment or combinations of underlayment materials. Consider self-adhering modified bitumen underlayment for ice dam protection and at ridges, hip, valley, and sidewall locations. The use of self-adhering modified bitumen underlayment over an entire roof area is normally not recommended. The higher protection value of low-perm underlayment used continuously over the roof area must be measured against its vapor retarding effect. Care should be used to insure that condensation problems are not created with this type of application.

7. WARRANTIES

7.1 Watertight Warranty – Furnish the roof panel manufacturer's non-prorated, 20-year no dollar limit warranty, guaranteeing that the complete system will be watertight and free from leaks.

7.2 Color/Finish Warranty – Manufacturer's 20-year no dollar limit warranty for the factory color finish (if applicable) warranting against color change, cracking, peeling or delaminating.

7.3 Roof System Installer warranty – Roofing installer's 2-year warranty against leaks and defective workmanship.

07600. METAL FLASHING, TRIM, DOWNSPOUTS

1. Design, fabrication and installation of new flashing and sheet metal work should provide a permanently watertight condition.

2. Flashings, trim, gutters and downspouts should be designed and installed in accordance with the current edition of the SMACNA Architectural Sheet Metal Manual.

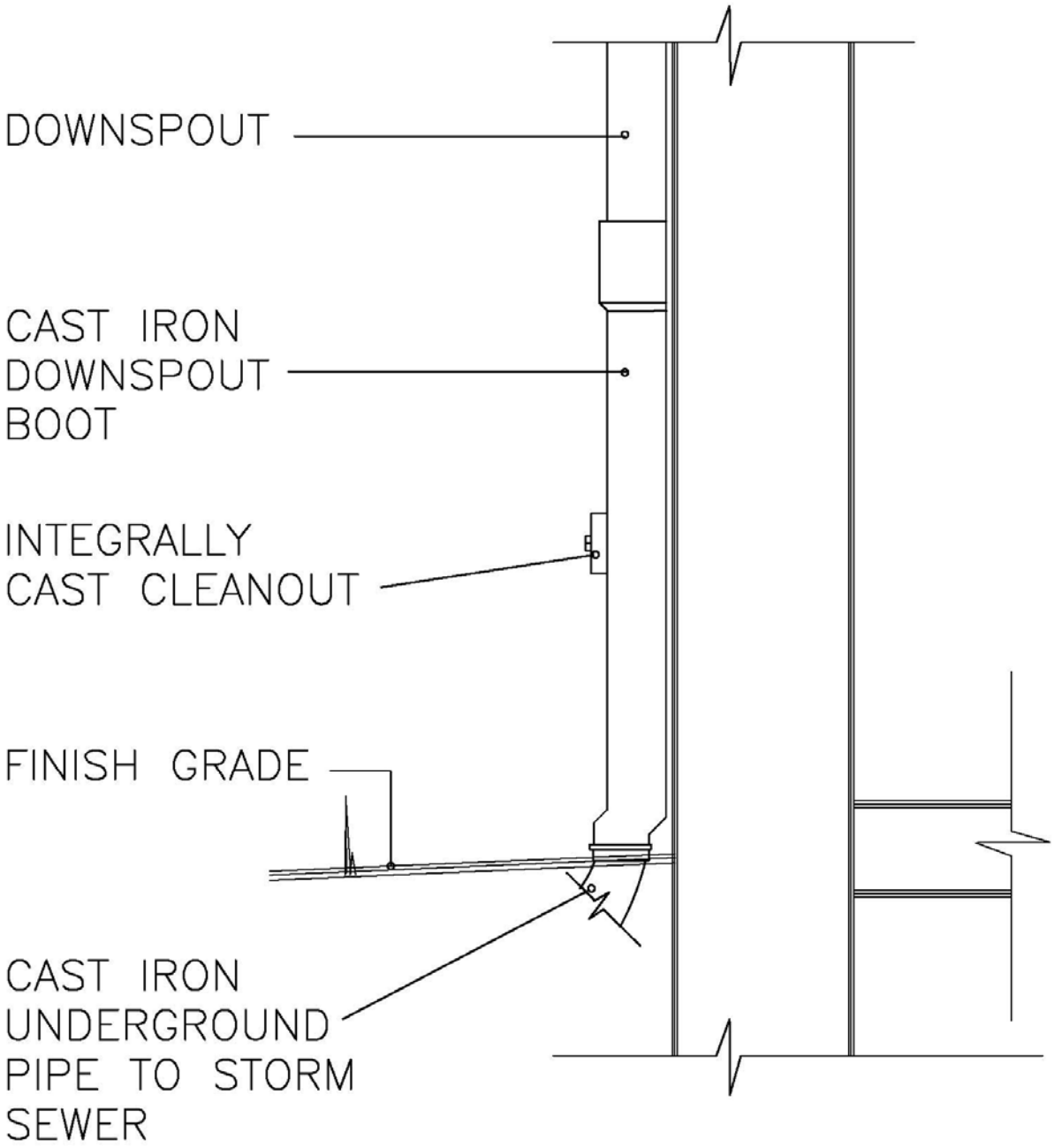
3. The basis of design and materials for all flashings, trim, downspouts and gutters should be reviewed with the University during design development on a case by case basis for each project.

4. Downspouts should be sealed at the bottom with a cast iron boot and have a slip joint on the lower 10' section to allow removal from the boot for cleaning.

5. Downspouts and underground pipe (new and existing) must be tested by the Contractor with a fire hose at the completion of roof work. Facilities Operations will provide the hose and the test must be done in the presence of Facilities Operations personnel.

6. Screens must protect the tops of all downspouts.

7. A cast iron boot should be used as a transition from the metal downspout to the underground storm water piping system to prevent damage to the exposed downspout. The boot should be constructed with an integral cleanout and brass screw-on cover for ease in rodding the underground portion of the drain pipe. The cast iron boot must match the size and shape of the downspout. (See diagram below.)



07901. SEALANTS

Updated: December 23, 2014

1. The University prefers silicone joint sealants for continuous weatherproof and airtight results throughout the building envelope.

    1.1 Provide one-part, non-sag, neutral-cure, medium modulus, UV-resistant, high-performance silicone sealant for glazing and general weathersealing applications.

    1.2 Provide one-part, non-sag, neutral-cure, low-modulus/ultra-low-modulus, UV-resistant, high-performance silicone sealant for high-movement expansion and control joints.

2. Provide acoustical sealant for applications consistent with the materials and conditions required to meet the design criteria for the project.

3. Provide cylindrical sealant backings, bond-breaker tape, masking tape, primers and wall coatings compatible with sealant manufacturer's current written instructions for optimum sealant performance.

4. Provide traffic grade sealants for exterior on-grade surfaces and elevated structures appropriate to the specific application.

5. The Designer should include field-adhesion testing in the construction documents to ensure proper quality control of sealant installations.

6. All sealants used on the interior and exterior of the building must comply with the VOC requirements of South Coast Air Quality Management District Rule 1168.